



MUSEUMS & GALLERIES
COMMISSION

Standards 4.
in the
Museum
Care of Larger &
Working
Objects
1994

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MUSEUMS & GALLERIES
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Standards in the Museum Care of
Larger and Working Objects:
Social and Industrial History
Collections 1994

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Foreword

by Dame Margaret Weston

It is no new situation that the preservation of our country's industrial heritage and its accompanying social history needs continuing attention if the results of fresh or recurring problems, economic stringencies, or even just passage of time, are to be addressed. Recognition of this has given rise to a number of collaborative efforts. This handbook, the fourth in the Museum & Galleries Commission Care of Collections Series, is the latest of these.

Let us take a look at what has been done so far, for it does seem to me that here is a sequence which shows quite clearly that it is working together, whether in groups, partnerships or wider-ranging networks, which offers the best prospect for future progress and for the kind of achievements we can relish.

The first project I want to mention developed from a Science Museum initiative in 1987 of bringing together in a Forum representatives of a number of industrial museums. They identified a need for a survey of industrial collections to understand more clearly the scale of problems and the current standards of care. As a result the very useful survey 'The Conservation of Industrial Collections' was carried out by Don Storer in a mere three months, and was published in 1989 as a joint venture between the Science Museum and The Conservation Unit of the Museums & Galleries Commission. It drew attention, for instance, to twenty of the forty museums visited having significant collections housed in the open air. This caused the MGC, when administering its Capital Grant scheme to give special priority to bids designed to alleviate this situation. The MGC also agreed to a change in the terms of what is now known as its PRISM Fund, run for it by the Science Museum, to include the restoration as well as the acquisition of industrial and scientific material, in order to assist with the backlog of conservation work which had been found to exist.

The MGC grants system forms an important method of support giving in addition to funds, initial advice and in the case of successful applications, a seal of approval. It shows good overall return for grant expenditure. It also encourages museums to meet the minimum standards of operation laid down in the MGC's Registration Scheme. But grant availability in general is limited, and museums and other, often voluntary, preservation bodies have always had to achieve most of what they do from within their own resources. It was felt

important that in carrying out their work they should have ready access to advice and information on 'good practice' in their various fields. This was the underlying reason for the MGC's Standards in the Care of Collections Series.

When this present handbook was planned the group of professional museum people convened decided that they wanted it to concentrate on problems peculiar to their field: the large size of objects being preserved, and the fact that many of them were originally working objects. As one who, on my first day in charge of the Science Museum, became responsible for setting up the National Railway Museum, and some time afterwards had a telephone call suddenly offering Concorde 002 (housed only with the co-operation of the Fleet Air Arm Museum) I appreciate their reasoning. I can also see, as could they, that they have an unusually extended range of potential users of their work, for in addition to longer-established museums many of the independent museums established over the last thirty years have been set up to preserve some aspect of the industrial heritage. In addition there are a number of societies and some private owners having large objects in their charge who, while they may have a strong interest in operation, also have a concern for long-term preservation. The group devising this handbook tried to keep all these potential users in mind, and arranged a wide-based consultation process before publication which in itself proved valuable. I hope that publication will stimulate further useful debate.

I found that this handbook profits from careful acquaintanceship. One way is to write its Foreword, but a much better way is to use it.

Introduction

This booklet is one of a series being published by the Museums & Galleries Commission, setting out standards in various aspects of museum work. Those already published cover the museum care of archaeological, biological and geological collections, while musical instruments and photographic collections are to follow.

The purpose of this booklet is to set down standards for the museum care of larger objects in the fields of social and industrial history, and to provide guidance on the interpretation of those standards. We have not tightly defined "larger objects", but mean anything too big to carry, and in this booklet have in mind principally industrial and agricultural objects, excluding buildings.

Of course, a beam engine, a vacuum-tube computer, and a farm wagon present very different problems to the museum, but they also present some similar and distinctive problems, simply by virtue of their size. It is on these aspects that this booklet focuses.

In the fields of industrial and social history our heritage is preserved, not only by professionally-staffed museums, but also by groups of enthusiasts and by private individuals. Though this booklet is addressed primarily to registered museums, the Museums & Galleries Commission hopes that everyone who looks after larger and working objects will find it useful.

In particular, the booklet should encourage museums and other preservation bodies to work more closely together, to the benefit of their shared aim: the preservation of our heritage for public education and enjoyment. A number of correspondents have suggested that this publication might be followed by simpler advice on the care of larger objects; MGC would be glad to cooperate with people active in the field.

To draft this booklet, the Museums & Galleries Commission drew together a group of practising curators, conservators and other experts, and this publication owes everything to their discussions and conclusions. The standards represent a consensus of current professional opinion of best practice; every museum should be aspiring to reach them. "Aspiring" is the key word. We take the pragmatic view that not all museums will be able to achieve all of them in the short-term. We hope, however, that all will actively work towards them.

Though of a similar format, this booklet differs in a number of ways from its predecessors:

- It breaks new ground in recommending an approach to assessing the importance of an object, and drawing up a Conservation/Maintenance Plan based on that assessment.

- It draws together the best practice of a number of leading preservation bodies, and recommends that besides its Conservation/Maintenance Plan, every larger object should have its own Conservation/Maintenance Record.
- It addresses the vexed question of whether museum objects should be worked. Operation or static preservation can both be right; the booklet recommends that the decision should be based on an assessment of the object's importance and its role in the museum, and that every object which is worked should have its own Operating Manual and Operating Log.
- This is the first booklet in the series to venture on Standards for the Condition of Objects.
- This booklet gives extra consideration to Health and Safety questions. Caring for objects cannot be divorced from caring for people.
- This booklet is longer because there is comparatively little in print on the care of larger objects, so we have gone into some detail in some of the Guidelines and notes sections.
- Without abandoning its purpose to set out standards, the style of this booklet has been made as user-friendly as possible. This was something requested by many of those who kindly commented on the draft, in order that as many people as possible might find it useful.

Other differences between booklets in the series may be simply because the expert groups thought they could make improvements. The standards set out in all these booklets will certainly change, as techniques develop and expert opinion changes. The Museums & Galleries Commission intends to publish up-dated editions of these booklets every few years; we hope each one will be better than the last.

How do we envisage this booklet being used?

- A curator is asked to draw up a schedule of performance objectives and indicators for the care of collections. The national standards in this booklet will be a bench-mark for the museum's own objectives and performance indicators.
- An auditor (internal or external) may wish to review how a local authority is looking after its collections. This booklet will give defined national standards against which achievement may be measured.
- An enthusiasts' group, preservation society or museum is trying to decide whether to operate a large machine, or to preserve it for static display. This booklet sets out the criteria on which to make the decision.

- A curator is trying to persuade a museum governing body to make more resources available for care of collections. This booklet will help make the case.
- A local history museum run by volunteers is reviewing its acquisition policy, and is looking for guidance on the implications of acquiring various classes of material. This booklet will help in drawing up a sensible policy reflecting the constraints posed by the museum's resources.
- An architect is asked to design a new Large Objects Store. This booklet sets out the standards of security, environmental control, etc that should be attained.
- A grant-giving body needs reassurance that a museum applying for grant will use it responsibly. These standards enable it to judge whether the museum is likely to do so.

Each aspect of caring for collections is divided into three sections:

- The standards themselves. These are the standards at which every Museums & Galleries Commission registered museum should be aiming. Larger and specialist museums may already be meeting even higher standards.
- Guidelines and notes, explaining and enlarging on the standards.
- Sources of advice and help: generally one or two basic publications and a first-stop address.

We have tried, in each section, to achieve a balance between the statement of principles and detailed guidelines.

The Museums & Galleries Commission is grateful to the Department of National Heritage for funding its standards development programme, and to the members of the "expert group" and others who gave their help. They are listed below.

Users of the booklet are warmly invited to comment on its usefulness, and to make suggestions for improvements - or even for a new approach - for a second edition.

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Richard Compton-Hall	The Royal Navy Submarine Museum
Tony Conder	National Waterways Museum at Gloucester
Jackie Cope	Vintage Carriages Trust
Michael Cope	Vintage Carriages Trust
Neil Cossons	The Science Museum
Pamela Craig	Historic Scotland
John Crompton	The Black Country Museum
Michael Davies	National Traction Engine Trust
Neil Davies	
Gareth Davies	The Council of Museums in Wales
L R Day	The Newcomen Society
David de Haan	The Midlands Federation of Museums and Art Galleries
Steven Dyke	Darlington Railway Centre & Museum
Clive Ellam	The Newcomen Society
Michael Fopp	The Royal Air Force Museum
George Forty	The Tank Museum
Wilfred Foxe	Museum Training Institute
Jim France	National Museums & Galleries on Merseyside
R A Gailey	Ulster Folk & Transport Museum
Alison Gale	Independent expert
Richard Gibbon	National Railway Museum
R C Hall	National Tramway Museum
Ann E Hamlin	Environment Service, Department of the Environment for Northern Ireland
	Kent County Council
Simon Hawkins	The Council of Museums in Wales
Jane Henderson	Midland Railway Trust
John Hett	N E Scotland Agricultural Heritage Centre
Andrew Hill	National Motor Museum, Beaulieu
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Tony Hirst	Dorothea Restorations Ltd
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Gaynor Kavanagh	Museum Documentation Association
Guy Kilminster	North of England Museums Service
Stella Mason	Historic Scotland
Roddy McDougal	Royal Naval Museum
H Campbell McMurray	Royal Commission on the Ancient and Historical Monuments of Scotland
Roger Mercer	
	The Excelsior Sailing Trust
Christine Monkhouse	Institution of Mechanical Engineers
Keith Moore	Yorkshire & Humberside Museums Council
John Wm Morris	The Royal Aeronautical Society
AW L Nayler	The Science Museum
Hazel Newey	United Kingdom Institute for Conservation
Mark Norman	Royal Commission on the Ancient and Historical Monuments of Scotland
Miles Oglethorpe	
	Association of Railway Preservation Societies
Peter Ovenstone	Science & Industry Curators Group
Dr E S Owen-Jones	North of England Museums Service
Hazelle Page	The 'Hotties'
Andrew Patterson	Association for Industrial Archaeology
Amber Patrick	Museum of London
Robert Payton	

Oliver Pearcey	English Heritage
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Graham Perry	Great Western Society
Chris Potter	Home Office
J E Potter	Bluebell Railway Operating
Cathy Proudlove	Norfolk Museums Service
M J Raven	The Institution of Gas Engineers
Fergus Read	East Midlands Museums Service
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Diane Young	Historic Scotland

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Part One: Managing Collections

1

Standards for collecting

- 1.1 The museum's¹ governing body should draw up and publish a detailed acquisition and disposal policy, which should be formally reviewed at least every five years.
- 1.2 The museum should ensure that it secures legal title to items it acquires.
- 1.3 Every larger object must be acquired in accordance with the code set out in the Museums & Galleries Commission's *Guidelines for a Registration Scheme for Museums in the United Kingdom*, and with the law (see also 5.25).
- 1.4 Once a decision has been taken formally to acquire items for a museum's permanent collections, there should be a presumption against disposal. If disposal of items is considered, it must be undertaken in accordance with the procedure outlined in the Museums & Galleries Commission's *Guidelines for a Registration Scheme for Museums in the United Kingdom*.
- 1.5 The greatest effort should be made to acquire all available information and associated objects, with each object at the time of collecting, particularly where an object is removed from its context (see Section 2).
- 1.6 Larger objects should only be acquired, even though they may fit with the museum's Collecting Policy, after the following questions have been answered:
- Why is this object sought for the collections?
 - How important is it in regional, national or international terms?
 - Can space be made available for it?
 - How long can it be preserved?
 - What standard of care will it be afforded?
 - How much will it cost to keep it?
 - What are the Health and Safety implications?
- These questions should be asked again and again, as the object is moved, re-displayed, conserved or otherwise used.
- 1.7 On the basis of the answers to these questions, a decision should be made on the status of the object (see Appendix A).
- 1.8 There should be a presumption in favour of preserving fixed objects in situ.
- 1.9 Museums should always ensure that people who help them to collect are adequately and courteously thanked and acknowledged, and that collecting is done in cooperation and agreement with other museums in the field.

Guidelines and notes

- 1.10 Because of the cost of maintaining them, larger objects impose a very special responsibility on museums to decide, at the time of acquisition, exactly why they are being collected and how they will be maintained.

- 1
- 1.11 Why is this object sought for the collections? An object may be required, for example, in order to illustrate an important social or technological development, for research purposes, for demonstration or to provide atmosphere. The implications of each reason for standards of care are very different.
 - 1.12 How important is it? A rare and important object clearly demands the highest standards of care, which not every museum may be able to provide. National and international lists of certain classes of larger object are being drawn up, eg textile machines, horse-drawn vehicles, trams and aircraft. This assessment is crucial to the object's acquisition and future management within the museum; it ought to be carried out after the most careful research into the history of the object, and in consultation with the leading specialists in this class of object. It will form the basis of the object's care and maintenance programme (see 4.1 and 4.7, and Appendix A). The rarest and most important objects should never be altered, adapted, "restored" or operated in any way at all, but (like type specimens in the Natural Sciences), should be kept in the best possible condition for future study.
 - 1.13 Can space be made available for it? Will space suitable to its needs be available as far into the future as can be foreseen, and will it affect future acquisition decisions?
 - 1.14 How long can it be preserved? This is a question which must be faced for larger objects. An aeroplane kept outdoors, for example, cannot be expected to survive, even with the highest standards of care, for more than about fifty years.
 - 1.15 What standard of care will it be afforded? Not every museum will be able to afford every larger object the very highest standard of care. The approach in each case should relate to the importance of the object (nationally and internationally, as well as to the museum which holds it) and to its role in the museum collections. An assessment procedure similar to that outlined in Appendix A will help make this decision. Its implications should be set out in a Conservation/Maintenance Plan for the object (see 4.1 and 4.7). Larger objects are often assemblages of different parts. It may be that certain elements of the object are particularly significant and deserving of a higher standard of care than others, in which case the Conservation/Maintenance Plan should indicate what treatment is appropriate for what parts.
 - 1.16 How much will it cost to keep it? These decisions have serious cost implications. Costs of handling, transport, conservation and even simple maintenance can be very high for larger objects. Are the resources (money, equipment, time and skills) likely to be available? A museum should seek to acquire larger objects only if it can afford to keep them at the appropriate standard.
 - 1.17 What are the Health and Safety implications? Health and Safety aspects are covered in Sections 23 and 24, below. Both the collection and the maintenance of a larger object may have Health and Safety implications.
 - 1.18 These questions should be outlined in the museum's Collections Management Policy. This should also cover the museum's acquisition policies, which should include reference to the geographical area from which collecting takes place, and to the collecting policies of other registered museums, in order to avoid unnecessary duplication and waste of resources, and to ensure that local initiatives also serve a wider national goal. They should also reflect the limitations on collecting imposed by such factors as inadequate staffing, storage and conservation.
 - 1.19 Some museums hold two distinct collections, the usable and the sacrosanct; sometimes objects in the latter are accessioned but not those in the former. But an object may change its status (may be recognised, for example, as unique), or may be able to be operated carefully for a limited time without suffering. We therefore suggest a more sophisticated approach, based on regular assessment of each larger object's importance. Appendix A is offered as an example. What matters is that each museum should adopt and stick to a clear policy.

- 1.20 A museum may in addition wish to acquire objects for spare parts. In this case this should be made clear to donors, and the museum should have a firm policy on whether and how spare parts are documented (see 6.23 and 6.24).
- 1.21 Museums must ensure that the law is respected when acquiring larger objects from listed or scheduled buildings or sites, or when caring for larger objects in situ. The archaeological and historical integrity of a site should be respected. It must be remembered that all machinery within a scheduled monument is scheduled; re-erection of large machines may require planning permission. English Heritage and its Scottish, Welsh and Northern Ireland counterparts can give advice (see also 5.25).
- 1.22 The museum should have a standard procedure for passing to other appropriate museums and preservation bodies information about larger objects which it cannot afford to acquire, but which deserve preservation.

Sources of advice and help

- Advice on drafting a Collections Management Policy can be obtained from the Area Museum Councils or from the Museums & Galleries Commission.
 - Museum of English Rural Life
University of Reading
Whiteknights
Reading RG6 2AG
- Advice on the importance of an object, and on techniques of collecting and recording, can be obtained from the appropriate national museum and from various specialist societies and museums, including:
 - The Ordnance Society
J W Briggs - Hon Sec
38 Crofton Close
Purbrook
Waterlooville
Hants PO7 5QA
 - Association of British Transport & Engineering Museums
John Liffen - Secretary
Science Museum
Exhibition Road
London SW7 2DD
 - The PRISM Fund
Science Museum
Exhibition Road
London SW7 2DD
 - See also 9.6.
 - British Aviation Preservation Council
Don Storer - Secretary
2 Dale Road
Coalbrookdale
Telford TF8 7DT
 - Guidance on the cost of caring for larger objects is given in:
 - Hallam, J., 'Conservation and Storage: Machinery', in Thompson, J. M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.
 - Lord, B., Lord, G. D. and Nicks, J., *The Cost of Collecting: Collection Management in UK Museums*, 1989, HMSO, London.
 - The Computer Conservation Society
The Science Museum
Exhibition Road
London SW7 2DD
 - Industrial Collections Forum
Science Museum
Exhibition Road
London SW7 2DD
 - Valuable background reading includes:
 - Kenyon, Janet, *Collecting for the 21st Century: A Survey of Industrial and Social History Collections in the Museums of Yorkshire and Humberside*, 1992, Yorkshire & Humberside Museums Council.
 - National Historic Ships Committee
Capt C G Allen RN - Secretary
66 Hartford House
Pembroke Park
Portsmouth
Hampshire PO1 2TW

Storer, J. D., *The Conservation of Industrial Collections: A Survey*, 1989, The Science Museum/The Conservation Unit of the Museums & Galleries Commission, London.

1 Anderson, Robert, 'Can Contemporary Collecting be Objective?', in *Proceedings of the 7th International Congress of Maritime Museums*, National Maritime Museum of Stockholm, 1990.

Footnotes

¹ This booklet is addressed primarily to registered museums. Many other preservation bodies, of course, play an equally crucial role in caring for larger and working objects. The Museums & Galleries Commission hopes that some of them may also aspire to achieve these Standards, and that everyone involved in caring for our heritage will find the advice contained in this booklet helpful.

Standards for fieldwork and recording

- 2.1 An industrial and social history collecting policy should include provision for recording in situ the context of larger objects which are to be removed to the museum.
- 2.2 Before an object is moved there should be detailed on-site research of the object and its context.
- 2.3 The context of an object should be carefully and systematically recorded in the most appropriate way and the record should be available as part of its Object File (see Section 10 and 6.29).
- 2.4 The recording of an object's context in the field should, where possible, involve the person who will be responsible for it in the museum.
- 2.5 As much information as possible should be recorded about the object. This will include technical information, eg records of the last operation of a machine, but also details of who used it, paid for it, developed it, maintained it, or relied on it.
- 2.6 The condition of any object to be moved should be recorded in detail.
- 2.7 The dismantling of a larger object should be carefully and systematically recorded, and the records kept in its Object File. A record of the method of dismantling is itself important for what it may reveal, and as a guide to reassembly.
- 2.8 Where it proves impossible to remove the whole object, those parts left in situ should be fully recorded.
- 2.9 Wherever possible, all items associated with the object's construction, operation, promotion and use should be collected or recorded.

Guidelines and notes

- 2.10 Where larger industrial and social history objects are collected and moved to a museum they are, inevitably, removed from their context. These Standards, Guidelines and notes address the issue of recording context, and relating that record to the objects in museum collections.
- 2.11 In some instances the objects may be whole structures or even industrial complexes, in which case the context and the relationship of objects one to another is of fundamental importance to their display and interpretation.
- 2.12 Larger objects often have to be dismantled for removal. Careful planning and recording are essential; drawings should be made before, during and after the operation, and every constituent part given a temporary number. All stressed parts should be carefully inspected and crack tested, and the findings should be fully documented to ensure safe operation in the future. Electronic equipment, if it is ever to be run, must have every lead labelled and recorded.
- 2.13 Original construction locating marks, which often occur on large machines, should be looked for and recorded.
- 2.14 The context of a larger object will include a great deal of information and a great many objects; the more that is recorded, the greater the value of the object to the museum.

Context should be seen as including:

- geographical location;
- physical location in relation to other objects, structures, machines and buildings;
- relationship to other tools and processes;
- the social and economic background of the object.

2.15 Recording of the context may use a variety of techniques including:

- photographs;
- measured plans and drawings;
- field sketches;
- film and video records;
- tape recording;
- reproduction (if collection is not possible) of printed and handwritten material associated with the object;
- archaeological excavation.

2.16 Objects associated with a larger object may include:

- original plans, patterns and engineers' drawings;
- operation and maintenance manuals and records;
- parts catalogues;
- spare parts;
- special tools, jigs and cradles;
- safety equipment;
- clothing;
- company and trade union materials, such as rule books;
- personal ephemera;
- examples of products and raw materials;
- computer software and specialist test rigs.

All should be collected, and the manufacturer, if still existing, should be approached for further information.

2.17 Where a substantial archive is available, which illustrates and enhances context, its acquisition should first be discussed with the appropriate archive service. Names and addresses of these are given in the Royal Commission on Historical Manuscripts, *Record Repositories in Great Britain*, 1991 (9th edition), HMSO, London.

- 2.18 If the museum proposes to retain such an archive, reference should be made to the Museums & Galleries Commission's *Code of Practice on Archives for Museums in the United Kingdom*, 1990, agreed by the Association of Independent Museums, Museums Association and Society of Archivists. See Section 19 for the conditions in which primary records should be kept.
- 2.19 Where archaeological recording is required, a brief may be prepared based on the Association of County Archaeological Officers, *Model Briefs and Specifications for Archaeological Assessments and Field Evaluations*, 1993. Such fieldwork should normally be published.

Sources of advice and help

- The County or Region Archaeologist, or Royal Commission on Historical Monuments will be able to offer advice on the recording of sites (see Section 10), as will staff at some of the larger regional museums. The Royal Commission may already have surveyed the site, or might be persuaded to do so.
- Advice on recording the context of objects can be found in:
 - The following publications are useful:
 - Association for Industrial Archaeology, *Working for the Future*, 1991, Association for Industrial Archaeology, Shropshire.
 - Royal Commission on the Historical Monuments of England, *Recording Historic Buildings: a Descriptive Specification*, 1991 (2nd edition), RCHME, London.

Ambrose, Timothy and Paine, Crispin, *Museum Basics*, 1993, ICOM/Routledge, London.

Fleming, D., Paine, C. and Rhodes, J. G. (eds), *Social History in Museums: a Handbook for Professionals*, 1993, HMSO, London.

Thompson, P., *The Voice of the Past: Oral History*, 1978, OUP, Oxford.

3

Standards for the condition of larger objects

- 3.1 No part of an object should be avoidably deteriorating.
- 3.2 Both the physical condition of an object and its historical integrity as a source of evidence and information must as far as possible be maintained.
- 3.3 Objects should be preserved, as far as possible, by reducing risks and the causes of deterioration. Remedial treatment should be kept to the essential minimum.
- 3.4 Factors causing deterioration, such as pests, damp, excessive light and sub-standard storage conditions must be rectified promptly.
- 3.5 The condition of the collections should be regularly audited.

Guidelines and notes

- 3.6 The condition to which each larger and working object is to be maintained depends on its assessed importance, and its condition standards should be set out in its Conservation and Maintenance Plan (see 4.1 and 4.7). This section offers a model set of standards for important objects which the museum seeks to preserve in perpetuity.
- 3.7 Objects in museum collections may sometimes perform their original function, but they are primarily a source of evidence and enlightenment about the past. They are in this sense meaningful objects. Their preservation must address both their physical care and their nature as evidence.
- 3.8 The most important symptoms of active deterioration include pest infestation (moth, woodworm, vermin), corrosion (rust), flaking paint, mould, expansion or contraction due to humidity change, and serious physical damage such as insecure breaks and separated parts. Deterioration may, however, be invisible; stress may cause faults that only appear if the wrong treatment is applied, while concealed deterioration may result from residual chemical action, contamination with fuels and hydraulic fluids and contaminants associated with the original use of the object (see Part 2).
- 3.9 Maintaining the historic integrity of an object does not mean that it cannot be worked on, but that every action affecting it as material evidence must be documented, and effects on the object kept to a minimum.
- 3.10 Risks include theft, vandalism, fire, water damage, building collapse and physical damage. Causes of deterioration include overcrowded stores, an inappropriate environment, inadequate control over handling and access, or fundamental incompatibility of the materials from which the object is constructed. They may be reduced by applying the relevant Standards (see Part 2).
- 3.11 Remedial treatment should adhere to professional guidelines and codes of practice, including those of the United Kingdom Institute for Conservation (UKIC), the International Council of Museums (ICOM), and the American Institute for Conservation. Such guidelines may not always be wholly applicable, but their spirit should always be adhered to.
- 3.12 The condition of the collections should be regularly checked as part of the collection audit. A record of the audit should be made, and an appropriate response planned. In addition, the condition of each object should be recorded in its Conservation/Maintenance Record (see 6.8 and 6.31).

Sources of advice and help

- Help and advice is available from:

Area Museum Councils
The Conservation Unit of the Museums &
Galleries Commission

4

Standards for curation and conservation

- 4.1 A Conservation/Maintenance Plan should be written for each larger object. It should set out a programme of conservation and curatorial care, based on the latest assessment made of the object (see 1.7). The assessment and the programme of care must be regularly reviewed.
- 4.2 The care programme for each object should start with detailed research into its materials, composition, condition and history.
- 4.3 The collections should be regularly audited. Three types of audit are necessary:
- Can the objects on the accession register be accounted for? For this, a random selection is made from the register, and the objects physically located.
 - Are the objects deteriorating? This audit is undertaken by a sample survey based on store locations.
 - Are the objects documented, or at least inventoried? This audit can also be undertaken by a sample survey based on store locations.
- 4.4 Everyone responsible for the care of objects should undertake regular and appropriate training on operating procedure, conservation and maintenance, and health and safety requirements.
- 4.5 Objects should be dismantled as little as possible and reassembled as soon as possible. The greatest care must be taken, and detailed records should be made at every stage. These should normally include drawings and photographs and where possible exploded drawings. All parts should be securely labelled and when possible kept together (see 2.7, 6.22 and 6.27).
- 4.6 To avoid the dangers inherent in moving collections, the museum should have long-term tenure of its premises.

Guidelines and notes

- 4.7 Each larger object's Conservation/Maintenance Plan should contain a written assessment of its importance and museum purpose, particularly including any special circumstances which affect future care, for example:
- where it has been decided that it is only possible to retain the object for a limited number of years (such as an aircraft for which indoor storage will not be available);
 - where the object is being preserved for its form and function rather than exclusively for its fabric (such as a boat which is to remain afloat, with constant inevitable renewals and repairs of timber, coatings, cordage, etc);
 - where an object has been acquired primarily for demonstration purposes, or as a contingency to provide spare parts.
- 4.8 This assessment should then be used as the basis for a written care programme for the object. Appendix A suggests one possible approach to drawing up a care programme for a museum's collections, based on the importance and role of each object, but every museum should adopt its own approach. Regular revision of both the assessment and the care programme is vital, as the status of an object is likely to change over time.

- 4.9 Museums with industrial and social history collections of any size should have on the staff, or regularly available, sufficient appropriately trained and experienced conservators to fulfil the functions set out in these Standards. All museums holding industrial and social history objects should arrange continuing access to curatorial and conservation expertise.
- 4.10 Larger objects, more than most museum items, have benefitted from care rooted in the traditional craft skills, eg those of the fitter, the wheelwright and the boat-builder. The aim of every museum should be to preserve and build on these traditional skills, and to combine them with the scientific understanding and ethical approach of the laboratory-trained conservator. The person caring for the collections (in museums usually called curator or conservator) should ideally combine both sets of skills.
- 4.11 Many important social and industrial history collections, and in particular many larger objects, are in the care of museums and preservation bodies run entirely by volunteers, or with a very small professional staff. Every museum whatever its size, has a duty to care for its collections, and at a minimum should maintain formal arrangements for them to be inspected regularly by a trained and experienced conservator.
- 4.12 All objects require regular care. A written programme should be drawn up for each larger object, in discussion between the conservator and the staff or volunteers who are to carry it out; this is known as its Conservation/Maintenance Plan (see 6.30). The conservator should regularly oversee the work, and work not specified in the care programme should not be undertaken without his or her approval. All work undertaken on an object should be recorded in its Conservation/Maintenance Record (see 6.31).
- 4.13 Where parts have to be replaced, the original part should normally be retained in the museum's collection and marked appropriately.
- 4.14 New or reproduction parts fitted to an object should be recorded and should be, wherever possible, clearly and indelibly marked so that the date of manufacture and the museum's name are retrievable.

Sources of advice and help

- The Science Museum and other appropriate national museums, Area Museum Councils and Countywide Consultative Committees and Forums will be able to advise smaller museums about local specialist staff who may be able to give guidance and supervision.
- The following may be helpful in writing a care programme for larger objects and in planning audits:

<p>Bacon, A. D., <i>Restoring the Tramcar</i>, 1982, Tramway & Light Railway Society, Gratwicke Paper No. 13, Colchester.</p> <p>Canadian Conservation Institute, <i>CCI Notes 15/1: Care of Objects made from Rubber and Plastic</i>, 1993, Canadian Conservation Institute, Ottawa.</p>	<p>Canadian Conservation Institute, <i>CCI Notes 15/2: Care of Machinery Artifacts Stored Outside</i>, 1993, Canadian Conservation Institute, Ottawa.</p> <p>Chippington, C, Fitzgerald, L. and Storer, J. D. (eds), <i>Stopping the Rot 2: the Active Conservation of Aviation Collections</i>, 1993, The British Aviation Preservation Council/The Museum of Science & Industry.</p> <p>Fitzgerald, L. and Storer, J. D. (eds), <i>Stopping the Rot: the Passive Conservation of Aviation Collections</i>, 1991, The British Aviation Preservation Council/The Museum of Science and Industry.</p> <p>Greenhill, B. (ed), <i>Proceedings of the First International Congress of Maritime Museums</i>, 1972, National Maritime Museum, London.</p>
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Keene, S., 'Audits of Care: a Framework for Collections Condition Surveys', in *Storage: papers given at UKIC conference Restoration '91*, 1991, United Kingdom Institute for Conservation, London.

Knowles, John, *An Enquiry Into the Means Which Have Been Taken to Preserve the British Navy*, 1821.

Lord, B., Lord, G. D. and Nicks, J., *The cost of collecting; collection management in UK museums*, 1989, HMSO, London.

Mann, P. R., 'The Implications of Using Museum Vehicles', in Zeuner, D. (ed), *World Forum for Motor Museums: The Way Ahead*, 1990, Beaulieu.

Mikesh, R. C, 'Preserving Unsheltered Exhibit Aircraft', *Transport Museums Yearbook of the International Association of Transport Museums*, Vol 15/16, 1988/89, International Association of Transport Museums, Gdansk.

Spectre, P. H., 'The Issues of Maritime Preservation', in *Wooden Boat*, No 38, January 1981.

Storer, J. D. (ed), *Preserving the Aviation Heritage*, 1989, Ironbridge Institute/British Aviation Preservation Council.

Tilbrooke, D., 'Display and Storage of Vehicles and Machinery', *Institute for Conservation of Cultural Material Bulletin*, Vol 5, Nos 3 & 4, Sept/Dec 1978.

Ware, M., 'Restoration of Motor Cars', reprinted from *Transport Museums*, Vol 7, 1980, Gdansk.

White, Cdr. D. C. B. and Bagley, J. A., 'Preservation and display of ultra-large objects', *Museums Journal*, Volume 78, Number 4, March 1979, Museums Association, London.

- The Conservation Unit of the Museums & Galleries Commission maintains a Register of qualified and experienced conservators. It also publishes a guidance leaflet *How to Choose a Conservator or Restorer*. Contact:

The Conservation Unit
Museums & Galleries Commission
16 Queen Anne's Gate
London SW1H 9AA

- A similar service is provided in Scotland by the Scottish Conservation Bureau of Historic Scotland.

Historic Scotland
3 Stenhouse Mill Lane
Edinburgh EH11 3LR

Please note that from September 1994, Historic Scotland's address will be:

Longmore House
Salisbury Place
Edinburgh EH9 4SH

- The staff of larger specialist museums will be glad to advise on the care of particular types of larger object. Possible sources of help include:

General:

The Science Museum
The National Museums of Scotland
The National Museum of Wales
The Ulster Folk & Transport Museum
Museum of Science & Industry in Manchester

Agriculture:

Museum of English Rural Life
Welsh Folk Museum
Hampshire County Museums Service

Textile machinery:

Lancashire County Museum Service

Road transport:

The National Motor Museum, Beaulieu

Rail transport:

The National Railway Museum
The National Tramway Museum

Air transport:

The Imperial War Museum
The RAF Museum
Fleet Air Arm Museum

Water transport:

Merseyside Maritime Museum
The Boat Museum, Ellesmere Port
The National Maritime Museum
Royal Navy Submarine Museum

Military material:

Imperial War Museum

5

Standards for the operation, maintenance and repair of working objects

- 5.1 Only objects which have been identified as suitable for operation should be operated, and then in strict accordance with their Conservation/Maintenance Plan and Operating Manual. These will include comprehensive instructions for their operation, inspection and maintenance, and a list of those authorised to operate them.
- 5.2 Both the Conservation/Maintenance Plan and the Operating Manual of every working object should state the point beyond which operation will not be allowed to proceed, because to do so would result in an unacceptable loss of original material through wear, repair and replacement of component parts, and risk of damage. The reasons for the decision to operate an object, and the operating cut-off point, should be recorded and included in the object's Operating Log and Conservation/Maintenance Record.
- 5.3 Working objects must be inspected and maintained at regular intervals. The results of the inspections of wearing components should be compared with the operating cut-off point.
- 5.4 An Operating Log should be kept for every working object, containing a record of all operations.
- 5.5 A Conservation/Maintenance Record should be kept for every working object, as for all other larger objects. It should contain a record of all work carried out on the object.
- 5.6 Appropriate training must be provided to all who operate working objects, and appropriate supervision given to trainees.

Guidelines and notes

- 5.7 Demonstrating an object in motion can add immeasurably to our understanding of its purpose and significance; riding on a transport exhibit designed to carry passengers not only shows us how it was made and controlled, but demonstrates conditions of life for those who worked on it or used it. A visitor who has never seen textile machinery at work will have difficulty understanding a static loom, let alone the working conditions of Victorian mill-hands. Running an early computer gives an unique insight into early computing practices.
- 5.8 Operating an object may also actually contribute to its preservation, eg through distributing lubricants or varying stress points.
- 5.9 Operating an object may also help to preserve or rediscover appropriate skills.
- 5.10 However, operating most mechanical objects will inevitably result in their wearing out. At the very least surfaces will be worn and information thus be lost; at the worst the object will end up like the proverbial Grandfather's Axe, with little or nothing preserved from the days before it entered the museum.
- 5.11 Wear is not the only irreversible alteration effected by working an object. Examples of adaptations required by present-day operation include the fitting of tachographs to historic vehicles, the removal of asbestos insulation, or the replacement of rivetted originals by welded fabrications.

- 5.12 It should therefore be clear from the outset why an object has been acquired, and whether it is to be preserved for as long as humanly possible, or whether it is to be operated for public education and enjoyment, or indeed for research. This is the thinking that lies behind the recommendation in these Standards that each museum should decide the status of each larger object, and on that basis draw up a Conservation/Maintenance Plan for it (see 1.6, 1.15 and Appendix A).
- 5.13 This decision is likely to be a difficult and sometimes controversial one. Some museums will tend to favour more use, others will lean towards stricter preservation. The question should be widely discussed with specialists in the field, and should be regularly reviewed.
- 5.14 Some objects will be identified as able to be operated, some as operable only occasionally and with care, and some as never to be operated. All should be regularly inspected and their status be reviewed.
- 5.15 Each object to be operated should have an Operating Manual which sets out in detail how it is to be operated and by whom, and an Operating Log which records every operation (see Glossary).
- 5.16 Workloads and running speeds should be determined in the object's Operating Manual. Excessive workloads or running speeds should be avoided, so that operating stresses and wear are limited.
- 5.17 Particular care should be exercised with regard to the regular inspection and maintenance of infrequently or irregularly operated objects.
- 5.18 Manufacturers' operating instructions may need to be used with care. They may include directions not compatible with established curatorial/conservation practice, or with current health and safety laws, and may assume that spare parts are available.
- 5.19 The same caveat applies to military manuals, which may have been written for circumstances where the 'acceptable' level of risk is very different from that required in a peacetime civilian context. Any such documentation should be used as a starting point for risk assessment within a museum context.
- 5.20 Fuels and lubricants should be carefully chosen according to their application. The manuals and lubrication instruction plates on old machines may require interpretation to establish the best currently available substitutes. Some modern fuels and lubricants (eg motor vehicle engine and gearbox oils) are unsuitable for many older machines; on the other hand some components, such as open gears, can probably be lubricated much better now than when the machine was made.
- 5.21 All maintenance work, repair and conservation should be recorded in the object's Conservation/Maintenance Record. All work should be prepared in consultation between the curator, conservator and craftsperson/technician/engineer, setting out possible treatment options, specifying the action decided upon, the reasons for taking that decision, and recording the work undertaken (see 6.31). All lubricants and cleaning materials used should be recorded.
- 5.22 Where parts have to be replaced, the original part should normally be retained in the museum's collection and marked appropriately.
- 5.23 New or reproduction parts fitted to an object should wherever possible be clearly and indelibly marked to show the date of manufacture, and the identity of the museum.
- 5.24 See Section 24 for the safety implications of operating objects.

Where machinery/equipment is fixed within a listed or scheduled building there are statutory controls. Fixed machinery may be covered by the listing of the building, or it may be scheduled in its own right. If attached to a listed building you may not move or significantly alter the machinery without consent but you may undertake 'like for like' repair. Listing may even extend to paintwork. Advice should be sought from the local planning authority in the first instance. If machinery is scheduled, no restoration or other work which affects its fabric may be undertaken without scheduled monument consent. Advice should be sought from the Department of National Heritage in the first instance.

Sources of advice and help

- Advice on lubrication is available from a number of commercial companies, for example Shell (or other major oil refiners/suppliers), Morris Lubricants (Castle Foregate, Shrewsbury, SY1 2EL, blenders of oil for steam engines, vehicles and locomotives), Senator Oil (28 Cobham Way, Gatwick Road, Crawley, W Sussex, RH10 2RX), and Penrite Oil (Sunderland Hill, Ravensden, Bedford, MK44 2SJ, oils for older motor vehicles). Help with difficult problems can be obtained from The Institute of Tribology, University of Leeds.

- Contemporary textbooks and manufacturers' catalogues, instruction manuals, and spare parts lists (sometimes available in facsimile from specialist publishers) often provide a useful introduction to the subject.

- The Training Officer of the Area Museum Council will be able to advise on appropriate training for operators.

- The following publications will be useful:

British Rail, *Handbook for Steam Locomotive Drivers*.

Dowson, D., *History of Tribology*, 1979, Longmans, London.

Harvey, D. W., *A Manual of Steam Locomotive Restoration and Preservation*, 1980.

Health and Safety Executive, *Locomotive Boilers*, 1986, HSE.

Keene, Suzanne and Swade, Doron, *Collecting and Conserving Computers*, 1993, Science Museum, London.

National Traction Engine Trust, *Code of Practice for Traction Engines and Similar Vehicles*, 1992. (Note: This is normally available only to members of the Trust. Details from M. O. Davies, Chairman, NTET Engine Owners Sub-committee, Hill Farm, Avon Dassett, Leamington Spa, CV33 0AA).

Salmon, W. M. (ed), *Modern Manual for Drivers of Steam Road Vehicles*, 1967.

Seaton, A. E., *A Manual of Marine Engineering Practice*, 1880 ff, (various edns).

- There are several other advisory bodies which produce codes of practice, or can advise on aspects of operation:

- Association of Railway Preservation Societies
- Association of Independent Railways
- Computer Conservation Society
- The Steam Boat Association of Great Britain
- British Aviation Preservation Council
- National Vintage Tractor and Engine Club

6

Standards for documentation¹

- 6.1 ENTRY RECORDS must be maintained for all items deposited in the museum, whether as enquiries, loans or potential acquisitions, and should include records relating to legal/licence requirements, eg firearms licence or chemical hazards note.
- 6.2 Every new acquisition should be accessioned as soon as possible, normally within one month.
- 6.3 BOUND ACCESSIONS REGISTERS must be maintained with records about all accessions, each including an unique identity number for accession or inventory purposes.
- 6.4 There must be a policy covering the inventory control of objects. The museum should maintain up-to-date information identifying ALL objects in its care, including loans in and out, temporarily deposited objects and other unaccessioned objects.
- 6.5 All accession systems must have a security backup; automated ones in another medium with good archival life. These back-up records must be brought up to date on a regular basis, and kept securely in a separate building.
- 6.6 Each individual item added to the permanent collections must (where appropriate) be MARKED OR LABELLED with an unique object number (accession or inventory number). Such marking should normally be durable but reversible and should not damage the object. Any previous markings should be preserved or recorded.
- 6.7 A CATALOGUE should normally be maintained, bringing together all the primary information about each larger object.
- 6.8 Each larger object should have a CONSERVATION/MAINTENANCE PLAN and a CONSERVATION/MAINTENANCE RECORD.
- 6.9 One or more INDICES, or equivalent information retrieval facilities, must be maintained, including (where appropriate) location, donor and subject lists.
- 6.10 A record should be kept of each audit of the collections (see 4.3).
- 6.11 Each working object should have an OPERATING MANUAL and an OPERATING LOG (see Section 5).
- 6.12 An OBJECT FILE should be maintained for each larger object, to contain additional object related information, eg letters, photographs, etc.
- 6.13 The museum must have documentation procedures to deal with the management of LOANS, both in and out of the collections.
- 6.14 EXIT RECORDS should be maintained for all items leaving the museum for whatever reason.
- 6.15 If the museum has a backlog of documentation, it must adopt a formal policy to deal with it in a set timescale.

Guidelines and notes

6.16 The Standards above require the following records for each larger object:

- an Accessions Register entry;
- a Catalogue entry;
- an Object File, containing:
 - entry record,
 - correspondence, photographs, etc,
 - any loan out records,
- a Conservation/Maintenance Plan;
- a Conservation/Maintenance Record;

Objects to be operated will also have:

- an Operating Manual;
- an Operating Log;

6.17 Up to date ENTRY RECORDS should always be maintained. However, with a larger object collected in parts over a period of time, the actual moment of acquisition may be difficult to determine, so each museum should adopt a convention on when "entry" is deemed to have taken place.

6.18 On acquisition, sufficient details of each larger object should be entered into the museum's REGISTER at least to enable it to be identified in the future, and an unique accession or inventory number should be allocated to it. The work of accessioning should be completed as soon as possible after collecting has finished: it may be reasonable to extend the normal period of one month to a maximum of three months, for very large and complex items collected in many parts.

6.19 Each individual specimen should be MARKED or labelled with its own unique number. With larger objects, the method of marking or labelling selected, and its location on the object, must be capable of surviving under extreme conditions of handling, use and storage, and must be appropriate to the size and materials of the object. Museums should develop written conventions covering the location of marks or labels on larger objects.

6.20 Whilst in general marking and labelling techniques should not damage an object, this may not always be possible with larger objects. Sometimes durability is more important than reversibility. Museums should regularly check larger objects in store to ensure that marked numbers remain legible.

6.21 When conservation or restoration work will result in their obliteration or removal, any old accession markings should be recorded.

6.22 Sometimes larger objects have to be dismantled for collection and may remain in store in their dismantled state (but see 4.5). Sometimes, too, it is better to store an object dismantled purely because it keeps incompatible materials apart. Museums should develop and apply written procedures and conventions for the sub-numbering or sub-lettering of component parts of an assembly which is essential if parts are to be easily located.

- 6.23 Where a museum maintains two distinct collections, one for permanent preservation and one for use, it should develop documentation and marking systems to prevent the two getting confused. These should include central written records of what items are held and the reasons for acquisition, and a location record. Entry and legal title paperwork must also be clear, and donors must understand what is intended. It is recommended that wherever possible 'spares' should be stored separately from the permanent collections, to avoid confusion.
- 6.24 Museums should also develop an effective and distinctive marking and labelling system for such objects. Systems in use include marking items with a distinctive code, symbol or colour flash, perhaps together with the entry form number or the accession number of the object for which they are held as spares.
- 6.25 Museums should hold CATALOGUE records covering each item in their collections, for reference and research use. When larger objects have to be held in museum stores in a disassembled state, the catalogue information becomes particularly important.
- 6.26 Larger objects, or their component parts, may of their nature incorporate Health and Safety hazards or threats to their own survival which are not apparent on superficial examination: examples are the presence of chemical coolants or the need for special lifting requirements. Documentation systems and procedures should actively provide for the recording of all such information, including where relevant the size and weight of the complete object and of its component parts. This documentation should always be referred to before any part of an object is moved, or any work is carried out on it (see Sections 23 and 24).
- 6.27 Where a larger object needs to be dismantled for removal to the museum, this process should be documented in sufficient detail to explain what was done, together with the reasons behind the decisions taken. This is important, even when it is expected that the object will be reconstructed at once, both because plans can change quickly and to pass on the lessons learned through experience. It is particularly important to record the methodology of assembly and disassembly, which may itself provide useful research information, for example on original construction techniques. While too often larger objects have to be collected at very short notice, museums should as far as possible plan such projects in advance and develop documentation and numbering systems that will enable progress to be clearly and methodically recorded as work proceeds (see also Sections 2 and 18).
- 6.28 Museums should develop documentation conventions within which to record the context from which all larger objects are collected, particularly physical relationships to other objects and buildings, and with other processes (see Section 2).
- 6.29 Each larger object should, in addition to its Accessions Register entry and catalogue record, have an OBJECT FILE or series of files (see Glossary). This provides a central location for all the information relating to that object or accession group which may be accumulated over the years. It should contain at least a copy of everything that exists, even where originals are held elsewhere, save where there is so much that it becomes impractical. The contents will vary according to the type of object and the nature of its museum use, but may include:
- records of the original site and context, including drawings and photographs;
 - film, tape or video records of the object whilst still in use;
 - drawings, specification documents, makers' instructions, etc: originals or copies;
 - the full records of the disassembly process;

- the current storage location of ALL component parts if not recorded elsewhere, particularly where security or environmental considerations mean that all parts cannot be stored in one place;
 - copies of the object's Conservation/Maintenance Plan and Conservation/Maintenance Record;
 - for a working object, copies of its Operating Manual and Operating Log;
 - copies of any loan agreements, and of correspondence concerning the object;
 - details of all research findings about the object and its relevant original context, particularly including information on any discoveries about its manufacture and use made during conservation in the museum and subsequently concealed;
 - published references to the object.
- 6.30 The CONSERVATION/MAINTENANCE PLAN sets out the programme of care agreed between conservator and the staff or volunteers who are to carry it out (see 4.12). It should include an assessment of the object's condition when received, the action required, materials to be used and timescale, and should cover simple dusting and cleaning as well as more invasive treatment.
- 6.31 The CONSERVATION/MAINTENANCE RECORD records every intervention on the object, including conservation work, regular maintenance and cleaning. It also records every assessment made of the object's condition (see 3.12). It should, as well as noting the condition of the object and what has been done, record the reasons why a particular decision was taken: this may not always be obvious in the future.
- 6.32 Museums should have documentation procedures to deal with the management of LOANS in and out of the collection. These should be capable of accommodating the very considerable amounts of information and special agreements that are frequently necessary to record the loan of a larger object, particularly where it is to work (see Section 8).
- 6.33 Objects may leave the museum for a variety of reasons, not only as loans. For example a road vehicle may take part in a rally or procession. This becomes part of the ongoing history of the object, in addition to being a collection management concern. It is essential that an EXIT RECORD be made.
- 6.34 If there is a documentation backlog, The Museum & Galleries Commission's Registration Scheme requires the museum to tackle it systematically. Advice on how to do so is readily available; see over.

Sources of advice and help

- The Museum Documentation Association determines standards for museum documentation, publishes appropriate guidance, record cards and computer programs, and offers general advice on all aspects of documentation.

- An invaluable introduction to museum documentation is:

Holm, Stuart A., *Facts & Artefacts: How to Document a Museum Collection*, 1991, Museum Documentation Association, Cambridge.

- See also the Museum Documentation Association's Outreach Factsheets numbers 16-20, 23, 27, 29-31 on *Labelling and Marking Techniques*, 1991, Museum Documentation Association, Cambridge.

- The Museum Documentation Association is developing the *UK Museum Documentation Standard* (the first edition is due April 1994). Information is available from the Museum Documentation Association.

- A specialist classification system is available:

Museum Documentation Association, *Social History and Industrial Classification*, 1994 (2nd edition), Museum Documentation Association, Cambridge.

- Advice can be obtained in the first instance from the Area Museum Councils or direct from:

Museum Documentation Association
347 Cherry Hinton Road
Cambridge CB1 4DH
(Tel 0223 242848)
(Fax 0223 213575)

Scottish Museums Documentation Unit
National Museums of Scotland
Chambers Street
Edinburgh EH8 9DW
(Tel 031 225 7534)
(Fax 031 220 4819)

Footnotes

¹ 'Documentation' in this booklet means all the recorded information a museum holds about its collections, and also the gathering, storing, manipulation and retrieving of that information.

7

Standards for access

- 7.1 The museum should promote an access policy which defines the standards it seeks to provide, in relation to its purpose, to the status of its collections, and to the needs of its users.
- 7.2 It should be the aim of the museum to allow as much access as possible to the collections, and all forms of access should be considered. The museum should aim to provide the same access for all groups of people.
- 7.3 Some types of larger object, for example guillotines or military materiel such as sliding breechblocks on artillery pieces, represent major potential hazards. In such cases access may have to be limited (see Sections 23 and 24).
- 7.4 Museums with collections of significance for researchers should adopt standards for access which include publishing a description of the collections, a response time for confirming the presence or not of particular types of object (recommended maximum 15 working days), and a period within which an appointment to study the object or objects can be offered (recommended maximum 30 working days).
- 7.5 The museum has a duty to safeguard the collections and records, which may conflict with ease of access. The access policy should properly balance the requirements of access with conservation and security (see Part 2).
- 7.6 As far as possible all museums should observe the standards and guidelines for customer care set out in the Museums & Galleries Commission's booklet *Quality of Service in Museums and Galleries*.
- 7.7 As far as possible all museums should observe the *Guidelines on Disability for Museums and Galleries in the United Kingdom* published by the Museums & Galleries Commission and the Museums Association.

Guidelines and notes

- 7.8 The definition of a museum emphasises the fundamental presumption that collections are held by the museum for the public benefit. Thus there should be a presumption against storing objects without the active development of policies and facilities to promote their use and access to them. Such use may however lie in the future: larger objects, if not collected by a museum, will often be scrapped.
- 7.9 There are many different forms of access appropriate to different museums, different objects and different users. The appropriate types of access to each object will be determined by its status within the museum (see 1.6), and by the needs of users. Thus non specialists may be content to look at a steam engine from behind a barrier, but a specialist will need to get much closer, and so may visually impaired people. The aim should be to provide appropriate access for all the museum's users, and to ensure that they have the same access to larger objects as to other parts of the museum's collections.
- 7.10 Where physical access to the object itself is really impossible, for example when the object is dismantled and boxed, drawings and photographs will provide an alternative form of access.
- 7.11 Balancing public access in the present against preservation for the future is of course the fundamental task of every museum. The aim of these Standards and Guidelines is to ensure that museums take the necessary decisions consciously, and with as full information as possible.

Sources of advice and help

- The following publications will be useful:

English Tourist Board, *Providing Accessible Visitor Attractions*, 1994, ETB, London.

Code of Conduct for Museum Professionals, in *Museums Yearbook*, Museums Association, London, published annually. Palfreyman, T.,

Museums & Galleries Commission/Museums Association, *Guidelines on Disability for Museums and Galleries in the United Kingdom*, 1992, HMSO, London.

Museums & Galleries Commission, *Disability Resource Directory for Museums*, 1993, Museums & Galleries Commission, London.

Museums & Galleries Commission, *Quality of Service in Museums and Galleries, Customer Care in Museums, Guidelines on Implementation*, 1993, HMSO, London.

Designing for Accessibility, 1993, Centre for Accessible Environments, London.

Standards for the loan of larger objects

- 8.1 Every museum should have a written policy and procedure for lending, and standard conditions. Borrowers must accept these conditions in writing before a loan is made.
- 8.2 Every loan of an object which is to be operated by the borrower should be covered by additional standard conditions for the loan of working objects, to be understood, agreed and signed by the borrower before a loan is made.
- 8.3 Each loan of a working object usually requires specific conditions peculiar to the object, the borrowing institution and the operating requirements of the owning institution. Such specific conditions must also be understood, agreed and signed by the borrower.
- 8.4 The borrower must be aware of, and must apply, all appropriate health and safety requirements when operating a working object.

Guidelines and notes

- 8.5 There should normally be a presumption in favour of lending items from the collection, whether for exhibition, for research or for demonstration. However, such loans inevitably put objects at extra risk, and a responsible museum will approach the drafting of a loans policy and procedure with great care, and will ensure that they are rigorously observed.
- 8.6 It is the responsibility of the lender to make the curatorial decision to operate, based on an assessment of the value of and risk to the object (see Section 5).
- 8.7 Standard loan conditions should normally include:
- object condition reporting;
 - insurance arrangements;
 - length of loan and arrangements for renewal or cessation;
 - conditions of security, handling, presentation and environmental monitoring and control;
 - agreements on limits to conservation work;
 - agreement on where and how the object is to be kept and displayed;
 - arrangements for return;
 - transport arrangements;
 - photography, filming and commercial use;
 - arrangements for periodic inspection;
 - arbitration and successors;
 - acknowledgement of the loaning institution.

8.8 If objects on loan are to be used or demonstrated, many museums require a qualified member of staff to accompany them for this purpose, Alternatively the borrower may be accepted (and specifically trained if necessary) as competent in the object's operation, to the standards of the lending museum.

8.9 Standard loan conditions for working objects should also normally include:

- stipulations on who may operate the object;
- general requirements on display/storage between periods of operation;
- agreements on routine maintenance and limits on necessary repairs;
- standards for recording operation and maintenance.

8.10 Conditions specific to a particular loan will normally cover:

- frequency and nature of operation (eg limits on time and dates of working; mileage covered; speed; loading and severity of work);
- details of approved fuels, oils, water treatment processes, etc;
- any financial arrangements for the loan, including hire/operating charges, cost of maintenance and repairs, percentage of earnings (especially, for instance, on film or TV work) payable to the lender, etc;
- access for monitoring the condition of the object.

All such conditions should be discussed, fully understood, and agreed in principle before substantive arrangements for the loan are put in place.

8.11 Periodic monitoring by the lender of working objects, and of the loan conditions, is particularly important. It is reasonable to require the borrower to:

- pay for travel and subsistence on an agreed number of monitoring visits during the loan period;
- provide appropriate access and workshop facilities for an inspection of the object (including an internal inspection where necessary) during the course of a monitoring visit.

8.12 A permanent record of every loan should be kept, for example by keeping the Exit Record and loan agreement on the object's Object File (see 6.32 and 6.33).

Sources of advice and help

- The staff of leading specialist museums will be glad to advise on any aspect of loaning or caring for larger objects. Museums & Galleries Commission, *Standards for Organising and Receiving Temporary Exhibitions* (forthcoming).
- The following publication is essential reading: The National Railway Museum is drawing up a *Model Agreement for Loans* which will have a value far beyond railway collections.
Association of Independent Museums, *AIM Guideline 14, 'Museum Collecting Policies and Loan Agreements'*, revised 1988, Association of Independent Museums.

9

Standards for research

- 9.1 The museum governing body should formally approve a policy for research, which should be regularly reviewed.

Guidelines and notes

- 9.2 Research is fundamental to the function and purpose of a museum, though its form will vary greatly between museums of different sizes and types. Such research includes research into an object, wider historical or scientific research, and research into the history of the museum collection.

- 9.3 The museum's research plan should preferably be written as part of the museum's, Strategic Plan, Forward Plan or Collections Management Policy. It should be realistic, relevant to the museum's collections, its staff and resources, and to its public role.

- 9.4 The museum's research policy should take into account the special problems posed by the larger objects in its collections, or associated with the activity towards which research is directed. Larger objects, for example, may be less accessible or may be under greater threat.

- 9.5 Outside researchers may ask for partial or total dismantling to investigate the configuration of a larger object. Research may also bring requests to work the object for research purposes. The museum needs to decide how it would respond to such requests.

- 9.6 The research policy should be drawn up in consultation with neighbouring and related museums and with appropriate local and national academic societies and specialist groups or individuals interested in the field. These may include:

- Association for Industrial Archaeology
- British Agricultural History Society
- The British Computer Society
- Institute of Marine Engineers
- Institute of Metals
- Institution of Chemical Engineers
- Institution of Civil Engineers: Panel for Historical Engineering Works
- Institution of Electrical Engineers
- Institution of Gas Engineers
- Institution of Mechanical Engineers
- The Newcomen Society
- Railway & Canal Historical Society
- Royal Aeronautical Society

- Royal Air Force Historical Society
- Royal Institution of Naval Architects
- Trade Unions
- Universities

9.7

Research without publication or proper recording is useless. The museum should ensure that its own staff, and as far as it can other researchers using its collections, work to the highest academic standards, with proper citation of sources, including reference to Object Numbers.

Sources of advice and help

- Beside those bodies listed above, help can be given by staff at national and other specialist museums.

- An example of a research plan may be found in:

The Science Museum, *Science Museum Research Policy*, 1992, Science Museum, London.

- Useful background reading is:

Association for Industrial Archaeology, *Industrial Archaeology: Working for the Future*, 1991, Association for Industrial Archaeology.

Jones, William D., 'Collections research: industry' in Thompson, J. M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

10 Standards relating to Sites and Monuments Records

- 10.1 Museums with provenanced British industrial archaeology collections should provide information on them to the relevant Sites and Monuments Record.
- 10.2 There should be an established procedure whereby the museums notify the Sites and Monuments Record that relevant information is available and the Sites and Monuments Record/planning authority notifies museums with an active interest in industrial archaeology of planning applications and other work which might require the rescue of objects.

Guidelines and notes

- 10.3 Sites and Monuments Records play a key role in the planning process. In England this is set out in *Planning Policy Guidance Note 16* (see below). It is essential that their records are as complete as possible in order to preserve the archaeological heritage. Museums should ensure that the information they hold is considered when planning decisions affecting the industrial archaeological resources of an area are made.
- 10.4 Sites and Monuments Records are invaluable to research and can make a major contribution to conservation, management, tourism, education and research.
- 10.5 The information which museums routinely pass to Sites and Monuments Records should include not only that relating to acquisitions, but also information about items brought in for identification, or learned from enquirers or during fieldwork.
- 10.6 All English counties now have Sites and Monuments Records, almost all maintained by the County Council, except in London where the Sites and Monuments Record is maintained by English Heritage, and the Sites and Monuments Records of former Metropolitan Councils, now jointly funded by District Councils. In Wales the Sites and Monuments Records are maintained by the four Archaeological Trusts; in Scotland they are maintained by the Regional Councils. That for Northern Ireland is the responsibility of the Environment Service of the Department of the Environment for the province.
- 10.7 The Royal Commissions on the Historical Monuments of England, Wales and Scotland are the lead national bodies for oversight of the system of local Sites and Monuments Records. They coordinate and promote the work of Sites and Monuments Records, and maintain a national index (the National Monuments Record) in addition to the more detailed records held locally. Together, the Sites and Monuments Records form a national archaeological database. In Northern Ireland the Sites and Monuments Record is part of the Monuments and Buildings Record within the Environment Service.
- 10.8 Some museums, mainly those with active fieldwork sections, may hold their own Sites and Monuments Records separately from their county one. These should always have clear links with the records held at county, regional and national level.
- 10.9 Authorities with the responsibility for maintaining Sites and Monuments Records should guarantee access free of charge for museums, in order to enable them to meet their responsibilities in framing policies and actions to safeguard the archaeological inheritance.

See over for sources of advice and help

Sources of advice and help

- The Association for Industrial Archaeology has published a handbook and recording form to guide voluntary societies and individuals in recording and transferring data to Sites and Monuments Records. The system is known as *Index Record of Industrial Sites* (IRIS). Copies of the handbook are available for £2.50 from:

Association for Industrial Archaeology
c/o The Ironbridge Gorge Museum
The Wharfage
Ironbridge
Telford TF8 7AW

- Department of the Environment, *Planning Policy Guidance: Archaeology and Planning (PPG 16)*, November 1990.

- Royal Commission on the Historical Monuments of England, *Recording England's Past: a Review of National and Local Sites and Monuments Records in England*, 1993, HMSO, London.

- Information about Sites and Monuments Records relevant to anywhere in Britain is available from:

The Hon Secretary
Association of County Archaeological Officers
c/o Association of County Councils
Eaton House
66A Eaton Square
London SW1W 9BH

- The four lead bodies are:

Royal Commission on the Historical Monuments of England
National Monuments Record Centre
Kemble Drive
Swindon SN2 2GZ
(Tel 0793 414600)

Royal Commission on the Ancient and Historical Monuments of Scotland
John Sinclair House
16 Bernard Terrace
Edinburgh EH8 9NX
(Tel 031 662 1456)

Royal Commission on Ancient and Historical Monuments (Wales)
Crown Buildings
Plas Crug
Aberystwyth
Dyfed SW23 2HP
(Tel 0970 624381)

Environment Service
Department of the Environment for Northern Ireland
5-33 Hill Street
Belfast BT1 2LA
(Tel 0232 235000)

Part Two: Protecting Collections

11

Standards for protecting larger objects from theft

11.1 Standards for physical protection

11.1-1 The structure of the building or the perimeter of an open site should be designed and/or defended to a degree that will deter an attack by a thief or vandal.

11.1.2 Windows, doors and perimeter gates should be designed, constructed and secured so that an intruder is deterred from trying to get in, or is delayed long enough to allow a supporting intruder alarm to trigger a response before the intruder can enter, steal and escape.

Guidelines and notes

11.1.3 Further advice on these standards and guidelines can be obtained from the Museums & Galleries Commission's Museums Security Adviser. The difficulties in achieving the above standards of physical protection on some open sites and historic buildings are well understood. Indeed, it may sometimes only be possible to counterbalance physical weaknesses by the use of supervisory regimes involving people or equipment.

11.1.4 The structure of any building in use should be such that penetration through the walls and roof is difficult and time consuming. Even relatively weak buildings, eg of wooden construction, can be improved to meet this requirement.

11.1.5 The number of windows should be reduced to the essential minimum (though necessary ventilation must be maintained). Windows no longer required should be filled in to a similar strength and appearance to the surrounding structure. Windows in use, and those in historic buildings, should be protected by a means agreed with the Museums Security Adviser.

11.1.6 Doors to the outside should be reduced to the minimum, leaving only those required for entry or as Emergency Exits. Unused doors should be filled in as with windows, or blocked by other methods agreed with the Museums Security Adviser. Remaining wooden doors should be of at least 2" (50mm) thick solid construction and fitted with security standard mortice deadlocks. Emergency exit doors should be fitted with modern quick release door furniture which must be capable of being deadlocked when the building is unoccupied.

11.1.7 Pitched roofs of slate or tile should be fitted over close-boarded timber. Measures to modify roofs constructed of other materials should be agreed with the Museums Security Adviser. Unauthorised access to the roof should be limited by physical barriers, such as fencing, anti-climb paint or anti-vandal barriers.

11.1.8 The risk to objects on display will vary enormously, and in the case of open-air museums may be increased by weaknesses in the site perimeter. Other factors which should be considered are value, both as a collectable item and for use as recycled scrap material. Larger objects are also at risk if small parts can easily be removed, or are themselves collectable items. These risks need to be assessed and countered by the mode of display which may sometimes involve the use of replica parts or objects.

11.1.9 Modification of historic buildings may require Listed Building or other consents.

11.2 Standards for perimeter alarms

- 11.2.1 All openings in the building fabric, such as doors, windows and rooflights, should fall within the protected zone of an intruder detector. Detectors appropriate to use on an open site are available and can be used to detect entry through the perimeter defences and the gates. An intruder detection system which qualifies for a National Approved Council for Security Systems (NACOSS) certificate and is to BS 4737 specification should be fitted by a company recognised and approved by NACOSS for such installations.

Guidelines and notes

- 11.2.2 The system should be as simple as possible to avoid an unacceptable false alarm rate and should depend upon suitable sensors fitted to doors and other openings. Separate movement and body heat detectors are prone to false alarms, but newer devices which combine both techniques are more reliable.
- 11.2.3 The signalling of an alarm condition should be by means of a monitored line to an alarm company's central station. This will give an alarm if the line is cut.

11.3 Standards for invigilation

- 11.3.1 The level of invigilation must be appropriate to the risk.
- 11.3.2 The bona-fides of all researchers and others with access to objects should be checked and recorded, and they should be adequately supervised.
- 11.3.3 Nobody should be allowed into museum stores unless accompanied by an authorised person.

Guidelines and notes

- 11.3.4 The risk to items on display should be assessed and an appropriate level of invigilation be provided. This level should never be reduced; if sufficient invigilators are not available the gallery or even the whole museum should be closed. Special care should be taken at unusual times, for example while an exhibition is being installed or during evening events.
- 11.3.5 Researchers have, unfortunately, been responsible for serious thefts from museums. Everyone using the collections should be made aware that access is subject to Guidelines; even the most senior researchers should be obliged to follow them.
- 11.3.6 The Museums Association's *Guidelines on Security When Using Outside Contractors* should be observed.
- 11.3.7 Any larger objects which fall within the legal definition of firearms or prohibited weapons (for instance artillery or tanks with functional armament) must at all times be under the control of an authorised member of the museum's staff. It is extremely doubtful in law whether an unpaid volunteer, let alone a member of the public, can be left in 'possession' or control of such objects. This could for instance affect the use of unsupervised volunteers for conservation.

11.4 Standards for key security

11.4.1 A strict policy regarding the possession of keys should be devised and enforced.

Guidelines and notes

11.4.2 There should never be more keys than is strictly necessary and the number of people in possession of keys should be kept to the barest minimum. All keys, other than the external doorkeys held by keyholders, and keys to safes, should remain within the building in a secure key cabinet or safe, and should be identified by a coding system. An issue system against signature should be used as a security measure.

Sources of advice and help

- The following publications are useful:

Burke, R. and Adloye, S., *Basic Museum Security*, 1991 (2nd edition), International Council of Museums, Paris.

Hoare, Nell, *Security for Museums*, 1990, Committee of Area Museum Councils.

Kluwer Handbooks, *Handbook of Security*, Updated periodically, Croner Publications Ltd, Kingston on Thames.

A leaflet published by the Museums & Galleries Commission, *Museum and Gallery Security*, 1989, Museums & Galleries Commission, London.

Museums Association's *Guidelines on Security When Using Outside Contractors*, published annually in *Museums Yearbook*, Museums Association, London.

Thompson, J. M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

- Advice is readily available from the Museums & Galleries Commission's Museums Security Adviser (Tel 071 233 4200) and from the Area Museum Councils.

12 Standards for protecting larger objects from fire

- 12.1 Museum buildings should be designed or adapted to minimise the risk of fire and to prevent its spread. On an open site the risk of fire should be considered when deciding what grass, plants, bushes and trees to have where. In open-air museums, picnic areas where visitors smoke or use small stoves can be a particular risk. Depending on the use of a building and the number of people working in it, a fire certificate as required by the *Fire Precautions Act 1971* may be needed.
- 12.2 Areas housing collections should be rigorously insulated to a high standard (not less than half an hour protection, but preferably one hour) from fire spread from areas of risk, eg workshops, laboratories, kitchens, boilers or chemical stores. The degree of risk from 'risk areas' must be reduced as much as possible, eg by using an external chemical store. If chemicals are kept within the building, it must be in accordance with the advice of the local authority's Fire Officer and must comply with Control of Substances Hazardous to Health (COSHH) Regulations. A suitable COSHH assessment must be made and a copy kept in a convenient place for passing to emergency services on arrival at an incident (see also 14.5).
- 12.3 Larger industrial objects themselves can constitute a significant fire hazard. Rendering objects safe may require a significant compromise of their historical integrity. These should be taken into account before the decision to acquire them is made.
- 12.4 Appropriate precautions must be taken for each type of object (see 12.13).
- 12.5 In museum buildings all electrical wiring and equipment (including portable equipment) must be installed in accordance with the appropriate British Standard, the Institution of Electrical Engineers' Regulations, and the Electricity at Work Regulations. Electrical installations should be regularly maintained and checked as required by those regulations, preferably by someone familiar with that specific installation. Mechanical equipment must also be installed in accordance with appropriate British Standard and statutory instructions, and be regularly maintained. A Register of each piece of equipment should be established which should contain maintenance records and inspection certificates.
- 12.6 Mechanical installations should be maintained in accordance with the Heating and Ventilating Contractors Association guidelines on *Standard Maintenance Specification for Mechanical Services in Buildings*, published in 5 volumes.
- 12.7 The advice of the Building Control Officer and Fire Officer should be sought on the selection of all materials used in displays and storage areas. Normally all such materials should be fire-retardant, class O or A. Quite apart from their statutory responsibilities they should be invited to inspect the premises at least once a year, and be made aware of the particular requirements of museums. Their recommendations should be reported to the museum's Board of Management. A formal application for Building Regulation Approval is normally required for any structural work.
- 12.8 All contracts for work on the premises should be on a 'Permit to Work' basis and no hot work should normally be permitted. If hot work has to be done it should be to the safety regulations contained in Section 31(4) of the *Factories Act 1969*.
- 12.9 Wherever possible buildings housing objects should be covered by an automatic fire-detection and alarm system, installed and maintained in accordance with *BS 5839: Fire Detection and Alarm Systems in Buildings*. Consideration should also

be given to fitting such equipment to vulnerable objects, such as wooden boats permanently displayed ashore.

- 12.10 The premises should be equipped with fire-fighting equipment as recommended by the Fire Officer and complying with *BS 5423: Portable Fire Extinguishers* and *BS 5306: Fire Extinguishing Installations and Equipment on Premises*.
- 12.11 Fireproof cabinets should be provided to house the primary records and museum documentation, and wherever possible copy records and backup computer disks should be kept in a different building.
- 12.12 All staff and volunteers should regularly attend training in fire prevention and response. The level and standard of this training should be at least consistent with Part 1 (18) *Fire Precautions Act 1971*.

Guidelines and notes

- 12.13 Different types of larger object present different risks and demand different precautions. The following notes may prove useful:

STEAM VEHICLES:

Vehicles in use:

Steam powered vehicles are not inherently a fire risk if certain basic precautions are observed:

- the vehicle should never be left unattended when in steam;
- spark arrestors should always be in place and should be regularly checked and maintained;
- ash pans should be regularly and carefully cleared;
- drivers should be particularly vigilant near dry vegetation, thatched buildings or other easily combustible materials;
- disposal of hot ash or smokebox char should always be at an appropriate place - and well wetted if necessary.
- all the fire should be cleared out before an engine is left;
- engines should be cool before being covered;
- oil lamps should not be over-filled, and oily rags should be destroyed;
- excessive deposits of lubricants and coal dust etc should be removed from fire box, ashpan and foundation ring;
- Lagging that will come into contact with very hot surfaces, eg the smoke box, should be non-combustible.

Exhibits in the museum:

- all combustibles should be cleaned out;
- a safe cabinet should contain all lubricants, rags etc.

STATIONARY STEAM ENGINES IN USE:

There should be relatively little fire risk in any well maintained stationary steam engine.

- where lubrication is by gravity feed, lubricators must be turned off when the engine is stopped;
- where the steam raising plant is modern, operators must remember that the engine it runs - particularly a reciprocating steam engine - may impose unusual operating conditions on that plant;
- where the steam raising plant is itself historic, detailed operating procedures, including safe procedures for shutting down the plant, will be needed (see Section 22).

MOTOR VEHICLES:

Vehicles in use:

There should be relatively little fire risk in any well maintained historic vehicle.

- normal precautions should be taken to inspect fuel tanks, pumps, lines and carburettors, and electrical wiring and apparatus that may pass close by them;
- an on/off switch in the fuel line is an advantage;
- the battery should be properly secured and if possible covered with an insulated covering; it should have an on/off switch, and the terminals should be shrouded in insulating material;
- wiring should be regularly checked and any faulty wires changed in their entirety;
- fuses should be of the correct rating, specified by the manufacturer;
- the ammeter should be regularly checked as a means of detecting wiring faults;
- a CO₂ fire extinguisher should be kept in the vehicle as well as nearby. In vehicles with their own firefighting systems (eg tanks) these must be operational;
- pyrotechnics should be safely stored.

Exhibits in the museum:

- there is no agreement over whether it is more dangerous to leave petrol in a fuel tank, or to drain it and leave a vapour. Ideally, any vehicle coming in to the museum should be entirely drained of fuel, and the fuel lines disconnected to allow the whole system to be flushed or blown through so that the vapour is dispersed;
- fuel pumps and carburettors should be emptied;
- batteries should at least be switched off or disconnected, and ideally removed;
- if possible the vehicle should be able to be wheeled out of the building in the event of a fire, eg not on jacks, nor with flat tyres;
- vehicles fitted with magnetos should be earthed to a nearby earthing point.

BOATS:

Gas:

- gas is a frequent cause of fires in boats; bottled gas is heavier than air and readily settles in bilges. If gas is used a gas detection system and alarm should be fitted;
- where possible, gas bottles should be situated in a sealed containment fitted with a vent to discharge outside of the vessel;
- any gas bottles not required should be removed; any required but not in use should be switched off at the bottle.

Electricity:

- electricity should only be used if absolutely essential;
- all supplies to water-borne craft should be through an isolating transformer (110 volt if possible) and via an earth circuit leakage breaker;
- the rating of fuses should be only just sufficient for the anticipated load. This may be less than in operational use and potential danger can be reduced by keeping the fuse rating to a minimum. This is particularly important where old wiring is still in use.

Fuel:

Boats are normally powered by either diesel or petrol, and a few craft still use coal. Diesel or coal can be relatively safe, but petrol is almost as dangerous as low pressure gas. Heavier-than-air fuel gas is a major hazard on boats; bilge-gas explosions form a high proportion of boat fires.

- unless the engine needs to be working, all petrol should be removed from the tanks which should be well ventilated;
- when filling tanks, avoid spillage into the bilges or on to adjacent water. If there is any spillage in the boat, ensure the hull is well ventilated;
- no smoking or naked lights should be allowed in the vicinity of the boat when it is being refuelled with petrol.

Precautions:

- all boats should be equipped with dry powder or CO₂ type extinguishers;
- no smoking should be permitted in any part of preserved craft;
- large boats should have smoke/fire alarms fitted throughout interior accommodation. Very large boats open to the public should have an emergency evacuation plan;
- regular checks should be made for leaking fuel lines, old rags and other potential risks;
- bilges should be frequently ventilated;

- pyrotechnic flares should be regularly renewed if required, and safely removed if not;
- all buoys and standing and running rigging should be regularly checked.

AIRCRAFT:

Aircraft in use

Maintenance and fire safety procedures for live aircraft are strictly governed by the Authority on whose register they appear. In the UK this is usually the Civil Aviation Authority, although some aircraft may be registered with foreign authorities such as the United States Federal Aviation Authority.

Exhibits in the museum

- the entire fuel system should be drained and purged with air or, better still, with nitrogen. Draining alone is not adequate because there may be a residue of vapour, or pockets of liquid in awkward corners of some fuel tanks;
- pyrotechnics (cartridges) should be removed, eg ejection seats, engine starters and Very pistols;
- pressure vessels, especially oxygen cylinders, should be drained;
- batteries should be removed, or disconnected by removing the earth strap and taping up the terminal;
- aircraft fitted with magnetos should be earthed to a nearby earthing point.

Wood and fabric aircraft are high risk items which need special care, for example during any work being carried out nearby which might generate a spark.

ELECTRICAL AND ELECTRONIC EQUIPMENT :

- all equipment should be installed by suitably qualified electrical engineers, as required by the Joint Industries Board, Institution of Electrical Engineers and National Inspection Council for Electrical Installation Contracting;
- installation should be provided with switchgear as defined in Chapter 53 of current IEE Regulations, so as to eliminate danger from arcing and overheating;
- electrical installations within exhibits or equipment should be constructed to ensure that heat generated by the electrical systems does not transfer to combustible materials;
- where a risk of overheating exists, the enclosure should be force-ventilated and a high temperature cut-out fitted to isolate the electrical supply;
- lamps used in displays should comply with BS 4533 and BS 3456 and should be well ventilated;
- exhibits to which the public has access should use low voltage switching on the public interface;
- foolproof precautions are required against unauthorised switching on.

- 12.14 A survey is needed to decide the type, number and location of fire-detection sensors appropriate to the premises. Indeed, a wider ranging survey can be undertaken to identify specific risks and precautions required, to provide a fire precautions manual containing checklists and Disaster Response Plans (see Section 14) and to set out a reporting procedure. Both specialist companies and many major security firms can give such advice.
- 12.15 A major cause of fires affecting larger objects in museums is vandalism. Good site security is essential (see Section 11). General tidiness is also vital; inflammable material and rubbish left lying around an open-air site is an invitation to vandalism.
- 12.16 Smoking should be forbidden in all parts of the site or premises which contain collections.
- 12.17 Public events pose a particular fire hazard. Careful thought should be given to fire prevention when planning events, and emergency procedures planned and practised.
- 12.18 Any original firefighting system, in an aircraft, vehicle or boat, which incorporates methyl bromide, should be rendered safe or replaced with a CO₂ or other modern approved system. Note that an aircraft which is only taxied, and not flown, must still have an operational firefighting system.
- 12.19 Some larger objects bring with them their own protection against fire or excessive escape of heat. This often takes the form of asbestos, for example on boilers, pipework, and even in the chimneys of hot tube ignition engines.
- 12.20 A sprinkler system should be considered; they can be highly effective in the event of fire. Museums have sometimes avoided sprinkler systems in the past because of a fear of water damage. However, modern systems are reliable and selective if well planned and well maintained.
- 12.21 Historic buildings pose particular problems over fire precautions, as they do over security. Compromise is, however, very often possible, and specialist advice should be sought. Modification of historic buildings may require Listed Building or other consents.

Sources of advice and help

- The Local Authority Fire Prevention Officer and the Local Authority Building Control Department will both be glad to give advice.

- Information about UK fire authorities and companies offering prevention and detection services is given in the Security & Fire Prevention Yearbook, available from:

Paramount Publishing
17-21 Shenley Road
Borehamwood
Herts

- Other useful information such as safety data sheets can be obtained from:

Fire Protection Association
140 Aldersgate
London EC1

and

Fire Prevention Information
Aldermay House
Queen Street
London EC4N 1TJ

- Some advice on preventing fire in preserved aircraft is included in:

Fitzgerald, L. and Storer, J. D. (eds), *Stopping the Rot: the Passive Conservation of Aviation Collections*, 1991, The British Aviation Preservation Council/The Museum of Science & Industry.

- Many museums are in or include historic buildings, whose adaptation to meet fire prevention and security requirements often causes problems. *Fire Safety in Historic Buildings*, 1990, published by the Fire Protection Association is a useful source of advice. Area Museum Councils can also give advice - directly or through consultants - on possible solutions.

- Useful information on the interpretation of the Fire Precautions Act 1971 can be found in *Code of practice for fire precautions in factories, offices, shops and railway premises not required to have a fire certificate*, 1989, HMSO, and in *Fire Precautions Act 1971: guide to fire precautions in existing places of work that require a fire certificate*, HMSO.

13 Standards for protecting larger objects from flood

- 13.1 As far as possible no pipework or tanks should be permitted in new buildings in areas where collections are kept; every effort should be made to exclude pipework from such areas in old buildings. Adequate drainage should be provided in buildings where there is a possibility of flooding.
- 13.2 No object which can be raised (if necessary on a pallet, with lifting gear), should be placed lower than 6" (150mm) above the floor.
- 13.3 Tanks and boilers on steam engines should be drained before they are laid up indoors.
- 13.4 Special precautions need to be taken to prevent flooding in larger objects kept outdoors.
- 13.5 Special precautions need to be taken to prevent flooding in ships and boats kept in the water.
- 13.6 Appropriate precautions should be taken in museums liable to flood.

Guidelines and notes

- 13.7 "If a flood can occur, one day it will"; this assumption should guide all arrangements in the museum.
- 13.8 Compliance with relevant building regulations and recommendations, especially in old buildings, may make complete exclusion of pipework difficult. Every effort should be made, in discussion with the appropriate technical consultant, to find a satisfactory compromise solution. In areas where objects can be raised off the floor, one solution may be to run the pipework at ground level rather than ceiling level. Automatic cut-off valves should be installed, and leak detectors are desirable.
- 13.9 All pipework and stop-cocks should be labelled in accordance with *BS 1710 Identification of pipelines and services*, should be noted on the building plan in the museum's Disaster Response Plan (see 14.4), and should be very frequently inspected during frosts.
- 13.10 Adequate drainage to cope with flooding should be provided; drains should have non-return traps.
- 13.11 All taps to sinks should be of the spring-loaded automatic turn-off type.
- 13.12 The danger of water damage as a result of fire should be considered in Disaster Response Plans (see Section 14), and should be regularly discussed with the Fire Brigade.
- 13.13 As extra protection from water leaking from above, larger objects may be protected with polythene sheeting. Waterproof boxes, cabinets, etc should be used whenever possible, though the danger of condensation should be considered.
- 13.14 The Local Authority and local Water Authority should be asked for advice on the likelihood of flood; long-resident neighbours should also be consulted. Bund walls, stop boards, sandbags and other precautions may be appropriate in some museums.
- 13.15 If the museum site includes a body of water, eg a mill pond, the facilities and arrangements for controlling overflow, draining and dealing with emergencies should be regularly

reviewed with representatives of the National Rivers Authority and the Fire Brigade. Where the museum is adjacent to a body of water it does not control such a regular review is equally essential, and clearly needs to involve the owner.

- 13.16 All staff and volunteers should receive regular training in flood prevention and response.
- 13.17 A portable water pump should be available for emergency use.
- 13.18 Boats are subject to particular risks of flooding, and require special precautions (see also Section 21):
- craft should be regularly pumped out, to prevent rainwater increasing the weight of the craft and possibly bringing a damaged seam below water level;
 - boats on tidal waters or rivers should be moored with lines long enough and strong enough to cope with strong tides and surges;
 - bilges should be checked regularly; whenever possible automatic bilge pumps should be installed, positioned so that if the vessel lists they do not run dry and overheat;
 - a small mark placed at normal waterline will show a change of level, perhaps due to a leak;
 - flooded craft should be raised as quickly as possible to prevent damage to equipment and fittings; craft that have been under water should be dried out slowly;
 - if there is a risk of sinking, non-essential equipment should be removed;
 - water and heating systems should be regularly checked;
 - all through-hull openings should be fitted with a 'sea cock' valve, which should be regularly maintained and where possible kept closed.

Sources of advice and help

- The Fire Brigade will provide advice on the prevention of flooding.

14 Standards for planning response to disasters

- 14.1 The museum should draw up a Disaster Response Plan for the protection and rescue of the collections in the event of fire, flood or other catastrophe. This Plan should make specific provision for the rescue of larger objects.
- 14.2 All museum staff and volunteers should receive regular training in how to respond to disasters.

Guidelines and notes

- 14.3 The Disaster Response Plan is a written document which sets out procedures to be followed in an emergency. Its general contents should be known to all staff through prior discussion and through regular training sessions and emergency exercises. Liaison with the public emergency services over its contents is essential; once written, it requires continued revision to ensure that it remains relevant.
- 14.4 The plan should include:
- responsibilities of personnel, method of raising alarm and communication to others;
 - emergency telephone numbers, including home numbers of staff;
 - confidential up-to-date plan of site and buildings clearly showing all services, hazardous stores, etc. A separate copy of this should be available to the fire brigade on arrival;
 - priorities in limiting damage to the collection and to its documentation;
 - sources of relevant expertise, including conservators and nearby museums, archives, etc as agreed beforehand;
 - list and locations of material and equipment, (every museum should have a 'disasters box' containing mops, buckets, cloths, overalls, etc);
 - list of suppliers and services (eg freeze-drying, haulage contractors);
 - security measures for the collections if the premises are damaged, eg pre-arranged off-site safe storage;
 - arrangements for documentation of objects taken off site;
 - first aid measures for damaged collections, by type of material, drawn up in consultation with conservators;
 - an agreed budget including petty cash/chequebook, with a hierarchy of authority to spend in an emergency. The hierarchy should extend as far as possible in order to ensure that someone present at a disaster is authorised to spend money;
 - a safety policy for working in hazardous conditions.
- 14.5 A complete record of the collection and its disposition within the stores or displays, together with a COSHH assessment, should be available some distance from the collection itself, and a duplicate should be held in another building (see also 12.2).

- 14.6 It is essential that the Disaster Response Plan be drawn up in close cooperation with the Fire Service, and be regularly reviewed with them.
- 14.7 The Disaster Response Plan should in every museum be only part of a wider policy for the protection and rescue of people (first) and of the collections (see Sections 23 and 24).

Sources of advice and help

- The following publications are useful:
 - East Midlands Museums Service, *The Museums and Records Office Emergency Manual*, 1991, East Midlands Museums Service, Nottingham.
 - Fire Protection Association, *Fire safety in historic buildings*, 1990, Fire Protection Association, London.
 - Society of Industrial Emergency Services Officers, *Guide to Emergency Planning*, 1986, Paramount Publishing, Borehamwood.
- In some areas Emergency Conservation Units are available. Area Museum Councils can advise.
- The National Preservation Office video *If disaster strikes* is useful for training. Contact your Area Museum Council for hire or purchase of this video and to organise disaster contingency planning seminars.
- Advice can be obtained from the Area Museum Councils. In addition, The Conservation Unit of the Museums & Galleries Commission (Tel 071 233 3683, Fax 071 233 3686) maintains a Register of private conservators throughout England, Wales and N Ireland and a list of suppliers of materials. In Scotland this information is held by Historic Scotland's Conservation Bureau.

Standards for protecting larger objects from physical damage

- 15.1 Larger objects demand an adequate loading capacity of floors, plinths, pallets or other support.
- 15.2 Larger objects require adequate space for access, inspection, cleaning and moving.
- 15.3 Larger objects should be given any special support they need, for example axle stands for vehicles (but consider the implications for emergency evacuation: see 12.13).
- 15.4 Any necessary equipment (eg mobile gantry, platform, step-ladders) must be provided, must meet safety standards and the requirements of the appropriate British Standard or regulations, and must be regularly inspected. Staff and volunteers should be trained in their use.
- 15.5 Larger objects must be made physically stable.
- 15.6 Vulnerable surfaces with which visitors may come into contact should be protected.
- 15.7 Larger objects should be regularly inspected for pest damage, or any signs of physical or chemical deterioration. These inspections should be recorded in the object's Conservation/Maintenance Record (see 4.12, 6.31).

Guidelines and notes

- 15.8 The weight and distribution of load of each larger object should be carefully assessed, and a structural engineer consulted on the load bearing capacity of the building. Working objects have distinct floor loading/vibration implications.
- 15.9 Pallets, crates and other supports should be carefully designed for the object they must bear. If relying on hydraulic support, check hoses and fluid yearly; replace hydraulic fluid at least every four years; replace hoses as required. If a vehicle is resting on pneumatic tyres, the tyre pressures should be checked and the wheels turned regularly.
- 15.10 In store, nets can be used to secure irregularly shaped and soft/plastic objects in place, for example on a pallet. Light objects can be stored in a suspended hammock of netting. Pallet collars and pallet boxes are also valuable.
- 15.11 Surfaces of objects may be protected by the provision of plastic barriers, the provision of separate access through ramps and steps, or the replacement of original parts by replicas.
- 15.12 People working on or near objects should avoid wearing items such as tool-belts which might cause damage, and should normally wear gloves. Appropriate equipment to give proper and safe access to the object should always be provided.
- 15.13 Boats kept on land require good support to retain their shape and structural integrity. Small boats should ideally be placed on customised bases with keel support and fitted hull chocks; large vessels should be placed on closely spaced keel blocks and strategically-placed side shores. Vessels with extended fore and aft overhang must be well supported in these areas to avoid distortion and hogging.
- 15.14 When aircraft are to be suspended:
- the structural integrity of the aircraft must be confirmed;

- the aircraft must be weighed and its current centre of gravity established;
- the suspension points must be established in relation to the structure and display orientation. Balance weights may need to be added;
- All loose parts must be secured, and the undercarriage secured in the up position, if it is to be displayed so;
- the interface between the airframe and the suspension system needs to be design stressed, as does the airframe itself once the mode of attachment and the display attitude have been decided;
- the roof structure and fittings must be stress analysed to ensure they are fit for suspension;
- all components must have appropriate test certificates;
- the actual suspension must be carried out by competent persons.

15.15 Larger objects may not have been designed to bear their own static weight indefinitely. This is especially, though not exclusively, true of wooden framed machines, and it may be necessary to reinforce the support or to replace heavy components with lightweight reproductions.

15.16 The Museums Association's Guidelines on Security When Using Outside Contractors should be observed.

Sources of advice and help

- Advice is available from the relevant departments of National and other larger museums.
- The following publications are useful:

Chippington, C, Fitzgerald, L. and Storer, J. D. (eds), *Stopping the Rot 2: the Active Conservation of Aviation Collections*, 1993, The British Aviation Preservation Council/The Museum of Science & Industry.

Hallam, J., 'Conservation and storage: machinery' in Thompson, J. M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

16 Standards for protecting larger objects from dust and dirt

- 16.1 Objects should be protected as far as possible from dust and dirt.
- 16.2 A cleaning regime should be drawn up for each larger object, and recorded in the object's Conservation/Maintenance Plan.
- 16.3 Cleaning should be as gentle as possible and should be undertaken by trained people; the need for it should be reduced to a minimum.

Guidelines and notes

- 16.4 Dust and dirt encourages mould and corrosion by attracting and holding moisture, it can act as a catalyst for other chemical reactions such as fading and corrosion, and cleaning it off can abrade and scratch objects.

Prevention

- 16.5 Dust can originate from both internal and external sources; good housekeeping and simple preventive measures can be used to reduce levels of dust and dirt to a minimum. Windows should be close fitting and kept shut, and concrete floors covered or sealed. All larger objects stored indoors should be protected by dust sheets, and there should be large loop-piled doormats at the doors. Objects kept outdoors should be protected against splashed mud, wind-driven dust and bird-droppings.

Cleaning premises

- 16.6 A regular and effective cleaning regime should be established.
- 16.7 Indoors, all surfaces should be vacuum-cleaned (not swept), using vacuum cleaners with ultra- fine filters; they should conform to *BS 5412: Section 2.2, Supplement 1, Specification for type H industrial vacuum cleaners for dusts hazardous to health*.
- 16.8 Only materials approved by a conservator should be used; some cleaning materials give off damaging gases.
- 16.9 All curtains, dust-sheets etc should be regularly washed.

Cleaning objects

- 16.10 The cleaning of objects is a completely separate activity from cleaning the premises, and it should be planned and carried out quite separately. Where objects need to be cleaned, the method will differ according to the nature of the individual object, and the use to which it is put within the museum.
- 16.11 In particular, different approaches may be needed for working objects and those which have been significantly restored or where the exterior finishes are modern replacements, and for those retaining original finishes or where for some other reason special cleaning arrangements are required.
- 16.12 A conservator should make an assessment of the appropriate cleaning method for each object, based on an appreciation of its importance and condition, and this should be

recorded in the object's Conservation/Maintenance Plan. Cleaning itself should be undertaken only by appropriately trained and supervised staff.

- 16.13 For most larger objects there are traditional cleaning techniques. Often these result from generations of experience, but they may not be suitable in a museum context, because they damage the object. In past times the aim was cleanliness and appearance rather than preservation: for example, polishing brasswork wears it away. Such methods may sometimes be the most appropriate way to clean working objects or objects which have been heavily restored. Even then, however, traditional techniques may usefully be influenced by the insights and techniques of modern conservation science.
- 16.14 In other cases, particularly where an object retains exterior finishes, cleaning objects is conservation work, and should only be undertaken by or under the supervision of a conservator, using materials and techniques previously verified as safe and appropriate to that particular object.
- 16.15 The condition of some larger - especially ferrous - objects arriving at the museum may invite more aggressive cleaning techniques. Operations such as airblast cleaning (a range of abrasives can be used), chemical stripping, electrolytic stripping, power washing (which can also incorporate abrasive or chemical action), needle descaling or power chisels are all commercially available. Sometimes these methods may be appropriate, but they should be used only after the most careful research and discussion, and only under the direct supervision of a conservator.
- 16.16 In drafting the cleaning programme for an object's Conservation/Maintenance Plan, the following questions should be asked:
- How important is this object, and what level of care should it receive? (see 1.6)
 - Why clean? Is it dirt? Should some or all of it remain? Is the dirt doing damage? Is the "dirt" itself historical evidence?
 - Can the object tolerate being cleaned? What are the physical and chemical properties of a) the object and b) the dirt? What will affect the dirt without affecting the object?
 - What will be the effect of cleaning? What will the object look like after cleaning? Will its stability be affected? How often will it need cleaning in future?
 - How can the object be cleaned? Is there a suitable treatment? How does the treatment work? Is the treatment safe for both person and object? When should it stop?

Dusting

- 16.17 Dusting is such a common household activity that its dangers when applied to museum objects are often not recognised. Dusting can however, scratch objects, cause breakages, stir up more dust than before and encourage corrosion. Vacuuming is therefore preferable, though not always possible.
- 16.18 For dusting, brushes are preferable to cloths and cotton wool; they should be long bristle brushes of pigs' hair or equivalent. Lambswool dusters are also acceptable. Fibreglass brushes should not be used.
- 16.19 A vacuum cleaner, conforming to *BS 5412*, should be used to prevent dust removed by brushing from settling on adjacent objects. The nozzles of vacuum cleaners should be padded.

- 16.20 Avoid moving the object to be cleaned, and ensure that it is stable.
- 16.21 Dusting may disturb hazardous substances, for example powdery red lead paint, white lead paint, black leading, asbestos coatings and powder residues, old luminous surfaces, powdery metal corrosion products, discharges from electrical components, and microbial dusts and residues (eg bacteria causing Weils disease from rat excreta, sometimes found in very poor stores). Protective clothing and masks appropriate to the risk should be worn. In some situations dust/fume extraction equipment may be necessary (see also Section 23).
- 16.22 When vacuuming fabric or friable or loose materials, eg old paintwork, always use a nylon net over the nozzle.

Wet cleaning

- 16.23 No object should be cleaned other than according to the programme set out in its Conservation/Maintenance Plan.
- 16.24 Solutions in water, detergents and solvents may change the surface of the object, and may contaminate adjacent parts of the object made of different materials. Some surfaces, for example unfixed painted surfaces, porous metals and corroded metal surfaces, should not be washed. Objects may have been made or repaired with water soluble adhesives. Any detergent or solvent must be removed completely after cleaning. The work must always be guided by a conservator.
- 16.25 Cleaning materials should be softer than the material being cleaned; the cleaning technique should not put strain on the object.
- 16.26 Many household cleaners operate by abrasion, causing physical damage to the object; abrasion cleaners should not be used.
- 16.27 Cleaning materials should be provided in sufficient quantity to allow frequent changes and washes.

Sources of advice

- Area Museum Councils can point to sources of advice on particular problems and types of object.
- The following publications are useful:
 - Moncrieff, A. and Weaver, G., *Cleaning*, Science for Conservators series, Volume 2, 1992, The Conservation Unit of the Museums & Galleries Commission/Routledge.
 - Horie, C. V., 'Conservation and storage: leather objects', in Thompson, J. M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.
 - Sandwith, H. and Stainton, S., *The National Trust Manual of Housekeeping*, 1991 (2nd edition), Penguin Books, London, provides good accessible advice on the care of large furniture. The National Trust also publishes a training video of the same name.
 - Lancashire County Museum Service has notes available on the various processes for cleaning heavy industrial plant.

Standards for buildings and environment

- 17.1 Buildings used for the display, storage or examination of objects must be regularly inspected to ensure they provide adequate physical protection against the elements and are generally fit for their purpose. Maintaining the fabric of the building should have a high priority, and adequate funds should be budgeted for it. Inspections, maintenance, cleaning, small works, etc should be undertaken or supervised by fully trained and experienced people.
- 17.2 Expert technical advice should be taken when planning modifications to a building. Before any decision is made to control the environment (eg humidity control, heating or air-conditioning plant), advice should be taken from a suitably qualified building scientist or services engineer. The environment in the area to be controlled must be monitored.
- 17.3 Temperature, relative humidity and light should be monitored in all storage and display areas, and the records assessed regularly with reference to the conditions needed by the collections. At least every six months a conservator should collate and assess the records; a report should be presented to senior management and any recommendations acted on.
- 17.4 Sudden or extreme fluctuations in relative humidity or temperature must be avoided.
- 17.5 All sensitive materials should be protected from excessive exposure to sources of natural and electric light. The period of exposure to light must be kept to a minimum, as damage by light is cumulative.
- 17.6 Objects must, where possible, be isolated from sources of direct heat, including heat from lighting installations.
- 17.7 A programme for the regular calibration and maintenance of all environmental monitoring and control equipment should be established.
- 17.8 All harmful biologically active agents must be eliminated from the collections, storage areas, buildings and plant. Regular inspections and maintenance procedures should ensure that they remain so.
- 17.9 Objects must not come into contact with harmful substances such as gases, fumes or other pollutants.
- 17.10 All materials used for the storage, display or transport of objects should be tested by a recognised method before being used in contact with objects.

Guidelines and notes

- 17.11 This section deals with standards for buildings and the internal environment. If keeping an object outside is unavoidable, there are measures that can slow the effects of the elements (see Section 20).
- 17.12 Different materials have different environmental requirements. This is complicated by the fact that many larger objects are made of composite materials.
- 17.13 Levels of humidity and temperature recommended in publications should be used with caution, where possible taking expert advice. For organic materials in particular it is important to maintain an equilibrium between the moisture content of the object and its environment.

- 17.14 Boats constitute a particular problem when taken out of the water for which they were designed. The high moisture content of wooden boats demands especially careful consideration.
- 17.15 Appropriate levels of relative humidity (RH) and temperature within a building can be more easily attained if the building has been well maintained. The structure should be watertight, with all possible sources of damp (failed or non-existent damp-proof membranes, leaking pipes, water tanks, faulty guttering, missing roof tiles etc) identified and remedied.
- 17.16 As temperature falls, RH rises; as temperature rises, RH falls. This is true if no moisture comes in from outside or is generated from within, and there is no artificial control of the climate within the space.
- 17.17 Passive measures to stabilise the environment within a room or building should be taken first. Thermal insulation, draught-proofing and multiple glazing are ways in which temperature fluctuations can be reduced. However, these measures can also modify air flow through the space, which can have a deleterious effect on both collections and buildings. Therefore, technical advice should be taken from a building specialist, in order to identify the causes of instability before modifications are made. Otherwise these measures can make a situation worse.
- 17.18 Full air conditioning will control humidity by either dehumidification or humidification, will filter air to 99% or better, and will control temperature within very tight tolerances. However, air conditioning systems that are designed to control an entire building are expensive to install, to maintain and to run, tend to stir up dust, and can be noisy.
- 17.19 Instead, sensitive objects could be stored and displayed in small conditioned spaces, which will reduce capital installation costs and prove cheaper to run and simpler to maintain. An effective sensitive object store can be created, for example, by converting a refrigerated articulated lorry.
- 17.20 The higher the temperature, the faster chemical and biological changes progress. For this reason, the temperature in unoccupied areas should be kept as low as possible, though this should not be such as to cause the relative humidity to rise above the recommended levels (see Appendix A). It should be noted that legislation governs the minimum temperature for areas in which staff work.
- 17.21 Condensation can occur on the surface of a cold object when it is exposed to warm air. This is because a volume of warm air is capable of holding more moisture than the same volume of air at a lower temperature. The sudden drop in temperature around a cold object will cause moisture to condense out of the cooled air on to the cold surface of the object. This can be particularly significant for large metal objects when, for example, hangar doors are opened and objects stay cold for a long time; the temperature of the surrounding air will change more quickly than that of the object. Factory roller-shutter doors can be insulated by removable insulated panels.
- 17.22 Sudden or extreme fluctuations in relative humidity, particularly if repeated, can cause dry organic materials such as wood or leather to absorb or lose moisture, and may result in cracks developing.
- 17.23 Controlling humidity by installing dehumidifiers and/or humidifiers in bulk storage areas can be more efficient and cost-effective than installing heating plant. This is because as long as relative humidity is held at the required levels, the temperature can be allowed to fall.
- 17.24 All heating, ventilation and air conditioning systems should be regularly checked and maintained by suitably qualified engineers; spare parts must be available. The systems should have a standby capacity which is automatically brought into service in the event of

failure, and should indicate an alarm/plant failure in a control room or Building Management System (BMS).

- 17.25 Modern BMS provide centralised control of all mechanical and electrical services. They can also immediately give an alarm when temperature or humidity goes too high or too low, and can log ambient conditions and produce graphs. Such systems are also a valuable tool for monitoring and regulating energy consumption.
- 17.26 Ideally, environmental monitoring should cover all four seasons and be related to the external climatic conditions. Monitoring should also take account of visitor numbers.
- 17.27 Measuring and recording the climate by regular spot-checks using psychrometer or electronic thermohygrometer with meticulous record-keeping is the minimum acceptable level of monitoring. Ideally, monitoring should be continuous, by recording thermohygrographs (7/30 day charts) or by remote sensors connected to a datalogging system, which can make analysis simpler and quicker. Conditions outside the building should also be monitored. A schedule of regular cleaning and calibration of all monitoring equipment should be instituted. Staff responsible for this work should be suitably trained.
- 17.28 Even large industrial objects may have coatings or parts which are sensitive to light. The most noticeable result of over-exposure to light is fading or discolouration, but structural damage can occur in the long term. The standards can be attained by keeping all storage and display areas dark when not in use. Curtains, blinds, screens or opaque dustsheets provide an effective way of reducing light levels cheaply.
- 17.29 Ultraviolet light levels can be effectively reduced by the application of protective film or varnish applied to windows and/or lamps. These films have a limited life and require regular checking and replacement.
- 17.30 Length of exposure to light is as important as the level of illuminance when assessing the possible damage caused by light. Measuring exposure in lux-hours provides a more accurate record of total exposure:
- total exposure (lux hours) = time (hours) x illuminance (lux)
- 17.31 Both natural and electric light sources produce heat which can damage objects; for example, metal objects will expand as their temperature increases, which may lead to permanent distortion or displacement of their coatings or inlays. Sharp or repeated fluctuations of temperature are particularly damaging.
- 17.32 Objects should be positioned away from sources of heat, and excess heat dissipated by ventilation. New display lighting equipment, notably low-voltage lighting, creates less heat than old installations, although care needs to be taken in positioning the transformers. For general lighting in high bay industrial type buildings, both high pressure mercury discharge (metal halide) lamps and high pressure sodium discharge lamps give good colour rendering, high output, long life and low operating costs.
- 17.33 New building work, redecoration and routine cleaning can introduce contaminants such as dust, solvent fumes or large quantities of moisture which are potentially harmful to objects. Action should be taken to remove dust, excess moisture and other contaminants before collections are re-housed following building work.
- 17.34 When the walls are completely dry, microporous sealants can be applied to control dust but allow them to breathe.
- 17.35 Building and finishing materials give off both particles (eg sawdust and concrete dust) and vapours (eg ammonia and water), especially during and soon after application; objects should be protected from these effects. A newly decorated space should as far as possible

not be used to house objects until tests show that emissions have ceased. This may take some months; good ventilation will speed the process.

- 17.36 Many inorganic and organic materials are affected by gases, organic vapours and other compounds given off by other materials nearby. Possible sources of such pollutants include manufactured boards, natural fibres such as wool felt, fire retardant coatings, recently applied paint and adhesives, and some hardwoods such as oak. Materials for use in the display and storage of objects should be tested for any possible harmful effects, and time for this procedure needs to be allocated during the planning of any work.
- 17.37 Cleaning materials should be checked by a conservator for suitability for use in the vicinity of objects. A clear set of written instructions, stating the chemicals approved for each area, should be provided for everyone involved in cleaning operations. Care should be taken to ensure cleaning procedures do not cause damage to the collection (see Section 16).
- 17.38 Concentrations of reactive gases like sulphur dioxide, ozone and nitrogen oxide, as well as smoke and dust, can rise to high levels in city air. These gases cause fading and degradation of organic materials and deterioration of inorganic materials, while the particles cause staining and soiling. These pollutants can be reduced inside a building by sealing windows, doors and ventilation points. Sealed storage can contribute significantly to protection from external pollutants. The reduction of pollutants can be carried out more efficiently by air-conditioning which incorporates air-scrubbers or active charcoal filters. However, electrostatic air cleaners should not be used as they are a source of ozone, an oxidising agent also given off by photocopiers.
- 17.39 Biologically active agents include rats, mice, birds, insects, fungi, algae, bacteria, etc. A programme for regular monitoring of collections, buildings and equipment for pests should be instituted. Clear guidelines for effective eradication of pests or harmful substances should be drawn up.
- 17.40 All incoming objects, together with their associated packaging materials should be inspected for the presence of biologically active agents before being introduced to the main storage or display areas.
- 17.41 The storage and use of pesticides is controlled under the *Control of Pesticides Regulations*, 1986. Emphasis should be on 'good housekeeping', but where this fails to prevent or control infestation, local treatment of affected items using approved pesticides should be undertaken. Remedial treatments to eliminate any biological pest should be minimal, in order to reduce potential risk of damage to objects, the environment and to staff and visitors. Carbon dioxide is increasingly used as a pesticide.
- 17.42 All collections and storage areas must be kept clean and tidy, and a regime for regular cleaning instituted (see Section 16). Maintenance, monitoring, cleaning, pest control or related work should be undertaken or supervised by fully trained and experienced people.
- 17.43 Modification of historic buildings may require Listed Building or other consents.

See over for sources of advice and help

Sources of advice and help

- Advice can be given by:

Area Museum Councils
United Kingdom Institute for Conservation
The Conservation Unit of the Museums & Galleries Commission

- Advice on pesticides is available from all regional offices of the Health and Safety Executive, and from:

Registration Section
Health and Safety Executive
Magdalen House
Stanley Precinct
Bootle
Merseyside L20 3QZ

- Several organisations including some commercial conservation firms offer a testing service for the suitability of materials for use in exhibition or storage of museum specimens. These include:

Area Museum Council for the South West
North of England Museums Service
Wiltshire Library and Museum Service
British Museum Conservation Department

- An up-to-date introduction to the whole field is:

Cassar, May, *Environmental Management: Guidelines for Museums and Galleries*, 1994, Routledge in association with the Museums & Galleries Commission, London.

- Useful publications include:

Chartered Institution of Building Services Engineers, *Lighting Guide: museums and galleries*, (revised edition forthcoming), Chartered Institution of Building Services Engineers.

The Chartered Institution of Building Services Engineers, *CIBSE Guide*, Volumes A, B and C, 1986, The Chartered Institution of Building Services Engineers, London.

Hallam, J., 'Conservation and Storage: Machinery', in Thompson, J. M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

Health and Safety Executive, *Health and Safety Commission Approved Code of Practice for the Safe Use of Non-Agricultural Pesticides*, 1991, Health and Safety Executive.

HMSO, *Control of substances hazardous to health in fumigation operations*, Control of Substances Hazardous to Health Approved Code of Practice, 1988, Health and Safety Commission.

HMSO, *Pesticides*, a list of permitted pesticides, published annually on behalf of the Health and Safety Executive and the Ministry of Agriculture, Fisheries and Food.

McConnell, A., *Preservation of Technological Material*, 1976, Proceedings of a Symposium, Science Museum, London.

Pinniger, D., *Insect Pests in Museums*, 1990 (2nd edition), Archetype Publications, Denbigh.

Scottish Museums Council, *Caring for Museum Collections*, a Video and Information Pack, Scottish Museums Council, Edinburgh.

Staniforth, S., 'Control and Measurement of the Environment', in Thompson, J. M. A. et al (eds), *Manual of Curatorship*, 1992 (2nd edition), Butterworth-Heinemann/Museums Association, Oxford.

Storer, J. D., *The Conservation of Industrial Collections: A Survey*, 1989, The Science Museum and the Conservation Unit of the Museums & Galleries Commission, London.

Thomson, G., *The Museum Environment*, 1986 (2nd edition), Butterworths, London

- The Health and Safety Commission and the Health and Safety Executive publish a great deal of information which is of interest to museum managers. Many publications are available free of charge. Contact HSE Publications Point, St Hugh's House, Stanley Precinct, Bootle, Merseyside L20 3LZ (Tel 051 951 4000). A full list of current Health and Safety Commission/Health and Safety Executive publications, *Publications in Series*, is published twice yearly.

18 Standards for moving larger objects

- 18.1 The handling and movement of objects should be kept to an absolute minimum.
- 18.2 Trained personnel and suitable equipment must be available for the safe lifting and transporting of objects.
- 18.3 Every move of an object should be carefully planned in advance, adequate personnel and equipment provided, the route agreed and cleared, and the supervision of the operation agreed.
- 18.4 Objects being moved should be protected from physical shock, vibration and from hostile environmental conditions.
- 18.5 Objects and parts of objects being moved should be kept sufficiently apart from one another to prevent abrasion, crushing and contamination.
- 18.6 Staff and volunteers should be trained in the handling and moving of objects and should be aware of the potential risks to objects and to themselves.
- 18.7 Contractors used for lifting and heavy haulage work should have proven experience in the field and must work closely with museum staff to ensure best practice in care for the object.
- 18.8 Wheeled and tracked objects should only be moved on their own wheels after appropriate engineering advice has been obtained on the mechanical condition of all the moving parts, the suspension, if any, and particularly the bearings. Proper lubrication is essential before a wheeled or tracked object is moved on its own wheels.

Guidelines and notes

- 18.9 Larger industrial and social history objects may pose particular problems when moved because of their size and weight. Some may be able to move on their own wheels; some, though having wheels, may be too fragile, old or delicate to move in that way. Others may be so large or heavy, even when broken down into component parts, that specialist heavy hauliers and crane operators have to be engaged.
- 18.10 Moving larger objects, whether manually or mechanically, requires careful planning to ensure that it is done successfully and without danger to people or object.
- 18.11 Collecting larger objects in the field often raises the most severe difficulties of following proper procedures. The more difficult the job, the more important it is to entrust it to highly experienced people.
- 18.12 The following guidelines should in every case be followed:
- One experienced, capable person should be in charge of the whole operation.
 - Everyone involved should be trained and know their responsibilities. The team must ensure that control is maintained throughout the operation.
 - Assess the load: can it be moved? What are its weak points? What is its condition? The original specifications may give its weight: check that they accord with the object as built or as found. Original specifications may also give lifting points/lifting advice. Are the original lifting points still strong enough? Has the

object been moved before? If so, are there records of the move? How was it done? What difficulties were met?

- Modify the object. Can it be reduced into smaller and lighter units? But dismantling should be kept to the minimum necessary, and must be fully record at each stage.
- Does the object need a supporting frame/structure during transit? If so, prepare one.
- Drain all fluids.
- Choose a route and means of transport to minimise disruption to the object. Inspect the beginning, middle and end of the route. Note any obstacles or problems and make necessary preparatory arrangements.
- Check the floor loadings on the route, and provide plates and boards as necessary. Point loadings through wheels of trucks can be very high.
- If taking an unusual load on the roads, inform the police.
- Consider the advisability of a courier or accompanying member of staff.
- Follow the Government Indemnity Scheme "yellow guidelines" (available from the Museums & Galleries Commission) where applicable.
- Ensure security against thieves and vandals throughout the move.

18.13 Special problems attend the moving of some types of object. Aircraft for example have a relatively fragile external skin, which may look more robust than it is. When lifting an aircraft the appropriate manual should be consulted to determine the correct procedure. The aircraft must be lifted at approved jacking points or trestle locations. When lifting by crane, hoisting points and, in some cases, special slings or lifting beams will have to be used. When transporting an aircraft in a dismantled state, the correct cradles for the components must be used. Holding-down straps must be adequate, especially for lightweight items, and must be correctly placed.

18.14 When moving a computer, each cable end must be labelled, and heads of disk drives must be secured.

18.15 When moving unpowered wheeled vehicles, care must be taken to avoid an 'out-of-control' situation. A tug vehicle must have adequate weight and braking capacity for its load. If using a push pole, beware of jackknifing which could cause the load to overtake the tug vehicle.

18.16 For certain larger objects such as carriages, cars and boats, special adjustable trolleys can be designed, making their movement very much easier.

Mechanical handling

18.17 Moving larger and/or very heavy objects poses particular problems; contractors will almost certainly have to be used. It is important to check the experience and competence of such contractors, to develop a good working relationship with them, to talk through their proposals and the needs of the museum (and the object) and to oversee the operation. A crane company should be insured against damage to 'load under hook'.

18.18 Lifting other than from floor to vehicle should be avoided if possible; crane-hire is costly and greatly increases the risk to the object. If lifting is necessary, correct slinging is

essential to avoid damage to the object. Cranes and slings are subject to particular regulations under the Factories Acts.

- 18.19 Loads must be properly secured on or in vehicles; even the heaviest machine may move en route if it is not rigidly fastened down. Choose an air suspension vehicle.
- 18.20 The use of pallets and pallet movers, both manual and motorised, is key to the management of larger objects. Objects should be secured to their pallets by strapping devices, web netting or polythene wrapping sheets. Everyone who uses such equipment should receive appropriate training.
- 18.21 Object should be protected with appropriate packing materials. These will depend on the object, the type of transport, climate (at both ends and microclimate in transit), length of journey and route. Use packing materials that protect the object and do not themselves damage it; for example tarpaulin covers may be dirty and have abrasive fastenings. Suitable packing materials may include medium and high density polyethylene foam, bubble wrap, felt blankets, etc.

Manual handling

- 18.22 Heavy objects should be lifted and carried by hand as little as possible. Prior to any lifting operation a full risk assessment should be carried out (see Section 23).
- 18.23 Everybody involved should be aware of their responsibilities under the *Health & Safety at Work Act 1974*.
- 18.24 The weight alone of a load is no longer considered a sufficient indicator of whether it may be carried by one person without risk of injury. The object's size, stability and the distribution of its weight must all be considered. However, the *Manual Handling Regulations* indicate maximum guideline figures for a load, carried at elbow height close to the body, of 25kg for men and 16.7kg for women. The maximum weight for loads carried in any other position should be reduced by at least 5kg, and by 10kg when lifting from points below elbow height.
- 18.25 A heavy load should not be carried more than 10 yards (10m). Trolleys should be used, and lifts of adequate weight capacity between floors.
- 18.26 Floor surfaces should be clear of obstacles (including matting) and should not be slippery; lighting should be adequate and there should be sufficient space.

Sources of advice and help

- Guidance on manual handling will be found in:

Health & Safety Executive, *Manual Handling; Guidance on Regulations (Manual Handling Operations Regulations 1992)*.

19

Standards for the protection of primary records

- 19.1 Records, including paper, microform, disk, electronic tape, etc should as far as possible be kept to the standards set out in Appendix B.
- 19.2 Photographs should as far as possible be kept to the standards set out in BS 5687.

Guidelines and notes

- 19.3 Larger objects will often be accompanied by original documents, including original plans and engineers' drawings, manufacturers' manuals, parts catalogues, log books, personal ephemera and so on (see 2.16). These primary records are distinct from the museum's own documentation (see Section 6).
- 19.4 As far as possible records forming part of these primary records should be duplicated so that the originals are handled as little as possible. The originals can then be stored in a different building.
- 19.5 A copy of all industrial archaeological records should be deposited with the National Monuments Records maintained by the three national Royal Commissions on Historical Monuments or with the local Sites and Monuments Record (see Section 10).

Sources of advice and help

- Informal advice is available from the Association for Industrial Archaeology, from the Museum Documentation Association, from the County Record Offices, from the liaison branch of the Scottish Record Office or from the Royal Commissions.
- Useful publications are:
 - British Standards Institution, *BS 5454: Storage and Exhibition of Archival Documents*, 1989, BSI, London.
 - The Royal Commission on Historical Manuscripts, *A Standard for Record Repositories*, 1990, HMSO, London.
 - Swade, Doron, 'Collecting Software: Preserving Information in an Object-Based Culture', in Ross, Seamus and Higgs, Edwards, (eds), *Electronic Information Resources and Historians: European Perspectives*, Gottingen: Halbrue Reihe zur Historische Fachinformatik, A 20, 1993.

20 Standards for the care of larger objects kept outdoors

- 20.1 Museum objects should only be displayed or stored outside if no other course of action is possible.
- 20.2 Wherever possible, shelter from direct rain, wind and sunlight should be provided. All material should be kept clear of the ground on a hard standing. Steps should be taken to protect articles from frost damage, birds and rodents. Particularly vulnerable parts should be protected more closely.
- 20.3 Reasonable precautions should be taken to exclude unauthorised access to material stored or displayed outside (see Section 11).
- 20.4 Thorough records should be made of the location and condition of material stored or displayed outside. Particular care should be paid to the marking of detached parts (see Section 6).
- 20.5 Appropriate materials of high quality and low maintenance requirement should be employed for the protection of objects displayed outside.
- 20.6 Objects stored or displayed outside should be inspected on a regular and frequent basis for condition, and steps taken to remedy any defects (see Section 4).

Guidelines and notes

- 20.7 There is a strong presumption against keeping any museum object outside, because of the vastly increased threats to its well being. Serious consideration should be given to the wisdom of collecting material which has to remain outside.
- 20.8 Environmental control is impossible outside. However, considerable improvement can be made by the erection of a simple roof or awning, or otherwise enclosing the objects. A free flow of ventilating air is always desirable.
- 20.9 Blocking-up or palletising objects to keep them clear of the ground will help to avoid damage at the base. Use of a hard standing will ease cleaning around the object, help avoid the creation of puddles and stop objects from sinking into the ground. Good drainage should be arranged and rain splash prevented.
- 20.10 Any parts containing or likely to collect water should be covered or arrangements made for them to drain freely. Frequent inspections should be made during frost periods; care should be taken to avoid frost damage through expansion of water in joints, castings, oil ways etc.
- 20.11 Objects susceptible to wind damage, eg light aircraft, should be appropriately secured.
- 20.12 Parts more prone to weather damage should be removed and stored inside or liberally coated with inhibiting preparations: paint, lanolin fluid, etc. A conservator's advice should be taken, recorded in the object's Conservation/Maintenance Plan and followed.
- 20.13 Objects kept outside, particularly those which operate, should be immobilised and securely locked. Stored material is best kept within a fenced and well-lit compound. Valuable parts should be removed to a place of higher security to guard against vandalism and theft (see Section 11).
- 20.14 Injury caused to visitors or trespassers climbing on outside exhibits can result in litigation.

- 20.15 Every object and detached parts of objects should be clearly marked with their own unique numbers linked to their documentation, which should also record their location (see Section 6).
- 20.16 Most museums will lack the staff and resources to renew surface coatings on a regular basis. Long-life, low-maintenance materials applied after thorough preparation thus make good economic sense. However, these tend to be irreversible, and before using them it is imperative fully to record the underlying original surfaces, eg by taking paint samples. The appearance of the object, too, may have to be sacrificed in the interests of preservation, eg larger quantities of grease and oil.
- 20.17 It is particularly important that objects kept outdoors be inspected and maintained on a regular, frequent and timetabled basis. Prompt attention to problems will obviate more costly and serious work at a later date. Inspections should include the condition of the pallet or blocks upon which the object stands. Neglect could lead to collapse.
- 20.18 If sheeting has to be resorted to, canvas tarpaulin (even second-hand) will last far longer than plastic sheets. It should be supported on a frame.

Sources of advice and help

- Advice can be obtained from the Science Museum, the Imperial War Museum and the National Railway Museum.
- Useful publications include:
 - Woodgate, L., 'Open Air Storage of Aircraft - Preventive Conservation Measures', in Fitzgerald, L. and Storer, J. D. (eds), *Stopping the Rot: the Passive Conservation of Aviation Collections*, 1991, The British Aviation Preservation Council/The Museum of Science & Industry.
 - Canadian Conservation Institute, *CCI Notes 15/2: Care of Machinery Artifacts Displayed or Stored Outside*, 1993, Canadian Conservation Institute, Ottawa.
 - Mikesh, R. C., 'Maintaining Aircraft Outdoors', in Fitzgerald, L. and Storer, J. D. (eds), 1991, *op cit*.
 - Canadian Conservation Institute, *CCI Notes 9/3: The Cleaning, Polishing and Protective Waxing of Brass and Copper Objects*, 1984, Canadian Conservation Institute, Ottawa.
 - United States Air Force Museum Loan Agreement*, USAF Museum, Wright Patterson Airfield, Dayton, Ohio.
 - Ministry of Defence, *Manual for Storage of Aircraft* (AP 100V-20).
 - Mikesh, R. C., 'Preserving Unsheltered Exhibit Aircraft', *Transport Museums Yearbook of the International Association of Transport Museums*, Vol 15/16, 1988/89, International Association of Transport Museums, Gdansk.

21

Standards for the care of boats kept afloat

- 21.1 Boats kept afloat should be maintained and operated according to the programme of care and use set out in their Conservation/Maintenance Plan and their Operating Manual.

Guidelines and notes

- 21.2 Because they come in such a variety of sizes and materials, the care of boats, particularly of those afloat, can be more difficult than the care of any other larger object.
- 21.3 The decision on how to preserve and display the boat should be taken at the time of acquisition. The decision to place an accessioned craft in the water should only be taken after the most careful consideration, and should be regularly reviewed as the quality, importance and condition of the boat is reviewed (see Section 1).
- 21.4 Keeping the boat in the water allows it to be used and seen in its most natural condition, but incurs high maintenance costs and will ultimately require parts of the boat to be replaced.
- 21.5 Whenever possible boats in the water should be moored under roofed cover, as in a traditional boathouse. Alternatively, awnings or screens can be secured to quay or pontoon to give protection from sun and rain. If such cover is not possible, boats kept afloat should be moved around, to vary their aspect to the prevailing wind and sun; their load should be varied to vary their waterline, where rot and corrosion often concentrate. With large uncovered decked vessels particular attention must be taken to ensure that decks do not leak. Regular care and maintenance of caulking and paying is essential.
- 21.6 Boats should be well ventilated and kept clean inside. On-board equipment and materials such as spare parts, bedding, crockery etc should be removed to separate storage. Lockers and storage areas should be kept as clear of such materials as possible to allow for easy inspection and cleaning. Lockers and enclosed spaces should be opened as much as possible to encourage ventilation. Surface coatings, especially in under-floor bilge areas, must be well maintained. Large enclosed vessels can benefit from dehumidifiers and fans on board, particularly during winter months.
- 21.7 Boats should be regularly checked for signs of damage, corrosion or rot, particularly in hidden areas such as behind panels, in bilges, tanks, lockers etc. Water build-up in bilges must be monitored and kept to a minimum. The fitting of a powered automatic bilge pump is recommended (see also 13.18).
- 21.8 A regular programme of inspection and maintenance is essential. Boats afloat should not remain untended or unused for long periods. Frequent use is essential to ensure that equipment and plant is tested, particularly in power craft. The best way to monitor and maintain a floating boat is to use it regularly.
- 21.9 Consideration should be given, without interfering with the integrity of the vessel, to make improvements to allow easier inspection or better ventilation. Any such changes should be recorded.
- 21.10 Moorings should be set so as to keep moored vessels clear of quay or pontoon sides; fenders can cause severe chafing. However, on craft without gangways the gap between craft and quay should be kept to a minimum to facilitate safe boarding.
- 21.11 Deck shoes or similar non-marking footwear should be worn on finely built craft.

21.12

Boats that are permanently afloat will require periodic checking of their underwater hull and coatings. Removal from the water to monitor and maintain both hull and coatings is an essential part of the programme of care; small boats should be removed from the water annually.

Sources of advice and help

- Advice can be obtained from:

The Boat Museum

The Maritime Trust

Scottish Fisheries Museum

22

Standards for the care of steam boilers

- 22.1 Steam boilers must be maintained to the standards required by their certifying authority.
- 22.2 Steam boilers should be operated in accordance with their Conservation/Maintenance Plan and their Operating Manual. All work done on them should be recorded in their Conservation Maintenance Record, and all operation recorded in their Operating Log.

Guidelines and notes

- 22.3 All operational boilers and pressure vessels require to be maintained to meet the standards set by their certifying authority, usually an insurance company. Insurance company surveyors are sources of expert advice, and must be consulted in advance of any repairs being undertaken. Regular inspections and tests are a statutory obligation.
- 22.4 In addition, special measures are essential if boilers are to be protected to the maximum extent from fire and water side corrosion, and from thermal straining whilst in use. Every boiler design and operating regime requires a different approach.

- 22.5 Causes of thermal straining may include:

- too-rapid fire raising;
- rapid in-service rise or fall of boiler pressure;
- ingress of cold air or inadequate baffling;
- flame impingement caused by improper combustion;
- feeding of cold water after the fire is out;
- failure to box up the boiler after the fire is out;
- presence of oil on the water side.

- 22.6 Causes of fire side corrosion (acid corrosion) may include:

- use of high sulphur fuel;
- ashes or clinker not cleaned out after use;
- any steam or water leaks to the fire side;
- condensation during storage.

- 22.7 Causes of water side corrosion (acid corrosion) may include:

- acid feed water (eg from peaty soil);
- hard or impure feed water, leading to formation of scale and subsequent corrosion under the scale;

- oxygen dissolved in the feed water;
- oxygen drawn in by the injector;
- water line and steam space corrosion off load;
- dissimilar metals used in boiler construction;
- accumulation of sludge and debris in water spaces;
- oil introduced with the feed water.

22.8 Avoidance of these troubles requires a combination of good boiler management and probably also treatment of the boiler feed water. Manufacturers of feed water treatments are able to offer useful advice, which must take into careful account all the materials of which the boiler is constructed. Boilers should not be left full of water at a static water level for longer than necessary, and never for longer than ten days. Salt water must never be used.

22.9 A blow-down procedure should be carried out at regular intervals. The period between blow-downs will vary with the water treatment used, but should be at least once every seven to ten days of boiler use.

22.10 When boilers are out of service permanently or for an extended time, corrosion must be prevented. Fire side surfaces can be mechanically cleaned and then oiled, and every effort should be made to dry the water side and to exclude damp air. Firebars and supports should be removed. Drying of the water side can be much assisted immediately after the last use of a boiler by carefully blowing-down from a low pressure and emptying all the water out. A flow of air should then be introduced through the still-warm boiler to remove dampness. Superheater elements should be removed and up-ended to drain.

22.11 See also Section 12 for precautions against fire, and Sections 23 and 24 for safety aspects.

Sources of advice and help

- Essential advice on most aspects of the care of steam boilers is contained in the Health & Safety Executive's booklet *HS(G) 29: Locomotive Boilers*.

23

Standards for protecting people from objects

- 23.1 All museums must comply with the letter and the spirit of all legislation designed to protect the health and safety of people on the museum site.
- 23.2 The museum must draw up and maintain a Safety Policy, covering all aspects of its work. The Policy should take into account the various categories of people using its premises, from schoolchildren to specialists, and should seek to identify and prescribe for all risks inherent on the museum's premises, collections and activities.
- 23.3 All objects must be positioned and protected so as to minimise the risk of direct physical injury.
- 23.4 Objects containing or thought to contain hazardous substances must be prominently labelled and all staff informed of what action to take in the event of spillage or contact.
- 23.5 Unessential hazardous substances must either be rendered safe, taking account of expert advice, or disposed of according to statutory regulations.
- 23.6 No hazardous substance which is part of, or associated with, an object should be acquired unless it forms an essential part of that object.
- 23.7 All museum staff and volunteers must receive regular training in health and safety aspects and should be fully familiar with the museum's Safety Policy.

Guidelines and notes

- 23.8 Although this booklet is principally concerned with the protection of objects, the museum's first responsibility is to protect people, and the two need to be parts of one policy and approach. This section and the following one therefore draw attention to some of the particular threats posed by larger objects.
- 23.9 A wide variety of health and safety legislation applies to museums, and serves to help protect visitors, volunteers and staff. The principal laws affecting museums are:
- Control of Substances Hazardous to Health Regulations 1988
 - Environmental Protection Act 1990
 - Factories Acts
 - Health & Safety at Work Act 1974
 - Health & Safety (General Provisions) Regulations 1992
 - Manual Handling Operations Regulations 1992
 - Management of Health and Safety at Work Regulations 1992
 - Offices, Shops & Railway Premises Act 1963
 - Personal Protective Equipment at Work Regulations 1992
 - Provision & Use of Work Equipment Regulations 1992

- Transport and Works Act 1992
- Workplace (Health, Safety & Welfare) Regulations 1992

23.10

Some hazards which may be found in larger objects are:

- instability: unstable objects should be securely mounted using materials which are sufficiently strong to bear the load;
- load-bearing structures within the object should be checked by a competent person, and reinforcement provided if necessary;
- protruding parts, particularly sharp edges, should be padded and/or flagged if the object is not behind a barrier;
- pinch points, eg between gearwheels, should be immobilised or guarded;
- inadequate space: objects should be sufficiently spaced to allow people to pass without having to push against them;
- potentially dangerous moving parts should be immobilized, but without compromising the historical integrity of the object. It is better to remove parts, or to substitute newly made ones, than to modify an original part irreversibly;
- hazardous substances, for example asbestos, lead paints, radioactive luminous paints, polychlorinated biphenols (PCBs), mercury, solvents/fuels, acids/alkalis should be identified and appropriate precautions taken;
- wheels and tyres, particularly those with high pressures: tyres, wheels and hubs can all fail;
- fire bottles fitted to aircraft engines contain dangerous toxic substances;
- electrical systems within larger objects, notably aircraft, should be fully checked before being used in any way at all;
- electronic equipment poses particular hazards. For example, early television sets operate at very high voltages and have live chassis;
- ionising radiation can be a real hazard in industrial and medical equipment;
- acid in wet cell batteries and oil-filled electrical transformers can present dangers.

23.11

When an object is considered for acquisition, it should be checked for the presence of any hazardous substance, taking into account associated documentation or informed local advice. Careful consideration should be given to disposal or measures for rendering it safe, preferably before it is taken to the museum. If the substance has to be acquired with the object, it should be labelled immediately and all appropriate staff, particularly object handlers, should be informed.

23.12

The existing collections should be surveyed by a competent person, to identify potentially poisonous or hazardous substances. If in doubt, assume the worst and call in expert advice. Analysis of suspected substances may be necessary, and this can be costly.

23.13

Regular checks should be made for leaks or other deterioration.

23.14

When displaying objects which contain hazardous substances all appropriate precautions should be taken to minimise risk to the public, staff and volunteers.

- 23.15 Ideally, all hazardous substances should be disposed of, unless they themselves constitute historical evidence. Stringent statutory regulations are in force which control the manner in which this may be done. The advice of a reputable, licensed company should be sought and certification at the point of actual disposal is required. A receipt from a company which promises to take the substance to an incinerator or a landfill site is not sufficient: until this has been undertaken correctly, the substance is still the responsibility of the owner (in this case the museum). Under no circumstances may the substance be flushed into a sewer.
- 23.16 A record should be kept of all such actions. A note in the location record will help to minimize unnecessary handling or moving of objects which continue to present a hazard.
- 23.17 Even after disposal and cleaning, there may continue to be a risk from residual contaminants. In such cases warning labels should be attached.
- 23.18 When hazardous substances cannot be disposed of, expert advice on methods for sealing them in, or otherwise rendering them safe, should be sought.
- 23.19 Warning labels attached to objects containing hazardous substances should be prominent, unambiguously stating the nature of the hazard, and securely attached. Ideally, these should incorporate standard UK hazardous chemical symbols. Responsibility for enacting this will be agreed locally, but any member of staff who becomes aware of a potential hazard should attach a temporary label and immediately inform the responsible person.
- 23.20 Expert advice should be sought on appropriate first aid treatments for all hazardous substances, and freshly prepared antidotes kept in a suitable place; these should be checked regularly. All staff must know how to react in an emergency, but first aid should be administered only by those competent to do so. Clear instructions for the evacuation of the patient to the nearest hospital equipped to deal with the problem must be posted in a prominent position.
- 23.21 All persons handling, or coming into contact with, hazardous objects must wear adequate protective clothing. They should not move the object without an appointed responsible member of staff being present. All staff should know and should at all times follow the established safety procedures, set out in the museum's Safety Policy.
- 23.22 Application for permission to acquire and use lead-based paint for the restoration or maintenance of a "Work of Art" should be made to The Conservation Unit of the Museums & Galleries Commission.

Sources of advice and help

- A useful publication is:

Trevethick, R. A., *Environmental and industrial health hazards: a practical guide*, 1985 (2nd edition), Heinemann Medical Books Ltd, London.

- The Health & Safety Executive has a number of local offices throughout the UK, and should be consulted at an early stage. HM Pollution Inspectorate and the National Radiological Protection Board may also be relevant.
- The local Area Museum Council may be able to help with contact names for local experts in hazardous chemicals.
- The local Waste Regulation Authority will be able to offer advice on the disposal of hazardous materials.

- Two organisations able to offer advice and help to members are:

Royal Society for the Prevention of Accidents
Cannon House
The Priory
Queensway
Birmingham B4 6BS
(Tel 021 200 2461)

The British Safety Council
National Safety Centre
Chancellors Road
Hammersmith
London W6 9RS

24

Safety standards for working objects

- 24.1 Where a museum undertakes the operation of its objects, its Safety Policy must set out arrangements for dealing with any hazards likely to arise from their operation.
- 24.2 All working objects must comply with all relevant statutory requirements.
- 24.3 A responsible person, familiar with its operation, must be appointed to oversee the safe operation of every working object.
- 24.4 Objects must be operated only by designated personnel fully trained in safety and operating procedures.
- 24.5 The risk posed (to both object and people) by operating an object must be regularly assessed, and appropriate protection and supervision must be provided.
- 24.6 The same safety standards must be met in temporary displays as in permanent.

Guidelines and notes

- 24.7 This section supplements Section 23 by drawing attention to the safety problems associated with working objects.
- 24.8 As part of a museum's written Safety Policy a Code of Practice should be devised for all working objects. Whilst the precise format of such codes will vary from museum to museum, they should include comprehensive directions for the safe operation of each object. The Code of Practice should also include (in greater or lesser complexity as appropriate) a technical description of the object, operating and maintenance instructions and schedules, and should specify a syllabus for training personnel in the contents of the code.
- 24.9 The training and retraining of operators is extremely important. Every museum should have stringent rules on who has permission to operate what, and what training they must undergo.
- 24.10 Museum staff and volunteers not infrequently have had previous experience of the same or similar museum objects in industry. It is important that the procedures they learned then be reviewed; they may not be appropriate in the museum context.
- 24.11 Most of the statutory requirements covering the operation of museum objects are concerned with safety. Those most widely applicable include the guarding of dangerous parts of operating machinery, specified in the *Factories Act 1961*, the *Offices, Shops and Railway Premises Act 1963* and the *Provision and Use of Work Equipment Regulations 1992*. In the museum context there are two groups of people to be protected from dangerous machinery: the museum visitor, and the museum personnel operating the object. Care too needs to be taken to install guarding that does not compromise the historic and aesthetic considerations of the museum display. It follows then that two levels of safety guarding may often be appropriate: one relying on 'safety by distance' for the uninitiated visitor, and one as unobtrusive as possible for the operator, who should (having undergone safety training) be aware of potential safety hazards. All guarding originally fitted by a machine's manufacturer should be retained. In providing any additional protection necessary to meet modern requirements it is essential to work with the Factory Inspector, negotiating a mutually acceptable solution that maximises safety for visitor, operator and object, whilst respecting the aims of the museum.

- 24.12 There are numerous other statutory requirements applicable to museums with working objects, depending on their sphere of activity: mining, agriculture, transport and so on. A recent article on safety legislation for preserved railways contained a list - not complete - of no fewer than twenty-five relevant acts, regulations, and guidance notes (*Steam Railway*, April 1992, p 41).
- 24.13 In addition there may be the requirements of various controlling authorities to be met, for example the Civil Aviation Authority, the Department of Trade & Industry, Environmental Health Officers and the Railway Inspectorate.
- 24.14 Museum personnel operating vehicles or boats must hold the appropriate licence. For road vehicles, for instance tanks, each member must be properly trained in his or her role, including evacuation procedures. Passengers should not be taken on board vehicles not designed or adapted for passenger carriage, and designated crew numbers should not be exceeded. Particular care must be taken with moving parts, such as tank turrets, crane jibs or bulldozer blades.
- 24.15 The operation of some historic agricultural equipment requires the use of horses, the handling of which calls for special skills and training to ensure the safety of public, staff and animals alike. It is advisable for those in charge of horses used for demonstration purposes to have obtained a qualification approved by the Agricultural Training Board in the handling and management of heavy horses.

Sources of advice and help

- The following publications are useful:
 - Association of Railway Preservation Societies, *Railway Safety Manual*, (forthcoming).
 - Committee of Area Museum Councils, *Guidelines for safety in working museums*, London, Cirencester (considers the applications of the HSW Act 1974 to operation of museum objects, and contains useful 'Detailed Safety Recommendations' for various types of object).
 - Howie, F. (ed), *Safety in museums and galleries*, 1987, (includes material on the preparation of general safety policies for museums).
 - National Traction Engine Trust, *Code of Practice*, 1991, (contains guidance on safety at traction engine rallies which is applicable to all temporary displays of working machinery).
 - Society for the Protection of Ancient Buildings, *Guidelines to safety in wind and watermills*, 1980.
- A helpful introduction to the Health and Safety laws is published by the Health & Safety Executive:
 - Essentials of Health and Safety at Work*, 1990, HMSO, London.
- Advice on all aspects of training for staff and volunteers can be obtained from
 - The Museum Training Institute
Kershaw House
55 Well Street
Bradford BD15PS
(Tel 0274 391056)
(Fax 0274 394890)
 - Details of courses in heavy horse handling and management can be obtained from:
 - Hereford College of Agriculture
Holme Lacy
Hereford HR2 6LL
(Tel 0432 870316)
 - The Duchy College
Stoke Climsland
Callington
Cornwall PL17 8PB
(Tel 0579 370769)

Otley College of Agriculture
and Horticulture
Otley
Ipswich IP6 9EY
(Tel 0473 785543)

Geoff Morton
Hasholme Carr Farm
Holme-upon-Spalding Moor
Yorkshire YO4 4BD
(Tel 0430 860393)

A

Sample Care Programme for Larger and Working Objects

The following is an example of an approach to grading of collections care based on an assessment of an object or collection. The assessment of the significance of the object or collection must be based on condition and vulnerability as well as rarity or value. It may not necessarily be appropriate to subject the most significant objects to tight control when these are robust. This assessment could be applied to a single item, a collection or a whole museum. A museum may have areas where tight control is in operation and others where low control is appropriate. The status awarded an object or collection should be reflected in all aspects of its care and use, including security, documentation, conservation, display, interpretation and access.

Category of Object	Standard of Care
Category A: Objects which are internationally significant, or nationally very rare and vulnerable.	Tight Control
Category B: Objects which are nationally significant or regionally rare or internationally important but robust.	Moderate Control
Category C: Objects which are locally significant and/or central to the museum's collection or display and activities.	Simple Control
Category D: Objects which are useful for demonstration.	Basic Control

The fabric of the building housing the object or collection forms the primary means of providing a suitable stable environment. If due care is taken to ensure that a building is well insulated, maintained to a high standard and care is taken in the positioning of objects, this will go a long way to ensuring a long life for them. This involves a full understanding of the construction of the building and its services, the way it interacts with the external climate and climate modifiers such as people, kitchens, routine cleaning operations, and a knowledge of the materials of which the object/collection are made (see Section 17). An up-to-date introduction to the whole field is given in: Cassar, May, *Environmental Management Guidelines for Museums and Galleries*, (forthcoming), Routledge/Museums & Galleries Commission, London.

Tight control is normally only possible in the best resourced institutions. It involves having buildings built to the highest specifications for maintaining a stable environment and fitted out with 'state of the art' monitoring and control equipment. This level of care also requires a team of dedicated collection-care staff including curators, conservators, building engineers and technical support staff together with management systems and staff structure such that they can address the demands of monitoring and maintaining these high standards. The financial implications of this level of care should be taken into account in the overall budget.

Definitions A. Tight Control

Condition of objects/collection

A programme of monthly object condition checks is in operation. Any object deemed to be highly sensitive or vulnerable should be examined more frequently.

Environmental monitoring

The environment of all display, storage and conservation areas is monitored continuously, and a programme of analysis and interpretation of the collected data is in place.

Environmental control

- Relative humidity

Relative humidity should be controlled to within a band of +/- 4% of a specified level for greater than 90% of the time. This is the band of control that readily available technology can deliver, although it is possible to design systems to control to +/- 2%.

The *rate of change of relative humidity* should, as a general rule, not be greater than the equivalent of 10% in a 24 hour period¹.

Repeated sharp fluctuations in relative humidity should not occur. As a rule, any event repeated with a frequency of greater than once in 24 hours should be investigated and steps immediately taken to identify the cause and to rectify the problem.

- Temperature

Temperature is controlled to within a band of +/- 2°C of the specified level for greater than 90% of the time.

The *rate of change of temperature* should, as a general rule, be less than 10°C in 24 hours¹.

- Light

All light is excluded except for periods of display or inspection. Light levels should be kept to a level which gives maximum protection to the most vulnerable element of the object. Alternative strategies may be available to protect particularly vulnerable elements of an object, eg removal for storage elsewhere or localised protection in situ.

Both duration and level of illuminance are important when assessing the possible damage caused by light; both should be kept to a minimum.

Objects should be exposed to no greater than 10 µWatts per lumen of UV radiation from all sources of daylight and electric light combined. The performance of UV filters fitted to lamps, windows, skylights etc. should be checked every 6 months during the first five years of use and monthly thereafter.

Pest control

An integrated pest management programme is in place. This involves good building maintenance, a thorough cleaning programme, exclusion of sources of risk, eg food and drink, and monitoring and trapping of pests.

Air quality

Air entering the display or storage areas is filtered to remove more than 95% of particulate and gaseous pollutants. Where mechanical ventilation is available the condition of filters should be capable of being checked by measuring the pressure drop across the particulate filter. Internal air quality should be checked at least every 6 months. Where appropriate, display cases having reduced air exchange can be used to minimise the effects of external pollutants. Display and storage materials should be tested for any possible harmful effects, using the procedures established by the Department of Conservation at the British Museum.

Maintenance plan

A planned preventive maintenance programme is in place for all buildings and equipment.

A programme of servicing and calibration of monitoring equipment is in place. Frequency of servicing and calibration will vary according to the type of equipment used but in general thermohygrographs should be cleaned and calibrated every two months and/or whenever moved.

Documentation

All procedures are logged and data is available in a readily accessible form.

Quality control

A programme of continuous monitoring and assessment of performance of all the above is in place together with a scheme to evaluate and revise all operational procedures.

B. Moderate Control

Condition of objects/collection

A programme of three monthly condition checks is in operation.

Environmental monitoring

The environment of all display, storage and conservation areas is monitored continuously, and a programme of analysis and interpretation of the collected data is in place.

Environmental control

- Relative humidity

Relative humidity is controlled to within a band of +/- 10% of a specified level for greater than 90% of the time.

The *rate of change of relative humidity* should, as a general rule, not be greater than the equivalent of 10% in a 24 hour period¹.

Repeated sharp fluctuations in relative humidity should not occur. As a rule, any event repeated with a frequency of greater than once in 24 hours should be investigated and steps immediately taken to identify the cause and to rectify the problem.

- Temperature

Temperature is controlled to within a band of +/- 5°C of the specified level for greater than 90% of the time.

The *rate of change of temperature* should, as a general rule, not be greater than 10°C in 24 hours¹.

- Light

All light is excluded except for periods of display or inspection. Light levels should be kept to a level which gives maximum protection to the most vulnerable element of the object. Alternative strategies may be available to protect particularly vulnerable elements of an object, eg removal for storage elsewhere or localised protection in situ, where it is not necessary to protect the whole object.

Both duration and level of illuminance are important when assessing the possible damage caused by light; both should be kept to a minimum.

Objects should be exposed to no greater than 10µWatts per lumen of UV radiation from all sources of daylight and electric light combined. The performance of UV filters fitted to lamps, windows, skylights etc. should be checked every 6 months during the first five years of use and monthly thereafter.

Pest control

An integrated pest management programme is in place. This involves good building maintenance, a thorough cleaning programme, exclusion of sources of risk eg food and drink, and monitoring and trapping of pests.

Air quality

Air in the display and storage areas is filtered to remove more than 90% of particulate pollutants. Where mechanical ventilation is available, the condition of particulate filters should be capable of being checked by measuring the pressure drop across the filter. Where the level of gaseous pollution is of concern, consideration should be given to the installation of gaseous filters. Internal air quality should be checked at least every six months. Where appropriate, display cases having reduced air exchange, can be used to minimise the effect of external pollutants. Display and storage materials should be tested for any possible harmful effects, using the procedures established by the Department of Conservation at the British Museum.

Maintenance plan

A planned preventive maintenance programme is in place for all buildings and equipment.

A programme of servicing and calibration of monitoring equipment is in place. Frequency of servicing and calibration will vary according to the type of equipment used but in general thermohygrographs should be cleaned and calibrated every two months and/or whenever moved.

Documentation

All procedures are logged and data is available in a readily accessible form.

Quality control

A programme of continuous monitoring and assessment of performance of all the above is in place together with a scheme to evaluate and revise all operational procedures.

C. Simple Control

Where simple control is appropriate the building forms the primary, and perhaps only, means of providing a stable environment. Where this level of control is appropriate maintenance of buildings must have a high priority and adequate funds should be included in the budget.

Condition of object/collection

A programme of annual object condition checks is in operation. This work should be undertaken by a conservator or other person experienced in caring for the object type.

Environmental monitoring

The environment of all display, storage and conservation areas is monitored. This may be done by using recording devices or by a regular programme of spot readings. A programme of analysis and interpretation of the collected data should be in place.

Environmental control

- Relative humidity

Relative humidity is maintained within a band of +/- 10% of the daily average for greater than 75% of the time. Good draught proofing, insulation, building maintenance and, where appropriate, local humidification or dehumidification should enable this to be achieved.

The *rate of change of relative humidity* should, as a general rule, not be greater than the equivalent of 10% in a 24 hour period¹.

Repeated sharp fluctuations in relative humidity should not occur. As a rule, any event repeated with a frequency of greater than once in 24 hours should be investigated and steps immediately taken to identify the cause and to rectify the problem.

- Temperature

In occupied buildings the temperature should be maintained between 16°C and 19°C to meet legal requirements. In unoccupied or infrequently used buildings the temperature can be allowed to fall to 7°C and be controlled by a humidistat rather than a thermostat.

- Light

Daylight is not allowed to fall directly on objects. Blinds and filters are fitted to the windows of all rooms where objects are stored or displayed. All light is excluded except for periods of display or inspection. The elements of objects which are most vulnerable to damage by light should receive special protection. Light is excluded when the building is closed and/or not in public use.

Objects should be exposed to no greater than 10µWatts per lumen of UV radiation from all sources of daylight and electric light combined. The performance of UV filters fitted to lamps, windows, skylights etc. should be checked every 6 months during the first five years of use and monthly afterwards.

Pest control

An integrated pest management programme is in place. This involves good building maintenance, a thorough cleaning programme, exclusion of sources of risk, eg food and

drink, and monitoring and trapping of pests.

Air quality

The building can act as an effective buffer to protect from external air pollutants if air infiltration has been reduced. A "building within a building" and display cases having reduced air exchange, can provide a higher degree of protection.

Maintenance plan

A planned preventive maintenance programme is in place for all buildings and equipment.

A programme of servicing and calibration of monitoring equipment is in place. Frequency of servicing and calibration will vary according to the type of equipment used but in general thermohygrographs should be cleaned and calibrated every two months and/or whenever moved.

Documentation

All procedures are logged and data is available in a readily accessible form.

Quality control

A programme of continuous monitoring and assessment of performance of all the above is in place together with a scheme to evaluate and revise all operational procedures.

D. Basic Control

This applies to structures which do not have a satisfactory environmental performance to protect the object/collection. As a minimum all objects are protected by tarpaulin over a framework (so as not to touch object and to permit good air circulation) or simple roofed structure with walls to protect from the prevailing weather. Where it is not possible to cover an object other protective measures can be taken; specialist advice should be sought. Where appropriate, objects should be on a hard standing and rainwater should be diverted away to a drain (see also Sections 20 and 21).

Condition of objects/collection

Objects are prepared for storage outside (moving parts greased, ash etc removed, potential nesting sites for birds and mammals blocked).

Condition of objects is checked at least every 12 months but preferably at 6 month intervals.

Pest control

Regular inspections for pests are undertaken. Action is taken where pest infestations have occurred.

Quality control

All procedures are reviewed annually.

See over for notes and definition of terms

Notes	¹ Any event when this <i>rate of change</i> is exceeded should be subject to investigation of monitoring equipment, environment, building use etc, examination of its effect on the object to explain the change, and steps should be taken to ensure that such instances do not happen again.
Definition of terms	<p>Specified level - The term <i>specified level</i> is used when describing the level of relative humidity or temperature. No recommended level has been given in this section as its aim is to emphasise the importance of maintaining <i>stable</i> environmental conditions rather than ideal conditions for the material of which an object was made when new. Continuity of the conditions which objects have reached an equilibrium should normally be maintained.</p> <p>Event - This term is used to describe a deviation from the normal, such as a sudden rise or fall of relative humidity and/or temperature.</p>

B

Relative humidity and temperature for the storage of records relating to larger and working objects⁽¹⁾

Materials	Ambient Temperature ^(c)	Ambient Relative Humidity	Microclimates ⁽²⁾ (Where needed)
Historical Records:			
Documents on paper	13° - 18° ⁽³⁾	55 - 65 % ⁽³⁾	Not applicable
B&W prints	15° - 20° ⁽⁴⁾	30 - 50% ⁽⁴⁾	Prevention of condensation on cooled material important
B&W negatives:			
Cellulose ester base	<20°C ⁽⁵⁾	15 - 40 % ⁽⁵⁾	
Polyethylene terephthalate base	<20°C ⁽⁵⁾	30 - 40% ⁽⁵⁾	
Glass negatives (silver image photographic plates)	15° - 25° ⁽⁷⁾ (preferably below 20°C)	20 - 50% ⁽⁷⁾ (preferably below 40%)	
Modern Records:			
Magnetic recording media	18° - 22°C ⁽⁶⁾	35 - 45% ⁽⁶⁾	
Optical or laser discs	18° - 22°C ⁽⁶⁾	35 - 45% ⁽⁶⁾	
Microform/Film (master & copies):			Prevention of condensation on cooled materials important
Cellulose ester base	<20°C ⁽⁵⁾	15 - 40% ⁽⁵⁾	
Polyethylene terephthalate base	<20°C ⁽⁵⁾	30 - 40% ⁽⁵⁾	
Colour slides/negatives	2°C or below ⁽⁴⁾⁽²⁾	25 - 30% ⁽⁴⁾⁽²⁾	Higher than necessary RH accelerates deterioration
Colour prints	2°C or below ⁽⁴⁾⁽²⁾	30 - 50% ⁽⁴⁾⁽²⁾	

Notes

⁽¹⁾ There is great debate about acceptable levels. In general the nearer the minimum figure quoted the better.

⁽²⁾ Take advice on microclimates. Refrigeration of these materials should include RH buffering with conditioned silica gel. Allow materials to acclimatise to room temperature before use, and provide moisture sorbents, eg bagged silica gel, to counteract any possible condensation.

⁽³⁾ BS 5454

⁽⁴⁾ ISO 6051

⁽⁵⁾ ISO 5466

⁽⁶⁾ BS 4783

⁽⁷⁾ BS 5687

C

Glossary of terms

1. Documentation

The following terms, not all yet standard in museum work, have been adopted in this booklet and are recommended.

Object File:

The Object File (or series of files) supplements the museum's catalogue entry, and is the repository for other information about the object in correspondence, notes, press cuttings, curatorial and conservation reports etc. The Object File of a larger object should contain copies of its Conservation/Maintenance Plan and Conservation/Maintenance Record, and - if is a working object - also copies of its Operating Manual and Operating Log.

Other names for the Object File include "Object History File", "Supplementary Information File" or "Technical File".

Object Files need to be accessible by accession number.

Conservation/Maintenance Plan:

Sets out a programme of care for each individual larger object.

Conservation/Maintenance Record:

Records all work carried out on each larger object, whether routine maintenance work, cleaning or active conservation or repair.

Operating Manual:

Where the object is to be worked, the Operating Manual gives instructions on how to do so. It is better to produce a new document for museum use which may range from virtually identical with the manufacturer's operating manual to substantially different, depending on the inherent danger (to people and object) in the operation and the effect of modern safety legislation.

Operating Log:

Where the object is worked, the Operating Log records all operations. It may overlap with, or even be combined with, the object's Conservation/Maintenance Record.

2. Size of objects

The following terms are developed from those used in the survey of maritime collections published as Gale, Alison, *Catching the Tide: the Status and Future of Maritime Collections in North East Museums*, 1992, North of England Museums Service, Newcastle.

Small:

Objects which can be carried by one person.

Medium:

Objects which can be lifted by a team of people and conveyed on manually propelled trolleys etc.

Large:

Objects whose size and/or weight require cranes and powered transport to move them.

Extra-large:

These are distinct from Large Objects in their excessive size and weight, being more than 15m long or weighing more than 10 tons.

Super-large:

Objects weighing hundreds of tons, such as ships.

3. Treatment terms *

Conservation:

All actions aimed at the safeguarding of cultural property for the future. The purpose of conservation is to study, record, retain and restore the culturally significant qualities of the object with the least possible intervention.

Preservation:

All actions taken to retard deterioration of, or to prevent damage to, cultural property. Preservation involves controlling the environment and conditions of use, and may include treatment in order to maintain a cultural property, as nearly as possible, in an unchanging state.

Reconstruction:

All actions taken to recreate, in whole or in part, a cultural property, based upon historical, literary, graphic, pictorial, archaeological and scientific evidence. Reconstruction is aimed at promoting an understanding of a cultural property, and is based on little or no original material but clear evidence of a former state.

Restoration:

All action taken to modify the existing materials and structure of cultural property to represent a known earlier state. The aim of restoration is to preserve and reveal the aesthetic and historical value of an cultural property. Restoration is based on respect for the remaining original material and clear evidence of the earlier state.

Footnote

* taken from the Glossary in:

The International Institute for Conservation - Canadian Group, Canadian Association of Professional Conservators, *Code of Ethics and Guidance for Practice*, 1986, IIC-CG/CAPC, Ottawa, Canada.