

Environmental management

"An unsuitable storage environment is one of the commonest causes of damage to archives." - PD5454:2012 Guide for the storage and exhibition of archival materials.

Humidity, temperature, light and air-borne pollutants all contribute to the deterioration of archival materials. Within a storage area these factors can be controlled and monitored to ensure optimum conditions.

The Published Document PD5454:2012 which has superseded British Standard BS5454:2000, recognises that 'different types of archival material can require quite different storage environments...' and that the needs of the archival material need to be balanced by the needs of the user.

Consequently, PD5454:2012 details a series of recommendations aimed at helping custodians of collections in heritage buildings to determine the optimum conditions for their collection based on material type and usage.

Assessing the environment

When assessing archival storage, the environmental parameters can be measured by taking on-the-spot readings using, for example, thermometers and hygrometers. This can quickly establish whether or not the storage area meets the agreed optimum conditions, and will help to identify any particular areas of concern.

In the long term, monitoring equipment can be used to record readings over a period of time so that daily and seasonal fluctuations can be identified. If environmental control measures have been introduced then it is advisable to continuously monitor the environment so as to assess their efficacy.

When carrying out any monitoring of the environment it is essential that the equipment is correctly calibrated so as to give accurate readings. It may be necessary to consult a specialist to assist with interpretation of the data. In particular, if documents are already in poor condition, for example, damp and mouldy, then it is advisable to contact a conservator, who may also be able to give advice on how to improve the environment.

Environmental factors

Relative humidity and temperature

Storage conditions that are too damp can encourage insect pest activity and the growth of mould, while conditions that are too dry can cause archival materials to become brittle.

If the documents are subjected to sudden fluctuations in humidity then the rapid loss and absorption of moisture can cause microscopic structural damage which will contribute to the overall deterioration of the material.

The temperature can also affect deterioration because chemical reactions are faster in warmer conditions.

As a means of protecting sensitive materials such as wax seals and gelatine photographs that are stored alongside less sensitive materials, PD5454:2012 recommends a temperature range of 13-20°C (although aim to keep the temperature as low as is practicable and for as long as possible) and a relative humidity (RH) level between 35% and 60%.

These parameters are designed for the preservation of paper-based material. Other media may require cooler and/or drier conditions. Sections 4.3.2 and 4.3.3 of PD5454:2012 give recommended storage conditions for a variety of media.

Seasonal variation

Ideally, temperature and RH conditions should be stable within the ranges specified above. This may not be possible, however, due to fluctuating external weather conditions and archival building infrastructure.

Gradual fluctuation such as from the lower to upper limits over a week, month or longer can be acceptable. 'However, a continuous weekly cycle up and down the ranges will cause a gradually increased rate of deterioration of most archival materials when compared with this rate of change in a very stable environment.' (PD5454:2012 Section 4.2.4, p.11)

A stable annual average is recommended but seasonal variations in the temperature and RH throughout the year is acceptable as long as they lie within the ranges stated above. Accepting such seasonal variations can improve energy economy.

Air quality

A lack of air movement can lead to pockets of stagnant air where mould can grow more easily. It is therefore recommended that shelving is ventilated and that documents are stored away from the floor and ceiling.

Deteriorating materials, particularly some modern media, can produce gases which themselves contribute to the deterioration of surrounding materials. It is therefore advisable that the repository itself should be ventilated, but this should not compromise the stability of the RH and temperature.

When air is being mechanically drawn into the repository from outside, take care to ensure that pollutants are not being introduced, such as dust or traffic fumes. The air should be filtered, and the air quality monitored – PD5454:2012 specifies recommendations for filters and acceptable concentrations of pollutants.

Light

It is preferable to have as little constant light in a repository as possible, both to reduce direct damage to the documents through fading and to minimise the heat introduced by light energy. Sunlight is particularly damaging due to its intensity and the corresponding rise in temperature accompanied by localised drying of the air.

When designing a new repository or choosing rooms in an existing building windows should be avoided. If necessary, ensure that windows are as small as possible and positioned to avoid direct sunlight. Light coming through existing windows can be reduced by the installation of blinds which will also provide shade from direct sunlight. Ultraviolet light is the most damaging part of the visible spectrum and can be excluded by installing special filters over windows.

Electric lighting should be switched off when not in use and positioned at least 50cm above shelving to avoid localised heating which may affect documents.

Improving the environment

There are a variety of means for controlling the environment so as to achieve the parameters recommended by PD5454:2012. Environmental control need not involve expensive equipment – the key to safe storage of an archive is to ensure that the environment is stable and that extreme conditions are avoided. Several simple measures can be taken without needing specialist expertise.

The most effective way to achieve a stable environment is to ensure that the storage room, and ideally the building as a whole, promotes stability. Thick walls, few or no windows in the repository, and a solid roof will go some way towards insulating the storage environment from changes in the outside environment. Do not leave doors or windows open, and switch off lights when they are not in use.

Use conservation-quality boxes to store documents. Storing documents in boxes not only reduces their exposure to light, but can also provide some protection against sudden fluctuations in humidity or temperature.

Avoid storing documents on the floor or against an external wall because these areas may be damp. Open shelving is preferable because it allows air to circulate.

Mechanical control methods

A range of mechanical means of control can be used, from the use of fans and heaters, to air conditioning units and building management systems. For any environmental control system, maintenance of the equipment and monitoring of the resulting environment are both essential.

Heating, Ventilating, and Air Conditioning (HVAC) systems are probably the most frequently used means of control, and can be very successful. It is worth noting that such systems are usually intended for human comfort rather than for archival storage and so may need to be adapted for use in a repository.

A dehumidifier can be used where high humidity is a particular problem, but these must be regularly maintained to avoid leaks and floods.

An alternative approach is to control humidity through gentle heating. This requires the use of heaters controlled by humidistat rather than thermostat, therefore it may be necessary to consult a specialist.

An even simpler approach would be to improve ventilation of the room, or to install a fan to introduce gentle air movement. This would help to prevent pockets of stagnant, damp air from developing. Again, a specialist would be able to advise on the most appropriate method.

If converted rooms are being used to store archives then a central heating system may already be installed. Central heating is unlikely to result in desirable storage conditions because it tends to produce a warm, dry environment. In such circumstances it is advisable to consult a specialist because it may be possible to adapt the existing system to achieve more suitable conditions.

Searchrooms and acclimatisation

If the environment in an archive store is dramatically different from that in the reading rooms then the documents may be placed under stress when they are transferred. Documents

should be given time to acclimatise before being used and it may be worth setting aside a space specifically for this purpose.

This is particularly relevant for audio-visual media stored at the recommended low temperature and humidity. It is essential that these are acclimatised to avoid damage through the formation of condensation.

This is intended to be no more than an introductory guide to the issues involved in environmental control and monitoring. More detail on all these issues can be found in the full text of PD5454:2012 Guide for the storage and exhibition of archival materials.