CHARACTERISTICS OF WOOL *Fact Sheet*

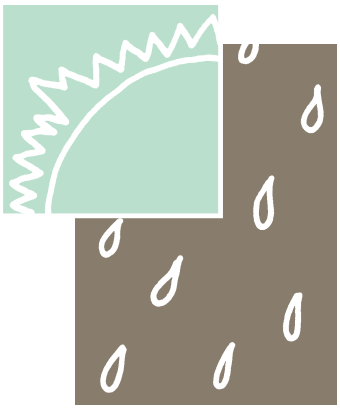
Durability & resilience
Fiber absorbency
Felting
Dyeability
Resistance to flame
Chemical structure
Resistance to compression

BENEFITS

- **Resists wrinkles**
  wool springs back quickly
- **Resists soiling**
  because the fiber is complex
- **Is durable**
  multi-part fiber resists wear
- **Repels moisture**
  fiber sheds water
- **Retains shape**
  resilient fibers return to size
- **Resists flames**
  fibers will not support combustion
- **Is comfortable in all seasons**
  keeps layer of air next to skin

DURABILITY AND RESILIENCE Each wool fiber is a molecular coil-spring making the fiber remarkably elastic. Nature has folded the chemical polypeptide chains back upon themselves in such a way that they act like a coiled spring which elongates when it is extended and retracts when it is released. This molecular crimp, along with the 3-dimensional fiber, allows wool fibers to be stretched up to 50% when wet and 30% when dry, and still bounce back to their original shape when stress is released. But be careful: When wool is wet the fibers are weaker. Recovery from stress takes place faster when the fiber is in a humid environment; that's why steaming a wool garment will freshen the fabric and why a steam iron is recommended for pressing wool.

The flexibility of the wool fiber also makes it more durable. A wool fiber can be bent back on itself more than 20,000 times without breaking, compared to about 3,000 times for cotton and 2,000 times for silk. The natural elasticity of wool also makes woolen fabrics resistant to tearing. In addition, the outer skin of the wool fiber acts as a protective film, giving wool cloth improved resistance to abrasion.



FIBER ABSORBENCY Wool is a hygroscopic fiber; it takes up moisture in vapor form. Tiny pores in the epicuticle make the fiber semi-permeable, allowing vapor to pass through to the heart of the fiber. Wool can easily absorb up to 30% of its weight in moisture without feeling damp or clammy.

The capacity to absorb makes wool a "temperature regulator" because it can protect the body in both cold and warm conditions. Wool always absorbs moisture from the atmosphere of greater humidity and releases it to the drier environment as it creates a balance in moisture conditions. This characteristic makes wool a versatile all-season fabric.

Wool absorbs perspiration; thus it keeps a layer of dry air next to the skin which, in turn, helps to hold in body heat. As wool absorbs atmospheric moisture, the hydrogen bond of water is broken and chemically reacts with molecules of the wool to generate heat.

Wool garments are therefore regarded as good protection against hypothermia… a condition that occurs when sudden drastic lowering of body temperature causes the body to lose heat faster than it can be produced.

The same principle of moisture contact on the skin acts to protect against hot weather as well. The body cools itself naturally with the evaporation of perspiration. Wool expedites this process by absorbing perspiration and keeping the same dry air next to the skin. This is why wool clothing is worn throughout the desert regions of the world where it's hot during the day and cool at night.

FELTS NATURALLY The physical structure of the outer scaly layer of the wool fiber contributes to wool's unique property of felting. Under the mechanical action of agitation, friction and pressure in the presence of heat and moisture, the scales on the edges of the wool fibers interlock, preventing the fiber from returning to its original position. Felting shrinkage is irreversible.

The felting property of wool is both an advantage and disadvantage. In a controlled situation the felting quality is called fulling or milling and creates a softer finish for woven wool fabric. Felting is also an advantage because it provides for a wide variety of non-woven felt fabrics for hats and for industrial uses. Felting is a disadvantage because it makes the washing of untreated wool fabrics difficult.

Treatments have been developed to prevent felting shrinkage, allowing wool garments to be machine-washed. The SUPERWASH® mark certifies that fabrics have been treated for machine-washability and dryability under strict standards set by The Wool Bureau, Inc. Technically, the process involves a mild chemical treatment applied to the fiber to form a microscopic film of resin that spreads evenly over the fiber surface. The film reduces friction and thus eliminates entanglement. The resin can't be washed or worn off; it is held in place permanently by chemical adhesive bonds.

TAKES DYE BEAUTIFULLY Wool absorbs many different dyes deeply, uniformly and directly without the use of combining chemicals. Wool is an amphoteric, which means it reacts with both acids and bases; thus it accepts both acid and basic dyestuffs. Dyes penetrate into the inner medulla core of the fiber where a chemical reaction occurs making the color change permanent except under extreme and prolonged fading conditions.

RESISTANCE TO FLAME Because wool contains moisture in each fiber, it resists flame without chemical treatment. Instead of burning freely when touched by flame, wool chars and stops burning when it is removed from the source of fire. Wool is self-extinguishing. It will not support combustion; this is why wool blankets are recommended for use in extinguishing small fires.

CHEMICAL STRUCTURE Wool is a natural protein fiber that grows from the follicles of the sheep's skin. It is like human hair in that it is composed of keratin-type protein. Chemically these proteins contain 5 elements: carbon, hydrogen, oxygen, nitrogen and sulfur. These 5 elements are combined into 19 amino acids linked together in ladder-like polypeptide chains.

RESISTANCE TO COMPRESSION Resistance-to-compression values are useful in assessing the suitability of wool for specific end uses. Resistance to compression (R to C) is the force per unit area required to compress a fixed mass of wool to a fixed volume. Resistance to compression is related to fiber diameter and the form and frequency of crimp.

For instance, low and medium R to C wools tend to be softer, more lustrous, more susceptible to felting, easier to process and produce strong fabrics. On the other hand, high R to C wools have a harsher handle, are resistant to felting and are bulkier.

Two resistance-to-compression studies conducted by Texas A&M University prove American wool is well-suited to produce the finest of fabrics as well as wool batting for the production of futons and other bedding materials. These studies confirmed that there is a good variety of wools available in the U.S. with low, medium and high resistance to compression. The majority of the wool finer than 28 micron in this test was analyzed as being in the middle resistance-to-compression range (53%). On the other hand, some 73 percent of the wool coarser than 28 micron was evaluated to be highly resistant to compression.

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