

University of Michigan Library

Exhibitions: Light-Exposure Policy and Implementation

Introduction

The University of Michigan Library has adopted the following policy for protecting all library and archival materials, especially artifacts in its special collections, from light damage when on display.

To some extent, *all* light is damaging to books, documents, photographs, artwork, and other archival materials commonly held in the University Library's collections. This policy is intended to mediate between a legitimate desire to make the Library's collections available to current scholars and to the public, and the library's responsibility to the claims of future generations to be able to view and use these materials as intact as possible.

The *extent* of the fading of color correlates directly to cumulative exposure to light over time; the *rate* of fading depends on the physical and chemical characteristics of a particular material. This policy posits a minimum of 100 years as the time period after which fading at a level perceptible to the human eye is acceptable. The policy places limits on the exposure of artifacts that are less susceptible to fading damage in order to reduce potential degradation mechanisms that are induced by light energy but may not result in a color change.

Policy and Implementation

Materials are assigned to one of five categories of light sensitivity based on the characteristics of the substrate (paper, papyrus, etc.), printing process, or other medium. The most sensitive component of an artifact determines the category to which it should be assigned. Similarly, lighting levels for a group of materials on display should be adjusted to the most light-sensitive artifact in that group.

Ultraviolet (UV) and infrared (IR) radiation, emitted by many common sources of light, are highly damaging to organic materials but do not enhance or affect human visual perception of the artifact. Therefore exposure to ultraviolet and infrared radiation must be eliminated as much as possible. Specifically:

1. Ultraviolet (UV) radiation must be eliminated or reduced to a maximum of 10 micro-watts/lumen ($\mu\text{W}/\text{Lumen}$).
2. Infrared (IR) radiation (heat) from light sources must be eliminated as much as possible, especially within a closed case.
3. LED bulbs are highly recommended because they emit little/no UV or IR.
4. Illuminance exposure for materials, measured in lux-hours, must be limited as follows (for details about each of the following five categories, see the next pages):
 - **Extremely Sensitive:** limit 500 lux-hours per year. If exhibited, artifact must be placed in dark storage for at least several months following exposure. It is strongly recommended that these artifacts never be exhibited if at all possible and that facsimiles be used instead.
 - **Sensitive:** limit 50,000 lux-hours/year
 - **Intermediate:** limit 100,000 lux-hours/year
 - **Durable:** limit 200,000 lux-hours/year
 - **Permanent:** Permanent materials may be displayed without regard to light levels or duration of exposure.
4. Artifacts must not be displayed partly covered (by a label or another artifact) in order to prevent the development of a visible fade/discoloration line.

Annual exposure limits may be combined for the equivalent of three years' exposure for one exhibition provided the artifact is allowed to rest in dark storage for that number of years before being exhibited again. For example, a document rated Sensitive (limit 50,000 lux-hours/year) may be placed on a three-month exhibition that exposes it to a total of 150,000 lux-hours. The artifact must then be placed in dark storage for no less than three years before being exhibited again. In no case, should exposure for one exhibition exceed three times the annual lux-hour limit for an artifact.

In order to monitor cumulative exposure, certain artifacts in the collection that are in demand for repeated display will be entered in a database and facts of their display recorded (page openings, duration of exposure, location of exhibition, light levels). This information will be used to determine whether permission for a future display, depending on the proposed beginning date and duration of exhibition and projected light exposure, can be granted.

Curators of the University Library's collections have responsibility for the implementation of this policy with the advice and assistance of the Conservation Unit.

Categories of light sensitivity

The following list of the five levels of light sensitivity provides examples of materials for each category. These lists are not exhaustive, and research in this area is evolving. University conservators should be consulted about appropriate ratings for materials not listed here or for ambiguous artifacts.

Extremely Sensitive

annual light-exposure limit: 500 lux-hours/year

We strongly recommend that facsimiles be used for exhibition. The following materials are classified as extremely light-sensitive.

- true blueprints, cyanotypes
- fluorescent dyed paper
- nonpermanent felt-tip pens, including fluorescent colors, highlighters, yellows, and some reds
- handcolored Japanese prints
- ultramarine in watercolor when on an acidic paper; light exposure may increase acidity and cause blue to disappear
- Polaroid photographic prints

Sensitive

annual light-exposure limit: 50,000 lux-hours/year

The following materials and techniques are classified as sensitive:

- paper containing lignin, especially cheap paper, e.g., newsprint, made after 1900; papers with high alum content (mostly post-1900 but some earlier); brittle paper; brown, discolored paper
- most dyed papers, e.g., blue gray, green gray, blue green, pink, particularly if aniline-dyed (post 1850)
- iron-gall ink including twentieth-century fountain-pen ink (assume highest sensitivity, since actual sensitivity can vary widely); if the ink is brown, it is likely that it has already degraded and is acidic and susceptible to fading
- ball-point pen ink, including signatures on documents
- felt-tip pen, e.g., documents with signatures, Inuit drawings
- most duplicating methods, e.g., copy press, spirit duplication, Ditto, Mimeograph, photostat)
- color ink-jet printing
- color photocopies, including those produced on laser printers
- poor quality (especially from developing countries) commercial offset printing inks
- multi-colored tempera images of unidentified pigments, e.g., illuminated manuscripts,

- tempera on paper or other supports such as silk
- pastels: any sensitive colors of cheap or unknown manufacture
- watercolors, including hand-colored prints; any sensitive colors of cheap or unknown manufacture; yellows and reds may be especially sensitive
- gouache: any sensitive colors of cheap or unknown manufacture
- bistre and sepia washes
- albumen photographic prints; most other nineteenth-century photographic processes
- color photographs of unknown quality including older color photographs
- most historic natural dyes on textiles, except indigo and madder on wool
- feathers, low-grade commercial materials used in collages

Specific pigments

All pigments having British Blue Wool or International Standards Organisation (ISO) sensitivity 1, 2, and 3 are classified as sensitive, including:

- gamboge (yellow)
- madder and indigo on cotton
- indigo in watercolor
- thin tints and washes of intermediate pigments, e.g., carmine
- most lake pigments (quercitron, carmine as watercolor washes on white paper)

Intermediate

annual light-exposure limit: 100,000 lux-hours/year

The following materials and techniques are classified as intermediate:

- papyrus
- black and white gelatin prints
- silver dye bleach processed prints
- color slides known to be Kodachrome, Ektachrome, Fujichrome, etc.
- Cibachromes
- color photographs processed after 1990
- gold toned, selenium toned, and other permanently processed photographs

Specific pigments

All pigments having ISO sensitivity 4, 5, and 6 are classified as intermediate, including:

- some traditional dyes on textiles (Padfield and Landi, 1966)
- vermilion (darkens rather than fades)
- Indian yellow
- brilliant reds: carmine, madder lake, alizarin lake

Durable

annual light-exposure limit: 200,000 lux-hours/year

The following materials and techniques are classified as durable:

- good quality rag papers and chemical-wood papers with little alum content
- carbon-based inks, including printing ink (either oil- or water-based)
- black typewriter ribbon; black carbon-paper copies
- carbon-black drawing/writing mediums: graphite, charcoal, chalk, crayon, Conté crayons
- black laser or xerographic toner
- silver- and metal-points drawings (coatings for metal-point papers are probably stable if

- white or lightly tinted, but not if deep colors)
- earth chalks and pigments: ochres, umbers, iron oxides, etc.
- plastics, polyethylene, synthetic resins

Specific Pigments

All pigments having ISO sensitivity 7, 8, and above are classified as durable, including:

- top quality “permanent” colors including watercolors, gouache, pastels, etc.
- modern cadmium red
- ultramarine, most blues
- aureolin (cobalt yellow)
- indigo and madder on wool

Permanent annual light-exposure limit: none

These classes of artifacts are not sensitive to light damage. Note that any hand painting or media applied to these materials may require reclassification under a more sensitive category.

The following materials are classified as permanent:

- stone
- ceramic
- metal
- glass
- wood

Sources

1. Colby, Karen M. A Suggested Exhibition/Exposure Policy for Works of Art on Paper. July 1993, available at The Lighting Resource website: <http://www.lightresource.com/policy1.html>, accessed 2 January 2013.
2. Chapter 1. Exhibition guidelines for photographic materials. *Photographic Materials Conservation Catalog*. American Institute for Conservation Photographic Materials Group. 2004. Available at: http://www.conservation-wiki.com/index.php?title=PMG_Section_1.4.1_Standards,_Guidelines,_and_Recommendations_for_Light_Levels_During_Exhibition, accessed 2 January 2013.