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SPECIFICATION FOR

SOYA FLOUR

SRI LANKA STANDARDS INSTITUTION

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SLS 1011 : 1994

Gr. 10

SRI LANKA STANDARDS INSTITUTION
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Colombo 3,
Sri Lanka.

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This standard does not purport to include all the necessary provisions of a contract.

SRI LANKA STANDARD

SPECIFICATION FOR SOYA FLOUR

FOREWORD

This standard was approved by the Sectoral Committee on Cereals, Pulses and their products, and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 94-03-31.

Soya flour is rich in protein. Due to its high content of lysine, an essential amino acid, soya flour serves as a nutritionally useful ingredient in blended and processed foods. Soya flour is used in a variety of bakery products. Defatted soya flour serves as a raw material for several soya products such as textured soya protein.

Precise control of heat treatment during processing of soya flour is important in that both the nutritive value and functionality are directly dependent on the degree of heat treatment.

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

During the formulation of this specification due consideration has been given to the relevant provisions made under the Sri Lanka Food Act No. 26 of 1980. Specific requirements given in this specification, wherever applicable, are in accordance with the relevant regulations. However, general provisions made under the Sri Lanka Food Act have not been included in this specification and therefore, the attention of the user of this specification is drawn to these general provisions.

For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the result of a test or an analysis, shall be rounded off in accordance with SLS 102. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this specification.

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

CODEX STAN 175-1989	Codex general standard for soya protein products.
IS 7835 - 1975	Indian Standard Specification for edible medium-fat soya flour.
IS 7836 - 1975	Indian Standard Specification for edible low- fat soya flour.
IS 7837 - 1975	Indian Standard Specification for edible full-fat soya flour.

1 SCOPE

This specification prescribes the requirements and methods of test for soya flour.

2 REFERENCES

SLS 102 Presentation of numerical values.
SLS 143 General principles of food hygiene.
SLS 428 Random sampling methods.
SLS 467 Labelling of prepackaged foods.
SLS 516 Microbiological test methods
Part 2 : Yeasts and moulds.
Part 5 : *Salmonella*.
SLS 669 Soya bean, whole.

3 DEFINITIONS

For the purpose of this specification the following definitions shall apply :

3.1 **full fat soya flour** : Product obtained by autoclaving, cracking, dehulling and grinding of soya beans (seeds of *Glycine max* (L). merr).

3.2 **medium fat soya flour** : Product obtained by autoclaving, cracking, dehulling, expeller pressing and grinding of soya beans (seeds of *Glycine max* (L). merr).

3.3 **defatted soya flour** : Product obtained by autoclaving, cracking, dehulling, solvent extracting and grinding of soya beans (seeds of *Glycine max* (L). merr).

4 TYPES

Soya flour shall be of three types :

a) Full fat soya flour;
b) Medium fat soya flour; and
c) Defatted soya flour.

5 REQUIREMENTS

5.1 Processing requirements

5.1.1 Soya flour shall be made from soya beans conforming to SLS 669.

5.1.2 Soya flour shall be manufactured, packed, stored and distributed under hygienic conditions as prescribed in SLS 143. The solvents used in extraction process shall be of food grade.

5.2 Product requirements

5.2.1 Soya flour shall be in the form of coarse or fine powder having a uniform consistency.

5.2.2 Soya flour shall be free from rancid odour. It shall also be free from extraneous matter, insect, rodent or fungal infestations.

5.2.3 Soya flour shall conform to the requirements given in Table 1 when tested by the methods given in Column 6 of the table.

TABLE 1 - Requirements for soya flour

Sl. No.	Characteristic	Requirement			Method of test
		Full fat soya flour	Medium fat soya flour	Defatted soya flour	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Moisture, per cent by mass, max.	7	7	10	Appendix B
ii)	Protein, on dry basis , per cent by mass, min.	42	45	48	Appendix C
iii)	Fat, on dry basis , per cent by mass.	17 min	5 to 10	1 max	Appendix D
iv)	Crude fibre, on dry basis , per cent by mass, max.	3.5	3.5	3.5	Appendix E
v)	Ash, on dry basis , per cent by mass,max.	6.0	6.5	7.5	Appendix F
vi)	Acid insoluble ash, on dry basis , per cent by mass,max.	0.1	0.1	0.1	Appendix G
vii)	Trypsin inhibitor, mg/g, max.	35	35	35	Appendix H

5.2.4 Soya flour shall comply with the microbiological limits given in Table 2 when tested by the methods given in Column 7 of the table.

TABLE 2 - Microbiological limits

Sl. No.	Test	n	c	Limit per gram		Method of test
				m	M	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Moulds	5	3	10^2	10^4	SLS 516 : Part 2
ii)	*Salmonella*	5	0	0	0	SLS 516 : Part 5

where,

n is the number of samples to be tested;
c is the maximum allowable number of samples yielding values between m and M;
m is the limit below which a count is acceptable for any sample; and
M is the limit above which a count is unacceptable for any sample.

6 PACKAGING

Soya flour shall be suitably packed in clean,dry and moisture proof bags. The packages shall be sealed air-tight.

7 MARKING

7.1 Each package shall be marked or labelled legibly and indelibly with the following:

a) Name of the product as 'SOYA FLOUR';
b) Type;
c) Net mass, in grams or in kilograms;
d) Name and address of the manufacturer/distributor (including the country of origin);
e) Batch or code number; and
f) Date of manufacture.

7.2 Marking and labelling shall also be in accordance with SLS 467.

NOTE

Attention is drawn to the certification facilities offered by the Sri Lanka Standards Institution. See the inside back cover of this standard.

8 METHODS OF TEST

Tests shall be carried out as prescribed in Parts 2 and 5 of SLS 516 and Appendices B to H of this specification.

APPENDIX A
COMPLIANCE OF A LOT

The sampling scheme given in this Appendix should 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 packages of the same size containing soya flour of one type and belonging to one batch of supply or manufacture shall constitute a lot.

A.2 GENERAL REQUIREMENTS OF SAMPLING

When drawing samples, the following precautions shall be observed:

A.2.1 Samples for microbiological analysis shall be drawn first.

A.2.2 Samples shall be protected against adventitious contamination.

A.2.3 Sampling instruments shall be clean and dry when used. When drawing samples for microbiological examination, the sampling instruments shall be sterilized.

A.2.4 Samples shall be kept in clean and dry containers. The samples for microbiological examination shall be kept in sterilized containers.

A.2.5 Sample containers shall be selaed air-tight and marked with necessary details of sampling.

A.2.6 Samples shall be stored in such a way that there will be no deterioration of quality of the material.

A.3 SCALE OF SAMPLING

A.3.1 The number of packages to be selected from a lot shall be in accordance with Table 3.

TABLE 3 - Scale of sampling

Number of packages in the lot (1)	Number of packages to be selected (2)
Up to 250	08
251 to 500	10
501 to 1 200	12
1 201 to 3 200	15
3 201 and above	20

A.3.2 The packages shall be selected at random. In order to ensure randomness of selection, tables of random numbers as given in SLS 428 shall be used.

A.4 PREPARATION OF THE SAMPLES

A.4.1 A sub sample of five packages shall be drawn from the packages selected as in A.3.1. Approximately equal quantities of material shall be drawn from each package of the sub sample using an appropriate sterile sampling instrument and transferred to five sample containers.

A.4.2 Approximately equal quantities shall be drawn from each package selected as in A.3.1 using an appropriate sampling instrument, mixed together and reduced to get a composite sample of sufficient size.

NOTE

These samples may be prepared at the place of inspection.

A.5 NUMBER OF TESTS

A.5.1 Each package selected as in A.3.1 shall be inspected for packaging and marking requirments.

A.5.2 Samples prepared as in A.4.1 shall be tested for the requirments given in 5.2.4.

A.5.3 The composite sample prepared as in A.4.2 shall be tested for the requirements given in 5.2.1 to 5.2.3.

A.6 CRITERIA FOR CONFORMITY

A lot shall be declared as conforming to the requirments of this specification if the following conditions are satisfied:

A.6.1 Each package inspected as in A.5.1 satisfies the packaging and marking requirements.

A.6.2 The samples when tested as in A.5.2 satisfy the microbiological limits.

A.6.3 The test results on the composite sample when tested as in A.5.3 satisfy the relevant requirements.

APPENDIX B
DETERMINATION OF MOISTURE

B.1 APPARATUS

B.1.1 *dish,* of silica or platinum, with a lid.

B.1.2 *Oven,* maintained at 105 ± 2 °C.

B.2 PROCEDURE

B.2.1 Dry the dish (B.1.1) in an oven (B.1.2) for about 30 minutes. Cool in a desiccator and weigh to the nearest milligram.

B.2.2 Weigh, to the nearest milligram, about 10 g of the sample in the dish (B.2.1). Dry in the oven (B.1.2) for about five hours. Cool in the desiccator and weigh. Repeat the process of drying, cooling and weighing at 30-minute intervals until the difference between two successive weighings does not exceed 1 mg.

B.3 CALCULATION

$$\text{Moisture, per cent by mass} = \frac{m_1 - m_2}{m_1 - m_0} \times 100$$

where,

m_1 is the mass, in g, of the dish and the lid with the sample before drying;

m_2 is the mass, in g, of the dish and the lid with the sample after drying; and

m_0 is the mass, in g, of the empty dish and the lid (B.2.1).

APPENDIX C
DETERMINATION OF PROTEIN

C.1 APPARATUS

C.1.1 *Kjeldhal flask,* of suitable capacity, usually 500 to 800 ml, preferably with a ground glass joint and provided with a pear-shaped glass bulb fitting loosely in the top of the neck of the flask.

C.1.2 *Digestion stand,* on which the Kjeldahl flask (C.1.1) can be heated in an inclined position in such a way that the heat is applied only to that part of the flask wall which is below the liquid level at all stages.

C.1.3 *Distillation or steam distillation apparatus,* with a 200 ml graduated dropping funnel and efficient splash head, the latter connecting the Kjeldahl flask (C.1.1) to the condenser.

C.2 REAGENTS

C.2.1 *Compound catalyst,* consisting of 97 g of potassium sulfate and 3 g of anhydrous copper (11) sulfate.

C.2.2 *Sulfuric acid,* concentrated, rel. den = 1.84 g/ml.

C.2.3 *Boric acid,* 20 g /l solution.

C.2.4 *Calorimetric indicator,* prepared by mixing 2 parts by volume of a cold saturated solution of neutral methyl red in 50 percent (V/V) ethanol with 1 part by volume of a 0.25 g/l solution of methylene blue in 50 per cent (V/V) ethanol.Store the indicator in a brown glass bottle.

C.2.5 *Sodium hydroxide,* 50 per cent (m/m), rel. den = 1.33 g/ml.

C.2.6 *Sulfuric acid,* standardized, c(H_2SO_4) = 0.05 mol/l solution

C.3 PROCEDURE

Weigh, to the nearest milligram, up to 10 g of the dried sample according to the presumed nitrogen content, and transfer to the predried Kjeldahl flask (C.1.1) taking care that none of the product adheres to the inner wall of the neck of the flask.

Add 10 g of the compound catalyst (C.2.1) and an appropriate volume of concentrated sulfuric acid (C.2.2) calculated by the formula (20 + 4 x mass of the test sample),in such a way that the acid rinses the inner wall of the neck of the flask.

Mix by swirling the flask gently until the mixture is free from lumps and the test portion is completely wetted. In order to avoid super-heating, add a boiling aid (for example glass beads). Insert the pear-shapped glass bulb in the neck of the flask and place it in an inclined position on the digestion stand (C.1.2).

Heat with care until the liquid in the flask boils gently. Continue to heat for 1 hour after the liquid becomes clear. In the case of digestion apparatus heated by gas, ensure that the flame does not extend beyond the part of the flask filled with liquid, in order to avoid loss of nitrogen.

Allow to cool.Rinse the pear-shapped glass bulb and the inner neck of the flask with a few millilitres of water, allowing the rinsings to run into the flask. Add, with care, between 50 ml to 200 ml of water (according to the apparatus used), while swirling. Connect the flask to the distillation apparatus (C.1.3) previously freed from ammonia by steaming.

Adjust the lower end of the condenser so that it just touches the bottom of a 500 ml conical flask containing a known volume (varying between 25 ml to 50 ml) of the boric acid solution (C.2.3) and 3 drops to 5 drops of the indicator (C.2.4). Render the digestion liquid alkaline by slowly adding through the graduated separating funnel placed in the neck of the flask, between 150 ml to 200 ml of the sodium hydroxide solution (C.2.5) ensuring that the stem of the funnel does not become empty. Mix well, then turn on the condenser water and start heating.

During distillation, ensure that steam generation is kept constant. Distillation is complete when 200 ml of liquid have been collected in 20 minutes to 30 minutes.

Turn off the heat and lower the conical flask. Allow the condenser to drip for a few minutes into the flask and rinse the tip of the condenser with water, collecting the rinsings in the conical flask.

The liquid contained in the flask should be green.

Titrate the contents of the flask with sulfuric acid (C.2.6) until the colour of the contents turns reddish violet.

Carry out the determination in duplicate and a blank test.

C.4 CALCULATION

C.4.1 Nitrogen content, per cent by mass $= \frac{0.70\ c\ (V_1 - V_0)}{m}$

where,

c is the concentration, in mol/l, of the sulfuric acid (C.2.6);
V_0 is the volume, in ml, of the sulfuric acid used in the blank test;
V_1 is the volume, in ml, of the sulfuric acid solution used in the determination; and
m is the mass, in g, of the test portion.

C.4.2 Protein content, on dry basis, per cent by mass = Nitrogen, per cent by mass X 6.25

APPENDIX D
DETERMINATION OF FAT

D.1 APPARATUS

D.1.1 *Soxhlet extraction apparatus*

D.1.2 *Oven,* maintained at 105 ± 2 °C.

D.2 REAGENT

Petroleum ether, boiling range 40 °C to 60 °C.

D.3 PROCEDURE

D.3.1 Dry the Soxhlet flask in the oven (D.1.2) for 30 minutes. Cool in a desiccator and weigh.

D.3.2 Weigh, to the nearest milligram, about 3 g of the dried sample and transfer to a suitable thimble. Extract with petroleum ether (D.2) in the Soxhlet apparatus (D.1.1) for about 16 hours. Evaporate the solvent. Dry the flask in the oven, cool in a desiccator and weigh. Repeat the process of drying, cooling and weighing at 30-minute intervals until the difference between two successive weighings does not exceed 1 mg.

D.4 CALCULATION

$$\text{Fat, on dry basis, per cent by mass} = \frac{m_1 - m_0}{m} \times 100$$

where,

m_1 is the mass, in g, of the flask with the fat;
m_0 is the mass, in g, of the empty flask (D.3.1); and
m is the mass, in g, of the sample.

APPENDIX E
DETERMINATION OF CRUDE FIBRE

E.1 APPARATUS

E.1.1 *Oven,* maintained at 105 ± 2 °C.

E.1.2 *Reflux condenser*

E.1.3 *Buchner funnel,* with perforated plate covered by a piece of cotton cloth or filter paper to serve as a support for a circular piece of suitable filter paper, washed with boiling water.

E.1.4 *Crucible,* with a thin, compact layer of ignited asbestos.

E.1.5 *Muffle furnace,* maintained at 600 ± 20 °C.

E.2 REAGENTS

E.2.1 *Sulfuric acid,* $c(H_2SO_4)$ = 0.128 mol/l solution.

E.2.2 *Sodium hydroxide,* c(NaOH) = 0.313 mol/l solution.

E.2.3 *Ethyl alcohol,* 95 per cent (V/V).

E.3 PROCEDURE

E.3.1 Dry the sample in the oven (E.1.1). Weigh, to the nearest milligram, about 2 g of the dried sample in a one litre flask. Extract the fat.(In the case of defatted soya flour, the extraction is not required). Add 200 ml of boiling sulfuric acid (E.2.1) and immediately connect the flask to reflux condenser (E.1.2). Bring to boil within one minute. Continue boiling for exactly 30 minutes while rotating the flask frequently ensuring that all the material is in contact with the acid. Pour into the prepared funnel (E.1.3) and wash with boiling water until the washings are no longer acidic to litmus.

Boil 200 ml of sodium hydroxide (E.2.2) under a reflux condenser. Wash the residue in the funnel with boiling sodium hydroxide into the flask. Immediately connect the flask to the reflux condenser and boil exactly for 30 minutes. Immediately filter through the funnel (E.1.3).

Wash the residue thoroughly with boiling water and transfer to the crucible (E.1.4). Wash the residue thoroughly first with hot water and then with 15 ml of ethyl alcohol (E.2.3).

E.3.2 Dry the crucible with contents in the oven (E.1.1). Cool in a desiccator and weigh. Repeat the process of drying, cooling and weighing at 30-minute intervals until the difference between two successive weighings does not exceed 1 mg.

E.3.3 Incinerate the contents of the crucible in the furnace (E.1.5). Cool in a desiccator and weigh to the nearest milligram.

E.4 CALCULATION

Crude fibre, on dry basis, per cent by mass

$$= \frac{m_1 - m_2}{m} \times 100$$

where,

m_1 is the mass, in g, of the insoluble matter (E.3.2);
m_2 is the mass, in g, of the ash (E.3.3); and
m is the mass, in g, of the sample.

APPENDIX F
DETERMINATION OF ASH

F.1 APPARATUS

F.1.1 *Dish,* of silica or platinum.

F.1.2 *Oven,* maintained at 105 ± 2 °C.

F.1.3 *Muffle furnace,* maintained at 600 ± 20 °C.

F.2 PROCEDURE

Dry the test sample in the oven (F.1.2) for about 2 hours. Weigh, to the nearest milligram, about 2 g to 6 g of the dried sample in the dish (F.1.1). Char the dried material using a suitable burner or a hot plate for about one hour. Complete the ignition in the furnace (F.1.3) until a grey ash is obtained. Cool in a desiccator nd weigh. Repeat the process of igniting, cooling and weighing at 30-minute intervals until the difference between two successive weighings does not exceed 1 mg.

F.3 CALCULATION

$$\text{Ash, on dry basis, per cent by mass} = \frac{m_1 - m_0}{m_2 - m_0} \times 100$$

where,

m_1 is the mass, in g, of the dish with the ash;
m_2 is the mass, in g, of the dish with the dried sample; and
m_0 is the mass, in g, of the empty dish.

APPENDIX G
DETERMINATION OF ACID INSOLUBLE ASH

G.1 PROCEDURE

Add 25 ml of 5 mol/l hydrochloric acid to the dish containing ash obtained in F.2. Cover with a watch glass and heat on a water bath for 10 minutes. Cool and filter through a slow ashless filter paper. Wash with water until the washings are free from acid. Place the filter paper with the residue in the dish and dry in the oven for about 30-minutes. Char the dried filter paper with the residue using a suitable burner or a hot plate. Ignite in the furnace for one hour. Cool in a desiccator and weigh. Repeat the process of igniting, cooling and weighing at 30-minute intervals until the difference between two successive weighings does not exceed 1 mg.

G.2 CALCULATION

$$\text{Acid insoluble ash, on dry basis, per cent by mass} = \frac{m_3 - m_0}{m_2 - m_0} \times 100$$

where,

m_3 is the mass, in g, of the dish with acid insoluble ash;
m_2 is the mass, in g, of the dish with the dried sample; and
m_0 is the mass, in g, of the empty dish.

APPENDIX H
DETERMINATION OF TRYPSIN INHIBITOR

PRINCIPLE

When trypsin under stated conditions is allowed to act on the synthetic substrate, Benzoyl -DL -Arginine -p- nitroanalide (BAPA) , the rate of hydrolysis is indicated directly by the colour of p-nitroaniline released which is measured at 410 nm using a UV spectrophotometer.

H.1 APPARATUS

H.1.1 *pH meter*

H.1.2 *Spectrophotometer*

H.1.3 *Water bath,* maintained at 37 $\pm$ 0.5 °C.

H.2 REAGENTS

H.2.1 *Sodium hydroxide,* 0.01 mol/l and 1 mol/l solutions.

H.2.2 *Hydrochloric acid,* 0.001 mol/l and 1 mol/l solutions.

H.2.3 *Acetic acid,* 30 per cent (V/V) solution.

H.2.4 *Tris buffer*

Dissolve 1.21 g of tris (hydroxymethyl) aminomethane and 0.59 g of calcium chloride ($CaCl_2.2H_2O$) in 180 ml of distilled water. Adjust the pH to 8.2 with 1 mol/l hydrochloric acid. Make the volume to 200 ml with distilled water. This solution prewarmed to 37°C for BAPA formulation is stable up to 8 hours.

H.2.5 *Trypsin solution*

Weigh accurately 2.0 mg of trypsin and dilute to 100 ml with 0.001 mol/l hydrochloric acid. Preparation of a fresh solution at each run is recommended.

One trypsin unit is arbitrarily defined as an incrase of 0.01 absorbance units at 410 nm per 10 ml of the reaction mixture under the conditions used herein.

H.2.6 *Benzoyl-DL-arginine-p-nitroanalide hydrochloride (BAPA) substrate*

Dissolve 0.080 g of BAPA in 2 ml of dimethyl sulfoxide. Dilute to 200 ml with Tris buffer (H.2.4) prewarmed to 37 °C. This solution is stable up to 4 hours.

H.3 PROCEDURE

H.3.1 *Preparation of the test sample*

Full fat and medium fat soya flour samples should be defatted by extraction at a temperature below 40 °C before the analysis. Grind the sample finely without raising the temperature.

H.3.2 *Preparation of the sample extract*

Weigh, to the nearest milligram, .1 g of the prepared sample (H.3.1). Extract with 50 ml of 0.01 mol/l sodium hydroxide (H.2.1) at room temperature for 3 hours, with a magnetic stirrer at low setting.

Maintain the pH of the resulting suspension between 8.4 to 10.0 using 1 mol/l hydrochloric acid or 1 mol/l sodium hydroxide as required.

Immediately dilute the suspension with distilled water so that 2 ml of the suspension produces trypsin inhibition of 40 per cent to 60 per cent of the trypsin used as the standard.

H.3.3 *Determination*

H.3.3.1 To each of four test tubes, add 2 ml of the diluted sample extract (H.3.2). Prepare a fifth tube for the trypsin standard by adding 2 ml of distilled water.

H.3.3.2 To three of the four tubes containing the sample extract and the tube containing distilled water, add 2 ml of the trypsin solution, mix and place in the water bath at 37°C for 10 minutes.

H.3.3.3 Add rapidly 5 ml of freshly prepared BAPA solution (H.2.6) prewarmed to 37°C to each tube. Mix immediately and return to the water bath at 37 °C and leave for 10 minutes.

H.3.3.4 Terminate the reaction by blowing in 1 ml of acetic acid (H.2.3) with immediate mixing.

H.3.3.5 Filter the contents of each tube through thick, medium speed filter paper with high retention and measure the absorbance of the filtrate at 410 nm vs. sample blank.

H.3.3.6 A sample blank (the fourth tube containing sample extract) is prepared by the same procedure mentioned above except that the trypsin solution is added AFTER the reaction is terminated by the addition of acetic acid.

H.4 CALCULATION

$$\text{Trypsin inhibitor, mg/g} = \frac{(A_{std} - A_{sam})}{0.019 \times m} \times \frac{d}{1000 \times V}$$

where

A_{std} is the absorbance for trypsin standard;
A_{sam} is the absorbance for sample extract;
d is the dilution factor;
m is the mass, in g, of the sample; and
V is the volume, in ml, of the sample.

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Further particulars of the terms and conditions of the permit may be obtained from the Sri *Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.*

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SRI LANKA STANDARDS INSTITUTION

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The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

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