SRI LANKA STANDARD 39 : 1978

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SPECIFICATION FOR

COMMON BURNT CLAY BUILDING BRICKS

(FIRST REVISION)

SRI LANKA STANDARDS INSTITUTION

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SLS 39:1978

Gr. 6

(Attached AMD 37)

BUREAU OF CEYLON STANDARDS

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Colombo 3.

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

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

SRI LANKA STANDARD

SPECIFICATION FOR COMMON BURNT CLAY BUILDING BRICKS

(FIRST REVISION)

FOREWORD

This revised Sri Lanka Standard Specification has been prepared by the Drafting Committee of the Bureau on Common Burnt Clay Building Bricks. It was approved by the Civil Engineering Divisional Committee of the Bureau of Ceylon Standards and was authorised for adoption and publication by the Council of the Bureau on 1978-08-18.

This standard specification is a revision of **CS 39:1968***.

The common burnt clay building brick is still the most extensively used building material in Sri Lanka, but unfortunately considerable variations in the quality and dimensions of the finished bricks continue to exist. This is partly due to considerable variations in the composition of the clays used for brick making, but more frequently the poor standard of bricks is due to the improper preparation of the clay mixture, moulding, drying and firing of the bricks. To guide the small scale manufacturers in overcoming these problems, preparation of a code of practice on the manufacture of hand-made bricks has been undertaken. This code of practice would include simple field tests on bricks which could be carried out without the use of laboratory equipment.

Provision has been made in this revision for two types of bricks, *viz:* machine made wire cut bricks and hand-made bricks. A compressive strength of 10.0 MPa (1450 lbf/in^2) has been specified for machine-made bricks and is recommended for use on load bearing walls of multistorey buildings. Hand-made bricks of compressive strength 4.8 MPa (700 lbf/in^2) is sufficient for two-storey buildings and those having a compressive strength of 2.8 MPa (410 lbf/in^2) may be used for single floor structures (*Note - The designer's attention is drawn to accepted Codes of Practice on Structural recommendations for load bearing walls).* The small scale manufacturers should, with ordinary precautions, be able to achieve this strength under existing conditions of manufacture.

**CS 39:1968 Common burnt clay building bricks.*

This revision specifies one standard format for brick work, namely, 230 mm x 115 mm x 75 mm (9.1 in x 4.5 in x 3.0 in). This includes the thickness of mortar joint, which for the purpose of this standard has been taken as 10 mm (0.4 in). At this stage it would be premature to specify a modular size for bricks. However, it should be noted that it is proposed to adopt a format of 300 mm x 100 mm x 100 mm at an appropriate stage of the modular co-ordination programme. Metric standards were incorporated in this revision so as to provide the necessary guide lines to the manufacturers for a gradual change over to the metric system. Thus all values are given in the international system of units with equivalent values in imperial units indicated within parenthesis. These equivalent values have been calculated in accordance with **CS 116:1971***.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or observation shall be rounded off in accordance with **CS 102:1971****. The number of figures to be retained in the rounded off value shall be the same as that of the specified value in this standard.

1 SCOPE

This Sri Lanka Standard specifies the dimensions, quality and strength requirements of common burnt clay bricks used in building work.

2 DEFINITION

For the purpose of this standard the following definition shall apply:

2.1 efflorescence : Formation of a white crystalline deposit on the face of the brick due to drying out of salts in the brick.

3 CLASSIFICATION

Bricks shall be of two types.

Type 1 : Machine-made wire cut bricks

Type 2 : Hand-made bricks

Bricks of Type 2 shall be classified as Grade I or Grade II according to compressive strength (see Table 1).

4 GENERAL REQUIREMENTS

Bricks shall be regular in shape with sharp clean arrises. The bricks shall be uniform in colour, free from cracks and flaws and when a broken surface is examined shall show a reasonably uniform texture and shall be free from black core or any signs of being imperfectly burnt. They shall be reasonably free from pebbles and expansive particles of lime of size more than 6 mm (0.2 in)

*CS 116:1971 *Principles of conversion*

**CS 102:1971 *Presentation of numerical values*

TABLE 1 - Specific requirements

Characteristic	Type 1	Type 2	
		Grade I	Grade II
Characteristic compressive strength average not less than MPa (lbf/in^2) (Clause 7.2)	10.0 (1 450)	4.8 (700)	2.8 (410)
Water absorption not more than (Clause 7.3)	18%	28%	28%
Efflorescence - highest permissible rating (Clause 7.4)	Slight	Moderate	Moderate
Nominal dimensions of individual bricks -	(For all types and grades)		
Length mm (in)	220 (8.7)		
Width mm (in)	105 (4.1)		
Height mm (in)	65 (2.6)		
Overall dimensions of 24 bricks (Clause 7.1)	(For all types and grades)		
Length mm (in)	5 280 ± 75 (207.9 ± 3.0)		
Width mm (in)	2 520 ± 40 (99.2 ± 1.6)		
Height mm (in)	1 560 ± 40 (61.4 ± 1.6)		

in the case of Type 1 bricks and 10 mm (0.4 in) in the case of Type 2 bricks. In the case of Type 1 (i.e. machine-made) bricks the bed faces shall be provided with grooves, frogs (depressions) or holes to ensure adequate bonding.

5 SPECIFIC REQUIREMENTS

Bricks when tested in accordance with the relevant method shall conform to the requirements specified in Table 1.

6 SAMPLING

6.1 Method of sampling

The sample shall be drawn by either of the two methods given below.

6.1.1 *Sampling in motion*

Samples shall be taken, whenever practicable, while the bricks are being loaded or unloaded. One brick shall be taken at random from equal portions of the consignment.

6.1.2 *Sampling from a stack*

The stack shall be divided into a number of real or imaginary portions and the required number of units taken at random from each portion.

The units shall be taken from the top of the stack, the sides accessible and from the interior of the stack by removing units from the upper layers of the stack.

6.2 Lot

All the bricks of the same type and grade manufactured essentially under the same conditions and available for inspection shall constitute a lot.

6.3 Scale of sampling

The bricks shall be selected and inspected for each lot separately for ascertaining their conformity to the requirements of the relevant specification.

The number of bricks to be selected for testing for the requirements given under Clause 4 and Clause 5 shall depend upon the size of the lot and shall be in accordance with Table 2.

NOTES

1 Same bricks tested for dimensions can be used for examining for visual defects and thereafter for testing for the other requirements. Thus the total number of bricks that have to be drawn is equal to the number given in Column 2 of Table 2. But few more bricks may have to be drawn to allow for breakage etc.

2 The tests for the three groups of requirements should preferably be carried out according to the sequence in which the groups are listed in Table 2. At the completion of each set of tests, the reduction of the sample shall be done at random, after the removal of any defective or damaged bricks.

6.4 Criteria for conformity

6.4.1 *Dimensions*

If the sample when tested for dimensional requirements passes the test given in Clause 7.1, then the lot shall be considered as conforming to the dimensional requirements.

6.4.2 *General requirements*

If the number of defective bricks in the sample when examined for general requirements specified in Clause 4 is less than or equal to the permissible number of defectives given in Column 5 of Table 2, then the lot shall be considered as conforming to the general requirements, otherwise not.

TABLE 2 - Scale of sampling and permissible No. of defectives

No. of bricks in lot	No. of bricks to be selected			Permissible No. of defectives	
	Dimensions	General requirements	Water absorption, Comp. strength and Efflorescence	General requirements	Efflorescence
(1)	(2)	(3)	(4)	(5)	(6)
Up to 10 000	24	20	5	1	0
10 000 to 35 000	48	32	10	2	0
above 35 000	72	50	15	3	1

6.4.3 *Compressive strength and water absorption*

From each of the samples tested for compressive strength and water absorption the averages shall be calculated. If the averages satisfy the relevant requirements specified and if any individual brick does not fall below 20% of the value specified then the lot shall be considered as conforming to the relevant requirements, otherwise not.

6.4.4 *Efflorescence*

Conformity of a lot with respect to effloresence shall be determined on the same basis as for general requirements.

7 METHODS OF TEST

7.1 Checking the dimensions

The bricks selected in accordance with Clause 6 shall be grouped into one or more sets of 24 bricks. The overall dimensions shall be measured by placing each set of 24 bricks in contact in a straight line on a level surface in each of the arrangements indicated in Fig. 1. Any blisters or other small

projections together with any loose particles of clay shall be removed before the bricks are assembled for measurement. The overall length of each set of assembled bricks shall be measured with a steel tape, or other suitable inextensible measure long enough to measure the whole row at once. Measurement by repeated application of a short rule or measure shall not be permitted. If the measured dimensions of each set of 24 bricks falls within the limits specified in Table 1 the bricks shall be considered to have passed this test.

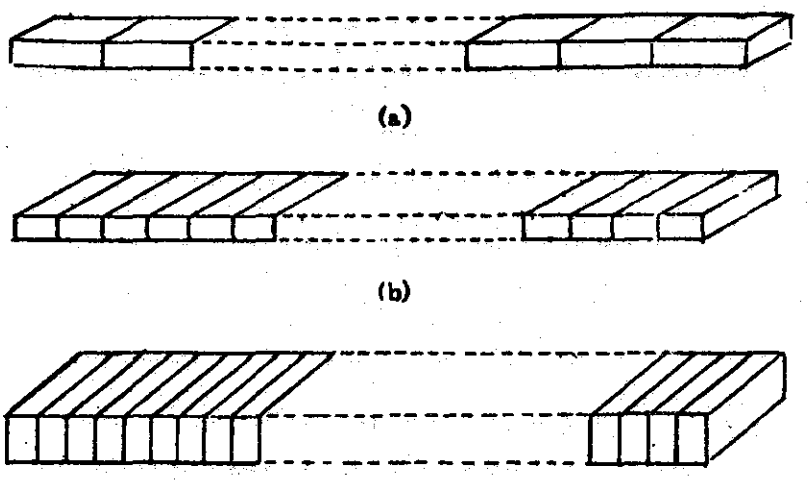

FIG.1 - Arrangement of bricks for measurement of dimensions

7.2 Determination of compressive strength

Bricks to be tested shall be preconditioned in the following manner:

Each specimen shall be rubbed down as necessary to obtain a smooth plane surface on each face to receive the load.

Solid bricks shall be immersed in water at room temperature for 72 hours.

Bricks with frogs, grooves or holes shall be immersed in water for an initial period of 24 hours at room temperature, removed and surplus moisture drained out. Frogs, grooves or holes and any voids in the bed faces shall be filled flush with cement mortar (The composition of the mortar shall be 1 cement : 1 clean coarse sand of grade 3 mm and down by volume). The specimens shall then be stored under damp jute bags for 24 hours followed by immersion in water for a further period of 72 hours as for solid bricks.

The bricks shall be removed and allowed to drain at room temperature, wiped free of surplus moisture and subjected to the test within 90 minutes of immersion. They shall be placed between two 3-ply plywood sheets, 4 mm thick, and carefully centred between the platens of the machine.

One of the platens of the testing machine shall have a ball seating in the form of a portion of a sphere, the centre of which coincides with the centre of the face of the plate. The load shall be applied in the direction of the thickness of the brick at a rate of 14 MPa (2.0×10^3 lbf/in^2) per minute until failure occurs. The compressive strength shall be calculated by dividing the maximum load on failure by the area of the face on which the load is applied and shall be expressed in MPa (lbf/in^2). If the arithmetic mean

of the compressive strengths of the bricks tested does not fall below the relevant value specified in Table 1, the bricks shall be considered to have passed this test.

NOTE - For the purpose of this test the brick shall be deemed to have failed when there is a momentary decrease in the rate of advance of the indicator of the testing machine, combined with fracture of the brick.

7.3 Determination of water absorption

The bricks shall be dried to constant mass in a well ventilated oven at 100 °C to 115 °C. They shall then be cooled to approximately room temperature and weighed.

NOTE - In a ventilated room bricks properly separated require about four hours for cooling unless an electric fan passes air over them continuously, in which case about two hours may suffice.

The dry bricks shall be totally immersed without preliminary partial immersion, in clean water at room temperature for 24 hours. As far as possible, the water shall have free access to all surfaces of the bricks. Each brick shall then be removed, the surface water wiped off with a damp cloth, and the brick weighed in a balance sensitive to about 0.1 per cent of the weight of the brick. The weighing of each brick shall be completed within three minutes after its removal from the water.

The percentage of water absorption by mass shall be calculated as:

$$\text{The percentage of water absorption} = \frac{(M_2 - M_1)}{M_1} \times 100$$

where,

M_1 = mass of the dry brick, and

M_2 = mass of the brick after 24 hours immersion in cold water.

7.4 Test for efflorescence

Place the ends of the bricks in a shallow flat-bottom dish having an area of approximately 0.10 m^2 (160 in^2), containing distilled water, the depth of immersion in water being 25 mm (1.0 in). Place the whole arrangement in a well ventilated room until all the water in the dish evaporates. When the water has been absorbed and bricks appear to be dry, place a similar quantity of water in the dish and allow it to evaporate as before. Examine the bricks for efflorescence when the bricks are dry and report the results.

The liability to efflorescence shall be reported as *nil*, *slight*, *moderate*, *heavy* or *serious* in accordance with the following definitions.

a) *Nil* - When there is no perceptible deposit of efflorescence.

b) *Slight* - When not more than 10 per cent of the area of the brick is covered with a thin deposit of salts.

c) *Moderate* - When there is a heavier deposit than *slight* and covering up to 50 per cent of the area of the brick surface but unaccompanied by powdering or flaking of the surfaces.

d) *Heavy* - When there is a heavy deposit of salts covering 50 per cent or more of the brick surface but unaccompanied by powdering or flaking of the surfaces.

e) *Serious* - When there is a heavy deposit of salts accompanied by powdering and/or flaking of the surfaces and tending to increase with repeated wettings of the specimen.

CERTIFICATE OF COMPLIANCE

If the purchaser so requires, the supplier shall furnish him with a certificate from a recognised body or institution to the effect that the bricks conform to the requirements of this specification.

9 INDEPENDENT TEST

If the purchaser, or his representative, insists upon an independent test, samples shall be taken in his presence immediately after delivery, and shall be tested in accordance with this specification.

AMENDMENT NO. 1 APPROVED ON 1981-01-29.

SLS 39:1978 SPECIFICATION FOR COMMON BURNT CLAY BUILDING BRICKS

Page 4 - FOREWORD

In the fourth para delete the last sentence.

In the fifth para second line, delete 200 mm x 100 mm x 75 mm (7.9 in x 3.9 in x 3.0 in) and substitute 230 mm x 115 mm x 75 mm (9.1 in x 4.5 in x 3.0 in).

Page 5 - Clause 4 - GENERAL REQUIREMENTS

Add the following at the end of this Clause.

In the case of Type 1 (i.e. machine made) bricks the bed faces shall be provided with grooves, frogs (depressions) or holes to ensure adequate bonding.

Page 6 - TABLE 1 SPECIFIC REQUIREMENTS

In the fourth cage delete the values given against length and width and substitute the following.

Length mm (in) : 220 (8.7)

Width mm (in) : 105 (4.1)

In the fifth cage delete the values given against length and width and substitute the following:

Length mm (in) : 5280 $\pm$ 75 (207.9 $\pm$ 3.0)

Width mm (in) : 2520 $\pm$ 40 (99.2 $\pm$ 1.6)

Page 11 - Clause 7.2

DETERMINATION OF COMPRESSIVE STRENGTH

Delete the first para and substitute the following.

Bricks to be tested shall be preconditioned in the following manner:

Each specimen shall be rubbed down as necessary to obtain a smooth plane surface on each face to receive the load.

Solid bricks shall be immersed in water at room temperature for 72 hours.

Bricks with frogs, grooves or holes shall be immersed in water for an initial period of 24 hours at room temperature, removed and surplus moisture drained out. Frogs, grooves or holes and any voids in the bed faces shall be filled flush with cement mortar (The composition of the mortar shall be 1 cement: 1 clean coarse sand of grade 3 mm and down by volume). The specimens shall then be stored under damp jute bags for 24 hours followed by immersion in water for a further period of 72 hours as for solid bricks.

SRI LANKA STANDARDS INSTITUTION

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