

## **BHUTAN STANDARD**

**Raw Silk – Grading and methods of test parts**



**ICS 59.060.10**

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BHUTAN STANDARD BUREAU  
The National Standards Body of Bhutan  
THIMPHU**

# **BTS 305:2020 IS 15090(1-11): 2002**

## **NATIONAL FOREWORD**

This Bhutan Standard which is identical with IS 15090(parts 1 to11) Raw Silk – Grading and Methods of Test Parts issued by the Indian Standards Bureau (IS) was adopted by Bhutan Standards Bureau by Textile Technical committee (TC-06) and approved by the Bhutan Standards Bureau Board (BSB Board) on June, 2020.

The text of the IS Standard has been approved as suitable for publication as Bhutan Standard without deviation. Certain conventions are however, not identical to those used in Bhutan Standard.

Attention is particularly drawn to the following:

- a) Where the words “IS Standard” appear referring to this standard, they should be read as “Bhutan Standard”.
- b) Wherever page numbers are quoted, they are “IS (IS Standard)” page numbers.

**AMENDMENT NO. 1 FEBRUARY 2007  
TO  
IS 15090 (PARTS 1 TO 11) : 2002 RAW SILK —  
GRADING AND METHODS OF TESTS  
PARTS 1 TO 11**

(Page 2, clause 3.2) — Substitute the following for the existing:

'The unit of grading shall be for one lot. The quantity of one lot shall consist of 2 to 4 cartons of 30 kg each or 1 to 2 bales of 60 kg each.'

(Page 2, Note under clause 3.2) — Delete.

(Page 5, Table 4) — The values of Evenness Variation II against Grades 'C', 'D' and 'E' be changed to '15', '20' and 'Above 20' respectively.

(Page 13, clause 3) — Substitute the following for the existing:

'The test shall be conducted at prevailing room temperature and  $65 \pm 5$  percent relative humidity.'

(Page 19, clause 5.1, line 4) — Substitute '300 revolutions/minute' for '300 sec/min'.

(Pages 19 to 22) — Substitute the words 'Linear Density' for 'size (count)' wherever appears.

IS 15090 (Parts 1 to 11) : 2002

(Superseding IS 2938 : 1992,  
IS 2941 : 1991, IS 2942 : 1991,  
IS 2943 : 1991, IS 2944 : 1991,  
IS 2945 : 1991, IS 2946 : 1991  
and IS 2947 : 1991)

(Reaffirmed 2012)

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कच्चा रेशम — ग्रेडिंग और परीक्षण पद्धतियाँ  
भाग 1 से 11

*Indian Standard*

RAW SILK — GRADING AND METHODS OF TESTS

PARTS 1 TO 11

ICS 59.060.10

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## FOREWORD

This Indian Standard (Parts 1 to 11) was adopted by the Bureau of Indian Standards, after the draft finalized by the Silk and Silk Products Sectional Committee had been approved by the Textile Division Council.

The standards on grading and methods of test for raw silk originally published in 1964 were revised in 1991 to ensure that the standards are able to encompass comparative large proportion of production to have a meaningful effect.

The standards have been revised again and are being published as parts 1 to 11 of a new standard taking into consideration the strengths and weakness of Indian Silk Industry and present level of quality of raw silk. In this standard the top end of the existing grades has been maintained as such for comparison at par with the standards of International Silk Association, while slightly extending the cut off point from B to E at the bottom end so as to provide a means of differentiating among the substandard lots. It is expected that this will form the starting point for any strategic improvement to be brought forth in the raw silk quality as a result of implementation of the standard. The lot size and sample size for testing of raw silk has been revised based on detailed study of raw silk lots transacted in India conducted by CSTRI, Bangalore. Accordingly the values in respect of maximum deviation for various grades are different than those specified in International Silk Association Standards.

The Committee while finalizing the standard decided that all standards relating to grading and methods of test for raw silk be published as parts in one volume. Accordingly this standard on 'Raw Silk — Grading and Methods of Tests' consists of parts detailed below:

- Part 1 Grading
- Part 2 Visual and tactual examination
- Part 3 Determination of conditioned mass
- Part 4 Conducting winding test
- Part 5 Determination of size (count) deviation and maximum deviation
- Part 6 Determination of conditioned size (count)
- Part 7 Determination of evenness variation
- Part 8 Determination of cleanness
- Part 9 Determination of neatness and low neatness
- Part 10 Determination of tenacity and elongation by serigraph test
- Part 11 Determination of cohesion

Accordingly, various parts of this standards supersede the earlier standards on the subject as indicated on first page of each part.

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, shall be rounding off in accordance with IS 2:1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## Indian Standard

# RAW SILK — GRADING AND METHODS OF TESTS

### PART 1 GRADING

#### 1 SCOPE

This standard (Part 1) prescribes method of grading of raw silk.

#### 2 TERMINOLOGY

For the purpose of this standard, the following definitions in addition to those given in SP 45 : 1988 'Handbook on Glossary of Textile Terms' shall apply.

##### 2.1 Book

A compressed package of raw silk weighing about 5 kg and containing a suitable number of skeins.

##### 2.2 Cleanness

The degree of cleanness of raw silk panels, determined on the basis of incidence of cleanness defects which are classified as 'super major defects' 'major defects' and 'minor defects' by using Official Standard Photographs for Cleanness. Cleanness is expressed as a percentage.

##### 2.3 Cohesion

The degree of agglutination of cocoon filaments forming raw silk thread, determined by subjecting the raw silk threads to friction in a cohesion tester and counting the number of strokes required to spread and open out constituent filaments.

##### 2.4 Conditioned Mass (or Correct Invoice Mass)

The mass of raw silk obtained by adding to its oven-dry mass, 11 percent of its oven-dry mass.

##### 2.5 Evenness

The degree of evenness of raw silk panels within approximately the same length as the sizing skeins, determined on the basis of incidence of evenness defects by using Official Standard Variation Photographs. Evenness defects are those portions of raw silk which show stripes caused by the variation in the size of raw silk to such a degree as is easily noticeable by visual inspection. Evenness is expressed as the number of stripes for 20 panels, categorised as Evenness I, II and III depending on the intensity of the stripes.

##### 2.6 Hand

The term 'hand' shall denote the feel of raw silk in terms of hardness and smoothness.

##### 2.7 Hank

Silk reeled and removed from a reeling machine in the form of an open band. It shall be one continuous thread made by tying all breaks with good, clean knots, with the loose ends cut not more than three millimetres (one-eighth inch) long. The outside end of the thread shall be tied round the hank in such a manner as to be easily found. The hank shall be laced at places equally spaced with a fine, soft twisted, cotton or spun silk yarn passed through at least five diamonds in the width of the hank, tied such that the knot is about one centimetre (one-half inch) from the edge of the hank, and the loose ends ought not to exceed one centimetre (one-half inch) in length from the knot.

##### 2.8 Maximum Deviation

The degree of size variation in the test skeins; it is expressed by the higher of the two differences namely, the difference between the average size and the average size of a known number of coarsest skeins and the difference between the average size and the average size of the same number of finest skeins.

##### 2.9 Neatness

The degree of neatness of raw silk panels, determined on the basis of incidence of defects which are smaller than those classified as 'minor cleanness defects' by using Official Standard Photographs for Neatness. Neatness is expressed as a percentage.

NOTE — Low neatness is the average of the neatness percent values of one-fifth of the panels inspected for neatness, which show the lowest neatness values.

##### 2.10 Raw Silk

Raw silk is the thread reeled from several silk cocoons and is understood to be a continuous thread from beginning to end of the skein.

### 3 GRADES

3.1 For grading purposes, raw silk shall be divided into three categories according to their sizes:

Category I 2.0 tex (or 18 denier) or below

Category II 2.1 to 3.6 tex (or 19 to 33 denier)

Category III 3.7 tex (or 34 denier) or above

The grades shall be expressed in the following order in all categories of raw silk where 4A is of the highest and E is of the lowest merit : 4A, 3A, 2A, A, B, C, D and E.

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### 3.2 Unit of Grading

The unit of grading shall be a lot of 4 bales of 30 kg each. If the quantity to be tested and graded is more than 4 bales, it shall be divided into lots of 2 bales each and part thereof.

NOTE — In case of last part is less than 2 bales. One bale from one of the lots shall be transferred to the last part so as to make it minimum of two bales of 30 kg each.

### 3.3 Sorting of Bales

If individual bales appear to be uniform in colour, even though the bales vary in colour from one another, the consignment shall be sorted on the basis of colour into groups as may be necessary.

#### NOTES

- 1 All bales as sorted out for the purpose of grading shall constitute a lot.
- 2 In case a lot is required to be divided into groups, the number of sample skeins to be drawn from each group shall be proportional to the total number of books in each group.

### 3.4 Preliminary Examination

**3.4.1** The raw silk skeins, books and bales shall be examined to verify, whether they are meeting the requirements specified in Annex A.

**3.4.2** The net mass of bales shall be determined by the method prescribed in Annex B.

**3.4.3** The proforma for record and report as given in Annex C shall be used for recording the test data and reporting the results of the preliminary examination.

### 3.5 Examination and Tests

Each lot of raw silk shall be examined visually and tactually according to the method prescribed in Part 2.

**3.5.1** Taking the size of the silk marked on the bale as the basis, each lot shall be evaluated for the characteristics listed in Table 1 except cohesion, by the method of test prescribed in the part of standard stated against each characteristic. In case, the marked size is 3.7 tex (or 33 denier) or below, the lot shall be evaluated for cohesion also, according to the method indicated in Table 1.

## 4 METHOD OF CLASSIFICATION

The grade of a lot shall be determined by comparing the test values with the corresponding values given in Tables 2 to 4 in the following manner.

### 4.1 Grading in Accordance with the Major Tests

The grade of a lot of size 2.6 tex (or 33 denier) and finer (categories 1 and 2) shall be determined according to the lowest respective grade of its size deviation, evenness variation I, evenness variation II,

cleanness, average neatness and low neatness, whereas the grade of a lot of size 3.7 tex (or 34 denier) and coarser (category 3) shall be determined according to the lowest respective grade of its size deviation, maximum deviation, evenness variation 1, evenness variation II, cleanness, average neatness and low neatness, as given in Tables 2 to 4.

In case, any one or more of results fall below the limits prescribed for a grade, the lot shall be degraded to the lowest grade wherein such value is given in the Classification Tables.

### 4.2 Degrading in Accordance with the Auxiliary Tests

**4.2.1** In case of lot of size 2.6 tex (or 33 denier) and finer if observed value for maximum deviation, evenness variation III, winding, tenacity, elongation or cohesion, and observed value for evenness variation III, winding, tenacity or elongation in case of lot of size 3.7 tex (or 34 denier) and coarser, is found to be lower than the corresponding value specified in the class of auxiliary test, then the grade provisionally established in accordance with the preceding paragraph shall be lowered by as many grades as the numerical difference that exists between the required auxiliary test class and the class actually found, provided that any difference of more than one class shall be deemed as one class difference with respect to the maximum deviation and evenness variation III of a lot of size 33 denier and finer and evenness variation III of a lot of size 34 denier and coarser.

**Table 1 Characteristics and Methods of Tests**  
(Clause 3.5.1)

SI No.	Characteristics	Reference to Part of this Standard
i)	Size deviation	5
ii)	Evenness variation	7
iii)	Cleanness	8
iv)	Neatness	9
v)	Low neatness	9
vi)	Maximum deviation	5
vii)	Winding (breaks)	4
viii)	Tenacity	10
ix)	Elongation	10
x)	Cohesion	11
xi)	Conditioned size	6
xii)	Conditioned mass	3

NOTE — In case the results of 'Conditioned Size Test' differ from the size marked on the bales by more than 7 percent either way, the results of all the tests listed in Table 1, except the 'Conditioned Size Test' shall be discarded. Further, taking the results of the 'Conditioned Size Test', as the basis, all tests, including the 'Conditioned Size Test' shall be repeated and 'Grading Certificate' shall be issued on the basis of result of the repeat tests

**Table 2 Classification Table for Raw Silk of Category I  
[2.0 tex (or 18 denier) or Below ]  
(Clauses 4 and 4.1)**

Items	Grade	4A	3A	2A	A	B	C	D	E
Size	1.3tex(or 12 d) and below	0.089 (0.80)	0.106 (0.95)	0.122 (1.10)	0.150 (1.35)	0.189 (1.70)	0.256 (2.30)	0.322 (2.90)	Above 0 320 (Above 2.90)
Deviation	1.4 to 1.7 tex (or 13 to 15 d)	0.100 (0.90)	0.117 (1.05)	0.139 (1.25)	0.167 (1.50)	0.200 (1.80)	0.272 (2.45)	0.339 (3.05)	Above 0.339 Above 3.05
Tex (or denier)	1.8 to 2.0 tex (or 16 to 18 d)	0.111 (1.00)	0.133 (1.20)	0.156 (1.40)	0.189 (1.70)	0.211 (2.00)	0.289 (2.60)	0.356 (3.20)	Above 0.356 (Above 3.20)
Evenness variation I	(count)	30	34	38	42	46	48	50	Above 50
Evenness variation II	(count)	2	3	5	7	11	15	20	Above 20
Cleanness, percent		97	95	93	88	83	79	75	Below 75
Average neatness, percent		94	92	90	87	82	78	74	Below 74
Low neatness, percent		90	87	83	77	74	72	70	Below 70
Items	Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Maximum	13 tex (or 12 d) and below	0.23 (2.1)	0.29 (2.6)	0.33 (3.0)	0.40 (3.6)	0.52 (4.7)	0.67 (6.0)		Above 0.67 (Above 6.0)
Deviation	1.4 to 1.7 tex (or 13 to 15 d)	0.27 (2.4)	0.31 (2.8)	0.37 (3.3)	0.46 (4.1)	0.64 (5.8)	0.72 (6.5)		Above 0.72 (Above 6.5)
Tex (or denier)	1.8 to 2.0 tex (or 16 to 18 d)	0.30 (2.7)	0.36 (3.2)	0.42 (3.8)	0.51 (4.6)	0.67 (6.0)	0.81 (7.3)		Above 0.81 (Above 7.3)
Items	Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Evenness variation III	(count)		0		1	2	3	4	Above 4
Items	Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Winding	13 tex (or 12 d) and below	2	4	6	9	12	15		Above 15
(breaks)	1.4 to 2.0 tex (or 13 d to 18 d)		3	5	8	11	14		Above 14
Items	Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Tenacity g/tex (or g/denier)				33 (3.7)					Below 33 (Below 3.7)
Elongation, percent				18					Below 18
Items	Class	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Cohesion (strokes)			40			30			Below 30

In case two or more auxiliary test classes are found to be lower than the corresponding values listed in the classes of the auxiliary tests, then the lot shall be declassified by a number equal to the highest of the numerical differences as determined above.

**4.2.2** In case the result of the visual inspection of a lot is found to be 'poor' in the general finish and/or the result of the skein finish inspection in the winding test of a lot is found to be 'poor', the grade of the lot shall be one below that as determined in accordance with **4.2.1**.

**4.2.3** In case the result of the visual inspection of a lot is found to be 'inferior' in its general finish, or in

case the number of breaks in the winding test exceeds the limits mentioned below, the lot shall be classified as E grade:

	Breaks
13 tex (or 12 denier) or below	...30
1.4 to 2.0 tex (or 13 to 18 denier)	...28
2.1 to 3.6 tex (or 19 to 33 denier)	...26
3.7 to 7.7 tex (or 34 to 69 denier)	...24
7.8 tex (or 70 denier) or above	...22

**4.3** The proforma as given in Annex D shall be used for issue of Certificate of Grading.



**Table 3 Classification Table for Raw Silk of Category II**  
**[2.1 to 3.7 tex (or 19 to 33 denier)]**  
*(Clauses 4 and 4.1)*

Items	Grade	4A	3A	2A	A	B	C	D	E
Size	2.1 to 2.4 tex (or 19 to 22 d)	0.128 (1.15)	0.150 (1.35)	0.178 (1.60)	0.217 (1.95)	0.261 (2.35)	0.317 (2.85)	0.383 (3.45)	Above 0.380 (Above 3.45)
Deviation	2.6 to 2.8 tex (or 23 to 25 d)	0.144 (1.30)	0.167 (1.50)	0.200 (1.80)	0.244 (2.20)	0.289 (2.60)	0.333 (3.00)	0.389 (3.50)	Above 0.390 (Above 3.50)
tex (or denier)	2.9 to 3.2 tex (or 26 to 29 d)	0.156 (1.40)	0.183 (1.65)	0.217 (1.95)	0.261 (2.35)	0.306 (2.75)	0.344 (3.10)	0.394 (3.55)	Above 0.390 (Above 3.55)
	3.3 to 3.7 tex (or 30 to 33 d)	0.167 (1.50)	0.194 (1.75)	0.228 (2.05)	0.278 (2.50)	0.328 (2.95)	0.378 (3.40)	0.428 (3.85)	Above 0.430 (Above 3.85)
Evenness variation I	(count)	30	34	38	42	46	48	50	Above 50
Evenness variation II	(count)	2	3	5	7	11	15	20	Above 20
Cleanness, percent		97	95	93	88	83	79	75	Below 75
Average neatness, percent		94	92	90	87	82	78	74	Below 74
Low neatness, percent		90	87	83	77	74	72	70	Below 70
Items	Class	(1)	(2)	(3)	(4)	(5)	(6)		(7)
Maximum	2.1 to 2.4 tex (or 19 to 22 d)	0.38 (3.4)	0.40 (3.6)	0.48 (4.3)	0.59 (5.3)	0.70 (6.3)	0.78 (7.0)		Above 0.78 (Above 7.0)
Deviation	2.6 to 2.8 tex (or 23 to 25 d)	0.39 (3.5)	0.46 (4.1)	0.54 (4.9)	0.66 (5.9)	0.73 (6.6)	0.78 (7.0)		Above 0.78 (Above 7.0)
Tex (or denier)	2.9 to 3.2 tex (or 26 to 29 d)	0.42 (3.8)	0.50 (4.5)	0.59 (5.3)	0.70 (6.3)	0.76 (6.8)	0.80 (7.2)		Above 0.80 (Above 7.2)
	3.3 to 3.7 tex (or 30 to 33 d)	0.44 (4.0)	0.52 (4.7)	0.61 (5.5)	0.73 (6.6)	0.80 (7.2)	0.84 (7.6)		Above 0.84 (Above 7.6)
Items	Class	(1)			(2)	(3)	(4)	(5)	(6)
Evenness variation III	(count)	0			1	2	3	4	Above 4
Items	Class	(1)	(2)		(3)	(4)	(5)	(6)	(7)
Winding (breaks)		1	3		5	7	11	13	Above 13
Items	Class	(1)							(2)
Tenacity g/tex (or g/denier)		33 (3.7)							Below 33 (Below 3.7)
Elongation, percent		18							Below 18
Items	Class	(1)				(2)			(3)
Cohesion (strokes)		60				40			Below 40

**Table 4 Classification Table for Raw Silk of Category III**  
**[3.8 tex (or 34 denier) and Above]**  
*(Clause 4)*

Items	Grade	4A	3A	2A	A	B	C	D	E
Size	3.8 to 5.4 tex (or 34 to 49 d)	0.289 (2.60)	0.344 (3.10)	0.406 (3.65)	0.494 (4.45)	0.589 (5.30)	0.689 (6.20)	0.794 (7.15)	Above 0.794 (Above 7.15)
Deviation	5.6 to 7.7 tex (or 50 to 69 d)	0.417 (3.75)	0.489 (4.40)	0.578 (5.20)	0.706 (6.35)	0.833 (7.50)	0.978 (8.80)	1.128 (10.15)	Above 1.128 (Above 10.15)
Tex (or denier)	7.8 tex (or 70 d) and above	0.494 (4.45)	0.583 (5.25)	0.689 (6.20)	0.844 (7.60)	0.944 (8.50)	1.144 (10.30)	1.350 (12.15)	Above 1.350 (Above 12.15)
Maximum	3.8 to 5.4 tex (or 34 to 49 d)	0.81 (7.3)	0.88 (7.9)	0.94 (8.5)	1.03 (9.3)	1.11 (10.0)	1.18 (10.6)	1.29 (11.6)	Above 1.29 (Above 11.6)
Deviation	5.6 to 7.7 tex (or 50 to 69 d)	0.94 (8.5)	1.02 (9.2)	1.10 (9.9)	1.19 (10.7)	1.26 (11.3)	1.30 (11.7)	1.34 (12.1)	Above 1.34 (Above 12.1)
tex (or denier)	7.8 tex (or 70 d) and above	1.03 (9.3)	1.11 (10.0)	1.18 (10.6)	1.28 (11.5)	1.33 (12.0)	1.38 (12.4)	1.44 (13.0)	Above 1.44 (Above 13.0)
Evenness variation I	(count)	30	34	38	42				Above 50
Evenness variation II	(count)	2	3	5	7	11	20	28	Above 28
Cleanness, percent		97	95	93	88	83	79	75	Below 75
Average neatness, percent		94	92	90	87	82	78	74	Below 74
Low neatness, percent		90	87	83	77	74	72	70	Below 70
Items	Class	(1)			(2)	(3)	(4)	(5)	(6)
Evenness variation III	(count)	0			1	2	3	Above 4	
Items	Class	(1)	(2)		(3)	(4)	(5)	(6)	(7)
Winding	3.8 to 7.7 tex (or 34 to 69 d)	0	2		3	6	9	12	Above 12
(breaks)	7.8 tex (or 70 d) and above	0	1		2	5	8	11	Above 11
Items	Class	(1)					(2)		
Tenacity g/tex (or g/denier)					33 (3.7)	Below 33 (Below 3.7)			
Elongation, percent					18	Below 18			

## ANNEX A

### (Clause 3.4.1)

#### REELING AND PACKING OF RAW SILK

##### A-1 REELING

Raw silk shall be carefully cross-reeled on reels of  $150 \pm 2$  cm circumference into hanks each weighing approximately 70 g or approximately 140 g. Each hank shall be of one continuous thread made by tying all breaks with good clean knots and with loose ends of the knots not more than 3 mm long. The outside end of the thread shall be tied round the hank in such a manner as to be easily traced.

NOTE — Hanks of 70 g and 140 g shall not be mixed up in any lot.

**A-1.1** Each hank shall be carefully and neatly 'laced' at places equally spaced using fine soft twisted, undyed cotton yarn or spun silk yarn.

**A-1.2** Each lacing shall pass through at least 5 diamonds in the width of the hank and neatly tied so that each knot is about 1 cm from the edge of the hank, and the loose ends of the knots do not exceed 1 cm in length from the knot.

**A-1.3** 5-6 hanks so prepared shall be taken on a smooth finished stainless steel rod and hung on a wooden bar

of the long skein book making machine. The other end of the hank is taken on an aluminium tube and given 2-3 turns. The aluminium tube is passed over another stainless steel rod placed parallel to the stainless steel rod already placed. The silk hanks are slipped on to this rod by removing the aluminium tube.

##### A-2 PACKING

**A-2.1** Skeins shall be uniform in circumference, width and mass; these shall be free from reel arm gums; the beginning of raw silk thread shall be capable of being unwound from the skein with the least possible amount of waste. Suitable number of such skeins prepared as in **A-1.3** shall be made into neat books, each weighing approximately 5 kg, of equal dimensions on a long skein book-making machine. Each such book shall be neatly tied with separate cotton bands at three or five different places and wrapped in light packing paper. Twelve such books of 5 kg shall be carefully wrapped in a cotton 'shirt' and jute cloth and packed into a bale.

**A-2.1.1** The net mass of silk in a bale shall be 30 kg.

## ANNEX B

### (Clause 3.4.2)

#### METHOD FOR DETERMINATION OF NET MASS

##### B-1 PROCEDURE

**B-1.1** Take a bale from the lot and remove its jute cloth. Weigh the bale with its cotton shirt on and note down the gross mass of the bale. Remove the cotton shirt and determine its mass.

**B-1.2** Note down the number of books in the bale. Select at random 5 books from the bale. Remove their packing paper and labels, if any, and determine their mass. Carefully take out the middle cotton band of each of the 5 books and determine the collective mass of the 5 bands. Multiply this value by 3 or 5 as the case may be, to obtain the mass of all the cotton bands on the 5 books.

**B-1.3** Calculate the tare per book by the following formula:

$$T_1 = \frac{M_1 + M_2}{5}$$

where

$T_1$  = tare per book,

$M_1$  = mass of packing paper and the label, and

$M_2$  = mass of all cotton bands.

**B-1.4** Calculate the total tare of the bale by the

following formula:

$$T_2 = nT_1 + M_3 = 12T_1 + M_3$$

where

$T_2$  = tare per bale;

$n$  = number of books in the bale, which is 12;

$M_3$  = mass of the cotton shirt; and

$T_1$  = tare per book.

**B-1.5** Calculate the net mass of the bale by the following formula:

$$M = G - T_2$$

where

$M$  = net mass of the bale;

$G$  = gross mass of the bale (see **B-1.1**); and

$T_2$  = total tare of the bale (see **B-1.4**).

**B-1.6** Determine similarly the net mass of the remaining bales.

**B-1.7** After putting on the middle cotton bands and wrapping the books with the packing paper, replace them in the respective bales from which they are drawn. Seal the bales with identification tickets inside.

**ANNEX C***(Clause 3.4.3)***PROFORMA FOR RECORD AND REPORT OF PRELIMINARY EXAMINATION FOR RAW SILK**

.....

(Name of Conditioning House)

**RECORD AND REPORT OF PRELIMINARY EXAMINATION OF RAW SILK**

[Conducted in accordance with IS 15090 (Part 1) Raw silk — Grading and methods of tests : Part 1 Grading]

Mark of the lot .....

No. of bales .....

Serial No. of bales in the lot .....

Preliminary examination of external characters:

Mass of the bale	
No. of books or bundles in a bale	
Mass of a book or bundle	
Manner of packing of the lot	
Skein formation	
Skein weight (g)	
Crossing of the skeins	
Circumference of the skeins	
Reeling device/Domestic basin/Cottage basin/ Charkha/Multiend/Automatic	

Remarks:

- 1) Admixture of commercial varieties of raw silk
- 2) Adulteration in any manner .....
- 3) Other peculiarities .....

Lot accepted/rejected for grading

Date:

Signature of Tester

## ANNEX D

(Clause 4.3)

## PROFORMA FOR GRADING CERTIFICATE OF RAW SILK

[Conducted in accordance with IS 15090 (Part 1) Raw silk — Grading and methods of tests: Part 1 Grading]

.....

(Name of Conditioning House)

Grading Certificate No.....

Mark of the lot .....

Serial No. of bales in the lot .....

Chop .....

No. of bales in the lot .....

Average conditioned size, 2.31 tex

<i>Characteristic</i>	<i>Observed Value</i>	<i>Corresponding Major Test Grade</i>	<i>Characteristic</i>	<i>Observed Value</i>	<i>Corresponding Auxiliary Test Class</i>	<i>Required Auxiliary Test Class</i>	<i>Difference in the Case of Deficient Auxiliary Test Value</i>
Size deviation	0.172 tex	2A	Maximum deviation	0.84 tex	7	4	1
Evenness variation I	40 stripes	A	Evenness variation III	3 Stipes	4	2	1
Evenness variation II	6 stripes	A	Winding (breaks)	6	4	3	1
Cleanness	93 percent	2A	Tenacity	34 g/tex	1	1	0
Average neatness	88 percent	A	Elongation	21 percent	1	1	0
Low neatness	87 percent	3A	Cohesion	39	3	1	2

Strokes

Grade 'A' lowered by two grades = C grade

Overall grade = C grade

NOTE — Values included in the table for illustration only.

*Indian Standard***RAW SILK — GRADING AND METHODS OF TESTS****PART 2 VISUAL AND TACTUAL EXAMINATION****1 SCOPE**

This standard (Part 2) prescribes the method to inspect visually and by hand the general finish and characteristic nature of a lot of raw silk.

**2 TERMINOLOGY**

For the purpose of this standard the definitions as given in Part 1 shall apply.

**3 TEST SAMPLE**

All the books (or bundles) and skeins in a lot shall constitute the test sample.

**4 APPARATUS**

The visual inspection shall be conducted in a 'Standard Visual Inspection Room'. The room shall have a window directly facing north which enables the inspector to utilize the natural light free from reflection of any surrounding object, or a standard artificial lighting equipment which emits light closely near in its spectral energy distribution to that of the natural daylight.

**5 PROCEDURE****5.1 General Finish**

Examine the lot for general condition of the making

of books and presence of the following defects :

Skeins irregular in weight; Improper making of books; Disturbed books; Cut ends; Dissimilar skeins included; Dissimilar threads; Gum knots on skeins; Adhered substance on skeins; Skeins of other size; Mechanical damages; Chemical deterioration; Shrunk threads; Insect-bitten threads; Soiled threads; Gummed skeins.

NOTE — In case there are any skeins so defective as to fall short of certain standard and are unsuitable for a lot, their removal shall be dealt with by the applicant for testing, as instructed by the inspector.

**5.1.1** The general finish of a lot shall be indicated as Good, Fair, Poor or Inferior. Presence of abnormal defects shall be mentioned in the test certificate.

**5.2 Characteristic Nature**

The lot shall be examined for the degree and uniformity of colour and lustre and smoothness of hand.

**6 RECORD**

The results of the visual inspection of a lot shall be recorded in the proforma for record and report given in Annex A.

**ANNEX A**

*(Clause 6)*

**PROFORMA FOR RECORD AND REPORT**

.....

(Name of Conditioning House)

**RECORD AND REPORT OF VISUAL AND TACTUAL EXAMINATION OF RAW SILK**

[Conducted in accordance with IS 15090 (Part 2) Raw silk — Grading and methods of tests: Part 2 Visual and tactual examination]

Mark of the lot.....

Serial No. of bales in the lot .....

**A) General Finish**

(a) Good (b) Fair (c) Poor (d) Inferior

**B) Nature**

**1) Degree of Colour**

(a) Light (b) Medium (c) Deep

**2) Lustre**

(a) Bright (b) Medium (c) Dull

**3) Hand**

(a) Smooth (b) Medium (c) Rough

(Words not applicable should be scored out)

Remarks:

Date. ....

Signature of Tester

*Indian Standard***RAW SILK — GRADING AND METHODS OF TESTS****PART 3 DETERMINATION OF CONDITIONED MASS****1 SCOPE**

This standard (Part 3) prescribes method to determine the moisture free mass of the raw silk plus 11 percent of the dry mass allowed as regain of moisture.

**2 TEST SAMPLE**

Six skeins, drawn from books at the rate of one skein per book, shall constitute the test sample. The books shall be drawn, distributing them equally, as far as possible, from the bales in the lot. The books shall be drawn from different parts of the bale. While drawing skeins, each skein shall be drawn from a different part of the book.

The skeins shall be divided into 2 sets of 3 skeins each.

**NOTES**

1 The skeins should be drawn at the time when the net mass of the bale is determined. The two sets of skeins should be immediately weighed and their mass recorded separately.

2 After the skeins have been drawn, the books shall be replaced in the respective bales.

**3 APPARATUS****3.1 Weighing Balance**

Platform type balance with a capacity of one hundred kilogram and least count of 0.1 kg.

**3.2 Skein Balance**

Balance to weigh skeins with a capacity of one kilogram and least count of 0.1 g.

**3.3 Oven**

Conditioning oven with forced ventilation, positive valve control and capable of drying the sample skeins at 140°C shall be equipped with a balance arranged to weigh the skeins with an accuracy of 0.1 g while suspended within the drying chamber. The holder of the skeins shall be of such a type as to ensure free access of the dry air to all skeins.

**4 PROCEDURE**

4.1 The two sets of 3 skeins each shall be weighed on the skein balance nearest to a centigram, in the same ambient atmosphere as surrounds the bale as sampled (see Note 1 under 2).

4.2 Place one set of 3 skeins in the conditioning oven, dry it for 15 min and weigh to the nearest 0.1 g. Allow

the skeins to dry for another 5 min and weigh to the nearest 0.1 g. The second weighing shall be taken as oven-dry mass provided the loss between the first and second weighings does not exceed 0.25 percent of the first weight. If the loss between the first and second weighings exceeds 0.25 percent, the skeins shall be dried and weighed again at 5 min intervals until the loss between successive weighings does not exceed 0.25 percent.

4.2.1 The moisture content percent of the set of skeins shall be calculated by the following formula:

$$\text{Moisture content, percent} = \frac{(M_1 - M_2)}{M_1} \times 100$$

where

$M_1$  = mass of a set of test skeins before drying,  
and

$M_2$  = mass of the same set of test skeins after drying.

4.3 Repeat the test with the remaining set of skeins and calculate the moisture content in percentage. The average moisture content ( $m$ ) of the two sets of test skeins shall be calculated.

4.4 If the two results vary by more than 0.5 percent, the test shall be repeated.

**4.5 Determination of Conditioned Mass of the Bales**

4.5.1 The bales under test shall be weighed individually on the platform scale. The net weight of the bale shall be calculated by deducting the tare.

4.5.1.1 All materials used in packing the raw silk shall be considered as tare, except the cotton lacings in the skeins, provided these lacings do not exceed one metre per skein.

4.5.2 The oven-dry mass of the bale shall be calculated as given below:

$$\text{Oven dry mass of the bale, } D = M_n (1 - m/100)$$

where

$M_n$  = net mass of the bale (see 4.5.1), and

$m$  = moisture content, percent as obtained in 4.3 or 4.4.

4.5.3 The conditioned mass of the bale shall be calculated by the following formula:



**IS 15090 (Part 3) : 2002**

Conditioned mass of the bale =  $D + \frac{(D \times 11)}{100}$

where

$D$  = oven-dry mass of the bale calculated as in  
**4.5.2.**

**5 RECORD**

The proforma as given in Annex A shall be used for recording the test data and reporting the results of the test.

**ANNEX A**  
(Clause 5)  
**PROFORMA FOR RECORD AND REPORT**

.....

(Name of Conditioning House)

**RECORD AND REPORT OF CONDITIONED MASS OF RAW SILK**

[Conducted in accordance with IS 15090 (Part 3) Raw silk — Grading and methods of tests :  
Part 3 Determination of conditioned mass]

Mark of the lot .....

Serial No. of bales in the lot .....

**I Calculation of average moisture content in the bale:**

- |  |       |
|--|-------|
| 1. Mass in g of the first set of skeins before drying            | ..... |
| 2. Oven-dry mass in g of the first set of skeins                 | ..... |
| 3. Moisture content, percent, of the first set of skeins, $m_1$  | ..... |
| 4. Mass in g of the second set of skeins before drying           | ..... |
| 5. Oven-dry mass in g of the second set of skeins                | ..... |
| 6. Moisture content, percent, of the second set of skeins, $m_2$ | ..... |
| 7. Average moisture content, percent $\frac{m_1 + m_2}{2} = m$   | ..... |

**II Calculation of the conditioned weight of the bale:**

- |   | kg    |  | kg    |
|---|-------|--|-------|
| 1. Mass of 'shirt' ( $M_{cs}$ )   | ..... |  |       |
| 2. Mass of wrapping papers and labels of 5 books ( $M_{pl}$ )           | ..... | Gross mass of the bale ( $M$ )                 | ..... |
| 3. Mass of middle cotton bands of 5 books $\times 3(M_{mcb})$           | ..... | Net mass of the bale $M_n = (M - T)$           | ..... |
| 4. Tare of 5 books = ( $M_{pl} + 3M_{mcb}$ )                            | ..... | Oven-dry mass of the bale $D = M_n(1 - m/100)$ | ..... |
| 5. Tare of one book = ( $M_{pl} + 3M_{mcb}$ )/5                         | ..... |  |       |
| 6. Tare of all the books ( $n$ ) in the bale = $n(M_{pl} + 3M_{mcb})/5$ | ..... | Conditioned weight of the bale (1.11D)         | ..... |
| 7. Total tare of the bale $T = n(M_{pl} + 3M_{mcb})/5 + M_{cs}$         | ..... |  |       |

Remarks:

Date: ....

Signature of Tester

## Indian Standard

# RAW SILK — GRADING AND METHODS OF TESTS

## PART 4 CONDUCTING WINDING TEST

### 1 SCOPE

This standard (Part 4) prescribes the method of test to determine the number of times the raw silk will break during a certain period of winding it on the bobbins off the skeins and the feasibility of skeins for the winding operation.

### 2 TEST SAMPLE

The sample for the test shall be 10 skeins in the case of a lot consisting of skeins of approximately 70 g each and 5 skeins in the case of a lot consisting of skeins of approximately 140 g each.

### 3 ATMOSPHERIC CONDITIONS FOR CONDUCTING THE TEST

The test shall be carried out in a standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature.

### 4 CONDITIONING OF TEST SAMPLE

Prior to test, the test sample shall be conditioned to moisture equilibrium in a standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature for 24 h.

### 5 APPARATUS

#### 5.1 Winding Frame

The winding frame shall be equipped to drive the bobbins from both ends and shall be capable of being adjusted to run at a uniform winding speed of 110,

140 or 165 m/min (see Fig. 1).

- Swifts* — The swifts used in the test shall be automatic, self centering, pin-hub swifts, and each swift shall weigh about 530 g (see Fig. 2).
- Bobbins* — The bobbins used for the test shall be smooth and well balanced so as to give regular tension and uniform angular speed. The dimensions shall be as follows (see Fig.3):

Diameter of head	...60 mm
Diameter of barrel	...38 mm
Length between heads	...85 mm
Weight	...105 g

#### 5.2 Stop Watch

### 6 PROCEDURE

One half of the sample skeins shall be wound from the outer surface of the skeins, and the other half from the inner surface of the skeins (In case of 140 g skein, 3 skeins shall be wound from the outer surface and the other 2 skeins from the inner surface or *vice-versa*). The sample skeins shall be put on the swifts with care to ensure that each skein is in good condition.

The average winding speed, the breaks counting period and the time of the preliminary winding operation for the winding test shall be determined according to the size under test as follows:

Size Under Test tex (denier)	Average Speed M/min	Breaks Counting Period in minutes		Preliminary Winding Period in minutes (Only Inner)
		Skeins of 70 g each	Skeins of 140 g each	
1.3 tex (or 12 d) or below	10	60	120	10
1.4 to 1.9 tex (or 13 to 18 d)	140	60	120	10
2.0 to 3.7 tex (or 19 to 33 d)	165	60	120	10
3.8 to 7.7 tex (or 34 to 69 d)	165	30	60	5
7.8 tex (or 70 d) or above	165	20	40	5

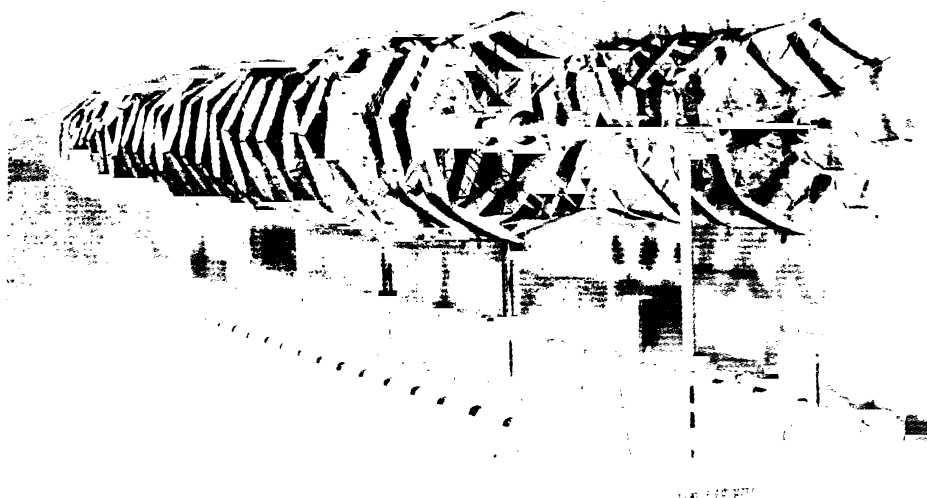


FIG. 1 WINDING FRAME

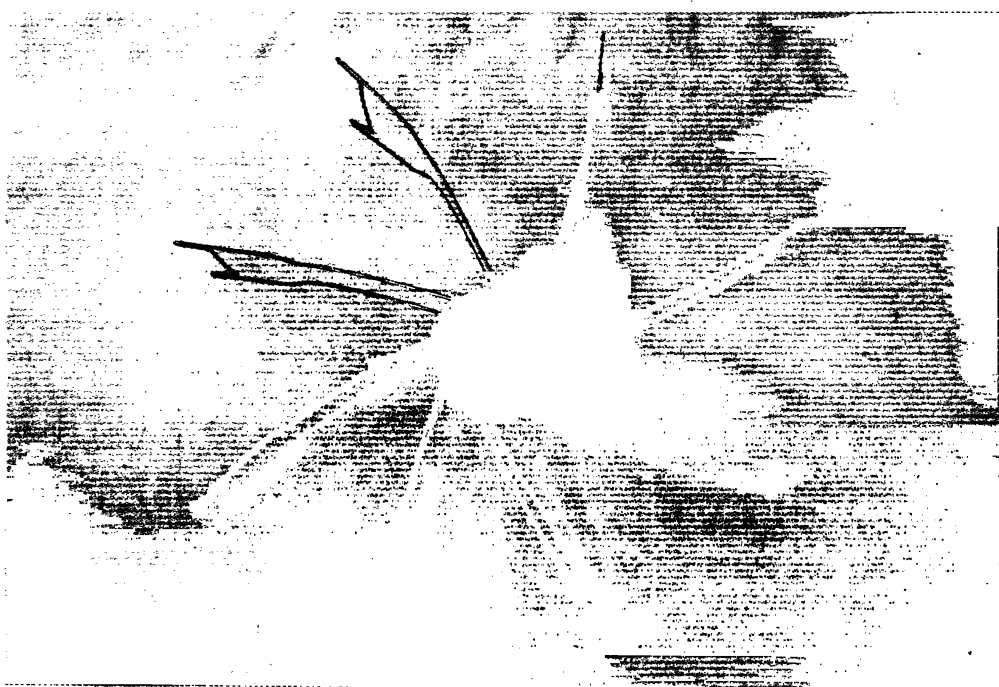


FIG. 2 PIN SWIFT

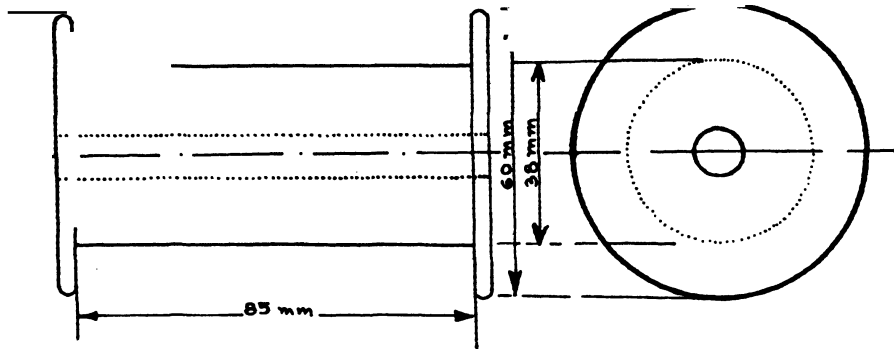


FIG. 3 BOBBIN

The preliminary winding operation is applicable only for the winding from the inner surface, and the breaks occurring during a specified period shall be counted and recorded.

In the case of winding skeins of approximately 140 g each, the winding for the first half of the winding period shall be done on a set of 5 bobbins and the second half of the winding period shall be done on another set of 5 bobbins so as to prepare 10 bobbins in total.

## 7 RECORDS

The results of the winding test shall be recorded in the following manner:

The record shall show the number of breaks in respect of each skein by a frequency distribution chart and the total number of breaks occurring in 10 sample skeins in the case of skeins of approximately 70 g each and in 5 sample skeins in the case of skeins of approximately 140 g each during the specified period.

The proformas for record and report as given in Annex A and B shall be used for recording the test data.

NOTE — The bobbins wound for these tests are required subsequently for other tests in grading raw silk. They should, therefore, be kept properly after completion of this test.

## 8 OPTIONAL TEST

### 8.1 Skein Finish Inspection

The inconvenience caused by the presence of the following defects in the finish of skeins shall be observed during the winding:

Hard gum spots; gummed threads; irregular traverse; partial lack of traverse; improper marking of the thread end; improper skein-lacing; slackened threads; pulled threads; entangled threads; doubled skeins; threads drooping from the swift; fine passages; involved waste; and double ends.

The feasibility of the sample skeins for the winding operation shall be observed during the whole period of winding from the beginning of putting the skeins on the swifts, and any inconveniences affecting the winding efficiency shall be determined according to the following standards:

- Inconvenience in spreading skeins over the swift: hard or slight.
- Inconvenience in finding the right end to continue the winding: hard or slight.  
'Hard' given above: to remove the inconvenience, it is necessary to strip off threads from the skein in a layer. 'Slight' given above : to remove the inconvenience, amending is required but not stripping off of threads.
- Continued breaking on account of gum spots: to remove the inconvenience, it is necessary to soften the gum spots or strip off threads.
- Continued breaking on account of the defects other than gum spots: to remove the inconvenience it is necessary to strip off threads from the skein in a layer.
- Removal of double ends: three metres and above in length.
- Removal of involved wastes.

The gum spots which caused a continued breaking of raw silk threads should be softened by grasping the skein firmly in both hands about two inches apart or holding the skein at both ends of its width with the gum spot between the hands, twisting it one half turn while stretched taut and gently rubbing it or separating off the threads piece by piece by means of the tips of the fingers of the right hand while fixed at one side by the left hand, until the gum spots become loose and open, care being taken not to damage the thread (see Fig. 4 and 5).

### 8.2 Record

The ???

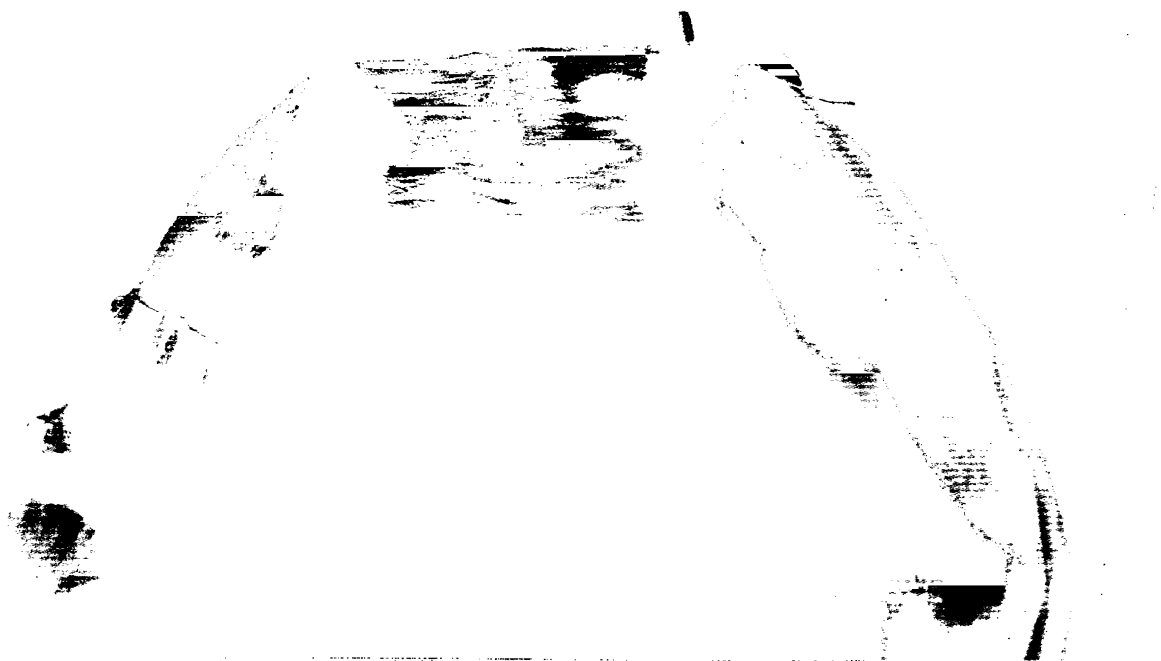


FIG. 4 GUM SPOTS — FIRST POSITION

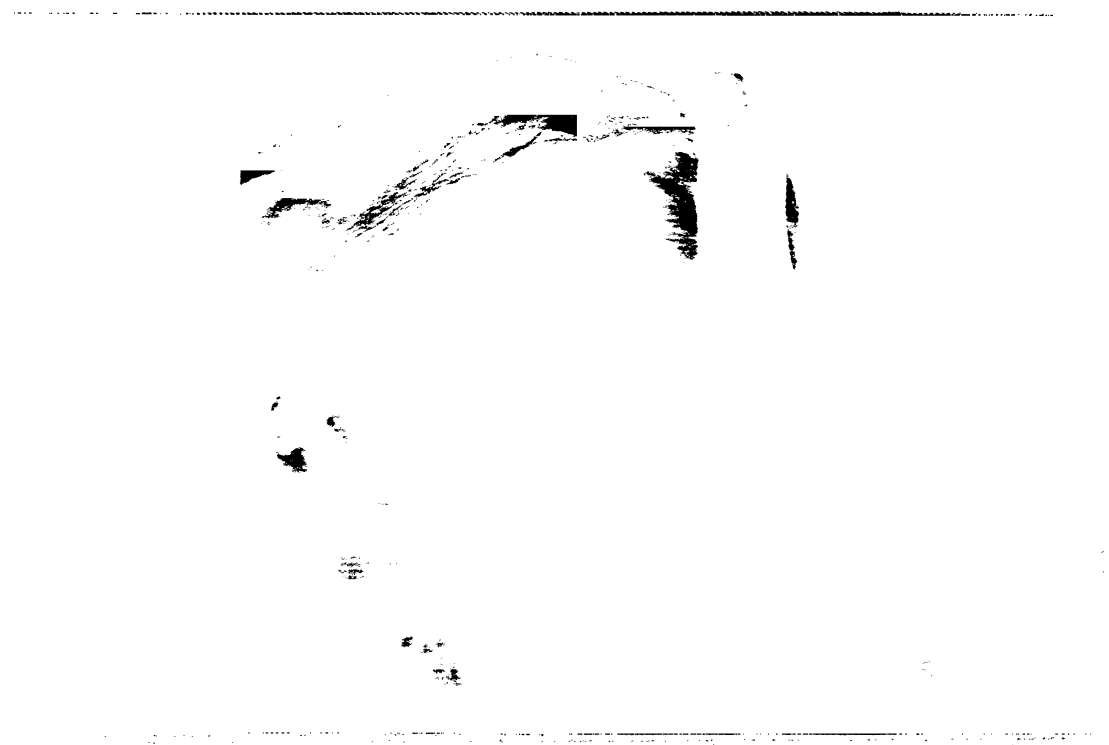


FIG. 5 GUM SPOTS — SECOND POSITION

## IS 15090 (Part 4) : 2002

**Table 1 Penalty**  
(Clause 8.2)

Inconvenience	Penalty
Inconvenience in spreading the skein over the swift:	
hard	3.0
slight	0.5
Inconvenience in finding the right end to continue the winding:	
hard	3.0
slight	0.5
Continued breaking on account of gum spots	2.0
Continued breaking on account of the defects other than gum spots	3.0
Removal of double ends	3.0
Removal of involved waste	0.5

for various inconveniences as given in Table 1 on the basis of the inspection, and the result of Skein Finish Inspection shall be indicated by Good, Fair, or Poor according to Table 2.

**Table 2 Grading on Inspection**  
(Clause 8.2)

Total Penalty	Indication
0	Good
0.5-10.0	Fair
Above 10.0	Poor

If the result is indicated as 'Poor', the inconvenience suffered shall be mentioned together with the degree and frequency in the test certificate.

The double ends shall, even if the result observed is 'Fair', be mentioned in the test certificate when they are 500 metres or more in length, or two or more in number, or three or more in ply.

The results of the skein finish inspection be mentioned under remarks in the proforma for record and report of winding test.

**ANNEX A**

(Clause 7)

**PROFORMA FOR RECORD AND REPORT**

.....

( Name of Conditioning House )

**RECORD AND REPORT OF WINDING TEST OF RAW SILK**

[Conducted in accordance with IS 15090 (Part 4) Raw silk — Grading and methods of tests:  
Part 4 Conducting winding test]

Mark of the lot .....

Serial No. of bales in the lot .....

Starting time:

Nominal denier of the lot:

Ending time :

Speed of the machine (m/min):

Total time:

(min)

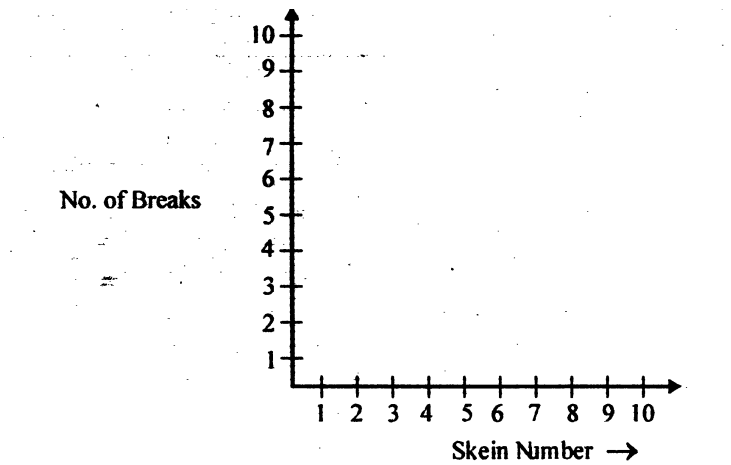
<i>Skein No.</i>	<i>Breaks</i>	
	Preliminary Winding	Winding Period
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
Total		

Breaks for 10 skeins per hour of winding .....

Remarks:

Date .....

ANNEX B  
(Clause 7)  
FREQUENCY DISTRIBUTION CHART



Remarks:  
Date .....

Signature of Tester

## *Indian Standard*

# **RAW SILK — GRADING AND METHODS OF TESTS**

## **PART 5 DETERMINATION OF SIZE (COUNT) DEVIATION AND MAXIMUM DEVIATION**

### **1 SCOPE**

This standard (Part 5) prescribes method to determine the degree of size (count) variation within the test pieces of definite length of raw silk, expressed in tex units (or denier).

### **2 TEST SAMPLE**

Ten bobbins prepared for the purpose of conducting the winding test (*see* Part 4) shall constitute the test sample.

### **3 ATMOSPHERIC CONDITIONS FOR CONDUCTING THE TEST**

The test shall be carried out in a standard testing atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature.

### **4 CONDITIONING OF TEST SKEINS**

Prior to test, the sizing skeins shall be conditioned in a standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature for 24 h.

### **5 APPARATUS**

#### **5.1 Wrap Reel**

A machine for making the sizing skeins shall have a reel having circumference of 1.125 m (400 revolutions equal 450 metres), revolving at a uniform speed of 300 sec / min. It shall be provided with a dial showing the number of revolutions and shall be equipped with an automatic stop-motion to stop the reel immediately in case the thread breaks or when the skein is complete (*see* Fig. 1).

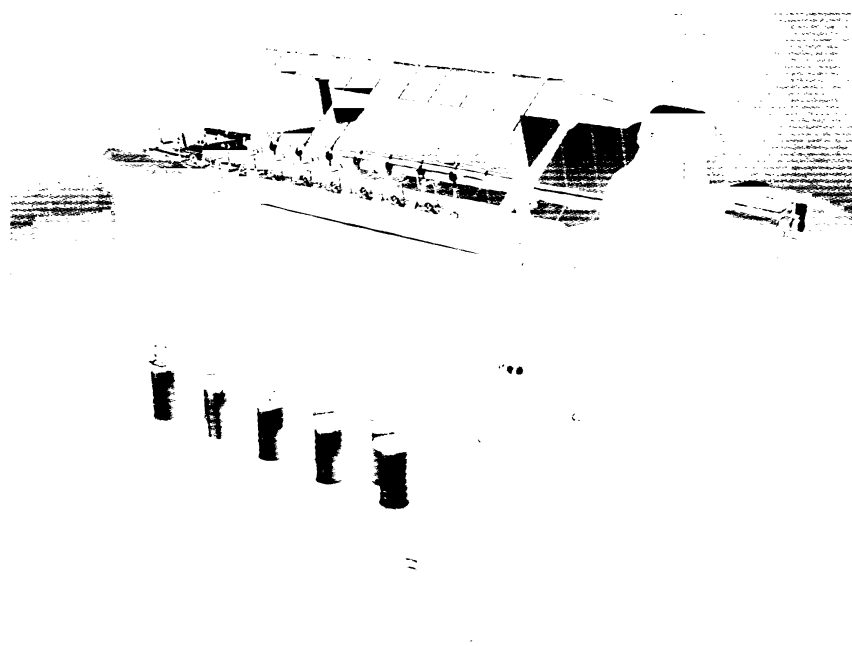


FIG. 1 WRAP ???





FIG. 2 QUADRANT BALANCE

**5.2 Yarn Balance**

The quadrant or any other suitable balance (*see* Fig. 2) to read directly the count in tex (or denier) of the individual test skein; scale having the capacity and sensitivity as under

<i>Capacity</i>	<i>Sensitivity</i>
5 tex (or 40 d)	0.025 tex (or 0.25 d)
10 tex (or 80 d)	0.05 tex (or 0.5 d)
20 tex (or 160 d)	0.1 tex (or 1.0 d)
50 tex (or 400 d)	0.25 tex (or 2.5 d)

**6 PROCEDURE**

Ten bobbins constituting the test sample shall be placed upright on the wrap reel. For silk of 3.7 tex (or 33 d) or below, 4 sizing skeins each of 450 m shall be reeled from every bobbin, winding a total of 40 sizing skeins. For silk 3.8 tex (or 34 d) or above, 8 sizing skeins each of 112.5 m from every bobbin shall be reeled,

winding a total of 80 sizing skeins. Sufficient tension on the thread shall be applied during winding, so as to keep it tight without stretching. The sizing skeins shall be conditioned (*see* 5).

Each individual sizing skein shall be weighed separately on a quadrant or any other suitable balance and the individual tex (or denier) values shall be recorded.

**7 CALCULATION**

**7.1 Average Size and Size Deviation**

The average size (M) and standard deviation shall be calculated from the records of individual skein size in tex (or denier) as illustrated in example given in Annex A.

**7.1.1** The result of the standard deviation shall be calculated up to 3 places of decimal in tex or 2 places of decimal in denier.

## IS 15090 (Part 5) : 2002

**7.2 Maximum Deviation**

**7.2.1** The tex (or denier) of the four coarsest and the four finest sizing skeins in the case of 3.7 tex (or 33 d) or below, and of the eight coarsest and eight finest sizing skeins in the case of 3.8 tex (or 34 d) or above shall be taken.

**7.2.2** From the average tex (or denier) of the coarsest sizing skeins the average tex (or denier) of the test sample shall be subtracted.

**7.2.3** Similarly the average tex (or denier) of the finest sizing skeins shall be subtracted from the average tex (or denier) of the test sample.

**7.2.4** The results are compared and the higher of the two shall be taken as the maximum deviation in tex (or denier) of the test sample.

**7.2.5** The maximum deviation shall be calculated up to two places of decimal in tex or one place of decimal in denier.

**8 RECORD**

Proforma as given in Annex B, shall be used for recording the test data and reporting the results of the test.

NOTE — The sizing skeins prepared for this test are required for determining the average conditioned size of silk. They should, therefore, be kept properly after completion of this test.

**ANNEX A**

(Clause 7.1)

**EXAMPLE OF CALCULATION OF SIZE DEVIATION**

<i>Count of Individual</i>	<i>Observed</i>	$X^{(1)}$	<i>Deviation</i>	
Skein in tex	Frequency ( $F_i$ )		$F_i X_i$	$F_i X_i^2$
17.5	—	- 5	—	—
18.0	2	- 4	- 8	32
18.5	3	- 3	- 9	27
19.0	4	- 2	- 8	16
19.5	4	- 1	- 4	4
20.0	8	0	0	0
20.5	5	1	5	5
21.0	6	2	12	24
21.5	4	3	12	36
22.0	3	4	12	48
22.5	1	5	5	25
	$N = 40$		$\Sigma f_i x_i = 17$	$\Sigma f_i x_i^2 = 217$

In this example,

Mean chosen close to centre of frequency

$$\text{distribution } (A) = 20$$

$$\text{Interval } (A) = 0.5$$

$$\text{Frequency } (N) = 40$$

$$\text{Thus, } M = A + h \frac{\Sigma f_i x_i}{N}$$

$$= 20 + 0.5 \times \frac{17}{40} = 20.2125$$

$$S = h \sqrt{\frac{1}{N} \Sigma f_i x_i^2 - \frac{(\Sigma f_i x_i)^2}{N}}$$

$$S = h \sqrt{\frac{1}{40} 217 - \frac{(17)^2}{40}} = 1.14$$

<sup>1)</sup> Deviation from 'A' mean chosen close to centre of frequency distribution with ???

## ANNEX B

(Clause 8)

## PROFORMA FOR RECORD AND REPORT

.....

(Name of Conditioning House)

## RECORD AND REPORT OF SIZE DEVIATION AND MAXIMUM DEVIATION OF RAW SILK

[Conducted in accordance with IS 15090 (Part 5) Raw silk — Grading and methods of tests:  
Part 5 Determination of size (count) deviation and maximum deviation]

Mark of the lot.....

Serial No. of bales in the lot.....

Count of Individual Sizing Skein (denier)	Observed Frequency ( $f_i$ )	$x_i$	Deviation	
			$f_ix_i$	$f_ix_i^2$
		$\Sigma f_i$	$\Sigma f_ix_i$	$\Sigma f_ix_i^2$

$$M = A + h \frac{\Sigma f_i x_i}{N}$$

$$S = h \sqrt{\frac{1}{N} \left[ \Sigma f_i x_i^2 - \frac{(\Sigma f_i x_i)^2}{N} \right]}$$

Maximum deviation =

Remarks:

Date: .....

Signature of tester

## Indian Standard

# RAW SILK — GRADING AND METHODS OF TESTS

## PART 6 DETERMINATION OF CONDITIONED SIZE (COUNT)

### 1 SCOPE

This standard (Part 6) prescribes method to determine the average conditioned size (count).

### 2 TEST SAMPLE

All sizing skeins prepared for the purpose of determining size deviation and maximum deviation shall constitute the test sample (see Part 5).

### 3 APPARATUS

#### 3.1 Conditioning Oven

A conditioning oven with forced ventilation, positive valve control, capable of maintaining a constant temperature of 140°C shall be equipped with a balance to weigh the skeins with an accuracy of 0.1 g while suspended within the oven. The holder of the skeins shall be of such a type so as to ensure free access of the hot air to all portions of silk.

### 4 PROCEDURE

**4.1** Place all the test skeins in the conditioning oven, dry them for 10 min and weigh to nearest 0.1 g. Allow the skeins to dry for another 5 min and weigh to nearest 0.1 g. The second weighing shall be taken as oven-dry mass, provided the loss between the first and second does not exceed 0.25 percent of the first dry mass. If the loss between the first and second weighings exceeds 0.25 percent, the skeins shall be dried and weighed again at five minute intervals until the loss between two successive weighings is within 0.25 percent.

### 5 CALCULATION

#### 5.1 Average Conditional Size

The conditioned mass of the test skeins shall be calculated by the formula given below:

$$M = M_1 + \frac{M_1 \times 11}{100}$$

where

$M$  = conditioned mass of test skeins in gram,  
and

$M_1$  = oven-dry mass of the test skeins in gram.  
The average size in tex (or denier) of the skeins correct to the nearest 0.01 of the unit shall be calculated, on the basis of their conditioned mass as given below:

- a) Average conditioned size in tex =  $\frac{M}{L} \times 1000$
- b) Average conditioned size in denier =  $\frac{M}{L} \times 9000$

where

$M$  = conditioned mass of test skeins in grams,  
and

$L$  = total length in metres of silk in all the test skeins.

### 5.2 AVERAGE CONDITIONED SIZE VARIATION

The average conditioned size of a lot shall not vary by more than the following limits either way from the contract size:

2.2/2.4 tex (or 20/22 denier) or below	4 percent
2.3/2.6 to 2.9/3.1 tex (or 21/23 to 26/28 denier)	3.5 percent
3.0/3.2 tex (or 27/29 denier) or above	Unless otherwise agreed to between the buyer and the seller, the average conditioned size in tex (or denier) shall fall within the limits specified.

### 6 RECORD

The average size shall be indicated by the conditioned average size of all the test skeins, and it shall be recorded in tex (or denier) by omitting the figures beyond the second place of decimal. The proforma for record and report as given in Annex A shall be used for the purpose.

**ANNEX A**

*(Clause 6)*

**PROFORMA FOR RECORD AND REPORT**

.....

(Name of Conditioning House)

**RECORD AND REPORT OF CONDITIONED SIZE TEST OF RAW SILK**

[Conducted in accordance with IS 15090 (Part 6) Raw silk — Grading and methods of test:  
Part 6 Determination of conditioned size (Count)]

Mark of the lot.....

Serial No. of bales in the lot.....

- |  |       |
|--|-------|
| a) Number of test skeins weighed in oven-dry condition   | ..... |
| b) Total oven-dry mass of test skeins in gram  | ..... |
| c) Regain, percent   | ..... |
| d) Total conditioned mass of the test skeins in gram   | ..... |
| e) Average conditioned size in tex (or denier) on the basis of conditioned mass of the test skeins | ..... |

Remarks:

Date. . . . .Signature of Tester

## *Indian Standard*

# RAW SILK — GRADING AND METHODS OF TESTS

## PART 7 DETERMINATION OF EVENNESS VARIATION

### 1 SCOPE

This standard (Part 7) prescribes method to determine the degree of evenness variation occurring in raw silk threads.

### 2 TERMINOLOGY

For the purpose of determining the intensity of variations, the following three standards are established and shown by the Standard Variation Photographs as mentioned below.

**2.1 Evenness Variation I** — The intensity of variation greater than the  $V_0$  panel but does not exceed the  $V_1$  panel of Standard Variation Photographs.

**2.2 Evenness Variation II** — The intensity of variation greater than the  $V_1$  panel but does not exceed the  $V_2$  panel of the Standard Variation Photographs.

**2.3 Evenness Variation III** — The intensity of variation which includes all the variations greater than the

$V_2$  panel of the Standard Variation Photographs.

### 3 TEST SAMPLE

The sample for the test shall consist of a total of 20 panels from 10 bobbins, taken at the rate of 2 panels from each bobbin.

### 4 INSPECTION ROOM AND LIGHTING

The description of the inspection room and lighting as per Japanese design and equipped for conducting the test is given in Annex A. (This room is also used for other tests such as cleanness and neatness.)

### 5 APPARATUS

#### 5.1 Seriplane Winding Machine

A frame designed to revolve an inspection board in such a manner that the raw silk threads can be wound upon it with uniform spacing (*see* Fig. 1 and 2). The

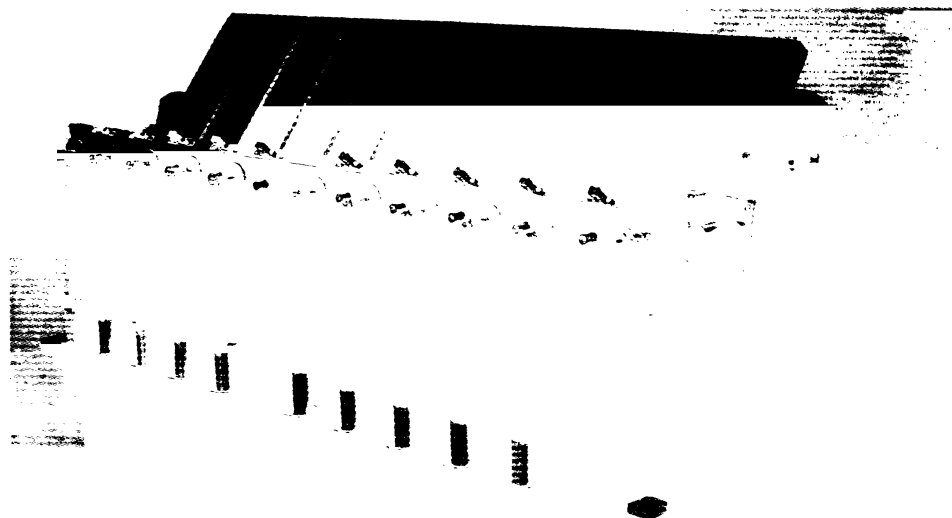


FIG. 1 SERIPLANE ???

## IS 15090 (Part 7) : 2002

inspection board shall revolve at a uniform speed of 100 rev/min. In case of excessive breaks, the speed may be reduced to 80 rev/min. The machine shall be equipped with a device to secure uniform tension on the thread and may be equipped with a counter to indicate the number of raw silk threads wound on the panel.

### 5.2 Inspection Board

An inspection board is a flat rectangular board one metre in perimeter upon which the inspection panels of 127 mm × 457 mm of raw silk may be wound. It shall have a uniformly flat black surface without streaks,

bars or other imperfections which might influence the estimator or give a false effect.

### 5.3 Standard Variation Photographs

The Standard Variation Photographs prepared by the Silk Conditioning Houses of Yokohama and Kobe, Japan and officially adopted in 1968 by the International Silk Association shall be used (*see* Fig. 3).

## 6 PROCEDURE

Place the bobbins constituting the test sample upright on the seriplane machine and wind 2 panels for each bobbin taking care to adjust tension and traverse so



FIG 2 TRAVERSE ADJUSTMENT



FIG. 3 STANDARD PHOTOGRAPH FOR EVENNESS VARIATION

that threads on the inspection panel are spaced according to the size under test as follows:

16.7 to 21.9 tex (or 150 to 197 d)	28
22 tex (or 198 d) or above	25

*Universal Count (or Denier) Threads per 25.4 mm*

1.0 tex (or 9 d) or below	133
1.1 to 1.3 tex (or 10 to 12 d)	114
1.4 to 1.8 tex (or 13 to 16 d)	100
1.9 to 2.9 tex (or 17 to 26 d)	80
3.0 to 4.0 tex (or 27 to 36 d)	66
4.1 to 5.3 tex (or 37 to 48 d)	57
5.4 to 7.6 tex (or 49 to 68 d)	50
7.7 to 11.6 tex (or 69 to 104 d)	40
11.7 to 16.6 tex (or 105 to 149 d)	33

The test shall be conducted by the estimator taking a position at a distance of about 2 m directly in front of the inspection panels which are placed in such lighting conditions that the panels receive the same intensity of light by indirect lighting over the entire board. On any one side of the inspection board, each stripe found on each panel shall be carefully compared with the standard variation photographs, and the level of variation shall be determined. Evenness variation level of all the 20 panels shall be recorded separately.



## 7 RECORD

The record shall show total number of stripes having variation grouped as Evenness Variation I, II and III for the 20 panels observed. The proforms for record and repeat as given in the Annex B shall be used for the purpose.

NOTE —The 20 panels of raw silk would be required subsequently for Cleanness and Neatness tests. The unused portion of the silk thread on the bobbins used in the preparation of panels is required for (a) serigraph and (b) cohesion tests. The panels and the bobbins may also, therefore, be kept properly after the completion of this test.

## ANNEX A

(Clause 4)

### DESCRIPTION AND SPECIFICATION OF A SERIPLANE INSPECTION ROOM FOR CONDUCTING EVENNESS, CLEANNESS AND NEATNESS TESTS

#### A-1 CONSTRUCTION

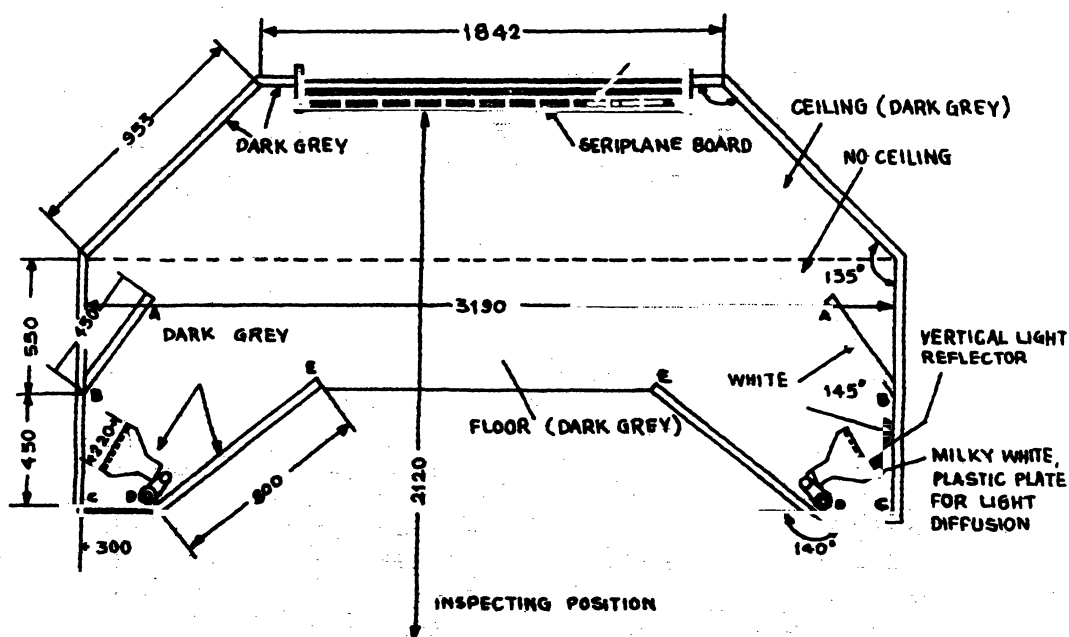
A-1.2 The dimensions of the inspection room shall be as shown in Fig. A1.

A-1.2 The inside walls of the room shall have a smooth surface, and shall be at least 2 400 mm high from the floor level.

A-1.3 Except for the portion *ABC* of the walls, all the walls shall be painted dark grey. The portions *ABC*, from floor to ceiling shall be painted white.

A-1.4 The ceiling of the room shall be painted dark grey and the whole of the floor shall be painted dark grey (instead of paint, the floor can also be covered with dark grey mat).

A-1.5 When painting walls, floor and ceiling, three coats shall be applied to all the surfaces, allowing adequate time between each coat for thorough drying. The first priming coat shall consist of a glue or varnish. The second undercoat shall consist of either white or



All dimensions in millimetres.

FIG. A1 SERIPLANE INSPECTION ROOM AND ARTIFICIAL LIGHTING APPARATUS FOR EVENNESS TEST — PLAN

dark grey paint reduced with turpentine (approximately 250 ml of turpentine to a litre of paint shall be used for this purpose). The third finishing coat shall consist of white or dark grey paint applied without reduction, keeping the brush well filled with paint during painting.

## A-2 VENTILATION

**A-2.1** Forced ventilation of the inspection room is recommended, provided that it is so arranged that no light or dirt enters the room and that it does not reduce the area of the reflecting surfaces of the walls, the floor level of which is indicated by *ABCDE* in Fig. A1.

## A-3 LOCATION OF THE EQUIPMENT

**A-3.1** The seriplane board and standard photographs shall be located in the inspection room as shown in Fig. A1 and A2. Two vertical reflectors containing a set of three fluorescent tubes each shall be located as shown in the Fig. A1 and A2 such that they throw uniformly distributed light over the seriplane panels under test and the standard photographs. These vertical reflectors shall be used for conducting evenness test

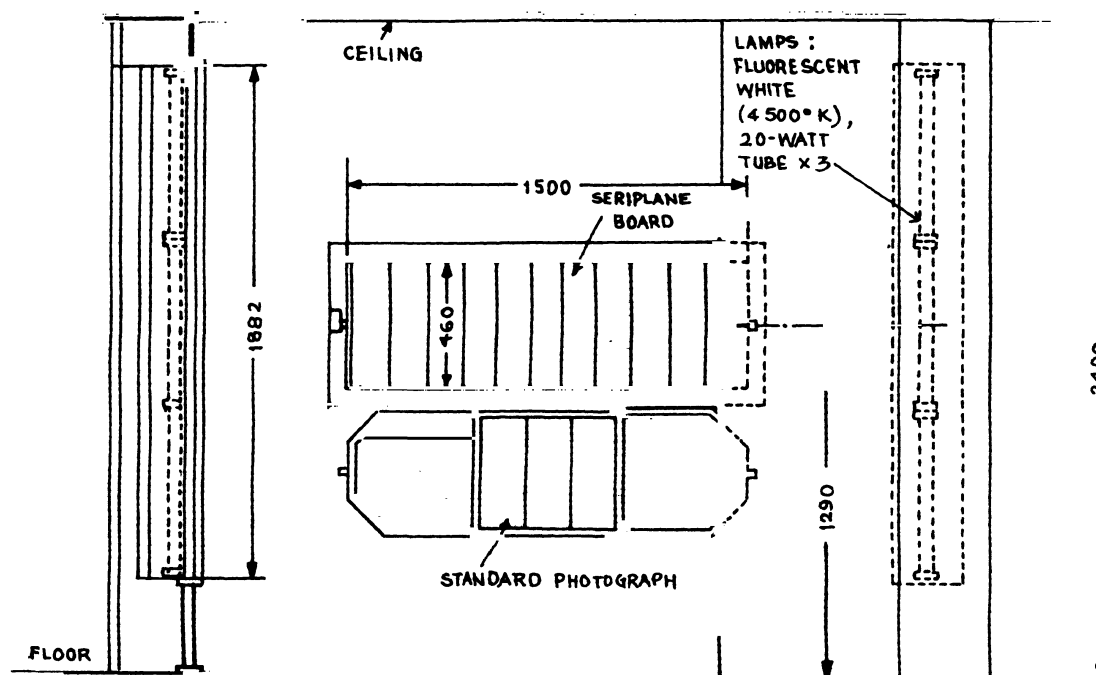
on seriplane panels. One horizontal reflector containing a set of 3 fluorescent tubes shall be fixed as shown in Fig. A3, A4 and A5. This is used for conducting cleanness and nearness tests on the seriplane panels. A 2-way switch shall be conveniently located so that lights in the reflectors of the two types may be turned on and off independently of each other.

### A-3.2 Vertical Reflector

Each of these reflectors shall be fitted with 3 fluorescent white (4 500°K) 20 watt tubes (*see* Fig. A1 and A2). These reflectors shall have chromium plated reflecting surfaces, corrugated or plain and front of these reflectors shall be covered with milky white plastic/glass plate for light diffusion.

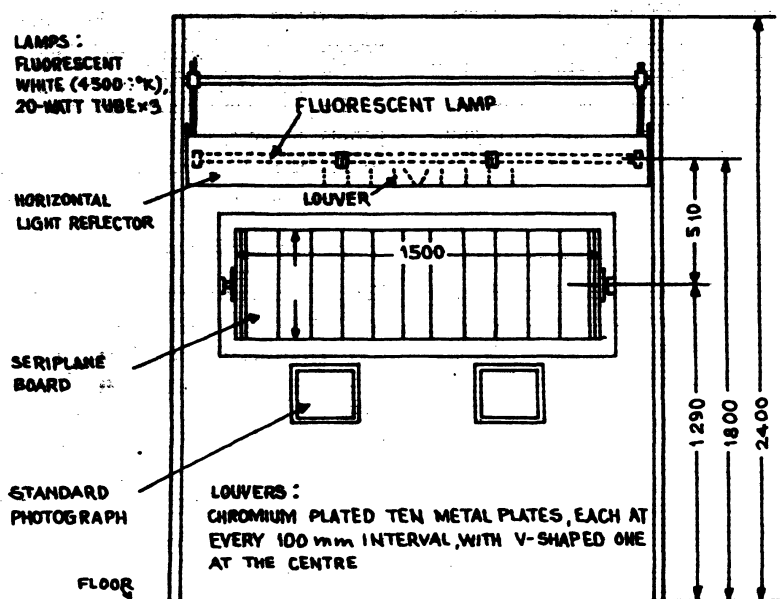
### A-3.3 HORIZONTAL REFLECTOR

This reflector shall be fitted with 3 fluorescent white (4 500°K) 20 watt tubes (*see* Fig. A3, A4 and A5). This reflector shall have chromium plated reflecting surfaces, corrugated or plain and front of these reflectors shall be covered with pear-skinned glass of 2 mm thickness.



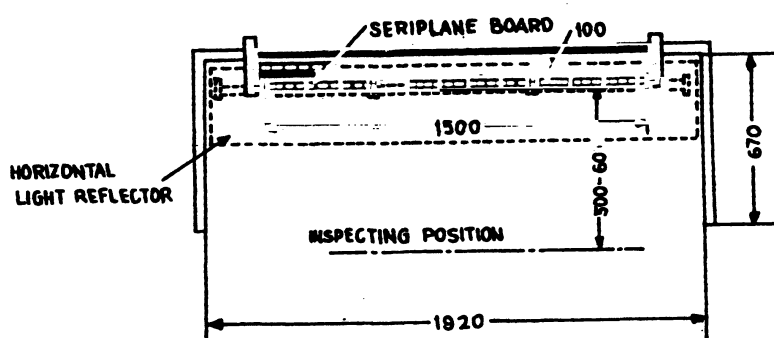
All dimensions in millimetres.

FIG. A2 SERIPLANE INSPECTION ROOM — FRONT ELEVATION



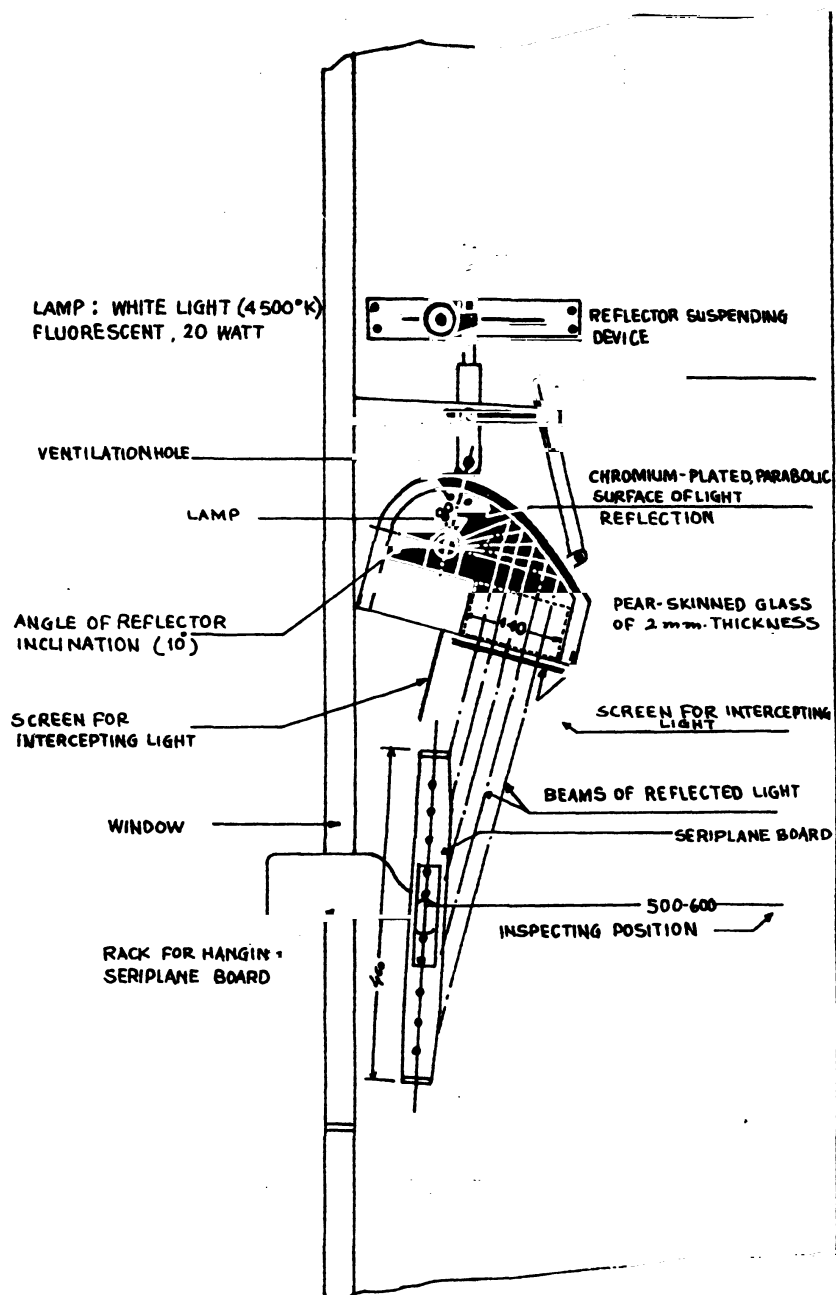
All dimensions in millimetres.

FIG. A3 ARTIFICIAL LIGHTING APPARATUS FOR CLEANNESS AND NEATNESS TEST IN SERIPLANE ROOM — FRONT ELEVATION INSPECTION



All dimensions in millimetres.

FIG. A4 ARTIFICIAL LIGHTING APPARATUS FOR CLEANNESS AND NEATNESS TEST IN SERIPLANE INSPECTION ROOM — PLAN



All dimensions in millimetres.

FIG. A5 SECTION OF REFLECTING LIGHT FOR NEATNESS AND CLEANNESS TEST IN SERIPLANE INSPECTION ROOM

**ANNEX B***(Clause 7)***PROFORMA FOR RECORD AND REPORT**

(Name of Conditioning House)

**RECORD AND REPORT OF EVENNESS VARIATION OF RAW SILK**

[Conducted in accordance with IS 15090 (Part 7) Raw silk — Grading and methods of tests:  
Part 7 Determination of evenness variation]

Mark of the lot.....

Serial No. of bales in the lot.....

Nominal denier .....

1	2 <i>Evenness Variation (Stripes)</i>						3 <i>Total</i>		
Seriplane Boards →	1			2					
Seriplane Panels ↓	I	II	III	I	II	III	I	II	III
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
Grand Total									

Evenness variation I = Grand total of column 3 (I)

Evenness variation II = Grand total of column 3 (II)

Evenness variation III = Grand total of column 3 (III)

Remarks:

Date: . . . .

Signature of Tester

*Indian Standard*

**RAW SILK — GRADING AND METHODS OF TESTS**

**PART 8 DETERMINATION OF CLEANNES**

**1 SCOPE**

This standard (Part 8) prescribes method to determine the degree of cleanness on the basis of number of cleanness defects of raw silk.

**2 TERMINOLOGY**

**2.1** Cleanness defects are classified into three categories, namely, 'Super-major defects', 'Major defects', and 'Minor defects'.

**2.2 Super-Major Defects** — Cleanness defects which are ten or more times as large as the minimum size of the major defects in length or in size.

**2.3 Major Defects** — The following defects shall be classified as major defects :

- a) *Waste* — A mass of tangled cocoon filaments or fibres attached to the thread.
- b) *Large Slugs* — Considerably thickened places in the thread seven millimetre and above in length, or extremely thickened places with less length.
- c) *Bad Casts* — Abruptly thickened places in the thread due to the cocoon filaments not being properly attached to the raw silk thread, or made by adding more than one cocoon filament at a time.
- d) *Very Long Knots* — Knots which have loose ends 10 mm and above in length, or those caused by improper tying of threads.
- e) *Heavy Corkscrews* — Places in which one or more cocoon filaments are longer than the remainder, and give the appearance of a very thick and large spiral form.

**2.4 Minor Defects** — The minor defects are divided into four groups as follows:

- a) *Small Slugs* — Considerably thickened places in the thread from 2 mm to less than 7 mm in length, or extremely thickened places less than 2 mm in length.
- b) *Long Knots* — Knots which have loose ends, from 3 mm to less than 10 mm in length.

c) *Corkscrews* — Places in which one or more cocoon filaments are longer than the remainder, and give the appearance of a thick spiral form.

d) *Long Loops or Loose Ends* — Loops or split ends, 10 mm and above in length, when measured along the filament.

**3 TEST SAMPLE**

The seriplane panels prepared for the purpose of conducting Evenness Variation Test (see Part 7) shall be used for this test.

**4 APPARATUS**

**4.1 Inspection Room**

Inspection room shall be same as required for conducting the Evenness Variation Test (see also Part 7).

**4.2 Standard Photographs**

The standard photographs for cleanness defects prepared by the Silk Conditioning Houses of Yokohama and Kobe, Japan and officially adopted in 1962 by the International Silk Association shall be used (see Fig. 1).

**4.3 Lighting Equipment**

The lighting equipment shall consist of a horizontal reflector as described in A-3.3 of Part 7.

**5 PROCEDURE**

The actual number of cleanness defects of each category shall be counted on both sides of the inspection board, omitting the defects on its edges by taking a position at the distance of about 0.5 mm in front of the inspection panels. The category and kind to which each defect belongs shall be determined by comparing with the standard photographs for cleanness defects.

**6 RECORD**

The proforma for record and report as given in Annex A shall be used for recording the test data and reporting the???

FIG. 1 STANDARD PHOTOGRAPH FOR CLEANNESS

the number of defects in 20 panels. The total penalty is calculated for the defects observed as per the rates given below:

For each super-major defect	...1.0
For each major defect	...0.4
For each minor defect	...0.1

The average cleanness percentage is calculated by using the following formula:

$$\text{Average cleanness percentage} = \frac{20 - p}{20} \times 100$$

where

$p$  = total penalty for 20 panels.

**ANNEX A**

(Clause 6)

**PROFORMA FOR RECORD AND REPORT**

.....

(Name of Conditioning House)

**RECORD AND REPORT OF CLEANNESSTEST OF RAW SILK**

[Conducted in accordance with IS 15090 (Part 8) Raw silk — Grading and methods of tests:  
Part 8 Determination of cleanness]

Mark of the lot .....

Serial No. of bales in the lot .....

1	2		3
Serial No. of Seriplane Boards → Categories of Defects ↓	Board 1 1 2 3 ..... 10	Board 2 1 2 3 ..... 10	Total
Super Major Defects			
Major Defects Waste Large slugs Bad casts Very long knots Heavy corkscrews			
Total			
Minor defects Small slugs Long knots Corkscrews Long loops/loose ends			
Total			

Penalty:

Total No. of Super Major Defects × 1.0 = .....

Total No. of Major Defects × 0.4 = .....

Total No. of Minor Defects × 0.1 = .....

Grand Total (p) = .....

Average cleanness, percent =  $\frac{20 - p}{20} \times 100$

Remarks:

Date .....

Signature of Tester



## *Indian Standard*

# RAW SILK — GRADING AND METHODS OF TESTS

## PART 9 DETERMINATION OF NEATNESS AND LOW NEATNESS

### 1 SCOPE

This standard (Part 9) prescribes method to determine the neatness percentage of raw silk.

### 2 TERMINOLOGY

For the purpose of this standard, the defects which are smaller than those classified as minor Cleanness defects, are called neatness defects and shall include the following:

- a) **Nibs** — Small thickened places or spots in the thread which are less than 2 mm in length.
- b) **Loops** — Small open places in the thread due to the excessive length of one or more cocoon filaments, and are less than 10 mm in length when measured along the filament.
- c) **Hairiness and Fuzziness** — The condition of the thread which shows small loose ends of less than 10 mm and fine particles of co-coon filaments, projecting from the thread.
- d) **Raw Knots** — Knots which have loose ends which are less than 3 mm in length.
- e) **Fine Corkscrews** — Places in which one or more cocoon filaments are longer than the other and give the appearance of a fine spiral form.

### 3 TEST SAMPLE

Seriphane panels prepared for the purpose of conducting evenness variation test shall be used for this test (*see* Part 7).

### 4 APPARATUS

**4.1 Standard Photographs** — The standard photographs for neatness defects prepared by the Silk Conditioning Houses of Yokohama and Kobe, Japan and officially adopted in 1962 by the International Silk Association, indicating relative values of neatness, shall be used (*see* Fig. 1). This set consists of photographs of panels rated as 100, 90, 80, 70, 60, 50, 30 and 10 percent free from neatness defects.

**4.2 Inspection Room** — Inspection room shall be same as required for conducting the evenness test (*see* Part 7).

**4.3 Lighting Equipment** — The lighting equipment shall be the same as used for cleanness test (*see* Part 8).

### 5 PROCEDURE

The inspector shall take up a position at a distance of about 0.5 metre directly in front of the inspection panels. Each panel on the inspection board shall be

FIG. 1 STANDARD PHOTOGRAPH FOR NEATNESS

carefully compared with the standard photographs for neatness defects and its neatness value shall be estimated in percentage. In case the panels are rated 50 percent or higher, the estimate shall be to the nearest 5 percent and to the nearest 10 percent in case of panels rated below 50 percent.

## 6 RECORD

The record shall show the neatness percentage of each panel, the average neatness percentage of a total of 20 panels and the low neatness percentage represented by the average percentage of the lowest 4 panels that is one-fifth of all panels examined. The proforma for record and report as given in Annex A shall be used for the purpose.

## ANNEX A

(Clause 6)

### PROFORMA FOR RECORD AND REPORT

.....

(Name of Conditioning House)

#### RECORD AND REPORT OF NEATNESS TEST OF RAW SILK

[Conducted in accordance with IS 15090 (Part 9) Raw silk — Grading and methods of test:  
Part 9 Determination of neatness and low neatness]

Mark of the lot .....

Serial No. of bales in the lot .....

1	2		3
	Neatness	Percentage	
Serial No. of Serialplane Boards → Serial No. of Serialplane Panels 4 ↓	1	2	Total
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Grand Total		(ΣN) =	

Average neatness, percent =  $\frac{\Sigma N}{20}$

Average low neatness percent =  $\frac{\text{Sum of neatness of the lowest 4 panels}}{4}$

Remarks:

Date . . . . .

Signature of tester

## *Indian Standard*

# RAW SILK — GRADING AND METHODS OF TESTS

## PART 10 DETERMINATION OF TENACITY AND ELONGATION BY SERIGRAPH TEST

### 1 SCOPE

This standard (Part 10) prescribes method for determining the tenacity and elongation of raw silk.

### 2 TEST SAMPLE

The test skeins to be tested shall be taken from 10 bobbins prepared for the purpose of winding test (see Part 4). From each one of the 10 bobbins, a sizing skein, shall be prepared in the manner prescribed under 6 of Part 5, limiting the number of threads in each skein as given below for tenacity and elongation tests:

<i>Universal Count (or Denier) of Silk</i>	<i>Number of Strands in Sizing Skeins</i>
Up to 1.4 tex (or 13 d)	400
1.5 to 2.2 tex (or 14 to 20 d)	300
2.3 to 3.3 tex (or 21 to 29 d)	200
3.3 tex (or 30 d) or above	100

### 3 ATMOSPHERIC CONDITIONS FOR CONDUCTING THE TEST

The test shall be carried out in standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature.

### 4 CONDITIONING OF TEST SAMPLE

Prior to test, the test sample shall be conditioned in the standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature for 24 h.

### 5 APPARATUS

#### 5.1 Serigraph

A constant rate of traverse pendulum type yarn strength testing machine, graduated in grams and capable of recording simultaneously the breaking load and the corresponding elongation of the threads, shall be used (see Fig. 1). The machine shall be power-driven so that the moving clamp has a traverse of 15 cm/m. The distance between the clamps shall be capable of being adjusted to 10 cm.

#### 5.2 Wrap Reel and Balance

The same as used in size deviation test of raw silk (see Part 5).

### 6 PROCEDURE

**6.1** The size (tex or denier) of each test skein shall be determined by the method prescribed in Part 5. Take one test skein and wrap around a strip of soft cardboard. The cardboard shall be placed and secured in the upper clamp of the machine in such a manner that all the threads are held firmly and none is crushed by the pressure of clamps or their edges. The threads shall be drawn parallel, straight and taut, and wrapped around a second strip of soft cardboard at such a position that when the strip is secured in the lower clamp, the distance between the clamps is 10 cm. It shall be seen that (a) all the threads are uniformly taut and none excessively stretched, and that (b) no portion of the test skein which is not between the clamps is subject to the tensile force generated by the machine.

**6.2** The machine is operated in such a way that the moving clamp shall traverse at the rate of 15 cm/m. The breaking load in grams, of the test skeins and the elongation of the specimen as recorded on the machine shall be noted.

**6.3** The test shall be repeated with the remaining test skeins.

### 7 CALCULATION

Calculate the tenacity of each test skein by the following formula:

$$\text{Tenacity in g per tex (or g per denier)} = \frac{z}{n \times d}$$

where

$z$  = breaking load in g of test skein,

$n$  = number of strands tensioned, and

$d$  = tex(or denier) of test skein.

### 8 RECORD

The result shall be indicated by the average of results of ten test samples. The result of the tenacity shall be

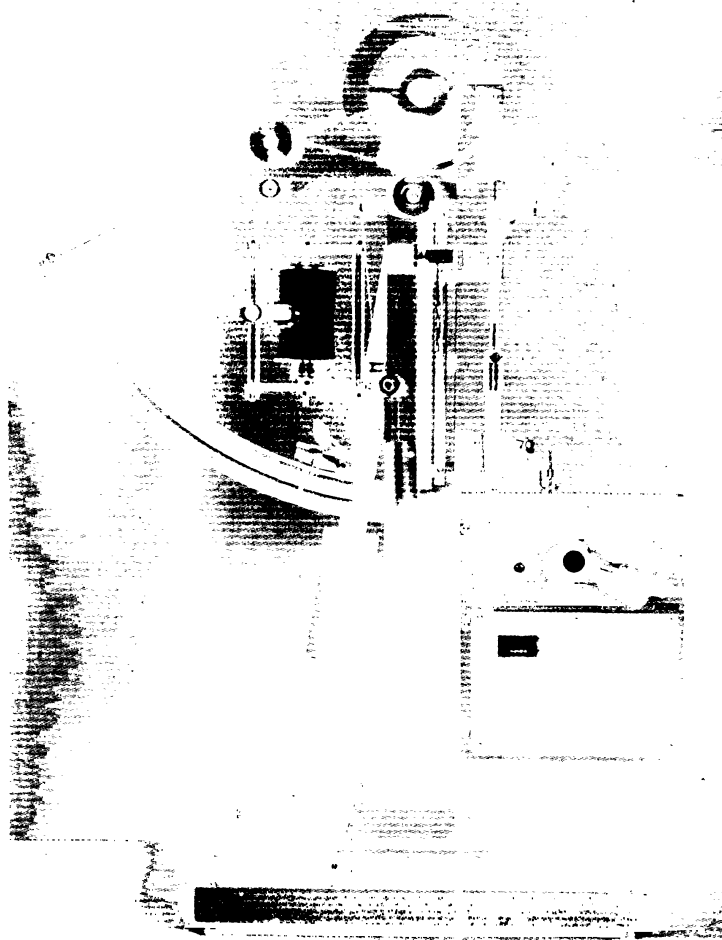


FIG. 1 SERIGRAPH

calculated by omitting the decimals in the case of  $g/tex$  (or omitting the figures beyond the first place after the decimal point in the case of  $g/d$ ). The result of the elongation shall be calculated by omitting the decimal

place. The proforma for record and report as given in Annex A shall be used for recording the test data and reporting the results of the test.

## ANNEX A

(Clause 8)

## PROFORMA FOR RECORD AND REPORT

.....

(Name of Conditioning House)

## RECORD AND REPORT OF SERIGRAPH TEST OF RAW SILK

[Conducted in accordance with IS 15090 (Part 10) Raw silk — Grading and methods of test:  
Part 10 Determination of tenacity and elongation by serigraph test]

Mark of the lot .....

Serial No. of bales in the lot .....

Nominal Denier .....

No. of strands tensioned (n) .....

Sl No. of Test Skein	Tex (or Denier) of Test Skein (d)	Breaking Load, g	Tenacity g/tex (or $g/d = \frac{z}{n \times d}$ )	Elongation, Percent
(1)	(2)	(3)	(4)	(5)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Total				

Average tenacity, g/tex (g/d) =  $\frac{\text{total of column 4}}{10}$

Average elongation, percent =  $\frac{\text{total of column 5}}{10}$

Remarks:

Date .....

Signature of Tester

*Indian Standard***RAW SILK — GRADING AND METHODS OF TESTS****PART 11 DETERMINATION OF COHESION****1 SCOPE**

This standard (Part 11) prescribes method for determination of the degree of agglutination of cocoon filaments forming the thread.

**2 TEST SAMPLE**

The sample shall consist of 10 test pieces taken from the 10 bobbins prepared for the purpose of winding test (see Part 4). The thread shall be free from any cleanness or pronounced evenness defect in the portion which is to be tested.

**3 ATMOSPHERIC CONDITIONS FOR CONDUCTING THE TEST**

The test shall be carried out in standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature.

**4 CONDITIONING OF TEST SAMPLE**

Prior to test, the test sample shall be conditioned in the standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature for 24 h.

**5 APPARATUS**

**Duplan Cohesion Tester** — The cohesion tester (see Fig. 1 and 2) consists of a framework upon which a continuous thread of raw silk is placed zigzag between a set of ten hooks on each side of the frame, under constant and uniform tension in such a way that the thread can be subjected to a friction action at 20 different places simultaneously, and the number of strokes recorded automatically. The total load to be given for tension is 180 g.

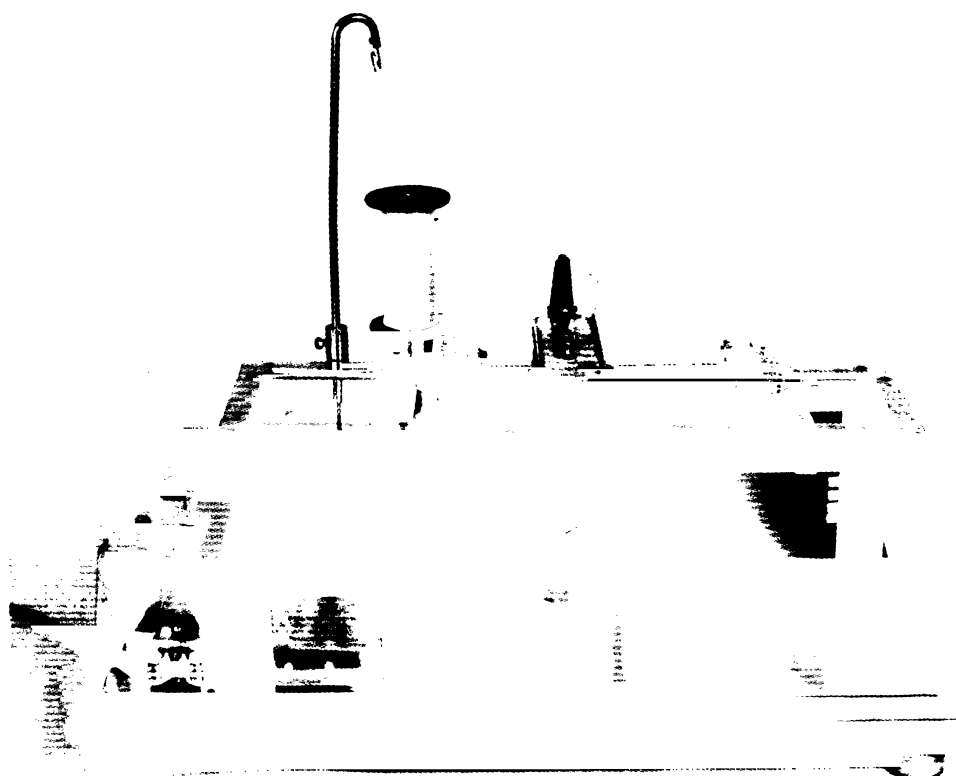


FIG. 1 DUPLAN COHESION TESTER

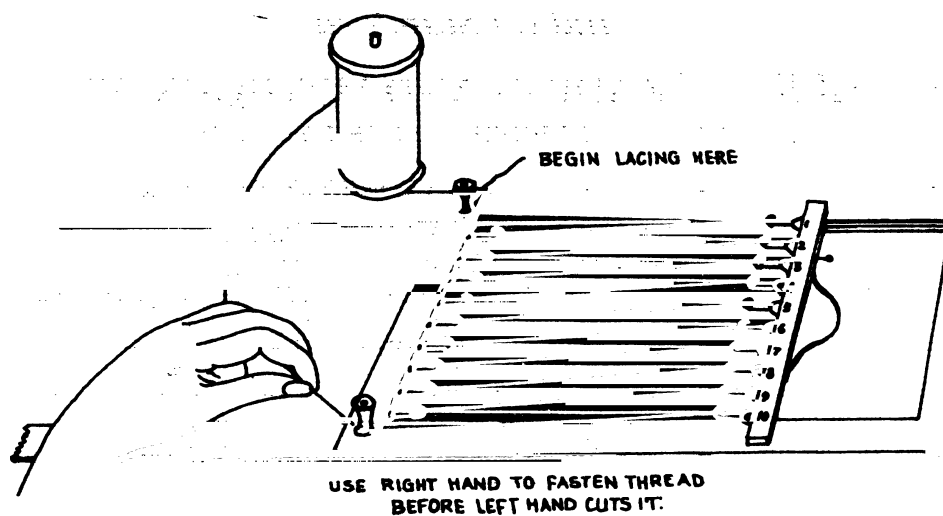


FIG. 2 LACING ARRANGEMENT OF DUPLAN TESTER

## 6 PROCEDURE

One of the bobbins constituting the test sample shall be placed on the rack of the cohesion tester. The top friction plate bracket shall be lifted and turned back on the hinge. The end of the thread shall be withdrawn from the bobbin and fastened with the knurled thumb screw provided in the machine for the purpose and laced round the hooks in a zigzag fashion. The thread shall be inspected carefully to make sure that it is free from cleanness defects (*see* Part 8) or pronounced evenness defects (*see also* Part 7) or any other imperfection which would produce abnormal results. The motor shall be started slowly, increasing its speed gradually up to a maximum of 140 strokes per minute (*see* Note). The machine shall be stopped every 10 strokes and the tension of the thread released slightly. The thread shall be carefully inspected to see if there is any open place. As soon as 10 different open places,

each of 6 mm length or more, are observed, they shall be recorded along with the number of strokes which shall be considered as the strokes of the thread opened.

NOTE — A stroke is one complete passage of the friction plate to and fro over the thread, that is, one complete revolution of the driving wheel.

The test shall be repeated with the remaining bobbins constituting the test sample and the average of the test values shall be calculated to the nearest whole number.

## 7 RECORD

The record of the test shall be indicated by the average number of strokes of 10 test samples. The result of cohesion shall be calculated by omitting decimals. The proforma for record and report as given in Annex A shall be used for the purpose.

**ANNEX A**

(Clause 8)

**PROFORMA FOR RECORD AND REPORT**

.....

(Name of Conditioning House)

**RECORD AND REPORT OF COHESION TEST OF RAW SILK**

[Conducted in accordance with IS 15090 (Part 11) Raw silk — Grading and methods of tests :  
Part 11 Determination of cohesion]

Mark of the lot .....

Serial No. of bales in the lot .....

Nominal denier .....

<i>Sl No. of Boobins</i>	<i>Strokes/Sl No. of Hook — Carriers</i>										<i>Total Strokes</i>
(1)	(2)										(3)
	1	2	3	4	5	6	7	8	9	10	
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
Total											

Grand Total (N) = Sum of column 3

Cohesion (strokes) = N/100

Remarks:

Date.

Signature of Tester



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