SRI LANKA STANDARD 511:1994

UDC 686 . 864

SPECIFICATION FOR

BALL POINT PEN REFILLS

(FIRST REVISION)

SRI LANKA STANDARDS INSTITUTION

SPECIFICATION FOR BALL POINT PEN REFILLS

(FIRST REVISION)

SLS 511 : 1994

Gr. 8

SRI LANKA STANDARDS INSTITUTION
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 BALL POINT PEN REFILLS
(FIRST REVISION)

FOREWORD

This standard was approved by the Sectoral Committee on Fundamental Standards, Road Vehicles and Industrial Safety and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 1994-01-13.

This standard is the first revision of **SLS 511** Specification for Ball point pen refills published in 1981. Ball point pen refill is the vital component on which the writing quality of ball point pen depends. Refill is separately assembled in all types of ball point pens except the type which has ink container formed into the barrel. This standard covers the requirements of materials and dimensions to ensure interchangeability and functional tests to guarantee effective performance and durability.

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

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 **SLS 102**. The number of figures to be retained in the rounded off values shall be the same as that of the specified value in this standard.

The Sri Lanka Standards Institution gratefully acknowledges the use of the following publications of the Indian Standards Institution and the South African Bureau of Standards, in the preparation of this standard:

a) **Indian Standard**
SPECIFICATION FOR REFILL, BALL POINT PEN
(Second revision)
IS : 3707 - 1984

b) **South African Bureau of Standards**
STANDARD SPECIFICATION FOR BALL POINT PENS
SABS 785 - 1976.

1 SCOPE

This Sri Lanka Standard specifies the requirements to be satisfied by the ball point pen refills used in both retractable and non-retractable types of pens.

2 REFERENCES

SLS 102 Presentation of numerical values
SLS 428 Random sampling methods
SLS 868 Printing paper and writing paper

3 DEFINITIONS

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

3.1 **ball** : The metal ball seated at the end of the writing tip.

3.2 **collar**: The ring or round flange against an object chiefly to restrain motion along its axis within given limits.

3.3 **barrel (holder)** : The body of the pen, into which the refill is fitted.

3.4 **writing tip (point)** : The seat of the ball which is fitted to the ink tube.

3.5 **refill (ink cartridge)** : The part of a ball point pen, having a writing tip fitted to a tube, which contains ink.

3.6 **stop (crimp)** : For retratable type of pens, the widened part of the ink tube, which serves to retain the spring.

3.7 **tube (ink container)** : The part of the refill which contains ink

4 REQUIREMENTS

4.1 Material

4.1.1 Tube (Ink container)

4.1.1.1 The tube shall be made of plastic or non-corrosive metal and shall have a smooth surface finish.

4.1.1.2 The plastic tubes shall pass the flammability test specified in 7.1 and the metal tubes shall pass the corrosion resistance test, specified in 7.2.

4.1.1.3 The tube shall be compatible with the ink and with the writing tip, and it shall be impervious to water, vapour, gases and ink solvents.

4.1.2 Writing tip

Writing tip shall be made from brass, nickel/ copper alloy, stainless steel or any other non-corrosive metal having the strength and hardness characteristics equal to or higher than that of brass and shall pass the corrosion resistance test specified in 7.2.

4.1.3 Ball

4.1.3.1 The ball shall be stainless steel, tungsten carbide or any other similar material, having a minimum hardness of 60 HRC (or 720 HV).

4.1.3.2 The ball shall pass the corrosion resistance test, specified in 7.2.

4.1.4 *Ink*

4.1.4.1 The ink shall be homogeneous, shall not congeal during the shelf life of the refill.

4.1.4.2 It shall not have an objectionable odour or contain any poisonous ingredient in a quantity that is toxic to humans and shall be compatible with all the components of the refill.

4.1.4.3 The colour of the ink shall normally be black, blue, green or red.

4.1.4.4 The ink shall comply with the following requirements:

a) **Drying time**
When a refill is tested, as specified in 7.3, the writing shall dry within 5 seconds and shall not smudge.

b) **Water resistance**
Writing made with a refill shall be legible, after testing as specified in 7.4.

4.2 Manufacture

4.2.1 Writing tip

4.2.1.1 The writing tip shall fit, into the ink tube in a manner which precludes any leakage.

4.2.1.2 The performance of the writing tip together with the ball shall be such that,

a) It shall not break, crack, warp or have a permanent set;
b) The ball shall not retract within the writing tip;
c) It shall not show any sign of ink leakage; and
d) The writing shall comply with all the requirements specified in 4.4.2.

4.2.2 Refill

4.2.2.1 The refill shall be so manufactured as to be straight and concentric with the ball.

4.2.2.2 The refills used on retractable type of pens shall have either a collar or a stop (crimp) at a distance from the ball end as specified in Figure 1 or Figure 2 respectively.

4.2.2.3 The refills shall be so manufactured that they are completely interchangeable with the ball point pens, for which they are meant.

4.2.2.4 The ball shall be so mounted as to have free rotation to enable smooth, continuous writing, but shall not be loosely fitted nor become loose in use.

4.2.2.5 The tube (ink container) shall be filled with ink conforming to the requirements specified in 4.1.4.

4.2.2.6 The ink shall not, spill over the tube or leak around the ball or at the place where the writing tip fits into the ink tube. When the refill is turned or jerked, with the writing tip facing upwards, the ink shall not ooze out.

4.2.2.7 The refill shall contain sufficient ink to write a continuous line having a length not less than 1100 m.

4.2.2.8 The tip holding the ball shall be suitably crimmed so that its edges shall be smooth and shall not have any feathers or fins that would scratch the paper while writing.

4.3 Dimensions

4.3.1 Refill

The shape and dimensions of the refill shall preferably be as shown in Figures 1, 2 and 3. When refills having dimensions other than those given in Figures 1, 2 or 3 are manufactured, they shall conform to all other requirements, specified in this standard.

4.3.2 Ball

The diameter of the ball shall be as specified below :

a) Medium : 0.80 mm $\leq$ diameter $\leq$ 1.0 mm
b) Fine : diameter < 0.80 mm

4.4 Performance

4.4.1 Resistance to ageing

After a refill has been subjected to the "Accelerated ageing test" as specified in 7.5, it shall comply with the following requirements:

a) The ink tube shall not have become brittle or show a loss of rigidity ;
b) The refill shall show no sign of ink leakage from the writing tip (ball leakage) or from the tube; and
c) It shall comply with all the writing quality requirements, specified in 4.4.2.

4.4.2 Writing quality

When tested for writing quality by hand writing as specified in 7.6 the refill shall conform to the requirements of 4.4.2.1, 4.4.2.2 and 4.4.2.3.

4.4.2.1 Smoothness and line continuity

The writing shall be smooth and uniform, shall have a good line continuity, and shall be free from line splitting, variations in line width and in intensity of colour, excessive deposits of ink on the paper or on the writing tip , when tested as described in 7.6.2.

4.4.2.2 Starting characteristics

The refill shall start writing the first line within a distance of 15 mm. On subsequent lines, it shall start writing a line immediately, when tested as specified in 7.6.3.

4.4.2.3 Feathering and penetration
The writing shall not feather or spread and shall not have penetrated to the reverse side of the paper, when tested as specified in 7.6.4.

4.4.3 Shelf life

After storage for one year, from the time of manufacture, under normal storage conditions, the refill shall fulfil the writing quality requirements specified in 4.4.2.

5. PACKING

5.1 The refills before packing may be given a protective coating at the ball end.

5.2 Refills shall be packed in suitable cartons or packing so that they can be stored without drying under normal storage conditions for a storage period of at least one year.

5.3 Only the refills of the same design, material, ball size, nominal length of writing, and having ink of the same colour, shall be packed in the same carton or packing.

6. MARKING

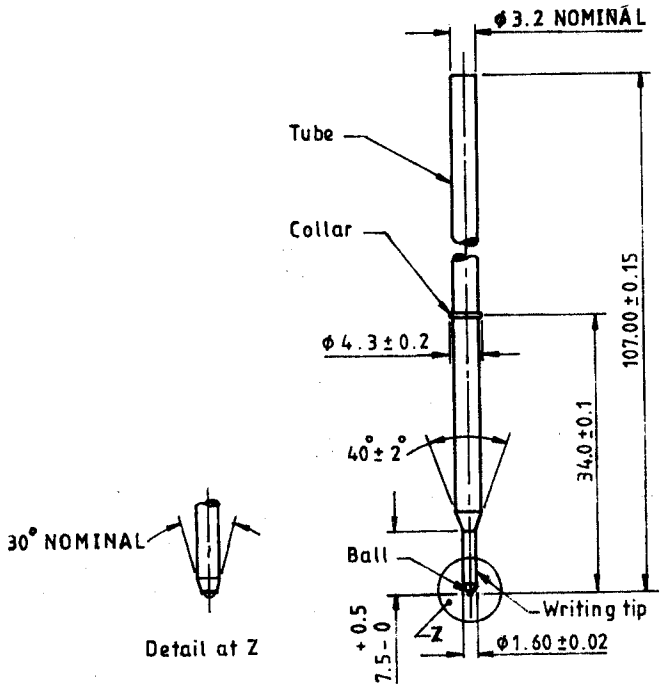
The manufacturer's name and/or trade mark shall be legibly and indelibly marked on the barrel of the refill.

The following information shall be legibly and indelibly marked on the carton or packing, or on a lable securely attached to it:

a) Name of product;
b) Manufacturer's name and/or trade mark and address;
c) Month and year of manufacture;
d) Classification, that is :'Fine point' or 'Medium point';
e) Colour of ink;
f) Quantity of refills; and
g) Batch number.

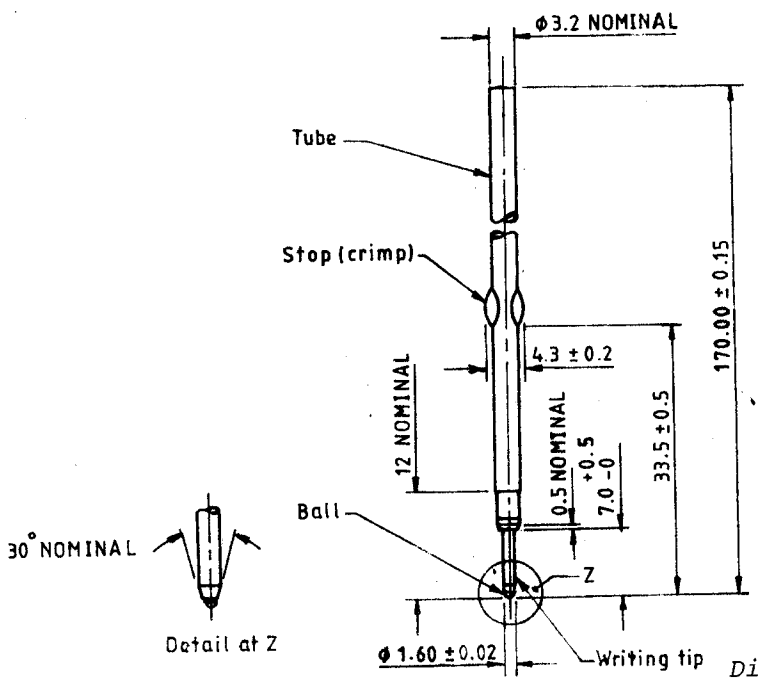
NOTE

Attention is drawn to certification facilities offered by SLSI. See the inside back cover of this standard.



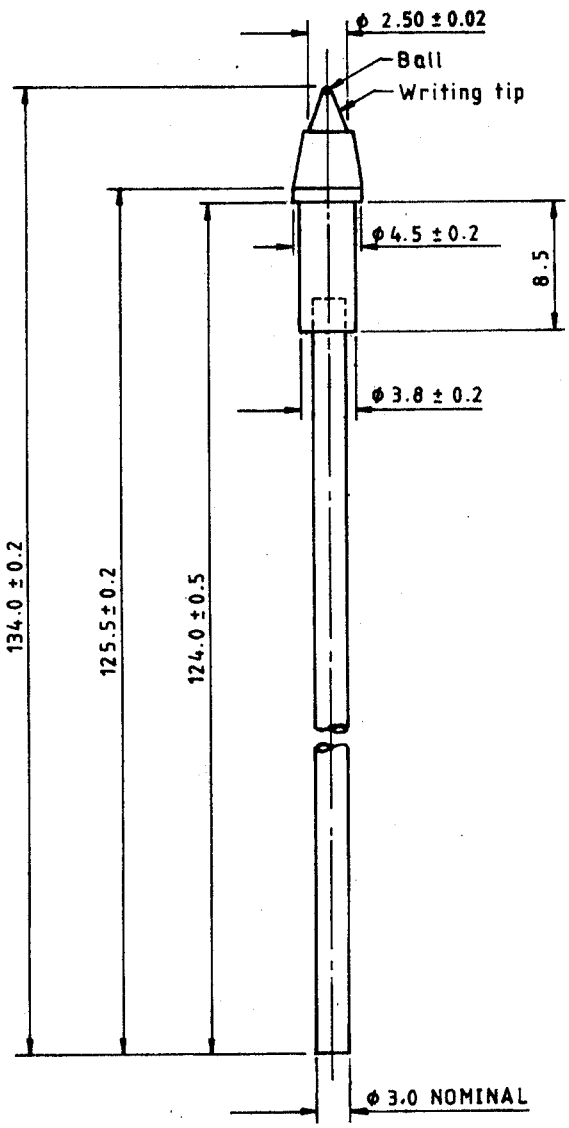
Dimensions in millimetres

FIGURE 1 - Refill with collar for retractable pen



Dimensions in millimetres

FIGURE 2 - Refill with stop(crimp) for retractable pen



Dimensions in millimetres

FIGURE 3 - Refill for non - retractable pen

7. METHODS OF TEST

7.1 Flammability test

A draft shield shall be used to reduce air current effects. Hold the test sample horizontally within the shield, above the Bunsen Burner having a 25 mm to 30 mm blue flame just touching the end of the refill (not the writing tip end) until the sample ignites or for a period of not more than 30 seconds, whichever occurs first. Remove from the flame.

If the sample does not burn within 30 s, it is "non-flammable". If the sample burns, when in contact with the flame but will not continue to burn when removed from the flame, it is "flame resistant". If the sample continues to burn at a rate of less than 60 mm per minute, it is considered as 'slow-burning' and deemed to have met the requirements. If the sample burns into flames or burns at a rate of more than or equal to 60 mm per minute, it shall be considered as not meeting the requirements of this specification.

7.2 Corrosion resistance test

The metal parts shall be dipped in a boiling 10 per cent (by mass) aqueous solution of sodium chloride for a period of 15 minutes. After removal from this solution, they shall be immediately immersed in another 10 per cent aqueous solution of sodium chloride at room temperature for at least one hour. They shall then be removed, wiped with a soft cloth lightly and allowed to dry for 24 hours at room temperature. The metal parts, shall not show any visible signs of corrosion at the end of the test.

7.3 Test for drying time

Place a sheet of bond paper specified in **7.7.1**, on a smooth, flat surface. Using one of the test samples reserved in accordance with **7.7.3**, write six 8's on the paper. Allow the writing to dry for 5 seconds, then place a 100 g flat-bottom cylindrical mass-piece of diameter 25 mm, on the corner of a second sheet of paper, and draw the clean sheet of paper and the 100 g mass, slowly over the writing. Repeat the procedure with each of the remaining test samples, and examine the writing for smudging [or, compliance with **4.1.4.4 (a)**].

7.4 Test for water resistance

Write the equivalent of six, five- letter words on a sheet of bond paper specified in **7.6.1**. Immerse the paper in distilled water at room temperature for 48 h. Remove, and then allow the paper to dry, and then examine the writing, at normal reading distance, for compliance with **4.1.4.4.(b)**.

7.5 Accelerated ageing test

Subject the test samples to the following two cycles after removing the protective coating , if any:

a) **First cycle** - Place the test samples in a vertical position with the writing tips facing downwards and expose them to the cycle of temperature changes given in Table **1**.

TABLE 1 -Temperature cycle

Duration h (1)	Temperature (°c) (2)
16	0 ± 2
8	25 ± 2
16	50 ± 2
8	25 ± 2

b) **Second cycle** - Repeat the procedure described for the first cycle but with the tips facing upwards.

7.6 Manual writing quality test

7.6.1 Bond paper

The bond paper used for the writing quality test shall be of grammage 75 ±5 g/m² nominal value and thickness 89 m to 122 m and shall comply with **SLS 868**.

7.6.2 Test for smoothness and line continuity

Remove the protective coating (if any) from the balls, of the test samples, and test each test sample by writing by hand, numerous turns, flourishes, reversals, intersecting curves or figures of eight, on the bond paper specified in **7.6.1**. Examine the writing produced by each test sample for compliance with sub clause **4.4.2.1** (Reserve the test samples for the test for starting characteristics).

7.6.3 Test for starting characteristics

Use bond paper specified in **7.6.1** with a vertical line ruled about 25 mm from the left hand edge. One hour after completion of the test described in **7.6.2**, place the ball of a test sample(fitted to a pen), on the ruled line and, applying a moderate force to the pen, move it to the right across the full width of the paper. Immediately afterwards, draw four more lines, in the same way. Repeat the procedure with the remaining test samples, and examine the writing produced by each test sample for compliance with, **4.4.2.2**. (Reserve the test samples for the tests for "Drying time" and "Water resistance").

7.6.4 Test for feathering and penetration

Write the equivalent of six, five- letter words on a sheet of bond paper specified in **7.6.1**. After 48 hours examine the writing for compliance with **4.4.2.3**.

APPENDIX A

COMPLIANCE OF A LOT

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 tests and check tests or any other procedure, appropriate schemes of sampling and inspection should be adopted.

A.1 Lot : In any consignment all ball point pen refills, manufactured under same conditions of manufacture shall be grouped together to constitute a lot.

A.2 Scale of sampling

A.2.1 Number of refills to be selected from a lot shall be in accordance with Column 1 and Column 2 of Table 2.

TABLE 2 - Scale of sampling

Number of ball point pen refills in the lot (1)	Number of ball point pen refills to be selected (2)	Sub sample size (3)
upto 1200	20	3
1201 - 3200	32	5
3201 - 10000	42	6
10,000 and above	50	8

A.2.2 Ball point pen refills shall be selected at random. In order to ensure randomness of selection random number tables as given in SLS 428 shall be used.

A.3 Number of tests

A.3.1 Each refill selected as in A.2.2 shall be inspected for marking and visual requirements specified in 4.

A.3.2 Six sub samples of size as given in Column 3 of Table 2 shall be selected from the sample selected as in A.2.2 and ball the refills in sub samples shall be subjected to the tests given below.

Sub sample 1 - Manual writing quality test.
Drying time test.
Water resistance test.
Sub sample 2 - Accelerated ageing test.
Sub sample 3 - Flammability test.
Sub sample 4 - Corrosion resistance test.

A.4 Criteria for conformity

A lot shall be declared as conforming to the requirements of this standard if the conditions given in A.4.1 and A.4.2 are satisfied.

A.4.1 Each ball point refill inspected as in A.3.1 satisfies the relevant requirements.

A 4.2 The ball point refills of each sub sample when tested as in A.3.2 satisfies the relevant requirements.

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.