Preventive Conservation in Storage of Collections

by Colin Pearson

INTRODUCTION

Once acquired by a Museum, a work of art or artefact will then spend the majority of its life in storage. It may be examined from time to time and may even be placed on display, hopefully if of a sensitive nature, for not too long. The remainder of the time will be spent sitting on a shelf or in a cupboard or box, or hanging on a frame or roller. It is during this storage life that many of the works housed in our museums and galleries have deteriorated over the years due to adverse storage environments, overcrowding, the presence of insects and rodants, mould growth, harmful vapours emitted by storage containers, etc. Works are often not examined in detail and sometimes never even looked at for long periods of time, and there are well documented cases of entire collections having been eaten by insects or rodants, damaged by excessive light levels or corroded by organic acid vapours from wooden shelving.

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The preservation of a work does not finish once it has left the Conservation Laboratory, it must continue throughout the remainder of its life, including the periods spent under examination and handling, storage and display. In fact, it is a great waste of time and money to conserve and restore a work for it subsequently to be allowed to deteriorate. Remember also, during storage the work is the responsibility of the curator or the registrar of collections. Inspection of all items in the collection is required on a regular basis, and the conservation staff should be involved in matters of preventive conservation. It is important, therefore, to consider what are the basic guidelines that should be followed to ensure the safe storage of a work of art or artefact.

POLICY FOR STORAGE OF COLLECTIONS

The majority of museums are situated on prime real estate. As a large part of each museum must be allocated to the storage of its collections, then the museum must have a firm policy for both the acquisition and storage of its collections, otherwise on the one extreme, extra space will be required for items not really suited to the collections of the museum - costing a lot of money. On the other hand, poor preplanning often means that even new storage systems are full before they are even built. The result is overcrowding to the detriment of the works of art and artefacts.

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In the report of the Committee of Inquiry into Museums and National Collections in 1975,[1] of the 16 institutions listed, 13 had fully used all of their storage space and the remainder between 80 to 90%. Although a number of new museum and gallery buildings have been completed over the past few years, the situation has probably not changed very much, and even for these new institutions, do they have sufficient storage space for the next ten years or until additional storage space will become available?

It is imperative, therefore, that each institution does have a well defined policy, planned well in advance, for the safe storage of its collections.

GENERAL STORAGE DESIGN REQUIREMENTS

With the assumption that the museum has designed adequate sized storage facilities for its current and future collections, and that the storeroom has also been located with consideration to users of the collections, i.e. curators and conservators, there are a number of general considerations to be taken into account whatever the type of collection.

Security. The storage area must be high security as the value of works stored will far exceed collections held elsewhere on display. There are obviously a number of ways of achieving this which is outside the brief of this paper, but keep in mind that storerooms should be used for storing works, not areas which become permanent work stations for curators or their assistants. This use of storerooms for other functions is significant when we discuss the control of the environment and illumination levels (see Storage Environment and Lighting)

Fire Safety: Each storeroom must have a fire detection system and depending on the works housed there, also a fire suppression system. Again, the choice of the system is outside the scope of this paper and the level of sophistication will often depend as much on the funds available as on the type of collection being stored. This is definitely a job that requires expert advice.

Water Safety: Water causes as much damage in storage areas as fire. In fact, it can often cause more damage. Literature indicating what to do in the event of and following a disaster in a cultural institution concentrates on water damage, probably as fire damage is irreversible whereas water damage can often be restored.

Water may come from fire fighting equipment, overhead pipes, floods, etc. Most of these can be avoided with preplanning. There should, if possible, be no overhead pipes in the storeroom, and any services in floors above should be ducted along the perimeters. If water sprinkler systems are installed for fire suppression, they must be of the type that are specific to a given area, i.e. if one is activated, that alone will spray water on the fire and the neighbouring ones remain closed until they also are activated. In addition, once the fire is extinguished, the sprinkler will automatically turn itself off. If such sprinklers are used or if there are unavoidable overhead water pipes, it is advisable to provide all storage units in the room with a slight pitched roof plus overhang. This will prevent overhead water from dripping down through the storage units soaking everything in its way.

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Many storage units are in basements of buildings. If so, they must be well sealed against rising damp and extra precautions are necessary if the area is prone to flooding. Such systems as an alarm activated water pump should be installed if water enters the storeroom to a depth of 2cm or more. The other design feature that must be followed is that no item should be stored (or left) on the floor, and all storage units should be at least 10 cm off the floor. Remember, water can soak its way upwards, particularly if the storage unit is constructed of wood.

Storage Environment: The environment for storage must be controlled to provide clean air at a constant set temperature and relative humidity. The levels of the latter two requirements will depend to some extent on the material type of the works in storage.[2] The general specification for a mixed collection is 20±2° C and 50±3% relative humidity. Some museums provide secondary air conditioning systems for storage areas, however, the requirement for these must be carefully investigated. Remember, air conditioning units can malfunction and produce a very adverse environment. If the storage room is buffered by other rooms, it is well insulated, and is used only as a store and not a work room, i.e. staff should not be continuously using the room, then the environment will remain quite stable within the storeroom. This obviously requires monitoring. If the case is proven, it will be a significant saving in equipment purchase, running and maintenance costs, and also avoid the problems of malfunction in the secondary airconditioning system.

Lighting: If the store is used correctly, ther should be no requirements for lights to be left on in the storeroom except during the brief visits of museum staff. If this is the case, then there is not the necessity for the low controlled levels of illumination required for works of art and artefacts, i.e. 50 lux for very sensitive objects and 150 lux for sensitive objects. There is, however, still the necessity to remove all ultra violet radiation from the light sources to below 30 μwatt/lumen (1500 μwatt/m^2) for very sensitive, and 80μwatt/lumen (12,000 μwatt/m^2) for sensitive objects. It is recommended therefore that illumination (but with no UV output) levels are high enough to enable detailed examination of an object to be carried out in the storeroom, if not in front of the storage container, at an examination table in the storeroom. Objects

should be moved and handled as little as possible and should not need to be transported to a curator's office for examination.

Insect and Rodant Control These can be two of the most damaging agents in a storeroom, particularly if it is rarely entered and there is no regular inspection of the collections. Rodants can usually be controlled by the conventional poisons, which must obviously be kept away from objects. The control of insects, however, is more difficult. There is a large range of insects that can attack museum collections.[3] and the dark, undisturbed stable environment of a storeroom is ideal for insects.

There are two basic systems for dealing with the problem. The first is to enable fumigation of the entire storeroom to be carried out in case of an insect infestation. If this is small it can possibly be treated within the storage units, or the works removed for treatment elsewhere. If the infestation is extensive,it will be necessary to treat the whole storeroom. The fumigant must be chosen such that it does not cause any damage to works in storage, but at the same time, it must have good penetration and be capable of killing all stages of the insect (i.e. egg through to adult). Insectigas (CIG) which is based on DDVP (dichlorvos) is suitable for this purpose as is methyl bromide for some collections. It is necessary in all cases for the work to be done by a licensed operator. In addition, to facilitate the requirement for fumigating a storeroom, an independent room air exhaust system should be installed, and provision made for the airconditioning system to be switched off during the fumigation process. However, remember, gaseous fumigation will kill only what is alive at that time, it has no residual effect. The storeroom can be readily reinfested shortly after fumigation if no other precautions are taken.

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As a basic preventive conservation procedure, an insecticide should be used that has a reasonable residual effect. Nothing on the current market is residual for more than about 3 months, therefore, regular maintenance is necessary. The principle of this procedure is one of isolating the storage units, i.e. by spraying the skirting and corners of the room and then around the bases of each storage unit. As most of the insect pests in museums move by crawling, then this method will (a) prevent insects getting into a storage unit, or (b) prevent insects that have managed to get into the unit (perhaps brought in on unit object) from moving from one unit to another, i.e. retaining the infestation. A suitable residual insecticide is the carbamate range, e.g. Multamat (Schering), known previously as Ficam W.

Mould Control: Mould will break out in any storage area if the relative humidity is allowed to remain above 65% for a period of time. Therefore, control of the RH (See storage Environment) is the main way of controlling any mould growth If there is a mould infestation then objects should either be treated elsewhere, e.g. by ethylene oxide (such as Fumigas 10) in a fumigation chamber, or treated locally with a fungicide such as Thymol vapour.

Vibration Control: The storeroom must not be subject to vibration, such as from a nearby railway line or main road. In addition, storage units must run smoothly on runners or tracks. Mobile units such as Compactus, should be dampened so that there is no jaring when the units close.

People Control: It is often said that museum personnel cause more damage to objects than any other hazard. This may or may not be true but a lot of damage can be avoided by care in handling objects. The use of gloves,the use of correctly designed transport devices (trolleys etc.) for different types of objects, sufficient illumination to enable examination in situ (and also to avoid stumbling in the dark), the careful arrangements of objects so that they do not touch a neighbour, the correct and clear labelling of storage units and also objects. All of this will help to cut down damage caused by handling.

Storage Units: There is a whole range of storage units and materials available and also used for storing works of art and artefacts. It will be normal, however, to have a range of modular storage units available as most collections have both large and small items necessitating high and low density storage. In addition, the units must be large enough and also designed such that no one work will be touching another.

Materials of Construction of Storage Units: Over the past few years, there has been concern about the damage caused to works from harmful chemicals released by a range of construction materials used for storage (and also display) units. Chipboard and polyvinyl acetate (PVA) glue, for example, are very common materials of construction and both can release vapours damaging to objects. If they must be used then the curator must be aware of the dangers. It is possible, however, to treat chipboard with urea (i.e. a mixture of 50 gm of urea to 75 ml of water brushed on to each. m^2 of wood surface[4]) to prevent the release of harmful formaldelyde vapour. If in doubt, test the materials of construction - before construction begins, i.e. in the design stage, otherwise it gets expensive. There

are a number of simple methods available for testing such materials and these have recently been reviewed by Padfield and others[5]. In addition, the following list of harmful and safe materials of construction for storage units is taken from their paper. Note, however, whichever paint system or adhesive system is used, it should be allowed plenty of time to cure thoroughly before objects are placed in the storage units.

SOME MATERIALS KNOWN TO RELEASE HARMFUL VAPOURS AT ROOM TEMPERATURE[5]

Wood, particularly hardwood, releases organic acids, alcohols, aldehydes, esters and hydrocarbons. Protein-based glues and wool can release volatile sulphides (refined, photographic quality gelatin is sulphur-free). Cellulose nitrate releases oxides of nitrogen. Cellulose diacetate can release acetic acid. Polyvinyl chloride releases hydrogen chloride. Polyvinyl alcohol is made by hydrolyzing polyvinyl acetate and may continue to release traces of acetic acid. Polyvinyl acetate and its copolymers are generally regarded as forming very stable films but it certainly releases acetio acid. Polyurethanes contain voltile additives. Dyes. Some dyes contain labile sulphur.

MATERIALS THAT ARE SAFER[5]

Metals
Glass
Ceramics
Inorganic pigments
Polyethylene
Acrylic polymers (solutions rather than emulsions).
Polycarbonates
Polystyrene
Polyester fibres
Cotton
Linen

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One area of current disagreement is the basic choice between the use of metals or wood for thematerials of construction of the storage units. The advantages of wood include its relative humidity buffering effect, and it is safer in the case of fire. Metal storage units do not have the problem of releasing harmful vapours but they can be the cause of condensation with a sudden drop in temperature, and also can create an oven effect in the case of a fire, resulting in damage to the contents even if flames never reach inside the unit.

CONSERVATION FACTORS AFFECTING THE SELECTION OF STORAGE SYSTEMS

The following factors should be considered when designing a storage system and also storage units for a particular type of material, type of metals or wood for the materials questions to be asked are, how sensitive is the work to the effects of:

- light (illumination and UV levels)
- temperature and relative humidity (levels & fluctuations)
- dust and air pollutants (including harmful vapours from materials of construction)
- insect, rodant and mould attack
- fire and water
- vibration
- frequency of handling
- stresses in storage (requirement of special support systems).

Also, what is the significance of the monetary, historical or rarity value of the work as regards security. If these are considered, then with the basic guidelines in mind,it should be possible to design a suitable storage system.

CONCLUSIONS

As works of art and artefacts spend the majority of their lives in storage, particular attention should be given to ensure that they are well looked after while in this state. Careful thought must be given to the requirements of the work and its sensitivity to agents of deterioration. With this in mind and considering the need to provide a safe storage area, it is possible to design storage units which will ensure the preservation of the works.

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