

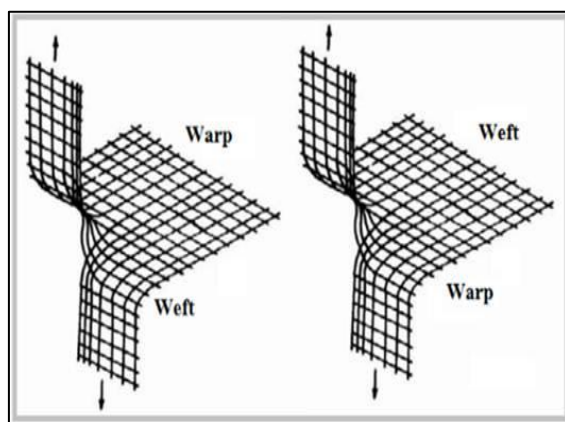
TENSILE STRENGTH OF A YARN OR FABRIC

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Definition

Tensile strength is the ability of a yarn or fabric to withstand a pulling or tensile force. It is measured in units of force per cross-sectional area.

Tensile strength of a woven fabric is one of the most important properties which make it superior in many applications as compared to non-woven and knitted fabrics. Tensile strength can vary widely if the fabric is wet or dry. For e.g. the strength of wet cotton yarn is greater than that of dry cotton yarn.



Factors affecting tensile strength of a yarn

- **Staple length** - Longer staple length of cotton fiber gives higher tensile strength to the yarn.
- **Fiber Fineness** - Fine fiber gives greater yarn strength than coarse fibers when spun into a given size.
- **Twist** - A twist less than or greater than the optimum amount results in a yarn of lower strength.
- **Evenness** - The greater the uniformity of a spun yarn, the higher is its strength.
- **Fiber length distribution** - Variations in the distribution of fiber lengths will cause a variation in yarn strength. Greater the percentage of short fibers, lower the strength of the yarn.
- **Fiber finish** - The type and amount of chemical finish applied to fibers has also an effect on the strength of the yarn.
- **Maturity** - If maturity of fiber increases, yarn strength increases.



Factors affecting tensile strength of a woven fabric

The tensile strength of a woven fabric depends on a number of factors. The strength of the constituent yarns is the most important one. Besides this, it also depends upon other factors like

- Yarn linear density, yarn twist per unit length, twist direction, yarn structure.
- Fabric geometry, warp and weft density, weave design or yarn interlacement pattern
- Weaving conditions such as temperature, humidity and yarn tensions during weaving
- Fabric finishing treatments.

Tensile Strength Testing

Tensile strength of woven fabric are tested by two type of tests

1. **Strip Test** – The Strip Method uses a sample of fabric (50mm wide x 200mm long) and the complete width of the specimen is gripped in the jaws of the testing machine. The fabric is extended at a constant rate of 100mm/min until the fabric ruptures, and the maximum force and the elongation at rupture is recorded in Newtons per 50mm (N/50mm).



Fig 1.1 – Fabric Tensile strength Test machine

2. **Grab Test** – The Grab test method uses a sample of fabric (100mm wide x 100mm long) and the centre part of the specimen is gripped in the jaws of the testing machine. The fabric is extended at a constant rate of 50mm/min until the fabric ruptures, and the maximum force is recorded in Newtons (N).

Wishing you a great week ahead!

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