

☐Strength

☐Tensile Strength Testing

☐Strip Test

☐Grab Test Method

☐Grab Test Method {Procedure}

☐Comparison between Strip Test and Grab Test

☐Tearing Strength Testing

☐Methods of measuring Tear Strength

☐Bursting Strength Testing

☐The Hydraulic bursting tester

STRENGTH

Before any strength test of fabric is done the end use has to be clarified so that a good idea of the fabric performance can be determined.

The strength of the fabric may be determined from the following 3 approaches.

1. Its resistance to a tensile force.
2. Its resistance to a tearing force.
3. Its resistance to a bursting force.

TENSILE STRENGTH TESTING

The breaking strength is a measurement of the resistance of the fabric to a tensile load or stress in either warp or weft direction.

To measure the breaking strength, there are three tests that may be used. They are-

1. Ravelled Strip Method
2. Cut Strip method(You will see it in BV)
3. Grab method.

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STRIP TEST (BRITISH) BS 2576

In This Method a Fabric Strip is extended to its breaking point by a suitable mechanical means which can record the breaking load and extension.

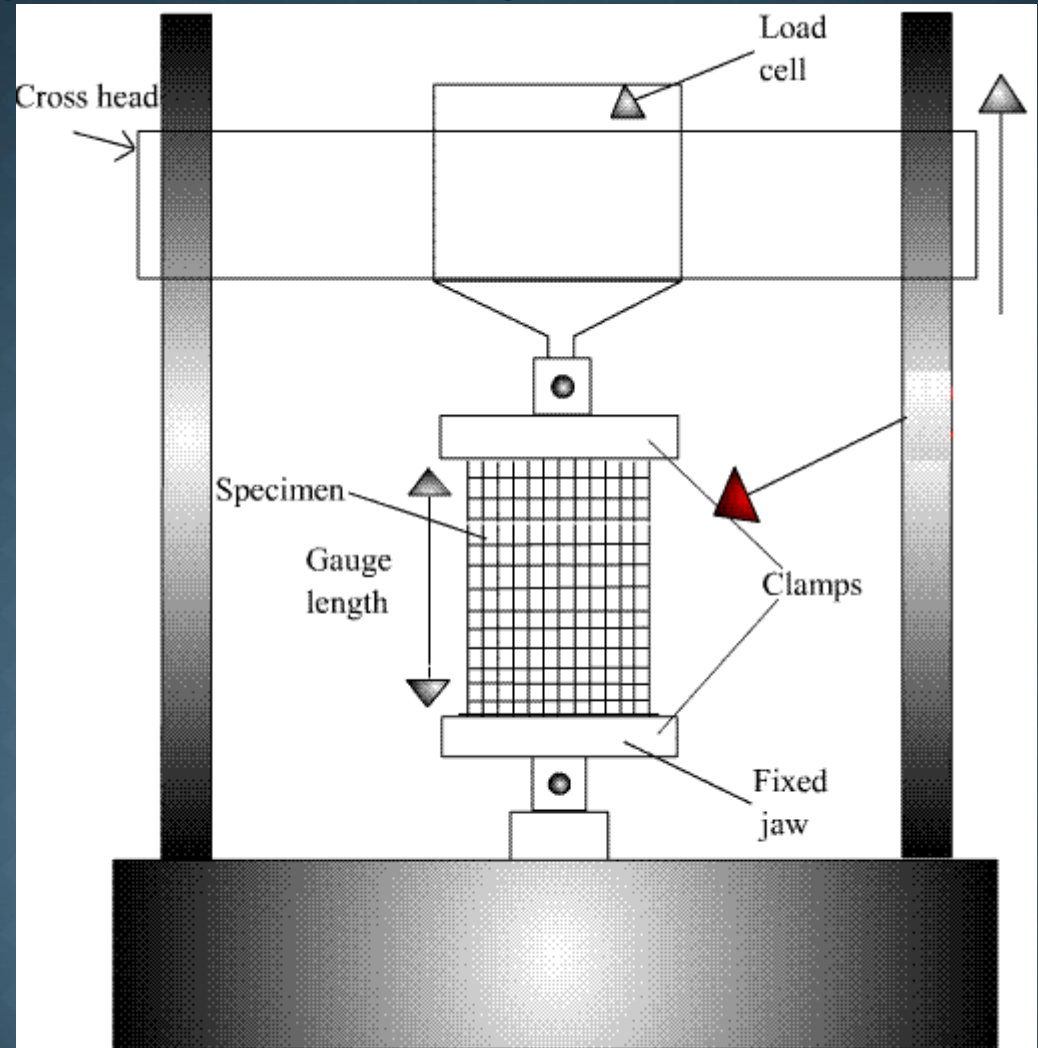
Five Fabric Sample both in warp and weft direction are prepared with each not containing the same longitudinal thread.

Samples are prepared 60 mm * 300 mm and then frayed to get 50mm wide specimen.

The Rate of Extension is set to 50 mm/min and gauge length is 200 mm

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STRIP TEST (BRITISH) BS 2576



The apparatus for a fabric tensile test

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STRIP TEST (BRITISH) BS 2576

Any breaks that occur within 5mm of the jaws or at loads substantially less than the average should be rejected.

The mean breaking force and mean extension% of initial length are reported.

Samples are cut (60mm * 300 mm) parallel to warp/weft

Frayed the threads from both sides of the width to bring down to 50 mm wide.

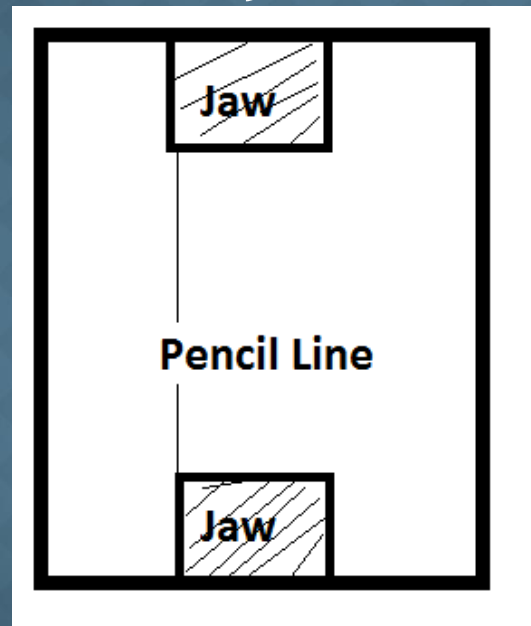
For havilly milled fabrics, no fraying is done (50 mm * 300 mm)

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GRAB TEST METHOD

It is a tension test on the fabric in which only a part of the width of the specimen is gripped in the clamps. For example, if the specimen width is 4 inches and the width of the jaw is 1 inch, the specimen is gripped centrally in the clamps.



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GRAB TEST METHOD

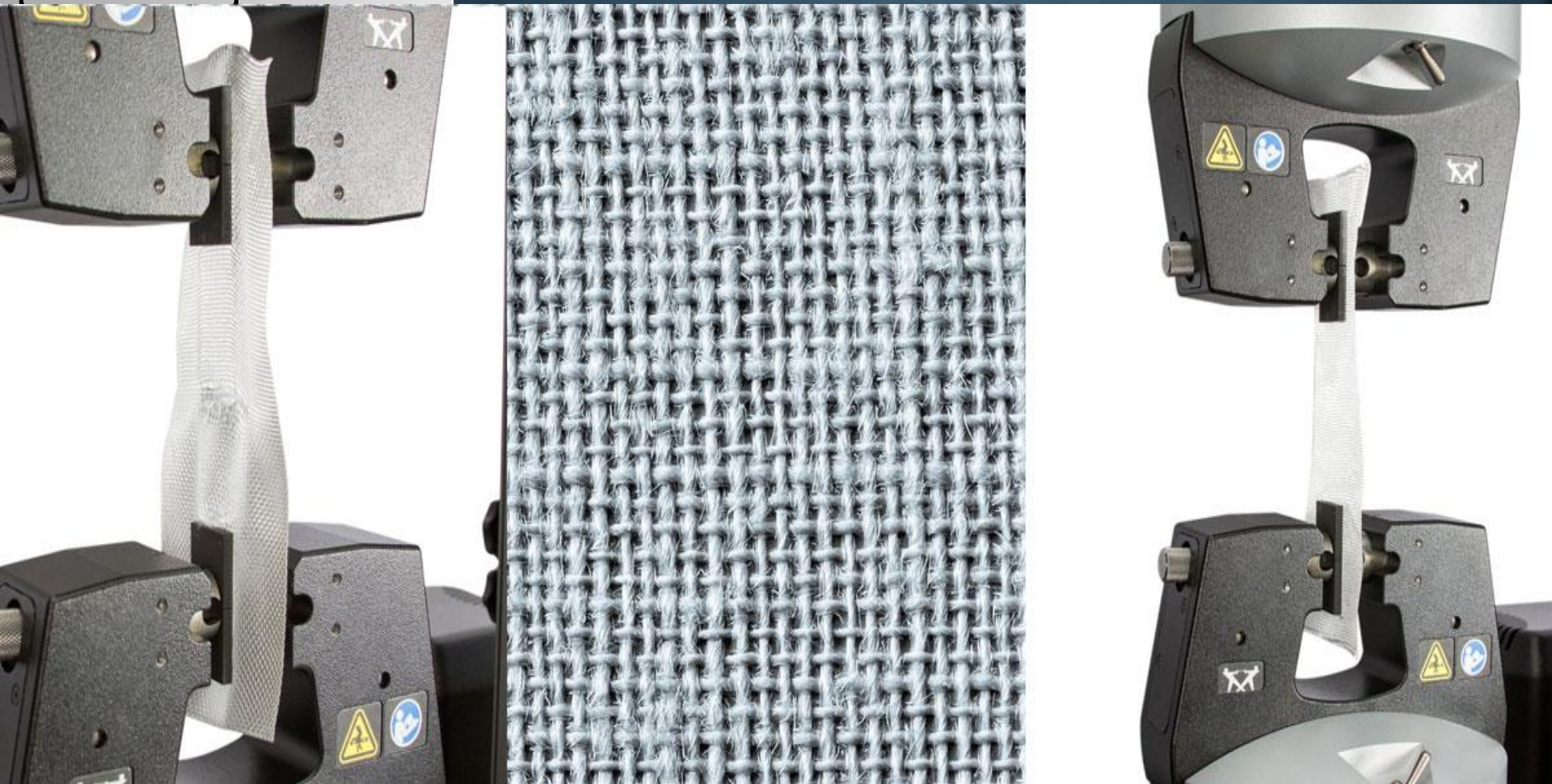
Test samples of size 4×6 inches are cut from the master sample. The 6 inch length is parallel to the yarn to be tested and it is dependant on the gauge length.

In setting the testing instrument, the clamps must be set 3 inches apart. The lower jaw moves at a rate of 12 inches per minutes.



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GRAB TEST METHOD (ASTM D4632)



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GRAB TEST METHOD {PROCEDURE}

1. Inspect the tester for correct size of the clamps, distance between the clamps etc.
2. If stress strain chart can be made in the instrument, the position of pen on the chart is set properly.
3. Place the sample in the clamps. It is important that the same ends are caught by both the clamps.
4. Apply the load to the sample by screw mechanism. When the sample breaks, reverse the movement of the lower clamp and raise the pen from the chart, if it is used.
5. Record the breaking strength and return the pendulum to the zero position.

Five breaks are made for warp and weft breaking strength.

COMPARISON BETWEEN STRIP TEST AND GRAB TEST

During the grab test, as some loose fabric is supporting the specimen on both sides of the jaws, the strength obtained in grab test will be more.

The preparation of sample in grab test is much easier as there is no use of ravelling operation to remove the threads. Hence it is suitable for routine work and not for research work.

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TEARING STRENGTH TESTING

The tearing strength is a measure of the resistance to tearing of either the warp or weft series of yarns in a fabric.

A fabric which tears easily is regarded as an inferior product. The amount of resistance of a fabric to tearing is often important and particularly in fabrics like, bandage cloth, adhesive tapes, military fabrics etc.

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METHODS OF MEASURING TEAR STRENGTH

- The Tongue Tear Test**
- The Tongue Double Rip Test**
- Trapezoid Tear Test**
- Ballistic Tear Test** (The tearing tests described above are normally done at a slow rate of jaw separation, but in practice tears are produced accidentally and at a relatively high speeds. The rapid action of the ballistic test may, therefore, provide a better method which is more approximate to actual tearing of a fabric. The ballistic tester records the energy required to break the specimen)
- Wing Rip Tear Test**

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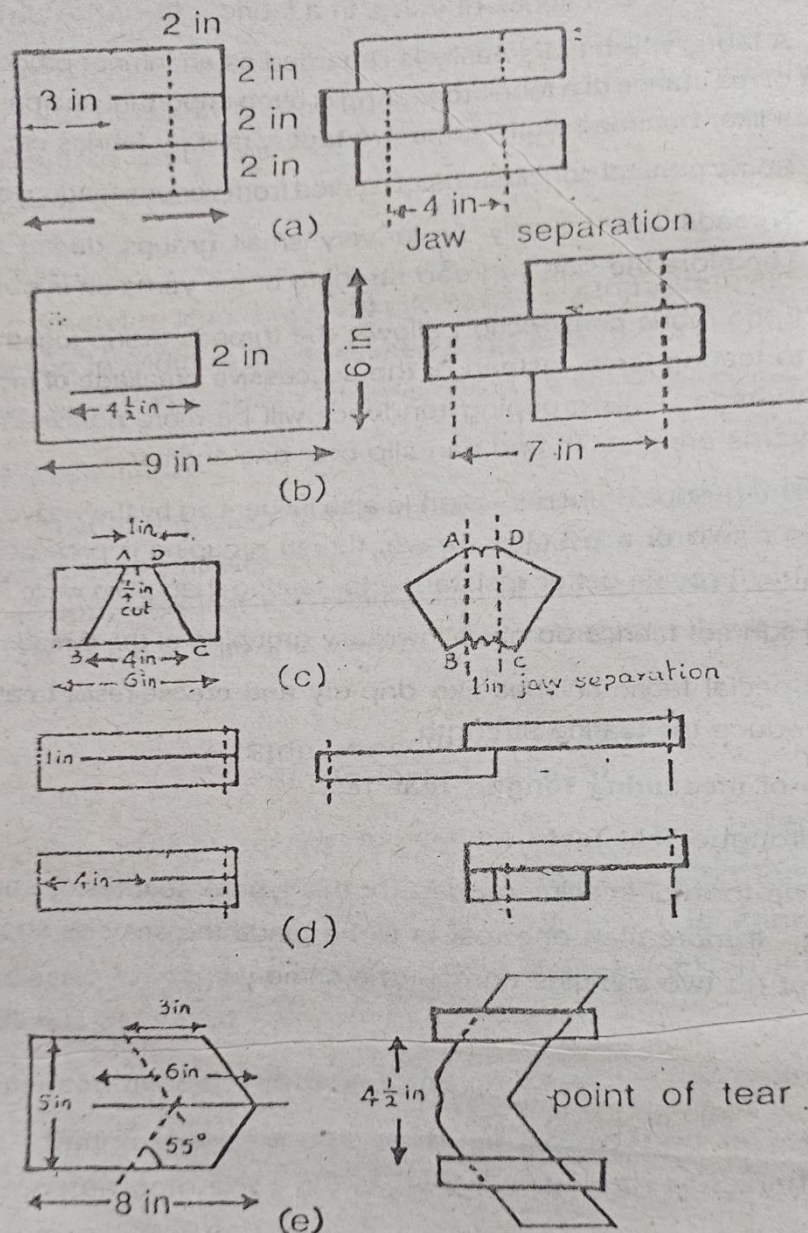


Fig: 4-10 Tearing strength test specimens,

a - Tongue tear test

c - Trapezoid tear test

e - Wing rip tear test

b - Tongue double rip tear test

d - Ballistic Single rip tear test

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TEARING STRENGTH TESTER (ASTM D2261)

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TEARING STRENGTH TESTER (BALLISTIC TEAR TEST)

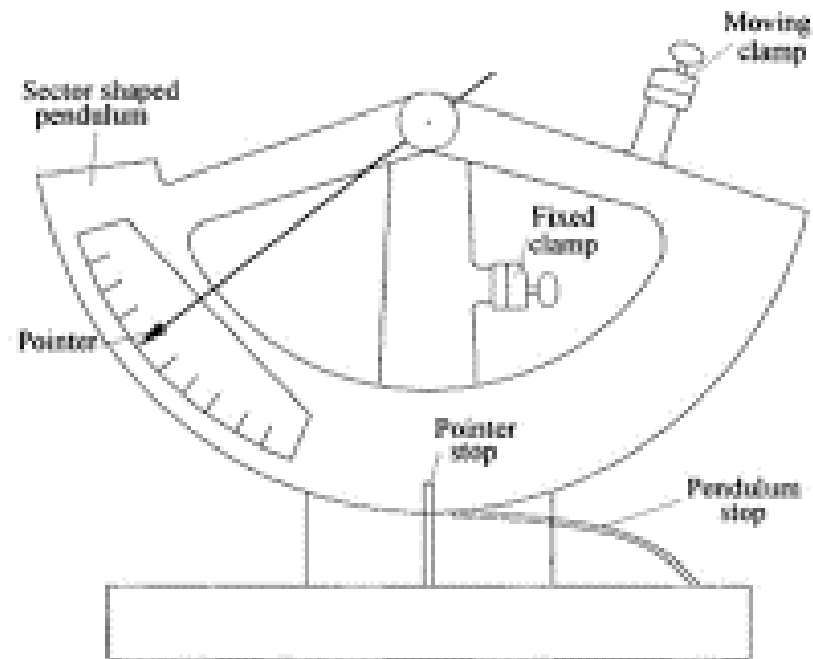


Figure: Elmendorf tear test.

BURSTING STRENGTH TESTING

Bursting Strength is the strength of a fabric against a multidirectional flow of pressure.

The Bursting test measures a composite strength of both warp and weft yarns simultaneously and indicate the extent to which a fabric perpendicular to the surface of the fabric.

The reason for this method of tearing may be due to the material in use is stressed in many directions simultaneously. Filter cloths, sacks, nets and parachute cloths are examples for fabric stressed in all direction. Also knitted fabrics can not be easily tested in strip form and fabrics without well defined direction like felted cloth or bonded fabrics may be conveniently tested on a bursting strength tester.

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THE HYDRAULIC BURSTING TESTER

Principle: The pressure in a liquid is exerted in all directions and this phenomenon of a liquid is used for testing bursting strength in Hydraulic bursting strength tester.

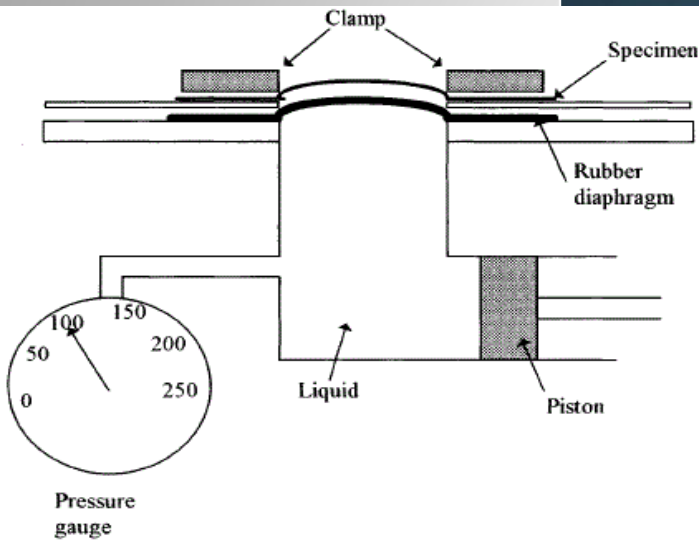
Sample Size: The specimen for this test should be cut so that the sample is $\frac{1}{2}$ inch greater in diameter than the outside diameter of the clamp ring. Ten specimens are chosen avoiding inclusion of the same ends in the different specimens.

Instrument Criteria: The instrument used for testing bursting strength should have a constant rate of speed and must be capable of giving a uniform displacement of 6 ± 0.25 cubic inches per minute. For proper operation, the machine must be stopped at the instant of rupture in order to avoid additional application of pressure and load on the specimen.

THE HYDRAULIC BURSTING TESTER

Procedure:

Briefly the specimen is clamped by a ring over a thin flexible rubber diaphragm as shown in fig which itself is clamped over a circular hole in the upper face of a reservoir. The liquid used may be water or glycerin. The pressure in the liquid is increased, by valves or screw-driven piston. Due to increase in pressure, the diaphragm bulges, taking with it the specimen. At some point the fabric bursts, and the pressure at that point is indicated by the pressure gauge.



Since the rubber diaphragm requires a certain pressure to stretch it, corrections are made by doing a blank test, i.e. noting the pressure required to distend the diaphragm the same amount without the presence of fabric.

WOUNDED BURSTING STRENGTH TEST

In the Test Specimen, if cuts by chisel for $\frac{1}{2}$ inch is made (either in warp or in weft direction or in both) or if a $\frac{1}{4}$ inch hole is punched and then the same test is carried out, then it is called wounded bursting strength test.

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FABRIC TENSILE STRENGTH DEPENDS ON

- Raw material.
- Yarn strength (twist: more twist for more strength)
- Fabric construction (*weave*: plane weave is stronger than floats-satin, sateen which are weaker, *Density*: low density cause weave slippage which result in seam slippage).
- Finish applied (resin finish improves weave slippage).
- Adverse of “finishing” process.