इंटरनेट मानक

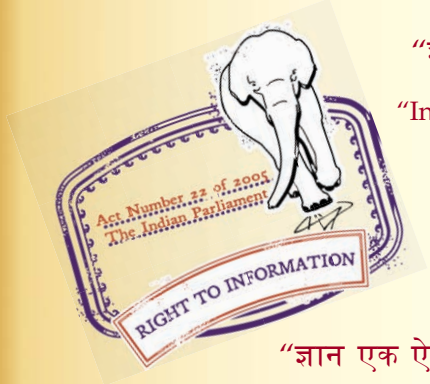
Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 7032-1 to 8 (1986): Physical methods of test for uncut Indian jute, Mesta and Bimli [TXD 1: Physical Methods of Tests]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

IS : 7032 (Parts 1 to 8) -1986
(Reaffirmed 2000)

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

(First Revision)

UDC 677·13+677·142 : 677·017

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 8

September 1987

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

(First Revision)

Physical Methods of Test Sectional Committee, TDC 1

Chairman	*Representing*
DR V. SUNDARAM	Cotton Technological Research Laboratory (ICAR), Bombay
Members	
DR V. G. MUNSHI (*Alternate* to Dr V. Sundaram)	
AGRICULTURAL MARKETING ADVISER TO THE GOVERNMENT OF INDIA	Directorate of Marketing & Inspection (Ministry of Agriculture), Faridabad
SHRI A. T. BASAK	Directorate General of Supplies & Disposals (Inspection Wing), New Delhi
SHRI D. K. NANDY (*Alternate*)	
SHRI B. N. BASU	Office of the Jute Commissioner, Calcutta
SHRI C. BHATTACHARYA	Indian Petrochemicals Corporation Ltd, Vadodara
SHRI H. C. BHATIA (*Alternate*)	
GENERAL MANAGER (OPERATIONS)	The National Rayon Corporation Ltd, Bombay
SHRI D. S. NADKARNI (*Alternate*)	
SHRI R. GHOSH	Ministry of Defence (R & D)
SHRI S. S. BAGGA (*Alternate*)	
DR V. G. KAMATH	Nirlon Synthetic Fibres & Chemicals Ltd, Bombay
DR A. R. MUKHERJEE (*Alternate*)	
SHRIMATI A. KAPLESH	The Silk & Art Silk Mills Research Association, Bombay
SHRI M. R. PARANJAPE (*Alternate*)	
SHRI M. K. MAM	Ministry of Defence (DGI)
SHRI P. C. BASU (*Alternate*)	
DR B. R. MANJUNATHA	Intexa India, Bombay
DR (SHRIMATI) G. R. PHALGUMANI	Textiles Committee, Bombay
SHRI M. RADHAKRISHNAN	The Bombay Textile Research Association, Bombay
SHRI A. V. RAVINDRANATHAN (*Alternate*)	

(*Continued on page* 2)

(*Continued from page* 1)

Members	*Representing*
SHRIMATI G. P. RANE	Wool Research Association, Bombay
DR S. R. RANGANATHAN	Indian Jute Industries' Research Association, Calcutta
DR U. MUKHOPADHYAY (*Alternate*)	
SHRI M. S. RATHORE	National Textile Corporation Limited, New Delhi
SHRI K. N. SESHAN	The South India Textile Research Association, Coimbatore
DR G. S. SINGH	The Raymond Woollen Mills Limited, Thane
SHRI J. K. BANERJEE (*Alternate*)	
SHRI C. SIVARAMAN	Textile India Research Bureau, Bombay
SHRI T. N. SONWALKAR	Central Silk Board, Bangalore
DR T. V. K. SRIVASTAVA	Office of the Textile Commissioner, Bombay
SHRI S. RAVINDRAN (*Alternate*)	
SHRI T. A. SUBRAMANIAN	Ahmedabad Textile Industry's Research Association, Ahmadabad
SHRI M. G. THANAWALA	M. Best Cotton Rope Manufacturing Co, Bombay
SHRI J. N. VOHRA	Punjab State Hosiery and Knitwear Development Corporation Ltd, Chandigarh
SHRI P. T. BANERJI (*Alternate*)	
SHRI R. I. MIDHA, Director (Tex) (*Secretary*)	Director General, BIS (*Ex-officio Member*)

Physical Methods of Test for Jute Subcommittee, TDC 1 : 3

Convener	
DR U. MUKHOPADHYAY	Indian Jute Industries' Research Association, Calcutta
Members	
SHRI S. K. CHATTERJEE (*Alternate* to Dr U. Mukhopadhyay)	
SHRI G. M. BHANDARI	Indian Jute Mills Association, Calcutta
SHRI S. K. KARIWALA (*Alternate*)	
SHRI A. C. BISWAS	National Jute Manufactures Corporation Ltd, Calcutta
SHRI A. GHOSH	National Test House, Calcutta
DR K. CHAKRAVARTY	Directorate of Jute Development (Ministry of Agriculture), Calcutta
SHRI N. C. HALDER (*Alternate*)	
SHRI D. K. DUTTA	Office of the Jute Commissioner, Calcutta
SHRI S. N. GHOSH	Jute Technological Research Laboratories (ICAR), Calcutta
SHRI N. K. SIL (*Alternate*)	
SHRI SEKHAR GUHA	Eskaps (India) Private Limited, Calcutta
SHRI B. MAJUMDAR	Export Inspection Council of India, New Delhi
SHRI P. K. GIRI (*Alternate*)	
SHRI A. N. SANYAL	The Jute Corporation of India Ltd, Calcutta
DR R. K. SARKAR	Ministry of Defence (DGI)
DR DEBANJAN SUR	Institute of Jute Technology, Calcutta
SHRI S. C. ROY (*Alternate*)	

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Parts 1 to 8) (First Revision) was adopted by the Indian Standards Institution on 27 June 1986, after the draft finalized by the Physical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 This standard consisting of nine parts (Parts 1 to 9) was published between 1973 and 1976 and covered methods of test for various characteristics of jute fibres. After the publication of IS : 271-1975 'Grading of white, *TOSSA* and *DAISEE* uncut Indian jute (*second revision*)', IS : 9846-1981 'Grading of uncut Indian *MESTA*', and IS : 11596-1986 'Grading of uncut Indian *BIMLI*' have been published. These standards have taken into consideration the characteristics such as strength, lustre, colour, density, fineness, root content and defects, etc, for grading of fibres. These grading standards prescribe the 'Hand and eye method' for grading and allot scores for different characteristics. This standard (Parts 1 to 8) has been revised to make it applicable to *MESTA* and *BIMLI* fibres also. The method for determination of brightness (colour) (Part 9) has been withdrawn.

0.3 This standard is aimed at obtaining instrumental measures for characteristics of jute, *MESTA* and *BIMLI* fibres for the purpose of grading. To achieve this aim only those methods, which are simple and could be adopted by the graders with the minimum of efforts and where scoring could be possible, have been selected after survey of the work done by research institutions, the published literature and also keeping in view the type of instruments available with the industry.

0.4 In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

*Rules for rounding off numerical values (*revised*).

As in the Original Standard, this Page is Intentionally Left Blank

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

PART 1 GENERAL

(First Revision)

1. SCOPE

1.1 This standard (Part 1) prescribes the definitions of terms, sampling procedure and atmospheric conditions for testing of uncut Indian jute (white, *TOSSA* and *DAISEE*), *MESTA* and *BIMLI* fibres.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Fibres

2.1.1 *BIMLI* — It is a substitute for jute obtained from the bark of *Hibiscus sabdarifa*. It is generally inferior and coarser than jute. Chemically the fibre is different from jute in its low lignin content.

2.1.2 *Jute* — A multicellular fibre obtained from the bast of various species of Corchorus, of which the round pod jute (*Corchorus capularis* or white jute) and the long pod jute (*Corchorus clitorius* or *TOSSA* or *DAISEE* jute) are the most important. The fibre strands are long usually varying from 1·5 to 3·5 metres.

2.1.3 *MESTA* — It is a substitute for jute obtained from the bark of *Hibiscus cannabinus*. It is generally inferior and coarser than jute. Chemically the fibre is different from jute in its low lignin content.

2.2 General Terms

2.2.1 *Colour* — The property of a fibre which distinguishes its appearance as creamy, white, grey, etc.

NOTE 1 — The colour description of white, *TOSSA* and *DAISEE* jute in relation to the terms used for the purpose of grading in IS : 271-1975* is given below :

Term	*Colour Description*		
	White Jute	*TOSSA* Jute	*DAISEE* Jute
Very good	Light creamy to white	Golden to reddish white	Reddish
Good	Creamy pink to brownish white	Reddish to brownish white	Reddish to brownish with some light grey
Fairly good	Brownish to reddish white with some light grey	Reddish or brownish with some light grey	Brownish or light grey with some grey
Fair average	Brownish to light grey	Light grey to copper colour	Light grey
Average	Grey to dark grey	Grey to dark grey	Grey to dark grey

NOTE 2 — The colour description of *MESTA* fibres in relation to the terms used for the purpose of grading in IS : 9846-1981† is given below:

Good	Creamy to whitish
Fair	Light grey
Average	Greyish to dark

NOTE 3 — The colour description of *BIMLI* fibres in relation to the terms used for the purpose of grading in IS : 11596-1986‡ is given below:

Good	Creamy to whitish
Average	Greyish to dark

2.2.2 *Density* — Mass per unit volume of the fibre including its air-spaces. The higher density is a characteristic of better quality fibre. In the hand and eye method for grading of raw jute, heaviness or body of the fibre is assessed. This is more or less equivalent to the bulk density of the fibre.

2.2.3 *Fineness* — A measure of diameter (width) or mass per unit length, or both of the fibre filament. (The finer the fibre, the better is its quality.)

2.2.4 *Foreign Matter* — These are dust and mud, moss and stick which are mostly lost during processing and are thus subject to claims.

*Grading of white, *TOSSA* and *DAISEE* uncut Indian jute (*second revision*).
†Grading of uncut Indian *MESTA*.
‡Grading of uncut Indian *BIMLI*.

2.2.5 *Lustre* — The display of different intensities of light reflected both specularly and diffusely from different parts of a surface exposed to the same incident light. Due to this reflection of light the surface of textiles (fibre, yarn or fabric) looks glossy or shining.

NOTE — In case of jute fibres, higher lustre is generally a characteristic of a better quality fibre.

2.2.6 *Natural Dust* — The dust which might get associated with the fibre during the process of its production.

2.2.7 *Parcel* — A consignment containing certain number of bales, bundles or drums.

2.2.8 *Reed* — The fibre system from the individual jute, *MESTA* and *BIMLI* plants.

2.2.8.1 *Reed length* — The length of the reed from bottom to top (excluding the underground root portion in case of *BIMLI*).

2.2.8.2 *Effective reed length* — The length of the reed after the root and hard barky croppy ends have been removed.

2.2.9 *Root* — The hard barky region at the lower end of the reed which requires additional softening treatment, normally called, 'cuttings'. This includes the underground root portion in case of *BIMLI*.

2.2.10 *Strength* — The ability of the fibres to resist strain or rupture induced by external force.

2.2.10.1 The strength aspect of the fibres is classified depending upon their tenacity.

NOTE 1 — Tenacity is the breaking load of a material under test divided by the linear density of the unstrained material, expressed as grams per tex.

NOTE 2 — Linear density is the mass per unit length; the quotient obtained by dividing the mass of fibre or yarn by its length. When the mass is expressed in grams and the length in kilometres, the resulting value, that is, the quotient, is expressed as tex.

NOTE 3 — IS : 271-1975* specifies the terms 'very good', 'good', 'fairly good', 'fair average', 'average' and 'weak mixed' for the purpose of grading jute fibres.

NOTE 4 — IS : 9846-1981† specifies the terms 'very good', 'good', 'fairly good', 'average' and 'weak mixed' for the purpose of grading *MESTA* fibre.

NOTE 5 — IS : 11596-1986‡ specifies the terms 'good', 'fair', 'average' and 'weak mixed'.

---

*Grading of white, *TOSSA* and *DAISEE* uncut Indian jute (*second revision*).
†Grading of uncut Indian *MESTA*.
‡Grading of uncut Indian *BIMLI*.

2.3 Defects

a) *Major* — Entangled croppy end fibre, centre root, dazed and over-retted fibres, mossy fibre, runners, knots, entangled sticks and hunka.

b) *Minor* — Croppy fibre, weak croppy fibre, gummy fibre, loose sticks, specks, leaf and loose leaf.

2.3.1 *Centre Root (BUK CHHAL)* — The hard barky region in the middle part of the reed which requires additional softening treatment.

2.3.2 *Croppy Fibre* — Fibre with top ends rough and hard (but not barky) caused by careless retting.

2.3.2.1 *Weak croppy fibre* — Fibre which has become unusually weak over a length of about 30 cm at the top end.

2.3.2.2 *Entangled croppy end fibre* — Fibre with unusually entangled croppy end.

2.3.3 *Dazed Fibre* — Fibre which is weak in strength and dull in appearance, due to usually being stored in moist condition.

2.3.4 *Gummy Fibre* — Fibres held together by undissolved pectinous matter.

2.3.5 *Hunka* — The very hard barky fibre running continuously from the lower end to almost the tip of the reed.

2.3.6 *Knots* — Stiff barky spots in the body of the reed which break the continuity of the fibres when opened.

2.3.7 *Leaf and Loose Leaf* — It is the dark grey leafy or paper like substance (remnant of the skin of the plant) appearing on the strand. Loose leaves are those that lie loosely on the fibre and are easily removable.

2.3.8 *Mossy Fibre* — A type of vegetation which sometimes gets attached to the plant. Its portions may remain on the fibre even after retting and washing. It can be separated by hand.

2.3.9 *Over-Retted Fibre* — Fibre which has lost its strength and brightness on decomposition due to prolonged retting.

2.3.10 *Runners* — Hard barky fibre running from the lower end to the middle region, more or less continuously.

2.3.11 *Specks* — Soft barky spots in the body where fibres can be separated with some effort without breaking their continuity, though they may remain as weak spots.

2.3.12 *Sticks, Entangled Sticks and Loose Sticks* — Sticks are remnants of woody part of jute, *MESTA* and *BIMLI* plant over which fibre sheath is formed. Entangled sticks are broken sticks which are linked with fibre mass and are not easily removable. Loose sticks are broken sticks easily removable by shaking.

3. SAMPLING

3.1 Lot — The quantity of raw jute, *MESTA* or *BIMLI* of one type and quality delivered to one buyer against one despatch note shall constitute a lot.

3.2 The samples for testing shall be drawn in accordance with Table 1.

TABLE 1 SAMPLING OF JUTE, *MESTA* AND *BIMLI*

No. of Bales in the Lot	No. of Bales to be Drawn and Opened	No. of *MORAHS* to be Drawn	No. of Strands to be Drawn
(1)	(2)	(3)	(4)
Up to 10	1	5	30
11 to 20	2	10	30
21 to 100	3	15	30
101 to 150	4	20	40
151 to 200	5	25	50
Above 200	—	—	50*

*The number of bales and *MORAHS* shall be so drawn as to get 50 strands.

4. ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

4.1 The test shall be carried out in prevailing atmospheric conditions. However, in case of dispute, the conditioning and testing shall be carried out at standard atmospheric conditions of 65 ± 2 percent relative humidity and 27 ± 2°C temperature (*see also* IS : 6359-1971*).

*Method for conditioning of textiles.

As in the Original Standard, this Page is Intentionally Left Blank

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

PART 2 REED LENGTH

(First Revision)

1. SCOPE

1.1 This standard (Part 2) prescribes a method for the determination of reed length of jute, *MESTA* and *BIMLI* fibre strands.

2. EQUIPMENT

2.1 The following equipment are required:

a) A smooth platform or floor,

b) Measuring tape, and

c) A pair of scissors.

3. PROCEDURE

3.1 Reed Length — Lay the fibre strand on a smooth horizontal platform or floor. Remove any kinks or bends with minimum tension without unduly stretching the fibre strand. Measure the length of the strand from one end to the other with the help of a tape correct to 0·5 cm (L).

3.2 Effective Reed Length — Measure the length of the root (L_1) and croppy end portion (L_2) correct to 0·5 cm. Determine the effective reed length by the following formula:

$$\text{Effective reed length} = L - (L_1 + L_2)$$

3.3 Repeat the test with the remaining test specimens and determine the average of all the values.

4. REPORT

4.1 The report shall include the following information:

a) Average reed length,

b) Average effective reed length, and

c) Size of the sample (strands).

As in the Original Standard, this Page is Intentionally Left Blank

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

PART 3 ROOT CONTENT

(First Revision)

1. SCOPE

1.1 This standard (Part 3) prescribes a method for the determination of root content of jute, *MESTA* and *BIMLI* fibre strands.

2. EQUIPMENT

2.1 The following equipment are required:

a) Weighing balance, and

b) A pair of scissors.

3. PROCEDURE

3.1 Take a test specimen consisting of full length reeds. Weigh it in a balance correct to 1 g (W_1).

3.2 Cut off the bottom root portion from each individual strand so that the cut fibres do not contain any root. Weigh the root portion correct to 1 g (W_2).

3.3 Repeat the test with the remaining test specimens.

4. CALCULATIONS

4.1 Calculate the root content of the individual test specimens as follows:

$$\text{Root content} = \frac{W_2}{W_1} \times 100$$

4.2 Calculate the average of all the values obtained in **4.1**.

5. REPORT

5.1 The report shall include the following information:

a) Average root content, percent; and

b) Size of the sample (strands).

As in the Original Standard, this Page is Intentionally Left Blank

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

PART 4 DEFECTS

(First Revision)

1. SCOPE

1.1 This standard (Part 4) prescribes a method for the determination of defects (centre root, crop-end, runners and hunka) in the jute, *MESTA* and *BIMLI* fibre strands.

2. EQUIPMENT

2.1 The following equipment are required:

a) Weighing balance, and

b) A pair of scissors.

3. PROCEDURES

3.1 Take a test specimen consisting of full length reeds and determine its mass to an accuracy of 1 g (W).

3.2 Cut the centre-root and crop-end portions and keep them separately. Determine the mass of the centre-root (W_1) and crop-end (W_2) to an accuracy of 1 g.

3.3 Separate out the runners from the cut fibres, if any, and determine its mass to an accuracy of 1 g (W_3).

3.4 Remove the hunka from the cut fibres and determine its mass correct to 1 g (W_4).

3.5 Repeat the test with the remaining test specimens.

4. CALCULATIONS

4.1 Calculate the percentage of centre-root, crop-end, runner and hunka of the individual test specimens as follows:

a) Centre-root, $P_1 = \frac{W_1}{W} \times 100$

b) Crop-end, $P_2 = \frac{W_2}{W} \times 100$

c) Runner, $P_3 = \frac{W_3}{W} \times 100$

d) Hunka, $P_4 = \frac{W_4}{W} \times 100$

4.2 Determine the percentage of total defects by adding P_1, P_2, P_3 and P_4.

4.3 Determine the average of all the values.

5. REPORT

5.1 The report shall include the following information:

a) Average percentage of:
   1) centre-root,
   2) crop-end,
   3) runner, and
   4) hunka;

b) Average total defects; and

c) Size of the sample (strands).

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

PART 5 FOREIGN MATTER

(First Revision)

1. SCOPE

1.1 This standard (Part 5) prescribes a method for the determination of foreign matter (dust, mud, moss and stick) of the jute, *MESTA* and *BIMLI* fibre strands.

2. EQUIPMENT

2.1 Weighing Balance

3. PROCEDURES

3.1 Take a test specimen and weigh it to an accuracy of 1 g (W_1). Beat the fibre strand against a hard surface and shake to remove dust, mud and other foreign matter. Continue beating until the mass becomes reasonably constant. Separate out by hand the moss and sticks, if any, from the strand. Then determine the final mass of the strand to an accuracy of 1 g (W_2).

3.2 Repeat the test with the remaining test specimens.

4. CALCULATIONS

4.1 Calculate the percentage of foreign matter of the individual test specimen as follows:

$$\text{Foreign matter, percent} = \frac{W_1 - W_2}{W_1} \times 100$$

4.2 Calculate the average of all the values.

5. REPORT

5.1 The report shall include the following information:

a) Average amount of foreign matter, percent; and

b) Size of the sample (strands).

As in the Original Standard, this Page is Intentionally Left Blank

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

PART 6 BULK DENSITY

(First Revision)

1. SCOPE

1.1 This standard (Part 6) prescribes a method for determination of bulk density of jute, *MESTA* and *BIMLI* fibres.

2. PREPARATION OF TEST SPECIMEN

2.1 Take clean portions of 100 mm length at random from the middle region of the reeds (that is, leaving aside rooty bottom, croppy-end and defects). Adjust the sample 'size' so that the mass of each sample is 40 g. Prepare at least 3 such samples.

3. APPARATUS

3.1 Metallic Plates — of 100 × 25 mm with suitable arrangements for bringing them close by applying pressure in the form of dead weight. An outline sketch of an apparatus suitable for this purpose is given in Appendix A.

3.2 Weighing Balance

4. PROCEDURE

4.1 Take a sample as laid down in **2.1** and place it in between the two metallic plates keeping the gadget flat on the table. Suspend the instrument from the handle. Apply a load of 10 kg and note down the volume of the fibres from the scale of the instrument.

NOTE — The samples may be tested in the prevailing atmospheric conditions. However, in case of dispute, the sample shall be conditioned and tested in standard atmospheric conditions.

4.2 Similarly, test other two test specimens.

5. CALCULATIONS

5.1 Calculate the bulk density by the following formula:

$$D = \frac{M}{V}$$

where

D = bulk density,

M = mass of fibres compressed in g, and

V = volume of fibres under compression in ml.

6. REPORT

6.1 The report shall include the following information:

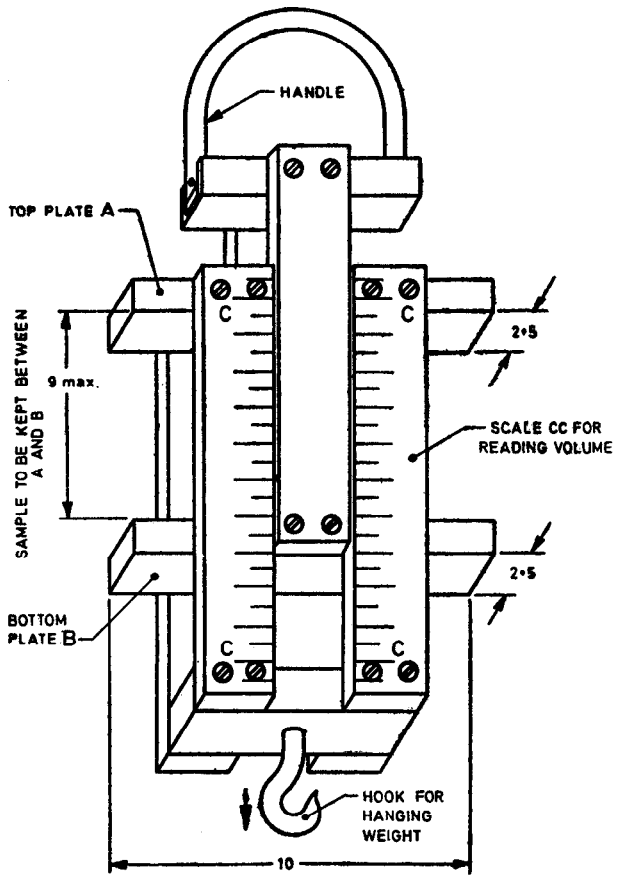
a) Type of fibre,

b) Number of test specimens tested, and

c) Bulk density.

APPENDIX A

(*Clause* 3.1)



All dimensions in centimetres.

FIG. 1 BULK DENSITY MEASURING GADGET

As in the Original Standard, this Page is Intentionally Left Blank

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

PART 7 BUNDLE STRENGTH

(First Revision)

1. SCOPE

1.1 This standard (Part 7) prescribes a method for testing bundle strength of jute, *MESTA* and *BIMLI* fibres by tensile testing machines, working at constant rate of loading (CRL), constant rate of elongation (CRE) and constant rate of traverse (CRT).

2. PRINCIPLE

2.1 A bundle of fibres of 1·5 to 3·0 kilotex is gripped between two suitable clamps and their breaking load is determined on tensile testing machines. Then tenacity is calculated by dividing the breaking load by the mass of the fibres held between the clamps.

3. PREPARATION OF TEST SPECIMEN

3.1 Take clean portion of 200 mm in length at random from the middle region of the reeds (leaving aside rooty bottom, croppy end and defects). Cut out sufficient length from each portion to cover fully both the clamps. The mass of each portion should be approximately 300 to 600 mg; heavier ones shall be thinned out from the side and to the lighter ones another reed or a portion of a reed shall be added. Make this adjustment simply by feel. Take 5 portions constituting 5 test specimens (bundles).

3.2 Similarly prepare at least 2 more sets of 5 specimens as in **3.1.**

4. APPARATUS

4.1 Testing Machine — Tensile strength testing machine with a capacity of 100 kgf or a little more working on one of the following principles:

a) Constant rate of traverse (CRT),

b) Constant rate of load (CRL), or

c) Constant rate of extension (CRE).

The specimens shall break within 20 ± 5 seconds. In case of constant rate of traverse machine the time of break shall exceed the inertial period of the instrument. The load range of the machine shall be such that the observed values would be between 10 and 90 percent of the full scale load. The permissible error in the machine at any point in this range shall not exceed ± 1 percent of the maximum load. The machines shall be provided with the following arrangements:

a) Two clamps with the following provisions to grip the specimens:

1) Each clamp shall be such that at least 10 mm of fibre length is gripped. There should be no slippage of fibres during test. To prevent slippage the inside of the clamps should preferably be lined with leather or rubber padding.

2) The clamps shall be capable of being adjusted on to 50 mm test length.

b) A scale or dial for recording the load in kilograms.

5. PROCEDURE

5.1 Mounting the Test Specimen — Place the two clamps 50 mm apart. Put the fibre bundle in one of the clamps and tighten it. Straighten the fibres, putting a small tension and tighten it in the other clamp. If the clamps are detachable, these can be taken out of the machine, placed on a platform, separated 50 mm apart and the fibre bundle fixed as above. The clamps can then be inserted into the clamp holders on the machine. The fibre bundle should be parallel to the axis of the machine.

5.2 With the help of preliminary specimen, set the machine so that the specimen breaks within 20 ± 5 seconds. In the case of constant rate of traverse type machine set it at a rate of traverse so that the time of break exceeds the inertial period of the instrument.

5.3 Operate the machine and carry the test to rupture and record the breaking load of the specimen. If the specimen slips in the jaws the test shall be discarded but noted, and another test taken in view thereof.

NOTE — Even if a test value is isolated on account of break near the jaw, the value shall be noted but not taken into account in calculations. If such breaks exceed 10 percent of the number of specimens tested, suitable corrective action on the machine may have to be taken.

5.4 With a knife or sharp razor blade cut the fibres flush at the inner edges of the two clamps and collect the tufts of fibres thus obtained. Test the other test specimens in similar manner.

5.4.1 Weigh the broken tufts of fibres for the 5 specimens together.

5.5 Test at least 3 groups of 5 specimens each in similar manner.

6. ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

6.1 All the tests shall be carried out as laid down in **4.1** of IS : 7032 (Part 1)-1986*.

6.1.1 In case standard atmospheric conditions are not available, the samples may be conditioned and tested at the prevailing atmospheric conditions and the prevailing relative humidity shall be noted and correction applied for mass and breaking load as given below:

a) *Correction for mass* — Convert the mass of fibre bundles as obtained in **5.4.1** to equivalent mass at 65 percent relative humidity. For this purpose, the equilibrium moisture regain for jute corresponding to prevailing RH, will require to be determined from the regain humidity curve for jute or by using a suitable moisture regain meter. For example, if the moisture regain at the prevailing RH is R the corrected mass at 12 percent moisture regain corresponding to 65 percent RH will be given by the formula $M \times \frac{(100+12)}{100+R}$

(12 is the approximate moisture regain of jute at 65 percent relative humidity).

b) *Correction for breaking load* — Convert the breaking load values obtained in **5.3** for the difference in relative humidity to breaking load at 65 percent relative humidity by multiplying with the applicable correction factor as given in Appendix A. However, if the relative humidity is between 35 to 75 precent, the correction for breaking load value is small and may be ignored.

The corrected values of mass and breaking load shall be used in the formula given in **7.1.**

7. CALCULATION

7.1 Calculate the tenacity of the fibre by the following formula:

$$\text{Tenacity (in g/tex), } S = \frac{50\dagger \times T}{M}$$

where

T = sum of the breaking load values of 5 bundles of fibres in kgf, and

M = total mass of all the bundles in milligrams.

7.2 Determine the average value of tenacity S from at least 3 sets of readings.

*Physical methods of test for uncut Indian jute, *MESTA* and *BIMLI* (*first revision*). Part 1 General.

†This has been obtained by multiplying length by 10. The length indicated in **4.1** [a (2)] is 5 cm.

NOTE — When the difference between any two values of tenacity (S) exceeds 15 percent of the mean, another value for S should be obtained and the average of four readings shall be reported.

8. REPORTS

8.1 The report shall include the following information:

a) Type of machine,
b) Number of test specimens tested, and
c) Tenacity.

APPENDIX A

[*Clause* 6.1.1 (b)]

FACTORS FOR CORRECTING BUNDLE STRENGTH OF JUTE AT DIFFERENT RELATIVE HUMIDITIES (OR MOISTURE REGAINS) TO STRENGTH AT 65 PERCENT RH (12·4 PERCENT MOISTURE REGAIN)

Equilibrium Related Humidity Percent	*Moisture Regain* Percent	*Correction Factor* (Multiply by)
10	3·0	1·35
15	3·9	1·21
20	4·8	1·13
25	5·7	1·08
30	6·5	1·05
35	7·0	1·03
40	8·0	1·01
45	8·7	1·0
50	9·5	
55	10·5	
60	11·5	
65	12·4	
70	13·5	1·01
72	14·0	1·02
75	15·0	1·03
80	16·5	1·06
85	18·8	1·09
90	22·0	1·15
95	26·8	1·24

NOTE — No correction is necessary when the relative humidity of the testing atmosphere ranges between 35 and 75 percent.

Indian Standard

PHYSICAL METHODS OF TEST FOR UNCUT INDIAN JUTE, *MESTA* AND *BIMLI*

PART 8 FINENESS

(First Revision)

1. SCOPE

1.1 This standard (Part 8) prescribes a method for determination of fineness of jute, *MESTA* and *BIMLI* fibres by air flow method.

2. PRINCIPLE

2.1 A specified mass of fibres is compressed to a constant volume in a cylindrical chamber with open ends to which a flowmeter and a manometer are connected. A regulated current of air is then passed through the compressed fibres and the average fibre fineness read from the scale.

3. APPARATUS

3.1 Air Flow Apparatus — It shall consist of the following principal parts:

a) *Constant Volume Chamber* — for taking a known mass of fibres and compressing it to a fixed known volume. It generally comprises:

1) a plug cell into which the fibres are packed,

2) a plunger which compresses the fibres, and

3) a screw cap which clamps the plunger to the base.

b) *Means for Air Regulation* — for regulating and controlling the flow of air through or air pressure difference across the specimen. It shall give sufficiently fine control of air supply so that the level of the flowmeter or manometer may be quickly adjusted to the working valve.

c) *Means for Producing Air Flow* — Capable of producing the required air pressure applied to the specimen or the required pressure difference across the specimen.

d) *Means for Measuring the Resistance of Specimen to Air Flow or the Air Pressure Difference Across the Specimen* — The combination of manometer for maintaining the air pressure applied to the specimen and a flowmeter for indicating the rate of air flow through the specimen may be used. Flowmeter or manometer shall be calibrated to directly read the fineness in tex or denier.

NOTE — Two suitable instruments developed by: (a) Ahmedabad Textile Industry's Research Association, Ahmadabad (modified by Indian Jute Industries' Research Association, Calcutta), and (b) Jute Technological Research Laboratories (ICAR), Calcutta, are described in Appendices A and B.

3.2 Balance — capable of weighing the specimen to an accuracy of $\pm$ 5 mg.

3.3 Device for Fibre Cutting — fibre cutter or a pair of scissors.

4. PREPARATION OF TEST SPECIMEN

4.1 Take a suitable portion at random from the middle regions (leaving aside the rooty bottom and under-retted crop ends) of several reeds, covering the full range of the sample. Clean each portion so as to free it from barky, specky and knotty spots, hard gummy fibres as well as other extraneous materials. If necessary the cut fibre reeds shall be lightly struck against a hard surface to shake off the adherent dirt and dust. Cut the fibres bundles to a specified length and take the mass of the fibres as required by the instrument used (*see* Appendices A and B).

5. PROCEDURE

5.0 Make the necessary preliminary adjustments appropriate to the instrument used. Ensure that the meniscus of the manometer is at the zero mark.

5.1 Place the test specimen in the fibre compression cylinder, taking care that all the fibres are placed inside. Adjust the machine as recommended by the instruction manual of the instrument (*see* Appendices A and B).

5.2 Cause the air to flow through the specimen and read the air flow or the difference in pressures on the scale to an accuracy of half a division of the scale.

5.3 Remove the test specimen from the fibre compression cylinder and take one or two more readings on the same specimen as recommended by the instruction manual of the instrument.

5.4 Take the other test specimens and determine the test values in the manner set out in **5.1** to **5.3**.

6. CALCULATIONS

6.1 Calculate the average of all the values taken for all test specimens.

7. REPORT

7.1 The report shall include the following information:

a) The instrument used;

b) Number of test specimens; and

c) Fibre fineness in tex, or denier.

APPENDIX A

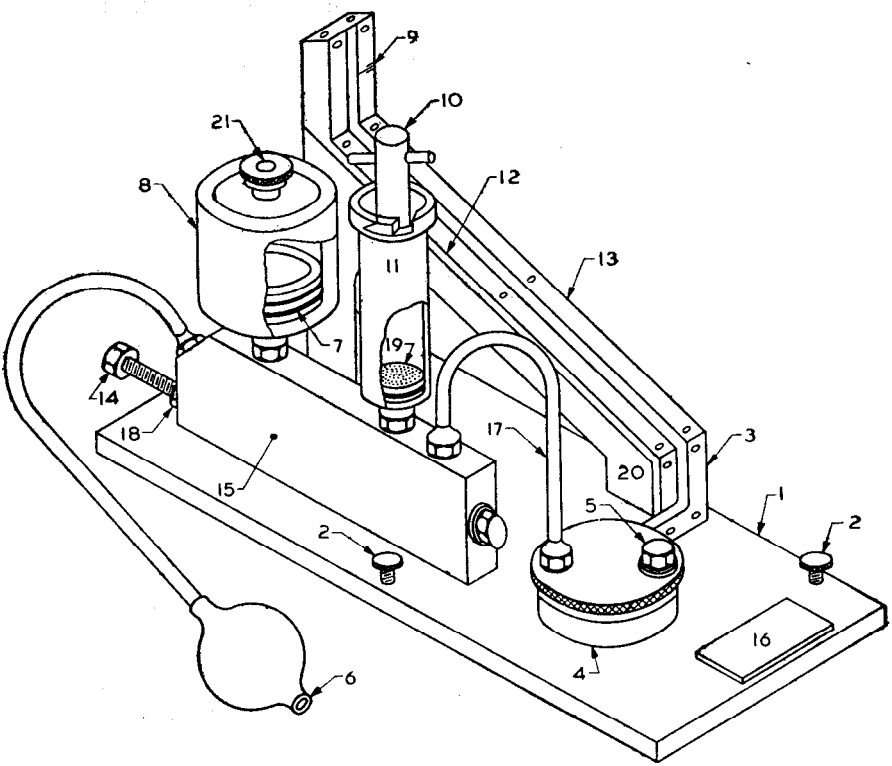
(*Clauses* 3.1, 4.1 *and* 5.1)

IJIRA JUTE FIBRE FINENESS TESTER*

A-1. DESCRIPTION OF THE INSTRUMENT

A-1.1 A working sketch is shown in Fig. 1. A rubber bulb (6) which when squeezed, pumps air into a tank (8), equipped with a loosely fitting float (7) which can rise to the top of the tank. As the float descends, it forces air through the outlet of the apparatus If the rate of flow is sufficiently small, sensibly constant air pressure can be secured for a sufficiently long interval. The air outlet in the needle valve is (14) connected in series with the sample chamber (11). The cylindrical sample chamber is filled with a weighed amount of the opened sample under investigation, and closed by a perforated piston (10) which compresses the plug to the same dimensions each time. After passing through the plug, the air escapes into the atmosphere. The junction of the needle valve and the sample chamber is connected to the reservoir manometer (4). The measuring limb of this reservoir consists of three parts, namely, a first vertical section, which is always filled by the manometric liquid when testing any sample within the range of the instrument; an inclined section which is directly calibrated in denier, and a third vertical section which serves to monitor the constancy of total pressure. The entire assembly is mounted on a board provided with levelling screws.

*Modified by Indian Jute Industries' Research Association, Calcutta (original model for cotton developed by Ahmedabad Textile Industry's Research Association, Ahmadabad). Mention of the name of a specific (or proprietary), instrument is not intended to promote, or give preference to the use of this instrument over others not mentioned.



1. Thermosetting laminate mounted board
2. Levelling screws
3. Reference mark for liquid
4. Reservoir for manometric liquid
5. Reservoir plug
6. Aspirator bulb
7. Float
8. Air tank
9. Reference mark for total pressure
10. Piston
11. Sample chamber
12. cm scale
13. Denier scale
14. Needle valve
15. Distributor
16. Name plate
17. Air pressure maintaining tube
18. Check nut
19. Perforated disc
20. All gradient stand
21. Air filter

FIG. 1 IJIRA FIBRE FINENESS TESTER

A-1.1.1 The calibrated section of the manometer is inclined (horizontal gradient 1 in 5) in order to increase the sensitivity and spread out the scale.

A-2. OPERATING PROCEDURE

A-2.1 Level the instrument with the help of the levelling screws and a spirit level.

A-2.2 Collect about 40 g of raw jute after proper sampling. Cut the fibre to approximately 1 cm pieces. Mix the cut fibres thoroughly and tease out by hand.

A-2.3 Divide the cut sample into 3 sub-samples. Weigh one specimen of 8·65 g from each sub-sample.

A-2.4 Pack the weighed specimens into the sample chamber and close the chamber by piston (10).

A-2.5 Squeeze the aspirator bulb (6) a number of times as that the float in the tank (8) rises to the top. Stop squeezing and the float will start descending. Observe the position of manometer liquid. At a certain point the manometer reading will remain steady for a while. Note the denier reading corresponding to this position of the manometer liquid.

A-2.6 Remove the specimen, fluff it out and repeat for a repeat test.

A-2.7 Repeat as in **A-2.6**. Altogether take 3 readings for each specimen.

A-2.8 Repeat the test for the other two specimens as in **A-2.3** to **A-2.7**.

A-2.9 Find the average of the 9 readings.

A-3. CHECKING

A-3.1 In order to check from time to time that the instrument is performing satisfactorily, readings should be taken on the calibration sample provided.

APPENDIX B

(*Clauses* 3.1, 4.1 *and* 5.1)

JTRL JUTE FIBRE FINENESS TESTER*

B-1. DESCRIPTION OF THE INSTRUMENT

B-1.1 Air Flow Production Arrangement — The aspirator (*I* in Fig. 2) is a wide flat tank T_1 of 400 cm^2 area with a narrow outlet O_1 of 6 mm diameter. The tank is raised to suitable height (40 to 50 cm) by a stand the outlet at O_2 being extended below by a rubber tube *E*. This provides for a higher water head without having to handle a large quantity of water.

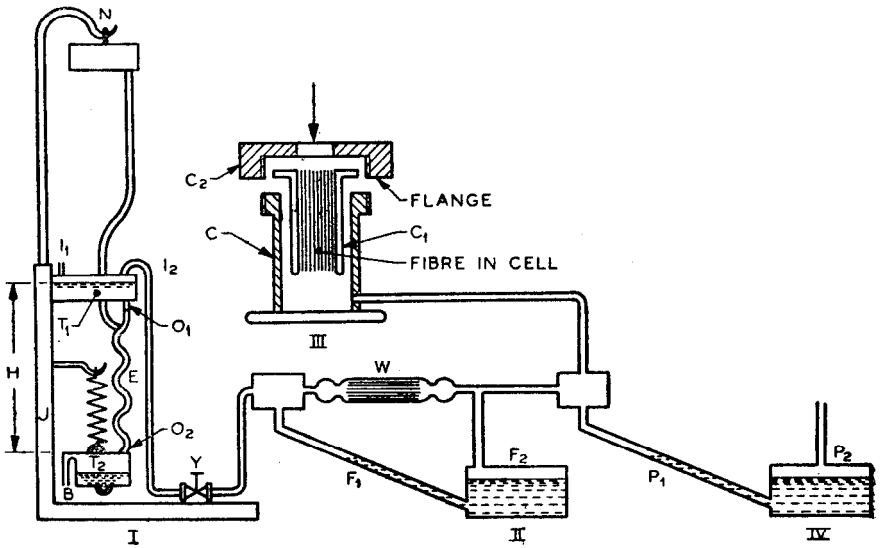
B-1.1.1 To maintain a constant water head, the top level drop has been neutralized by pulling down the end of the outlet rubber tube to some extent, such that the difference in water head (*H*) between the water level in the tank and the tip of the outlet O_2 remains constant. This has been achieved by a simple device. The end O_2 of the outlet rubber tube is attached to the top opening of the receiver T_2 hung from a spring. The spring is so adjusted that the weight of liquid being drained into the receiver is sufficient to extend the spring by an amount equal to the drop in the liquid level in the T_1. The constant level difference thus maintained ensures constant rate of flow.

B-1.1.2 For refilling the tank T_1 the receiver T_2 is hung upside down from a hook *N* above the tank T_1 into which the receiver empties itself through the same rubber tube *E*. The tank T_1 has two openings, I_1 and I_2, at the top, I_1 having a tap, and one outlet with a tap at the bottom. The inlet tube I_2 is connected to the regulating valve *Y* and the other parts of the instrument, through it air is sucked in as water flows out of the tank. The tap I_1 provides an opening to the atmosphere during refilling. In the receiver T_2 also the side opening *B* maintains a connection between the inside and the outside atmosphere. The specification of the flow system are such that a maximum flow rate of about 15 ml per second can be mentioned for 25 seconds.

B-1.2 Flow Gauge — The flow gauge (*II* in Fig. 2) is essentially a manometer (F_1, F_2), attached to the two ends of a glass wool plug or an equivalent glass or brass capillary tube *W* in a glass tube. For a particular flow rate through the plug, a difference of pressure develops between the ends

*Mention of the name of a specific (or proprietary) instrument is not intended to promote, or give preference to the use of that instrument over others not mentioned.

of the plug and is indicated in this manometer. This manometer is calibrated in terms of flow rate, since pressure difference is proportional to the flow rate. The packing of the glass wool plug may be altered for different ranges of flow rate.



I	Aspirator	I_1	Tap
II	Flowmeter	I_2	Inlet tube
III	Plug chamber	*J*	Stand
IV	Manometer	*N*	Hook
B	Side opening	O_1	Narrow outlet
C	Chamber	O_2	End of the rubber tube
C_1	Plug cell	P_1, P_2	Pressure gauge
C_2	Centre open screw cap	T_1	Tank
E	Rubber tube	T_2	Receiver
F_1,F_2	Manometer	*W*	Glass wool plug
H	Water head	Y	Regulating valve

FIG. 2 INSTRUMENT FOR FIBRE FINENESS DETERMINATION

B-1.2.1 To increase the sensitivity of the flow gauge manometer, the area of limb F_2 is made much larger than that of the other, such that the depression in the wider limb is negligible in comparison to the elevation of the liquid in the narrow limb, and further, the narrow limb is kept inclined at 60° to the vertical. A sliding scale is placed beside the narrow limb. The zero of the scale is made to coincide with the liquid meniscus before starting the test. If the meniscus level falls below a mark, some liquid may be

added into the wider limb. The glass wool plug is so adjusted that the flow gauge manometer reading is changed from 0 to 26 cm with increase in flow rate from 0 to 15 ml per second.

B-1.3 Fibre Plug and the Chamber — A plug is formed of parallel fibre bundles. Such a plug is introduced longitudinally into a cylindrical cell C_1 of 1·25 cm diameter and 5 cm length (*III* in Fig. 2). At one end, the cell has a flange which can be pressed air-tight on the rubber ring over the rim of a wider chamber C by a centre open screw cap 2.

B-1.3.1 The chamber is thus open to the atmosphere at the top, and a small tube at the bottom connects the chamber to the manometer and the other parts of the instrument.

B-1.4 Pressure Gauge — The pressure gauge P_1, P_2 (*IV* in Fig. 2) is a manometer used for registering the difference of pressure between the two ends of the fibre plug. One end of the manometer as well as the fibre plug is open to the atmosphere. The design of the gauge is exactly similar to that of the manometer used for the flow gauge. The zero of the scale is always set at the liquid meniscus before the experiment is started.

B-2. FIBRE CUTTER

B-2.1 For a 5-cm plug cell, the fibre bundle has to be cut to 5 cm length. Fibre cutter (Fig. 3) consists of a channel of rectangular cross section with a closely fitting plunger both cut exactly to 5 cm length. The fibre is placed longitudinally in the channel with ends projecting on both sides. The plunger is then pressed by a crew, from the top. The projecting ends of the fibres are then cut flash with the channel ends by a chisel and hammer. The rotatable rectangular frame through which the crew works can be turned aside when the fibre is put in the channel. The plunger is provided with a projection (not shown in Fig. 3) across the length to prevent tilting.

B-3. OPERATION OF THE INSTRUMENT

B-3.1 A group of raw jute fibre samples is cut to 5 cm length by the cutter and exactly 3 g are weighed out of it to form the test bundle. This mass is found suitable for the size of the plug cell used and is also specific for a particular calibration. The bundle is wrapped tightly in a paper strip and introduced into the plug cell C_1. The paper is then taken out or torn off by pushing the bundle gently either way, keeping the fibre ends flush with the cell ends. The cell is then fitted air-tight onto the chamber C.

B-3.1.1 The tank T_1 is filled with water and the top tap I_1 is closed. With the receiver on the spring S, the outlet tap O_1, is opened. The regulating valve Y is then manipulated to attain a fixed difference of pressure indicated on the pressure gauge. Immediately the flow gauge reading is taken.

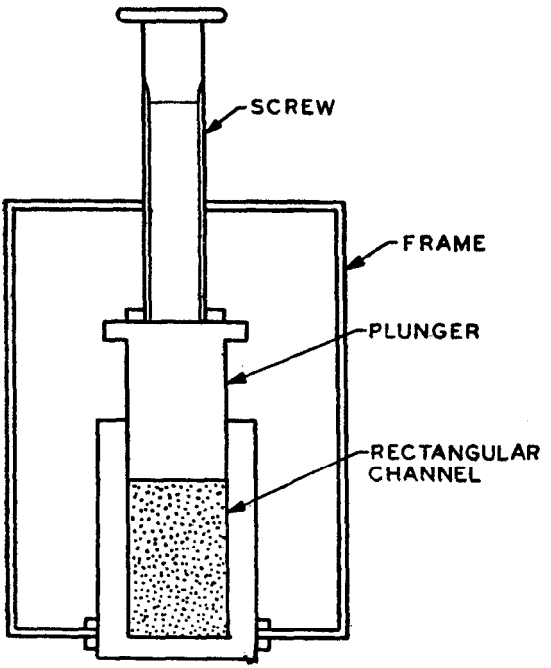


FIG. 3 FIBRE CUTTER

B-4. CALIBRATION OF THE INSTRUMENT

B-4.1 Calibration of the Pressure Gauge Manometer

B-4.1.1 The fibre plug chamber *C* is disconnected and the instrument connected to a vertically mounted U-tube manometer through the leg of a T-tube. One end of the head piece of the T-tube is connected to the U-tube manometer and the other end closed air-tight by means of a screw clip on a rubber tubing.

B-4.1.2 The water aspiration system is replaced by a suction pump which is connected to the regulating valve *Y*. The suction pump is run on and the regulating valve *Y* opened slowly to obtain a steady pressure difference in the U-tube manometer. The two liquid columns in the U-tube may be made level again by letting in air through the screw clip on the T-tube.

B-4.1.3 The steady pressure difference in the U-tube manometer is 9 cm with a manometric liquid (kerosine oil) of specific gravity 0·82. The corresponding pressure gauge reading on the instrument is then marked on a scale placed beside it. For subsequent readings of the flow gauge, the air suction through the valve *Y* should be controlled so as to give this particular valve of steady pressure on the pressure gauge manometer of the instrument.

B-4.2 Calibration of the Flow Gauge Manometer

B-4.2.1 Take a vertically mounted rotameter (a flowmeter having a rotating indicator of air-flow) and connect a rubber tubing at the lower end. Clamp on the rubber tubing a screw clip to regulate air flow through the rotameter.

B-4.2.2 Disconnect the U-tube manometer and connect the upper end of the rotameter to this point. Run on the suction pump. Adjust the control valve *Y* and the screw clip of the rubber tubing attached to the rotameter alternately so as to have different flow rates at the particular steady pressure indicated by the pressure gauge manometer of the instrument (corresponding to a pressure head of 9 cm in the U-tube manometer referred to).

B-4.2.3 Note down the rate of air flow in the rotameter, and mark this flow on the scale beside the flow gauge manometer of the instrument. A number of flow rates all at the steady pressure difference, are thus marked on the flow gauge scale. A calibration curve is drawn relating flow rates (ml/s) and scale length (cm) of the flow gauge. This calibration curve is used to find out the different 'tex' values corresponding to the different flow rates by using the formula, tex $= 0\ 283 \times$ flow in ml/s. The flow gauge scale is then calibrated directly in terms of tex values.

B-5. SENSITIVITY OF THE INSTRUMENT

B-5.1 Since both the pressure and the flow gauges are sensitive enough to detect a change of 1 mm in reading, the approximately error of observation is not likely to exceed 2 percent, when the pressure gauge stands at 18·0 cm and the flow gauge between 6·0 and 26·0 cm. Considering the variation within a sample, this order of sensitivity seems to be sufficient for textile fibres. A 3-g bundle may be made to represent as many regions as possible, to minimize the variation between readings.