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Portable rigid plastic hermetic grain silo —Specification

EAST AFRICAN COMMUNITY

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Copyright notice

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC 066, *Packaging*

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

Portable rigid plastic hermetic grain silo —Specification

1 Scope

This Draft East African Standard specifies the requirements, methods of sampling and test for portable rigid plastic hermetic silos used for storage of dry food commodities, derived products and seeds where controlled conditions of moisture and oxygen is a requirement

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1663, *Rigid cellular plastics — Determination of water vapour transmission properties*

ISO 4591, *Plastics -- Film and sheeting -- Determination of average thickness of a sample, and average thickness and yield of a roll, by gravimetric techniques (gravimetric thickness)*

ISO 2556, *Plastics -- Determination of the gas transmission rate of films and thin sheets under atmospheric pressure -- Manometric method*

ISO 1926, *Rigid cellular plastics -- Determination of tensile properties*

ISO 8256, *Plastics — Determination of tensile-impact strength*

ISO 10193, *General use light gauge metal containers -- Nominal filling volumes of round cylindrical and tapered containers of up to 40 000 m*

ISO 1183-1, *Plastics -- Methods for determining the density of non-cellular plastics -- Part 1: Immersion method, liquid pyknometer method and titration method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1998 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp.

3.1
water vapour transmission rate
quantity of water vapour transmitted through unit area of a test specimen in unit time under specified conditions of temperature, humidity and thickness

3.2
oxygen transmission rate (OTR)
quantity of oxygen transmitted through unit area of a test specimen in unit time under specified conditions of temperature, humidity and thickness

3.3
batch
silos of the same design and type produced from the same grade of polymer by the same converting unit in a given period of time

3.4
closure
device that effectively closes and seals an opening in a silo

3.5
brimful capacity
volume of grains held by the silo when filled to the point of overflowing at 25 °C ± 2 °C, while standing on a level surface

3.6
nominal capacity
volume of grain the silo is intended to hold at 25 °C ± 2 °C

3.7
container mass
mass in grams of a fully finished empty silo excluding the top closure

3.8
dried food commodity
grains (cereals, pulses, nuts) and other dried food products whose moisture content is within acceptable limits as specified in the relevant product Standards

3.9
derived products
processed products from grains and other dried food commodities

3.10
rigid plastic hermetic grain silo
potable storage structures that are made of non-flexible material (LLDPE and HDPE) used for storage of dried food commodities that limits exchange of oxygen, Carbon dioxide and Water vapour with the environment when sealed

4 Requirements

4.1 General requirements

4.1.1 Materials

4.1.1.1 Portable rigid plastic hermetic silos shall be made from food grade material that shall be UV stabilized.

4.1.1.2 The silo shall retain its colour through the life-span.

4.1.1.3 Any additives such as plasticizers, antistatic agents, pigments, and inhibitors, shall be compatible with the polymer and shall not deleteriously affect the grains and other products.

4.1.1.4 Resins and articles intended to come into contact with dry food commodities and their derivatives shall be manufactured in compliance with Good Manufacturing Practice so that under their normal or foreseeable conditions of use, they do not transfer constituents to foodstuffs in quantities that are harmful to humans.

4.2 Construction

The body and the bottom of the silo shall be integral, i.e. moulded into one piece. The closure shall be firmly secured on to the barrel of the silo to ensure hermeticity.

4.3 Finish

4.3.1 Both the inside and outside of grain silo shall be free from pits and flashing, and pigmentation shall be evenly distributed.

4.3.2 The body of the silos shall be smooth and shall have no sharp edges and any other imperfections.

5 Specific requirements

When tested in accordance with the methods specified in Table 1, Portable rigid plastic Hermetic silo shall comply with the requirements specified therein.

Table 1 — Specific requirements for Portable rigid plastic Hermetic silo

S/No.	Characteristic	Requirements	Test method
a)	Water vapour transmission rate (WVTR), (g/m^2/day),max.	10	ISO 1663
b)	OTR, (cc/m^2/day),max.	250	ISO 2556
c)	Thickness of the walls, mm, min	4	ISO 1663
d)	Tensile strength at break, MPa min.	22	ISO 1926
e)	Air tightness	shall not decay by 10%.	ASTM E 2930
f)	Drop test	Shall show no splitting, cracking, permanent distortion or other signs of failure.	Annex A
g)	Impact Strength	Shall show no splitting, permanent distortion or other signs of failure.	ISO 8256
h)	Density of the finished product (polymer material),g/mm^3min	0.935	ISO 1183-1
i)	UV stability	The tensile strength shall not deviate by more than 10 %	ISO 4892-3
j)	Colour fastness	Shall not be less than 4, on the grey scale	ISO 4892-3

6 Food grade requirements

6.1 Overall migration

When tested in accordance with method specified in Annex B, the hermetic storage bag shall also comply with the overall migration limits. 60 mg/kg (max.) of the foodstuff; and for liquid foodstuffs or of simulants, the limit shall be 60 mg/l (max.).

6.2 Pigments, colorants and heavy metals

When tested in accordance with Annex C, the hermetic storage bag shall comply with the list and limits of the pigments, colorants and heavy metals specified therein.

7 Capacity

When tested in accordance with Annex E, the capacity of the silos shall be as declared with a tolerance of ± 2 %.

8 Labelling

The silos shall be legibly and indelibly marked with the following information.

a) manufacturer's name and address /or registered trade mark.

b) name, "Portable rigid plastic Hermetic grain silo"

c) nominal capacity in in Kg as dried maize equivalent, e.g. 360

d) tare weight of the Silo with lid in kg.

e) batch number or code

f) instruction for correct use,

g) instruction for storage and disposal

h) the declaration, 'Country of origin.

9 Sampling

Portable rigid plastic Hermetic silo of shall be done as follows;

9.1 Lot

9.1.1 All Portable rigid plastic Hermetic silos of the same raw material, same type, size and produced under relatively uniform conditions of manufacture shall constitute a lot.

9.1.2 Sampling shall be done randomly from the lot

9.2 Sample size

The sample size shall be determined in accordance with table 2.

Table 3 — Determination of sample sizes

Sl. No.	Lot size	Sample size	Acceptance number
a)	Upto 50	1	0 failure
b)	51 to 200	2	0 failure
c)	201 to 300	3	0 failure
d)	301-500	5	0 failure
e)	501 and above	8	1 failure

Annex A
(normative)

Drop test

A.1 Principle

The drop test is used to determine the ability of the silo to withstand rough and sudden drop from a height.

A.2 Procedure

Fill the silo with sand or any other weight to designated load. Elevate it to a height of 3 m ± 0.05 m, keeping it in a vertical position. Drop it from this position in such a manner as to fall freely and to strike the concrete floor. Repeat the test three times.

After each drop observe any physical damage to the silo.

Annex B
(normative)

Determination of overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs — Method of analysis

B.1 Principle

This annex specifies the methods of analysis for determination of overall migration of constituents of single or multi-layered heat-sealable films, single homogeneous non-sealable films, finished containers and closures for sealing as lids, in the finished form, preformed or converted form.

B.2 Simulants

The determination of migration in simulants is carried out using the simulants listed below:

B.2.1 Simulant 'A' – Distilled water or water of equivalent quality.

B.2.2 Simulant 'B' – 3 % acetic acid (*w/v)* in aqueous solution (using the simulant 'A')

B.2.3 Simulant 'C¹' – 10 % ethanol (*v/v)* in aqueous solution for foodstuffs having alcohol less than 10 % (*v/v)* (using the simulant 'A')

B.2.4 Simulant 'C²'- 50 % ethanol (*v/v)* in aqueous solution for foodstuffs having alcohol more than 10 % and less than 50 % (*v/v)* (using the simulant 'A').

B.2.5 Simulant 'D' – *n*-heptane – shall be freshly distilled before use.

B.2.6 Simulant 'E' – Rectified olive oil or mixture of synthetic triglycerides or sunflower oil.

B.3 Selection of standard test conditions and simulants for different foods

The choice of simulating solvents and test conditions (time-temperature) depends on the type of food and condition of use of food products. Food products have been classified into seven major groups as per Table B.1. It also gives suitable simulants to be used for different types of foods.

Table B.1— Classification of foods and selection of simulant

Sl no	Type	Description	Example	Simulant
i)	1	Aqueous, non-acidic foods(pH >5) without fat	Honey, mineral water, sugar syrups, skimmed milk, infusions, yeast paste etc.	'A'
ii)	2	Aqueous, non-acidic foods(pH ≤5) without fat	Fruit juices, squashes, fruit chunks or puree or paste, vinegar, jams, jellies, carbonated beverages, lemonade, processed vegetables, rennet, preparations of soup, broths, sauces, RTS beverages etc.	'B'
iii)	3	Alcoholic Beverages: a) Alcohol concentration less than 10 % b) Alcohol concentration above 10 %	 Beer and some pharmaceutical syrups Wine brandy, whiskey, arrack and other alcoholic drinks	'C[1]' 'C[1]'
iv)	4	Oils, fats and processed dry foods with surface fat or volatile oil	Vegetable oils, ghee, vanaspati, cocoa butter, lard biscuits, spice powder, snacks and savoury, chocolate, caramels, malted foods, egg powder, tea, coffee powder, confectionery, fried and roasted nuts	'D'
v)	5	Non-acidic foods(pH>5) or high fat and having high moisture content	Butter, bread pastry, milk based sweets, ice-cream, moist and fatty confectionery products	'A and D'
vi)	6	Acidic foods(pH<5) or high fat and having high moisture content	Pickles, ketchup, cheese, with low curd, fresh and processed meat and fish products, sauces having fat, frozen foods, mayonnaise etc.	'B and D'
vii)	7	Dry processed foods without fat	Cereals and pulses, dehydrated vegetables and fruits, dried yeast, corn flakes, salt, sugar, milled products, barley powder, oats, vermicelli, spaghetti etc.	No end test

D.4 Table B.2 lists the simulants and tests conditions (time-temperature) for extractability studies to be carried out as above depending on the type of food and conditions of use.

Table B.2 — Simulating solvents for different types of food and temperature – Time conditions

Sl No	Conditions of use	Type of food	Water(time-temp)	3% acetic acid (time-temp)	10% alcohol(time-temp)	50% alcohol (time-temp)	*n*-Heptane(time-temp)
i)	High temperature heat sterilized (retorting)	I, II, IV, V and VI	121°C 2h	121°C 2h	-	-	66 °C for 2h
ii)	Hot filled or pasteurized above 66 ˚C, below 100 ˚C	II, IV, V and VI	100°C 2h	100 °C 2h			49 ˚C and 30 minutes
iii)	Hot filled or pasteurized above 66 ˚C	I to VI	70°C 2h	70 °C 2h	70 °C 2h	70 °C	38˚C and 30 minutes
iv)	Room temperature filled and stored (no thermal treatment in container) and also in refrigerated and frozen conditions	do	40 ˚C 10 days	40 ˚C 10 days	40 ˚C 10 days	40 ˚C 10 days	do

NOTE 1 Heptane simulant not to be used on wax lined containers

NOTE 2 Heptane extractivity results shall be divided by a factor of five in arriving at the extractivity of a food product.

B.5 Method 1: For finished containers (within 2-L capacity) or sealable single/multi-layered flexible films (one side exposure)

B.5.1 Apparatus

B.5.1.1 Electric oven/water bath, equipped with thermostat to maintain the desired temperature up to ±1º accuracy.

B.5.1.2 Electric hot plate, with temperature control regulator**.**

B.5.1.3 Analytical balance with a sensitivity of 0.1 mg.

B.5.1.4 Glass beakers, Pyrex of 1000-mL capacity or equivalent.

B.5.1.5 Stainless steel evaporating dish of 100-mL capacity.

B.5.1.6 Stainless steel tongs.

B.5.2 Selection of samples

Minimum triplicate samples representing the lot/batch have to be selected. Samples in each replicate shall not consist of a number of containers (preformed or converted products) with nearest exposed area of 1000 cm². In the case of films representative sample shall be of sufficient size to convert into 2 pouches of size 125 mm width and 200 mm length (inner dimension excluding seal area) with 1000 cm² surface area coming in contact.

B.5.3 Preparation of test specimen

The containers/pouches used shall be carefully rinsed with water (25-30 °C) to remove extraneous materials prior to actual migration test.

B.5.4 Simulant quantity

Equal to nominal filling capacity or at least 1mL/cm² of contact area.

NOTE Glassware, laboratory apparatus which come into contact with simulants and/or the sample during the test shall be thoroughly washed and dried prior to the test.

B.5.5 Procedure

Fill the container/pouch to their filled capacity with preheated simulant at test temperature and close it. In the case of pouches, exclude air as much as possible before sealing and expose the filled container/pouch to specified temperature maintained in oven/water bath/pressure cooker/autoclave for the specified duration of time. After exposure for the specified duration, remove the container/pouch and transfer the contents immediately into a clean Pyrex beaker along with three washings of the specimen with small quantity of the fresh stimulant.

B.5.6 Determination of amount of extractive

Evaporate/distill the contents in Pyrex beaker to about 50 ml - 60ml and transfer into a clean tared stainless steel dish along with 3 washings of Pyrex beaker with small quantity of fresh stimulant and further evaporate the concentrate in the dish to dryness in an oven at 100 °C ± 5 °C. Cool the dish with extractive in a desiccator for 30 min. and weigh to nearest 0.1 mg till constant weight of residue is obtained. Calculate the extractives in mg/dm² and mg/kg or mg/L or ppm of the foodstuff with respect to the capacity of container/pouch to be used. Blank shall also be carried out with the sample.

Amount of extractive (Ex)= $\frac{M}{A} \times 100$ mg/dm; and

$\frac{M}{V} \times 1000$ mg/kg or mg/l or ppm

Where

M = mass of residue in mg minus blank value

A = total surface area in cm² exposed in each replicate, and

V = total volume in ml of simulant used in each replicate

NOTE 1 For irregular shaped containers, nearest surface area is obtained by superimposing the graph sheet on the container and getting the surface area by increments in each segment.

NOTE 2 In case of heptane as solvent, divide *Ex* by a factor of five in arriving at the extractivity for a food product.

B.6 Method ii: For larger containers made of single homogenous material above 2-L capacity

B.6.1 Selection of sample

Minimum 3 containers representing the lot/batch are to be selected.

B.6.2 Test Specimen

Cut 5 pieces each of size 10 cm ×10 cm from each container at different places (each piece exposing about 200 cm² surface area both sides). In the case of thick material area corresponding to thickness of the sample shall be included.

B.6.3 Procedure

Immerse 5 thoroughly cleaned pieces cut from each container into a clean glass container (2-L capacity beaker) containing preconditioned simulant at test temperature such that no two pieces touch each other by placing a 2 to 3 mm diameter glass rod in between the specimens and cover the beaker with glass plate/watch glass and keep the set at specified temperature maintained in oven/waterbath/pressure cooker for the specified duration of time.

After exposure for the specified time, remove the test specimen from the extracted simulant with the help of clean tongs and wash the pieces with a small amount of fresh simulant and combine with the extracted simulant. Blank shall also be carried out without the sample.

B.6.4 Determination of amount of extractive

Calculate the extractive in mg/dm² and mg/kg or mg/l or ppm with respect to capacity of the container in accordance with the procedure specified in **5.6**

Amount of Extractive (*Ex*) = $\frac{M}{A}$ ×100 mg/dm²

Ex in ppm = $M \times TSA \times \frac{1000}{A \times V}$

Where

M = mass of residue in mg minus blank value,

A = surface area in cm² exposed in each replicate,

TSA = total surface area of the container in cm², and

V = total volume of the container.

NOTE Heptane extractive to be divided by factor of five

B.7 Method iii: Both side exposure for single homogenous film, which cannot be heat sealed

B.7.1 Apparatus

B.7.1.1 Cylindrical glass jar, inner dimension of 10 cm diameter and 14 cm height with 1000-mL capacity (for 1-L beaker)

B.7.1.2 Water bath/electrical oven, equipped with thermostat to maintain the desired temperature up to ± 1° C.

B.7.1.3 Glass/stainless steel pins, of 7.5 cm - 8.00 cm working length with extra bends at both the ends

B.7.1.4 Electric hot plate, with temperature regulator.

B.7.2 Specimen size

A film sample of 1000 cm² surface area both sides with width not more than 10 cm and an appropriate length to get the required area (10 cm×50 cm×2 sides = 1000 cm²).

B.7.3 Simulant quantity

Not less than 1000 ml to immerse the sample completely.

B.7.4 Preparation of the specimen

The film sample is rolled in the form of a coil in different concentric rings such that no two layers shall touch each other, and held in shape with the help of glass or stainless steel (SS) pin.

B.8 Procedure

Fill the cylindrical jar of 1000-mL capacity with the required quantity of preheated simulant at the test temperature. Immerse the test specimen in the simulant completely. Cover with a glass plate and place the jar with sample immersed in simulant at the prescribed temperature for the prescribed length of time. At the end of the test period remove the sample with the help of glass rod and wash the sample with small quantity of fresh simulant and combine with the extractants. Concentrate the extracted simulant 50-60 mL by evaporating on a hot plate under low heat (n-heptane shall be concentrated by distillation).

Transfer the concentrate into a clean tared stainless steel dish along with three washings with small amount of fresh simulant and further evaporate the concentrate to dryness in an oven at 100 ± 5°C. Cool this in a dessicator for 30 min and weigh to nearest 0.1 mg till constant weight of residue is obtained. Calculate the extractive in mg/dm². Blank shall also be carried out without the sample.

$$\text{Amount of extractive } Ex) = \frac{M}{A} \times 100 \text{ mg/dm}^2$$

Where

M = mass of residue in mg minus blank value, and

A = total surface area in cm² exposed in each replicate.

NOTE Heptane extractive value to be divided by factor of five.

B.9 Method iv: for closures, sealing gaskets, liners and like materials

B.9.1 Selection of the sample

At least triplicate samples each consisting of a number of closures/sealing gaskets/liners with the lids exposed about 100 cm² contact area (or ten lids) per replicate in each representing a lot or batch shall be selected.

B.9.2 Procedure

Smallest size glass bottles/jars actually being intended for use with closures can be used as containers to contain the simulant. Fill the glass containers to their nominal capacity or 100 ml, whichever is lower with simulant preheated to test temperature and closed tight with the closures/lids lined with the test specimen. Place the closed containers upside down (to ensure the contact of the closures with the simulant) in an oven maintained at test temperature.

After the exposure to the stipulated time, the closures from the containers are opened and the content from each replicate is pooled together in a glass beaker along with the washings of the exposed closures with small amount of fresh simulant. Blank shall also be carried out without the sample.

B.9.3 Determination of amount of extractive

Proceed with the determination amount of extractive by method described at B.5.6. Calculate the amount of extractive in ppm for the particular size of container being tested.

Amount of extractive (*Ex)* = $\frac{M}{V}$ ×1000 ppm

Where

M = mass of residue in mg minus blank value, and

V = volume of the container in ml in a replicate in actual use.

NOTE 1 If the extractive values for a smaller size container are within the prescribed limits, it may be taken that extractive values for a larger size container of the same material and shape will definitely be less than the smaller container used.

NOTE 2 Heptane extractives to be divided by factor of five.

B.9.4 Method v: Materials of articles intended to come into repeated contact with foodstuffs

The migration test(s) shall be carried out three times on a same sample one after the other in accordance with the conditions laid down already using fresh simulant(s) in each occasion, following any one of the methods applicable to it described earlier. Its compliance shall be checked on the basis of the level of the migration found in the third test. However, if there is conclusive proof that the level of migration does not increase in the second and third tests and if the migration limit(s) is/are not exceeded on the first test, no further test is necessary.

B.10 Evaluation of results

The materials and articles are regarded as conforming to the specifications if in the migration tests for each simulant used, the average of at least three results does not exceed the value of overall migration limit specified in the relevant standards.

NOTE Before carrying out the test, make sure that the sample is free from all traces of dust, fats and other impurities. If necessary, it shall be thoroughly wiped with filter paper. The sample shall be handled carefully to avoid any contamination.

B.11 Colour migration

In the case of coloured plastic material, colour migrated to simulant or decolourized coconut oil or food packed shall not be apparent to the naked eye. If the colour migrated is clearly visible, such materials are not suitable for food contact applications, even though the extractive value is within the limit.

Annex C
(normative)

List and limits of the pigments, colorants and heavy metals

C.1 Principle

C.1.1 This annex provides a list of permitted pigments and colorants for use in plastics and shall be regarded as safe for use in contact with foodstuffs, pharmaceuticals and drinking water

C.1.2 Pigments and colorants used shall not show visible bleeding or immigration from the finished product and shall show no signs of instability or degradation during processing.

C.1.3 Pigments and colorants used shall have a high degree of purity. In particular, if the following impurities are present, these shall not exceed the limits specified below.

a) Lead, per cent by mass, max. 0.01

b) Arsenic, per cent by mass, max. 0.005

c) Mercury, per cent by mass, max. 0.005 (soluble in N/10 HC)

d) Cadmium, per cent by mass, max. 0.10 do

e) Zinc, per cent by mass, max. 0.20 do

f) Selenium, per cent by mass, max. 0.01 do

g) Barium, per cent by mass, max. 0.01 do

h) Chromium, per cent by mass, max. 0.025 do

i) Antimony, per cent by mass, max. 0.025 do

j) Total aromatic amines, per cent by mass, max. 0.05 do

C.1.4 Carbon black, if used shall conform to the following requirements:

a) Benzene extract - 0.1 per cent by mass, max.

b) 3 Benzpyrene - no traces.

E.2 List of pigments and colorants for use in plastic in contact with foodstuffs, pharmaceuticals and drinking water

C.2.1 Organic pigments

Sl No	Composition
Yellow	
a)	o-Nitroaniline-acetoacetanilide
b)	p-Natroaniline-acetoacetanilide
c)	4-Chloro-2-nitroaniline-o-chloro-acetoacetanilide

d)	o-Nitro-p-tuluine-acetoacetanilide
e)	2:5-Dichloraniline-3-methyl-l-phenyl-5-pyrazolone
f)	2:4-Dichloraniline(2 mol)-4:4' -bis-(o-acetyl-aceto-toluidine)
g)	1-Amino-5-benzamindo-anthraquinone-oxalyl-chloride
h)	1:1-Diamino-athraquinol-terephthalate
i)	Bis(2"-anthraqunonyl) –6:6'-dibenzothiazolyle
j)	Pigment yellow-Benzidine-yellow
Orange	
a)	o-Nitro-p-anisidine-o-acetyl-acetotoluidine
b)	2:4-Dinitroanile-2-naphthol
c)	2-Nitro-4-toluidine-3-methyl-phenyl-5-pyrazolone
d)	o-Dianisidine-acetylacetoquinilide (2)
e)	5:5"-Dibenzoylamino-1:1-anthrimide-carbazole
f)	Napthalene-tetracarboxylic acid-1:2-diamino-benzene (2 mol)
Red	
a)	4-Nitraniline-2-naphthol
b)	2-Nitro-4-toluidine-2-naphthol
c)	2-Anisidine-2-naphthol
d)	5-Nitro-2-toluidine-4-chloro-3-oxy-2-naphthanilide
e)	2-Nitro-4-toluidine-3-oxy-3' -nitro-napthanilide
f)	4-Nitro-2-totuidine-3-oxy-2-napththo-8-o-toluidine
g)	N:N'-diethyl-4-methoxymetanilamide-5-chloro-3-oxy-2', 4'dimethoxy-2-napthanilide
h)	4-Nitro-2-anisidine-3-oxy-N-1-naphthyl-2-naphthamide
i)	1-Naphthylamine-I-naphol-5-sulphonic acid (calcium salt)
j)	2-Amino-naphthalene-1-sulphonic acid-2-naphthoic acid (calcium salt)
k)	6-Amino-m-toluenessulphonic acid-3-oxy-2-naphthoic acid (calcium salt)
l)	6-Amino-4-chloro-m-toluenesulphonic acid-oxy-2 naphthoic acid (calcium salt)
m)	3:3' -Dichlorobenzidine-3-carbothoxy-phenyl-5-pyrazonolone (2 mol)
n)	2-Amino-naphthalene-1-sulphonic acid-3-hydroxy-2-naphthoic acid (calcium salt)
o)	1:2-Dioxyanthranthraquinone (alizarine) calcium ferrous and alumina lakes
p)	Benzoyl-1-amino-4-hydroxyanthraquinone
q)	2-Thionaphthene-2' -acenaphthene-idigo
r)	1-Amino-2-methoxy-5benylsuphone-oxy-naphtho-m-xylidide
s)	1-Amino-2-methoxy-5-benzoxy-5-benzoylaniline-2:3-oxynaphtho-4-chloro-2,5-dimethoxyanilide
t)	Dihydroquinacridone comparable with phthalo-cyanines
u)	Bis-(1-amino)-(3-chloro-benzene)-bis(2'-oxy-3-naphthalo)-4,4-diamino-3,3-dichlorodiphenyl

v)	Bis-(amino)-2-methyl-5-chlorobene)-bis(2'-oxy-3-naphtho)-4'4'-diamino-3-diphenyl
w)	Bis-(1-amino)-(2-methyl-3-chlorobenzene)-bis(2'-oxy-3-naphtho)-4':4-diaminophenyl
Violet	
a)	6:6' -Dibromo-isoviolanthrone
b)	Dioxazine-2:5di(N-ethylcarbozoyl)-3'-3:6-dichloro-1:4-benzoquinone
c)	Pigment violet red-quinacridone
Blue	
a)	N-dihydro-1:2:1':2' anthroquinone-azine (idnanthrone)
b)	3:3'-dichloro-indanthrene
c)	Indigo
d)	Phthalocyanine
e)	Cobaltic complex of partially suphonated phthalocyanine
f)	Cupric complex of phthalocyanine
g)	Sulphonic derivative of cupric phthalocyanine
Green	
a)	Ferrous complex of alpha-nitroso-beta-naphthol
b)	Cupric complex of 4-Nitrobenzene-azo-2-naphthol
c)	Actachlorophthaloyanine of copper
d)	Pigment green oxide-chromium

C.2.2 Cellulose Film Dyes

C.2.2.1 Yellow

Azine arising from the oxidation of dehydrothio-p-toluidine sulphonic acid orange

C.2.2.2 Orange

3-Carboxyl (parasulphophenyl)-5-pyrazone acid benzidine-salicylic acid (sodium salt)

C.2.2.3 Pink

Aniline (2 mol)-6:6-bis-1-mino-bis 1-naphthol-3-sulphonic

C.2.2.4 Red

Gamma acid-benzidine-salicylic acid

C.2.2.5 Blue

O-dinianisidine-8-amino-1-naphthol-5:7-disulphonic acid

C.2.2.6 Green

a) Successive condensation of cyanogen chloride on 1-animo-4 p-phenylene-diamine-2-anthraquinone sulphonic, p-phenylene diamine-p-amino-salicylic acid aniline

b) P-Nitraniline-8-amino-1-naphthol-3:6-disulphonic-benzidine-salicylic acid

C.3 Inorganic pigments

C.3.1 Metals

a) Aluminium

b) Copper

c) Silver

d) Gold

e) Tin

f) Platinum and platinum group metals

E.3.2 Alloys

a) Bronzes

b) Brasses

C.3.3 White

a) Bartytes (barium sulphate)

b) Whitening (calcium carbonate)

c) Calcium sulphate (gypsum, plaster of paris)

d) Kaoline

e) Titan white (titanium oxide)

f) Alumina

g) Aluminium strearate

h) Talc

C.3.4 Yellow

a) Cadmium yellow (cadmium sulphides and selenium-sulphide)

b) Yellow iron oxide

c) Stanic sulphide (SnS)

C.3.5 Brown

a) Ferrite of magnesium

b) Cupric ferrocyanide

c) Umber

d) Sienna (natural ferric oxide)

C.3.6 Red

a) Red ferric oxide

b) Cadmium red, cadmium sulpho-selenium

c) Double sulphide of cadmium and mercury

C.3.7 Blue

a) Prussian blue (ferric ferrocyanide and turnbulls blue)

b) Ultramarine blue (complex silicate of aluminium and sodium sulphurated)

c) Egyptian blue (double silicate of copper and calcium)

d) Cobalt blue (cobalt aluminate)

C.3.8 Green

a) Chrome green (insoluble Cr2 O3 oxide)

b) Aluminate of chrome

c) Ultramarine green (complex silicate, sulphurated)

d) Terre verte (complex silicate)

C.3.9 Black

a) Carbon black

b) Black oxide of iron (natural and artificial magnetite

Annex E
(normative)

Test for capacity

E.1 Procedure:

E.1.1 Establish the grains to be standardized in this case, beans, maize, sim sim, peas, green gram and groundnuts

E.1.2 Check the moisture content of the grains as per specific grain Standard

E.1.3 Establish the reference volume for which weight is to be established, such as, 0.5, 0.7 & 1.0 litre.

E.1.4 Measure each of the volumes (0.5, 0.7, 1.0 ltr) using a calibrated measuring jar and weigh each using a calibrated weighing scale, offset the weight of the measuring jar (100gm) - record weights and take pictures of each.

E.1.5 Establish the average weight (AW) per liter of each grain type.

E.2 Report

Use the average weight (AW) per liter to establish corresponding weights capacity for each of the hermetic storage equipment in this case 500, 750 & 1250 liter (AW x 500 ltr= weight in Kg)

Bibliography

[1] KS 2874, *Portable rigid plastic Hermetic grain silo —Specification*

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