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EC74-492 Fabric Flammability and Clothing

Jane Speece

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EC 74-492



SLOW BURNING



FABRIC

**FLAMMABILITY
and CLOTHING**

FAST BURNING



Extension Service
University of Nebraska-Lincoln College of Agriculture Cooperating with the
U. S. Department of Agriculture and the College of Home Economics
E. F. Frolik, Dean J. L. Adams, Director

FABRIC FLAMMABILITY AND CLOTHING

Jane Speece

Extension Specialist (Clothing)

Whenever clothing fires occur, we are made aware of the need for flame-retardant clothing. The U. S. Department of Health, Education and Welfare estimated in 1971 that deaths from burns associated with ignited fabrics numbered from 3,000 to 5,000 a year. The number of injuries was estimated at between 150,000 to 300,000 annually. Clothing fires and the resulting injuries often occur in the home; children and the elderly are the most frequent victims.

Choosing garments that do not burn easily seems a simple solution. When we consider, however, that just about any material will burn or melt when flame or heat is applied, the solution becomes more complicated. How easily clothing will burn depends upon the fiber, the fabric and the design. These three factors should be considered first when we begin to consider clothing that is resistant to fire.

FIBERS

Natural Fibers

Wool is the least flammable of the natural fibers. Though it can catch fire, it resists burning and extinguishes itself. *Cotton* is highly flammable. It catches fire easily and burns quickly. *Silk* and *linen* will burn almost as easily as cotton and burn rapidly.

Cellulose Based Manmade Fibers

Rayon, *acetate* and *triacetate* are as highly flammable as cotton. In addition, the acetate and triacetate may melt and cause serious burns.

Non-cellulose Based Manmade Fibers

Nylon, *polyester*, *acrylic* and *olefin* are not highly flammable. Once ignited, however, the melting of the fiber can cause serious burns. Modacrylic has inherent flame retardant properties.

Other Fibers

Two fibers that are non-flammable are *asbestos* and *glass*, but neither can be used in clothing worn for daily wear. Both fibers irritate the skin and asbestos would be too heavy for regular garments.

FABRICS

Fabric construction will affect the rate of burning. The same fiber used in different kinds of fabric constructions may burn at different rates. The more air that each fiber is exposed to, the more oxygen there is available for burning. Open or loose-textured fabrics will catch fire and burn more readily than firm, tightly woven fabrics. Lightweight or sheer fabrics will catch fire and burn more readily than durable, closely woven fabrics. Fuzzy or napped fabrics add a surface to the structure and will ignite and burn more readily than a smooth fabric.

Blends of fibers are common, and though one of the fibers may have an inherent fire retardant property, the other fiber in the blend may be highly flammable. In other cases two fibers may be combined to produce a fabric that not only flames but melts.

DESIGN

Clothing design also has an influence upon flammability. Once the fabric is ignited, the amount of oxygen that can reach the garment makes a difference. Clothing that stands away from the body permits oxygen to reach both *inner* and *outer* surfaces of the garment.

Some designs make the wearer more prone to fire accidents than others. Flared or pleated skirts, flowing sleeves or full pant legs will let fire spread more quickly throughout the garment than closer fitted styles. The extra material in the more flowing styles also supplies more fuel for the fire to consume. In addition, ruffles, sashes, fringe or long skirts may serve as a quick connection with a source of fire. Closer fitting, tailored clothing allows less oxygen to reach the inner surface. It also gives less fuel for the fire to burn.

DEVELOPING SAFER FABRICS

Two methods exist to make fabrics flame retardant. Fibers that in themselves resist flame can be developed or chemical finishes can be applied to existing fibers. Producing a flame-retardant product, however, is not an easy task. The manufacturer has to work toward a balance between comfort, aesthetics, utility, performance,.

Standards are difficult to set in this era of quickly developing technology. Performance tests are difficult because a textile fiber passing laboratory tests may react differently when made into a fabric or when it is blended with another fiber. A fabric swatch may perform one way under tests and then the design of the garment may increase the possibility of fire hazards.

Many problems need to be resolved. Laundry results are not always the same. Care instructions have to be followed faithfully to retain flame retardant properties of the fabric. Aesthetic qualities such as color, texture or the feel of a flame-retardant garment may be changed. Prices may have to be increased to cover costs of the flame-retardant properties.

Though developing fire-resistant fabrics presents problems, government and industry have worked together to try to provide solutions. The original call to action was provided by the government.

LEGISLATION

The Flammable Fabrics Act was passed by Congress in 1953 with the intent of prohibiting the sale of fabrics and wearing apparel that easily ignite. Hats, gloves and footwear were excluded. The purpose of the act was to discriminate between conventional fabrics, which present generally recognized hazards, and the special types of fabrics, which were highly dangerous and presented unusual hazards.

A burning test standard was set. This standard did remove from the market many fabrics and garments that easily ignited or flash-burned. The high-pile and brushed fabrics used in sweaters and children's costumes in the 1950's were examples of highly flammable fabrics that were banned.

Burn accidents continued to happen, however, when an individual was wearing regular apparel fabrics which presented generally recognized hazards. Thus, in the next few years action was instituted

to increase consumer protection from burn injuries.

In 1967 Congress enacted amendments to the act to increase the scope of consumer protection. Hats, gloves and footwear were added, as were interior furnishings. Paper, plastic and other materials used in all wearing apparel and interior furnishings were included.

Authority was given to the Secretary of Commerce to issue amended or new standards when it was found to be in the public interest. This authority included studies and research into the flammability of fabrics, investigation of clothing fires and testing of means to reduce fabric flammability. The Federal Trade Commission (FTC) was given the power to enforce standards set by the Department of Commerce.

Further amendments have increased the protection of consumers against injurious flammable fabrics. Both imported and domestically manufactured articles must pass the standards of flammability set for that article. Standards for carpets, rugs and bathmats also have been issued by the Secretary of Commerce.

Of particular interest are the standards set by the Department of Commerce for children's sleepwear (sizes 0-6X) that went into effect on July 29, 1972. After July 29, 1973, all children's sleepwear in sizes 0-6X manufactured in the United States or imported must meet the Federal standards of flammability by passing the flame test. Included are pajamas, nightgowns and robes. The standard also includes yard goods intended or promoted for use in children's sleepwear. Fabrics may be rendered flame retardant by the use of fibers which are inherently flame retardant or by application of flame retardant chemical finishes to fabrics. Provision is also made for fabrics which melt or drip on contact with flame.

The standards require that strips of fabric from various parts of the garment, including seams and trim, must self-extinguish within 10 seconds and will not burn over seven inches when exposed to a vertical flame. The same garment must meet the same requirements after it has been laundered 50 times.

Care instructions are required so that care agents or treatments do not decrease the flame retardant properties. It is important that the Consumer read and follow the care instructions so that the garment remains flame retardant.

In 1972 Congress passed a bill to create the Consumer Product Safety Commission. The bill transfers enforcement of existing consumer product laws from the FTC to the new agency. The agency

will have the responsibility for testing products, setting standards and enforcing flammability regulations. Until the new agency becomes fully operative, the FTC will continue to act as the enforcement agent for flammability standards.

Other items of clothing are expected to have standards set. Being considered are older children's sleepwear, girl's dresses, underwear, men's shirts, and apparel for the elderly. Other standards will be set for furnishings. Those areas in which the need seems the greatest will be approached first. Congress has made clear by legislation that it believes protection is needed from flammable fabrics. The power to carry out the legislation has been given to a government agency so that action may be instituted in this area. Manufacturers are attempting to meet these standards by developing new finishes and improving present fibers.

INDUSTRY

Industry has developed fire-resistant fabrics. Fabrics which offer protection to firemen and others in occupations that have daily risk of fire have been successfully used for some time. These fabrics, however, are often not suitable for daily wearing.

Many of the manmade fibers have been modified so that the consumer will gain protection. High temperature-resistant nylons and modacrylics are available as are flame-resistant acetate, polyester and rayon. A fire-retardant cotton has been produced. Others are in the development process. Some fire retardantness will be inherent in the fiber, others will have fire-retardant finishes. Some will have both.

CONSUMER RESPONSIBILITY

Consumer responsibility plays an important part in preventing clothing fires. The consumer must be careful about fire hazards. Fire prevention is the first precaution to take against clothing fires. Clothing will not burn unless something is present to ignite it. Elimination of fire danger from everyday life should be an important goal. Legislators and manufacturers cannot solve this problem for the consumer.

The consumer must be willing to accept the flame-resistant clothing. Flame-retardant garments have not sold well even when

offered at prices equal to or below untreated garments. The consumer may have to make a choice between the comfort and appearance of what he is used to and the safer product of the fire-resistant material. He may have to accept an unfamiliar odor in a fabric, along with a slightly higher price, in order to gain the safety feature of a fire-resistant garment.

The individual consumer is the key to successful action. Injuries and death from clothing fires can be significantly reduced through the cooperation of government and industry, but the final responsibility lies with the consumer. Individually you as consumer can:

- (1) Use those less flammable or flame-retardant items now on the market.

- (2) Ask for flame-retardant items when shopping to help create a demand for them.

- (3) Advise others, particularly those with children and elderly people in their care, about available flame-retardant items.

- (4) Educate yourself about fire prevention and flame-retardant items.

- (5) Join with others to provide a collective voice to help increase the use of flame-retardant fabrics.

REFERENCES

"Fabric Flammability," talk by William Segall at the 1971 Agricultural Outlook Conference, February 25, 1971.

"Facts on Fabric Flammability," Textile Industry Product Safety (TIPS) Committee, 1973

"New Flammability Standard for Children's Sleepwear," *Family Economics Review*, United States Department of Agriculture, December 1972, p. 22.

"Guide to Manmade Fibers," Manmade Fiber Producers Association, Inc. 1973.

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