CARING FOR COLLECTIONS

A Manual of preventive conservation

The Heritage Council
An Chomhairle Oidhreachta

December 1999

FOREWORDS

As part of its strategic plan 1997-2000 the Heritage Council identified the need to produce high quality information on aspects of heritage and also the need to assist people in improving their skills to care for and maintain our heritage. The Heritage Council is delighted that through partnership with the Institute for the Conservation of Historic and Artistic Works in Ireland, this publication, *Caring for Collections, a Manual of Preventative Conservation* has been produced. Written and researched by Susan Corr, this publication aims to inform the general reader of the basic concepts of collection care and good housekeeping. We hope that it will enable people to plan the long-term future of their collections in an informed way, within the resources available to them. The book will also play a key role in the continuing establishment of museum standards in Ireland.

The Heritage Council would like to thank Institute for the Conservation of Historic and Artistic Works in Ireland, and Susan Corr for the help in creating this publication, which should become a vital aid in the care of our heritage.

Michael Ryan
Chairperson
Museums and Archives Committee
December 1999

Since 1992, the Institute For The Conservation Of Historic And Artistic Works In Ireland has organised "Caring for Collections" courses annually. In 1999, an extra one was held, funded by the Heritage Council, which was very successful. Because they appreciate that they are ultimately responsible for the artefacts in their collections, museum staff want training in this area. However the Institute does not have the resources to expand the course, either in terms of treating each topic in greater detail, or enlarging the syllabus. Taking these considerations into account, we readily agreed to co-operate with the heritage council in the publication of "caring for collections, a manual of preventive conservation". We believe that the message will now reach a wider audience, who will feel reassured that their problems are not unique, but shared by many others, and that a common sense approach to these problems will contribute much to the preservation of their collections.

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HON.SECRETARY
The Institute for the Conservation of Historic and Artistic Works in Ireland,

December 1999

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PROLOGUE

Within our homes, the objects that we enjoy and value are looked after carefully and conscientiously. We want to ensure that they do not get damaged or dirty and we may even wish to pass them on to the next generation. We expect long life from our possessions in return for appropriate care. In this sense, care is synonymous with preservation.

Intuitively, we know to keep our delicate things out of harm's way by putting them somewhere safe. Objects susceptible to wear and tear we might only use on special occasions. Indeed, in less obvious ways, care is implicit in most aspects of the daily routine of looking after a house. By opening windows, stale and stuffy air is flushed out. Dusting and vacuuming keep surfaces clean and free from all the particulate debris that is shed by ourselves, the furnishings and atmospheric pollutants. Curtains and blinds insulate our windows, and protect carpets, fabrics and paintings from the bleaching effects of daylight.

In fact, the domestic routine is akin to a regular, monitoring exercise that can alert us to potential or existing problems before they get out of hand. In such routine and common sense responses to the continuous threat of deterioration from wear and tear, light, heat, damp, dirt and insects, are found the means to preservation.

This book interprets these familiar principles and practices within the context of caring for collections. Some of the main processes of deterioration are explained and measures to minimise further damage are suggested. While these measures will not turn the clock back, and there may be many problems which require the attention of a professional conservator-restorer, it is hoped that readers will feel better able to positively contribute to the preservation of the objects in their care.

INTRODUCTION TO COLLECTIONS AND MUSEUMS

WHAT IS A COLLECTION?

Many of the great public collections are amalgamations of what were once small, private collections, gathered together, stored and documented with varying degrees of expertise and diligence. Still more material has been, and continues to be, retrieved or salvaged from cupboards, fields, garages and abandoned buildings throughout the country. Forgotten, or simply made redundant by advancing technologies, changes in fashion or taste, these objects may acquire renewed significance as historical cultural artefacts. Needless to say, collections do not always consist of old things, modern or contemporary material is also collected, and it too needs looking after. Today's kitsch could be the valued artefact of tomorrow.

Some collections are united by a common theme, which might include broad categories such as paintings, farm machinery, or fossils. Some have a quite specific focus such as the work of a certain artist or memorabilia from a particular period, Ming vases or newspaper cuttings. Others are eclectic, typically comprising a great variety of different types of objects of different ages. Invariably, however, collections are composed of various types of materials (wood, paper, metal, *etc.*,) often combined in one object, each with it own, specific preservation needs.

WHAT IS A MUSEUM?

Gathered together, some of these collections are recognised formally as museums, such as the National Museum.

According to the definition given by the Heritage Council, museums are:

> '...not for profit institutions that collect, safeguard, hold in trust, research, develop, and interpret collections of original objects, or objects on loan, for the public benefit. Their public function is to be places where people learn from and find inspiration and entertainment through the display and research of original objects...'

A museum is not a static entity, nor is it the sum total of its collection.
It is an active body engaging with the public on many levels. It must share its knowledge and material but in so doing must also keep it in trust for future generations. Museums therefore, have to find an appropriate balance between the demands of curatorship, scholarship, exhibition, and the long term care of the collection.

WHAT IS PRESERVATION?

Preservation or Preventive Conservation can be defined as any measure that prolongs the life of a building or object without compromising its cultural, historical or aesthetic integrity. Preventive Conservation means creating the right kind of environment and maintenance regimes for an object or building which will minimise or reduce any risk of damage. It addresses the needs of a collection in its entirety and of the building in which it is housed.

Conservation, on the other hand, implies intervention, is object-specific and seeks primarily to stabilise an artefact which is deteriorating and to redress the damage it has sustained; it does not attempt to replace or restore what is lost. Conservation is only of real, long-term value if the object is subsequently preserved correctly.

Restoration is the attempt to suggest what is lost only in so far as it allows us to use, understand or appreciate an item better. Such intervention should not attempt to re-create the original.

WHAT IS A PRESERVATION PROGRAMME?

A preservation programme is a strategy for routine monitoring and regular maintenance of a building and its contents. Based on good housekeeping practises, it is one of the most cost-effective measures any museum body can take and is one to which all museums should subscribe.

Preservation is not the exclusive responsibility of curators and conservators, but concerns all those who work in and around collections. It should prompt people to consciously evaluate their working methods from the point of view of the collections' safekeeping so that any further, unavoidable damage is prevented. This depends on routine standard practices based on principles of care, such as in a home.

WHAT IS A COLLECTIONS CARE POLICY?

A collections care policy is a declaration of intent with respect to the preservation and conservation of the material for which a museum is responsible. To be effective it must do the following.

- Identify the issues that are of particular concern to a collection and examine current practices.
- Undertake environmental monitoring.
- Assess the condition of the material.
- Clarify what problems may exist and define the nature and extent of any damage.

- Decide what can be done.
- Change bad practices and address problems in order of priority of attention. With limited funding it is better to invest resources in ways that will most benefit the collection as a whole. Such measures can extend to looking after the building structure itself, providing proper shelving or buying a piece of monitoring equipment.

- Agree when it can be done.
- Indicate a time frame for action.
- Set sustainable goals and achieve them.
- Avoid short-term measures that may prove more expensive in the long term.
- Revise these goals on a regular basis.

LOOKING AFTER A COLLECTION

Two main issues are central to the care of a collection:

i. That no further damage is caused to the objects, *i.e.,* that they are preserved;

ii. That objects which are already damaged get the appropriate treatment, *i.e.*, that they are conserved. Collections need to be provided with a sympathetic

environment so that incipient problems are not aggravated. Proper storage will retard deterioration and correct handling techniques will prevent further damage.

SECTION 1

THE BUILDING AND THE ENVIRONMENT

1.1 USE OF THE BUILDING AS A FIRST STEP IN ENVIRONMENTAL CONTROL

In a strategic approach to collections care, the building is seen as the initial protective layer or wrap to what should be in effect a series of progressively more focused protective measures around the contents. The fabric of the building should be maintained and used to regulate broadly the interior climatic conditions. Some buildings can do this more successfully than others. The suitability of a building from the point of view of caring for collections is really a measure of the level of environmental stability it can offer. This criterion applies to all buildings whether they are purpose-built museums or not.

To balance the type of environment that can be realistically sustained against the requirements of a museum may demand adaptation or structural change. The need for such intervention must be determined by the results of prior environmental monitoring which has been carried out for a long a period as possible, together with an evaluation of the use to which spaces can be put. Sensible use of a building may obviate the need for work to the fabric. For instance, a north facing room that is expensive to heat for human comfort might make a fine storage room for objects.

An assessment of the structure and the materials from which a building is made will determine the appropriateness of any proposed intervention. It must be emphasised that any measures taken to alter or modify the environment, such as the introduction of air conditioning, must not be such as would damage the fabric of the building, for example, by causing interstitial condensation.

Finally, it may be the case that a building is not suitable for the purposes of housing museum or archival material without major disruption or structural change. Where the historic nature of a building does not allow, or where the work required would be too expensive to make it worthwhile, a case should be made for the transfer of the collection. This may be done by documenting the environmental conditions in the building and relating these to the damage the artefacts are suffering as a result.

1.2 THE BUILDING AS AN HISTORICAL ARTEFACT

While a building is the envelope that offers a collection shelter and protection, it may also be of historical importance in its own right. Standing as a testament to past skills, methods of building, use of materials, design and craftsmanship, the preservation of such a building maybe just as important as the preservation of its contents.

Any maintenance, which needs to be carried out on a regular basis, should be sensitive to the character and nature of the materials used in the building. These must be understood so that no harm is caused to the fabric.

For instance, some unsuitable modern external renders intended to keep water out, act as impervious barriers that force moisture to accumulate inside the matrix of the walls. On the other hand, the removal of a render to reveal a stone facade may lead to the destruction of that same facade, if the stone is unsuitable for exposure to weathering.

All the features of an historic building should be recorded in detail, and any work carried out must be documented.

The recommended approach is to repair rather than replace and any modifications or 'improvements' should be carried out with expert advice and supervision: outlay in this direction is always money well spent in the long term.

- **Do** make certain that the professional engaged has the necessary conservation background and experience.

1.3 LOOKING AFTER A BUILDING

1.3.1 THE EXTERIOR

The fabric of a building is the primary barrier or skin against the exterior climate. Not unlike a semipermeable membrane, it can absorb moisture to a greater or lesser extent, depending on the materials used in its construction. The structure of the building may allow heat to be lost, or wind and rain direct access through its eaves, windows, doors and, to some degree, chimneys.

This affects the natural interior climate of a building and any attempts to modify this climate will be expensive and even wasteful if the building cannot contain the environment so created. The fabric therefore, must remain an effective barrier between the exterior and interior climate which requires that it is regularly and properly maintained and inspected for damage and weathering.

- **Do** regularly check the outside of a building. It is constantly exposed to weathering; prevailing winds and rain can wear a building in a particular direction.

- **Do** examine roofs for broken or missing tiles and slates and repair or replace promptly.

- **Do** ensure that flashing in gullies, and around windows and chimneys, is in good order.

- **Do** regularly clear gutters and drains of falling leaves and debris. Leaking or blocked gutters misdirect rainwater that may cause it to find its

way in under the eaves and so into the masonry and timbers or to pool at the base of a building.

- **Do** check the condition of downpipes. Look out for open seams or fractures at the back of them that allows water to escape undetected into the wall. Left unattended, water can accumulate in the matrix of the wall and appear as an internal damp patch.

- **Do** note the condition of the pointing between brick or stone. Water can penetrate where it has decayed or is loosened causing further erosion that may eventually lead to damp patches on interior walls.

- **Do** check internal timbers such as struts and joists both in basements and attics for damp. Wet rot, which thrives in saturated timbers, and dry rot, which requires a high moisture content, are both fungi which destroy wood, possibly leading to eventual structural failure.

- **Do** monitor for rising damp. Rising damp describes the unimpeded upward movement of groundwater through the building structure. It can be further accelerated when heat is turned on in a building. Informed professional advice is essential in seeking a remedy for this problem.

- **Do** note growth of surrounding vegetation. Trees and shrubbery may offer protection from directional winds but in an area without much ventilation, moisture can be retained which can exacerbate a damp problem.

- **Do** make sure chimney pots are secured to prevent birds, bees and wasps nesting and to inhibit the rain coming in. Nests are a constant source of insect infestation.

- **Do** ensure that fireplaces and chimney flues are not hermetically sealed off. They are needed as a source of ventilation. Any structural change should only be carried out with expert advice. All work must be documented in case the building should ever change hands and the chimney put into use again. A permanent notice should be affixed to indicate the intervention.

- **Do** have an arrangement whereby a museum building that is closed for six months of the year is checked at least twice during this period with a view to maintenance and repair.

1.3.2 THE INTERIOR

The fabric of a building warms and cools in response to weather conditions and direct sunlight. How quickly this affects the interior climate is a measure of the insulating properties of the building. If a building is well insulated the transfer of heat from the exterior to the interior will be slow, likewise the loss of heat from the interior of the building will be retarded which reduces the risk of stress to materials caused by

sudden fluctuations in climate. Thick walls of old buildings have good insulating properties but there are many buildings now occupied by museums where the fabric of the building does not offer good insulation. This may need to be addressed at a fundamental level but there is much that can be done from a good housekeeping point of view to improve the thermal retaining properties of a building.

- **Do** insulate roof spaces appropriately. Heat loss through the roof creates up-draughts that draw all the warm air up to the top of the building.

- **Do** reduce unwanted free passage of air from the exterior to the interior by ensuring that joints between the walls, windows and eaves are properly maintained. However do not cut off appropriate sources of ventilation by hermetically sealing the building.

- **Do** upgrade and repair leaky windows and doors by planing and resetting of the originals. Where this is not possible or viable, they should be replaced using appropriate materials. The use of synthetic materials is not considered appropriate in historic buildings.

- **Do** provide an interior lobby or porch, which creates a buffer zone for air entering and exiting a building.

- **Do** enforce the use of shutters and blinds on windows, particularly when rooms are not in use.

- **Do** try to exclude draughts, where possible keep doors closed. The use of draught excluders and even curtains over front doors can be very effective.

- **Do** source the cause of damp, for example, look for rising damp, leaking gutters or drain pipes, *etc*. If rising damp is discovered, seek professional help.

1.4 WHAT ARE ENVIRONMENTAL CONDITIONS AND HOW DO THEY AFFECT THE COLLECTION?

Light, heat, humidity and air-borne pollutants are the main elements that determine environmental conditions within a building. How they combine with each other describes the ambient environment with regard to how bright it is, how warm, how humid and how clean. There are internationally acceptable levels that are recommended for the preservation of material. However, it is recognised that continuous fluctuations, particularly of heat and humidity, are more damaging than conditions that fall outside the recommended parameters but remain constant. Gradual changes in environmental conditions allow objects time to acclimatise; but fluctuations that are sudden are very stressful.

1.4.1 MANAGING THE ENVIRONMENT

There are two ways of achieving a stable environment.
One is by the provision of an air conditioning plant to maintain an evenness of relative humidity and temperature all year round. The introduction of such a plant usually requires that a building is well insulated and completely sealed for it to work efficiently. Realistically speaking, this is not possible for every museum and neither is the introduction of full air conditioning appropriate to every building both from an aesthetic (an old house, for instance) and structural point of view. The fabric of a building may not sustain an air conditioned environment without damage, while the fitting of ducting in itself may cause irreversible destruction to the integrity of an historic building.
An air conditioning plant also requires continuous servicing, it can be expensive to run and should it fail, the sudden change in climatic conditions could cause severe stress to the objects acclimatised to an unchanging environment.

The other approach is based on the fact that many artefacts have survived, and continue to survive, perfectly well in less than ideal conditions. This is because they have become accustomed to their environment. Acknowledging this, the emphasis nowadays lies in working with the building and the natural environment that it provides, so as to find ways of sustaining an even and stable internal climate on a continuous basis.

Recommendations for environmental conditions should be sensibly interpreted in the light of the building's natural environment. Whatever modifications are to be made must take not only the materials and manner of construction of the building into account, but also the treatment and exposure histories of the objects in the collection.

Be wary of moving material kept in air-conditioned storage, or any location where it has acclimatised to a relatively unchanging set of conditions. Material can be placed under undue stress when it is suddenly removed from this environment, perhaps to a warm reading room, or for photography, or microfiching, where the material is exposed to warm, bright lights. This should be borne in mind when dealing with sensitive and valuable items. In the case of painted or illuminated paper or parchment this can cause it to contract quickly creating hair-line fractures in the paint layer or more seriously cause the paint layer to flake off.

For purposes of lending an item to another institution it is essential to establish what the environmental conditions are in the borrowing institution before agreeing to the loan.

1.4.2 LIGHT

All light, irrespective of the source, natural or artificial, is radiant energy and causes permanent and irreversible damage.

The intensity or strength of the light and the length of time that an object is exposed has a direct bearing on the amount of damage that is caused. These two factors are

inversely proportional to one another, so that one hour of exposure at 200 lux has the same effect as two hours at 100 lux. Reducing the amount of light and the length of exposure is the only way to curtail damage.

The quality of the light is also a major contributory factor in the process of damage. Light is energy in the form of wavelengths of different frequency, the shorter the wavelength the higher the energy output. This energy bombards the molecular structure of materials, particularly organic materials such as paper, skins, textiles, gums and natural colourants, inducing chemical damage evidenced as colour change and fading and physical degradation evidenced as fraying, embrittlement and desiccation.

Light extends across a spectrum ranging from ultra violet at the short end of the waveband to infra red at the long end of the waveband. The high-energy radiation of ultra violet light accelerates deterioration. However, as it does not affect how we see things it can be filtered out without compromising their appearance. Infra red light, at the other end of the light spectrum, emits intense heat, as do the warmer colours that lie near it. This heat raises the ambient temperature, as anyone knows from experiencing the difference between a north facing room and a south facing room. Heat affects the RH in a room, creates hot spots, and accelerates chemical decay.

Natural daylight allows us to read colours and tones comfortably but, containing as it does the full range of the light spectrum, its use as a source of illuminance must be managed, filtered and brought within acceptable levels.

Most exhibition spaces have a combination of natural and artificial light. The control of natural light requires disciplined intervention in the routine opening and closing of blinds, shutters, curtains or louvres. A note should be made of seasonal changes, and the long hours of daylight in the summer should be blacked out where possible after closing hours, to reduce the time of exposure.

For exhibition purposes where material is on continuous display, recommended light levels range from 50 lux for sensitive material such as watercolours and textiles, to 200 lux for less sensitive material such as oil paintings and leathers. The recommended total annual exposure to light for sensitive material is 146,000 lux hours and for less sensitive material, 584,000 lux hours.

A museum light meter is invaluable for measuring the amount of light hitting an object and so is useful in setting or adjusting light levels; it also allows staff to calculate the amount of lux hours for which an object has been exposed over the duration of an exhibition. This may decide when the item can go on display again.

1.4.3 HEAT

Heat is about temperature. A cool temperature slows down the rate of chemical reaction and cold in itself will have no direct adverse effect on objects, indeed, generally speaking, objects survive better at lower temperature levels. People, on the other hand, need a certain amount of heat in order to work comfortably and the level

required invariably means modifying the temperature relative to ambient conditions as dictated by weather/climate. It is important to be cognisant of the fact that such heat will modify the natural interior climate by changing the amount of moisture or humidity the air can hold at that temperature.

Because temperature affects the amount of moisture the air can hold, it can be used beneficially to keep damp at bay. Alternately, too much heat in a given space can cause over dryness. Many people are aware that central heating dries out skin and hair during the winter months. Overheating has a similar effect on all organic material, since this too contains moisture. If the air gets too dry from overheating, this moisture can be lost to the atmosphere.

When the heat is turned off and the temperature drops, the air cools and the relative humidity increases which may in turn, cause objects to re-absorb moisture. This constant absorbing and releasing of moisture causes internal stress in objects, particularly if the fluctuations are violent or sudden. Heat should be introduced gradually and reduced gradually, and where possible humidistat controls should be in place with localised areas of extra heat designated strictly for office and work places. In storage it is better to introduce a latent background heat so as to prevent damp and to maintain an evenness of RH all year round.

1.4.4 CONDENSATION

As warm air holds more moisture than cold, condensation occurs when warm air meets a cold surface causing the air at the point of contact to rapidly cool and release moisture. This can happen on metals, windows and external walls particularly if they have a non-absorbent paint or tiled surface. It can also happen if more moisture is introduced to an already saturated atmosphere and again the moisture will condense on cold surfaces.

1.4.5 HUMIDITY

Humidity refers to the amount of moisture vapour in the air. This in turn affects the moisture content of the surrounding materials. Relative Humidity (RH) is the actual amount of moisture in the air at a given temperature relative to the total amount of moisture the air could hold at the that temperature. The RH is expressed therefore as a percentage of this maximum humidity. The ideal RH for many objects, and which can really only be achieved by an efficient air conditioned system, lies in a band between 55%+/- 5% RH, *i.e.,* 50% - 60% RH at a temperature range between 19 - 23 degrees Celsius. However these same objects will quite happily exist in a broader range of conditions 40% - 65% avoiding sudden fluctuations.

Factors that affect the relative humidity in a given space:

i. Changes in the weather conditions outside are reflected in rises and falls in RH in the interior spaces.

ii. Turning heating on and off dries and cools the air respectively. A sudden drop in temperature can precipitate moisture out of the air and can cause condensation.

iii. People gathered in a confined space raise the temperature and release moisture; this may also give rise to condensation as the air can become saturated causing water to condense out.

iv. Wet clothes and umbrellas will increase air moisture.

v. Rising damp, and or excess moisture in the fabric of the building, related to poor building maintenance, causes internal humidity.

How the relative humidity can be controlled:

i. By insulating the building, so that weather conditions on the outside are slow to penetrate through to the interior.

ii. By using the fabric of the building itself to act as a buffer. Introducing materials that are hygroscopic (moisture absorbent) in the décor, such as certain woods, fabrics and paints, will help lower the level of humidity in the ambient environment. Vinyl floor coverings, tiles, vinyl paint on walls, venetian blinds, chrome and large areas of glazing as found in mirrors and display cabinets are all surfaces which do not absorb moisture.

iii. By reducing visitor numbers in sensitive locations and providing cloakrooms for wet coats and umbrellas.

iv. By using temperature to control the relative humidity; lowering the temperature will increase the relative humidity, while raising the temperature will decrease the relative humidity for a given body of air.

v. By using humidifiers and dehumidifiers. The use of these machines can be helpful but it is important to understand their function and purpose. (The RH should be monitored, continuously if possible, or on a regular basis. There are also health and safety implications in using them so the operating instructions should be closely followed.)

vi. Delicate artefacts that need a very specific RH may have their own microclimate created for them. A properly constructed display case or storage container can be sealed to provide an internal climate whose RH is controlled by the use of a buffering material such as silica gel which has been conditioned to maintain the desired RH. (Silica Gel must be handled with care, as the dust it creates can be hazardous to health. It can affect the respiratory system.)

1.4.6 HUMIDIFICATION

A continuous low RH *i.e.*, 40% or less can adversely affect objects, with the exception of metals. The risk from low RH is greatest in winter, when heating is turned on. The problem can be overcome by control of the heating itself. The informed use of humidifiers may also be appropriate. The National Trust use heaters that are fitted with humidistats. Set at predetermined levels of RH, they respond to a drop in RH by reducing heat output.

An evaporative humidifier is recommended for the museum environment whereby water is discharged as a draught-free vapour. A humidistat monitors the level of RH in the room and the machine, pre-set to a required RH, responds by switching on or off accordingly.

Because the humidistat sensor is built into the machine, its proximity to the source of the moisture may not reflect real RH values in a given space. Independent monitoring of RH and temperature must be carried out. It is also important to make sure that the air circulates sufficiently so as to prevent pockets of saturated air accumulating.

A note on the use of humidifiers:

i. The addition of moisture to the air due to the evaporation of water from the felt in the humidifier causes a slight fall in temperature.

ii. The higher the temperature in a room, the more moisture is required to approximate an RH between 50-55%. This can make the atmosphere feel heavy and sticky. Keep temperatures low where possible. This may obviate the need for humidifiers.

A note on health and safety:

i. Humidifiers require personnel dedicated to overseeing and filling the water reservoir on a regular basis.

ii. They also have to be thoroughly inspected and disinfected at least twice a year to prevent the build up limescale, growth of micro-organisms and for the cleaning of working parts, air filters and felts.

1.4.7 DEHUMIDIFICATION

A continuous high RH *i.e.*, above 65%, encourages mould growth on objects. High humidity usually occurs in summertime when the weather can be both warm and damp. It can also happen when a lot of people are gathered together in an enclosed space or there is damp in the building.

Excess moisture can be extracted by the use of dehumidifiers. There are two main systems, advice on the choice of which should always be sought, as one is perhaps more appropriate to a given set of circumstances than the other.

A note on the two types dehumidifier:

i. One is a desiccant system where moist air is passed over a drying agent such as silica gel. The silica gel is in turn continuously dried out by warm air that must be exhausted away from the room being dehumidified.

ii. The other is a refrigeration system where moist air is cooled, and water condenses out into a collecting basin that must be emptied regularly. The reduction of moisture in the air causes a slight rise in temperature. Independent monitoring of such spaces must be provided.

1.4.8 DAMP

For damp spaces, a combination of background heating and dehumidification is recommended but only as a short-term measure or until the source of the damp can be dealt with in a more fundamental way.

1.4.9 AIR POLLUTANTS

There are two forms of air pollutants; dust and dirt, known as particulate matter, and gases such as; carbon monoxide, sulphur dioxide, ozone and nitrogen oxides. Both forms of pollutant require different types of filtration to keep them out from the museum environment.

Dust and dirt

In the case of dust and dirt, good housekeeping measures go a long way to keeping this form of pollution at bay. Mats at the doors which are cleaned regularly, an entrance lobby to prevent swirls of debris gusting inside, cloakroom facilities to allow visitors to shed outdoor clothing, and the routine dusting and vacuuming of rooms are all part of environmental management. The provision of archival boxes, glazed and sealed picture frames, and, where appropriate, dust sheets and covers, will protect the actual objects.

Finely meshed dust screens over air vents filter out dust particles, the finer the mesh the smaller the particle of dust that will be prevented entry. As these filters become dust-laden they can impede ventilation or airflow and so it is necessary that they are checked and changed regularly. This type of filtration can be used even where there is no air conditioning plant

Gaseous pollutants

Some external gaseous pollutants can be screened out of the general atmosphere using special filters which absorb these gases. These filtres can be included in an air

conditioning system and even then because this type of filtration is expensive to service and maintain, many air conditioning plants only filter out particulate matter.

Objects that are particularly sensitive to atmospheric pollutants should be provided with their own microclimate, involving the use of an activated carbon layer or screen within an exhibition case or storage container.

1.4.10 Ventilation

Everyone needs clean fresh air, and so do objects. Stagnant air eventually contaminates the materials with which it comes in contact. It is important to keep air moving around objects to avoid the development of unwanted microclimates. This is why large paintings, for instance, are traditionally hung with little cork wedges attached to the back of the frames. The space provided allows air to circulate behind the frame and prevents the build-up of moisture. The same applies to furniture, which should always be stood a few centimetres out from the wall. A fan can also be used to aid circulation particularly in areas where the air seems to become still or damp.

If a room gets too stuffy and humid, the atmosphere can be improved by simply opening a window. Windows can be opened and closed regularly, but in every instance common sense and routine should apply. If it begins to rain or if the temperature plummets, the response should be immediate, and the windows promptly closed.

SECTION 2

The Contents of a Collection

2.1 What are Collections made from?

Collections consist of an extraordinary range of objects. In the context of preservation these objects need to be understood from the point of view of the materials from which they are made. Stone, metal, bone, fabric, glass *etc.*, all have distinct properties and characteristics. They react differently from one another, and require different conditions in order to thrive. Conditions that favour the preservation of wood, for example, may not suit metal.

This situation is further complicated by the fact that many objects are constructed from a variety of materials. Clocks, furniture, easel paintings, guns, and musical instruments are all perfect examples of mixed materials. Keeping such diverse materials in equilibrium with one another, especially when they are component parts is important to the function and well being of the object. This relies on a clear identification of the materials involved so that they can be accommodated in the right kind of environment, and provided with appropriate archival storage materials.

Metals will corrode or rust if there is too much moisture in the atmosphere, whereas wood will shrink and warp, and glues embrittle, if there is not enough moisture. Dimensional and structural changes caused by inappropriate environmental conditions may render an object unusable or damaged beyond repair. However, as a general rule of thumb, most objects are suited to a stable ambient environment midway between too dry and too damp (40%-65%RH)

Materials can be divided into two broad groups: Organic and Inorganic.

i. Organic material is best described as material that was once living, *e.g.*, wood. Such material already contains a certain amount of moisture, which is essential to its natural state, it can lose this moisture if the surrounding air gets too dry or it can absorb moisture if it gets damp. Such changes can be harmful to the object as they cause the material to contract and expand accordingly thus weakening it and altering its shape. Therefore, organic material varies from being acutely sensitive *e.g.*, vellum, to moderately sensitive to ambient environmental conditions *e.g.*, hardwood. Organic material will be destroyed by fire and can easily be damaged by poor handling and inappropriate storage.

ii. Inorganic material is mineral derivative, *e.g.*, glass. It is generally moderately sensitive to fluctuations in environmental conditions, but there are some materials that react adversely to high levels of humidity. Metals such as iron will rust and expand; this characteristic is familiar to everyone who has ever had wrought iron railings. Weeping glass will absorb moisture out of the air, little droplets of water may be seen or felt on the glass itself, and can lead to crizzling or hairline fractures in the glass. Inorganic material does not burn readily but can be severely affected by fire. It can be equally sensitive to inappropriate handling and storage.

Organic	**Inorganic**
Wood	Stone
Paper	Metal
Textiles	Glass
Animal products:	Ceramics
- leather	
- bone	
- feathers	
- hair	
Plastics	
Plant extracts	
- inks	
- dyes	
- pigments	

N.B. not all pigments, inks, dyes are organic or not completely.

2.2 WHAT IS MEANT BY THE CONDITION OF AN OBJECT?

The condition of an object is an assessment or evaluation of whether or not the object has suffered damage.

2.3 WHAT IS A CONDITION REPORT

A condition report is a record of that state in which the object is found. Traditionally, information is recorded by filling in a condition card accompanied by photographs, but it can also be gathered by a variety of means including a tape recorder, video recorder or digital camera linked to a computer. Information gathered should be documented methodically; physical, chemical and biological damage should be noted and where possible the source of the problem identified.

The nature and extent of the damage can determine the future role of that object within the collection, whether it can go on display, be loaned, be made available for consultation or be removed to storage until such time as conservation treatment can be carried out. An object should be flagged if it has particular storage requirements or needs further conservation treatment.

The example condition report provided here is general to most objects and is fairly self-explanatory. Although quite detailed, it shows the approach most likely to taken by a conservator. It might be more helpful at a later stage, to draw up a condition report specific to a type of object *i.e.*, furniture, books, paintings, *etc.*

To correctly identify the range or type of damage, the services of a conservator must be used.

Finally, apart from recording the current condition, an object may be given an overall condition rating in terms of priority of attention.

CONDITION REPORT

Object Cat. No.
Date of Object Location
Artist/manufacturer Dimensions
Labels, Identifying Marks:

Materials/Media:

Present storage system:

Damage description

Physical damage

i. Major structural damage: (*e.g.*, parts detached, broken. Tears, fractures, pieces missing, holes)

Suggest cause \ source:

ii. Minor structural damage: (*e.g.*, small tears, holes, creases, folds, loose parts, *etc*.)

Suggest cause \ source:

iii. Surface damage: (cupping, flaking, abraded \ scratched surfaces, veneer lifting, delamination, cracked glazes)

Chemical damage: (corrosion of metals, acidity in paper \ textiles, corrosion of inks, encrustation, tarnishing of metals and crizzling of glass)

Suggest cause \ source: (internal or contaminant.)

Biological damage: (*e.g.*, rodents, pests, mould, and mildew)

Suggest cause \ source:

Previous Repairs:

Surface accretions and disfigurements: (*e.g.*, soiling, stains, dirt, deposits, sellotape, staples, discoloured adhesives, discoloration and fading)

Further comment or recommendations:

Condition rating: (good, fair, poor, or do not handle)

Treatment priority: (urgent, high, medium, low)

Condition rating code:

i. Good: object is stable, can be handled and exhibited with care.

ii. Fair: object may be damaged and is vulnerable to further damage, must be handled with caution and may need remedial attention.

iii. Poor: object is seriously compromised

iv. Do not handle; object is extremely fragile and vulnerable.

Treatment priority code:

i. Urgent: requiring immediate conservation treatment or removal from present conditions.

ii. High: object is actively deteriorating.

iii. Medium: may be damaged but is not actively deteriorating. Will need remedial treatment.

iv. Low: proper storage and care will ensure preservation.

2.4 WHAT IS MEANT BY A CONDITION SURVEY?

A condition survey identifies the type of problems that affect a collection and based on a sampling rate, for example: examining one item in every five, attempts to quantify how much material is affected and to what extent. This latter involves grading the material on a condition scale ranging from very good to poor.

An in-depth survey will identify factors, which may contribute to continuing deterioration, such as inappropriate environment and storage conditions. It will also evaluate the material most in need of attention and make recommendations for a subsequent course of action.

A secondary benefit of surveys is that they provide a benchmark for comparing the change, if any, to a collection over a given timeframe, say five years.

2.5 WHAT ARE THE TYPES OF DAMAGE?

The condition of an object may be compromised in one or all of three ways:

i. It can be physically damaged.

ii. It can deteriorate because of chemical degradation.

iii. It can suffer from biological activity.

2.5.1 PHYSICAL DAMAGE

Physical damage is caused by mechanical stress incurred by mishandling, inadequate storage support and unsuitable environmental conditions. Perhaps a design fault in the structure of an object such as an item of furniture or a top-heavy piece of glass will render those objects very vulnerable to breakage. Physical damage is the most immediately apparent of the three, it is also the most avoidable, yet it occurs with great frequency in the museum situation.

THE SOURCES OF PHYSICAL DAMAGE:

i. Human intervention: overuse, forceful use, inappropriate use and plain careless handling leads to breakage, dents, ruptures, fractures, tears and creases.

ii. Mechanical friction between surfaces leads to abrasion, fraying and wearing down of parts. Dust and dirt can also be abrasive.

iii. Lack of appropriate storage: offering inadequate support to objects builds up internal stress and leads to shattering, tearing, sagging or general misalignment.

iv. Environmental conditions: an unsuitable environment leads to dimensional changes.

v. Insects, such as beetles, silverfish, woodworm, and moths, and rodents can cause extensive physical damage as they gnaw and chew their way through wood, paper, textiles, and other nutrient rich substrates.

PREVENTING PHYSICAL DAMAGE:

- **Do** know how to handle the object in question and offer the appropriate support.

- **Do** restrict the use of something that is inherently fragile.

- **Do** make sure that working parts are regularly maintained if an artefact is operational.

- **Do** provide correct storage support.

- **Do** provide a relatively stable and sympathetic ambient environment. This will reduce the risk of contraction and expansion of sensitive materials.

- **Do** keep spaces dust and dirt free.

- **Do** take note of seasonal changes, which may cause the ingress of pests. Certain times of the year pose a greater threat.

- **Do** identify methods and sources of entry for pests, ensure that they are sealed off. Insects and their larvae may be inadvertently carried into a museum on objects, including items received on loan, so a quarantine room is a good precaution until such items can be thoroughly examined.

2.5.2 CHEMICAL DAMAGE

Chemical damage may arise as a result of intrinsic qualities within the objects, which are unstable and inherently harmful. For instance, the presence of residual wood components in paper, together with acids introduced during the paper making process, can induce extreme brittleness and discoloration in paper.

External factors, such as incorrect environmental conditions, pollutants in the atmosphere, and contaminant materials, can also trigger chemical deterioration. High levels of humidity can cause soluble salts in stone or ceramics to go into solution and migrate to the surface where they crystallise. Atmospheric pollutants can tarnish metals. Black silver sulphide forms on the surface of silver objects, which also affects photographs with a silver emulsion base. Lead white pigments may turn black in the presence of sulphur dioxide. 'Bronze disease' can break out suddenly on the surface of objects containing copper alloy.

THE SOURCES OF CHEMICAL DAMAGE:

i. The problem may reside in the nature of the material from which the object is made.

ii. Concentrations of harmful vapours such as acetic acid, formaldehyde and ammonia can be released from materials used within the museum space.

iii. High levels of urban pollution such as carbon monoxide, sulphur dioxide and nitrogen oxides, lead to colour changes, fading, embrittlement and tarnishing.

iv. Emissions such as ozone from photocopiers and office machinery can contribute to pollutant gases.

v. Chemical reactions can occur between an object and its support material, and contaminant constituents can migrate from one object to another in the presence of moisture.

vi. Environmental conditions can cause chemical damage; the presence of too much light, heat or humidity can trigger or accelerate the rate of chemical deterioration.

PREVENTING CHEMICAL DAMAGE:

- **Do** provide a relatively stable and sympathetic environment, which will help slow down the overall rate of deterioration. It may be more realistic to place sensitive material in its own microclimate than try and achieve tight control of the larger environment.

- **Do** try to reduce the level of atmospheric contaminants to which objects may be exposed; paints, sealants, glues, fabrics and woods used for decoration and in the building of shelves, cabinets, exhibition cases and storage spaces must not off gas, that is, release harmful vapours. Many suitable materials are standard products and are readily available if specified.

- **Do** keep all spaces free of dust. Dust attracts moisture and may in itself become an agent for further deterioration.

- **Do** keep office equipment separate to the collection.

- **Do** isolate contaminant materials in storage such as corroding metals, mouldy materials, acidic papers, fabrics, textiles or wood.

- **Do** keep conserved material away from non-conserved material particularly if the proximity of both will cause further damage.

- **Do** provide correct archival materials and storage systems.

2.5.3 BIOLOGICAL DAMAGE

Biological damage is caused by microbial activity. These micro-organisms include fungi, such as moulds and mildew, and tiny insect life such as woodworm. The larvae of many pests require high levels of humidity, particularly those of the silverfish.

Biological damage occurs on organic materials rich in nutrients such as paper, wood, leather, animal glues and starches. All vegetable matter and any materials containing protein are liable to attack. Stone, in the presence of high humidity, is vulnerable to the growth of moss and algae.

THE SOURCES OF BIOLOGICAL DAMAGE:

i. Environmental conditions can be a source of biological damage. Too much moisture in the atmosphere creates favourable conditions for all microbial activity.

ii. Mould and mildew are airborne spores which occur naturally, and which are activated by high levels of moisture.

iii. Wet rot and dry rot are forms of fungi associated with wood; their growth is stimulated by high moisture content.

iv. Foxing, as characterised by brown specks or staining in paper and textiles, is a type of microbial activity related to the presence of heavy metals, most notably iron.

v. Algae and moss grow on stone; they can rupture the surface of the stone and, because they retain moisture, encourage further decay in combination with atmospheric pollutants.

vi. Pests and their larvae feed off organic materials, destroying them in the process, whilst some secrete enzymes which further contribute to the destruction of an artefact after the pest has been eradicated.

PREVENTING BIOLOGICAL DAMAGE

- **Do** reduce excess moisture in the environment, this will cause microbial activity to cease and any fruiting bodies to dry out. The moisture content of the atmosphere should be reduced gradually to allow the object to acclimatise.

- **Do** have the damage that is caused by mould or fungal activity assessed, treated or removed on the advice of a conservator.

- **Do** be on the alert for signs of insect activity which will include small piles of dust around furniture, the presence of larvae, tiny black specking of surfaces which may be faeces and fresh holes. Special sticky strips designed for museum environments can be placed in cupboards and around doors; catching any insects that come in contact with them it is possible to monitor pest activity and subsequently identify the type of insect.

- **Do** locate the source of a pest infestation. New acquisitions and even loans should be thoroughly inspected for insects and their larvae before being incorporated into the collection.

- **Do** talk to a conservator on correct treatments and fumigants.

SECTION 3

MANAGING THE COLLECTION

3.1 OBJECT IDENTIFICATION

An inventory of the collection should be compiled as a matter of course and every object assigned a unique inventory, or Object ID, number. This number should be attached to every document relating to the object, from condition reports to correspondence. This is a basic requirement not only from a security point of view, it is also essential to the organisation of a collection with respect to retrieval and access, as well as for scholarship.

The inventory should include information under headings such as: provenance, date and circumstances of acquisition, conditions of acquisition (if any), date or age of object, storage and/or exhibition location, detailed description, dimensions, condition or state of preservation, repairs or previous conservation treatment and photographs. For convenience, some aspects, such as conservation reports or photographs, are often stored separately, but should always be cross-indexed with the inventory using the unique Object ID number.

The more integrated the data, the more sophisticated and useful the inventory. Take, for example, an inventory that records when, where and for how long an object is on exhibition, if it is or has been out on loan and to whom, and how often it has been accessed. This information can be used to build up a recent life history, which can inform the preservation or conservation programme. Statistics on the materials from which an object is made, and its dimensions, can be very useful in planning and rationalising storage with respect to size and grouping of objects.

For ease of reference, the information contained in an inventory should be organised hierarchically, based on how frequently different types of information are required. Data relating to present location, provenance and description or type are often more frequently consulted than, for example, correspondence or conservation reports.

Propriety museum inventory databases are available commercially, but hard copies should always be kept, preferably in a separate building as a security measure in the case of fire or theft. Back-up procedures should also be put in place.

3.2 MONITORING

Monitoring means keeping a regular eye on the building and its contents. From a simple routine visual inspection, to the use of instruments, which record and measure such environmental factors as the amount of light in a room or the level of moisture in the atmosphere, monitoring develops a picture of what is happening to a collection over time.

A regular visual inspection is like a 'watching brief'. It serves to build up a familiarity with the building and the conditions within it throughout seasonal changes; *e.g.*, draughty windows and doors, shafts of sunlight on objects at certain times of the year, the smell of damp or mustiness in certain rooms. Such a routine is also extremely useful in alerting staff to incipient problems or noting damage as it occurs such as vandalism, leaking pipes or the appearance of mould on material.

Instruments that give on-the-spot readings or continuously measure and record environmental conditions over a period of time can provide a more sophisticated and detailed picture of the climate within a building. Measuring devices such as thermohygrographs simultaneously record temperature and humidity in given spaces. Light meters measure the amount of light on an object and are very useful for adjusting light levels for display. While these instruments provide objective information they should be used to complement visual inspections.

3.2.1 THE IMPORTANCE OF RECORDS

Keeping records is vital. Records inform the development of a collections care policy. They are also of historical importance in themselves, for they allow a retrospective view of the collection. They make it possible to gauge the effectiveness of previous preservation measures, and in fifty or a hundred years later, the patterns they reveal may be of significance with regard to future decisions. Therefore, all of the information gathered and decisions made with respect to the care of the collection

should be logged in a diary or ledger, succinctly and legibly, so that they can be consulted long after the person who made the notes has moved on. Appropriate measures must also be taken to ensure that all records and data associated with the collection are securely stored with a view to their long-term preservation.

3.3 Acquisitions and Deaccessioning

Museums are normally in the business of acquiring objects, some museums may also be able to decommission or dispose of objects by passing them on to other museums or collections, if their constitution allows. The decommissioning of an object should not arise out of failure to care or safeguard, but should be part of responsible forward planning and policy decision. This means thoroughly vetting the new home of the object, and its intended use there, as well as supervising its relocation. Copies of the Object ID and any condition reports should be kept by both parties, and should include a brief statement outlining the reasons why the object is being deaccessioned.

3.4 Good Housekeeping Tips

- **Do** avoid handling sensitive objects such as photographs, glass plate negatives, polished metals, paper, textile and vellum articles with bare hands. Human skin transfers grease and sweat.

- **Do** keep dust to a minimum throughout the building by vacuuming regularly.

- **Do** lift dust off objects with a soft brush and use a vacuum to collect the dust.

- **Do not** rub dust off, as rubbing over a surface acts in the same way as polishing.

- **Do** have a second vacuum cleaner specifically for artefacts as opposed to one for general purpose vacuuming.

- **Do** have a supply of clean cloths, chamois leathers and soft brushes for cleaning.

- **Do** keep one kind of brush for one kind of material.

- **Do** keep polishing to a minimum as all polishing has an abrasive effect which, with time, wears down surface details, patinas or plating.

- **Do not** use proprietary polishing or cleaning agents.

- **Do not** use damp cloths except where safe to do so. Metals such as bronze and copper can react adversely to moisture.

- **Do** avoid dusting Perspex framed pictures, the friction created causes static which may lift delicate pigments or friable media.

- **Do** check for metal fatigue in steel wires and brackets, which support objects such as paintings and free-hanging sculpture.

- **Do** place archival sticky insect traps in cupboards and on shelves and check regularly.

3.5 Handling and Access

Physical damage occurs most frequently during handling and access of material. Objects need to be handled with respect and care and should be correctly supported at all times. Where possible, no unsupervised access should be allowed to untrained and uncaring hands. Where material is available for consultation ensure that users are encouraged in good practises by providing suitable working space and that they are informed of proper handling procedures. Printed reminders informing and thanking people for their care raises awareness of conservation issues.

All sensitive material particularly paper objects, textiles, vellum and photographs should be handled wearing clean cotton gloves. On no account should food or drink be consumed in the vicinity of the material as it is consulted or examined and inks, pens and biros should be prohibited. Do not lick your fingers to turn pages.

Restricted or inadequate storage spaces make access to objects difficult. With little room to manoeuvre in awkward spaces, where other objects usually have to be moved to get at the required item, retrieval forays consistently lead to chipped corners, crumpled edges, unwanted creases, tears and fractures. It is most important then, that the storage of an item takes into consideration its size, weight, type of material and frequency of access leaving necessary room for manoeuvre.

Monitoring handling and access:

- **Do** know how to handle the artefact, beware of wearing jewellery and clothing hardware that may catch. Wear gloves where appropriate especially when handling paper, skins and delicate textiles.

- **Do** have correct trolleys, baskets, bins, cushioned if necessary, to move objects.

- **Do** be aware of changes in environmental conditions from storage to usage areas, for display, reference or photographic purposes.

- **Do** have a designated area for examining material with clean flat surfaces sufficient in size and height to accommodate the artefact comfortably.

- **Do** use correct materials such as plinths, plastazote - a polyethylene foam used for cushioning material - paper weights, and gloves to support and handle the material.

- **Do** use a controlled and sufficient light source.

- **Do** employ monitored access of material to non-professional staff (general public, students, *etc.)*

- **Do** keep record of access by non-professional staff.

- **Do** use a condition embargo with regard to access should the material be in poor condition or appears to be actively suffering.

- **Do** develop a profile on frequency of access.

- **Do** get professional conservation advice on condition, suitable protection, and handling procedures.

- **Do** have training updates with staff attending relevant Collections Care Seminars.

- **Do not** exert pressure on an object to open, unfold, or unroll.

- **Do not** make room on an office desk to examine something.

- **Do not** allow liquid, inks, felt tip pens in the vicinity of the material.

- **Do not** carry something that is too large or too heavy.

- **Do not** store heavy items above waist height unless there is machinery to help access.

- **Do not** stuff, bend, crease or exert pressure on an object to make it fit in its storage place.

3.6 STORAGE

The storage of objects must rate as important a function as any other activity and is one that ultimately guarantees the preservation of the material itself. Inappropriate storage causes damage and given that only a small percentage relative to the entire collection is usually on display this damage can extend to most of the collection.

Traditionally, storage is regarded as a 'holding mechanism', somewhere to keep things while they are not in use. Indeed, it is often a case of out of sight, out of mind and

consequently storage spaces are often relegated to those locations in a building that are considered the least useful or least desirable. Such areas are also often characterised by 'object density', *i.e.*, more material than the space can actually hold. This problem is twofold. Either a collection is actively acquiring beyond its means and requires more space than it has available, or the existing spaces need to be rationalised. A policy decision has to be taken at this juncture.

An actively acquiring body must be able to accommodate the material it is acquiring, if it has purchasing power it must seriously consider the conservation/ preservation implications for an acquisition and this should be built into the purchase price.

- **Do** have a secure space but one that facilitates easy evacuation of material in the case of emergencies.

- **Do** have a layout plan.

- **Do** know where the location of services such as electricity cables, water pipes and related plumbing, telephone and computer cables are and have a diagram of these services at reception.

- **Do** have the correct fire extinguishers. This should be discussed with the local fire brigade.

- **Do** have proper floor covering specifically to reduce dirt and breakage. A smooth linoleum surface is best if the option is available. Wooden floors should be kept dust free. The application of any surface finishes to floors or storage surfaces cannot be carried out while the stores are occupied because of harmful vapours.

- **Do** use appropriate materials in the construction of shelving, cabinets, *etc.*

- **Do** provide dust filters, however simple, on air vents to keep dust out.

- **Do** avoid having stores in the basement or up in the roof, unless good insulation and environmental monitoring proves them stable.

- **Do** block all sources of daylight. Keep stores in the dark when not being used.

- **Do** use appropriate and flexible artificial lighting.

- **Do** have an area where material can be safely consulted in the store with a suitable light source for that purpose.

- **Do** use suitable racking systems, drawers, and planchests.

- **Do** line shelves and drawers with an archival barrier board, or card such as is used in the construction of archival boxes.

- **Do** keep sensitive objects off the floor, especially if at ground or basement level.

- **Do** store like materials together.

- **Do** isolate materials likely to contaminate other objects.

- **Do** provide archival materials that are suitable to the object.

- **Do** keep stores free of dust and dirt by vacuuming regularly. Dust particles can absorb moisture.

- **Do** provide insect traps.

- **Do not** use bubble wrap or any plastic material to protect or wrap objects whilst in storage. Plastic can cause materials to sweat if there are rises in temperature; it does not allow an object to 'breathe'.

- **Do not** use materials that off gas such as particular types of wood, specifically oak, beech, composite boards like chipboard and plywood and some types of MDF board, which contain formaldehyde.
-

- **Do not** use sellotape, plastic tapes, staples, pins, paper clips, safety pins or any material that is likely to corrode or leave degradative products on the original material.

- **Do not** stack objects on top of one another or against each other.

- **Do not** keep objects stored loose in drawers that move every time the drawer is opened.

3.7 EXHIBITION AND DISPLAY

Objects on exhibition must be carefully displayed with due regard to the materials from which they are made. A watercolour painting needs to be displayed in dim light so as to protect the pigments from fading, whereas ceramics and glass can be exhibited in much brighter spaces. This has implications for where objects may be placed or hung within a building space, and indeed for the length of time that they may go on exhibition. The more tailored the surroundings, or the better adapted they are to meet the needs of the objects, the less likely they are to be damaged by being displayed or exhibited.

At their most basic, display cases or glass cabinets form a security barrier and, in addition, offer protection from fingering, dust and dirt. The importance of this latter function should not be underestimated, while even the simplest cabinets do offer some form of environmental buffer against fluctuating environmental conditions on the outside. A glazed picture frame, appropriately backed, acts in a similar way.

The provision of display cases may be seen as a reasonable alternative to providing expensive air conditioning for the broader environment. Stable internal environmental conditions or microclimates as they are called, can be provided within a case if it is totally sealed incorporating silica gel or art-sorb beads. Even then, heat from a light source focused on the case can lead to a rise in temperature and cause a subsequent drop in RH. All material used in the construction of the case must be to a high specification, so as to prevent the build up of harmful gases within the case itself.

While many objects do not require such tight environmental specifications, it is possible to improve overall conditions within existing cases by making sure there is nothing in the cases, including the exhibits themselves, which may give off toxic vapours. The use of absorbent materials such as certain textiles, conservation boards and even some carefully chosen woods (those which will not release harmful gases), will afford protection against sudden rises in humidity by absorbing moisture themselves. This will have the effect of reducing the amount of moisture uptake by the object itself. Light fittings within cases should be examined to make sure that they are not emitting heat. In this respect fibre optic light is a good means of illuminance within a case as the light source is stationed outside, only the light itself is transmitted along the fibres.

Harmful light waves such as UV, whether radiated by artificial or natural light, must be filtered out from exhibition spaces using UV screens such as films, varnishes, UV absorbing glass or a polycarbonate such as Lexan. All filters have an expiry date, which is governed by the conditions in which they are used. Strictly speaking, films and varnishes are considered a short-term measure although they may last for several years. They can be difficult to remove and replace and for this reason are not suitable for use on old glass. UV filters can be placed directly on fluorescent tubes that emit UV. All filters need to be monitored and replaced fairly regularly. Tungsten halogen lamps or spots require a heat resistant glass which contains an UV filter whilst the ordinary tungsten filament emits very little UV.

Good house keeping practices applied sensibly and routinely will go a long way towards preventing damage.

- **Do** make a condition report of an item prior to exhibition or loan.
- **Do** make sure the object is correctly and securely supported.
- **Do** avoid overcrowding by judicious choice of objects for display.
- **Do** make sure that the appropriate materials are used both in the supports and the furnishings.

- **Do** look out for direct or oblique sunlight reaching exhibits throughout seasonal changes.

- **Do** note the position of radiators, central heating pipes and windows when laying out exhibits and try to avoid proximity.

- **Do** know the appropriate light levels, relative humidity and temperature for the different exhibits.

- **Do** know existing levels and light sources as found in the exhibition space. Agree on protective measures such as UV screens, blinds, humidifiers and dehumidifiers, old fashioned covers on display cases, *etc.*

- **Do** grade material into very sensitive, sensitive, least sensitive and use the exhibition space and cases accordingly *e.g.*, try and keep items that require low levels of light in the same space.

- **Do** keep exhibits in the dark when the exhibition is not open to the public.

- **Do** monitor conditions and up-date condition reports.

- **Do** check the exhibits regularly, look out for dust, dirt, vandalism, stress such as sagging, billowing of canvases, curling or contraction of paper, splitting and delamination of wood, foxing, clouding or bloom on surfaces from metals to glass to varnishes. Except for vandalism, nearly all the other problems are signs of incorrect environmental conditions.

- **Do** know how to recognise damage and have a coherent means of response to problems even if it only means removal from the current situation.

- **Do** note the condition of the material after the exhibition.

- **Do not** pin, tack, stick or adhere the original object to the support structure.

- **Do not** display objects in unsuitable environments or in a manner that will cause harm to them.

- **Do not** 'make do'.

- **Do not** insist on conservation primarily from an aesthetic point of view for the purposes of exhibition. Damage to an item may tell a story and this can be explained alongside the object.

3.8 LOANS

- **Do** ensure that objects are in a condition to be loaned out.

- **Do** record the condition of an object prior to exchange. Make a note of areas that are vulnerable to damage and signal accordingly.

- **Do** photograph, mark and annotate damage on the photograph itself or on a transparent polyester sheet covering the photograph.

- **Do** make sure the object is adequately insured.

- **Do** know how the object is going to be treated at the other end, for how long and where the object will be on display.

- **Do** estimate whether conditions are similar to those in which the object is currently being held, if not allow the object to acclimatise by introducing it slowly to its new environs. Do likewise on its return.

- **Do** agree light levels and where possible the control of the RH and temperature.

- **Do** record the condition of the object on its return.

3.9 TRANSPORT

- **Do** avoid unnecessary transport, question whether the journey needs to be undertaken. Can a procedure be carried out in the objects own environment? For example, photography, bring the photographer to the object.

- **Do** pack objects in suitable materials and ensure that it is properly cradled or supported.

- **Do** wrap loose parts individually. Plastazote foam, acid free tissue paper, acid free corrugated boxes, bubble wrap, Kraft paper and tape, foam pellets are all useful to have in stock for such occasions as well as environmental buffering material such as silica gel..

- **Do** have sufficient manpower and machinery for heavy items, including folklore objects.

- **Do** allow the crate/case time to acclimatise before opening.

- **Do not** leave in the boot of the car, both from a security and environmental point of view.

3.10 DISASTER PLANNING

Despite the best of intentions things can go wrong on a disastrous scale and the collections may need to be evacuated. Fire and flood are the two most likely threats of disaster. The risk of further damage after the event can be significantly reduce if people are prepared and have a number of agreed procedures. Confusion often reigns at the scene of a calamity so it is all the more important to plan for a disaster.

i. Liase with the local Fire Station and Police Station. Invite them to the museum to discuss the type of material that is housed there and the layout of the building in relation to evacuating the material.

ii. Have the type of fire hydrant best suited to the collections and make sure the staff know how to use them.

iii. Supply these services with a shortlist of staff names to be contacted in the case of an emergency.

iv. Have plan of building services *i.e.,* electricity cables, plumbing, *etc.* at reception and a spare copy off premises.

v. Negotiate with neighbouring premises for emergency evacuation space

vi. Have access to freeze drying facilities.

vii. Have spare set of keys, relevant phone number and person to contact.

viii. Have a disaster kit to include plastic bins for carrying out material, spare buckets, mops, rubber gloves, torches, rolls of cotton wool, packages of blotting paper, clean towels, pliers, screwdrivers, hammers, wellington boots and hard hats.

ix. Prioritise material for evacuation, draw up a list, issue it to appropriate personnel and keep secure. Get the most valuable pieces out first.

x. Delegate tasks. Each person should have a designated role; *e.g.,* if the collections have to be evacuated, ensure there is a member of staff there to receive and account for the objects as they are brought in.

xi. Get in touch with a conservator or conservators as soon as possible. Good advice may prevent greater damage and later expenditure.

xii. Instruct and use volunteers.

SECTION 4

THE ROLE OF THE CONSERVATOR

4.1 WHAT IS A CONSERVATOR?

A conservator is some one who has gained the necessary knowledge, experience and qualifications in a particular area within the field of conservation. There are many different types of conservators reflecting the diversity of objects that require specialist attention and care. These include oil-painting restorers/conservators, archaeological conservators, paper conservators, furniture restorers, ceramic restorers and many more.

In the practice of their profession, conservators have obligations to the integrity and survival of historic and artistic works, and to their owners or custodians, the public and to posterity.

A strict code of ethics therefore, governs professional conservators in the manner of their work and in the limits of what can and cannot be achieved. This is an important point to make because implicit in using the services of a qualified conservator is a client's recognition of standards in the care of cultural objects.

4.2 WHEN TO USE A CONSERVATOR?

Most museums/collections have neither conservators nor conservation facilities entirely dedicated to the care of the material. In these situations the services of a private conservator are sometimes used. This is usually a finite or short-term arrangement, the contract terminating on completion of the conservation treatment and return of the object.

However, the long-term, successful outcome of such an arrangement, or of any intervention, depends on sound preservation practices being in place on the part of the commissioning body. It is a distressing fact that many items that are conserved and sometimes at considerable cost, are returned to environments or situations which may have contributed to damage in the first place. The initial decision to conserve an object is often based on the ad-hoc exigencies of loan, current usage or exhibition rather than on sound preservation principles. This is frustrating not only for the conservator but also for the museum or collecting body who at the end of the day may have wasted valuable resources.

The relationship between conservation/restoration and preservation, between the decision-makers and the conservator needs to be clearly understood. Because conservation is object specific, its benefit to the collection as a whole is somewhat

limited. A genuine need for conservation treatment exists but conservation must be integrated into the task of preserving all the collection. The preservation of every object depends on safe housing and stable conditions, what goes forward for conservation treatment should fulfil very strict criteria in terms such as the objects value within the collection, the amount of usage it gets and its actual condition.

The conservator has a professional role to play in preservation. A conservator can carry out a survey of the collection in order to identify problems and quantify the amount of material that is stable/unstable, needing preventive conservation or interventive conservation measures. By helping to identify what needs to be conserved in the first place and by assessing conditions that present a current threat to the long term survival of a collection, a conservator's services can be used to co-ordinate preservation strategies. A conservator will also offer general advice on the environment and can make specific recommendations for environmentally sensitive objects.

The advice a conservator can offer may save on greater expenditure down the road.

4.3 Where to find a Conservator

The quickest way to source a conservator working in Ireland is through the Irish Conservation Directory. The Conservation Unit of the Museums and Galleries Commission, London also has a register of conservation studios and conservators working in Britain and Ireland.

The professional status of the conservator may be confirmed by verifying background experience, training, qualifications and length of time practising. It is perfectly acceptable to ask for references, request, where possible, to see previous work or commissions and to inspect the studio where the work will be carried out. Most conservators are members of professional bodies such as The Irish Professional Conservators and Restorers Association (IPCRA) and The Institute for the Conservation of Historic and Artistic Works in Ireland (ICHAWI), which is an accrediting body. Many conservators are also members of the United Kingdom Institute of Conservation (UKIC), British Antique Furniture Restorers Association (BAFRA) and the Association of British Picture Restorers (ABPR). Both (BAFRA) and (ABPR) confer accreditation.

- **Do**, if necessary, seek independent professional advice on the nature of the commission to ensure equity and responsibility towards the object to be conserved and to the conservators tendering for the job.

- **Do** select the type of conservator appropriate to the situation or job in hand.

- **Do** seek qualifications, references, accreditation or relevant experience.

- **Do** visit the conservator's studio. Check security arrangements and conformity to health and safety regulations.

- **Do** discuss the commission. Express expectations against what can reasonably be delivered.

- **Do** ask for a written condition assessment, treatment proposals, (there may be more than one option depending on how and where the object will be housed, or on financial resources available) and estimate of costs.

- **Do** agree insurance cover should the item have to be removed to the conservator's premises.

- **Do** agree a time frame.

- **Do** discuss how conservation treatment will be recorded and seek full documentation of the work as carried out.

GLOSSARY OF TERMS

Activated charcoal: granulated carbon, which has the ability to absorb pollutant gases and odours, used for gaseous filtration in exhibition cases.

Air conditioning: a mechanical system, which, depending on whether or not it has the appropriate facilities, circulates relatively dust-free, pollutant-free air through ductwork and maintains the temperature and relative humidity within pre-determined set-points

Ambient environment: the local environmental conditions that prevail within a given a space.

Artsorb: silica gel supplied either in sheet form or beads. When used in a sealed space, it maintains a stable RH. It can be supplied to 'pre-conditioned' to a specific moisture content depending on the RH required.

Buffer material: a material that has the ability to absorb and release moisture with changes in the ambient RH, *e.g.,* silica gel.

Condensation: the precipitation of moisture in the atmosphere into water droplets.

Conservation heating: the use of heating to control RH.

Cradle: a support of Perspex or plastazote foam for books or vulnerable objects.

Dehumidification: the extraction of moisture out of the atmosphere either by cooling and condensing or by drying using a desiccant material.

Fibre optic lighting: a method of lighting whereby light is transferred away from the light source along glass or plastic fibres. The light is emitted from the tip of these fibres with little or no radiant heat or ultraviolet light.

Fluorescent light: electricity is discharged into a mercuric vapour contained within a glass tube coated with phosphors. These fluoresce and give off light, which contains ultraviolet light. Fluorescent tubes require an UV filter.

Humidification: the addition of moisture to the atmosphere.

Humidistat: a control, set to predetermined levels of RH in the ambient environment, is triggered when conditions fall outside these levels.

Hygrometer: an instrument equipped with moisture sensitive material such as hair or paper, which responds to and displays changes in the RH. The instrument requires regular calibration.

Hygroscopic: any material capable of absorbing moisture.

Infra-red radiation: long wave light energy which lies between visible light and radio waves. At the other end of the light spectrum to ultraviolet light, long wave radiation produces little energy which is less damaging to artefacts. It does produce heat and emits a 'warm' or yellow light.

Inorganic materials: mineral derivative materials such as stone, glass, or metal.

Interstitial condensation: internal condensation occuring within the wall of a building: it occures when the temperature with the wall falls below the dew point.

Interventive conservation: intervention by a conservator to stabilise the condition of an object.

Light intensity: amount of illuminance, light intensity is proportionate to the distance the object is removed from the source.

Light meter: an instrument used to measure the amount of light falling on an object.

Lumen output: a measure of the total amount of visible light emitted.

Luminous efficacy: the total amount of light given off for each watt of electricity used. Expressed as lumens \ watt.

Lux: unit of measurement of illuminance. 10.76 lux is equal to one foot candle. This is the amount of light a candle emits held one foot away from an object.

Moisture equilibrium: balance attained when the moisture content of hygroscopic materials such as leather or wood is in equilibrium with the moisture content of the ambient environment.

Mylar / Melinex: a transparent, stable polyester film used in the protection and handling of sensitive documents, textiles, or suitable material.

Organic materials: materials derived from plant or animal products.

Photo-degradation: chemical decay caused by light.

Plastazote: nitrogen expanded inert polyethylene foam, available in sheet size to different thickness.

Preventive conservation: any measure that prolongs the life of a building or object without compromising its cultural, historical or aesthetic integrity.

Pre-conditioned silica gel: to sustain a relative humidity within predetermined parameters in a sealed container, silica gel must first be 'conditioned' to a specific moisture content depending on the RH required.(see 'art-sorb'). In a hermetically sealed environment, it can then be expected to maintain the RH constant for a long time. It is useful to put humidity indicator strips into the showcase (container) with the silica gel to monitor any change in RH.
Silica gel exposed over time to the environment in which an object is kept will condition itself to that environment. It can then be used to maintain that environment in a packing case, or an exhibition case, alongside the object, provided the case is tightly sealed.

Restoration: the attempt to suggest what is lost only in so far as it allows us to use, understand or appreciate the item better. Such intervention does not attempt to recreate the original.

Relative humidity (RH): the actual amount of moisture in the air at a given temperature relative to the total amount of moisture the air could hold at the same temperature.

RH indicator strip: moisture sensitive strips of paper coated with cobalt chloride, graded colour change reflecting fluctuations in the ambient moisture content correspond to RH values indicated at the side.

Self-indicating silica gel: silica gel that has been coloured with cobalt chloride. Blue when dry the gel gradually turns pink on the uptake of moisture.

Silica gel: a mineral, which is able to absorb or release moisture in large quantities. Used as buffer material it can regulate the RH in a sealed space once it has been conditioned to the required RH. See 'conditioned silica gel'.

Solar control film: a film for glass, which reduces the amount of visible and UV light transmitted. It must not affect colour rendering, *i.e.*, the colour of objects as we see them in daylight.

Spot reading: on-the-spot measurement of RH, temperature, light levels using appropriate instruments such as a light meter or digital RH monitor.

Thermohygrograph: an instrument, which simultaneously records temperature and RH. Elements sensitive to change in the ambient temperature and RH transmit this information mechanically to pen nibs, which record the information on a graph attached to a rotating drum. The graph must be changed once a week or once a month, and the instrument needs to be calibrated regularly.

Tungsten filament lamp: a tungsten filament is lit to incandescence within an inert gas contained in a glass bulb. It has a low luminous efficacy so that more energy is given off as heat rather than light. Emits very little UV.

Tungsten halogen lamp: a tungsten filament is lit to incandescence within halogen gas contained in a glass bulb \ spot. Gives off more UV than heat and has a 'cool' colour rendering. Tungsten halogen is the source for fibre optic light. It is a more efficient source of light in terms of energy consumption than the tungsten filament lamp.

Ultraviolet light (UV): short wave light energy which lies between visible light and x rays on the light spectrum. At the opposite end of the spectrum to infrared the risk of deterioration is great because short light waves produce high energy. Conversely they emit little heat and so produce a 'cooler blue light.

FURTHER READING

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Museums and Galleries Commission, London *Standards in the Museum Care of Collections* (Archaeological, Biological, Geological and larger and Working Objects Series)

Thomson, G. *The Museum Environment* (Second Edition) London

USEFUL ADDRESSES

The Institute for the Conservation of Historic and Artistic Works in Ireland (ICHAWI)
73 Merrion Square, Dublin 2

Irish Professional Conservators and Restorers Association (IPCRA)
C/o National Gallery of Ireland
Merrion Square West, Dublin 2

The Heritage Council,
Rothe House, Kilkenny
Tel. (056) 70777, Fax. (056) 70788. E-mail: heritage@heritage.iol.ie

Northern Ireland Museums Council (NIMC)
66 Donegal Pass, Belfast BT7 1BU.
Tel. (01232) 550 215. Fax. (01232) 550 216

Preventive Conservation Resource Centre, Ulster Museum
Contact: Edith McCandless. Department of Conservation, Botanic Gardens,
Belfast BT9 5AB.
Tel. (01232) 383 000 ext. 3081. Fax. (01232) 383 003

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