Paintings, Prints and Drawings

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Introduction

There exists in nature processes by which matter changes its form and when the change in form is undesirable we sometimes call the processes deterioration or degradation. Chemical, physical and biological agents may act in many varying ways, for example simultaneously or consecutively, to bring about the degradation of materials. The relationships between a storage system for material of cultural significance and its surrounding environment are thus extremely complex.

If we are to plan a storage network suitable for preservation purposes we must consider not only the physical aspects of storage design but the interplay between the storage system and the environment. Furthermore, the environment must be seen as operating at macro and micro levels, if we are to fully understand its effects. The ultimate process by which degradation occurs may be represented by the following general equation:

$$\text{Material} + \text{Energy} \quad \begin{bmatrix}\text{Chemical}\\ \text{Physical}\\ \text{Biological}\end{bmatrix} \longrightarrow \quad \text{Material}^*$$

The resulting product (material*) represents matter which has undergone some change in state. To preserve material, a storage system must thus reduce possible energy changes which may take place as a result of chemical, physical or biological interactions with the material in question. In many cases we know from experience what factors cause deterioration. Our knowledge generally fails in the details of deterioration processes: mechanisms and most importantly in the rates at which deterioration occurs.

Before examining the requirements for the storage-preservation of pictorial material I think it is appropriate to examine what we mean by the term 'standard' and attempt to interpret how it relates to environmental control and storage practice for materials. The word 'standard' as it applies in the present context, may be defined broadly as: *a model for imitation or guidance.* Standards for storage design and environmental control may thus be viewed under two broad categories:

1. General standards suitable as guidelines for performance.

2. Specific standards which should be closely imitated.

Much of the information we have regarding storage design is based on cumulated experience of an essentially qualitive nature. Generally there is some uniformity of opinion regarding the best method or methods for storage, however, in some cases where there is some uniformity of opinion it has not been reconciled with contrary opinion which I think is a necessary requirement in the production of a realistic or universal standard. Many of the standards presented in the following text are tentative and in essence 'standard' because they are popular. Popularity does not necessarily mean that a method is the most suitable, the most efficient or practical. There is thus a need for a logical examination and the development of much of our experience regarding storage systems for preservation. For the purposes of this paper, standards for environmental control and those for storage systems will be treated individually. Such divisions are somewhat arbitrary although reasonably useful. Much of the subject matter which should be included in this paper has already been discussed in detail by previous speakers to the conference. Therefore most of the material for this paper will be treated quite briefly.

The Environment

Environmental standards for the preservation of pictorial collections are concerned with the definition of the methods of control and the levels of

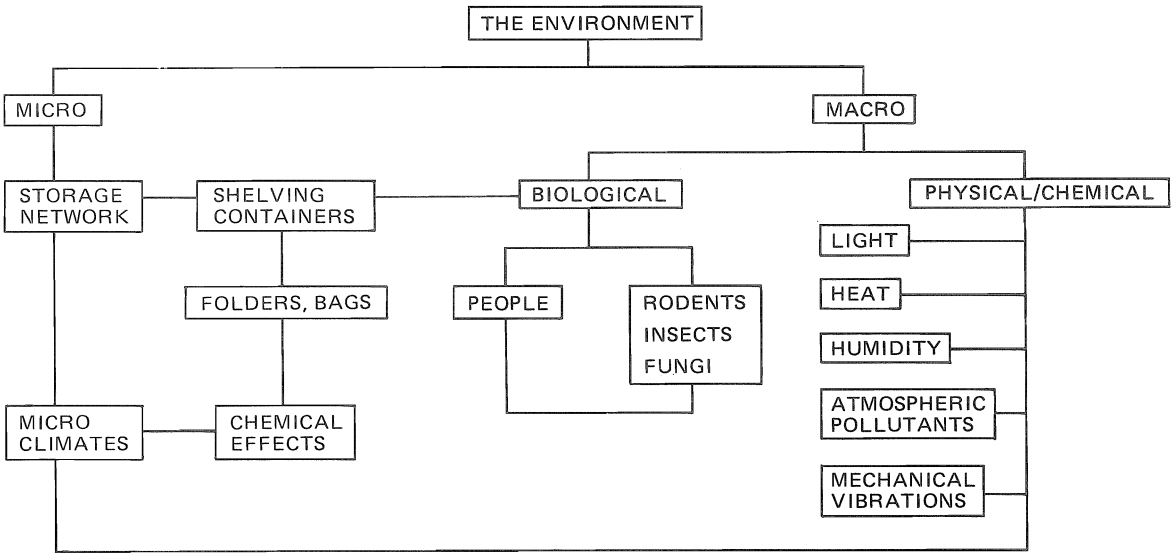

Fig. 1 The Environment and a Storage Network

control required for the following parameters which may interact with materials:

1. light
2. temperature/heat
3. humidity (atmospheric water content)
4. atmospheric pollutants:
   - particulates
   - aerosols
   - gases
5. vibrational movement:
   - mechanical vibrations through solid materials.
   - vibrations transmitted through the atmosphere including those produced by sound.
6. biological systems:
   - man
   - rodents: rats and mice
   - insects
   - fungi

The relationships among these various parameters and a storage network are schematically summarised in Figure 1.

The development of control standards designed to reduce the rates of deterioration of material are related to two factors:

1. The intended use of the material.
2. The inherent nature of the material in structural and chemical terms.

It is impossible to produce methods of control which will be ideal, because standards specified will not be completely suitable for each specific object in a collection of many objects. Economic and user considerations may create a situation far from the ideal or in direct conflict with the aim to preserve a collection. At best and in the majority of situations, control conditions can achieve only an average improvement in stability for each object.

Environmental Control Standards

Light. Generally the damage caused by light to pictorial materials cannot be entirely eliminated because of user considerations. However, the rate of damage may be reduced by the following methods of control:

elimination of ultraviolet radiation produced by light sources.

elimination of the heat transmitted from light sources.

the reduction of illumination levels.

These three processes of control have been used to develop more formal guidelines presented below. The reader is referred to the following references for details related to these guidelines (1–12).

Elimination U.V. radiation from light sources. All light sources whether they be natural or man-made should be filtered for U.V. radiation in exhibition, work and storage areas.

Elimination of heat from Light Sources. If it is desirable to maintain a temperature condition around 20°C and if by radiation effects from light sources, the temperature of the surface of a painting, print or drawing rises above the desirable level by an unreasonable amount say e.g. 5° – 10°C, then such light sources should be replaced or filtered to reduce heat radiation effects.

Reduction of Illumination Values. In considering the effects of light on paintings, prints and drawings Thomson (12) has proposed the following levels of

illumination for the exhibition of these materials:

easel painting: 150 lux*

watercolours, prints and drawings: 50 lux.

The time of exposure to high illumination levels in work areas should be reduced to a minimum. It should be remembered that a one day exposure to 100 lux will have the same effect as 20 days of exposure at 50 lux*.

Temperature. High temperature and variations in temperature cause physical changes in materials as well as promoting the rates of chemical – deterioration processes (3,5,13-16).

There generally appears to be wide agreement that the standard for temperature should be 20°C with a range of ± 2°C or less. Such a temperature is satisfactory for humans and also appears to be reasonable for materials.

For infrequently used paper-based materials a lower temperature is theoretically desirable, however, the cost of cold storage around or below 0°C is high. Cold storage also restricts (practically) the immediate usefulness of the stored material because the material may become brittle.

Humidity. The relative humidity of the atmosphere and the equilibrium moisture content of paper, canvas wood and composite board are directly related to the physical handling properties of the materials and also the likelihood of attack from micro organisms such as fungi. The moisture content of paper which is in equilibrium with 30% R.H. represents the lower limit of safety for frequently handled paper. When the relative humidity remains above 70% fungi growth will occur on cellulose based materials. There appears to be some agreement for a standard relative humidity of 50% ± 5% resulting from the above considerations (17–21).

For easel paintings 50% ± 5% R.H. would appear satisfactory, for some paper based materials, however, some workers have suggested lower relative humidities for infrequently used material (22). Easel paintings on wooden panels may require a humidity level somewhat higher, e.g. 60–65% R.H.

Pollutants. Pollutants of concern include dust and dirt, acid mists, and gaseous pollutants such as sulphur compounds, the nitrogent oxides and ozone, (16, 22-27). Many of these pollutants occur naturally in the atmosphere in low concentrations. Data related to the relationship between concentration of pollutant and rate of deterioration of materials are not well defined. It is thus difficult to state absolute limits which should be implemented in planning pollutant control of storage areas. For the present time I think that the most that can be said is that attempts should be made to reduce pollutant concentrations to the minimum concentrations economically feasable.

Vibration. In many buildings there are many sources of vibration both in terms of the building structure and in terms of its atmosphere. Little work has been done on the effects of continuous low frequency sound and fluctuating air currents. In certain circumstances, particularly continuous air conditioning, there could be serious long term problems related to vibrational effects. Objects with material structures such as easel paintings would appear to be the most vulnerable. Although the effects of such problems are yet to be studied in detail, emissions from sources of noise and vibration should be reduced to a minimum. The movement of air should also be reduced if it is excessive.

Biological Systems. Generally there are three basic areas of control required if damage due to biological systems is to be reduced to a minimum:

Maintenance of desirable climatic conditions in order to avoid biological infestations such as fungi (standards for temperature and relative humidity have already been presented above).

Systematic 'in-house' cleaning of rubbish, dust and dirt within the storage building to discourage the presence and breeding of insects and rodents.

The education of both staff and the public regarding the care and handling of objects.

It is beyond the scope of this paper to list detailed standards for the above areas of preservation practice, the reader is therefore recommended to such references as (5,28,29,30).

Storage Networks for Easel Paintings

In considering the development of standards for storage of easel paintings. There are two areas of concern:

permanent storage facilities

temporary storage facilities

Popular current permanent storage methods include the use of screen compactors, fixed, open-screens and storage bins. It seems that economic considerations largely determine the type of storage system used by most institutions. All three of the above mentioned systems have their specific advantages. Compactors offer a great saving in space, however, the works are continually moved on the screens. Similarly, bin storage will normally require a work to be moved for viewing. Bin storage with bin size related to the size of specific items, however, offers very adequate protection for both the face and rear of paintings. Also, items are not hung in bins and thus there is no risk of hooks (or other hanging devices) breaking with consequent possible

*1 lux is equivalent to 1 lumen M^{-2}.

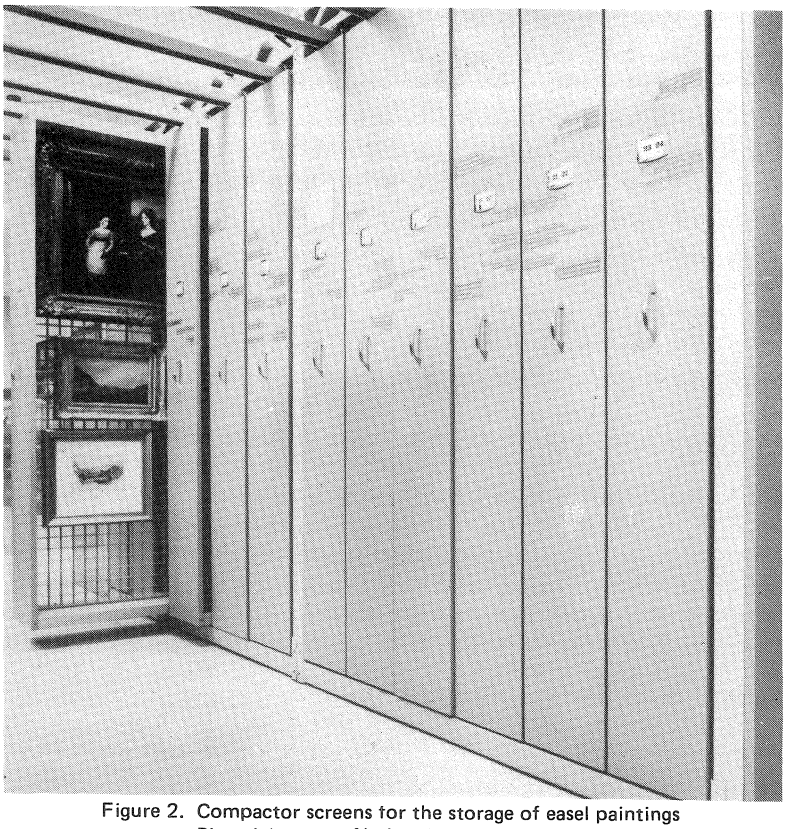

Figure 2. Compactor screens for the storage of easel paintings
Pictorial storage National Library of Australia

Figure 3. Painting temporarily stored on padded blocks

damage due to impact. Open screens have the great advantage that works may be viewed without handling and there is also a large air space surrounding each work which could be important in unairconditioned storage facilities.

Temporary storage should insure that works are removed from the floor by using simple storage bins or padded blocks (29). The front and rear of works should be protected by the use of thick board or similar material especially if people are moving or working near the temporarily stored items.

The preparation of easel paintings for storage by e.g. framing or some other form of packaging must also be included in the overall planning of any storage network because the physical preparation of the work will determine not only the structural dimensions of storage furniture but the physical and chemical stability of the stored work. The following processes are typical of those which must be included in the framing package:

The felting of frame rebates
The use of metal securing brackets for attachment of works into their frames
The protection of the rear of paintings by boards (especially important for works on canvas)

Storage Networks: Prints, Drawings and Watercolours

Paper based materials are currently stored by three main methods:

Framing and vertical storage:
on compactor screens
on open screens
in storage bins

Mounting and horizontal storage in metal plan cabinets.

Horizontal storage in solander boxes or similar containers.

Each of the above systems has its advantages and disadvantages related to the type and amount of use the stored material will receive. To evaluate the appropriateness of a given system, parameters such as the size and weight of the material must be studied as well as the amount of handling.

Generally the storage requirements for a collection will be specific for the collection.

The preparation of works for storage should be seen as an integral part of the storage 'package' and thus processes such as the mounting and framing of items, must find their place in any set of control standards for preservation. To illustrate the range of standards involved in storage-preparation processes, the following examples are listed below:

1. The quality and chemical characteristics of mounting board, e.g. acid-free, pH 7–8.

2. The method of attachment of the work to the mount and the type of mounting.

3. The quality and type of adhesives used for mounting.

4. The use and quality of plastic bags or other surface protective materials for frequently used items.

5. The type of framing.

6. The type of glazing materials used in framing. e.g. an ultraviolet light filtering perspex instead of glass.

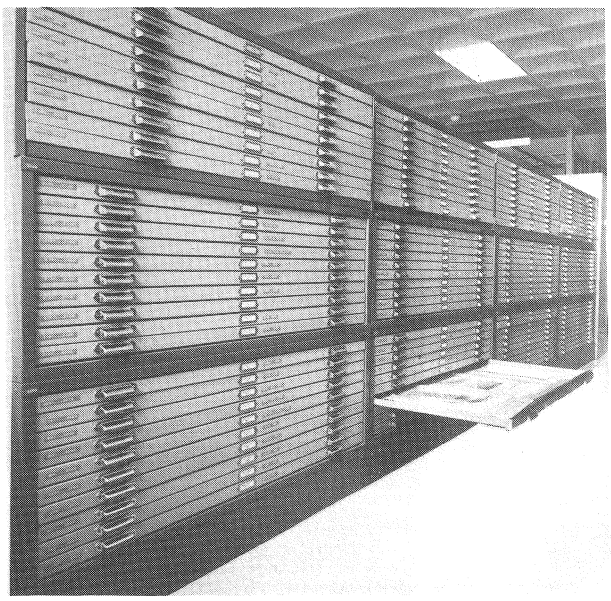

Figure 4. Metal plan cabinets for the storage of prints, drawings and watercolours National Library of Australia.

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