HISTORIC NEW ENGLAND
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**Property Care White Papers**

# Ultraviolet Protection: Assessment

## Assessing Need for Ultraviolet Protection

To determine the ultraviolet requirements of a property it is necessary to perform a needs assessment to identify sources of degradation, both current and potential, the sensitivity of the materials to the degradation and methods to prevent that degradation. No solution is perfect as the deterioration of materials on display in historic properties is unavoidable. However with sound planning and achievable techniques deterioration can be kept to a minimum.

## Guidelines for Ultraviolet Assessment

- Perform a site visit with collections team staff to review the potential issues at the site
- It is important to understand the nature of light and UV and the general sensitivity of different materials to light
- Review both natural and artificial sources of light in the historic property
- Review current methods of ultraviolet protection and their suitability
- Measure actual ultraviolet exposure

## Technical Information on Ultraviolet Assessment

*Perform a site visit with collections team staff to review the potential issues at the site*

A multidiscipline team is essential for understanding the requirements necessary for protecting both the structure and the collection items.

*It is important to understand the nature of light and UV and the mechanics of ultraviolet degradation*

Light—both visible and UV—is a very small part of the electromagnetic spectrum, which ranges from cosmic rays on the short-wave end, to radio waves on the long-wave end. All forms of electromagnetic radiation are classified according to wavelengths—such as gamma waves, infrared, and microwaves. Wavelengths are measured in nanometers (nm). A nanometer is one billionth of a meter.

The only visible part of the light spectrum is the segment between 400 and 760 nm. Next in frequency is UV radiation—ranging from 40 to 400nm. UV radiation is very energetic and can break chemical bonds making molecules reactive—changing their mutual behavior. This can visually be seen in fading textiles, dry, checking wood, and flaking paint. The atmosphere filters the shorter end of UV radiation and window glass filters a bit more, so the offending radiation is generally wavelengths from about 325 to 400nm. This becomes the part of the spectrum that needs to be eliminated completely in the museum setting. Almost any UV radiation protected material on the market filters to about 380nm. Very few products filter the complete UV spectrum.[1]

[1] Conserve O Gram: *Choosing UV-Filtering Window Films*. The National Park Service: Washington, D.C. Number 3/10, 2001.

There is another source of confusion. Museums measure UV radiation not in nanometers but in microwatts per lumen (μwatts/lumen). This is the percentage of total UV in the light that is being measured. Generally the commonly accepted standard for museums is to not exceed 50-100 μwatts/lumen.

While many people would say "sunlight" causes fading, most damage is from only a small part of the sun's energy or electromagnetic spectrum—the portion called ultraviolet radiation. Though ultraviolet comprises only 2% of the sun's energy, it accounts for an estimated 60% of the fading damage to fabrics and furnishings.[2] The remaining comes from radiant heat and other environmental factors.

*Review both natural and artificial sources of light in the historic property*

It is important to note that artificial sources of UV could also exist in museums. Artificial sources can include black lights, curing lamps, mercury vapor lamps, halogen lights, high-intensity discharge lamps, fluorescent and incandescent sources, and some types of lasers. Although the radiation is low, they can still affect collections.

*Review current methods of ultraviolet protection and their suitability*

UV protection, depending on the application method, can be detrimental to building materials—such as wood sash—and should be evaluated not only on effectiveness but also on potential to damage historic building elements.

*Measure actual ultraviolet exposure*

Measuring UV radiation can determine if more protection is needed in a room or if the UV installations are maintaining their intended purpose.

There are several ways to determine if UV radiation is entering a particular room. These include UV Beads and UV meters.

Ultraviolet Beads are ultra-low cost beads that are extremely sensitive to natural light and change color dramatically from white to various colors when exposed to UV radiation. Containing trace amounts of a photo chromic pigment that responds to the ultraviolet component of daylight, the beads can determine if UV radiation is present, but will not measure a specific amount.

A “Crawford-type” meter uses a dial that gives a range instead of UV radiation in μwatts/lumen. It is comprised of simple optical elements which allow radiation to pass through several filters to give a reading. Newer, electronic meters give a specific number, which can be more accurate.

[2] http://www.seriouswindows.com/performance-specs/seriousglass.html