



Clutch-Operated Draper FlexShades installed at Saatchi & Saatchi Rowland, Rochester, NY. Photography © 2004 Tim Wilkes Photography. Photo courtesy Draper, Inc.

- Today's shades can help cut heating and cooling costs and improve worker productivity.

Window shade fabrics used to be chosen based mostly on aesthetics. Today's window shade products and fabrics, however, play a significant role in helping to balance a building's beauty, functionality, and energy efficiency. Shades can even affect occupant performance, operating costs, indoor environmental quality, and safety, so selecting the proper shade fabric is more important than ever.

Health issues affected by shades include glare, temperature, visual comfort, and air quality. Glare can cause eyestrain, headaches, fatigue, and tension. It occurs when the background brightness far exceeds the brightness of the task. Controlling glare should always be a goal in selecting window shade fabrics for working environments. In an office atmosphere, contrast ratios between the brightness of the background and the brightness of the task should not exceed 1:3 between the direct field of vision and the computer screen and 1:10 between the indirect field of vision and the computer screen.

With unshaded glass, contrast ratios are often too high, causing glare on computer screens and work surfaces. This negatively affects a worker's welfare and performance. With effective window shading, contrast ratios are brought down to acceptable ranges and glare is greatly reduced.

Temperature has an impact on building occupants, and also on utility bills. Window shades can help lower the building's cooling costs by reflecting the sun's heat outside the building, instead of allowing it to be radiated into the building.

Openness factor and color affect building temperature, glare, and visual comfort. Openness factor is the area of the shade fabric surface that light can pass through. Typical openness factors are 1%, 3%, 5% and 10%. The higher the openness factor, the more light is allowed through. A shade fabric with a zero percent openness factor is an opaque fabric and will not allow any light through.

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WHITE PAPER: THE GREEN SIDE OF WINDOW SHADES

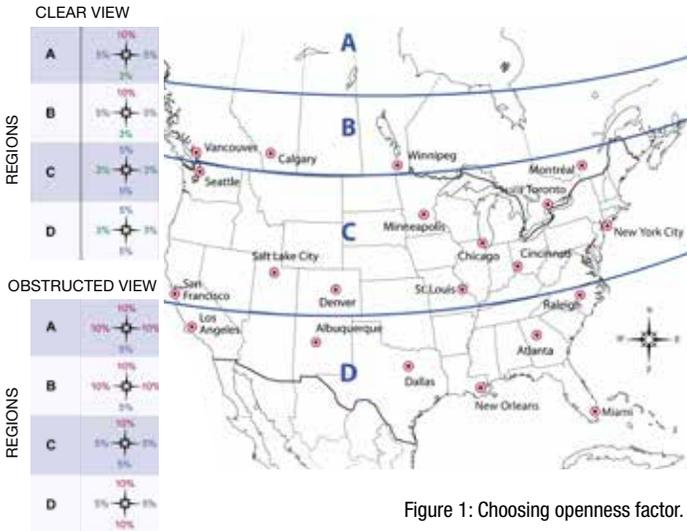


Figure 1: Choosing openness factor.

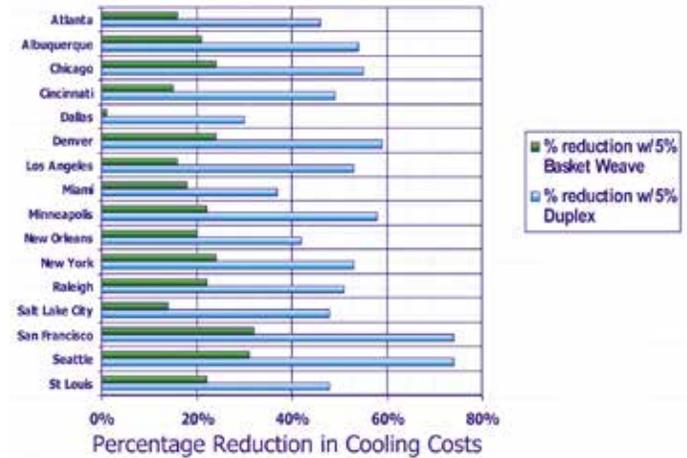


Figure 2: City-to-city energy savings comparison when considering Duplex and Basketweave Fabrics vs. A/C only.

To determine the openness factor for a project, you need to figure out the geographical zone and orientation of the building. (See Fig. 1.) The table considers the angle of the sun and the climate in specific locations on the globe, and references the openness factors that should be specified for each elevation of the building. For example, if your building is in Denver and faces south and there are no obstructions, such as buildings, trees, or anything that affects the angle of the sun between the building and the sunlight, the correct openness factor for the window shade fabric on the south elevation is 3%. If there is an obstruction the openness factor should be 5% instead of 3%. If your building is in New Jersey and faces east with an obstructed view the correct openness factor for the window shade fabric on the east elevation is 5%.

Fabric color is also an important factor in specifying window shades, and not just to fit an overall decorating scheme. To enhance comfort, health, and the work environment, it is best to select a window shade fabric that protects from glare and heat, while allowing the occupant to see outside and enjoy the positive effects of nature.

Light colors better control solar heat gain than dark colors. Light colors reflect sunlight and heat instead of absorbing it into the building. This means, however, that light colors do not control glare as well as dark colors. The reflective characteristic of light colors also makes viewing through the shade more difficult.

Dark colors are not as effective as light colors in controlling solar heat gain because dark colors absorb heat and then radiate the heat into the room. Dark colors do provide better

light and glare control because they absorb light rather than reflect it. Since they do not reflect light, it is much easier for occupants to view through the dark colors to the outside. Viewing the outdoors has been shown to have a positive effect on worker performance.

Energy conservation is important to consider when selecting window shade fabrics. PVC-free fiberglass and polyester fabrics are now available in different colors and openness factors. They are lighter in weight than PVC-coated fabrics and, as a result, they require fewer raw materials to manufacture. Also, unlike other fabrics, PVC-free fabrics discharge no measurable off gassing into the indoor environment.

Duplex fabrics provide a blend of the positive characteristics of both light and dark colors. They reduce lighting costs, control radiant heat, and harness light to our benefit. Due to the weaving process of duplex fabrics, the exterior-facing color is different than that on the interior facing side. Each color and side has its own function. The exterior is light to reflect the sun's heat and brightness. This increases thermal comfort and energy savings. The interior is darker to absorb brightness, decrease glare, provide greater visibility to the outside, and give excellent UV protection.

Figure two, above, compares the energy saving performance of duplex two-color fabrics, standard basket weave one-color fabrics, and uncovered windows. The utility savings are remarkable, no matter where the building is located.

Another plus for duplex fabrics is that they allow the specifier to keep the same uniform appearance on the exterior from window to window, while changing the interior color from room to room.



Coupled Motorized Draper FlexShades with Phifer Sheerweave® SW2600 fabric at the new home of Alvin Ailey American Dance Theater—The Joan Weill Center for Dance, New York, NY. Architects: lu + Bibliowicz Architects LLP. Photography: © 2005 Bruce Katz. Photo courtesy Draper, Inc.

Safety issues, such as flammability, the amount of smoke developed, and toxic fumes discharged while burning are important factors when specifying any indoor textile. Although there are no national standards for toxicity and gaseous emissions, shade fabrics are tested and approved per NFPA Standard 701 for flame retardant capabilities. Even with this approval, however, it must be remembered that each fabric has its own properties and characteristics when subjected to fire. Some fabrics support flame and emit more smoke; others discharge more toxic fumes into the environment. Fiberglass, unlike polyester, is a silica sand based material, so it does not support flame or negatively affect the environment when subjected to fire. If energy conservation and safety are both primary concerns, PVC-coated fiberglass or PVC-free fiberglass in a duplex weave are the optimum choices.

Some window shade fabrics are also more dimensionally stable than others. Dimensional stability is a fabric's resistance to stretching, sagging, and edge curl.

Generally speaking, there are two base manufacturing methods for window shade fabrics. One type coats the base material before it is woven. The second type weaves the base material before it is coated. To give the fabrics dimensional stability, they are placed under tension during the manufacturing process. Some fabrics are placed under tension in only two directions, while other fabrics are placed under tension in all four directions. Placing the fabric under tension in all four directions gives it the greatest dimensional stability.

Dimensional instability can cause problems over time, such as bagging, stretching, and edge curl. If a shade stretches and sags due to instability, the result is poor appearance and

wrinkling. Motorized shades, with limit switches set to cause the shades to stop uniformly at predetermined locations in the opening, can lose this window-to-window, uniform consistency.

In general, fiberglass fabrics will stretch and sag less than polyester fabrics because they are more dimensionally stable. Polyester fabrics are heavier, making them more susceptible to stretching and sagging.

Fabric type can also determine the size of the bundle of fabric wrapped around the shade roller when it is in the open position (referred to as the bundle diameter). The thicker the fabric, the larger the bundle diameter. Shades with large bundle diameters may require larger headboxes or fascias. This means more raw material and greater cost. To maximize sustainability in green buildings, consider fabrics that require lightweight rollers, hardware, and clutches, and, as a result, less power to operate. A fabric that is lighter will also stretch less, and retain its aesthetic value over time.

In addition to fabric selection, you also need to decide how to control the shades. There are two main methods for controlling window shades: electric motor, or manually, using crank, bead-chain clutch or spring roller.

Electric motor: This option is best for rooms where shades are up high, where there are several shades that need to be controlled simultaneously or where the shades are to be tied into a building control system. Motors operate on standard 115V or 220V, but there are also so-called "quiet motors," and low voltage motors where the current coming to the motor must already be stepped down.

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There are many options for controlling motorized shades. Most manufacturers provide low- and standard-voltage switching and remote control. Motorized shades can also be programmed to maximize the energy efficiency of shades. One of the latest technological advancements for buildings is the use of a solar tracking system. This system takes into account your position on the globe and interfaces weather station data with the movements of your shades. A constant broadband connection is needed for solar tracking to work. A less expensive alternative is RS 232 control, which offers great programming flexibility. RS 232 control can be managed from any convenient on-site computer system.

Manual: Manual shades are inexpensive and allow flexibility in controlling sunlight. There are three main types of manual shade control. The bead-chain clutch is operated by pulling a loop of bead chain. Shades operated with a bead-chain clutch are more limited than motorized as far as shade size, height and number of panels. Crank and spring roller operation are also available. Spring roller operation is the simplest and typically the least expensive option; these shades are operated simply by pulling them down.

The general environment of the work place can be affected negatively by too much glare, heat, and bright light. Window shades, if selected properly, can provide the positive effects of natural light and greatly lessen the negative effects of heat and glare. It is possible, with the correct window shade fabric to combine natural light and visual comfort. Studies have shown that significant, statistical improvement occurs in rooms where there are windows to allow more natural light. Natural light and views of nature have a positive affect on the human psyche. They also provide proven, greater worker performance.

For more information, visit Draper's Web site: draperinc.com.

draperinc.com/whitepapers_casestudies.aspx

LIST OF TERMS

Contrast ratio: The difference between the luminance of task and the luminance of the background—for example, the luminance of a computer screen (task) versus the luminance of a work surface (background).

Duplex fabrics: Shade fabric where the exterior facing side is a lighter color than the interior facing side. The exterior side of the fabric reflects the sun's heat and brightness. The interior side of the fabric absorbs brightness, decreases glare, and provides greater visibility to the outside.

Fiberglass: A material made from extremely fine fibers of glass, widely used in the manufacture of insulation and textiles.

Luminance: The amount of light emitted or reflected from a surface. It is measured in candelas or candles per square meter.

NFPA Standard 701: This is the National Fire Protection Association standard for the flame retardant capability of window shades and other products.

Openness factor: Area of the shade fabric surface that light can pass through. Typical openness factors are 1%, 3%, 5% and 10%. The higher the openness factor the greater the amount of light that is allowed to penetrate the fabric.

Opaque fabric: A fabric that is opaque does not let any light through.

Polyester: A category of polymers. Although polyesters exist in nature, polyester generally refers to the large family of synthetic polyesters (plastics), which are made from petrochemicals.

PVC: Polyvinyl chloride is a widely-used plastic produced from vinyl chloride, and made soft and flexible by adding plasticizers, such as phthalates.

U Value: Air-to-air transmission of heat due to thermal conductance, and the difference in indoor and outdoor temperatures. Lower U Values mean less heat is being transferred.

VOCs: Volatile Organic Compounds are chemicals that contain carbon and evaporate easily at room temperature.