

Preventive Conservation

How do you safeguard the items in your museum? This resource guide looks at practical steps you can take to ensure the protection, safety and security of your collection.

What is preventive conservation?

Preventive conservation is the practice of safeguarding the items you have in your care. It begins the moment you accept an object into your collection. It is achieved by practising:

- effective control of your building's environment
- safe handling and display techniques
- good storage
- pest management
- effective security
- planning for emergencies.

Looking at your museum through a preventive conservation lens will reduce the likelihood of damage and decay and avoid unnecessary, and often costly, remedial treatment or loss of valuable items.

Self help in preventive conservation

This guide aims in particular to help those museums that don't have ready access to specialist conservators. It identifies common risks to collections and suggests actions you can take to prevent risks from becoming realities.

Even if resources are limited, there is much you can do to maintain museum collections in a stable condition through applying the principles of preventive conservation outlined in this guide.

When deciding on actions, though, remember that it is necessary to consider the whole situation. Threats to a collection are numerous and rarely exist in isolation. For this reason, it is not possible to cover them all in detail in a publication of this kind.

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Planning for *emergencies*



Priorities in preventive conservation

Emergencies threaten collections. All museums need a plan of actions to be taken should some possible emergency occur in the future. A contingency plan covers this. It sets out what you will do in the event of an emergency - how you will handle it and how you will recover from it.

Contingency plans are often the last thing that people want to think about. In fact they should be one of the first things covered if you are taking preventive conservation seriously.

For an overall picture of preventive conservation, you should read this guide in conjunction with:

- *Minimising Disaster* (Te Papa National Services Resource Guides 6) which looks at planning for handling and recovering from emergencies
- *Emergency Procedures* (Te Papa National Services Resource Guides 7) which looks at developing plans and procedures for *immediate* response to emergencies.

PLANNING FOR CONTINGENCIES OFTEN REVEALS WEAK POINTS IN YOUR RESOURCES FOR SAFEGUARDING YOUR COLLECTION.

Highlighting problems

When you undertake a contingency plan, you may identify problems that need expert attention or would be very costly to remedy. If you understand the principal causes of deterioration in collections, you can still protect them from unnecessary damage. You can take preventive measures that stabilise conditions until a specialist can deal with the situation or you can afford a better solution.

If resources are limited for a long-term solution, your understanding of preventive conservation may help you to think creatively about an acceptable alternative.

Risks and **preventive** *actions*

The first requirement for the safety of collections is a sound building.

There are seven main sources of risk for museum collections. These are:

- your building and its surrounding area
- the environment inside the building
- natural light and artificial lighting
- storage and handling
- pest management
- fire hazards
- breaches of security.

We look at each source of risk and suggest some actions you can take to manage it. These have been divided into three categories: higher budget (comprehensive expert assistance - sometimes the only answer); lower budget (for alternative forms or uses of expert assistance); and good housekeeping - what you can do for yourself.

A LOT OF PREVENTIVE CONSERVATION IS

GOOD HOUSEKEEPING AND COMMON SENSE.

Your building and its surrounding area

Location

Your building's location may be a potential threat to collection safety. Consider its surroundings. Is the location vulnerable to extremes of nature or seismic activity? Is your building situated in an area subject to flooding or poor drainage? Has local development over the years exposed your museum to social changes resulting, say, in increased vandalism or vibration and pollution from traffic?

The building

Undertake a thorough inspection of your building. Inspect its exterior - look for maintenance requirements such as cracking plaster, damaged windows. Check that all gutters, drains and downpipes are in good condition and clear from blockage, especially by leaves.

Make sure there is no accumulation of garbage, for example, from kitchen waste or picnic lunches, that could attract rodents and insects. Check that shrubs and trees are pruned, allowing at least one metre clearance around the building's outside. Check seals on windows and doors. A poor seal will result in draughts, leaks and heat loss.

Suggested actions for problems

Higher budget

- If you see major problems, get professional advice from a conservation architect or building specialist. Ask for a thorough survey of the building and recommendations for improvements on areas of concern.

Lower budget

- Prioritise the repairs you need and get quotes from tradespeople to determine the potential cost of repairs. Apply for funding.

Good housekeeping

- Do whatever maintenance you can to reduce the risk to collections. For example, make sure the property is regularly inspected and maintained, clear rubbish regularly, prune trees, improve security lighting to discourage vandalism when the museum is closed.

The initial reason for preventive maintenance of this kind may be the care of collections, but other benefits are improved building maintenance, less damage to collections through pollution, dust, dirt and moisture, and a better environment for museum staff and visitors.

The environment inside the building

Relative humidity

Relative humidity (RH) is a measure of how much water is in the air compared with how much there would be if it were fully saturated at the same temperature. RH is shown as a percentage. Damage can be caused by sudden changes in RH or by inappropriate RH for the object. High relative humidity (over 65%) may cause mould and tarnishing. Low relative humidity (under 45%) may cause drying, warping and cracking.

A stable environment in the middle range of 50-55% is considered the best compromise and is the accepted standard to aim for. Without a climate control system or only minimal control a range of 45-60% is acceptable, but large, sudden changes should be avoided if possible. Gradual or seasonal fluctuation can be allowed for within this range.

Relative humidity and temperature can be easily measured using a wet and dry bulb psychrometer. This will give an 'on the spot' reading. However, it is better to record environmental changes over time using a datalogger or thermohygrograph. These instruments will show changes that occur over a weekly or monthly period and provide more information on climatic changes.

More on relative humidity

To explain relative humidity very simply: when RH is at 50%, the air is holding half the water it could at that temperature (the warmer the temperature, the more water the air can hold). A reading of 30% RH means the air is very dry, a reading of 95% RH means it is almost saturated.

The type of damage high or low levels of humidity can cause depends on whether the object is organic or inorganic. If it is organic, for example, paper, wood or textiles, fluctuations in RH will cause swelling and contraction that may stretch, crack or tear an object. If the object is made of inorganic materials, such as metal, moist conditions will cause corrosion and swelling of the products of corrosion. Some inorganic materials such as ceramics, glass or gold are much more durable, and will be less affected by moisture.

High RH may also encourage the growth of moulds. Mould will stain and eat away organic materials.



Measuring Relative Humidity

A thermohygrograph (left) has the advantage of being clockwork-driven and easily maintained. You will need a wet and dry bulb psychrometer to calibrate it. A new thermohygrograph costs about \$1400 but you can sometimes find them in second-hand equipment shops or surplus to requirements at engineers' offices.

A wet and dry bulb psychrometer (right) is a battery-driven instrument and you have to dampen the wet bulb to get a reading. It costs about \$800 new.

A datalogger (centre foreground) costs about \$450 new and you'll probably need to renew it every 3-4 years. You need suitable computer equipment to access its data, and calibration, if needed, can be expensive.

Temperature

Temperature can affect collections in similar ways to humidity as the two are closely related. A rise in temperature in your building will reduce RH while a drop in temperature will increase it.

If you had limitless resources, it would be better to provide two ranges of temperature in your museum: lower temperatures for collections and higher temperatures for staff and visitor comfort. For example, the environment for collections could be within the range 15-18 °C (in some cases very much lower than this); another environment for staff comfort within work areas could be within the range 20-22 °C. This requires more than one building system and is extremely costly.

For practical reasons, and where cost is a consideration, the best temperature for both collections and human comfort is a range of 18-22 °C.

Any changes in temperature need to be gradual and controlled.

Air cleanliness

There are three main sources of pollution from the air - gases, particles (for example, carbon from vehicle exhausts) and fungi.

- Paint, adhesives, building materials, plastics and wood, give off gases that cause corrosion and decay of museum objects. An example might be frequent tarnishing of metal objects made from silver or copper.
- Particles in smoke, dust lint and pollen cause abrasion.
- Fungi may cause mould when conditions are moist.

A filtered climate control system will help reduce pollutants or keep them under control, but this may be too expensive for many museums.

Suggested action for problems

Higher budget

- Get professional advice from a heating and ventilating engineer.

Lower budget

- Ask a conservator to undertake a survey of environmental conditions and to provide a written report.
- Try increasing control of the environment by sealing doors and windows to reduce draughts.
- Use appropriate measuring instruments to monitor and record conditions. Ask a mechanical engineer at your local council or a preventive conservator for help in acquiring and using the instruments mentioned above.
- Pack special items in crates or boxes for protection. This will slow the effect of environmental changes by creating a microenvironment within the container and help buffer contents from external changes. Seal wooden surfaces to reduce gas being given off from them.

HEPA filters

The HEPA (High Efficiency Particulate Air) filter is made to a recommended international standard that requires its efficiency to retain particles as small as 0.3 microns and has an efficiency rating of 99.97%. The filter was developed by the Atomic Energy Commission to remove radioactive dust from atomic plant exhausts.

Good housekeeping

- Air cleanliness can be improved by regular vacuum cleaning - this will help reduce dust particles. Ensure the cleaner has a good filter system to prevent dust blowing back into the air through the cleaner exhaust. A cleaner fitted with a HEPA filter is the most efficient.

Natural light and artificial lighting

There are three main causes of damage from natural light: ultra-violet radiation (UV) (measured in microwatts/lumen); visible light (measured in lux); and infra-red radiation causing heat damage.

UV radiation must be kept below 75 micro watts/lumen. There are many products available that filter UV, including films, filters and low UV lamps. They are readily available from lighting, glass and window specialists and easy to install.

Visible light is measured using a lux meter. Visible light should be kept within the range of 50 lux or lower for very sensitive objects such as watercolours and textiles, and 150-200 lux for less sensitive objects, for example, oil paintings.

When you have information on light levels it is easier to make the right decisions to rectify potential hazards.

Dangers from daylight

Many smaller museums are in buildings previously used as family residences. These do not have filtered windows and use a lot of natural light to display the museum in the way it may have appeared to its occupants. This is unfortunate because natural light is causing irreversible damage to furnishings and items on display. On a sunny summer day, light levels can be as high as 50,000 lux just inside an unfiltered window.

Suggested action for problems

Higher budget

- Consult a lighting expert, describe your requirements and ask how these can be achieved.

Lower budget

- Ask a conservator to measure light levels with a UV and lux meter and write a report on the conditions. Alternatively, ask an electrician, they sometimes use lux meters in their work.

Humidifiers and dehumidifiers

A common problem in winter is office air conditioning without humidity control. The air outside is cold and dry, and when it is drawn into a building and warmed, more moisture is removed. This can create a very dry environment sometimes as low as RH 30%. This causes cracking, warping and splitting of organic materials, for example, wooden furniture.

If this is a problem, a humidifier will help increase moisture and thereby reduce the drying effect. In cases where too much moisture is present a dehumidifier will remove excess moisture. Monitoring equipment will be needed to determine exact levels of moisture in the air.



Good housekeeping

- Use curtains or blinds which can be closed on bright sunny days. Avoid placing objects close to unfiltered windows
- Reduce natural light. Keep artificial lighting to recommended levels.

Storage and handling

For many museums, lack of space is usually the biggest problem for managing safe storage and handling. This can sometimes be overcome by reorganizing collections and using available space differently.

Lack of use is another common problem. Often storage rooms are left untouched for years allowing the effects of dust, dirt, insect infestation, moisture and mould to accumulate unnoticed.

Long-term exhibitions can have similar risks for objects on display as storage.

Suggested action for problems

Higher budget

- Improve storage conditions, including more space, new shelving, open crating systems, improved cataloguing and recording procedures. Perhaps consider some off-site storage.

Lower budget

- Survey collections or do a feasibility study to determine collection needs. Apply for a grant to cover costs. The survey will provide vital information for decision-making on storage improvements.
- Attend training on storage and handling to gain a better understanding of issues and solutions.

Good housekeeping

- Use water-based polyurethane to coat or seal surfaces on wooden shelving to reduce the amount of gas the wood gives off.
- Fit restrainers to objects to prevent damage (and possibly injury to people) from their toppling or falling off shelves.
- Create a small work area to provide space for working on collections.
- Wear gloves when handling objects to reduce tarnishing and transferring dirt from one object to another.

Pest management

Insects and rodents can cause irreparable damage to collection items by using them as a food source or for building nests, and by staining them with body waste. Dead insects, rodents and other creatures attract more pests.

Rodents should be monitored rather than trapped individually. In this way any increase in new activity will be recorded, indicating the extent of the infestation. Simply setting traps does not indicate where the rodents are or how many there are.

Buildings with a controlled environment will reduce insect infestation because the building must be sealed to maintain a stable environment. This reduces the chances of insects entering through window openings and spaces around doors.

Another common source of pests is from infested collections and objects coming into the building.

Suggested action for problems

Higher budget

- Consult a pest control specialist to put in place a pest management programme.

Lower budget

- Clearly identify any pest found by consulting an entomologist. Determine its life cycle and preferred habitat then attack it at source, for example, by removing the nest or food supply.
- Use fumigation only as a last resort or for a quick knockdown. Often a pest can be eliminated using other methods. Insect baits and sticky traps will help attract and capture specific insects. These may be obtained from a hardware store or one of the larger pest-control companies.
- Monitor rodents by placing poisoned bait around the building and recording any activity.



Good housekeeping

- Inspect all areas for evidence of pests and record sightings.
- Keep rubbish and food waste to a minimum and control its storage and disposal.
- Establish a regular cleaning and monitoring programme throughout the museum. This will draw your attention to other problems such as mould or fading which in turn may indicate a need for building repair or reduction of light levels.
- Inspect all incoming material for evidence of pests. Have a selection of polythene bags at the point of entry to contain the object or pest until treatment can be arranged.

Fire hazards

The threat to collections from fire is threefold:

- complete loss or partial damage from charring and scorching
- smoke damage
- water or chemical damage from the extinguishing agent.

Other damage may result from melting plastic materials and chemicals from the products of combustion.

Heat and smoke detectors and a sprinkler system are a minimum requirement to guard against fire. In this area of prevention, the high risks require consultation with a fire safety expert before making any major decisions on expenditure.

Suggested action for problems

Good housekeeping

- Avoid accumulating rubbish and dangerous chemical waste like paint and solvent.
- Keep doors and passageways clear.
- Avoid stacking heavy objects on top of high shelving as these may fall on staff and/or firefighters in an emergency.
- Have suitable fire extinguishers installed and checked regularly.
- Install smoke detectors.

Breaches of security

Vandalism, theft and loss of property, bomb threats and staff intimidation are just a few of the potential risks. *Emergency Procedures*, Te Papa National Services Resource Guides Issue 7, covers initial responses to handle these kinds of incidents.

Suggested action for problems

Higher budget

- Get professional advice from a security company for security monitoring and alarm systems.

Lower budget

- Install security lighting around the building if necessary after hours.

Good housekeeping

- Take photographs of important collection or loan items for identification if lost or stolen. Catalogue all collection items for easy identification if lost or stolen.
- Do not leave exhibition spaces unattended.
- Ensure all doors and windows are locked and alarmed when the museum is closed.
- Review insurance cover.

Sources of advice

Advice about conservation issues can be obtained from all major museums. For general enquiries the advice is usually given free. Leaflets on a variety of conservation topics are also available.

If you require the services of a conservator to visit your museum or provide a survey or detailed advice, expect to pay a fee. Funding for conservation surveys may be available from funding bodies. See *Funding Sources*, Te Papa National Services Resource Guides Issue 2 for contact details of major funding bodies.



Further reading

- Auckland Art Gallery Toi o Tāmaki (1998). *Artcare: The Care of Art and Artefacts in New Zealand*. Auckland: Auckland Art Gallery Toi o Tāmaki.
- Clarke, A. (1996). *Keeping Bugs Away - Pest Control for Small Museums*. Wellington: Museum of New Zealand Te Papa Tongarewa.
- Clarke, A. (1998). *Preventive Conservation Around the Home*. Wellington: Museum of New Zealand Te Papa Tongarewa.
- Museum of New Zealand Te Papa Tongarewa (2001). 'Minimising Disaster'. *Te Papa National Services Resource Guides 6*: 2001.
- Museum of New Zealand Te Papa Tongarewa (2001). 'Emergency Procedures'. *Te Papa National Services Resource Guides 7*: 2001.

Other resources

The New Zealand Directory of Conservators of Cultural Property, available from The Secretary, New Zealand Professional Conservators Group, P.O. Box 12349, Wellington 6001.

Te Papa National Services Resource Guides | He Rauemi are published by Te Papa National Services in support of its work with museums, galleries, iwi, and related organisations throughout New Zealand to enhance the museum services offered within communities.

For further information or to discuss training opportunities related to this topic, please contact:

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