PERFORMANCE PRODUCTS

CFFA CHEMICAL FABRICS & FILM ASSOCIATION, INC.

How Test Methods Impact Performance Standards For Coated Fabrics

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Today's Speakers

- **Eric Petersen**
  - Director of Sales & Marketing, CGPC America/Enduratex™
  - Chair of CFFA's Performance Products Division

- **Steve Rye**
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What is the Chemical Fabrics and Film Association?

CFFA CHEMICAL FABRICS & FILM ASSOCIATION, INC.

- The Chemical Fabrics and Film Association (CFFA) is an international trade association representing manufacturers of polymer-based fabric and film products, used in building and construction, automotive, fashion and many other industries.
- The members of the Performance Products Division (PPD) manufacture chemical fabrics and film used in numerous applications such as contract upholstery, marine upholstery, pool liners, and transportation interiors.

Learning Objectives

Participants will have a better understanding of:

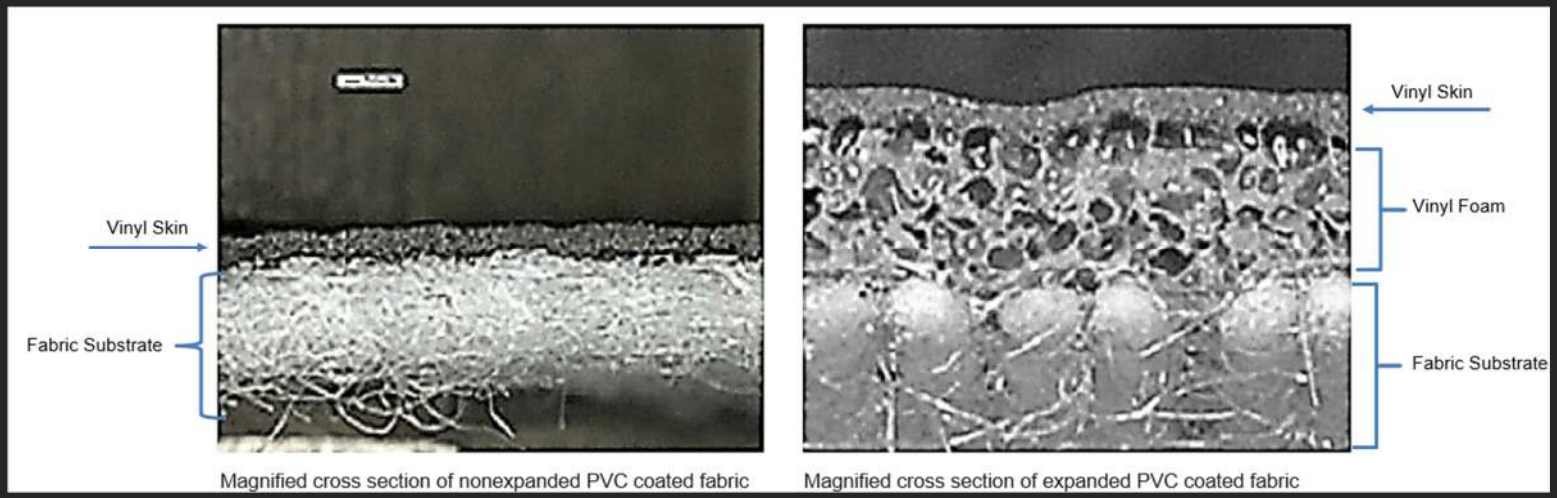
- which test methods are used to develop different performance standards
- which test methods most impact coated fabrics performance
- each test method presented

What are Coated Fabrics?

- Coated fabrics are a family of nonporous composite materials that can be manufactured to perform in a wide range of applications from upholstery to vinyl roofing to automotive products.

- The composite structure of a coated fabric is a multi-ply construction potentially composed of a top finish, solid film layer, foam, and adhesive, bonded to a flexible substrate. For upholstery, a top finish and film layer are the minimum components required to be bonded to the fabric substrate.

- The polymer-based layers can be made of PVC (vinyl), polyurethane, silicone, and thermoplastic elastomers.



Magnified cross section of nonexpanded PVC coated fabric

Magnified cross section of expanded PVC coated fabric

Why Use Coated Fabrics?

- Can stand up to abrasion, tough stains, exposure to sunlight, and daily wear and tear.
- Easily cleaned and sanitized, making them ideal for healthcare environments and public places where hygiene is also important.
- Can be manufactured in virtually any thickness, any texture, and any pattern and in almost any color.
- Performance, durability, and unlimited aesthetics including color, print, and texture make vinyl coated fabrics a natural choice for upholstery in any application.

Where Are Coated Fabrics Used?

Coated fabrics are chosen based on their performance features, styling appeal, and other considerations for use in markets such as:

- corporate offices
- food service facilities
- healthcare
- hospitality and entertainment
- retail
- recreational vehicles
- buses, trains, and planes, and
- stadiums and arenas.

Which Applications Use Coated Fabrics?

Coated fabrics can be found on many items, such as:

- contract seating
- dining seating
- medical furnishings
- guest room furnishings
- lobby furnishings
- spas and health club furnishings
- theater seating
- retail seating
- interior surfaces, and
- transit vehicle seating.

Coated Fabric Performance

- CFFA members have developed standards and laboratory test methods that set the bar for producing coated fabrics to ensure they withstand the normal conditions of commercial use.
- Members of CFFA responsible for these tests and standards subscribe to a philosophy of total quality management and continuous improvement for their products, processes, and services.
- In this presentation, we'll look at several performance tests for coated fabrics.

Performance Standards

- CFFA develops and maintains to promote product performance, facilitate quality control, and ensure customer satisfaction.
- These standards reference test methods developed by ASTM International, the American Association of Textile Chemists and Colorists (AATCC), and SAE International specifications. In the absence of relevant methods in the scientific community, the CFFA develops its own.
- Test methods are revised and updated as product requirements change, and newer polymer-based materials find increasing acceptance.

Performance Standards

Due to the wide variety of coated fabrics and films and the diverse end uses for each, individual performance standards have been developed. Three recommended minimum performance standards published by the CFFA are listed below:

- Recommended Minimum Performance Standards for Vinyl Coated and Other Chemical Coated Upholstery Fabrics – Indoor: CFFA-U-201G October 2020
- Recommended Minimum Performance Standards for Vinyl Coated and Other Chemical Coated Upholstery Fabrics – Marine: CFFA-MARINE/VINYL-201D
- Recommended Minimum Performance Standards for Polyurethane Upholstery – Marine: CFFA-MARINE/PU-101C.

Recommended Minimum Performance Standards for Vinyl-Coated and Other Chemical Coated Upholstery Fabrics - Indoor/CFFA-U-201G

Indoor/CFFA-U-201G: Key Elements

CFFA-U-201G was developed by a technical committee of chemists and engineers for the assessment of the basic attributes related to a chemical fabric's intended use via tests that measure two key elements:

- Inherent strength
- Durability in service to withstand normal commercial use

Note that in addition to the CFFA minimum standard, the specifier should consult the manufacturer's individual product data sheets to compare the actual performance level to the requirements of the end product.

COATED FABRICS SPECIFICATIONS = DURABILITY

Abrasion resistance	**LONGEVITY**
Accelerated light aging →	
Adhesion of coating to fabric	
Blocking	**LONG-TERM PERFORMANCE**
Crocking (wet and dry) →	
Flame and smoke resistance	
Flex resistance	**MEETS MINIMUM STANDARDS**
Seam strength →	
Tearing strength	
Tensile strength and elongation	

CFFA-U-201G: Properties

- In addition to strength and durability, there are additional tests and requirements for flammability, stretch and set, mildew and/or bacteria resistance, and accelerated exposure to disinfectants.

PROPERTY	TEST METHOD	KNITS	NONWOVENS	WOVENS
Abrasion: Contract/High Traffic Contract/Commercial General Use	CFFA #1a #10 Duck	 50,000 cycles 30,000 cycles 15,000 cycles	 50,000 cycles 30,000 cycles 15,000 cycles	 50,000 cycles 30,000 cycles 15,000 cycles
Accelerated Light Aging	CFFA 2[1]	4	4	4
Adhesion	CFFA 3	3.0 lb	3.0 lb	3.0 lb
Blocking	CFFA 4	No blocking, slight adhesion	No blocking, slight adhesion	No blocking, slight adhesion
Cold Crack	CFFA 6a[2]	No cracking	No cracking	No cracking
Crocking: Dry and Wet	CFFA 7	4	4	4
Flex	CFFA 10	25,000 cycles, no appreciable crazing	25,000 cycles, no appreciable crazing	25,000 cycles, no appreciable crazing
Seam Strength	CFFA 14	30 x 25 lb	35 x 35 lb	25 x 25 lb
Tear: Tongue Trap	 CFFA 16b CFFA 16c	 4 x 4 lb NA	 NA 15 x 15 lb	 4 x 4 lb NA
Tensile	CFFA 17	50 x 50 lb	50 x 50 lb	40 x 40 lb
Volatility	CFFA 18[3]	8%	8%	8%

Recommended Minimum Performance Standards for Vinyl-Coated and Other Chemical Coated Upholstery Fabrics – Marine - CFFA-MARINE/VINYL-201D

CFFA-MARINE/VINYL-201D: Key Elements

- This standard sets forth recommended performance standards for vinyl and other chemical coated upholstery fabrics produced with non-woven or substrates which are used as marine knit upholstery materials.
- This standard is not applicable to vinyl or chemical coated fabrics used in indoor applications.
- This standard covers but is not limited to their chemical coatings widely used for upholstery such as urethane and acrylic.

CFFA-MARINE/VINYL-201D: Properties

- Depending upon specific tailoring and performance requirements, these properties should be used to select the construction of coated fabric most suited for each end use.
- Properties are measured using CFFA Standard Test Methods.

PROPERTY	TEST METHOD	KNITS	NON-WOVENS
Abrasion	CFFA 1a #10 Duck	25,000 Cycles No Appreciable Wear	25,000 Cycles No Appreciable Wear
Accelerated Light Aging	CFFA 2[1]	No Appreciable Color Change	No Appreciable Color Change
Adhesion	CFFA 3	3.0 Lbs.	3.0 Lbs.
Blocking	CFFA 4	No Blocking, Slight Adhesion	No Blocking, Slight Adhesion
Cold Crack	CFFA 6a[2]	No Cracking	No Cracking
Crocking: Dry & Wet	CFFA 7	Good Slight Transfer	Good Slight Transfer
Flex	CFFA 10	25,000 Cycles No Appreciable Crazing	25,000 Cycles No Appreciable Crazing
Mildew Resistance	CFFA 120	No Growth	No Growth
Pink Stain	CFFA 121	No Stain	No Stain
Scrubbability	CFFA 130	200	300
Seam Strength	CFFA 14	30 x 25 lbs.	35 x 35 lbs.
Tear: Tongue Trap	CFFA 16b CFFA 16c	4 x 4 lbs. NA	NA 15 x 15 lbs.
Tensile	CFFA 17	50 X 50 lbs.	50 X 50 lbs.
Volatility	CFFA 18[3]	8%	8%

Recommended Minimum Performance Standards for Polyurethane Upholstery – Marine - CFFA/MARINE/PU-101C

CFFA/MARINE/PU-101C: Key Elements & Properties

- This specification is not applicable to polyurethane materials used in indoor applications.
- Polyurethane upholstery materials are manufactured from natural and/or synthetic fibers, coated with a urethane film or coagulant on one side to provide a durable, protective surface.
- Depending on the application, polyurethane upholstery will be colored, decorated, and/or textured to provide an aesthetically pleasing appearance and feel, while maintaining minimum performance standards under appropriate consumer usage.

PROPERTY	TEST METHOD	KNITS & WOVENS	NON-WOVENS
Abrasion	CFFA 1a #10 Duck	25,000 Cycles No Appreciable Wear	25,000 Cycles No Appreciable Wear
Accelerated Light Aging	CFFA 2[1]	No Appreciable Color Change	No Appreciable Color Change
Adhesion	CFFA 3	3.0 lbs.	3.0 lbs.
Cold Crack	CFFA 6a[2]	No Cracking	No Cracking
Crocking: Dry & Wet	CFFA 7	Good Slight Transfer	Good Slight Transfer
Flex	CFFA 10	25,000 Cycles No Appreciable Crazing	25,000 Cycles No Appreciable Crazing
Hydrolytic Stability	CFFA 110 CFFA 3 CFFA 1a CFFA 10	**Adhesion** 75% Retention **Abrasion** 25,000 Cycles **Flex** 15,000 Cycles	**Adhesion** 75% Retention **Abrasion** 25,000 Cycles **Flex** 15,000 Cycles
Mildew Resistance	CFFA 120	No Growth	No Growth
Resistance to Disinfectants	CFFA 100	Visual Inspection Manual flex	Visual Inspection Manual Flex
Seam Strength	CFFA 14	30 X 25 lbs.	35 X 35 lbs.
Tear: Tongue (Single Rip) Trap	CFFA 16b CFFA 16c	4 X 4 lbs. NA	NA 15 X 15 lbs.
Tensile Strength	CFFA 18	50 X 50 lbs.	50 X 50 lbs.

Coated Fabric Test Methods

- There are several test methods listed on the CFFA website that are used by the industry and its customers to determine the physical properties of chemical coated fabrics and films in all applications, to facilitate quality control and to ensure customer satisfaction.

- Test methods are categorized according to the key performance elements of coated fabrics:
  - Inherent strength
  - Durability in service to withstand normal commercial use

Testing for Inherent Fabric Strength

As it relates to inherent strength of the coated fabric before it is placed in service, specific CFFA test methods are intended to answer the following questions:

- Does the fabric resist seam tearing?
- How much force is required to tear the coated fabric?
- How much force is required to break the coated fabric?
- Is the coated fabric strong enough to withstand cracking when folded at low temperatures?
- How much force is required to separate the chemical coating from the base substrate?
- When the coated fabric is flexed and twisted, does it maintain its surface appearance without cracking?

Testing for Fabric Durability in Service

Once the fabric is put into service, its durability becomes paramount. Several of the CFFA Standard tests are intended to answer the following questions about the durability of the product:

- Can the chemical coating withstand surface wear when rubbed against another surface?
- Does the coated fabric endure exposure to sunlight without fading?
- Are liquid additives such as plasticizers fully compatible (i.e., do not exude or volatilize) when subjected to elevated temperature to ensure the coated fabric maintains its flexibility and performance characteristics?
- Does the coated fabric develop surface tackiness under heat and pressure?
- When a white cotton fabric is rubbed across its surface, does the chemical coating stain that fabric or transfer color?
- How does the coated fabric surface stand up to exposure to disinfectants used in cleaning?

Testing for Fabric Durability in Service

CFFA-1 Abrasion resistance

How resistant is the coated fabric to damage when rubbed by an abradant such as a coarse woven fabric?

The Wyzenbeek abrader is used for this test. A coated fabric is subjected to 30,000 to 100,000 cycles, depending on the severity of the application. While manufacturers are free to run higher cycles, the industry questions the value. A specifier should consider much more than Wyzenbeek when qualifying a product.

Wyzenbeek abrader

Coated Fabric Performance Tests

CFFA-2 Accelerated light aging test

Purpose: To determine the resistance to fading, discoloration, and loss of physical properties when exposed to ultraviolet light.

Standards: Several ASTM and AATCC standards are employed, depending on the apparatus used.

Vinyl coated fabrics that are used for both interior and exterior applications are subject to attack, typically by ultraviolet light. For outdoor products, a moisture cycle is included. After exposure, the specimens are examined for signs of stiffness, tack, crazing, color change, or other unacceptable deviations.

Specimens are rated on a scale of 1 to 4, with 4 indicating no change and 3 indicating slight change.

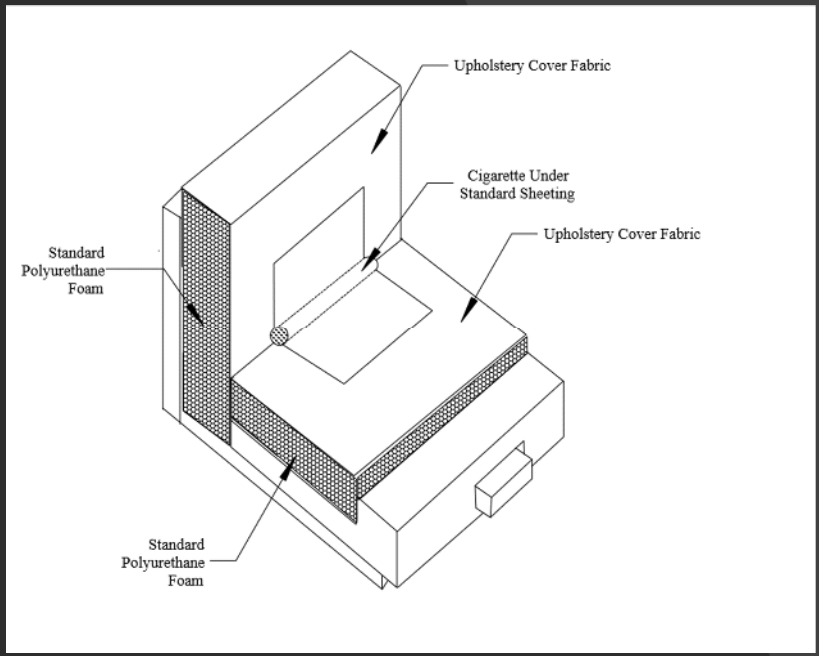
Q Panel for Light Aging Test

Coated Fabric Performance Tests

CFFA-9 Flame and smoke resistance

For contract furniture upholstery, the minimum standard for fire retardance is defined in California Technical Bulletin 117-2013 (Cal 117-13), a smoldering resistance test using a lit cigarette.

Certain applications will require more stringent test methods and may include limits on smoke density.



Mock-up assembly for smoldering resistance test of upholstery cover fabrics

Coated Fabric Performance Tests

CFFA-15 Stretch and set testing

Purpose: To determine the stretch resistance and recovery of coated fabrics.

Reference: Society of Automotive Engineers Method J855

The “stretch and set” values of coated fabrics are extremely important to the furniture manufacturer, factors that determine pattern size and direction of cut of each of the panels that will make up a sewn seat cover. There should be enough stretch to provide a tight, wrinkle-free, puddle-resistant fit over the foam cushioning and minimum set (maximum recovery) so that tension or tightness of fit doesn’t weaken or sag over the life of the seat.

Puddling

While stretch and recovery is an important factor in avoiding puddling, seat construction and the density of the foam cushioning are the major factors to be considered. Some foams will collapse or “bottom out,” while some seat designs do not allow the coated fabric to be pulled tightly around the cushion.

Coated Fabric Performance Tests for Inherent Strength

CFFA-17 Tensile strength and elongation

How much force is required to break the fabric? An Instron unit or other suitable universal testing machine consisting of a straining mechanism, holding clamps, and a load recording mechanism can be used for this test.

CFFA-16 Tear strength, 16b single tear and 16c trapezoid tear (shown)

How much force is required to tear the fabric? A universal tester is used to measure this property.

Tensile Strength

Tear Strength

Summary

- Coated fabrics have a long history of usage and development, and there is now a virtually limitless range of combinations of high-performance products available.
- Each product has its own performance characteristics related to its inherent strength as well as its performance in real-world installations.
- Some fabrics are specifically intended for outdoor and marine use and others for indoor use and contract furnishings.
- Becoming familiar with industry terminology, product materials, and the basics of how these fabrics are manufactured can assist greatly in improving product understanding.
- Selecting fabrics that meet CFFA standards ensure you are making an informed decision every time.

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