MINNESOTA HISTORICAL SOCIETY

# Environment Test Kit Manual

**CONSERVATION OUTREACH PROGRAM**
**345 KELLOGG BOULEVARD WEST**
**SAINT PAUL, MINNESOTA 55102-1906**

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## ACKNOWLEDGMENTS

The idea for this kit originated at the Canadian Conservation Institute, Ottawa. The present kit is a revised and expanded version of one that was developed in 1982 by Barbara Moore, then conservator for the Arizona State Museum, Tucson, and Bob Herskovitz, then conservator for the Arizona Historical Society, Tucson.

This kit was initially funded in 1990 by a grant from the Legislative Commission for Minnesota Resources. Since then, the kit and the manual have been augmented and modified several times by staff at the Minnesota Historical Society (MHS). Individuals who have contributed include Celeste Brosenne, Lori Leirdahl, Paul Storch (MHS objects conservator) and Bob Herskovitz (MHS chief conservator). This update and revision (1999) includes additional contributions by Herskovitz and Beth Doyle. Ms. Doyle worked at MHS in 1998 as a conservation outreach intern supported in part by a grant from the Land O'Lakes Foundation, St. Paul.

## INTRODUCTION

If an object, textile, book or paper artifact is stored, exhibited and housed in a proper environment, its life span will be longer than those from poor or fluctuating conditions. Major factors contributing to the longevity of an object's life include stable and proper temperature, appropriate levels and stability of relative humidity, and reduced levels of visible and ultraviolet light in the building and its storage areas. Other factors are control of insects and pests, and the type and quality of housing material used to make the folders, boxes or other storage and exhibit housings.

The Environment Test Kit is designed to help museum, library and archives personnel identify and remedy environmental problems in their institutions. Armed with more information and options, one can significantly reduce artifact deterioration and increase the useful life span of collections.

Air pollution, consisting of particulate and gaseous contamination, is another aspect of the museum or library environment. Although a potentially serious problem, current technology for measuring air pollution at levels low enough to be significant to collections requires a level of instrumentation and technical expertise beyond the scope of this kit. The chapters in Part I of *The Museum Environment* (included with this kit) are informative and should help you understand the issues.

*The Museum Environment*, by Garry Thomson, offers many suggestions for improving both light and relative humidity levels. These suggestions range from the simple and relatively inexpensive to the more complex and costly, which require long range planning. Parts of the book are straight forward and easily understood. Part II is more complex and intended for people with some technical background. Please do not be discouraged by the complex aspects in the second part of the book, and take advantage of what you can.

If you have any questions about the instruments, instructions, or supplies and services lists (see page 17) that accompany the Environment Test Kit, please contact the Minnesota Historical Society Conservation Outreach Program at 651/297-1867, 1-800-657-3773, or email: conservationhelp@mnhs.org.

## LIGHT

All organic materials (paper, photographs, textiles, leather, fur, feathers, baskets, etc.) suffer deterioration as a result of exposure to light. This happens because light is a form of energy. When light strikes an object, part of it is absorbed and part is reflected. The reflected portion is what enables us to see something. The absorbed energy does not vanish, but is converted into heat or becomes the energy that drives chemical reactions. These reactions cause degradation in the form of embrittlement and discoloration of fibers, fading of pigments and dyes, and deterioration of varnishes and paint media.

The deterioration that an object will suffer from exposure to light is cumulative over its life. The amount of damage is the function of many factors but will always depend upon the length of time it is exposed, the level of visible illumination, and the ultraviolet content of the light.

The length of time an object is exposed to light can be controlled. All sensitive materials should be stored in a dark room, or in cabinets or containers so that it is not exposed unnecessarily. When light-sensitive objects are on exhibit, precautions should be taken to limit time of exposure: Lights should be turned off and window blinds drawn when the building is closed; extremely light-sensitive objects should be exhibited for a limited time only, then rotated with similar objects from storage; and motion-activated switches can be installed.

The level of illumination to which a sensitive object is exposed is as important as the length of time it is exposed. Illumination can be measured in lux, foot-candles or lumens per square foot. We have provided an instrument that measures in lux, as this gives us the ability to monitor and discriminate differences that we frequently cannot see. These differences, although they may be subtle, will make a significant difference over time.

As different materials are variously sensitive to light damage, the following limits are recommended for objects on exhibit:

| | | |
|---|---|---|
| **High Sensitivity** | Paper, photographs, prints, books, dyed leather, fur, feathers, baskets, watercolors. | **50 lux or 115,000 lux-hours** |
| **Medium sensitivity** | Oil paintings, panel paintings, wood, undyed leather, un-upholstered furniture. | **150 - 200 lux or 345- 460,000 lux-hours** |
| **Low sensitivity** | Stone artifacts, metal, most ceramics, glass. | **300 lux or 700,000+ lux-hours** |

Since damage to collections from light is a function both of intensity and length of exposure, it is helpful to think of exposure in terms of **lux-hours**. Lux-hours are calculated by multiplying the intensity of visible light (measured in units of lux) by the number of hours an artifact is exposed to that light. For example, if the lights on your exhibits are on for 10 hours per week and an object is exposed to 50 lux, its exposure can be expressed as 500 lux-hours (10 x 50 = 500). These factors have a reciprocal relationship, so if the numbers are reversed (50 hours at 10 lux), the result is still 500 lux-hours. Therefore, any combination of reducing the intensity or duration will result in a lower exposure that translates to less damage to the object.

If a museum is open seven days a week, from 10 AM until 5 PM, Tuesday through Saturday, and until 9 PM one night a week, and from 12 noon until 5 PM on Sunday, the lights on the exhibits are on 44 hours per week. If a light-sensitive item is lit at 50 lux, the result is an exposure of 2200 lux-hours for the week (50 x 44), or 115,000 (rounded up) for the year. Each institution needs to establish maximum exposure to light based on its particular needs and circumstances. The table above gives guidelines that MHS often uses for maximum

annual lux-hours in the three categories of sensitivity listed.
If you find that the light levels to which your exhibited materials are exposed are higher than the recommended levels, you should consider lowering light levels or reducing the length of exposure. To achieve reduced intensity, lights can be placed farther from objects; incandescent bulbs can be replaced with bulbs of lower wattage; dimmer-switches could be used to reduce levels; and black electrical tape can be stuck on UV filters over fluorescent tubes in exhibit cases (see next section). You will find more detailed advice on lowering light levels in *The Museum Environment* or you can contact the MHS conservation outreach program. The procedures for operating the Lux Meter are described on page 6.

The third important contributor to light damage is light in the ultraviolet (UV) range. Due to its high energy content, light in the ultraviolet range is especially damaging and should be filtered as completely as possible. It is also important to note that UV light does *absolutely nothing* to aid in the visibility of an object; eliminating UV entirely will not in any way change people's ability to see artifacts on exhibit.

Incandescent lamps emit some UV, but provided that readings are not above the recommended levels (50 lux, 150 lux, or 300 lux) this is not generally considered a serious problem. Exceptions are low voltage track lighting systems, some of which have been observed to have UV outputs that exceed some fluorescent lights. The light sources that most frequently contain dangerous levels of UV are daylight and most fluorescent tubes.

The UV component can be largely eliminated from light by using special filters. A number of products are available to cover fluorescent tubes. Ultraviolet filtering films can be applied to windows. Window glass can also be replaced or double-glazed with UV filtering acrylic sheets such as Plexiglas UF-3. Equally, exhibit cases can be constructed with this material, and pictures and photographs can be glazed with it.** You can test whether the light in your museum contains too much UV with the ELSEC 764+ UV Monitor included in the kit. The instructions for operating the UV monitor are described in this manual.

***Pictures that should not be glazed with acrylic sheet include works in charcoal, pastel, or any other containing a powdery medium. An acrylic sheet is surrounded by an electrostatic charge that will lift powdery media from the paper or board substrate.*

## DIGITAL LIGHT METER


The light meter in the kit has been upgraded to the ELSEC model 764. This meter measures both visible and ultraviolet (UV) light that formerly were measured using two instruments in this kit. Both visible and ultraviolet light readings should be recorded and kept on file for future reference on a form such as the sample on page 9.

VISIBLE LIGHT

To take a reading for visible light, hold the meter close to the item being measured (the closer the better) and point the two white circles (the sensors) toward the source of illumination. Press the yellow button marked "Vis" for approximately one second, being careful not to 'shadow' the unit with your arm or body.

The green LCD display screen will first change to one that reads "ELSEC 764 UV Monitor" and then to a screen with the visible light reading. The meter has been set to read in units of lux, so the top line on the screen will read "Lux" and the number below it (for example 254) will be the amount of visible light striking the sensors. Disregard the next two lines that read "Min." and "Max." The bottom line will begin with an "H" indicating that the meter has taken a reading and is holding it. The current date and time are also displayed on the bottom line. The meter will display the reading for about 10 seconds and then shut off automatically.

If you hold the "Vis" button for approximately 3 seconds, the meter will change to a mode to take continuous readings. This will be indicated by a small diamond "◆" at the beginning of the bottom line of the LCD display screen instead of the "H". As you move the meter, the reading will change according to the light level in its current location. This feature allows you to move the meter over an item to determine the evenness or uniformity of the lighting. To shut off the continuous reading mode, press the "Vis" button again. The unit will switch to the "H" mode, hold the reading being displayed when the button was pressed, and then shut off after 10 seconds.

ULTRAVIOLET LIGHT

The ELSEC 764 UV monitor measures UV in two ways. Museums, libraries, and archives use a measurement that is the proportion of UV radiation to visible light coming from a light source. The unit of measurement for this is microwatts per lumen, which is abbreviated as "μw/lumen". Using this form of measurement means that, theoretically, it does not matter how far the instrument is from a light source, the proportion of UV to visible light will remain constant for that light source. Since this does not seem to work in practice, it is important that the meter be held close to the object to get an accurate reading of the amount of UV that is striking the object.

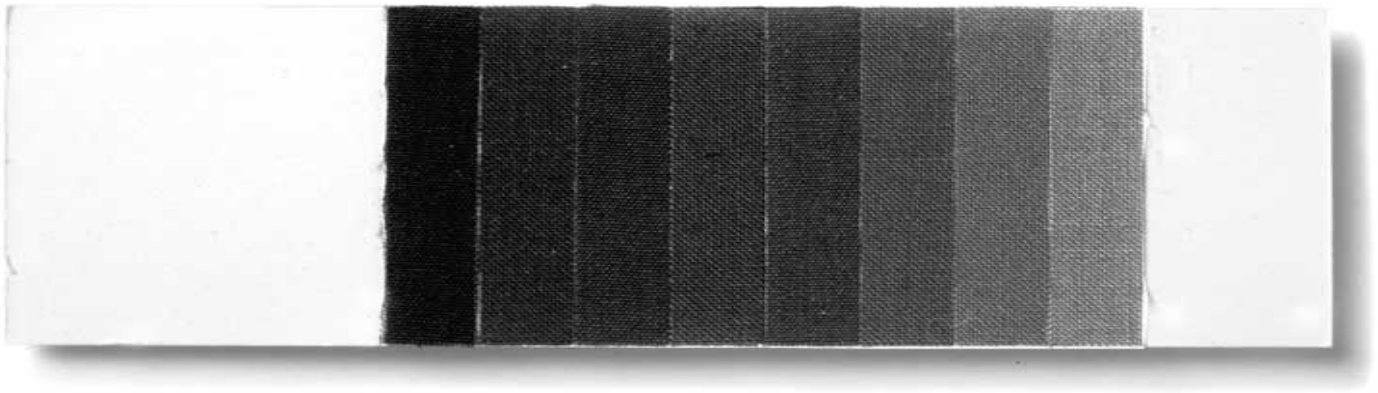
Since the energy from UV is very damaging and does not contribute anything to visibility, the goal for museums, libraries and archives should be to eliminate all UV. In practical terms, a reading no greater than 10 μw/lumen should be the objective. A reading greater than 10 μw/lumen means that filtration is necessary for the protection and

preservation of light sensitive artifacts (see table on page 4). The proportion of UV in daylight is high, so the first priority is to ensure that all daylight is filtered. Most fluorescent lamps also contain a high percentage of UV, although several bulbs are available with UV filtering built into them. The meter will show whether a filter is required and whether a filter that has been installed is still effective.

Measurement of ultraviolet light with the meter works the same way as with visible light. To take a reading, hold the meter close to the item, point the sensors toward the source of illumination, and press the button marked "UV." The first screen will read "ELSEC 764 UV Monitor" and then the meter will switch to a second screen. The top line of this screen will read "UV μw/lumen". The number on second line will be the measured amount of ultraviolet light present. Also, as with visible light, the meter can be set to take continuous readings of UV by holding the "UV" button for approximately 3 seconds. The continuous reading mode is indicated by a small diamond "◆" at the beginning of the bottom line of the LCD display.

NOTE: A "B" at the beginning of the bottom line of the LCD display of the ELSEC 764 meter signifies that the batteries are low and should be replaced. The meter uses 2 AA alkaline batteries. Spare batteries should be in the case in which the meter came. The battery compartment is accessed by unscrewing the single Philips head screw at the bottom center on the back of the case and removing the small, rectangular cover.

## THE BLUE WOOL STANDARDS CARD



The Blue Wool Standards card included in the kit will enable you to document the cumulative detrimental effect of light on light sensitive materials that you are exhibiting.

The Blue Wool Standards card contains eight samples of wool-dyed blue. The dyes are selected so that standard number 2 takes about twice as long to be perceptibly faded as standard 1, standard 3 about twice as long as standard 2, and so on.

To use the card, cut it in half lengthwise, and put one half in an envelope and place it in a drawer or cabinet where it will be completely protected from light. Place the other half of the card on a wall or in a case so that it receives as much light as the brightest part of the exhibit. You can use the digital light meter to determine this spot. Alternatively, place the whole card at the brightest spot and cover one half with heavy paper or card stock, so that no light reaches the covered half of the card. Record the date that the card is installed, as well as the location and amount of light that is striking the card. You might want to record the information on the back of both halves of the card to eliminate confusion.

To monitor the cumulative effect of light, remove the stored half of the card and compare it to the half placed in the exhibit at least once a month or two. Be sure to record the dates checked. If fading begins to occur while the exhibit is up, then the level of illumination and/or the UV content of the light at that spot is too high for sensitive materials and should be reduced.

The blue wool card in this kit is intended for you to keep. Use it for monitoring the light level in a storage or exhibit area in your institution.

# LIGHTING REPORT

**INSTITUTION:** **BUILDING:**

**EXHIBITION/STORAGE SPACE:** **DATE:**

**Instrument(s) Used:**

| Location | Time (If lit or effected by daylight) | Filters Y/N | Type of Lighting: Incandescent, Tungsten, Fluorescent, and/or Daylight | Visible Light Lux ☐ Foot candle ☐ | UV (microwatts/ lumen) | Remarks |
|---|---|---|---|---|---|---|
| | | | | | | |

Adapted from: Lafontaine, R.H., "Recommended Environmental Monitors for Museums, Archives and Art Galleries," *Technical Bulletin 3,* Ottawa: Canadian Conservation Institute, July, 1978

## TEMPERATURE AND RELATIVE HUMIDITY

Other factors that are critical for good long-term preservation of objects, textiles, books and paper are the levels and stability of temperature and relative humidity (RH).

Materials that contain moisture — wood, leather, textiles, bone and ivory, glues — expand and contract with changes in the relative humidity of the air around them. When changes in humidity occur at rates that exceed the artifacts' ability to adjust, such dimensional changes may lead to cracking, splitting and detachment of surface coatings such as paint and veneers. Conditions that are too dry lead to shrinking and embrittlement of organic materials. Conditions that are too damp lead to corrosion of metals, and risk of mold growth on organic material.

A stable RH between 35 and 50 percent and temperature between 65 and 70 degrees Fahrenheit are recommended for museums and libraries with mixed collections. Certain materials, in particular archaeological metals, may need a lower relative humidity. Organic materials would benefit from a lower temperature, which may be possible to achieve in storerooms. Most photographic negatives stored for *extended* periods of time are best kept between 20 to 30 percent RH and 50-65 degrees Fahrenheit. Negatives that are accessed and used relatively frequently should be kept in conditions that are closer to the RH and temperature of the environment in which they are used.

An institution can do a great deal, even on a small budget, to improve and stabilize its relative humidity. Objects that are particularly vulnerable to changes in RH such as musical instruments or painted or inlaid objects can be buffered from rapid variations simply by being stored in closed boxes or exhibited in cases rather than in the open air. Another way of buffering a building against rapid changes of RH is to use as many hygroscopic materials as possible within the building — cork, natural fiber curtains and carpets, homasote board, wood, etc. The same can be done inside exhibit cases.

Beyond these measures, humidifiers and dehumidifiers can be installed. Institutions might want to consider such an expenditure, particularly for chronic problem areas such as damp basement storage rooms. The relevant sections of *The Museum Environment* give further details on various types of equipment that is suitable for museum use. Installation of humidification systems into old and historic structures, however, is not without pitfalls. A historical architect who has experience in such matters should be consulted if a major installation is being considered. If you have questions about these issues, please contact a conservator at the Conservation Outreach Program.
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## THE PSYCHRO-DYNE PSYCHROMETER


The Psychro-Dyne psychrometer will enable you to quickly determine accurate relative humidity (RH) as well as temperature in different locations in your facility. It is best to take readings in several places in the building, since conditions can vary for many reasons. The RH may vary from storage area to storage area, and between storage areas and exhibit areas. It is also important to check "dead air" spaces such as closets, vaults, attics, or basements where air may be stagnant or locations where atypical climatic conditions may exist.

It is also important to take readings at least twice a day. If the building systems are less than adequate, the RH may be different early in the morning compared with late in the day after lights have been on, and people have been opening and closing doors. Also, the RH may vary from summer to winter due to air conditioning or forced air heating systems. You should borrow the kit more than once a year to ensure representative readings.

To operate the psychrometer, first remove the plastic water bottle that contains distilled water from its compartment inside the instrument. To do so, lift the cover from the left side of the instrument and remove the plastic bottle. To wet the cotton wick, flip up the spigot of the bottle, hold the spigot just above the wick, and saturate the wick with water one drop at a time until the wick is thoroughly wet. Be careful not to get any water on the other thermometer. Replace the water bottle and close the instrument cover. (CAUTION: If the bottle needs to be refilled, use only distilled or de-ionized water.)

To take a reading, hold or set the instrument horizontally with the graduations of the thermometers facing the operator. Turn the on-off control knob clockwise, until it clicks. This will start the fan motor and air will begin to flow past the thermometers. Let the instrument run for at least two minutes, until the temperature in both thermometers remains constant. It will take slightly longer for the wet bulb thermometer, the one on top, to stabilize. If the temperatures do not stabilize after three minutes, the fan motor is probably running too low due to weak batteries.

The Psychro-Dyne uses three alkaline D-size batteries. Be sure to turn the fan motor off after each observation, since unnecessary usage will reduce the life of the batteries.

aligned, read the RH under the black arrow to the left of the scales. Note that the RH scale increases from left to right. The upper scales on the slide rule need to be used if you obtain a temperature reading of less than 50 degrees F.

An example of a data sheet to record and keep your findings is included in this manual (page 14). The spaces for calibration method and dates are for an institution that uses this form to record readings from an electronic (digital) hygrometer. The psychrometer in this kit does **not** require periodic calibration.

After the temperatures have stabilized, read the wet bulb and dry bulb temperatures. Use the psychometric slide rule to determine the RH. Align the wet bulb and dry bulb temperatures on the two scales on the bottom of the ruler until they are opposite each other. After the two scales are
To measure and record temperature and humidity over an extended period of time, a datalogger may be used. This small, self-contained instrument measures temperature and RH and logs that information to a microchip. When the data is downloaded, it can be printed so that it is shown as both statistics in a chart and as a graph. The Conservation Outreach Program has several dataloggers that are available for loan. If you would like to borrow one, please contact Outreach Program staff to schedule a loan. There is no charge for this service; your only expense is return postage and insurance.

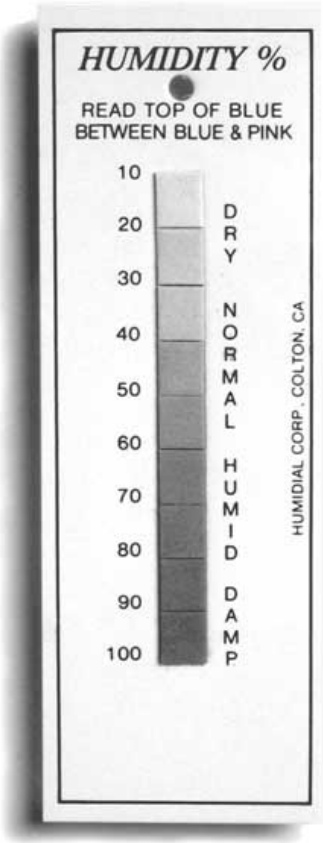
## HUMIDITY INDICATOR CARD

A humidity indicator card is a simple and inexpensive way to check the relative humidity (RH) at a location. The indicator card can be placed on a shelf, in a storage cabinet, or in an exhibit case. After placing the indicator card in the area, allow several hours for it to acclimate before recording a reading. The cards are not intended for precision readings, but are intended to indicate problems with either high or low RH; their accuracy is plus or minus 10 percent RH.

To read the humidity indicator card, find the top of the block that shows all blue, then read the figure from the numbers alongside the blocks. It is best to read when holding the card at arms-length, as heat and moisture from your body may affect the reading. The bluer the card, the drier the air. It is a quick and easy matter to have a staff person check the card frequently if there is a problem. It is important to keep a written record of the readings for later reference.

If the card indicates an extreme condition, a more sophisticated device such as a psychrometer or a hygrometer may be appropriate to get a more accurate reading. A recording hygrothermograph or a humidity datalogger will produce precise readings in written form so that the data may be saved and shared with the appropriate administrator or maintenance personnel. The humidity indicator cards are not easily damaged, but are affected by ammonia fumes and water. Care should be taken that the cards do not become wet.

Please keep the humidity card in this kit for use in a storage or exhibit area at your institution.



# RELATIVE HUMIDITY AND TEMPERATURE REPORT

**INSTITUTION:** **BUILDING:**

| Room | Date | Time | RH % | Temp °F | Remarks |
|---|---|---|---|---|---|
| | | | | | |

**Instrument(s) Used:**

**Date of Last Calibration:** **Calibration Procedure:**

**Comments on Records:**

Adapted from: Lafontaine, R.H., "Recommended Environmental Monitors for Museums, Archives and Art Galleries," *Technical Bulletin 3*. Ottawa: Canadian Conservation Institute, July 1978.

**pH PEN**


Acid-free and lignin-free paper and board have many uses in museums, libraries and archives. They are used to make exhibit supports, boxes, cartons, folders and other housings that protect collections from dust, handling, and climatic fluctuations in storage. They also deter the risk of acid migration. Acid migration is the term used to describe the transfer of acid from poor quality paper or board to collections that are in contact with them. The transfer of acid from the storage materials to the object, whether book, document, textile or other artifact, causes deterioration in the form of discoloration and embrittlement. This damage is frequently irreversible. To prevent this, use acid-free, lignin-free materials whenever possible.

Acid-free lignin-free paper and board with a 3 percent alkaline reserve buffer is recommended for most materials. The exceptions to this are photographs, blueprints, and silk and wool objects that should not be stored in contact with alkaline buffered paper. For these types of artifacts, a pH neutral, non-buffered, lignin-free paper is available from suppliers of archival materials. Consult the supplies list on page 17.

The Abbey pH pen in this kit offers a convenient and portable way of distinguishing between acidic and alkaline paper and board. Since it leaves a permanent mark, it should never be used on artifacts, books or archival collections. It should be used on storage and packing materials only.
To test a piece of paper, draw a line on the paper and observe the color as soon as it dries. The following chart indicates the pH content:

| | |
|---|---|
| **Definite purple color** | **Above pH 6.8** |
| **Yellow-brown or tan color** | **Between pH 6.8 and 6.0** |
| **Definite yellow color** | **Below pH 6.0** |
| **Light yellow or colorless** | **Below pH 5.0** |

Coated paper may have one pH on the surface and another in the base sheet. Tear the paper slantwise to get a diagonal cross-section, and run the pen across the torn surface.

The Abbey pH pen is most effective for determining pH 6.8 or above. If you need to distinguish the pH of papers below 6.8, it is better to switch to another indicator. Refer to the supplies list on page 17.

Paper can be relatively long-lived if its pH is as low as 6.0, provided it is well made and carefully used and stored. In order to last for centuries in today's polluted air, it must have an alkaline reserve of at least 2 percent calcium or magnesium carbonate. This usually implies a minimum initial pH of 7.0 or 7.5.

Please keep the pH pen in order to check paper and board storage materials that you purchase or use.

## INTEGRATED PEST MANAGEMENT


The goal of an Integrated Pest Management (IPM) program is to eliminate an infestation or to detect a problem involving insects or pests in its early stages before it has a chance to damage collection material. Early detection can often reduce or eliminate the need to have harmful and dangerous chemical poisons in your facilities. An effective pest monitoring program includes laying and regularly checking traps, inspecting collection material for infestation, educating staff about the warning signs of infestation, and taking effective action when a problem is first detected.

Systematic trapping and inspection are essential. A common and inexpensive method is the use of sticky traps or "blunder traps." Sticky traps are usually tent-shaped and have one surface coated with sticky glue. When pests "blunder" into them they get stuck and cannot escape. These traps are available from hardware stores, pest control businesses, or museum conservation suppliers. Each trap should have a number written on it and its location recorded. Ideal locations include exhibit and storage areas, staff break areas, and other locations where insects may infiltrate collections. Traps should be placed along walls, on windowsills, and near entrances.

Checking the traps once a week for the first three to six months is recommended. When checking the traps, record the date it is checked; type of pest(s) in the trap (also record if it is a museum or non-museum pest, and whether it is an adult or larvae); and number of pests found. Replace traps when there are too many insects to keep an accurate weekly accounting of new bugs, or when there is no room left on the glue surface to effectively trap insects. For example, if you find one insect in a week, record the insect and leave the trap in place. If there are numerous (5-10) insects in the trap, you may want to replace the trap with a fresh one. If a trap remains empty for one month, it can be moved to another location you wish to monitor.

Accurate identification is essential if an insect is discovered, especially for those species that attack museum objects. Identification of the insect yields its life cycle, nesting and breeding habits, and the food source for the pest, all of which will be helpful in eliminating the pest from your building. The identification of an insect can be made using a reference book (see "further readings") or by contacting the local agricultural extension office, pest control business, or university entomology department. Additionally, collecting samples is useful for identification. To do this, keep a collection of empty photographic film canisters, small glass vials, or other similar containers on hand. It should be mentioned that identification is easiest if the insect is left whole, not crushed to death.

Elimination of food sources and nesting materials, and maintaining a cool, dry environment may eradicate the intruders with no harmful side affects to collections or staff. It should be stressed, however, that serious infestations need professional attention. If museum pests are discovered, contact a conservator for advice regarding treatment options for infested museum objects. Quarantining infested objects is almost always the first step to take. A non-chemical method of killing pests and eggs in an infested artifact involves freezing; the chart (below) provides some use data on life cycles that you will need if you use this method. You are encouraged to contact the Minnesota Historical Society Conservation Department with any questions regarding eradication procedures or chemicals proposed for use.

## INSTRUCTIONS FOR USING STICKY TRAPS

1. Number each trap individually and place the traps in collection storage and exhibit areas. Record the location of the trap and trap number on your record sheet.
2. On your record sheet, record the date each trap is placed in position.
3. Check traps once a week and record any findings.
4. Replace a trap when there are too many insects in it to keep an accurate accounting, or when there is no more room on the glue to effectively trap any more bugs.
5. Traps that remain empty for one month may be moved to another location. When a trap is relocated or replaced be sure to note its new location on a separate line on the record sheet.
6. Review the data at least monthly to see if there are areas where concentrations of insects are being detected. If this is the case, consult with a pest control professional or a conservator for advice on how to eliminate the problem.

### STICKY TRAP RECORD SHEET

| Trap number | Location | Date Placed | Date(s) Checked | Number of Pests | Pest Type(s), museum or non-museum, adult or larvae |
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**Notes:**

# COMMON MUSEUM PESTS[1]

**This list is <u>not</u> an inclusive list of pests that may attack museum objects; rather these are some of the more common pests that may be found invading museum collections.**

| Common Species Name | Food source(s) | Egg hatching cycle |
|---|---|---|
| Booklice | Microscopic mold, paste, glue. | 6-9 days |
| Casemaking Clothes Moth | Hair, hides, feathers, some plant material, freeze-dried specimens. | 4-7 days |
| Cigarette Beetle | Seeds, paper, spices, drugs, grain and cereal, botanical specimens, insect specimens, silk, rodent bait. | 6-8 days |
| Cockroach (American, German, etc.) | Starchy materials, sugary or fermented foods, leather, parchment. | 14-50 days (varies) |
| Common Carpet Beetle | Wool, hair, fur, horn, skins, hides, feathers, insect specimens. | 13-20 days |
| Firebrats | Paper, starchy foods, bookbindings, textiles, wallpaper, sizing, linen, possibly cotton. | 14-48 days |
| Hide Beetle | Bones, carcasses, wool, wood, cork insulation into which larvae burrow pupal chambers. | 2-4 days |
| Powderpost Beetle | Unfinished hardwood, picture frames, hardwood artifacts, bamboo, basketry. | 6-15 days |
| Silverfish | Paper, starchy foods, bookbindings, textiles, wallpaper, sizing, linen, possibly cotton. | 19-43 days |
| Termites | Anything containing cellulose, structuralhighly variable wood, furniture, crating. | |
| Varied Carpet Beetle | Insect specimens, wool, fur, hair, bristles, horn, skins, hides, feathers, drugs, spices, grains, cereals. | 17-18 days |
| Webbing Clothes Moth | Hair, feathers, fur, wool, upholstered furniture, piano felt, natural bristles, lint. | 4-10 days |

[1] Information from Zycherman, Lynda A., et al., *A Guide to Museum Pest Control.* Washington, DC: American Institute for Conservation and Association of Systematics Collections, 1988.

## SUPPLIERS FOR EQUIPMENT AND MATERIALS

**Blue Wool Standards Cards**
Conservation Support Systems
PO Box 91746
Santa Barbara, CA 93190-1746
Phone: 805/482-6299
Fax: 805/682-2064
E-mail: css@silcom.com

Talas
568 Broadway
New York, NY 10012
Phone: 212/219-0770
Fax: 212/219-0735
E-mail: info@talasonline.com

University Products, Inc.
517 Main Street
PO Box 101
Holyoke, MA 01041-0101
Phone: 1-800/628-1912
Fax: 1-800/532-9281
E-mail: info@universityproducts.com

**Digital Lux Meter**
Art Preservation Services
315 E. 89th Street
New York, NY 10128
212/722-6300

Conservation Resources International
800-H Forbes Place
Springfield, IL 22151
Phone: 800/634/6932
FAX: 703/321/0629
E-mail: criusa@conservationresources.com
www. conservationresources.com

Dickson Company
930 So. Westwood Avenue
Addison, IL 60101-4997
Phone: 1-800/323-2448
Fax: 1-800/676-0498
E-mail: info@dicksonweb.com

Edmund Scientific Company
101 E. Gloucester Pike
Barrington, NJ 08007-1380
Phone: 609/573-6250
Fax: 609/573-6295
E-mail: scientifics@edsci.com

Gaylord Bros.
PO Box 4901
Syracuse, NY 13221-4901
Phone: 1-800/448-6160
Fax: 1-800/272-3412
Web site: www.gaylord.com/archival

**Fluorescent Fixture Cube Cell Lenses, Louvers**
Lighting Plastics of Minnesota
3326 Gorham Avenue
St. Louis Park, MN 55426
612/920-1400

local lighting/electrical suppliers;
Lumberyards

**Neutral Density Film**
Norcostco
attn. Kristi Jereska
3203 N Highway 100
Minneapolis, MN 54222
612/533-2791

**Track Lighting - Track, Fixtures, and Filters**

Halo
Customer Service
1121 Highway 74 South
Peachtree, GA 30269
770/486-4801
www.cooperlighting.com

Juno
1300 S. Wolf Road
PO Box 5065
Des Plaines, IL 60017
847/ 827-9880

Lighting Service Inc.
Stony Point Industrial Park
2 Kay Fries Drive
Stony Point, NY 10980
914/942-2800

Lightolier
631 Airport Road
Fall River, MA 02720
508/679-8131
www.lightolier.com

Also, local lighting/electrical suppliers;
Lumberyards

**UV Filtering Sheet Material**

Cadillac Plastic & Chemical Co.
1218 Central Ave. NE,
Minneapolis, MN 55413
612/781-6586
1-800/274/1000

Crown Plastics
12615 16th Ave. N.,
Plymouth, MN 55441
612/557-6000

**UV Filtering Sleeves (for fluorescent tubes)**

Light Impressions
439 Monroe Avenue
PO Box 940
Rochester, NY 14603-9952
Phone: 1-800/828-6216
Fax: 1-800/828-5539
www.lightimpressionsdirect.com

Talas
(See previous listing)

**UV Filtering Window Films**

See "Window Tinting and Coating" in your local Yellow Pages.

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This list is provided as a service by the Minnesota Historical Society. The Society does not endorse the products of any particular company and assumes no liability for the products sold by the firms listed.

If you have questions, contact the Conservation Outreach Program, Minnesota Historical Society by phone at 651-297-1867 or 1-800-657-3773, or by email at: conservationhelp@mnhs.org.

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