SRI LANKA STANDARD 546 : 1981

UDC 686.863.3

SPECIFICATION FOR GENERAL WRITING LEAD PENCILS

BUREAU OF CEYLON STANDARDS

SPECIFICATION FOR GENERAL WRITING LEAD PENCILS

SLS 546 : 1981

Gr. 6

BUREAU OF CEYLON STANDARDS
53, Dharmapala Mawatha,
Colombo 3,
Sri Lanka.

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 GENERAL WRITING LEAD PENCILS

FOREWORD

This Sri Lanka Standard was authorized for adoption and publication by the Council of the Bureau of Ceylon Standards on 1981-12-15, after the draft, finalized by the Drafting Committee on Black Lead Pencils, had been approved by the Chemicals Divisional Committee.

The standard values given in this specification are in SI units.

For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the results of a test or analysis shall be rounded off in accordance with CS 102*. The number of figures to be 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 obtained from the publications of the Indian Standards Institution and the United States Federal Supply Service, General Services Administration is gratefully acknowledged.

1 SCOPE

This specification prescribes the requirements, methods of sampling and test methods for lead pencils used for general writing. The specification does not provide for drawing pencils or special pencils such as carpenters' pencils or stenographers' pencils.

2 GRADES

Pencils for general writing shall be supplied in three grades, namely, hard, medium and soft.

*CS 102 Presentation of numerical values.

3 REQUIREMENTS

3.1 Material

3.1.1 *Lead slip*

The lead slip shall be free from grittiness and shall produce smooth, even and uniform writing.

3.1.2 *Wood*

The casing shall be made of soft, straight-grained, well seasoned wood free from defects such as knots, cracks, bore holes, splits and splinters.

3.2 Construction

3.2.1 *Casing*

Both halves of the wood casing shall be straight, of uniform structure and shall be securely glued together throughout the entire length of the pencil. The casing shall be finished with a suitable varnish, lacquer, or paint which shall be free from toxic substances, particularly lead. The casing shall be a circle or regular hexagon in section. The warpage in 80 per cent of the sample shall not exceed 0.5 mm and in the remaining 20 per cent of the sample the warpage shall not exceed 1.0 mm.

3.2.2 *Lead slip*

The lead slip shall be enclosed securely in the wood casing in such a way that the slip is centred.

3.3 Dimensions

3.3.1 The length of a pencil shall be 177 $\pm$ 3 mm.

3.3.2 The diameter of a pencil shall be between 7.4 mm and 7.9 mm for varnished lacquered or painted pencils. In the case of hexagonal pencils, the diameter shall be taken as the distance between any two opposite corners.

3.3.3 The diameter of a lead slip shall be not less than 2.00 mm nor more than 2.75 mm.

3.4 Performance

3.4.1 *General*

When sharpened in a pencil sharpener, the wood shall be readily cut, shall have a smooth, even finish and shall show no evidence of splitting, splintering or tearing of the wood grain. Drawn lines shall erase cleanly and thoroughly.

3.4.2 *Blackness of pencil markings*

When tested by the method prescribed in Appendix B, the blackness as measured from the reflectance values of the markings for the different grades, shall be as in Table 1.

TABLE 1 - Blackness index

Grade (1)	Blackness index (per cent reflectance) (2)
Hard	75 ± 3
Medium	72 ± 2
Soft	65 ± 3

3.4.3 *Point strength*

When tested by the method prescribed in Appendix C, the minimum values for breaking strength shall be as in Table 2.

TABLE 2 - Breaking strength

Grade (1)	Breaking strength, grams, min. (2)
Hard	1850
Medium	1500
Soft	1000

3.5 Gluing of wood casing

The casing of pencils when kept for 48 hours in a desiccator filled with water, shall not separate.

3.6 Uniformity of lead slip

The coefficient of variation of the electrical resistance of the lead slip when calculated by taking a class range of 5 ohms, shall not exceed 30 per cent. The method of test is described in Appendix D.

3.7 Chemical inertness of pencil markings

Pencil lines marked on a paper shall not be affected when dipped in hydrogen peroxide (20 volume).

4 MARKING AND PACKAGING

4.1 Marking

4.1.1 The following particulars shall be marked legibly on each pencil.

a) The name, address and/or trade mark of the manufacturer or supplier.

b) Grade - the words *hard, medium* or *soft,* as appropriate.

4.1.2 Other indications which may be specified by the purchaser may also be legibly marked on each pencil.

4.2 Packaging

Ten or twelve pencils of the same grade shall be either bound together with a suitable band or contained in a suitable package. The band or package shall indicate the name, address and/or trade mark of the manufacturer and grade of pencil. Ten or twelve such packs shall be contained in a box made of cardboard or other suitable material. Each box shall be marked to indicate the quantity, grade and batch number of pencils contained therein.

5 SAMPLING

The method of drawing representative samples of pencils and the criteria for conformity shall be as prescribed in Appendix A.

APPENDIX A

(See 5)

SAMPLING

A.1 DEFINITIONS

A.1.1 **lot**: In any consignment all boxes containing pencils of the same grade, manufactured under essentially the same conditions, drawn from a batch or days production as the case may be, shall be grouped to constitute a lot.

A.1.2 **box**: A container made of cardboard or other suitable material containing ten or twelve identical packs.

A.1.3 **pack**: Ten or twelve pencils of the same grade, bound together by means of a suitable band or contained in a suitable package.

A.2 SCALE OF SAMPLING

A.2.1 Samples shall be tested from each lot for ascertaining the conformity of the pencils to the requirements of this specification.

A.2.2 The number of boxes to be selected from each lot shall be in accordance with Columns 1 and 2 of Table 3.

TABLE 3 - Sampling plan

Number of boxes in the lot (1)	Number of boxes to be selected (2)	Number (N) of pencils to be selected for tests specified in 3.4.2 and 3.4.3 (3)
Up to 15	02	03
16 to 25	03	04
26 to 100	05	05
101 to 150	08	07
151 and above	13	10

A.2.3 From each of the boxes selected as above as far as possible an equal number of pencils, shall be drawn to form a final sample of 45 pencils.

A.2.4 The boxes and the pencils shall be selected at random in conformity with SLS 428*.

A.2.5 Testing of samples

A.2.5.1 All the pencils in the final sample shall be tested for the requirement specified in 3.6.

A.2.5.2 The pencils in the sample tested as above shall be divided at random into 3 sub-samples each of size 13.

A.2.5.3 All the pencils in the first sub-sample shall be tested for the requirements specified in 3.5.

A.2.5.4 All the pencils in the second sub-sample shall be tested for the requirements specified in 3.1, 3.2, 3.3, 3.4.1, and 3.7.

SLS 428 Random sampling methods.

A.2.5.5 From the third sub-sample, N pencils shall be selected at random as given in Column 3 of Table 3 and tested for the requirements given in **3.4.2** and **3.4.3**.

A.2.6 Criteria for conformity

The lot shall be considered to be in conformity with the requirements of this specification if the following conditions are satisfied:

a) The calculated value of the coefficient of variation of the electrical resistance shall not exceed 30 per cent.

b) The number of pencils not complying with the requirement specified in 3.5 shall not exceed 1.

c) The number of pencils not complying with the requirements specified in **3.1**, 3.2, 3.3, 3.4.1 and **3.7** shall not exceed 1.

d) From the results of testing the characteristics specified in **3.4.2** and 3.4.3 the mean ($\bar{x}$) and range (R) shall be calculated.

i) The value of the expression $\bar{x} \pm 0.4R$ lies within the range specified in Column 2 of Table 1.

ii) The value of the expression $\bar{x} - 0.4R$ shall be not less than the value specified in Column 2 of Table 2.

APPENDIX B

(See **3.4.2**)

DETERMINATION OF BLACKNESS OF PENCIL MARKINGS

B.1 APPARATUS

B.1.1 Marking of pencil lines

The apparatus shall consist of an arrangement where the pencil clamped in a vertical position by means of a holder and suitably loaded rests on a movable flat horizontal platen. A drawing paper shall be securely fastened to the platen. The load on the pencil including the mass of the holder shall be 575 ± 3 g. The reflectance value of the drawing paper measured by the method described in **B.1.2** shall be 80 ± 2 per cent.

B.1.2 Measurement of reflectance

a) Photometer

The apparatus shall consist of a box where light shall be incident on the pencil marking at an angle of 45° and the reflected light in a direction perpendicular to the markings shall be received by a photocell connected to a sensitive galvanometer. The inside of the box shall be painted with white paint giving a matt surface. To the output of the photocell and in series with the circuit, a suitable opposing electromotive force shall be applied using a dry cell and a variable resistance, so that the difference in the reflectance values will be magnified by controlling the sensitivity of the galvanometer (by using a shunt). The reflectance values shall be in the scale of zero reflectance for a perfectly black flat surface and 100 per cent reflectance for a perfectly white flat surface (magnesium carbonate block). Thin metal or plastic plates of known reflectance values may also be taken. If three such plates with reflectance values approximately in the range 58 per cent to 72 per-cent are placed in the box, the galvanometer reading may be plotted against the known reflectance values. This graph which is a straight line, may be used to convert the galvanometer readings to reflectance values.

b) Double beam spectrophotometer

Alternatively, a double beam spectrophotometer with an integrating sphere attachment for measurement of diffuse reflectance may be used, for this purpose. If this instrument is used, a direct reading of per cent reflectance could be obtained, when the instrument is adjusted using a perfectly white flat surface (magnesium carbonate block) for 100 per cent reflectance and perfectly black flat surface for zero reflectance. Surfaces of known reflectance in the range between 0 per cent and 100 per cent may also be used in addition to 0 per cent and 100 per cent surfaces for calibration.

B.2 MEASUREMENT OF BLACKNESS OF PENCIL MARKINGS

B.2.1 Procedure

The reflectance measurement shall be made with the help of one of the apparatus described above or any other suitable apparatus capable of measuring diffuse reflectance. The lead slip shall be cut square to its length and the end made flat by drawing a few lines, first on a sand paper and then on a drawing paper. Thirty parallel lines each of length 120 mm shall be drawn using the apparatus defined in B.1.1. The lines shall be drawn so that there is no intervening space between adjacent lines.

The paper with the markings shall be placed in the box or in the integrating sphere attachment of the spectrophotometer and reflectance readings shall be taken at 3 different positions of the markings. The mean value of these three readings shall be the blackness of the pencil markings.

APPENDIX C

(See 3.4.3)

DETERMINATION OF POINT STRENGTH

C.1 PROCEDURE

Pencils shall be sharpened in a mechanical pencil sharpener to a point having a diameter between 1.2 mm and 1.3 mm. The specified diameter may readily be produced by sharpening to a fine point in the pencil sharpener and then grinding the tip down to the required diameter. The pencil shall then be placed in a rigid holder set at a constant angle of 45° between the pencil and the scale platform (see Fig. 1). The pencil shall extend beyond the underside of the block 30 mm to 40 mm, measured along the pencil to the sharpened point. The scale platform shall be smooth and shall offer no resistance to the point moving across its surface. Pressure shall be applied by pushing the rod down gradually and uniformly to avoid variations and shock. Readings shall be taken at the instant of breaking. The breaking strength shall be based on the average of all tests made. Each pencil shall be subjected to not less than four tests.

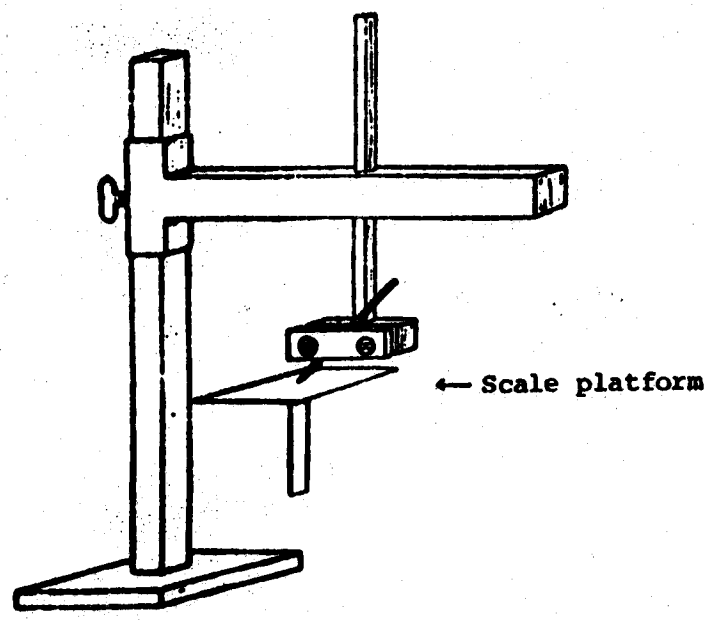

FIGURE 1 - Apparatus for determination of point strength

APPENDIX D

(See 3.6)

DETERMINATION OF UNIFORMITY OF LEAD SLIP

D.1 PROCEDURE

45 pencils shall be selected as described in A.2.3. The ends of the pencils shall be cleaned with sand paper and the electrical resistance of each lead slip shall be measured with a multi-range ohm-meter. The values obtained shall be recorded.

From the values obtained, the coefficient of variation shall be calculated.

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI *which includes surveillance inspection of the factory, testing of both factory and market samples.*

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.*

Printed at SLSI (Printing Unit)

SRI LANKA STANDARDS INSTITUTION

The Sri Lanka Standards Institution (SLSI) is the National Standards Organization of Sri Lanka established under the Sri Lanka Standards Institution Act No. 6 of 1984 which repealed and replaced the Bureau of Ceylon Standards Act No. 38 of 1964. The Institution functions under the Ministry of Science & Technology.

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.

The Institution is financed by Government grants, and by the income from the sale of its publications and other services offered for Industry and Business Sector. Financial and administrative control is vested in a Council appointed in accordance with the provisions of the Act.

The development and formulation of National Standards is carried out by Technical Experts and representatives of other interest groups, assisted by the permanent officers of the Institution. These Technical Committees are appointed under the purview of the Sectoral Committees which in turn are appointed by the Council. The Sectoral Committees give the final Technical approval for the Draft National Standards prior to the approval by the Council of the SLSI.

All members of the Technical and Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

In the International field the Institution represents Sri Lanka in the International Organization for Standardization (ISO), and participates in such fields of standardization as are of special interest to Sri Lanka.

Printed at the Sri Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.