

## Flammability of Clothing Textiles

**What are the factors which contribute to a Fabrics Flammability?  
Do we as Manufacturers, Agents, Buyers and Consumers consider these factors before manufacturing/Buying a product?**

### The way a fabric is made (knit, weave, lace, etc.) affects how it burns

Heavy close structures ignite with difficulty and burn more slowly than light, thin, or open fabrics. In general, summer weight clothing is more likely to catch fire than winter weight fabrics. However, heavy weight fabrics burn **longer** when ignited, because there is more flammable material present. Fabrics with more of the fiber surface area exposed to air have more oxygen available to support burning and therefore burn more easily. Thus, thin, gauzy fabrics, lace, or brushed fabrics can be very flammable. Also, fabrics with a napped or brushed surface of fine fibers can catch fire easily because of the greater amount of fiber surface exposed to oxygen in the air.

### The way a fabric burns depends partly on its fiber content

Natural cellulosic fibers (cotton, linen), manufactured cellulosic fibers (acetate, lyocell, and rayon), and synthetic fibers (acrylic, nylon, lastol, olefin, polyester, and spandex) can burn quickly when ignited, but they behave somewhat differently as they burn. Generally cellulose fibers burn with a yellow flame, light smoke, and have glowing embers—like a fire place log, only much faster. Synthetics may catch fire quickly or shrink from the flame initially, but ultimately, they will sputter, flame, and melt to the skin or the flaming melt will drop to the floor. Wool and silk are protein fibers and are difficult to ignite. They may self-extinguish, but this varies depending on the closeness of the weave or knit (fabric density) and other finish treatments.

Fabrics that are a blend of two or more fibers do not burn in the same way as either fiber. Sometimes, blends are more dangerous than either fiber. For example, fabrics of 50 percent cotton and 50 percent polyester tend to burn longer than a similar fabric of either cotton or polyester.



<b>Cotton/Linen</b>	Burns with a hot, vigorous flame, light colored smoke, and leaves red glowing ember after flaming stops. Does not melt or draw away from
<b>Rayon/Lyocell</b>	Burns similarly to cotton and linen, except that it May shrink up and become tighter to the body.
<b>Acetate</b>	Burns with a rapid flame and melts when burning. May melt and pull away from small flames without Igniting. Melted area may drip off the clothing carrying flames with it. When flames have died out, the residue is a hot, molten plastic and is difficult to remove from any surface.
<b>Acrylic</b>	a very heavy, dense, black smoke. It drips excessively.
<b>Nylon, Lastol, Olefin, Polyester, and Spandex</b>	Burns slowly and melts when burning. May melt and pull away from small flames without igniting. Melted area may drip off clothing carrying flames with it but not to the extent of acetate and acrylic. Residue is molten and hot and difficult to remove. May self-extinguish.
<b>Wool and Silk</b>	Burns slowly and is difficult to ignite (especially in winter garments). May self-extinguish.
<b>Modacrylic and saran</b>	Burns very slowly with melting. May melt and pull away from small flames without igniting. Self-extinguishes.
<b>Aramid, Novoloid and Vinyon</b>	Chars, does not burn.

### POTENTIALLY DANGEROUS FABRICS

#### Textiles with fuzzy or napped surfaces such as:

- Brushed flannel
- Chenille
- Sherpa fleece
- 100% cotton terry with long loops

#### Open weave or sheer fabrics weighing less than 2.6 oz/sq yd such as:

- Cotton
- Rayon
- Acetate
- Lightweight silk
- Cheesecloth

## Testing "Flammability" of Clothing Textiles

### 16 CFR 1610

Part 1610—Standard for flammability of clothing textiles is a test to determine the flame resistance of textiles for clothing and rate them accordingly.

#### Purpose

This test is to reduce danger of injury and loss of life by providing standard methods of testing and rating for flammability of textiles and textile products for clothing use.

The standard establishes three classes of flammability for classifying textiles and warns against the use of textiles that have burning characteristics unsuitable for clothing.

**Class 1:** Normal flammability. Fabric meets minimum requirements of the standard and has no unusual burning characteristics.

*Plain surface fabric: Average burn time is 3.5 seconds or more*

*Raised surface fabric: Average burn time is 7 seconds or more*

**Class 2:** Intermediate flammability. Fabric meets minimum requirements with flammability characteristics between normal and rapid and intense burning.

*Plain surface fabric: No standard; should not be sold.*

*Raised surface fabric: Average burn time is 4 to 7 seconds with 2 or more base burns*

*This class of fabrics is still technically acceptable to sell in US. However, CPSC has been asking retailers to stay away from Class 2 fabrics mainly because some of the Class 2 fabrics may turn into Class 3 when more garments are tested.*

**Class 3:** Rapid and intense burning. Fabric dangerously flammable and unsuitable for clothing.

*Plain surface fabric: Average burn time is less than 3.5 seconds*

*Raised surface fabric: Average burn time is less than 4 seconds with 2 or more base burns*

### Testing Procedure

➔ Fabrics in the non-washed as well as drycleaned / washed state are cut into specimens (2" x 6") which are dried and cooled.

➔ The specimens are placed at a 45° angle and impinged with a flame (5/8" length) for 1 second.

➔ The burn time(s) as well as burning characteristics (burn codes) are recorded.

### Exemptions

Hats (with less than 9" trims), gloves, footwear

Interlinings - unless garment could be worn open such as flannel lined windbreaker.

Also, if garment could be worn inside out, (e.g., sweatshirts), backside of fabric is subject to standard.

Plain surface fabrics weighing 2.6 ounces per square yard or more.

Note: Plain surface is defined as any fabric that does not have an intentionally raised fiber or yarn such as tufting, pile or nap.

Both plain and raised surface fabrics, regardless of weight, made entirely from or blended entirely from the following fibers:

Acrylic/Olefin/Modacrylic  
Polyester/Nylon/Wool