

# Solar Ultraviolet Radiation and Fading

A Pacific Energy Center Factsheet

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## Introduction

Ultraviolet radiation (UV) is the part of the electromagnetic spectrum with wavelengths between 10 and 380 nanometers, and is present in sunlight in the range of about 300 to 380 nanometers. These wavelengths, which are shorter than the deepest blue of the visible spectrum, lie just outside our visual perception range. Excessive exposure to UV can burn human skin and fade fabrics. Only about 3% of the solar energy reaching the earth's surface is ultraviolet, but windows can allow much of this potentially damaging energy to enter buildings.

## Damage to Fabrics and Artwork

A common misconception is that the ultraviolet portion of sunlight is to blame for all fading and material deterioration. In fact, all components of solar energy, including visible light and heat (infrared energy), can cause fading of dyes and deterioration of delicate materials like paper and textile art.

Six factors affect color fading and material deterioration. They are:

1. Ultraviolet light
2. Visible light
3. Heat
4. Humidity
5. Chemical vapors
6. Dye fastness

## Windows and UV Reduction

No glazing product can eliminate fading; however, many products offer some level of protection. To completely eliminate all fading would require that windows be boarded up, electric lighting be kept at a bare minimum, chemical and water vapor content of air be strictly controlled, and temperatures be kept low. In fact, this is the approach taken to preserve extremely delicate museum pieces like ancient tapestries.

Household furnishings and artwork may not need this level of care. If fading is a concern, limit the size and solar transmission of windows, block direct solar beams and use a glazing product with UV reduction.

The percentage of UV blocked for various 1/4" glazings is as follows:

Single pane clear	21-34%
Single pane tint	49-64%
Single pane spectrally selective tint	57-78%
Single pane reflective	73-99%
Double pane clear	36-41%
Double pane low-E	50-64%
Double pane spectrally selective low-E	61-79%
Heat Mirror™	99%
Laminate	99%
Applied film	95-99%

The sensitivity of a particular material or dye to each of the damage factors varies. Knowing the sensitivity of the material to be protected helps determine how well a particular glazing product will protect against fading or other deterioration.

### **Healthy Plants**

Another myth about ultraviolet is that plants need it to grow. Actually, UV will burn plants just as it burns the skin. The only portion of solar energy that plants really need is visible light. A good window choice for a healthy plant environment would include:

- UV reduction
- some solar control (to keep the plants from getting too hot)
- some insulation (to control wide temperature swings and keep the plants from getting cold)
- high light transmission

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### **For More Information**

Contact your PG&E representative or call 1-800-468-4743 for more information about PG&E's energy efficiency programs and other services.

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