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DRAFT STANDARD FOR PUBLIC COMMENT

(වෙනස්වීමට ඉඩ ඇත. திருத்தத்திற்குட்படக்கூடியது. Liable to alteration)

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Draft Sri Lanka Standard
SPECIFICATION FOR RAW MILK
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This draft should not be regarded or used as a Sri Lanka Standard.

අදහස් එවිය යුත්තේ : ශ්‍රී ලංකා ප්‍රමිති ආයතනය, 17, වික්ටෝරියා පෙදෙස, ඇල්විටිගල මාවත, කොළඹ 08.

Comments to be sent to: SRI LANKA STANDARDS INSTITUTION, 17, VICTORIA PLACE, ELVITIGALA MAWATHA, COLOMBO 08.

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Introduction

This Draft Sri Lanka Standard has been prepared by the Sri Lanka Standards Institution and is now being circulated for technical comments to all interested parties.

All comments received will be considered by the SLSI and the draft if necessary, before submission to the Council of the Institution through the relevant Divisional Committee for final approval.

The Institution would appreciate any views on this draft which should be sent before the specified date. It would also be helpful if those who find the draft generally acceptable could kindly notify us accordingly.

All Communications should be addressed to:

The Director General
Sri Lanka Standards Institution,
17, Victoria Place,
Elvitigala Mawatha,
Colombo 08.

Draft Sri Lanka Standard
SPECIFICATION FOR RAW MILK

DSLS:

Gr.

SRI LANKA STANDARDS INSTITUTION
17, Victoria Place,
Elvitigala Mawatha,
Colombo 8,
Sri Lanka.

Draft Sri Lanka Standard
SPECIFICATION FOR RAW MILK

FOREWORD

This Sri Lanka Standard was approved by the Sectoral Committee on Agriculture and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on…….

Milk is a nutritious food produced by milking animals for the nourishment of the newly born. Dairy animals often produced milk in excess of the nutritional requirement of their young. Surplus milk is therefore extensively used for human nutrition in variety of forms. Milk is used as raw material in processing various food products. Thus, of necessity raw milk must meet the required safety and quality requirements before it is processed into subsequent dairy products. Once raw milk is defective, it cannot be improved during processing, and defects often become more pronounced. This Standard is therefore being prepared to ensure safety and quality of raw milk produced and/or traded in the country.

Earlier the requirements of this Standard were covered by **SLS 181** "Specification for raw and processed liquid milk" which was first published in 1972 and revised in 1983. While reviewing this Standard, the committee decided to separate and update this Standard, as the basic requirements are different for raw milk and processed liquid milk.

This Standard is subjected to the provisions under the Food Act No. 26 of 1980, the Animal Diseases Act No. 59 of 1992 and the regulations and amendments framed thereunder, and any other regulatory and statutory requirements wherever applicable.

Guidelines for the determination of compliance of a lot to the requirements of this Standard based on statistical sampling and inspection are given in Appendix **A**.

All values given in this Standard are in SI units.

For the purpose of deciding whether a particular requirement of this Standard is complied with, the final value, observed or calculated, expressing the results of a test shall be rounded off in accordance with **SLS 102**. The number of significant figures to be retained in the rounded off value shall be the same as that of the specified value in this Standard.

In the preparation of this Standard, the valuable assistance derived from the following publications is gratefully acknowledged:

EU 605/2010	Animal and public health and veterinary certification conditions for the introduction into the European Union of raw milk, dairy products, colostrum and colostrumbased products intended for human consumption
CAC/RCP 57	Code of hygienic practice for milk and milk products
GB 19301	Raw Milk
KS EAS 67	Raw cow milk — Specification

1 SCOPE

1.1 This Standard specifies the requirements and methods of sampling and tests for raw milk.

1.2 This Standard applies for raw milk obtained from milking of cow, buffalo and goat.

1.3 This Standard does not applicable for raw milk for direct human consumption.

2 REFERENCES

ISO	5764	Milk - Determination of freezing point - Thermistor cryoscope method (Reference method)
ISO	13366	Milk - Enumeration of somatic cells - Part 1: Microscopic method (Reference method)
ISO	14501	Milk and milk powder - Determination of aflatoxin M_1 content - Clean-up by immunoaffinity chromatography and determination by high-performance liquid chromatography
ISO	14674	Milk and milk powder - Determination of aflatoxin M_1 content - Clean-up by immunoaffinity chromatography and determination by thin-layer chromatography
ISO	26844	Milk and milk products - Determination of antimicrobial residues – Tube diffusion test
SLS	102	Rules for rounding off numerical values
SLS	428	Random sampling methods
SLS	516	Methods of test for microbiology of food and animal feeding stuffs Part 1/ Section 1: Horizontal method for the enumeration of microorganisms - Colony count at 30°C by the pour plate technique Part 3/ Section 2: Horizontal method for the detection and enumeration of coliforms – Colony count technique
SLS	735	Methods of test for milk and milk products Part 1/ Section 10: Milk – Determination of fat content - Acido – butyrometric method Part 7/ Section 4: Determination of protein - Milk - Determination of protein and non-protein-nitrogen content and true protein content calculation (Reference method)
SLS	872	Code of hygienic practice for dairy industry
SLS	910	Maximum residue limits for pesticides in food
SLS	1404	Methods of sampling for milk and milk products

Official Methods of Analysis of the Association of Official Analytical Chemists (AOAC), 21st Edition, 2019

3 DEFINITIONS

For the purpose of this Standard, the following definitions shall apply:

3.1 milk: Normal mammary secretion, free from colostrum, obtained from healthy dairy animals by the complete milking without either addition to it or extraction from it, intended for consumption as liquid milk or for further processing.

3.2 raw/ fresh/ unprocessed milk: Milk in its natural liquid form and such milk may be chilled, but has not been subjected to temperature treatment or any processing intended to alter the quality or compositional characteristics of the milk.

4 REQUIREMENTS

4.1 Hygiene requirements

4.1.1 Milk shall be produced, handled, stored and delivered under hygienic conditions as prescribed in **SLS 872**.

4.2 General requirements

4.2.1 Raw milk shall be clean and obtained from healthy dairy animals.

4.2.2 Raw milk shall be free of colostrum.

4.2.3 Raw milk shall have white or pale yellow colour with natural odour and flavor.

4.2.4 Raw milk shall be free from adulterants and preservatives.

4.3 Compositional requirements

The product shall conform to the requirements given in Table **1**, when tested according to the methods given in Column **4** of the Table**1**.

TABLE 1 – Compositional requirements for raw milk

Sl No. (1)	Characteristic (2)	Requirement			Method of test (4)
		Cow (3)	Buffalo (4)	Goat (5)	
i)	Milk fat, per cent by mass, min.	3.5	7.0	3.0	**SLS 735: Part 1/ Section 10**
ii)	Protein,per cent by mass, min	3.0	3.5	3.0	**SLS 735: Part 7/ Section 4**
iii)	Milk solids other than milk fat, per cent by mass, min.	8.5	9.0	8.5	**Appendix B**

4.4 Physical and chemical requirements

The product shall conform to the requirements given in Table **2**, when tested according to the methods given in Column **4** of the Table **2**.

TABLE 2 – Physical and Chemical requirements for raw milk

Sl No. (1)	**Characteristic** (2)	**Requirement** (3)	**Method of test** (4)
i)	Freezing point, °C	-0.550 to -0.525	**ISO 5764**
ii)	Alcohol precipitation test	Negative	**Appendix C**
iii)	Clot-on-boiling test	Negative	**Appendix D**
iv)	pH	6.6–6.8	**Appendix E**
v)	Density at 27°C, g/ml, min	1.027	**Appendix F**
vi)	Titratable acidity, %, max.	0.17	**Appendix G**

4.5 Microbiological limits

4.4.1 The product shall not exceed the limits for microorganisms given in the Table **3** when tested using the methods prescribed in Column **4** of the Table **3.**

TABLE 3 – Microbiological limits for raw milk

Sl No. (1)	**Test organism** (2)	**Limit** (3)	**Method of test** (4)
i)	Total plate count, CFU/ ml	$3x10^5$	**SLS 516: Part 1/ Section 1**
ii)	Somatic cell count, cells/ml	$4x10^5$	**ISO 13366: Part 1**

4.6 Contaminants

4.6.1 Aflatoxins

The product shall not exceed the level 0.5 µg/ L for Aflatoxin M_1, when determined according to the method given in **ISO 14674** or **ISO 14501**.

4.6.2 Veterinary drug residues

Maximum residue limits for veterinary drugs shall comply with the national provisions and announcementswhen determined according to the method given in **ISO 26844**.

4.6.3 Potentially toxic elements

Raw milk shall not exceed the level 0.02mg/ kg for Lead (Pb), when determined according to the method given in AOAC 999.10

4.6.4 Pesticide residues

Raw milk shall comply with the maximum residue limits specified in **SLS 910**.

5 STORAGE AND TRANSPORTATION

5.1 Raw milk containers and utensils shall be clean, dry, free from musty and putrid smell. The containers and utensils shall be food grade, chemical resistant, smooth and seamless. The containers and utensils shall be cleaned with immediately after use using food grade cleaning material.

5.2 Water used for cleaning of milk containers and utensils shall be suitable for intended purpose and shall not introduce any hazard to the milk.

5.3 Raw milk collected from individual dairy cows shall be pooled in a clean container and immediately cooled to below 10 °C.

5.4 Time of transportation from immediately after milking directly orthrough milk collecting point to the milk chilling centershall not take longer than 2 hours. If milk is unable to transfer with in this time, temperature shall be reduced to 1 °C to 4 °C within two hours after milking and directly transferred to a chilling center within 24 hours.

5.5 The temperature of raw milk kept in the storage tank at the chilling center shall be maintained at 1 °C to 4 °C and delivered to the processing plant within 24 hours.

5.6 Mix of rejected milk with good quality raw milk is strictly prohibited.

5.7 Trucks or any mode of transportation for milk delivery from farms directly or through milk collecting point to the milk chilling center shall be clean and suitable for transport of milk containers.

5.8 Road tankers for delivery to the processing plant shall be designed to effectively maintain temperature and prevent contaminations as well as adulterations during transport.

6 PACKAGING

6.1 Raw milk shall be packaged in a food grade material/ container which is impermeable and non-absorbent.

6.2 It shall be sufficiently inert to preclude substances from being transferred to food in quantities large enough to endanger human health or to bring about an unacceptable change in the composition of the product or deterioration in its organoleptic properties.

6.3 The temperature of packaged raw milk shall be maintained 1 °C to 4 °C and used within 24 hrs.

7 SAMPLING

Representative samples of the product for ascertaining conformity to the requirements of this Standard shall be drawn as prescribed in Appendix **A**.

9 METHODS OF TEST

9.1 Tests shall be carried out as prescribed in Appendix **B** to **G** of this Standard, **ISO 5764, Part 1 of ISO 13366, ISO 14501, ISO 14674, ISO 26844, Section 1/ Part 1, Section 2/ Part 3 of SLS 516, Section 10/ Part 1, Section 4/ Part 7, Part 16 of SLS 735** and Official Methods of Analysis of the Association of Official Analytical Chemists (**AOAC**).

9.2 Unless otherwise specified, quality reagents, chemicals and distilled water shall be used in tests.

APPENDIX A
COMPLIANCE OF A LOT

The sampling scheme given in Appendix **A** shall be applied where compliance of a lot to the requirements of this Standard is to be assessed based on statistical sampling and inspection.

Where compliance with this Standard is to be assured based on manufacturer's control systems coupled with type testing and check tests or any other procedure, appropriate schemes of sampling and inspection should be adopted.

A.1 LOT

In any consignment, all the containers of the same size and belonging to one batch of manufacture or supply shall constitute a lot.

A.2 GENERAL REQUIREMENTS OF SAMPLING

In drawing, preparing, storing and handling samples, following precautions and directions shall be taken.

A.2.1 Samples shall be drawn in a protected place not exposed to damp air, dust or soot.

A.2.2 The samples for microbiological analysis shall be drawn first.

A.2.3 The samples shall be protected against adventitious contamination.

A.2.4 The sampling instruments shall be clean and dry when used. When taking samples for microbiological examination, the sampling instruments shall be sterilized.

A.2.5 The samples shall be kept in glass or suitable containers. They shall be clean and dry when used. The samples for microbiological examination shall be kept in sterilized containers.

A.2.7 The samples shall be stored in such a manner that there will be no deterioration of quality of the material.

A.2.8 The sample containers shall be sealed air-tight after filling and marked with necessary details of sampling.

A.3 SCALE OF SAMPLING

A.3.1 Samples shall be tested from each lot separately for ascertaining conformity of material to the requirements of this Standard.

A.3.2 The sampling shall be drawn as per procedure specified in **SLS 1404**, as appropriate for testing requirements.

A.3.3 The packages or containers shall be selected at random. In order to ensure the randomness of selection, tables of random numbers as given in **SLS 428** shall be used.

A.4 NUMBER OF TESTS

A.4.1 Each container shall be selected as in Clause **A.3.2** shall be examined for the general requirements given in clause **4.2**.

A.4.2 Each container shall be selected as in Clause **A.3.2** shall be examined and tested for the requirements given in Clause **4.3, 4.4, 4.5** and **4.6.**

A.5 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirements of this Standard if the following conditions are satisfied.

A.5.1 Each container inspected as in Clause **A.4.1** shall satisfies the relevant requirements.

A.5.2 All test specimens tested as in Clause **A.4.2** shall satisfy the relevant and applicable requirements.

APPENDIX B
DETERMINATION OF MILK SOLIDS OTHER THAN MILK FAT IN MILK

B.1 GENERAL

Cow milk has 87% of water and 13% of solids approximately. Total solids is a measure of the suspended and dissolved matter in milk that remains after all the water has been evaporated. A well-mixed milk sample of a known volume is evaporated to a constant weight in an oven maintained at a temperature of 70 °C to 80 °C. The mass of the dried sample's solids is determined and used to calculate the percentage of total solids in the sample. Solid nonfat is the fraction of solids excluding fat.

B.2 APPARATUS

B.2.1 Petri dishes

B.2.2 10 ml pipette

B.2.3 Boiling water bath

B.2.4 Analytical Balance

B.2.5 Desiccator

B.2.6 Oven

B.3 PROCEDURE

B.3.1 Dry petri dishes in an oven and cool in a desiccator.

B.3.2 Place 5g of acid washed sand into the petri dish and weigh (W_1).

B.3.3 Mix the milk sample well and add 10ml of it into the petri dish with sand and weigh (W_2).

B.3.4 Place the petri dishes in a boiling water bath for 30 minutes.

B.3.5 Then transfer the petri dishes into an oven at 70 ℃-80 ℃ for 6 hours/ until a constant weight.

B.3.6 Transfer petri dishes into a desiccator to cool and then weigh (W_3).

$$\text{Total Solids (TS) \%} = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

Solid Non-Fat (SNF) % = TS% - Fat%

B.4 CALCULATION METHOD

$$\text{SNF} = \frac{\text{CLR}}{4} + 0.22F + 0.72$$

$$\text{CLR} = \text{LR} + \text{CF} \times 0.1$$

Where,

CLR – Calculated lactometer reading;

LR – Lactometer reading;

CF (+) - difference in temperature of milk (°F) above lactometer calibrated temperature of lactometer (°F);

CF (-) - difference in temperature of milk (°F) below lactometer calibrated of lactometer temperature (°F); and

F - Fat percentage.

B.5 INTERPRETATION

Cow milk has an average of 8.5% solid nonfat. Adulteration with water can reduce both fat% and SNF%. Adulteration of milk with solids can increase SNF%.

APPENDIX C
ALCOHOLIC TEST

C.1 GENERAL

The alcohol test is used for rapid assessment of stability of milk for processing, particularly for condensing and sterilization. The alcohol test determines susceptibility of milk to coagulation due to high developed acidityor having mineral compounds in greater than normal amounts. The test also gives positive results for colostrum, milk from animals in the late lactation, milk from animals suffering from mastitis which the salt concentration has been disturbed.

C.2 APPARATUS

C.2.1 Test-tubes

C.2.2 Pipette

C.3 REAGENT

C.3.1 Ethyl Alcohol, minimum for cow 68 % by v/v, minimum for buffalo 64 %by v/v and minimum for goat 45 %by v/v

C.4 PROCEDURE

C.4.1 Mix equal amounts of milk and Ethanol in a test tube (preferably 2 ml).

C.4.2 Mix the contents of the test tube by inverting several times.

C.4.3 Note any flakes or clots.

C.4.5 The presence of a flake or a clot denotes a positive test.

C.5 INTERPRETATION

A negative test indicates low acidity and good heat stability of milk sample.

APPENDIX D
CLOT-ON-BOILING (COB) TEST

D.1 APPARATUS

D.1.1 Test-tube, preferably with a mark at 5 ml

D.1.2 Source of heating, boiling water-bath or a flame

D.2 PROCEDURE

D.2.1 Transfer 5 ml of the sample to the test-tube

D.2.2 Place the tube in a boiling water-bath and hold for about 5 min, ~~or~~ heat in a flame until boiled

D.2.3 Remove the tube and rotate it in an almost horizontal position and examine the film of milk or side of the test-tube for any precipitated particles.

D.2.4 The formation of clots indicative of a positive test.

D.3 INTERPRETATION

The principle features of the boiling test are speed and definiteness of results. Milk either remains unchanged or coagulates. Milk, which gives a positive COB. test, has acidity generally above 0.22% (as lactic acid) and is not suitable for distribution as liquid milk or for processing.

APPENDIX E
DETERMINATION OF pH

E.1 GENERAL

The pH value or hydrogen ion concentration gives a measure of the true acidity of milk. The relationship between pH and acidity of milk is only approximate. In normal cow milk the pH is ranges from 6.6 to 6.8. The value is reduced by the development of acidity. On the other hand, the pH value of milk from a cow suffering from mastitis is alkaline in reaction, the value being over 7.0. The pH test is mainly used for the detection of abnormal mastitis in milk.

E.2 APPARATUS

E.2.1 pH meter

E.2.3 Beakers

E.3 PROCEDURE

E.3.1 Put the meter into calibration mode.

E.3.2 Pour 10 ml of each pH buffer into a beaker.

E.3.3 Place the electrode into the buffer solution so the sensor end is immersed. Gently wave the electrode back and forth in the buffer until stable reading is given. Check that the value has been recognized correctly and saved.

E.3.4 Rinse the electrode with distilled water and dry with a tissue to make sure the second calibration point is from fresh.

E.3.5 Repeat the steps with the next buffer and rinse again.

Repeat for all buffers with rinsing the sensor with distilled water in between (Usually pH 4,7 and 10).

E.3.6 The pH meter should be calibrated once in every 25 samples.

E.3.7 Before measuring the pH of the test sample, rinse the electrodes with distilled water and dry

E.3.8 Put the meter into measurement mode

E.3.9 Immerse the electrode sensor into the beaker with sample and gently wave back and forth until a stable reading is given.

E.3.10 Rinse thoroughly in distilled water to remove any traces of the sample. For more samples repeat last two steps.

E.3.11 Keep the electrode tips in distilled water between tests.

E.3.12 Put the clean electrode into storage solution.

E.4 INTERPRETATION

If milk pH below 6.5 indicates developed acidity due to bacterial fermentation. Milk of pH over 6.9 should be regarded with suspicion as indication of some diseases of the udder, of late lactation milk or milk adulteration.

APPENDIX F
DETERMINATION OF DENSITY IN MILK

F.1 GENERAL

The density is a relationship between the body mass and the volume this body occupies in the space. The density test is performed in order to be used in the detection of adulteration in the milk since, the addition of water only would cause the decrease in density, whereas the skimming (fat removal) would cause an increased density in the milk, beside supplying important information for the determination of the total dry extract.

F.2 APPARATUS

F.2.1 Lactometer

F.2.2 Measuring cylinder/ jar

F.2.3 Thermometer

F.3 PROCEDURE

F.3.1 Sample of the milk shall be taken without incorporating air bubbles as this would interfere with the readings.

F.3.2 Pour well mixed milk sample along the wall of the cylinder, measure the temperature of milk and place the lactometer slowly into the milk

F.3.4 Remain for 30 seconds until the lactometer is floating freely. The lactometer should not be allowed to touch the sides or the bottom of the cylinder.

F.3.5 Then the lactometer should be read at the top of the liquid meniscus where appears to meet the stem.

F.3.6 Record the lactometer reading (LR) together with the milk temperature.

F.3.7 Calculate the corrected lactometer reading (CLR).

$$CLR = LR + (CF \times 0.1)$$

Where,

CF (+) = difference in temperature of milk (°F) above lactometer calibrated temperature of lactometer (°F); and

CF (-) = difference in temperature of milk (°F) below lactometer calibrated of lactometer temperature (°F).

$$\text{Density / Specific Gravity (SG)} = \frac{CLR}{1000} + 1$$

F.4 INTERPRETATION

The readings should be adjusted according to the temperature. It is best to combine the lactometer reading with a fat test because if the fat content is low and the density is high then the milk might have been skimmed. If the both fat content and the density is low, then water might have been added to the milk.

APPENDIX G
DETERMINATION OF TITRATABLE ACIDITY

G.1 GENERAL

An indicator, which changes colour at a specific pH, is added to the milk, and titrated with a base (added little by little) until the colour changes. By recording the volume of base required and the volume of the milk sample, the amount of lactic acid can be calculated.

G.2 APPARATUS

G.2.1 Two white porcelain dishes, hemispherical, 60 ml capacity

G.2.2 10 ml pipette, reading 1-10 ml and 1 ml pipette

G.2.3 Measuring cylinder, 25 ml

G.2.4 Burette, 0.1 ml graduations, with soda-lime guard-tubes

G.2.5 Glass rod for stirring, flattened at one end

G.3 REAGENTS

G.3.1 Phenolphthalein indicator solution (0.5% in 50% alcohol)

Dissolve one gram of phenolphthalein in 100 ml of 95 percent ethyl alcohol. Add 0.1 N sodium hydroxide solution until one drop gives a faint pink colouration. Dilute with the distilled water to 200 ml.

G.3.2 0.1 N sodium hydroxide solution

Prepare a concentrated stock solution of sodium hydroxide by dissolving equal parts of sodium hydroxide (pellets) in equal parts of water in a flask; Close the flask with a rubber stopper and allow any insoluble sodium carbonate to settle out for 3 to 4 days; Use the clear supernatant liquid for preparing the standard 0.1 N Solution. About 8 ml of stock solution is required per litre of distilled water.

G.4 PROCEDURE

G.4.1 Measure accurately 10 ml of milk in two porcelain basins.

G.4.2 Add 1.0 ml of the phenolphthalein indicator solution. Rapidly titrate the contents of basin 1 against the standard sodium hydroxide solution stirring the contents with a glass rod until the first definite change to a pink colour, which remains for 10- 15 seconds.

G.4.5 Complete the titration within 20 seconds.

G.4.6 Basin 2 will serve as a control for comparing change of colour of milk from opaque white to faint pink.

G.6 CALCULATION

Titratable acidity (%, by weight) $=\frac{9\times V1\times N}{V2}$

Where,

V_1 = Volume in ml of the standard sodium hydroxide solution required for titration;

V_2 = Volume in ml of milk taken for the test; and

N = Normality of the standard sodium hydroxide solution.

G.7 INTERPRETATION

Normal milk acidity ranges from 0.10 to 0.20% lactic acid. Any value in excess of 0.20 % can safely be reckoned as developed lactic acid