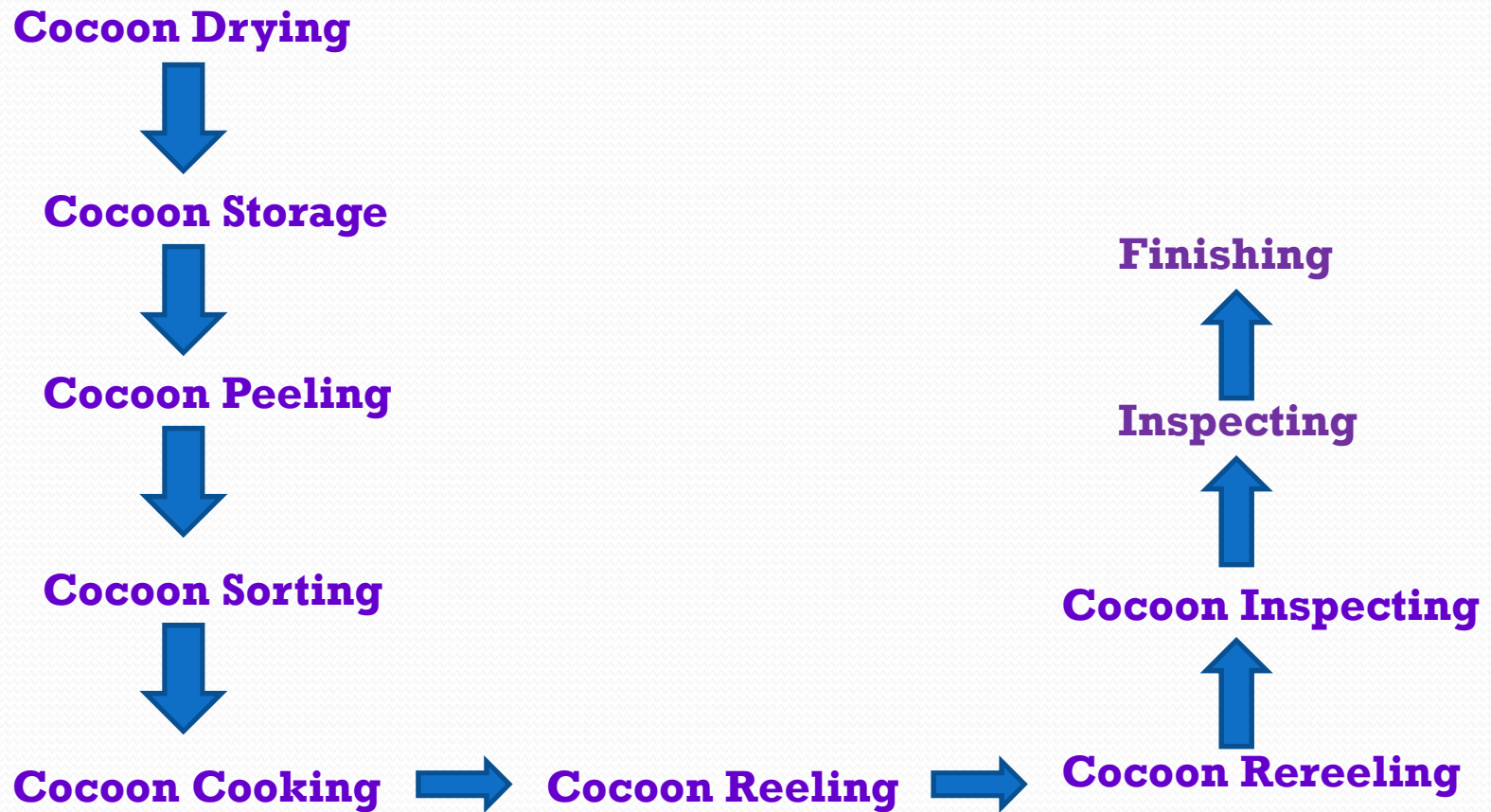




Raw Silk Testing

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Steps of Post Cocoon Technology



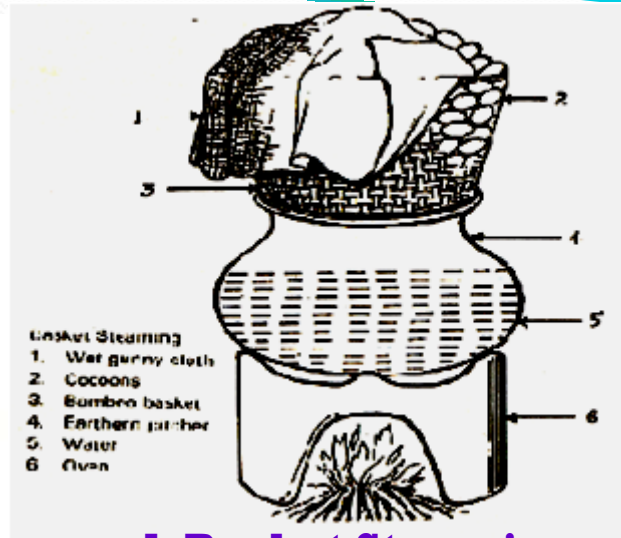
Types of Cocoon Stifling



Sun Drying



2.Barrel Steaming

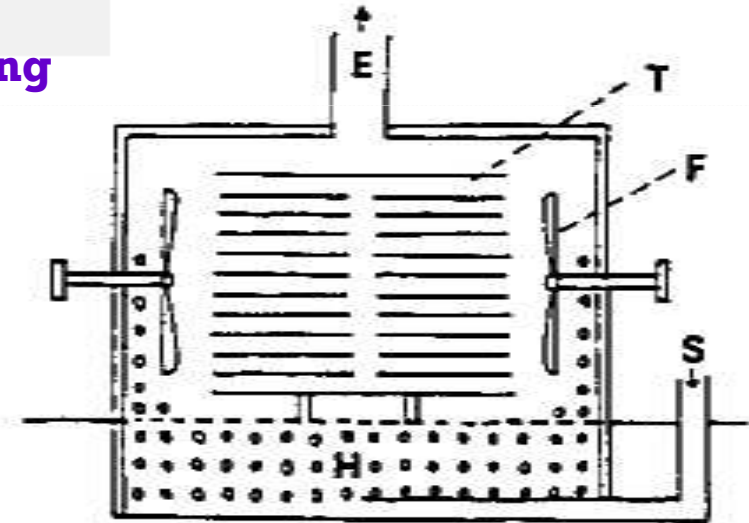


1. Basket Steaming

3. Chamber Steaming

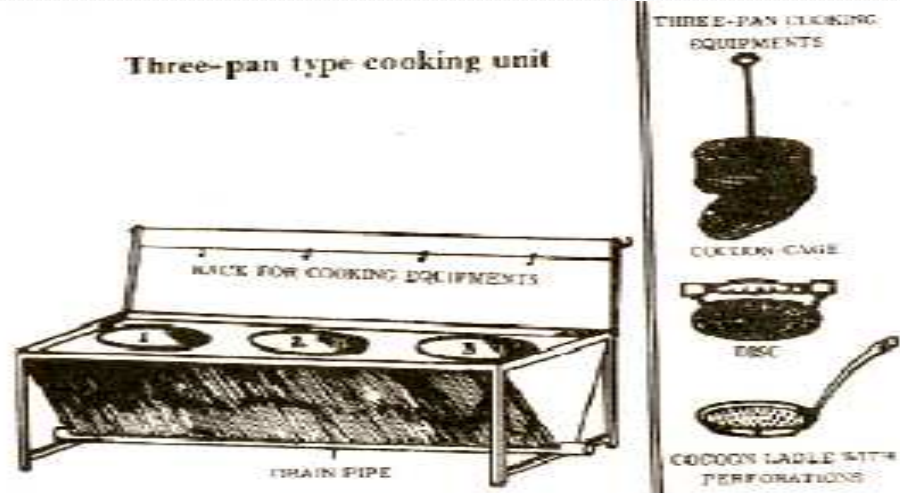


**B. Yamato Hot Air Drying Chamber
(Conveyer Type)**



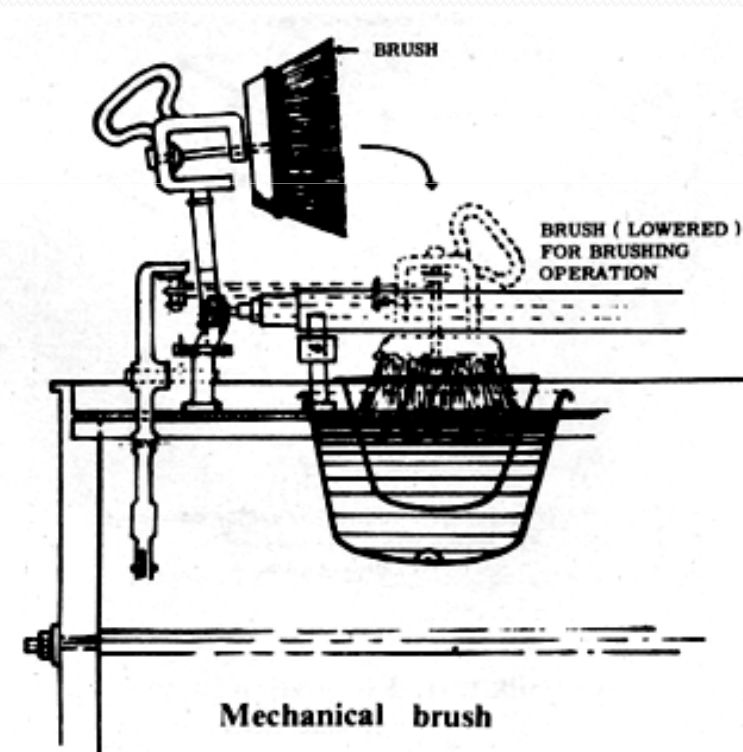
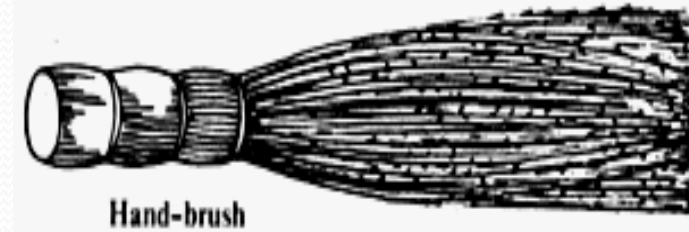
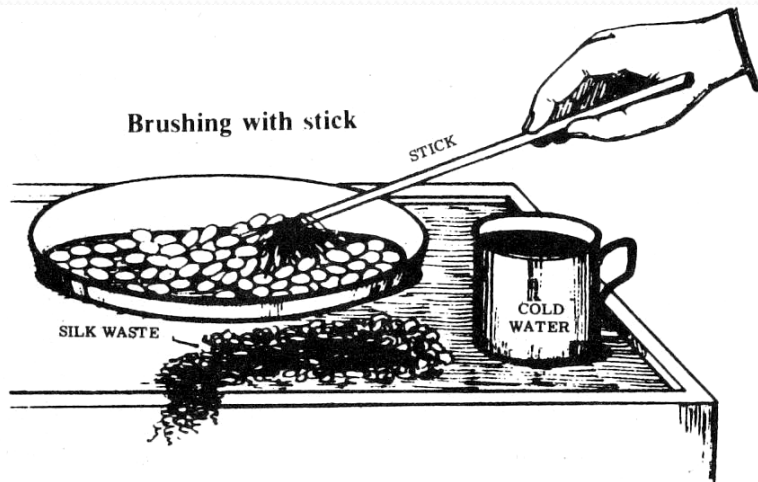
**A. Hot Air Drying Chamber
(For Batch Type)**

Types of Cocoon Cooking



Pressurized Cocoon Cooking Machine

Cocoon Brushing Methods



Cocoon Reeling Methods





SILK HANKS



LASING OF SILK HANKS



Twisted silk skein



RAW SILK BOOKS



RAW SILK TESTING-Objectives

- To test the quality of raw silk
- To determine the grade
- To facilitates fair & equitable transaction

**The testing is based on the procedure laid down
by the International Silk Association (I.S.A.)**

RAW SILK TESTING



Visual Inspection

- i. General Finish
- ii. Characteristic Nature

Mechanical test

- i. Winding test
- ii. Size deviation test
- iii. Seriplane test
- iv. Serigraph test
- v. Cohesion test

VISUAL INSPECTION

- **Visual Inspection** - This is carried out in an inspection room, which is well illuminated. There are three main factors that have to be tested.

These are:

- i. Uniformity** - In this test, the entire lot is inspected to assess the uniformity of colour, lustre and feel. It is classified as good, fair and inferior.

ii. General finish - Considering the presence and degree of a number of defects assesses the general finish of the lot.

The defects are:

- **Re-reeling:** Gummed skeins; gummed spots on skeins; double ends; irregular traverse.
- **Finish:** Tangled filament, defective lacing, filament out of place in skein (pulled filaments).
- **Arrangement:** Lacing of booking card through skeins; non-uniform skeins; wrong twisting; raised filament; streaky filament; cut ends; discoloured skeins; foreign matter on skeins; irregular skeins on book; knots on skeins; skeins or books of different types.
- **Damage:** Books of irregular shape; gummed books, soiled filaments; insect attached skeins, etc.
- The results are expressed in terms such as **good, fair, poor or inferior.**

iii. Nature

The lot are inspected and indicated in the following manner:

- Colour: light, medium or deep**
- Lustre : bright, medium or dull**
- Hand : smooth, medium or rough**

Sample Test

To conduct these tests, 50 skeins of the lot if the skeins weigh below 120 g. Alternatively, 25 skeins are taken if the skeins weight over 120 g.

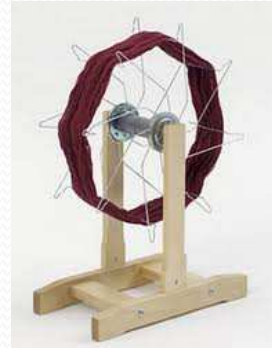
Mechanical Test

1. winding test

Equipment required

- Winding frame
- Wheels and bobbins

Reel



Bobbins



Number of sample :- 40 skeins out of 50 skeins @ 70 g and 20 skeins out of 25 skeins @ 140 g.



SILK HANKS



Twisted silk skein

When winding is started only the top half of the sample skeins should be wound. The winding should be carried out at a predetermined speed for a specific duration.

The number of breaks - counted and noted.



WINDING TESTER

Test Protocol

Average speed and winding period for winding test

Size under test	Preliminary winding	Average speed (metre/min.)	Winding period (minutes)	
			70 g skeins	140 g skeins
12 denier or finer	10	110	60	120
13-18	10	140	60	120
19-33	10	165	60	120
34-69	5	165	30	60
70 or coarse	5	165	20	40

Grading based on the Results

Winding	12 d. and below	7	15	25	above 25
(breaks)	13 d. - 18 d.	5	12	21	above 21

Winding	34-49d	1 below	6 below	13 below	22 below	22 above
(breaks)	70 above	0	4 below	10 below	18 below	18 above

Mechanical Test

2. Size Deviation Test

Equipment required

- Sizing reel
- Balance
- Denier Scale



Denier balance



Small skein sampler for size deviation test

Table: Number of skins in a lot and graduation in scale

Sizes	No. of skeins in a group	Accuracy of scale		Permissible range of denier
		For 1 skein	For group	
33 denier or finer	20	0.5 denier	0.5 denier	1.5 denier
33-49 denier	40	1.0 denier	2.0 denier	4.0 denier
50-99 denier	40	2.0 denier	2.0 denier	8.0 denier
100 denier or coarser	40	5.0 denier	2.0 denier	19.0 denier

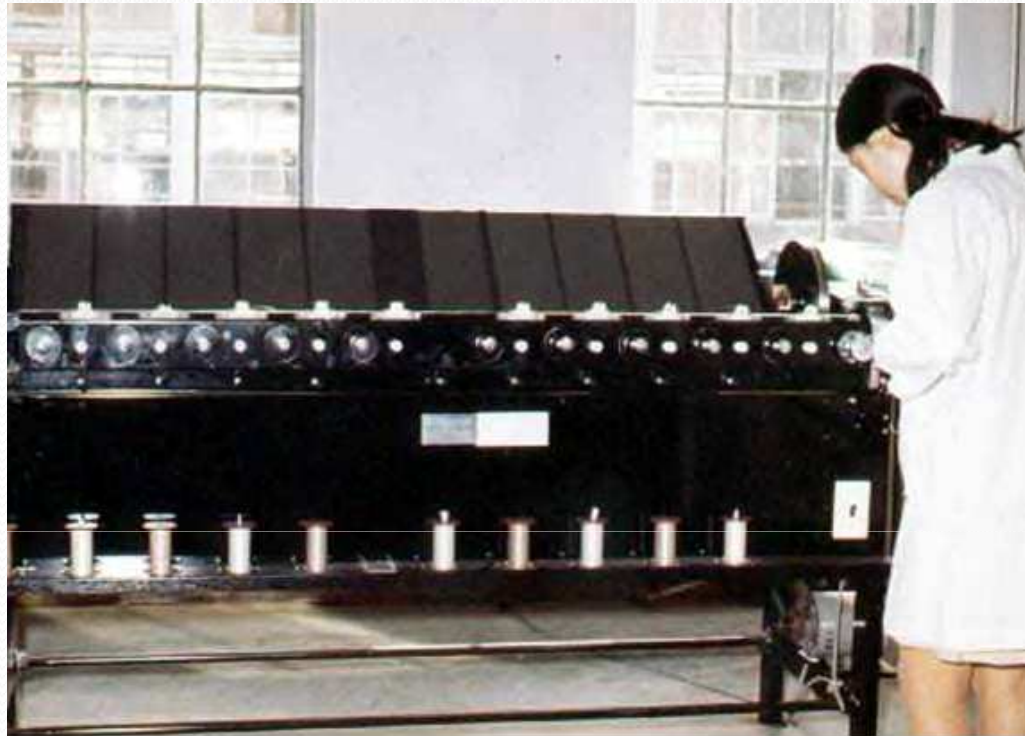
Table 1: Recommended Denier Ranges for Different Fiber Counts and Weave Types									
Size Deviation (denier)	34-49d	2.30 below	2.60 below	3.10 below	3.65 below	4.45 below	5.70 below	7.65 below	7.65 above
	50-69d	3.25 below	3.75 below	4.40 below	5.20 below	6.35 below	8.15 below	10.90 below	10.90 above
	70 above	3.90 below	4.45 below	5.25 below	6.20 below	7.60 below	9.75 below	13.05 below	13.05 above
Maximum Deviation (denier)	34-49d	7.0 below	8.0 below	9.5 below	11.0 below	13.5 below	17.0 below	23.0 below	23.0 above
	50-60d	10.0 below	11.0 below	13.0 below	15.5 below	19.0 below	24.5 below	32.5 below	32.5 above
	70 above	11.5 below	13.5 below	16.0 below	18.5 below	23.0 below	29.0 below	39.0 below	39.0 above



Evenness test

Evenness is the characteristic of being regular or homogeneous

The test is carried out with test samples of a fixed length using a Seriplane. These test samples represent fine passages and coarse ones, divided into 3 groups (Evenness Variation, I, II and III) according to the degree and frequency of size variations.



Seriplane winder

Panel - A panel is a section of raw silk 127 mm wide by 457 mm long uniformly wound from a bobbin on to an inspection board



Seriplane inspection for cleanness and neatness

The thread is spaced on the inspection panel according to the size under test as follows:

9 denier or finer	133 threads per 25.4 mm		
10 to 12 denier	114	"	"
13 to 16 denier	100	"	"
17 to 26 denier	80	"	"
27 to 36 denier	66	"	"
37 to 48 denier	57	"	"
49 to 68 denier	50	"	"
69 to 104 denier	40	"	"
105 to 149 denier	33	"	"
150 to 197 denier	28	"	"
198 denier or coarser	25	"	"

Cleanness test (Cleanliness): The state of being clean.

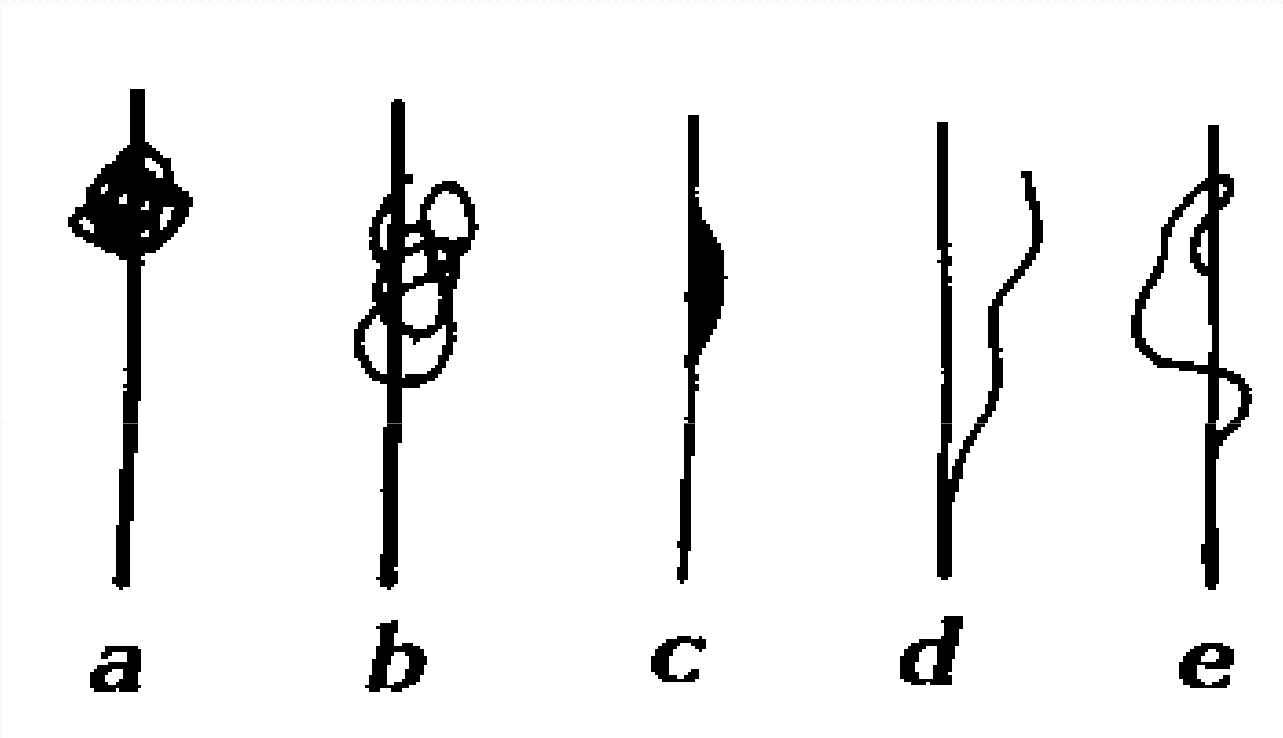
This test is conducted to ascertain Super Major Defects, Major Defects and Minor Defects.

Major Defects:

- 1. Waste-** Mass of tangled cocoon filaments attached to the yarn.
- 2. Large slugs-** Somewhat thickened places in the thread 7 mm and above in length, or very badly thickened places shorter than 7 mm.
- 3. Bad casts-** Abruptly thickened places due to the cocoon filaments not properly adhering to the raw silk yarn, or caused by feeding more than one cocoon filament at a time.
- 4. Very long knots-** These are knots, which have loose ends, 10 mm and over, or those made by incorrect tying of threads.
- 5. Heavy corkscrews -** one or more cocoon filaments are longer than the rest, and give the appearance of a very coarse and large spiral.

Minor Defects:

- 1. Small slugs** - which are considerably thickened places in the thread from 2 - 7 mm in length, or extremely thickened places less than 2 mm in length.
- 2. Long knots are knots, which have loose ends from 3-10 mm in length.**
- 3. Corkscrews** are places in which one or more cocoon filaments are longer than the remainder, and give the appearance of a thick spiral.
- 4. Long loops or loose ends** are loops or split ends, 10 mm and above in length, when measured along the filament.



Various cleanness

a) Waste, b) Slug, c) Bad casting, d) Split ends, e) Large loop



Neatness test:

The quality or condition of being neat

Neatness defects: Imperfection, which are smaller than those described as minor cleanness defects are known as neatness defects.

Nibs are small thickened places or spots in the yarn less than 2 mm in length.

Loops are small open places in the yarn caused by the excessive length of one or more cocoon filaments, less than 10 mm in length when measured along the filament.



Hairiness and fuzziness show small loose ends of less than 10 mm and fine particles of cocoon filaments protruding from the yarn.

Small knots are knots, which have loose ends, less than 3 mm in length.

Fine corkscrews are places in which one or more cocoon filaments are longer than the remainder and give the appearance of a spiral.



Apparatus and equipment: The Standard Photographs for neatness defects, Seriplane and lighting equipment.

Sample: The same as given in the Cleanness test.

Test: Each panel on any one side of the inspection board is carefully compared with the Standard Photographs for neatness defects and its neatness value is estimated in percentages.

From 100 to 50 % , the estimate should be to the nearest 5 % . Below 50 % , it should be made to the nearest 10 % .

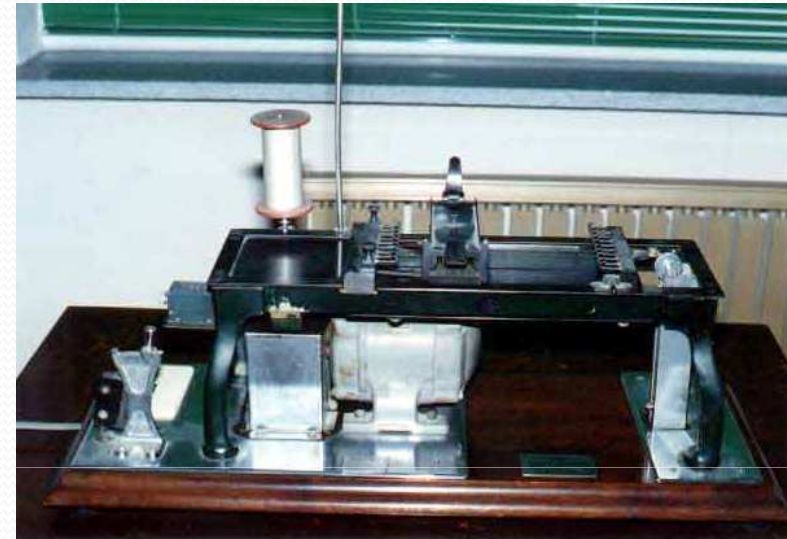
Table 3. Deducting points by Neatness results

Neatness	Deducting points
Above 80	0
75	0.25
70	0.5
65	0.75
60	1.0
55	1.25
50	1.5
40	2.0
30	2.5
20	3.0
10	3.5

Major items	Grade	4A	3A	2A	A	B
Evenness Variation I (count)		150	170	190	210	above 210
Evenness Variation II (count)		10	17	26	37	above 37
Cleanness (%)		97	95	93	88	below 88
Average Neatness (%)		94	92	90	87	below 87
Low Neatness (%)		90	87	83	77	below 77

Cohesion test:

By means of the Duplan cohesion tester, the **number of frictions required to split silk thread** for the purpose of examining the state of cocoon filaments sticking together, can be counted.



Duplan type cohesion tester

Apparatus: Duplan cohesion tester.

Sample: the sample for the test should consist of 20 test pieces taken out of 50 test pieces.

Test

The maximum speed of stroke should be 140 strokes per min

Table

Grade	4A	3A	2A	A	B
Major items					
Cohesion (strokes)	40				below 40

Tenacity and elongation test

To test the strength of the raw silk, the breaking point (g per denier) and the degree of elongation (percentage) is carried out on the Serigraph.



Tenacity and elongation tester

Apparatus: Serigraph, sizing reel and scale.

Sample: Ten test pieces taken out of 50 test pieces.

Test:

The sizing skeins to be tested are placed in a room, where standard humidity can be maintained, for a sufficient amount of time to allow them to become adjusted to standard conditions.

Table-1: Indian classification table for Class I raw silk (2.0 Tex (or 18 denier) and finer)

Grade	6A	5A	4A	3A	2A	A	B	C	D
Major items									
Size Deviation, (tex or denier)									
1.3 tex (or 12d) (or 12d) and below	0.089 (0.80)	0.094 (0.85)	0.106 (0.95)	0.117 (1.05)	0.128 (1.15)	0.130 (1.25)	0.150 (1.35)	0.167 (1.50)	above 0.167 (above 1.50)
1.4 to 1.7 tex (or 13 to 15d)	0.100 (0.90)	0.106 (0.95)	0.117 (1.05)	0.128 (1.15)	0.139 (1.25)	0.150 (1.35)	0.167 (1.50)	0.189 (1.70)	above 0.189 (above 1.70)
1.8 to 2.0 tex (or 16 to 18d)	0.117 (1.05)	0.128 (1.15)	0.139 (1.25)	0.150 (1.35)	0.161 (1.45)	0.178 (1.60)	0.194 (1.75)	0.217 (1.95)	above 0.217 (above 1.95)
Evenness (%)	94	93	91	89	86	84	82	80	below 80
Low Evenness (%)	87	85	83	80	77	75	73	70	below 70
Clearness (%)	96	95	94	93	92	90	88	85	below 85
Neatness (%)	95	94	93	92	90	88	86	84	below 84
Low Neatness (%)	92	90	88	86	83	79	75	70	below 70
Auxiliary	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)
Maximum Deviation, (tex or denier)									
1.4 to 1.7 tex (or 12d) and below	0.23 (2.1)	0.26 (2.3)	0.28 (2.5)	0.30 (2.7)	0.33 (3.0)	0.37 (3.3)	0.40 (3.6)	0.44 (4.0)	above 0.44 (above 4.0)
1.4 to 1.7 tex (or 13 to 15d)	0.27 (2.4)	0.28 (2.5)	0.30 (2.7)	0.33 (3.0)	0.37 (3.3)	0.40 (3.6)	0.44 (4.0)	0.50 (4.5)	above 0.50 (above 4.5)
1.8 to 2.0 tex (or 16 to 18d)	0.31 (2.8)	0.33 (3.0)	0.37 (3.3)	0.40 (3.6)	0.43 (3.9)	0.47 (4.2)	0.51 (4.6)	0.58 (5.2)	above 0.58 (above 5.2)
Auxiliary	(i)		(ii)		(iii)		(iv)		
Winding (breaks)									
1.3 tex (or 12d) and below	10		15		23		above 23		
1.4 to 2.0 tex (or 13 to 18d)	7		12		20		above 20		
Auxiliary	(I)			(II)			(III)		
Tenacity g/tex (or g/denier)	33 (3.7)			32 (3.6)			below 32 (below 3.6)		
Elongation (%)	19			18			below 18		
Cohesion (strokes) 1.4 to 2.0 tex (or 13 to 18d)	40			35			below 35		
Auxiliary	(I)					(II)			
Cohesion (strokes) 1.3 tex (or 12d) and below						below 30			

Table -2: Indian classification table for Class I raw silk (2.1 to 3.7 tex or 19 to 33 denier)

Grade	6A	5A	4A	3A	2A	A	B	C	D	E
Major items										
Size Deviation tex (or denier)										
2.1 to 2.4 tex (or 19 to 22d)	0.128 (1.15)	0.139 (1.25)	0.150 (1.35)	0.167 (1.50)	0.183 (1.65)	0.200 (1.80)	0.217 (1.95)	0.239 (2.15)	0.267 (2.40)	above 0.267 (above 2.40)
2.6 to 3.0 tex (or 23 to 27d)	0.156 (1.40)	0.167 (1.50)	0.183 (1.65)	0.200 (1.80)	0.217 (1.95)	0.233 (2.10)	0.256 (2.30)	0.278 (2.50)	0.300 (2.70)	above 0.300 (above 2.70)
3.1 to 3.7 tex (or 28 to 33d)	0.178 (1.60)	0.194 (1.75)	0.211 (1.90)	0.233 (2.10)	0.256 (2.10)	0.278 (2.50)	0.300 (2.70)	0.328 (2.95)	0.356 (3.20)	above 0.356 (above 3.20)
Evenness (%)	94	93	91	89	86	84	82	80	77	below 77
Low Evenness (%)	87	85	83	80	77	75	73	70	66	below 66
Cleanness (%)	96	95	94	93	92	90	88	85	81	below 82
Neatness (%)	95	94	93	92	90	88	86	84	82	below 82
Low Neatness (%)	92	90	88	86	83	79	75	70	64	below 64
Auxiliary	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)
Maximum Deviation, tex (or denier)										
2.1 to 2.4 tex (or 19 to 22d)	0.33 (3.0)	0.37 (3.3)	0.40 (3.6)	0.44 (4.0)	0.49 (4.4)	0.53 (4.6)	0.58 (5.2)	0.63 (5.7)	0.71 (6.4)	above 0.71 (above 6.4)
2.6 to 3.0 tex (or 23 to 27d)	0.42 (3.8)	0.46 (4.1)	0.49 (4.4)	0.53 (4.8)	0.58 (5.2)	0.63 (5.7)	0.69 (6.2)	0.76 (6.8)	0.82 (7.4)	above 0.82 (above 7.4)
3.1 to 3.7 tex (or 28 to 33d)	0.48 (4.3)	0.52 (4.7)	0.58 (5.2)	0.63 (5.7)	0.69 (6.2)	0.74 (6.7)	0.81 (7.3)	0.89 (8.0)	0.97 (8.7)	above 0.97 (above 8.7)
Auxiliary	(I)		(II)			(III)				
Winding (breaks) above 20	6		10			15			20	
Auxiliary	(I)			(II)			(III)			
Tenacity g/tex (or g/denier)	33 (3.7)			32 (3.6)			below 32 (below 3.6)			
Elongation (%)	19			18			below 18			
Cohesion (strokes)	60			50			below 50			

Table-3: Indian classification table for Class I raw silk (3.8 tex or 34 denier and coarser)

Grade	4A	3A	2A	A	B	C	D	E	
Major items									
Size Deviation, tex (or denier)									
3.8 to 5.4 tex (or 34 to 49d)	0.344 (3.10)	0.389 (3.50)	0.433 (3.90)	0.489 (4.40)	0.556 (5.00)	0.656 (5.90)	0.778 (7.00)	above 0.778 (above 7.00)	
5.6 to 7.7 tex (or 50 to 69d)	0.456 (4.10)	0.511 (4.60)	0.578 (5.20)	0.644 (5.80)	0.744 (6.70)	0.878 (7.90)	1.033 (9.30)	above 1.033 (above 9.30)	
7.8 tex (or 70d) and above	0.567 (5.10)	0.633 (5.70)	0.700 (6.30)	0.789 (7.10)	0.911 (8.20)	1.078 (9.70)	1.267 (11.40)	above 1.267 (above 11.40)	
Maximum Deviation, tex or denier									
3.8 to 5.4 tex (or 34 to 49d)	1.00 (9.0)	1.11 (10.0)	1.22 (11.0)	1.44 (13.0)	1.67 (15.0)	2.00 (18.0)	2.33 (21.0)	above 2.33 (above 21.0)	
5.6 to 7.7 tex (or 50 to 69d)	1.33 (12.0)	1.56 (14.0)	1.78 (16.0)	2.00 (18.0)	2.33 (21.0)	2.67 (24.0)	3.11 (28.0)	above 3.11 (above 28.0)	
7.8 tex (or 70d) and above	1.67 (15.0)	1.89 (17.0)	2.11 (19.0)	2.44 (22.0)	2.78 (25.0)	3.22 (29.0)	3.78 (34.0)	above 3.78 (above 34.0)	
Evenness (%)	91	89	86	84	82	80	77	below 77	
Low Evenness (%)	83	80	77	75	73	70	66	below 66	
Cleanness (%)	94	92	90	87	83	79	75	below 75	
Neatness (%)	93	91	89	87	84	81	78	below 78	
Low Neatness (%)	87	85	82	78	74	68	62	below 62	
Auxiliary	(I)		(II)		(III)		(IV)		(V)
Winding (breaks)									
3.8 to 7.7 tex (or 34 to 69d)	3		6		10		15		above 15
7.8 tex (or 70d) and above	2		4		6		10		above 10
Auxiliary	(I)			(II)			(III)		
Tenacity									
b/tex (or g/denier)	33 (3.7)			32 (3.6)			below 32 (below 3.6)		
Elongation (%)	19			18			below 18		

Miscellaneous tests

Quantitative test

Conditioned weight test

Boil-off test for raw silk

Exfoliation test for raw silk

Definition – Exfoliation in raw silk is the undesirable property of the individual filaments of silk split into very fine fibrils.

CLASSIFICATION OF RAW SILK



**Acknowledgements
to
INTERNET**