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10 Preventive Conservation

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10.1 Definition of 'Preventive conservation'

Preventive conservation can be defined as meaning all indirect actions aimed at increasing the life expectancy of objects and collections (THE DOCUMENT OF VANTAA, 2000); as opposed to the direct treatment of individual objects (**remedial conservation**). Preventive conservation requires the assessment of objects, deterioration agents, and the environmental context (surveys and investigations); as well as long-term judicious management and forward planning. The term covers all cultural heritage, be it movable or immovable, and aims to keep an object or group of objects in a preferred state where minimum damage and/or deterioration occurs, as well as addressing the assessment and management of potential risks to objects and collections and the formulation of emergency response strategies. It includes direct actions undertaken to avoid natural and manmade deterioration agents, in addition to improving the environmental conditions for the storage and/or display of objects. Indeed, notions of preventive conservation influence contemporary museum design for new buildings, and modification where possible of historic buildings (PADFIED, 2005). It should be noted, however, that the technical literature on preventive conservation mainly addresses the management requirements of museum and archive collections. Further examples of general preventive conservation literature and some more relevant for the issue of salt-related deterioration are given below.

Preventive conservation and salt deterioration

Within the context of salts-related deterioration of cultural property, objects are often exposed to direct weathering (e.g. historic buildings, outdoor monuments and sculpture). Objects affected by salt deterioration within historic structures include architectural surfaces and wall paintings, flooring, sculpture and monuments. The potential for controlling the environmental conditions within historic structures is subject to significant ethical, financial, and technical restrictions. Objects in museum environments are also often affected by salts which develop from gaseous emissions from storage materials and showcases, however, in such cases environmental control can be achieved comparatively more easily.

10.2 Interdisciplinary activity

Preventive conservation is an interdisciplinary activity and requires teamwork with conservation professionals (managers, fund-raisers, architects, conservators, geologists, chemists, engineers, etc.) working together with the non-professional stakeholders (owners, local people). Neal Putt and Sarah Slade (PUTT and SLADE, 2004) have produced a useful document which suggests a framework for planning and team-development to provide additional support for preventive conservation. Their approach of introducing teamwork to improve preventive conservation ─in the museum context─ was based on the experiences of eleven museums from nine European countries.

10.3 Preventive Measures

Actions undertaken as part of a building maintenance programme, are often be remedial but also serve as preventive measures in respect to salt deterioration. For example, the re-pointing of an exterior wall or the repair of a roof are remedial measures, but necessary to prevent liquid water infiltration. Other measures are seasonal and involve temporary modifications or intermittent implementation, e.g. against snow, warm weather condensation, etc.

The tempering and buffering of historic buildings as a preventive conservation strategy for ameliorating salt damage, may however, require direct actions or modifications to the building fabric and site, and building usage (changes to rainwater and drainage systems, roofing, drainage, awnings, heating and ventilation systems and/or regimes).

Direct interventions which could be considered as preventive measures, such as the application of sacrificial plasters, the mechanical removal of salts efflorescence and other forms of salt reduction and/or conversion will be dealt with elsewhere. The application of an organic coating on a wall painting would nowadays be classified as a remedial treatment. However, the waxing of wall paintings in England, in the first half of the 20th century was carried out with both remedial and preventive conservation aims, but unfortunately led to widespread damage to wall paintings through salt deterioration. Despite this modern classification, it is possible to view some practical measures as preventive. For example, the mechanical removal of any surface salts by a trained conservator. Such actions require assessment and analysis of the object, of the salts present and the environmental conditions, as well as subsequent post treatment monitoring to determine the efficacy of the action/s over time.

Potential modifications to the building envelope (interior, exterior)

Perhaps it is helpful to consider measures in terms of the following three categories:

- Preventive maintenance (drainage, rainwater system, roofing)
- Passive Interventions (the employment of preferential buffering materials, blocking of contamination or supply)
- Preventive Intervention (for example, the installation of an automatic air exchange regulated by absolute humidity, peripheral heating or other types of interior climate tempering, the mechanical reduction of salt efflorescences, or application of sacrificial plasters)

Possibility for the prevention or limitation of further salt supply

A bedrock of preventive conservation is the avoidance or blocking of deterioration agents, such as moisture, pests and other contaminants. In the case of salts, this means:

- Preventing ongoing contamination or deposition;
- Limiting or eliminating the source of salts where possible by preventive measures.

Disaster planning

A disaster plan should consider the possible damage caused by the ingress of water- be it on a minor or major scale.

Large-scale disasters:

- For example flooding: Flood prevention
- What to do in the case of flooding
- Fire (water infiltration)

Small-scale disasters:

- Water infiltration (e.g. after roof damage by storm)
- Leakage of water pipes (sewage).

10.4 Environmental assessment and monitoring leading to the management of environmental conditions

The term 'environmental management' is preferred in place of the overly optimistic 'environmental control'. In museums it is possible to aim for environmental control within specially designed and regulated buildings, display and storage cases. However, in the case of salts-related deterioration in the context of historic buildings and outdoor objects it is more realistic to aim for a beneficial modification of the environmental conditions. In very few cases will it be possible to 'control' the environment.

The first step towards environmental modification is an environmental assessment. This might include a survey of the sources of liquid water, measurement and analysis of moisture and salts within the object, environmental monitoring of relevant parameters.

- Relative humidity (RH)
- Temperatures (air and surface temperatures)
- Insolation (light monitoring)
- Air pollution

Environmental stabilisation cannot merely be considered solely in terms of relative humidity control. Other factors also need to be taken into account when trying to reduce the rate of salt deterioration. In particular, increases in temperature and air speed exert a significant effect on the rate of moisture transfer by porous materials. Consequently, the degree of ventilation and heating (especially the use of convective heating systems) within historic properties requires careful consideration not only in terms of relative humidity and temperature levels, but also for the kinetic effect they might have on salt behaviour (SAWDY, 2001).
Moreover, thermodynamic modelling of the behaviour of the salt-system present with respect to environmental parameters (PRICE, 2000) can give useful information as to whether a certain relative humidity/temperature regime might be beneficial or harmful (STEIGER, 2005).

Buffering

It is very important that the role of the support should not be overlooked. It has been demonstrated that lime plaster is extremely sensitive to environmental change and undergoes rapid desorption/adsorption, well within a 24-hour time-period. This has significant implications for the conservation of salt deteriorated wall paintings, and highlights the important role lime plaster plays in buffering environmental conditions (SAWDY, 2001).

Tempering

The effective tempering of historic buildings practically involves direct interventions to the building fabric with the installation of local or perimeter heating. For case studies of wall–base heating systems for the tempering of historic buildings see Henning GROSSESCHMIDT'S article and other useful contributions in KOTTERER et al. (2004).

General advice for best practice

- Avoid relative humidity and temperature fluctuation
- Avoid condensation
- Avoid strong airflow
- Avoid direct sunlight on the surfaces
- Remove salt efflorescenses

Passive systems

- Passive climate control (control or modification?)
- Buffering (methods and materials)
- Ventilation
- Costs
- Active systems

Heating and ventilation systems

- Active ventilation control (e.g. governed by absolute humidity values)
- Cost (equipment and running costs)

10.5 Deficits

It is important to note that preventive conservation measures do not guarantee success and can themselves be detrimental; leading to an acceleration of deterioration. Alterations and additions to historic buildings undertaken with the intention of preventive conservation can, if unsuccessful, cause greater damage. For example, the new installation or changes to existing rainwater and drainage systems, roofing, drainage, awnings, heating and ventilation systems can all potentially exacerbate salt and/or microbiological activity or otherwise adversely affect cultural property.

The successful implementation of preventive conservation measures presumes knowledge of the object, which in turn requires object assessment and ongoing monitoring both of the object and the microclimate. This is difficult to achieve! A range of options can be considered; from the cheap to the expensive; from the more easily implemented to those which are difficult to implement; from those which are directly achievable to the aspirational.

In respect to the salts, the requirement for specific assessment and evaluation is rarely undertaken at the level required (damage mapping, salts analysis topographical and stratigraphic distribution). Nonetheless, we still need to know what the nature of the problem is and how big a problem it is in relation to the object and its wider context. Clearly, we must take care not to recommend changes that address the salt problem but adversely affect the object in another way.

Problem areas, where research is needed

Pollution
One of the major tasks for preventive conservation is the exclusion of pollutants from the object. This can be done by environmental measures (e.g. filtering systems in museums).

Investigations

- What do we measure? The climate, the salts, etc.
- How do we measure it? What analytical methods are available, are all salt phases and ions known?
- How long do we measure for? Periodically, continuously, over what time period, e.g. one year?
- Are the measurements repeated? After one, two, or more years?
- What additional information is required (e.g. condition survey)?

Monitoring (see chapter on Monitoring)

Impact assessment/quality control
It is important to undertake some form of quality control/quality management in respect to the success of preventive actions taken. With an impact assessment and monitoring conducted in a systematic way measures can be evaluated and improved.

Heating
Heating has in past been shown in many cases to be responsible for exacerbating salt damage problems. However, resolving problems relating to heating is not easy. The salt system and many other parameters have to be identified and established in order to design and implement heating systems that do not promote further salt damage.

Education
Education may well be the most important of all these points, because of the influence it has on all others. People responsible for the management and care of cultural heritage have to be made aware of preventive conservation issues. The education and training of all parties involved, from conservation professionals to the custodian in a museum or the sexton of a church, plays a key role for the success of implemented measures.

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