



Environmental and Display Guidelines for Paintings

Introduction

The environment in which paintings are stored or displayed has a significant impact on their condition and long-term preservation.

Environmental factors discussed in this Note are lighting, relative humidity, temperature, pollution, and biological activity (i.e., mould and insects).

Lighting

The materials used in paintings — binding media, pigments, and varnishes — vary in their sensitivities and reactions to light. For example, while some pigments are "permanent" or lightfast, others fade even at low light levels. Since you may not know which, if any, paintings in your collection have permanent pigments, and since lighting schemes are generally set at one level for a group of paintings displayed at the same time, the lighting should be as low as possible to slow the rate at which sensitive colours change.

The effect of light is cumulative, so even low-level light will cause the most sensitive colours to fade noticeably over a matter of decades. Higher levels will cause more rapid colour loss.

To design a rational lighting scheme, an institution must decide how much colour loss is acceptable over what period of time. In the absence of

specific facts about the pigments in paintings, the following information and guidelines may be useful.

Light levels, both visible and ultraviolet (UV), should be measured (see CCI Notes 2/4, *CCI Environmental Monitoring Equipment*) at the surface of a painting.

Ideally, paintings should not be exposed to any ultraviolet light from daylight or from unfiltered, UV-emitting fluorescent lamps. If it is not possible to completely block the UV, levels should not exceed 75 microwatts/lumen (75 μ W/lm). Clear, UV-absorbing films on window panes will reduce the amount of UV light, but **will not** reduce the visible light (i.e., light intensity). Tinted films, however, can lower the visible light significantly. Drapes or blinds on windows will diminish both types of light. Where fluorescent lighting is used, low-UV-emitting tubes or UV-absorbing sleeves are recommended (see CCI Notes 2/1, *Ultraviolet Filters for Fluorescent Lamps*).

The UV from incandescent lights is negligible, but these lights do produce heat. Incandescent floodlights positioned properly on ceiling track systems (see CCI Notes 2/3, *Track Lighting*) are recommended for their versatility. The cooler, more diffused illumination of floodlights is preferable to the heat and intense beam of spotlights and individual picture

lamps. The Daylite Fluro-Spray floodlight is especially suitable (see CCI Notes 2/2, *Daylite Fluro-Spray Floodlight*).

Picture lamps attached to frames should not be used for display. These lamps emit uneven and excessive light and heat.

Light intensity is measured in "lux". Damage by light is directly proportional to **light intensity X exposure time**. For example, exposure to **200 lux for 200 hours** will result in the same damage as exposure to **100 lux for 400 hours** or to **50 lux for 800 hours**. Therefore, reducing light levels from 200 lux to 100 lux will reduce light damage by one-half over the same period of time. Alternatively, shortening the duration of the light exposure by one-half will have the same effect.

Exhibit paintings under the lowest light intensity that allows for their proper aesthetic appreciation.

For many paintings, an intensity level of 50 lux is adequate if a viewer's eyes have adjusted to the ambient light and if there are no adjacent areas with higher light levels. Some paintings or exhibition situations may require light levels of 150 to 200 lux (e.g., for viewing paintings with dark passages; for older visitors who generally need more light to see clearly). Raising the levels only for the required period and then reducing them or turning the lights off entirely will help to minimize light damage.

The intensity of ambient light can be reduced by using a bulb of lower wattage, by changing the angle of the light, and/or by increasing the distance between the light and the painting. For complete control of light intensity, each fixture should be equipped with a dimmer switch.

Intermittent display and/or automatic or visitor-activated light switches will shorten the periods during which a painting is exposed to

light, and will slow the process of colour change. This will preserve the artist's intent for a longer time.

More information on lighting and painting sensitivity can be found in Michalski's article, "Time's Effects on Paintings" (see "Further Reading").

Relative Humidity

Correct relative humidity (RH) is important to the well-being of paintings. The importance of eliminating both rapid fluctuations and extremes in relative humidity (excessive dryness in particular) cannot be stressed too strongly.

Fluctuations in RH can occur seasonally, with day/night cycles, and in proximity to drafts, air vents, radiators, heating ducts, working fireplaces, etc. These fluctuations affect the materials of a painting, creating tensions that eventually result in defects.

During winter months, heating systems produce low levels of relative humidity. In RH conditions below 35%, the size, ground, and paint layers of paintings become more brittle and are more likely to develop cracks. This may lead to lifting paint and to eventual paint loss.

In summer months, the relative humidity in museum environments is often high. Biological activity, particularly mould growth, is encouraged by RH levels above 65%. These high levels may occur in some areas of an exhibition or storage space (e.g., against exterior walls, near water pipes) despite adequate conditioning of the rooms.

The relative humidity for paintings on canvas or wood should be **constant**, somewhere between 40% and 60%. National and international consensus has favoured a constant RH of 50% for the sake of uniformity between lending institutions. Paintings on canvas and wood, however, fare best at an RH of about 60%, at which level their paint and ground layers remain flexible and less prone to cracking.

For paintings on wood, it is particularly important that the RH level remain constant to prevent warping and/or cracking of the wood and subsequent defects of the paint.

Therefore, if a painting on wood has acclimatized to one RH level, it may be detrimental to change it, even to a level that has been recommended. If a change in RH is unavoidable, do this as gradually as possible.

Because of the extremes of the Canadian climate, it is difficult to maintain a constant RH in a room. Keeping higher RH levels in winter may cause problems with the structure of a heated building. A more realistic solution in an air-conditioned building is to set the humidistat at 55% during the summer and at 38% during drier winter months. Given the probability of small fluctuations (plus or minus 3%), this solution prevents RH from rising above 58% in summer or dropping below 35% in winter. The transition from one season to another should be gradual — no more than 5% per month — with daily fluctuations not exceeding 5%.

In the absence of the full environmental control provided by a properly designed air conditioning system, it is possible to achieve some measure of protection with the correct use of portable humidifiers/dehumidifiers and fans. This, however, requires an in-depth knowledge of seasonal levels, trends, and variations within a room; meticulous attention to maintenance of the equipment; and continuous monitoring of conditions. Measures such as keeping doors and windows closed and avoiding display or storage near air vents, radiators, etc. will provide some protection against RH fluctuations.

The only way to be certain of RH levels and fluctuations in an area is to measure them (see CCI Notes 2/4, *CCI Environmental Monitoring Equipment*). A hygrothermograph is recommended for continuous monitoring and recording of relative humidity and temperature levels throughout seasonal cycles.

The RH around individual paintings can be controlled to some extent by applying backing boards (see CCI Notes 10/10, *Backing Boards for Paintings on Canvas*). Glazing a painting to which a backing board has been applied will provide even greater protection. Paintings that are particularly sensitive to environmental changes (e.g., those on wood or ivory) can be enclosed in specially built or modified frames (see article by McKay under "Further Reading").

Temperature

High temperatures can soften a painting, allowing dirt to stick to its surface. Low temperatures cause paintings to become more brittle and more susceptible to damage when moved.

Temperatures should be kept within the human comfort zone. However, lowering the thermostat a few degrees in winter (e.g., from 22°C to 18°C) will help to raise the RH to a more acceptable level.

Atmospheric Pollutants

Pollution is becoming more of a problem everywhere. Not only is it a result of industrial processes and the burning of fuels, but it also emanates from common materials we use for constructing, furnishing, and finishing rooms and display cases.

Problems caused by outside atmospheric pollutants can be greatly minimized by keeping windows and doors closed. Proper filters on air conditioning systems will help. Pollution within a gallery can be controlled to some extent by using recommended materials (e.g., stable paints on walls, carpeting that does not emit harmful gases) and by strictly adhering to non-smoking regulations. Paints, varnishes, and cleaning agents should not be stored in collection storage or display areas.

Insects

Insects can leave very acidic materials (e.g., excrement such as fly specks) on the surfaces of paintings, and wood borers can virtually destroy a wood support.

All incoming objects should be closely examined for signs of insect activity, such as wood dust, tiny flight holes, and burrowing channels. Isolate any affected objects, and consult a conservator for advice.

The most effective safeguards against insect problems are meticulous cleanliness and regular, methodical inspection. Keep doors and windows closed or screened. Avoid using, storing, or leaving beverages or foodstuffs in display and collection storage rooms.

Conclusion

This Note presents ideals towards which an institution can strive, with some guidelines for improving less-than-perfect situations. Even small efforts at controlling the environment in which paintings are maintained will have positive long-term effects on a collection.

Suppliers

UV-absorbing film:

see yellow pages under "Glass Coating & Tinting"

Further Reading

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Copies are also available in French.

Texte également publié en version
française.

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Cat. No. NM95-57/10-4/1990E
ISSN 0714-6221