UL Research Institutes | Chemical Insights

Specifying Upholstered Furniture Fire Barriers

Introduction

Upholstered furniture is the leading item to ignite in residential fires that result in death. Studies conducted by key research organizations have shown that the use of a barrier between the cover fabric and the foam cushion of a chair or sofa can significantly lower fire hazards (including peak heat release rates, temperature, smoke, and the production of carbon monoxide, and hydrogen cyanide), ultimately reducing the human health and property risks associated with residential fires. Moreover, a fire barrier eliminates the need for flame retardant chemicals which have been found to be carcinogenic or associated with other health concerns like thyroid disruption, delayed cognitive development, delayed physical development among children, obesity, advanced puberty, reduced fertility, and decreased lung function.

17%

of residential fires that result in death are started by a piece of upholstered furniture.

Fire barriers provide significant fire resistance without the use of flame retardants.

WHAT IS A FIRE BARRIER?

A fire barrier is a protective layer designed to prevent or delay a flaming ignition of the cushioning material used in furniture.

HOW DOES A FIRE BARRIER WORK?

During a fire, the cushion acts as the main fuel source. A fire barrier completely encapsulates the cushioning, like a sock or a wrapper, to prevent ignition and reduce both fire growth rate and fire size.

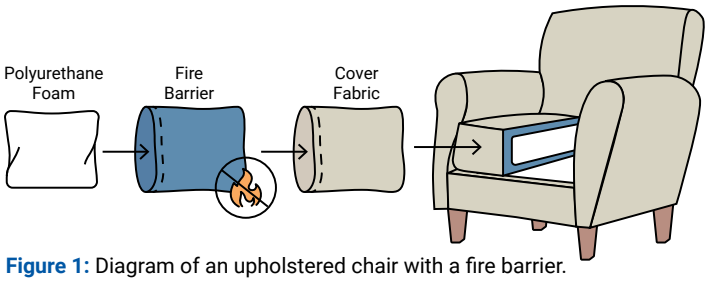


Figure 1: Diagram of an upholstered chair with a fire barrier.

HOW IS A FIRE BARRIER INSTALLED?

The barrier material can either be installed over the cushion before the installation of the cover material or laminated to the cover material and installed at the same time.

CAN YOU FEEL A FIRE BARRIER WHEN YOU SIT ON IT?

When a proper material is specified and installed, the barrier does not impact the final look or feel of the furniture.

HOW DOES A FIRE BARRIER COMPARE TO OTHER FLAME-RESISTANT STRATEGIES?

In studies, when compared to chairs both with and without flame retardants, chairs with fire barriers are significantly more effective in preventing or delaying fire ignition and ultimately delaying room flashover. If a room flashover occurs, occupants are unlikely to survive. A fire barrier can delay room flashover (from 2-6 minutes to 20-30 minutes), providing valuable time for occupants to evacuate and for first responders to arrive and extinguish the fire.

WHY IS PASSING BOTH TB 117-2013 AND AN OPEN FLAME TEST IMPORTANT?

The U.S. Consumer Product Safety Commission (CPSC) requires that upholstered furniture be tested for smoldering resistance according to the test method TB 117-2013 (cigarette smoldering test). Testing to this standard meets a minimum bar regarding fire safety and does not address protection from open flame hazards. According to NFPA, 95% of fire deaths occur in the presence of flaming — when fire spreads beyond the upholstered furniture item. This implies that flaming sources are significant and even in smoldering ignited fires, most fire deaths occur after transition from smoldering to flaming.

Scan this QR code to see:

- A video of how a chair with a fire barrier performs during an open flame test
- A video of how a fire barrier is installed

The Evidence

Studies on the availability and effectiveness of fire barriers used in upholstered furniture have been conducted by the following research and regulatory organizations:

- The National Institute of Standards and Technology (NIST)
- The State of California Department of Consumer Affairs Bureau of Household Goods and Services (BHGS)
- Chemical Insights Research Institute (CIRI) of UL Research Institutes

NIST
Studies found a couch with **a fire barrier extended flashover to 21 minutes** compared to six or seven minutes for two couches without a barrier. They evaluated different fire barriers and found four that performed well to reduce ignition to open flame.

BHGS
Studies compared 25 commercially available fire barriers and found that 23 were resistant to an open flame challenge. Five of those were tested in a full-scale burn and **four fire barriers were found to significantly delay the onset of flames**.

CIRI
Studies found that **a chair with a fire barrier never fully ignited** compared to other chair types with various flame retardant technologies that engulfed in flames at seven minutes on average after ignition (flashover at approximately 14 minutes).

The research identified many commercially available barrier materials for use in furniture construction in the marketplace. The following three examples were identified:

- Preferred Finishing, K-800: Cotton fiberglass knit with an intumescent coating
- Preferred Finishing, K-408: A glass/modacrylic/rayon blend with a urethane film laminated to the fabric
- Hanes Companies, Unigard #33025: A plain-woven fiberglass

Specifying A Fire Barrier

Fire barriers are made from a variety of inherently flame-resistant fibers (including carbons, polyesters, and fiberglass). Their structures often include common knits, coated knits, plain wovens, high-loft non-wovens, and composite non-wovens.

When selecting and specifying a barrier material, be sure it adheres to the following performance criteria:

The fire barrier is free of flame retardants and/or other hazardous chemicals.

The fire barrier meets the TB 117-2013 smolder test.

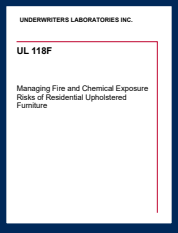
The fire barrier meets an open flame resistance test.

The fire barrier can be used without sacrificing aesthetics or comfort.

Scan the QR code to see these additional resources on fire barriers:

Summary Report R260: Research Data on Upholstered Furniture Fire Barriers

This report summarizes studies conducted by NIST, BHGS, and CIRI on the availability and effectiveness of fire barriers used in upholstered furniture.



UL 118F: Managing Fire and Chemical Exposure Risks of Residential Upholstered Furniture

This guidance document, developed by CIRI and a Furniture Flammability and Human Health Task Force, compiles scientific resources, key facts, and action steps.

Specifying Residential Upholstered Furniture to Safeguard Human Health and Well-Being

This toolkit, based on UL 118F, was designed to provide interior designers with information on fire barriers and how to specify safer residential upholstered furniture.

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