

COOLING with Shade

Summer comfort is determined by heat loss, heat gain, and heat production by our bodies. Air temperature and humidity are most important, but air movement, sunshine, clothing, activity level, and temperatures of surfaces around us also influence our comfort.

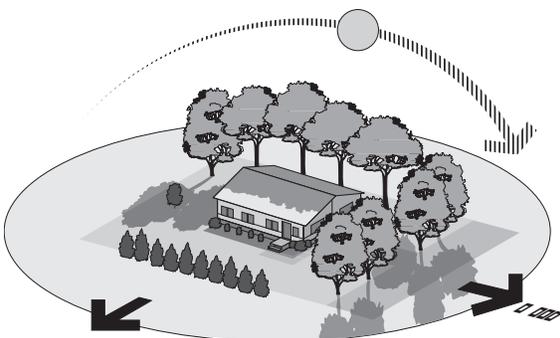
If you understand what makes you comfortable and if you begin using natural cooling methods, you won't need as much air conditioning.

Shading is the most effective strategy to control cooling costs. Solar heat falling on your home comprises more than one-half of the heat that requires removal by a cooling system. If you block this heat and prevent it from falling on your home, you may not need air conditioning.

Another effective way to improve comfort and reduce cooling costs is to use fans to promote ventilation with outdoor air during moderate weather and to circulate indoor air when the air conditioner is operating.

In moderate climates, shading, ventilation, and air circulation may provide all the cooling you need. In more humid climates, air conditioners are necessary to provide a high degree of comfort. In dry climates, evaporative coolers are effective and much less expensive to purchase and operate than air conditioners.

Figure 12-1 Shade Tree Placement



Shade trees on the home's south side shade the roof from overhead summer sun during the morning and early afternoon. Shade trees on the west shade the home during the afternoon when the sun is lower in the sky.

Figure 12-2 Percent of Solar Heat Blocked by Window Treatments

Shade Treatments for Single-Pane Glass

Sun Screen (indoors)	20-30%
Colored Venetian Blind	25-40%
Draperies (light colored)	40-55%
Opaque Rolling Shade (dark exterior)	45-50%
White Venetian Blind	45-50%
Window Films	40-75%
Light-Transmitting Rolling Shade	60-70%
Sun Screen (outdoors)	65-75%
Opaque Rolling Shade (white exterior)	75-80%
Aluminum Louvered Sun Screen	80-85%
Awnings	50-90%

The percentage of solar heat blocked varies according to the shading device used.

Shading and Reflecting

Heat from the sun shining through windows and on roofs is a major reason for needing mechanical cooling systems. The most effective way to reduce solar heat is simply to block it, using: shade trees, vines and trellises, metallized window films, awnings, sun screens, and bright roof coatings.

Shade trees and trellised vines provide the most effective shading. They don't allow the sun's rays to reach the home and they create cool buffer zones near the home. For a detailed discussion of the advantages of landscaping, please refer to *Chapter 3 Landscaping*.

Effective shading can also be gained from reflective roof coatings, window films, interior window treatments, sun screens, awnings, low-e glass, and reflective glass.

Reflective Roofs and Walls

Dark colors are inappropriate for walls and roofs in hot climates, because they absorb too much solar heat. The exterior walls and roof should be reflective to reflect unwanted solar heat.

If you repaint your exterior walls, choose white or a very light color.

When you reroof your home, choose a reflective roofing or roof coating. The most common reflective coatings are asphalt-based coatings, mixed with aluminum particles and mineral fibers. They reflect about 60% of solar heat hitting the roof. These reasonably-priced asphalt coatings vary in quality, mainly due to the amount of aluminum particles in each five-gallon container. The better coatings, which are more expensive, contain more aluminum and are more reflective. Be sure to stir this asphalt/aluminum coating vigorously and often during its application.

Bright white latex rubber coatings reflect up to 75% of solar heat. These latex coatings are more dependent on proper surface preparation than

asphalt coatings. The roof surface must be clean and dry before application. Some latex coatings require a primer coat.

Most large hardware stores and lumber yards carry both asphalt and latex roof coatings. Follow the manufacturer's instructions for surface preparation and application.

Interior Window Treatments

Interior window treatments with reflective surfaces—either metallized or bright white—can block solar heat effectively. Opaque roller shades with white surfaces facing the exterior repel about 80% of the solar heat entering the window. These roller shades block most of the light and all the view.

White venetian blinds and white slim shades (a smaller-scale venetian blind) repel 40% to 60% of the solar heat entering the window. These venetian blinds and slim shades also block most of the light and view.

If you want to retain some light or view, install roller shades made with metallized plastic window film. Like reflective films applied directly to glass, these metallized plastic roller shades can preserve the view and transmit some light, while blocking most of the heat.

Figure 12-3 Solar Transmittance

Glass Type	Solar Transmittance	Visible Transmittance
Single-Pane	85-90%	90%
Single-Pane Reflective	25-30%	30%
Double-Pane	70-80%	80%
Double-Pane Low-E (standard)	55-65%	75%
Double-Pane Low-E (hot climate)	45-50%	50%

Solar and visible transmittance for new window glass.

Figure 12-4 Trellis for Shading



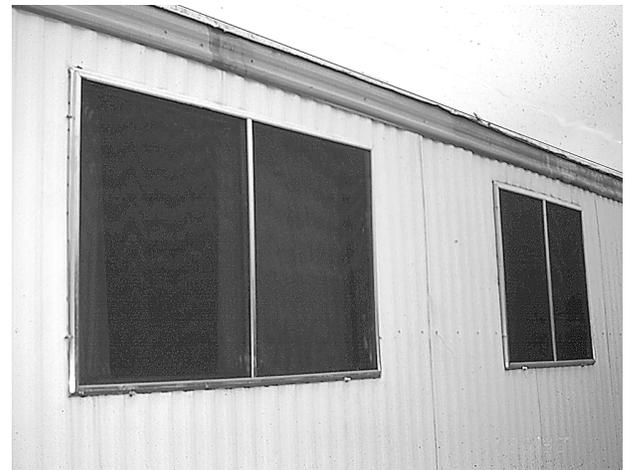
A trellis covered with climbing vines is a very effective shading device because it stops solar heat before it reaches the home.

Reflective Window Films

Metallized plastic window films (similar to those applied to automotive windows) can block 50% to 75% of the solar heat transmitted by single-pane glass.

A microscopic layer of metal on these films reflects solar radiation. Installed on the interior side of single-pane glass, reflective window films repel solar heat, cut glare, and reduce fading. The most effective films look like a mirror when viewed from outdoors during the daytime. Tinted films that color the glass are not as effective in blocking solar heat.

Figure 12-5 Sun Screens



Installed on the window's exterior side, sun screens block 65% to 85% of solar heat.

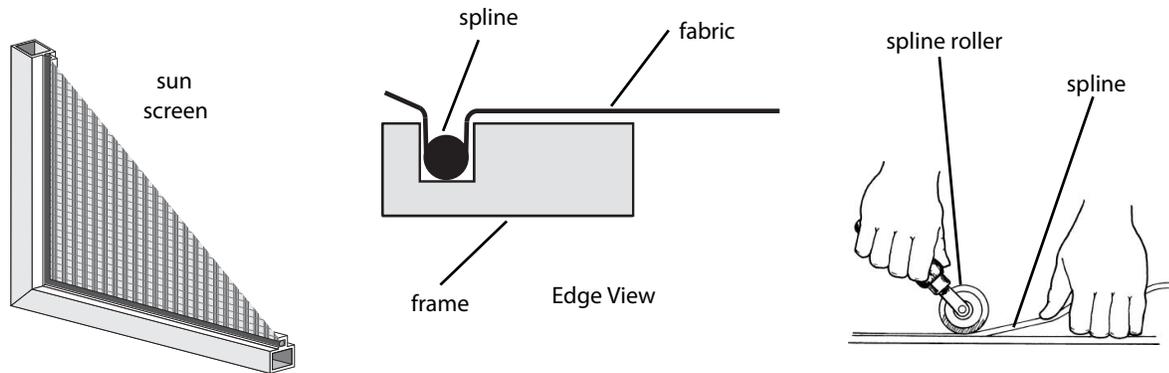


An aluminum patio cover and a wall of large sun screens shades this patio area from the strong desert sun.

Because reflective window films block daylight in addition to solar heat, consumer acceptance has been slow. Newer films (sometimes called low-e films) recently introduced to the marketplace, transmit more light while blocking most of the heat. These low-e films also reflect heat back into the home in winter.

Window films may be installed for \$3 per square foot or less. Installing reflective window film is a moderately difficult do-it-yourself project. These

Figure 12-6 Sun Screen Construction



Sun screens are constructed like insect screens. The fabric sun-screen material is stretched onto a metal frame and clamped in place by a plastic spline inserted in a track.

films—manufactured with removable protective layers—require careful placement and are very sensitive to dirt.

Unlike sun screens, reflective window films do not obstruct the operation of any kind of window.

Window films are probably the best shading method for unshaded sliding glass doors. Window films also work well for outwardly opening windows that wouldn't open if you installed an exterior sun screen.

Lower-quality window films may get cloudy or deteriorate because of intense sunlight, harsh cleaning fluids, or abrasion from cleaning by rough towels. Newer high-quality window films have a scratch resistant coating and can be easily cleaned with soapy water and a soft cloth.

Sun Screens

Sun screens are often the least expensive window-shading option that retains a full view through the window. Sun screens can be removed in winter to allow solar heating.

Most sun screens absorb 65% to 70% of solar heat before it enters the home. A different type of screen made of aluminum with tiny louvers

absorbs about 85% of the solar heat. The aluminum, louvered sun screens are more expensive than standard sun screens.

Sun screens are made like insect screens, with aluminum frames that have a channel and with retaining splines. Sun screen fabric is available in a variety of colors.

Sun screens must be installed on the exterior side of a window to be effective. For all windows that open outwardly, such as awning windows or casement windows, sun screens should be installed on the movable sash. Sun screens are frequently used to shade east- and west-facing porches.

Sun screens, like window films, are not easy do-it-yourself projects. Professionally built and installed sun screens cost \$2 to \$4 per square foot. You can save 50% or more with home built and installed screen kits, but your final product may not last as long as a professionally-built sun screen.

Awnings

Awnings are expensive but popular in hot sunny climates, since they intercept solar heat before it gets to the window.

The three most important considerations in selecting and designing awnings are:

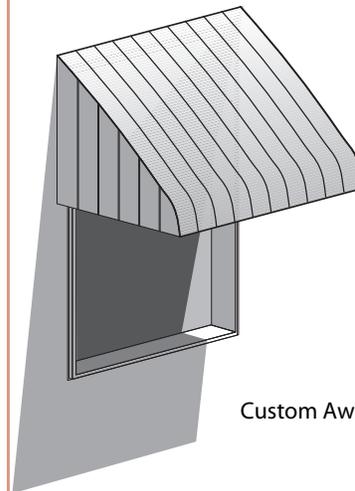
1. **Amount of shade desired.** The shade an awning produces is closely related to how far the awning drops down over the window. This distance is known as the drop of the awning.
2. **Importance of maintaining a view out the window.** Depending on their drop, awnings can cut off a significant portion of a window's view.
3. **Cost of the awning.** Custom-made awnings are more expensive than do-it-yourself awning kits or mass-produced awnings.

Awnings on a home's south side need a drop measuring 45% to 60% of the window height to block solar radiation from high in the sky. Awnings on the east and west need a drop of 60% to 75% in order to block solar radiation emanating from lower in the sky during morning and afternoon.

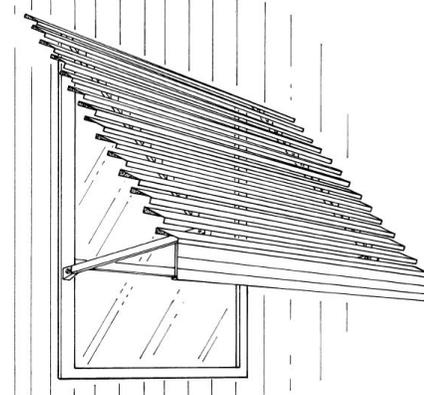
Custom-made awnings usually have sides which make them more effective at blocking a variety of the sun's angles throughout the day. Do-it-yourself awnings, lacking sides, are more effective if they are wider than the windows they shade. Some aluminum awnings are adjustable and can actually close completely (like a hinged lid), protecting the window from high winds.

Retractable awnings—although expensive—give maximum shade during hot weather while allowing sunshine and view during cooler weather. Some specialty awnings close over the window like a lid for protection from high winds. These protective awnings are particularly appropriate in the southeastern hurricane zones.

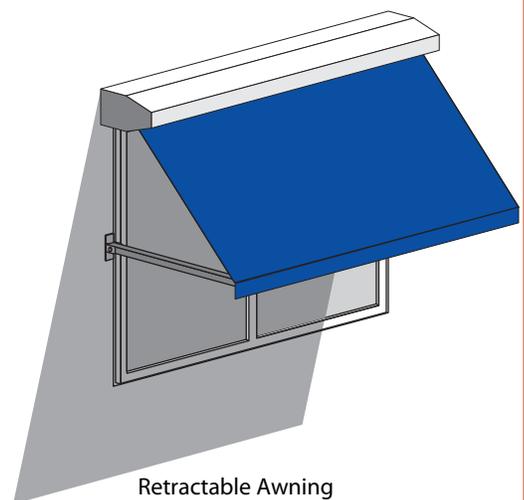
Figure 12-7 Awnings



Custom Awning with Sides



Do-it-yourself Slatted Awning



Retractable Awning

The most costly window shading device, awnings are also often the most effective.