ENERGY FACTS

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Fabrics for the Energy-Conscious Home

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Have you ever watched your brightly patterned curtains lose their color over a period of several months? Or has a favorite sofa placed near a window faded from dark blue to mottled gray? Color change in fabrics is only one of the ways that sunlight damages textiles. In the past, it would often take several years for a curtain or sofa to fade so much that it became unusable. We see this problem happening more quickly today because of the increasing use of the sun for space heating.

Another effect of the sun is deterioration of the fiber. The fabric shows wear very quickly because the fibers become weak and the yarns break. Fibers differ in their tendency to fade or deteriorate. For example, you could have a lovely red sofa that remains red but develops holes as the yarns start to break because fibers are being destroyed by the sun. These problems and others are some of those faced by energy-conscious homeowners.

Energy-conscious design is defined as the combination of energy conservation and solar heating to reduce a home's energy consumption. The interior heat fluctuations and sunlight pouring through large expanses of south-facing glass can wreak havoc on upholstery, carpet and window fabrics and shorten their wear life. Another concern is that inappropriate conductive, absorptive and reflective characteristics of fabrics used inside can hinder the thermal performance of the house.

To select the proper fabrics for energy-conscious design, you need to know the climatic conditions that affect fabrics, how the materials react to the conditions, and how you will use the fabrics.

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Effects of the Elements

LIGHT—Of all the elements, the sun has the most visible and devastating effect on fabrics. Sunlight will deteriorate almost any fabric over time. Local conditions, such as grime, dirt, fumes, heat and humidity, aggravate the situation and speed the weakening of the fabric's structure.

The two fabric characteristics to consider for a light-intensive setting are durability (resistance to deterioration), and amount of reflectance.

The durability of a fabric depends upon its fiber content, yarn type, construction method (weave), finish and dye type. The fiber must be inherently resistant to effects of the sun's rays, and the quality of the weave uniform throughout the material to eliminate weak points that are likely to deteriorate more rapidly than the rest of the fabric and wear through when the fabric is cleaned.

The photoreactive chemical property that gives a fabric its color also can initiate its deterioration in the presence of sunlight. Select a fabric whose dye composition has been treated to meet specific lightfastness requirements. (The manufacturer can tell you if it has been.)

A fabric's reflectance is determined by its color (lighter colors reflect more light than dark colors) and its finish. Many fabrics are now available with a special metallized coating on one side. These coatings greatly increase the material's reflectivity and thus decrease the sunlight and heat that can pass through it. A reflective surface on the outer facing of a drapery fabric or lining, for example, would reduce summer interior heat gain by reflecting the heat that strikes the drapery back to the outside.

HEAT—A fabric's heat resistance is based on its ability to insulate. The fabric's basic weave is the key to its ability to retain heat by trapping "dead" air that insulates against outside cold. Therefore, the fabric with the best insulating quality is one that permits air to be trapped between its fibers, or yarns. Fabrics with looser weaves, napped or pile surfaces, crimped or irregularly shaped fibers, or expanded foam plastic composition are recommended.

Often, several layers of varying fabrics can be used to create the dead air space. A firmly woven fabric that allows little air to pass through may be combined with a more openly woven fabric. This approach is particularly useful in window coverings. The best solution, however, is to choose a pile or napped fabric—one with a textured, fuzzy or downy surface—because it combines high durability and insulation qualities in a single fabric.

HUMIDITY—Moisture plays a major role in damaging fabrics. The relative humidity of a home can vary from almost bone dry in the winter to near saturation in the summer, and fabrics vary considerably in their ability to absorb this excess moisture. In upholstery and carpeting, a material with some absorptive quality is preferred because it reduces static electricity and increases comfort. But too much absorption, for example in drapery fabrics, can cause a fabric to stretch or shrink, thus losing its shape.

Appropriate Uses

Fabrics used in window treatments are the most vulnerable to the effects of light, heat and moisture. In selecting a drapery material, look for one that will suffer a minimal loss of tensile strength, offer good heat resistance, absorb minimal moisture, reflect light and resist indoor air pollution.

Admittedly, that's a lot to ask of a material, so choose a fiber that offers the greatest resistance to the severest of the elements to which it will be exposed. For a drapery in a sun-filled living area, a sun-sensitive fabric backed with a highly reflective lining can be more efficient than a sun-resistant but unlined fabric.

Upholstery materials are subjected not only to sunlight, but also to wear and tear caused by people. These fabrics should have above-average tensile strength in addition to sun and heat resistance. Moderate moisture absorption is desirable to minimize the static electricity that occurs in dry conditions and to increase body comfort.

(Though vinyl and leather are frequently used for upholstery, they absorb little moisture and can be uncomfortable in hot, sticky weather. Leather does "breathe" to a certain extent, so it offers more comfort than vinyl.)

The properties that make some fabrics suitable for upholstery also make them good for area rugs and carpeting. Wall-to-wall carpeting is recommended only where floor insulation is needed. Otherwise, straw mats are an excellent way to soften the appearance of a thermal mass floor without reducing its efficiency. Additionally, straw mats have been found to be effective absorbers of excess humidity—as much as 5 percent, in some cases. Floors receive the greatest physical abuse, so in addition to sun and heat resistance and tensile strength, rug fabrics also must be resilient.

Table 1 lists many fibers and their reactions to the various elements. In today's market, however, marketed fabrics rarely are composed of only one fiber—blends are the rule. You need to know the percentage and characteristics of the individual fibers in a blend to determine the suitability of the material for your particular use.

Further Reading

TEXTILE HANDBOOK
American Home Economics Association
2010 Massachusetts Avenue, N.W.
Washington, DC 20036
Attn: Publications
(202) 862-8300

CLOTHING, COMFORT AND FUNCTION
by Lyman Fourt and Norman Hollies
Marcel Dekker, Inc.
270 Madison Avenue
New York, NY Attn: Order Processing
(212) 889-9595

TEXTILES
by Norma Hollen and Jane Saddler
MacMillan Publishing Company, Inc.
Front and Brown streets
Riverside, NJ 08370
(609) 461-6500

FABRICS FOR INTERIORS
by Jack Lenor Larsen and Jeanne Weeks
Litton Educational Publishing, Inc.
7625 Empire Drive
Florence, KY 41042
(800) 354-9815

Table 1. Fiber Characteristics and Uses.

Generic Fiber	*Sunlight Resistance*	*Heat Resistance*	*Absorbency*	*Tensile Strength*	*Use*
Acetate	Slight loss of strength, little color loss	Little degradation	Low	Low	Not recommended
Acrylic	Very little loss of strength, no discoloration	Little degradation	Low	Medium	Windows Upholstery Carpeting
Cotton	Gradual loss of strength, gradual yellowing	Excellent resistance to degradation by heat	Medium	Medium	Upholstery
Glass	None	None	None	None	Windows
Leather	No loss of strength, slight discoloration	Embrittlement, stabilized by care	Low	High	Upholstery
Linen	Gradual loss of strength	Discolors at high temperatures	High	High	Upholstery
Modacrylic	Very little loss of strength	Little degradation	Low	Medium	Windows
Nylon	Gradual loss of strength, little color loss	Little degradation	Low	High	Windows
Olefin	Moderate strength loss, gradual embrittlement, can be stabilized	Moderate decomposition, embrittlement	None	Medium	Not recommended
Polyester	Very gradual strength loss, no discoloration	Little degradation	Low	Medium	Windows Upholstery
Rayon	Gradual loss of strength, affected more than cotton	Little degradation	High	Low	Not recommended
Silk	Moderate loss of strength, affected more than cotton, depends on dye and additives	Less affected than wool	Medium	High	Upholstery
Vinyl	No loss of strength, slight discoloration	Gradual embrittlement	None	High	Upholstery
Wool	Loss of strength, gradual fading	Loses softness from prolonged exposure	High	Low	Upholstery Carpeting

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