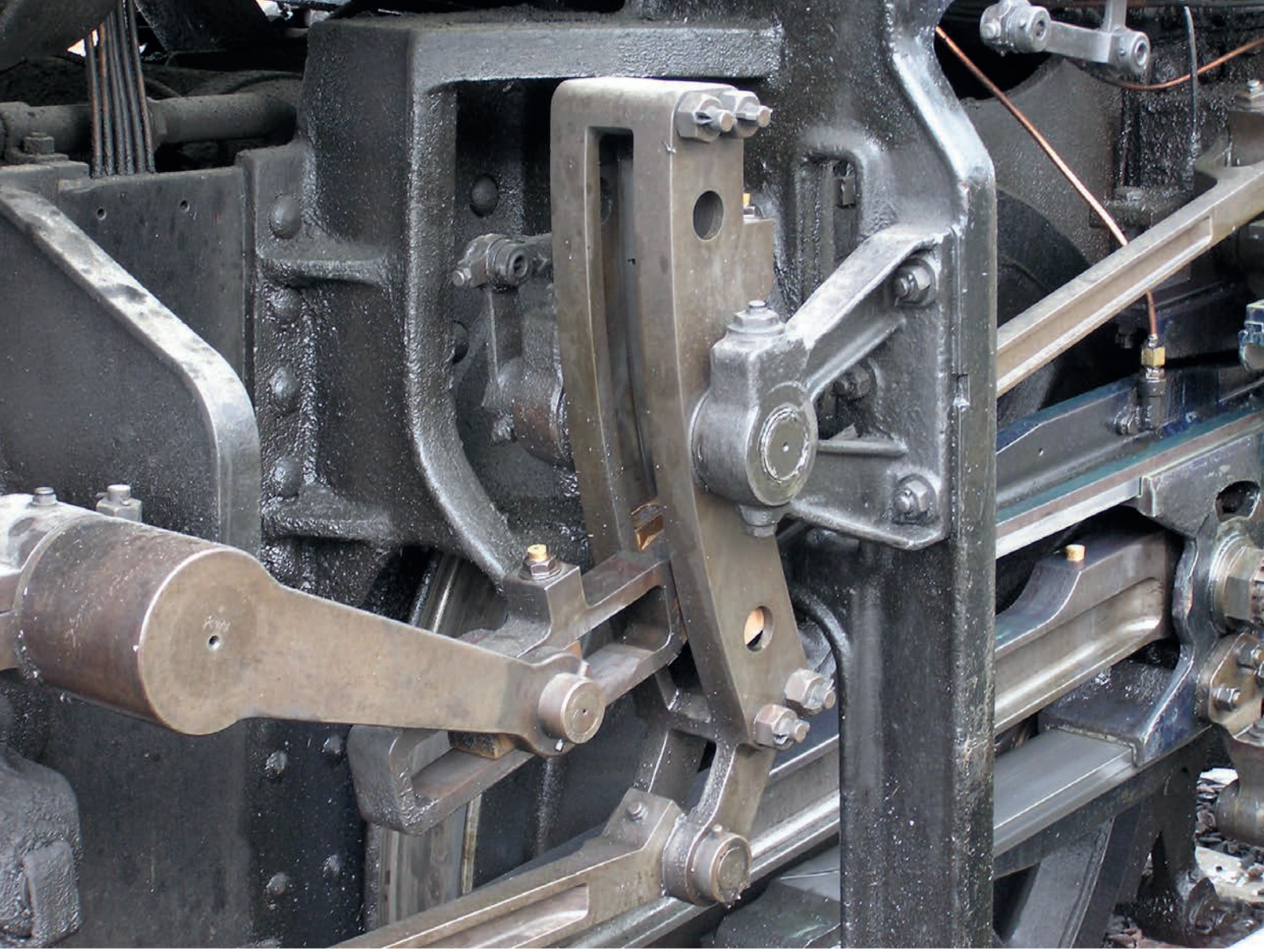

Guidelines for the Care of Larger and Working Historic Objects

ABTEM

ASSOCIATION OF BRITISH TRANSPORT & ENGINEERING MUSEUMS

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Table of Contents

Foreword

The Association of British Transport & Engineering Museums (ABTEM) is pleased to have initiated and supported the publication of these new *Guidelines for the Care and Operation of Larger & Working Historic Objects.* This development is a result of feedback from many working in the industrial and transport heritage sector lamenting the lack of up-to-date guidance about the care and conservation of their larger and working objects.

There have been a number of important publications on the subject, all now out-of-print. The Museums & Galleries Commission *Standards in the Museum Care of Larger & Working Objects* (Crispin Paine 1994) was followed by *Larger & Working Objects: A guide to their preservation and care* (Ball, 1997). In 2009 the Collections Trust published *Larger & Working Objects: a guide to standards in their preservation and care* (Andrew, 2009).

With many in the sector advocating the revision of these original standards, in 2014 ABTEM commissioned consultant Rob Shorland-Ball to undertake a scoping study funded by Arts Council England to ascertain demand for any new publication and potential content. After consulting with many in the sector, ABTEM, with further generous financial support from Arts Council England, worked with International Railway Heritage Consultancy (IRHC) to complete these new Guidelines. The IRHC team was Helen Ashby, Efstathios (Stathis) Tsolis, and Steve Davies. This work benefitted from the support of a steering group comprising Andrea Bishop, Andy King, Lis Chard-Cooper, Peter Ovenstone, Richard Sykes, Robert Excell, Ron Palmer, and Tim Bryan. Steph Gillett was project administrator and proof reading was undertaken by Jenni Butterworth, Drakon Consulting.

The new document could not have been completed without the support and advice of many in the sector and we hope it will be a worthy successor to the original 1994 and 1997 publications.

Importantly, we also believe that the new Guidelines will make an important contribution to supporting best practice in the broader industrial and transport museum world. We hope that they will be used by a wide variety of museums, volunteer groups and individuals to provide up-to-date advice on issues surrounding the operation and conservation of large objects and equipment. Much has changed since the original standards were produced more than twenty years ago, not least the growth of the internet, which does of course mean that the new guidelines can be updated on a regular basis ensuring that new developments and case studies will be added in the future.

Tim Bryan
Chairman
Association of British Transport & Engineering Museums
2018

How to use the Guidelines

These Guidelines have been produced to offer practical conservation advice to owners of historic objects be they heritage organisations (museums, societies or heritage sites) or private individuals, irrespective of the size of their collection.

The Guidelines support a flexible approach. They provide a source of information to help users to know and understand the processes needed for the care of their collections and to make informed decisions that best meet the needs of the object and its users.

The term 'Larger/Working' is not tightly defined but is taken to mean anything too big for one person to carry and which broadly refers to industrial, transport, military and agricultural objects, which may or may not be preserved in working order. Typically, these objects will need to be moved by a team of people with specialist equipment, ranging from jacks and trolleys to cranes and powered transport. These Guidelines are also applicable to other types of objects, from social history to automata and computers.

The Guidelines cover as many types of object as possible although each object poses its own challenges. A substantial amount of guidance is available from various bodies for specialist areas such as maintenance, operation, health and safety or logistics. The Guidelines offer an overview while signposting relevant documents and publications for those who are seeking more detail in any particular area.

The Guidelines provide a structured process for the conservation and care of historic objects, starting from acquisition, initial measures to stabilise an object and the research needed to understand its significance, through to conservation and maintenance. They work through the decision-making process for the selection of appropriate conservation routes that include, but are not limited to, the conservation of an object in static or working order.

The variety of conservation routes presented to an owner should not be seen as conflicting with each other but should be viewed as complementary. The important thing is to ensure that the merits and disadvantages of each approach have been carefully considered before any action is taken.

Throughout the Guidelines, **bold** type is used for the definitions described in Section 11; the definitions are only printed in bold on their first appearance in each numbered section. It is recognised that some terms have multiple meanings, but for consistency these definitions are used throughout the Guidelines.

1. First Steps

1.1 Early Evaluation and Acquisition

Creating collections of objects or groups of objects is a continuing process for both heritage organisations and private owners.

It is important to bear in mind that collecting comes at a cost, even when something is offered as a gift and these costs need to be understood before an object is acquired. The age, size and the complexity of an object will have a direct bearing on the acquisition, transport, storage and maintenance costs.

Before acquiring an object, it is useful to consider some initial questions to generate an early evaluation:

- How will the object benefit the existing or proposed collection?
- Is there a better or more appropriate home?
- How rare is it?
- How important is this object, regionally, nationally or internationally?
- How much of the historic material is still present?
- How easy/difficult is it to move?
- Is there available space for it?
- Are there people available to look after it once it is acquired?
- How long can it be preserved?
- How much will it cost to acquire, including purchase cost, packing, loading and transport?
- How much will it cost to keep it, including costs of ongoing storage, initial **conservation/restoration**, annual **maintenance** and inspections?
- Are there any health and safety or legal implications?
- If the object is to be operated:
  - is it possible and practical to do so?
  - is it possible to acquire or make spare parts for the object?
  - is sufficient knowledge/skill available to operate the object safely?
- Does the object come with any certification, operating records, drawings or other documentation?

National registers and databases, collectors or dealers with knowledge of similar object types, heritage organisations and historical societies can potentially help with questions on the rarity, provenance and **significance** of an object.

© 5BEL Trust

Motor Car 91 in workshop of Rampart Engineering, Barrow Hill, Chesterfield.
It will be one of the six cars to form the Brighton Belle Pullman Electric Train, restored for main line operation.

The acquisition of an object comes with certain liabilities. Provenance, authenticity, safety and insurance implications, intellectual property rights, special conditions for donated objects and sustainability of long-term preservation are some of the areas that need careful examination before the transfer of title.

A due diligence check is essential to establish the ownership and history of an object:

- Is the object coming from a reputable source?
- Does the person or organisation have the right and authority to offer an object?
- Has expert advice been sought about the object and its sources in this country or from the country of origin?
- Has the object been checked against databases of stolen cultural property?
- Are there any original documents related to the object (e.g. export licenses, registration documents, safety certificates, publications, wills, inventories and auction catalogues, photographic records, letters and correspondence, purchase receipts)? Can these be collected along with the object?
- Are there any visual characteristics that may provide information about the ownership and history of the object (e.g. old repairs, labels, inscriptions, signs that indicate that the object is a part of a larger object or building, distinctive mounting or other characteristics of a particular period)?

Owners and potential owners can sometimes fall in love with objects, overlooking the conservation challenges they may encounter later. Early evaluation can help owners to take a step back and examine whether an object is worth collecting and conserving in some form or another.

1.2 Condition Survey

An initial assessment of the condition of the object in relation to its intended future **use** saves time and money in the long term. It helps to establish whether it is worth acquiring the object in the first place and provides an idea of the budget that is likely to be needed for the **conservation** and care of the object. It should be borne in mind, however, that both budgets and **conservation route** might change at a later stage.

The initial condition assessment should include a thorough inspection of the object to assess the following:

- Completeness.
- Originality.
- Condition (e.g. wear, corrosion, mechanical or structural damage, chemical deterioration, mould, wood rot, pest infestation, water damage, damaged electrical wiring).
- Recommended immediate treatments.
- Presence of any hazardous materials (e.g. chemicals and toxic elements, asbestos, radioactive materials, biological hazards, explosive materials).
- If it is claimed that the object is in working order, verify with an operating test.
- Environmental and storage recommendations.

Professional assistance in performing the initial condition survey might seem an expensive prospect but may have future cost benefits. Experts such as mechanical or structural engineers, boiler inspectors, marine surveyors and conservators can identify areas of concern that may go unnoticed and cause challenges later.

The varying nature of objects means that a range of conservation processes will need to be considered depending on whether the **preservation** of the object's **fabric** or the operation of the object is deemed more important.

As part of any assessment and before any works begin, photograph and make notes on the object from as many angles as possible to record as much detail as possible. Dirt, grime, debris and apparent damage may provide key historical evidence of the object's past use, but their significance may not be obvious at this stage.

1.3 Stabilisation

Stabilisation of an object is an initial process to temporarily halt decay with minimal intervention and can often take place as a matter of urgency, especially when an object is under threat of being scrapped. In this context, keeping records of these initial activities may seem like a luxury, especially when resources are scarce. It is often easier to just get on with the task and leave recording for later. Nonetheless, lack of adequate documentation can have adverse consequences later. It is worth spending time on photographing the condition of the object at the time of acquisition, recording the stabilisation treatments and techniques applied and describing or videoing how an object was taken apart, moved or stored with the objective of producing a detailed record of the stabilisation activities.

If possible, an object is best handled as a whole throughout the stabilisation stage. If it cannot be avoided, dismantling of machinery, vehicles or mechanical components should be carried out carefully using a methodical approach. Components should be put back at the end of a task (e.g. if transport requires some dismantling, reassembly should be done immediately at the other end). Recording of the dismantling and reassembly processes is vital as often objects remain in a dismantled state longer than originally intended.

Issues identified during the initial condition assessment may need to be resolved before moving the object to a new location.

Ideally, the object should be placed under cover, in an environment where it is protected from deterioration, theft, fire and vandalism. If possible, the storage facility should be equipped with basic amenities such as power and water supply. Easy access can significantly speed up activities so location is important. Damp conditions in buildings can be regulated with the use of insulation or stand-alone devices (dehumidifiers); but it should be borne in mind that not all materials react in the same way under a given temperature and humidity. A dry environment may protect metals from rust but it can also cause wood or leather to shrink, crack and become brittle.

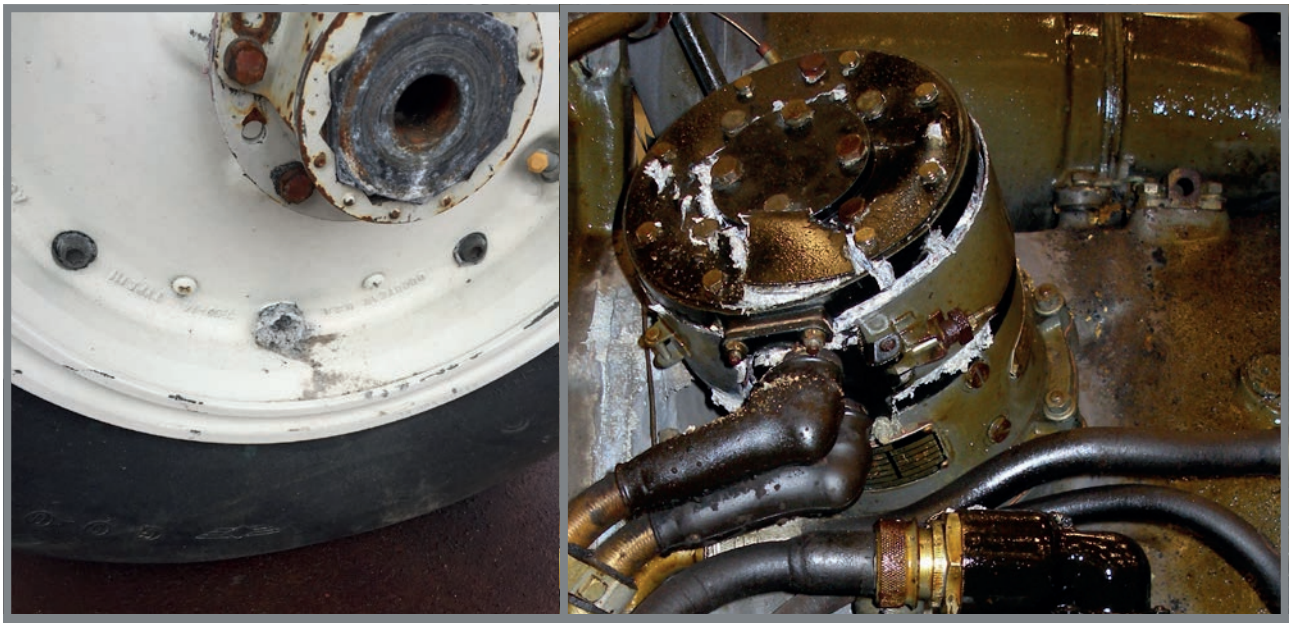
Indoor storage may not be immediately possible but if the object is stored outdoors, temporary covers can be employed to protect it from the elements and from water in particular. It is important to ensure adequate ventilation to prevent outbreaks of mould, rot and other types of deterioration that can be caused by inadequate ventilation.

Any hazards suspected or identified during the initial survey must be removed or managed. This must be carried out in line with any current legislation and may require the support of licensed specialists.

Individuals and small teams can work effectively by devising and agreeing a simple safe working code before any work is started. Larger groups or more complex tasks will require formal safety documentation. A Risk Assessment and a Method Statement are essential for a structured and comprehensive approach to risks and their reduction, and appropriate control measures must be in place. For example, work in confined spaces requires adequate ventilation and an emergency communication channel in case of distress.

In some cases, it may be obvious that an object will require some immediate treatment especially when there is evidence of chemical corrosion. An example of this is bimetallic corrosion caused when two dissimilar metal surfaces are connected in the presence of an electrolyte, such as rainwater. Any initial treatments should not extend beyond the minimum intervention required to temporarily halt decay. Furthermore, any treatment that requires the use of chemicals must be carried out with relevant precautions required by the Control of Substances Hazardous to Health (COSHH) Regulations.

During acquisition or stabilisation, it may become apparent that the object no longer matches the needs of the collection, or **conservation** is no longer viable due to lack of resources. There are numerous established heritage networks that can be used to contact other museums, trusts or owners that may be interested in acquiring the object. The Museums Association Disposal Toolkit *(Museums Association 2014)* sets out the requirements for ethical disposal from the collections of Accredited museums.



Bimetallic corrosion on aircraft components stored outdoors.

Stabilisation treatments may include:

- Treatment of active infestation of organic materials such as wood, leather and textiles. Insects, pests, rot and mould can be extremely damaging and if not isolated or treated can contaminate adjacent areas or other objects. Treatments include cleaning and vacuuming, freezing, anoxia (absence of oxygen) or use of insecticides and sterilisation agents.
- Cleaning of dirt, dust, grease and oil, removal of rubbish and vegetation. These treatments will help to reveal problematic areas previously hidden from view.
- Corrosion stabilisation using organic solvents or chemical solutions that displace humidity or react with corrosion layers to form a stable film on surfaces (e.g. tannic acid treatment for iron).
- Emergency **repairs** to improve the structural stability of an object that may otherwise fall apart.

Sometimes, moving an object to a more suitable location might be deemed necessary. The logistics of a move may involve lifting, hauling and transporting. These activities are safety critical and require people with specialist knowledge who are **competent** to carry them out safely and without causing further damage to the object.

Any move, from a major logistical exercise to the simplest hand-carriage of an object for a short distance, requires careful planning and consideration of several factors:

- Has the move been properly assessed for any risks?
- Are the people involved trained to manually handle or lift objects?
- Can the move be carried out using lifting equipment? For example, trolleys, forklifts or other carriers can be used for smaller moves. Similarly, cranes, trucks or low loaders may be deployed for large, complex moves. Note that lifting equipment requires annual safety checks and that a safety certificate must be provided.
- Is any information available from previous moves or moves for similar objects?

Seeking advice from others who have carried out similar activities will help prevent potential pitfalls.

- Can the object sustain the stress of the move? Weight alone is not a sufficient guide to whether an object can be safely lifted. Objects such as aircraft or boats are particularly prone to damage when they are lifted or moved due to their design and construction materials. The distribution of weight, the stability of the object and the condition of any lifting or jacking points should be carefully examined.
- In the case of wheeled objects, are the wheels and axles sufficiently robust to enable the object to be moved without specialist equipment? In particular, farm carts and wagons kept in a dry environment may have little or no strength left in their seemingly robust wheels.
- Has the route been examined carefully and any access points measured to ensure that the move is feasible? Moves via the road network will require checking for load clearance or restricted access. In the case of very large loads, permission from the local highways and/or police departments may be necessary.
- Are there appropriate access routes for the transport of the vehicle? There may be local or national highways regulations that restrict certain routes, or require an escort vehicle to accompany the move.
- Has the new location been prepared for the object?

Large object moves require careful planning, assessment of all risks involved, experienced personnel and appropriate equipment.

An RAF Chinook helicopter carefully moves a Sea Harrier by air from the Brabazon hangar at Filton Airfield to its new home at Aerospace Bristol.

Hazel Pullman Car, being lifted from the grounds of a pub in North Yorkshire (Hazel will be one of the six cars to form the Brighton Belle Pullman Electric Train, restored for main line operation).

Salvaged 1942 Sunbeam Trolleybus on its way to Tim Stubbs' restoration workshop, Burton upon Trent.

The lifting of Mossdale, an all wooden Mersey-Flat at National Waterways Museum Ellesmere Port.

George, a horse drawn Leeds & Liverpool short boat being returned to the National Waterways Museum Ellesmere Port, following an extensive reconstruction project in 2016.

1.4 Research

Research is a fundamental element in understanding a historic object. This understanding is important in enabling the proper assessment of the significance of an object and ensuring that appropriate decisions can be made about its long-term preservation.

Every aspect of an object, from the materials it is made of, the purpose for which it was made, its **working life**, and what has happened to it after being withdrawn from service, should be meticulously researched, without any assumptions or speculation. The starting point is the object itself as it will offer intrinsic information about its manufacture and use. The very **fabric** of an object can reveal information that cannot be traced in documentation or oral testimony. Documentation may refer to planned alterations that were never carried out, or **repairs** and design modifications may have been made without any form of recording. Small pieces of information in the form of makers' marks, wear marks, and repaired or altered sections will help to construct a more detailed understanding of the object. It is important to record all observations and findings so research is not duplicated in the future. All information should be made easily readable and readily understandable by others.

In some cases, it may be useful to dismantle an object to its basic components and record it in a logical order, using photography and drawings, which should contain some reference to the scale of the subject (possibly with the presence of a measuring guide).

Where possible, efforts should be made to acquire any maintenance records or histories associated with an object, and instructions or manuals. These can be invaluable in helping to understand how the object should have been maintained, and how it may have been modified over its lifetime. Any such records and manuals will also become items requiring **conservation** in their own right.

It is useful to seek advice from people with proven knowledge of an object type. They can offer an independent and fresh pair of eyes, shedding light on questionable areas, generating dialogue and even challenging assumptions.

Desk-based research includes locating primary sources such as original drawings, artistic impressions, historic photographs or even historic scale models of the object in question or objects of similar type. Oral history archives and published works such as books, articles, registers or surveys, Patent Office records, contemporary and subsequent technical journals, specialist magazines and records kept by subject enthusiast societies are also valuable sources of information. It is also useful to trace surviving owners' handbooks and manuals.

Cross referencing resources to test their reliability and to check how they match the surviving fabric of the object is a useful process. Likewise, scientific material analysis can reveal a wealth of information that may be used to cross reference archival resources, provide evidence for activities carried out, or confirm the presence of certain material that otherwise may have been inconclusive.

1.5 Sources of Further Guidance

- *Spectrum 5.0: Acquisition and accessioning,* Collections Trust, 2017. Retrieved from **www.collectionstrust.org.uk**
- *Conservation Principles, Policies and Guidance,* English Heritage, 2008. Retrieved from **www.historicengland.org.uk**

2. Understanding Significance

This process follows the initial assessment of the **significance** of an object, allowing the reasons that led to acquisition of the object to be re-evaluated in light of the additional information and documentary evidence that further research has revealed.

A thorough understanding of this significance will in turn lead to a **conservation route** and any decisions made for the future preservation of an object.

Where the object's **fabric** is largely intact, providing evidence of the origins and life of the object, careful planning of **conservation treatments** is likely to focus on ensuring that this evidence is retained.

When little remains from the 'as built' condition of an object, due to a long life of adaptations and alterations, there is a significant risk of unnecessary **reconstruction**. This can have irreversible consequences on the intrinsic information carried by the object, the loss of its **historic state** and the loss of evidence of what was necessary to make the object **function** correctly. This can be avoided if the life of the object is fully understood prior to any treatment being carried out.

Significance can be assessed by considering the following factors:

- Provenance. Where has the object come from? This includes where it was made, and who for, and the different owners and homes throughout its life, including where the current owner acquired it from.
- **Associations**. Is the object associated with historical figures, communities, events or places, which make it more interesting than other similar examples?
- Representativeness. Does the object represent a particular historical, social, aesthetic or technological achievement?
- Rarity. Is the object the only one of its kind remaining, or are there very few in existence? These may be sole survivors of a once common type or unique examples where only a very small number were made.
- Originality. How much has the object been altered during its **working life**? Have changes been made that have altered the **form** or purpose of the object which may have added to or detracted from its significance?
- Integrity. How much surviving historic material is still intact giving evidence of original design, materials, processes and techniques?
- Authenticity. Where little or no historic material remains, how authentic are the changes that have been made? Have changes and **repairs** made been based on strong material or documented evidence?

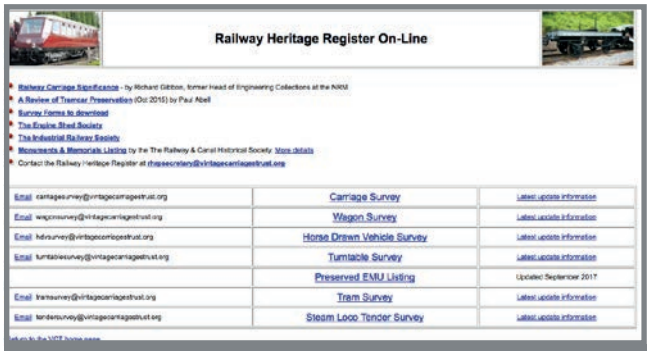
An object does not need to rank highly against every factor for it to be highly significant, but should have evidence against at least one.

In addition to these criteria, an object may have personal, emotional or nostalgic associations for an individual owner, which give it added significance.

For museums, there are also additional criteria that should be considered, for example:

- Does the object fit with the museum's Collections Development Policy?
- How will the object appeal to visitors and what interventions will be needed to enable them to appreciate it?
- How can the object be used to represent a particular story being illustrated?
- What is the emotional, sensory and physical impact of the object likely to be?
- If the object is not rare, are the other surviving examples in better condition or are they at risk? How does the significance of this object compare with the other examples?

A personal assessment of significance is rarely unbiased and often fails to consider all aspects. An object can be appealing in different ways and can trigger memories that can be deeply emotional to prospective owners and future users. This might lead to the elevation of certain aspects of significance while others may be overlooked or ignored altogether. Owners who have already made up their minds because they have fallen in love with an object, or have already committed time and money, are unlikely to be discouraged by the possibility of an object carrying less historical importance than originally assumed.



The internet database of the Railway Heritage Register Partnership lists: The Railway Heritage Register Partnership employs a methodical approach to assessing significance of preserved railway artefacts. Relevant documentation is available at: www.vintagecarriagestrust.org.

Considering that personal judgment can often be skewed, sound advice from people with proven knowledge is good practice and can be helpful. For larger organisations, the involvement of multiple staff with different specialisms, such as educators, curators, marketing staff and interpreters, as well as conservation and collections care staff, can mean that the assessment process is more likely to take a range of different views into account. For small organisations, this broader assessment can be achieved through discussion with owners of similar objects, specialist groups and local communities. A written significance statement can include the opinions of all those consulted and provide details of the research methodology followed. The nature of the **significance statement** will vary according to the individual object and to the owner's needs.

In practical terms, many grant-giving bodies require the applicant to provide evidence that significance has been assessed for objects included in the funding application and expect that proposals for **conservation** of, and access to, the objects take the significance into account.

Templates and scoring systems to assess significance can be developed to rank similar objects against each other. They should be used with caution as the assessment is still subjective. It is important to maintain a degree of flexibility and introduce a range of points of view in the discussion of significance, otherwise critical elements of importance may be neglected or overlooked.

© Canal & River Trust.

Rarity: Friendship is one of the most famous horse drawn, wooden narrow boats in the country. She is a rare example of an owner-operated horse boat and, for over 50 years, she was the livelihood and home for Joe and Rose Skinner.

© Science & Society Picture Library

Associations: LNWR Queen Victoria's Saloon (LMS No. 802), built in 1869. This lavishly decorated custom built carriage, was extensively used by Queen Victoria and even modified on her request during its working life. The fragile interior was conserved in 2005 with most historic textile elements carefully cleaned and preserved.

© National Museum of the Royal Navy.

Representativeness: Holland I was the first ever submarine commissioned by the Royal Navy. Sunk accidentally in 1913, it was rediscovered in 1981. In 1993 the Museum of Royal Navy undertook an innovative method of conservation, by building a bespoke tank and submerging the submarine in a solution of sodium carbonate for 5 years, to wash the salts out of the fabric of the hull.

Kennet and Avon Canal Trust.

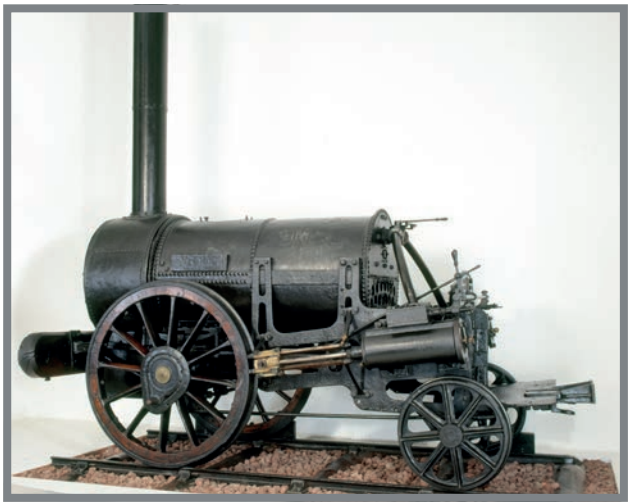
Rarity: Crofton Pumping Station. The engine house contains an operational Boulton & Watt steam engine largely dating back to 1812 that is the oldest beam engine in the world on its original site and still capable of doing the job for which it was installed, raising water to the summit level of the Kennet and Avon Canal.

© Ingenium - Canada's Museums of Science and Innovation.

Rarity: The Canadair North Star was a 1940s-50s Canadian development of the Douglas DC-4 designed for Trans-Canada Air Lines (TCA) and the Royal Canada Air Force (RCAF). An RCAF aircraft (serial no 17515), the sole surviving airframe of its type in existence, is currently undergoing a museum-run volunteer conservation project in Ottawa, Ontario, at the Canada Aviation and Space Museum - one of the museum members of Ingenium Canada.

© British Motor Industry Heritage Trust

Originality: This Hillman Imp was donated to the British Motor Museum collection. The car is in almost original condition, the owner maintaining and servicing the car, but carrying out no modifications or alterations. When acquired, the decision was made to display the vehicle in this condition, with only minor cleaning required and not to carry out any major restoration or conservation



© Science & Society Picture Library

Integrity: Stephenson's Rocket, built in 1829, Science Museum, South Kensington, London. Although preserved as a static display, the associated research of the historic material has resulted in the construction of operable replicas, now based at the National Railway Museum, York.

© Museum of London.

Authenticity: This reconstruction of a 17 Century Fire Engine, contains a historic central barrel and iron pumping mechanism. Based on an early photograph and an original drawing, the Museum of London was able to rebuild the engine to show how it looked and how efficiently it worked.

2.1 The Conservation Plan

Once the object's **significance** is assessed in an objective manner, the best way to move forward is the development of a **conservation plan**. A well-considered plan will help direct resources to best effect and could be the key to the success of a project - proper planning prevents poor performance.

- If a **significance statement** has already been written in detail, the conservation plan only needs to summarise the main points, otherwise the plan is the ideal platform to describe the object's significance, why it matters and to whom.

- The plan helps to identify any major concerns, such as need of **stabilisation**, evidence of active deterioration and the **conservation treatments** required, **remedial** or **preventive**.
- Any factors and risks that may have an impact on the significance of the object should be part of the plan. Such factors can be inherent, such as poor-quality **repairs** or alterations to the object's **fabric**, or interaction of materials that can cause rapid deterioration and require a tailored conservation treatment. There are also external factors that should be considered such as the human resources needed, level of training and quality of management or the technical ability of the owner, available funds and fundraising capacity.
- The plan helps to evaluate all of the elements which may affect the design and implementation of the appropriate conservation route including careful estimation of time, quality and costs.
- The conservation plan should include strategies to engage people with the object and improve public access. Access may be physical such as museum display or participation in events, or it may be intellectual such as availability of drawings and archival resources related to the object.
- The conservation plan should consider the long-term management and maintenance costs and allow for contingencies. Depending on the nature and the care needs of the object, a separate **maintenance plan** can be developed in conjunction with an **operating manual** if the object is in working order.
- A conservation plan can be made for an individual object or can be devised as the conservation management strategy for an entire collection.

Conservation Plan: The collection at Windermere Jetty Museum of Boats, Steam and Stories is a highly significant part of the UK's dispersed national boat and maritime collection, as individual vessels and as a collection all associated with Windermere in the English Lake District. A Conservation Management Plan was produced as part of a major redevelopment to explore the understanding, history and significance of the collection consisting of over 40 vessels and associated material all of which requires a broad range of conservation approaches. The Conservation Management Plan sets out Lakeland Arts' aims, policies and approach to conserving the collection in line with best maritime conservation practice and according to National Historic Ships guidelines particularly as detailed in Conserving Historic Vessels, Vol. 3 (2010). The Conservation Management Plan is available online at www.windermerejetty.org.

- The conservation plan can be used to establish a clear direction that can be communicated to everyone involved such as trustees, volunteers, specialist groups and the general public and ensures that there are no deviations from the agreed route that may endanger the object's significance. For a private owner, it can be used to help ensure that costs do not escalate and that work is completed in time to meet any personal or family deadlines.
- The conservation plan is effectively an assessment of whether an object can be conserved within the relevant parameters or not. If it cannot, options to be considered, include:
  - Stabilisation to buy time.
  - Passing the object on to someone else with an alternative plan.
  - Recording the object and making findings available for public benefit before disposal.
- a conservation plan may be a standard requirement when the **conservation** of the object depends on securing public or grant funding.

2.2 Making the Decision Whether to Operate

Many owners wish to restore or maintain their objects in working order. There are many factors to consider when deciding whether or not to operate a historic object, given that operation will inevitably lead to wear and tear on its components and potentially the eventual loss of its **historic state**.

The possible operational life of an object varies according to its type and may span a few years to several centuries, depending on the materials used and the method of construction. There will be a point beyond which it is better to preserve the object's **fabric** in non-operational condition and to replace or replicate for **use**.

As it is not possible to reverse the effects of wear and tear, this can lead to the loss of fabric, which provides evidence of historic manufacturing and operating techniques. If the components of an object are replaced or repaired too much, there may eventually be no historic material left. This means that the recording of any treatments or **repairs** becomes even more important.

Operation of an object can lead to increased risk of accidental damage or catastrophic failure of components and, in some cases, such as aircraft, total loss of the object.

Despite the risks to the integrity of an object that operation can bring, it can also provide significant advantages.

In some cases, a strong argument can be made for operation for the benefit of the object, in that it ensures that moving parts are kept free and lubricated as the designer intended through internal pumps and splash feeds, engines do not seize up and more constant attention is paid to the care of the object than would be the case with static exhibits. The benefits of running vehicle engines and transmissions should be weighed against the potential wear on other components such as leather upholstery when considering operating. Some objects may be considered so iconic that the **preservation** of their fabric should not be compromised.

In the case of large industrial machinery and transport collections, one of the best ways to gain an understanding of the operation and atmosphere of a historic process is to participate in a live experience. Seeing and hearing objects working may enhance the experience of museum visitors and can aid understanding of past working practices and the lives of those who operated them.

In some cases, the whole ethos of the collector, be it a museum or a private individual, is one of operation. This can bring the advantage of preserving the atmosphere of a historical industry and of maintaining traditional skills and knowledge associated with the objects. Many industrial museums have been set up specifically to preserve historic machinery in operation, as is the case at London Museum of Water & Steam at Kew Bridge and King Edward Tin Mine, near Camborne in Cornwall, and of course many private individuals only own their vehicles for the pleasure of maintaining them in working order and operating them.

Many museums focus more on preserving objects for static display and on conserving their fabric in 'as found' condition.

There may be a financial imperative to operate, where operation enables the generation of income, for example through admission fees, external hire and filming contracts. On the other hand, the costs of operating should not be underestimated and the ongoing costs of **maintenance** in terms of both time and money should be factored in on top of the initial cost of **restoration** to working order. Where constraints are encountered it should be remembered that at some stage in the future suitable resources and facilities to restore to running order may be available so irreversible changes to present an object in static condition should be avoided.

The decision to operate or not should ultimately lie with the owner of an object. What matters is that the decision is made with the full knowledge of the issues involved, which will require some background study and research to enable a balanced assessment of the advantages and disadvantages of operation.

Once all these factors have been considered it is good practice to record the decision-making process and the final decision, to ensure that future owners can understand the underlying rationale. These should form part of the **significance statement** and/or **conservation plan**.

These are some of the factors that should be taken into account when making this assessment:

- **Significance** of the object – what is it that makes the object important? Will any of this be lost through restoration of the object to working order or through continued operation? Does the object need to be operated to tell the story it represents?
- When was the object built? The age of the object is not necessarily of primary importance but associated documentary and anecdotal evidence, such as operating manuals, often provide important indicators to help date modern technologies. In contrast, for earlier objects, the intrinsic evidence held in the object is often the only surviving evidence
- Has the item been in more or less continuous use since its manufacture or for a significant number of years?
- Are there similar examples or is this the only one? Are any of the other examples working?

- Were methods of construction which no longer exist used to create the object of which evidence will be lost if the object were restored to safe and compliant working order?
- Were methods of construction which no longer exist used to create the object which mean that the object can no longer be made safely/legally operable?
- Is the object unique and irreplaceable or do other examples of the same type still exist and in what condition? Are other examples in better condition and are they preserved on static display or in working order? Is it possible to acquire a duplicate for operation and preserve the former in static condition?
- How much historic material remains? Will any of this be lost through restoration of the object to working order or through continued operation?
- How robust or fragile is the object? Is there evidence of rot, corrosion, contamination or hidden damage that could impact on the ability to restore the object to working order?
- Are there viable alternatives to operation of a historic object, such as the construction of an operating replica, the use of video footage, first person explanations, text and still images, which can aid **interpretation** and understanding of the object?
- Is restoration of the object to working order affordable and/or cost effective?
- Are spares available? Can worn out components be replaced with historic spares? If so, can these parts be considered as consumables?
- Are sufficient resources available to restore and operate the object in working order and will it continue to be available throughout the working life of the object?
- How frequently will the object be operated? Will the frequency of operation justify the cost of restoration?
- What will the cost of maintenance in working order be and can the costs be met?

Crich Tramway Village, home of the National Tramway Museum, views the demonstration of its Tramcar Collection as the most effective method of communicating a vehicle's form and function to the public. The care of those tramcars and whether they are used for demonstration is governed by principles and processes outlined in vehicle specific documentation, called an 'Attitude Statement'. The statements consider each tramcar with regard to curatorial, technical, social, health and safety, financial and commercial considerations.

The City & Royal Burgh of Edinburgh Tramcar No 35 is preserved in static condition, due to its rarity and the relatively minor changes made to the tramcar since its overhaul when it first entered preservation.

The London County Council Tramways Tramcar 106 has received major work to restore it to as close to original operating condition as possible, whilst allowing some non-original design modifications to facilitate demonstration at the Museum. It is part of the museum's demonstration fleet and it is maintained in working order.

- What are the risks (to both people and to the object) associated with operation of the object? Can the risks be mitigated effectively?
- Is there modern health and safety or other legislation that will impact on the operation of the object and that might alter the integrity of the object or compromise the operating experience?
- Does the owner/operator of the object have the experience and knowledge necessary to maintain and operate the object safely and in compliance with the law?

2.3 Regulating the Operation of Working Objects

An object that is deemed appropriate to operate can only do so safely if the period and nature of working is controlled carefully. The control must extend to who operates an object and how, ensuring that such persons are **competent** to undertake the task. Apart from the **conservation plan** all aspects of the operation of a working object should be governed by an object specific set of documents:

- An **operating manual**.
- An inspection and **maintenance plan** (that can be part of the operating manual).
- An **operating log**.
- An object breakdown emergency policy and procedure.

The purpose of these documents is to ensure the long-term preservation of the object.

The operating manual should be developed from a combination of sources such as:

- Original documentation and manuals associated with the object.
- Information provided by people who built, restored or worked with the object.
- Current or historic specification or operating procedures developed by industrial, regulatory or government bodies (e.g. the military).
- Audio-visual resources, drawings, patent records, technical journals, specialist magazines or information in the domain of heritage societies for similar objects.
- Experimentation when it can be performed without putting the object at risk.

A comprehensive operating manual should include:

- Standard Operating Procedures (SOPs) for the object to ensure safety and consistency in operation.
- Agreed limits of all operations in terms of loads, speeds and other appropriate parameters. These should be reviewed regularly so operating practice remains compliant with current health and safety legislation.
- Set time limited periods of operation to minimise wear and tear.
- Inspection and **maintenance** instructions.
- Fitness to operate procedure that is carried out before every occasion that the object is operated and duly signed off before operation commences.

- Information on modern materials such as fuels, lubricants, insulants and consumables that can be commercially sourced and used without causing damage to the object.
- Information on the level of training required for operators and a list of the people authorised to operate the object. There should be a written process for determining the competence of all operators on a regular basis as agreed by the owner(s) of the object and/or the organisation that has current custody of the object.
- Written authorisation from an approved signatory for the operation of the object (e.g. owner, Head of Collections, Director).
- Written information on how any risks identified in the risk assessments will be mitigated.

An **operating log** should be used to record all details relating to the operation of an object such as times and dates of working, reason for the operation, fuels and lubricants used, maintenance operation and replacement parts, loadings, speeds and other measurable conditions and any other noted effects or changes. The names of the operator(s) should also be recorded.

These important controls on operation presuppose two other factors: inspections and training. Regular inspection of the object, whether informally during normal operation or at routine intervals specified in the maintenance plan, is vital, and in some cases, this may require the use of an independent **competent** inspector. Constant evaluation of the condition of the object will determine both maintenance practice and the course of operation in the future. Training is related to operating practice: those who are authorised to operate and maintain working objects must have suitable training and possess the appropriate certificates.

Throttle arm breakage on the Boulton & Watt No.1 engine Crofton Pumping Station, July 2017. This occurred early in the start process and no further damage was caused to the engine. A temporary repair was made to enable operation to be resumed, pending professional conservation advice on permanent repair. This incident was an opportunity to review and improve inspection, maintenance operational and safety procedures, along with conservation and recording practices.

2.4 Sources of Further Guidance

- *Conservation Plan Guidance*, Heritage Lottery Fund, 2012.
- Gibbon, Richard, *Railway Carriage Significance, A Methodical Approach to Assessing the Significance of 'Preserved' Railway Carriages and Other Artefacts with a View to Advising Potential Funding Bodies,* Railway Heritage Register Carriage Group, 2003. Retrieved from **www.vintagecarriagestrust.org**

- Kerr, James Semple, *The Conservation Plan*, 7th ed. Australia ICOMOS 2013.
- Storer, J.D., *Priorities for Preservation: Working Towards a Classification Scheme, Co-ordinating the Collections on a National Basis,* Association of British Transport and Engineering Museums Autumn Study Meeting at the National Railway Museum, York, 7th October 1995.
- *The Trams Report, 2008 Edition,* The Tramway Museum Society, Crich, 2008.

3 Conservation

The stages described in these Guidelines, from acquisition to the creation of a **conservation plan**, inform a **conservation route** aimed at preserving the **significance** of the object. This may be achieved either by focusing on the **preservation** of its **fabric** or on the operation of the object as it was originally designed. While fabric and **function** are paramount, it is also important to consider the **form** of the object because sometimes the main challenge is not whether an object will be presented in static or working condition, but the extent of alterations required to return it to a known earlier state.

3.1 Selecting a Conservation Route

There is a crucial point where a choice should be made between **conservation routes** that are frequently contradictory. Operating an object causes wear that will inevitably lead to loss of **fabric** even if this happens at a very slow rate. The **preservation** of the fabric of an object can render it static and remove its working capacity, which may not meet the needs of some owners. Returning an object to 'as built' condition or to a specific state from part of its life often leads to the removal of fabric or the introduction of new materials. Leaning towards one route or the other means that decisions need to be made on which element carries more **significance** and thus becomes the main focus. It is important to acknowledge that following a particular route will involve a degree of loss of fabric, **function** or **form**.

The nature of working objects means that certain parts of their structure are affected by movement more than others. Many objects are constructed of a mixture of materials that require different environmental conditions or even interact chemically with each other. Therefore, to conserve an object, several processes may need to be adopted. For example, a vessel may have to remain afloat to keep its hull structurally supported in water, while appropriate measures will need to be taken to protect the structure above the waterline against exposure to the weather. In that respect, **maintenance** and overhaul of the hull will be necessary at some point, with an expected loss of fabric, while the remaining fabric of the vessel can be preserved for much longer. It is possible for a stationary engine to operate safely with minimal wear, thus demonstrating its function without significantly compromising the majority of its fabric. A vehicle can be conserved and remain operable under strict conditions to limit the possibility of damage or replacement of historic parts for as long as possible.

The precise point in the future where the operation of an object may have to cease to prevent loss of a high percentage of its fabric may be impossible to predict accurately. The conditions that will lead to this **cut-off point** do need to be considered and factored into the object **conservation plan**, with contingencies in place for an alternative approach should this point be finally reached.

© Matthew Hancock

Tip Toes 1948 International 14 racing dinghy, a boat known for a famous blow out in the 1948 class championships, in Cowes, Isle of Wight. Matthew Hancock, the owner of the boat, has started a conservation project focusing on preserving the function of the boat. Matthew feels that even if the conserved boat may not be as it was built in 1948, or competitive in modern racing standards, a functional boat will evoke the authentic feel and thrill of the 1940s racing experience. This project is supported by a Tru Vue/ Icon grant.

3.2 Conservation Processes

As mentioned already, the selection of a **conservation route** will determine the extent of preservation on **fabric**, **function** or **form**. The following sections describe the conservation processes that can be employed to reach a chosen conservation route.

Preservation aims to protect the original fabric of an object, while **restoration** and **reconstruction** concentrate mostly on aiding **interpretation** and public access by returning an object to a known earlier state or presenting its function. **Adaptation** is a process of modification to make an object more accessible to the public, to enable operation under modern safety standards or to prepare it for a different **use**.

All conservation processes and subsequent treatments carried out on an object should be recorded appropriately using **treatment records** kept in an object file.

3.2.1 Preservation

Preservation encompasses all activities designed to maintain an object in its existing state and slow down deterioration. It is applied to objects or parts of an object that are either sole survivors of a once common type or unique examples of technological innovation and industrial design. It may also be chosen where an object is very fragile because of age or

due to the nature of the materials used. The advantage of preservation is the possibility of retaining materials or components that may have lost their mechanical properties through age or **use**.

Many larger and working objects include components made from fragile or unstable materials, such as upholstered interiors, textiles and rubber parts. While it is not always possible to preserve their functionality, it may be possible to preserve the remains in situ to maintain the **historic state** of the object, which can be used as an authentic resource for the research and understanding of manufacturing practices and materials. Where the material is too degraded to preserve, it should be fully documented before removal.

Consideration also needs to be given to the preservation of surface finishes such as paint, varnish, patina or the evidence of manufacturing techniques and tool use/machining. They form an integral part of the object, its manufacture, use and **significance**.

Preservation often involves preventive measures that focus on controlling decay and remedial actions that are essentially **repairs** which follow the principle of minimum intervention. The **stabilisation** process described section 1.3 often employs similar methods.

Preventive conservation aims to create a stable environment for composite objects (made of several parts or materials) that benefits their long-term preservation. Temperature, humidity, light and air pollutants can cause damage to materials and composite objects behave differently under set conditions, for example iron will rust when humidity is high while wood will shrink and crack if humidity is low. Further information on preventive measures can be found in Section 6.

Remedial conservation treatments can be applied to objects that still maintain their ability to operate, but which are judged too significant, rare or fragile to do so. In this case inhibition techniques may be applied as a preventive measure to protect moving parts from seizing and internal corrosion. This is explored further in Section 4.

Holland I, the first ever submarine commissioned by the Royal Navy, salvaged in 1982, after being sunk for 69 years.

The Four-cylinder two-seater Bean 14 horsepower 'Sundowner' racing car has a remarkable history as a record-breaking vehicle. It officially joined the collections of the National Museum of Australia in 1981, where it underwent a comprehensive conservation program in the late 1990s. Today the 'Sundowner's battered, dented and scratched body still bears witness to its extraordinary journey across the world. And it still appears much as it did upon arriving in Melbourne in 1928, right down to the traces of sand and mud caked to its underside.

Remedial measures aim to preserve the integrity of an object's **fabric** and generally are designed for minimum intervention. Remediation can involve simple housekeeping techniques or complex and lengthy treatments such as those applied to waterlogged wood or historic textiles. More intrusive solutions can be reconstructive, for example, the replacement of deteriorated structural parts to prevent a large object from collapsing.

A conservation treatment should be an action that can be undone, leaving the object unaltered or in its previous state. It is widely accepted however, that most treatments cause a degree of change and conservation materials such as adhesives and consolidants should be tested for compatibility and long-term chemical stability. Treatments should be designed in a way that will allow them to be repeated in the future using the same techniques or using more advanced techniques that may become available.

A level of conjecture is inevitable where historic **reconstruction** is involved and should be balanced with research and objectivity. Professional conservators abide by standards set by the Institute of Conservation (ICON). Treatment decisions are made after careful research, often supported by chemical analysis and by consulting people with experience in dealing with similar conservation issues.

Investing resources to employ specialists invariably pays dividends. A **competent person** can advise with conservation planning, provision of training for staff and volunteers or by delegating manageable tasks that can be carried out under supervision. The person responsible for conservation activities should nonetheless hold the appropriate

A German-built Orenstein & Koppel (O&K) wagon, found in the vaults beneath Bath Spa Station in 2001. It is believed to be the only known example of its type to have survived. The wagon was restored at BRECO's workshops in Barry between 2015-16 to the specification recommended by conservation consultants, Steph Gillett and George Monger.

Badly degraded historic wood was replaced with sections of new wood treated with a woodworm-resistant solution and stained with a lighter colour to indicate the presence of replacement material. The wagon was designated by the Railway Heritage Committee as being of sufficient interest to warrant long-term preservation and it is a wonderful reminder of Bath's considerable industrial history.

qualifications or competencies, or have access to advice and guidance from someone who holds these competencies. Grant providers will often stipulate the involvement of qualified accredited conservation professionals and may be prepared for the cost to be included in the grant.

3.2.1.1 Case Study: Corsair KD341

© David Morris.

Corsair KD341with historic paintwork revealed.

© David Morris.

The historic factory markings were preserved intact under the 1960's paintwork.

The Corsair KD341 is an American fighter aircraft that saw service in World War II. It was then stationed at a Naval Training College until 1963 when it became part of the collection of the Royal Navy Fleet Air Arm Museum, Yeovilton (FAAM). Until its acquisition by the museum, the aircraft was still in its wartime service condition, including paintwork, squadron markings, in-service modifications, general wear and tear and damage witness marks gained on the aircraft while engaged on its wartime squadron service.

The entire aircraft was repainted in 1963, to display it in striking, newly-finished condition, reflecting the trend at the time for furnishing newly-opened museums like FAAM with attractive and impressive objects. The new paintwork did not extend to stripping or rubbing down of the aircraft's external surface, and the new paint was applied directly over the existing paint layer. In 2000, the museum decided to explore what was possible to achieve in examining, exposing, recording and preserving the historic finish that was concealed beneath the 1960's paintwork.

Removing areas of paint to explore colours, markings or details that lie beneath is not new practice, and many objects have received this form of treatment (focussing on small and specific areas) to establish and use details from the past. However, applying this method and treatment to an entire aircraft was ground-breaking. The project not only demonstrated what is achievable in returning an object to its **historic state** but also exposed and captured information that would correct and redefine numerous details regarding WW2 aircraft in general and Corsair aircraft in particular.

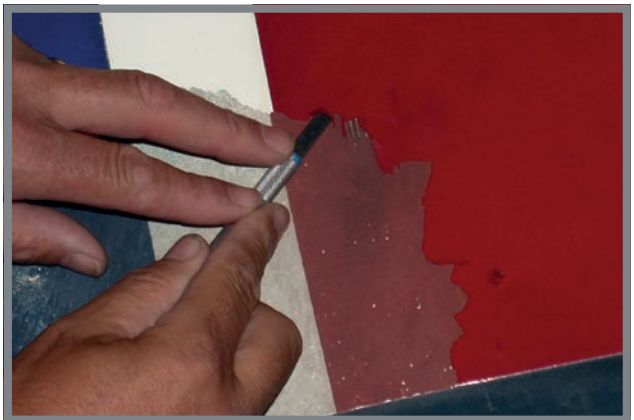
Using recognised conservation techniques as well as developing and experimenting with new ones, the team were able to painstakingly remove the 1960's paintfrom the entire surface of the aircraft to build an accurate picture of not only what the aircraft looked like during WW2, but also to establish where it had been in service and how it was worked on as a Naval aircraft in wartime operation.

After almost five years of painstaking work, the project revealed many unique and interesting finds, including: a gas reactive chemical warfare paint patch; factory production

line markings (believed to be unique); hand-scribbled jottings and markings made by individuals both in factory and service locations; damage witness marks that were deciphered to pinpoint where and when damage to the aircraft occurred. The result is an aircraft preserved as a time capsule in as near to its historic state from 1944 as it is possible to achieve.

The project was recorded in *Corsair KD431: The Time Capsule Fighter* (Morris, 2006) written by the museum's curator.

Gas reactive paint patch, believed to be the only remaining example on a WW2 aircraft.



The 1960's paintwork being painstakingly removed.

3.2.2 Restoration

Restoration means returning an object to a known earlier state by removing additions or by reassembling existing elements with the minimum introduction of new materials.

Although the term 'restore to working order' is frequently used, there are countless cases of objects that have been restored 'cosmetically' to present them in a more complete **form** or 'as built' appearance, without being capable of operation.

A variety of treatments can be used to clean surfaces without disturbing patinas developed with age, consolidate flaking paint finishes or reveal historic surfaces. A wealth of information can be revealed, such as paint pigments, inscriptions or manufacturing marks that can enhance the understanding of an object and add to its **significance**.

Most restorative actions require thorough research and careful examination of all aspects of the history of an object. The significance assessment may have demonstrated that a particular time in an object's life is worth revealing. This means

Restoration work in progress on a waterwheel from Abbeydale Industrial Hamlet, a unique example of an 18th and 19th Century water-powered industrial works on the River Sheaf in Sheffield. By 2004, both the tilt wheel shaft and the grinding hull wheel shaft had been repaired numerous times, and they were too rotten to support the weight of the wheels in rotation. New shafts were sourced from tree trunks of the correct diameter. Due to the scheduled ancient monument status of the site and Grade I listed buildings, the rotten shafts had to be moved out of their wheels without using any part of the building to lift from. Each of the shafts weighed between 2 and 3 tonnes with their cast iron ends fitted.

that elements that have been added at later phases and have been judged to be of lesser significance need to be removed, recorded and if possible retained. Unnecessary removal of **fabric** should be avoided however, as this may have implications in future evaluations of the object's significance.

The extent and nature of new work or additions need to be considered carefully before any restorative action begins. Parts or materials required to create the intended form need to be identified and sourced. Historic spare parts included should be recorded while **reproduction** parts should be made distinguishable using permanent labelling methods. For historic vehicles, the Charter of Turin defines the basic principles that guide restorative actions, including the use of authentic or modern materials and ways to distinguish restored areas while maintaining the vehicle in a coherent **historic state**.

3.2.2.1 Case Study: 1947 Leyland/Eastern Coach Works single deck bus

GUF 727 is a Leyland PS1/1 single-deck coach, built with an Eastern Coach Works body commissioned by Southdown Motor Services. It ran on express services to London from April 1947 to 1955, then converted to local bus service around Horsham. In 1960 the bus was passed to a local charity and it fell into disuse after three years. Paul Jefford, a bus enthusiast who had formerly ridden the bus on his local route in Horsham, bought it in 1972. With little more than replacement batteries, fresh fuel and pumping up tyres, it was started and driven away from the barn it had rested in for over a decade. With a little work on the engine, fitting of reflectors at the rear, and replacing a light bulb, it then passed an MOT test.

Paul and his wife Joyce were determined to present the bus as Paul had known it in the 1950s. They succeeded in preserving the bus and kept it roadworthy for over 11,500 miles with minimal intervention, despite facing several challenges including lack of time, costs, storage issues, scarcity of mechanical parts and other components, disappearing skills, performance and design differences between historic and modern vehicles.

From the outset, it was decided never to store the bus in the open, even if that meant that in the early years, the storage location was not easily accessible. Nonetheless, the decision to keep the bus undercover paid dividends: keeping the bus dry was the decisive factor in successfully preserving its wide variety of materials and components in good condition.

Parts no longer readily available often needed considerable time and effort to locate or replicate. Fortunately, the generally-sound mechanical condition of the bus minimised the need for replacement parts. Mechanical work beyond Paul and Joyce's capabilities

The bus in Horsham, soon to be on the road again, 1 June 1976

The bus in Lowestoft, 2017

included some routine maintenance, rechroming the radiator shell, and attention to brakes, flywheel, starter motor, fuel lift pump, windscreen wiper and electrical items. Finding people to do this was achieved by establishing contact with local transport museums and bus preservationists nationwide. The bodywork needed some framework repairs, some new panels and repainting to 1955 Southdown service livery. Interior work was mainly restricted to a careful cleaning, replacement of rotten plywood and textile trim and restitching of some seats.

Present-day road users are often unprepared for the slow acceleration and lower speeds of older buses. As standard practice, the bus carries a flashing beacon and a 'Slow Vehicle' notice in the rear window and drivers pull over where possible to clear tailbacks.

Design differences between historic and modern vehicles can lead to problems with roadworthiness testing and new traffic regulations. Supporting the Federation of British Historic Vehicle Clubs (FBHVC) means that Paul and Joyce are kept up to date with new proposals for legislation and regulation that may affect historic vehicles.

© The Tank Museum, Bovington, Dorset

The restoration of the Matilda II has been a unique undertaking for the Tank Museum in Bovington. The majority of the work is being carried out by museum staff and volunteers, using conservation and restoration techniques to suit. This has prompted lengthy discussions with regard to what items should either be replaced, preserved as they are, or remanufactured to original specifications. As the vehicle is expected to operate, the safe functionality of key systems such as steering, brakes and electrics sometimes require critical components to be replaced in order for them to work correctly. Wherever possible, this has been done using historic parts. There are other considerations, such as the museum's policy to remove hazardous materials (i.e. asbestos brake linings) and to make the vehicle safer to maintain/operate. Once the project is completed, the goal is to properly maintain the vehicle, using original service documents and gain further knowledge of the mechanics through use, which can then be passed on to future generations.

The project has been documented via a series a video diaries published on YouTube that have so far attracted over 200,000 viewers (as of November 2017).

Paul and Joyce systematically researched the history of their bus and kept a consistent restoration and maintenance record that spans back to 1972. They have chronicled their experience in *Our Southdown Tigers: … and Pictures of Many More* (Jefford, 2015).

3.2.3 Reconstruction

As with **restoration**, reconstruction also describes the conservation process applied to return an object to a previously known state. In this case, the main difference is the introduction of a significant amount of new material.

It should be borne in mind that spare parts to replace worn out components of historic objects may not be readily available. The manufacture of individual replacement components can be costly or impracticable and therefore caution should be exercised when planning **maintenance** which requires the use of replacement parts.

Sourcing original construction materials can be a considerable challenge since they may be scarce, no longer permissible or may require time-consuming manufacturing techniques. Alternatively, the use of modern technology can create parts more rapidly and economically than original techniques. New materials and innovative cost-effective techniques can enhance the integrity of an object. Objects that otherwise would only be

presented as historical remains, with limited understanding of how they looked or worked, can be reconstructed using retreatable and clearly-defined modern materials to present them in their complete **form**.

Reconstruction is often driven by the need to operate an object or where substantial loss of the object's **fabric** has reduced the effective **interpretation** and ability to demonstrate the significance of the object. It comes with considerable risk but also great benefits.

The main risk is that extensive reconstruction with inadequate evidence or lack of recording can result in an object of incoherent **historic state**. This can be confusing for the audience and can lead to misinterpretation of the history and operational capability of an object. Objects acquired in poor condition or objects that have been operating regularly over a long period of time, are at particular risk of losing integrity. If parts are simply discarded and replaced once they are worn out, the long-term outcome will inevitably be the creation of a replica.

However, reconstruction can be a powerful aid for interpretation and engagement and its use as a conservation process is legitimate under the right circumstances. For working objects, the reproduction of worn parts in a like-for-like manner helps to preserve traditional skills and ensure that elements of tacit knowledge that can only be acquired with practice and demonstration are passed on and preserved for the future.

Multi-format recording is a vital part of the process of reconstruction. A record can also be directly applied to the object to make the distinction between preserved fabric and new additions. Changes can be documented using a daily work diary, step-by-step photography or video footage, sketches and drawings. All records should be kept together in a safe and accessible place. Where records are in electronic format then ensure that future recovery programmes are available to allow access to the electronic content.

3.2.3.1 Case Study: 'Tom Tom' Vertical Fulling Stocks, late 19th Century

The 'Tom Tom' at the National Wool Museum Wales is a working textile finishing machine used to wash, shrink and thicken shawls. Three vertical plungers beat the cloth inside a slowly rotating barrel. This process gives the shawls a very soft feel particularly good for the nursing shawls used to carry babies in Welsh fashion.

Welsh woman wearing her baby in a traditional shawl, similar to those processed by 'Tom Tom'. Photo circa 1905.

Digging out the gear bearing.

The machine was named from the sound it makes when beating the cloth in the barrel and is the only working example in Wales.

The Industry Conservation Team at Amgueddfa Cymru was given the task of rebuilding and operating this unique textile machine. It presented a number of challenges in that it had been taken apart and not documented, working parts had not been lubricated since

© National Museum of Wales.

Positioning the new bearing and greasing system.

dismantling and were seized, and there was lack of knowledge of how to run the machine and operate it safely within modern regulations.

Through research via old photographs and interviews with local weavers, a plan for the reassembly of the machine was devised. The team spent many hours visiting the site to examine the working parts mechanically and formulating a plan to remove the main drive gear and replace it with a more efficient bearing with a remote greasing system. This involved digging the historic floor bearing out of two feet of concrete and building a new one from scratch. Further modifications were required to run the machine safely.

The project will enable the National Woollen Museum Wales to produce shawls from fleece to finished product all on the same site using historic machinery. It has highlighted the issues that need to be considered when operating historic machinery not only for demonstration purposes, but to undertake production work. During this process, rediscovered knowledge and skills can be passed onto the public, enhancing their experience within the museum.

© National Museum of Wales.

'Tom Tom' reassembled prior to its first run.

3.2.4 Adaptation

Adaptation describes all actions and activities involved in modifying an object in order for it to be suitable for a new **use** or to be safe to operate according to current safety standards. It is possible that such activities may result in loss of historic **fabric**. This

© Group 199 Volunteers.

Steam Pinnace 199 was built in 1911 and it is believed to be the last remaining operational naval picket boat. The Pinnace is part of the collection of the National Museum of Royal Navy. Between 2012-2015 and over 13,000 hours of work, volunteers completed a major refurbishment of the hull, replacing cracked beams and rotten timbers including a section of the keel, the hog and part of the stern. The boiler was re-tubed with all valves overhauled and all auxiliary machinery inspected and repaired. After completion in 2015, the project won the Icon Conservation Award for Volunteering in the Conservation of an Industrial Heritage Artefact, awarded by The Institution of Mechanical Engineers.

loss, however, may be justifiable if it is compensated by gains in the object's longevity; sometimes the survival of an object can only be ensured if it can be adapted to fulfil a useful new role.

Working objects usually require alterations and additions to ensure that they comply with modern health and safety regulations. Hazardous materials may have to be replaced with safer alternatives. Aircraft require rigorous structural testing to be airworthy. Steam locomotives cannot operate on the railway network without up-to-date safety equipment. These are just a few examples of the multitude of measures required by various regulatory bodies for the legal operation of working objects.

There are legitimate arguments for converting the power source of working exhibits to a more manageable or renewable source. A common example is the conversion of steam-operated machinery to run with compressed air as a means of cost-efficient **interpretation** of its **function**. A conversion of this kind can be beneficial for an engine in the long term as it can operate at a slower rate and with virtually no thermal stress. On the other hand, reversibility of the conversion might be challenging and the **maintenance** regime for the object may need to be altered, for example, by an increase of lubrication cycles or the application of an electric drive to formerly belt-driven machinery.

Adaptation should not aim to improve the performance of a working object (for example by replacing its engine with a more powerful one) or be simply for convenience. **Conservation** best practice should still be applied as far as possible even where extreme solutions are implemented.

Every decision needs careful consideration and it is useful to consult with third parties who may have encountered similar issues and managed to deal successfully with them - very often an impartial view can assist in developing a satisfactory solution.

3.2.4.1 Case Study: 1959 Crosslé Racing Car MKIII

Crosslé factory, car before restoration.

Crosslé car undergoing restoration in factory.

The Crosslé car was an early product of the company formed by John Crosslé who designed and built it and, in 1960, won the 1172 Championship of Ireland in it.

The car was acquired by the Ulster Folk and Transport Museum in the 1980s and kept in store for 25 years. A survey showed it to be substantially complete if somewhat worn out and neglected, and it was decided to return it to working condition for a new exhibition. This presented the museum with a unique opportunity to reunite the car with the person who designed and built it and record the entire process for posterity and as a result

the car was returned to the Crosslé Car Company in nearby Holywood, Co Down for refurbishment.

The project included inspection and refurbishment along with replacements and additions to ensure safe operation. All parts were dismantled to their individual components and inspected for damage and wear. The chassis had rusted and cracked at stress points near the gearbox and differential mountings. After repair, the chassis and wheels were sandblasted and checked again for cracks prior to painting. Axle and hubs were crack-tested using a penetrant coloured dye.

All brake pipes were replaced and brake pistons rebuilt using new seals and the system filled with non-hydroscopic brake fluid. Deteriorated tyres and inner tubes were replaced with new ones. Asbestos clutch and brake shoe linings were replaced with modern asbestos-free equivalent and a new aluminium petrol tank was fabricated. The prop shaft ran inside the bodywork beside the driver with only a light alloy guard covering it, but this was considered unsafe by today's standards, so a prop shaft protection cage was brazed in place and a curved aluminium sheet riveted over it. The resulting guard looks similar to the original but offers more protection in the event of prop shaft failure.

The Norton gearbox was fitted behind the driver's seat. Inspection showed that the seat back had been repaired a number of times as the chain-drive to the gearbox had worn holes through it. A more substantial replacement was made with heavier gauge material and the seat back slightly reshaped to lessen the chance of recurrence.

John Crosslé getting into car at Kirkistown race circuit.

John Crosslé in the car at Kirkistown race circuit.

A modern sealed battery is used when the car is operated, so that in the event of an accident there would be no chemical spill. A battery cut-out switch was added and a fire extinguisher is carried when the vehicle is in use.

Operation of the vehicle is subject to a risk assessment and the number of people allowed to drive it is restricted to a few museum and Crosslé staff with experience of driving similar cars. Driver safety has been improved by purchasing flameproof overalls, balaclava, gloves, boots and crash helmet to current motorsport safety standards.

Although the list of replacement and additional parts may seem substantial, samples of all old parts were retained. Much information was gained during restoration and public understanding of the car has been enhanced by its operation. Furthermore, it has allowed the museum to film the car being driven at historically significant venues and events by the car's maker, John Crosslé, and to produce a short documentary of the project, available on YouTube.

In 2015 the project was shortlisted for The Institution of Mechanical Engineers Award for the Conservation of an Industrial Heritage Artefact, recognising excellence in the conservation of operational or static examples of engineering.

3.3 Use of Replicas

A replica object is a copy based on information about a known type of object that no longer survives, or based on a historic example that survives but is too rare to use or incapable of operation. Replicas are constructed with varying degrees of accuracy in respect of their historic counterpart, depending on the availability of information, materials and funds, and the intended use and expected outcome.

A replica can be a faithful representation of a historic object and the product of painstaking research through archival material and the study of surviving **fabric**. Such **true replicas** are usually demanding in resources and many of them acquire historic status themselves, especially if their operation becomes part of the public consciousness.

More frequently, **operational replicas** can be used to demonstrate earlier manufacturing and working practices while meeting the requirements of current safety regulations. They can enable cost efficiencies through the introduction of modern manufacturing techniques and more readily available construction materials, and may even include subtle design changes to improve performance or **maintenance**.

When the historical record is incomplete, **hypothesis replicas** can be made to test theories based on archaeological and academic research. The use of hypothesis replicas can produce a great deal of information in many areas of **association** such as the manufacturing and operating practices of a historic period, the life of the operators and the social impact of a specific object type.

Replication can offer a satisfactory alternative when the risks associated with the **use** of a historic object outweigh the potential benefits. This can be the case in aircraft preservation where airworthy aircraft are in some cases complete replicas. This does not detract from the sensory and emotive experience that the casual observer can gain from the operation of the object.

The A1 Tornado is a new-built steam locomotive, completed in 2008 and owned by the A1 Steam Locomotive trust. It is considered to be the 50th Peppercorn A1, numbered next in the class after 60162, Saint Johnstoun, built in 1949. None of the 49 A1 Class locomotives produced in 1948-49, has survived and Tornado fills a gap in the classes of restored steam locomotives that used to operate on the East Coast Main Line. Tornado incorporates a number of safety improvements appropriate to operating on a modern rail network but otherwise is built to the original 1948 drawings and reproduces the renowned performance of the type whilst maintaining the sight, sound and smell of an original locomotive.

3.4 Traditional Skills

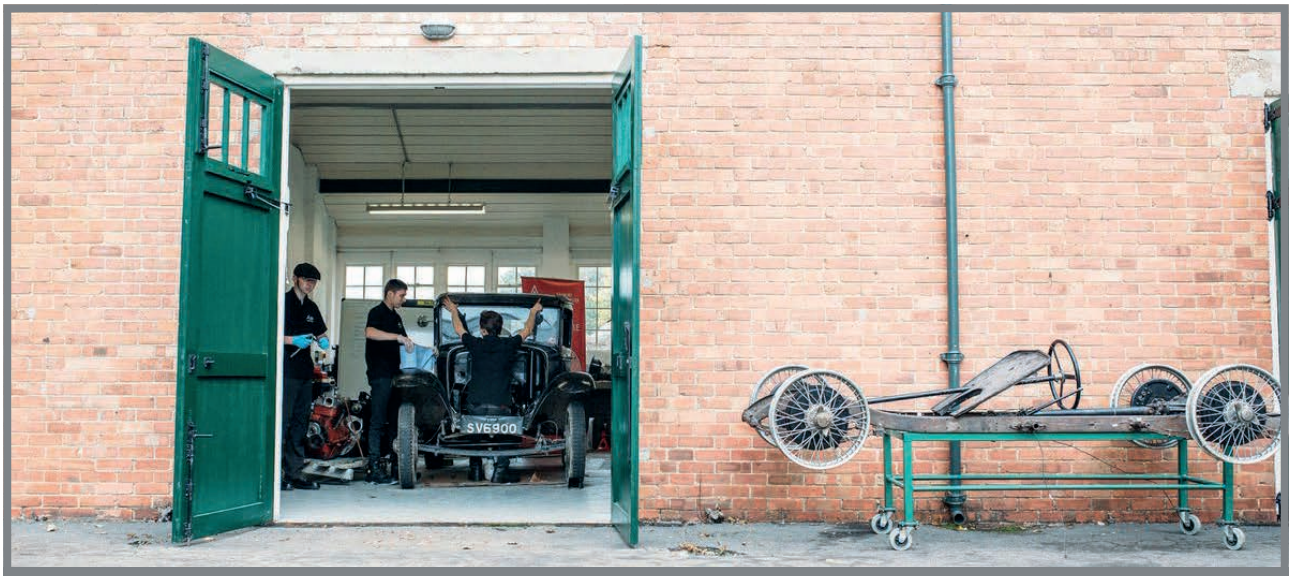
The **preservation** of traditional craft manufacturing skills and working practices is an important aspect of heritage preservation. The operation of working objects helps to promote and sustain traditional industries which in turn are essential in the provision of services and skilled personnel for their **maintenance**. **Reconstruction** and **replication** also play an important role in maintaining demand for traditional skills.

Schemes that promote learning and preservation of historic manufacturing practices, frequently funded by heritage grants, are supported by organisations and groups of various types, and each specialist sector should publish details of the key skills required and how they will be maintained. The following are examples where specialist training is being provided by special interest groups.

Sam Thompson pre-heating boiler tubes before removal on the steam coasting lighter VIC 56 (at Chatham) for Hatch Heritage and Steam Engineers, Swindon. Sam has completed a one-year foundation boilersmith course with Boiler and Engineering Skills Training Trust (BESTT), funded by the Heritage Lottery Fund (HLF) in 2015.

BESTT Trainees, Assessors and Trainers after a masterclass at North Yorkshire Moors Railway as part of their one-year boilersmith course funded by the Heritage Lottery Fund (HLF). BESTT is a partnership of steam heritage organisations representing railways, ships and traction engines and they have developed a range of training courses on boiler repair and mechanical overhaul of steam engines.

Emily Leese at the beginning of her four-year apprenticeship at the National Motor Museum, Beaulieu. Funding has generously been given by a small group of Beaulieu One Hundred members, committed to supporting the work of the National Motor Museum Trust. Additional support has been provided by an Automotive Apprentice Bursary from the Worshipful Company of Coachmakers and Coach Harness Makers of London, a charitable association which promotes excellence in the automotive, aerospace and rail industries. The training is overseen by apprenticeship provider Heritage Skills Academy, which specialises in enabling trainees to work towards industry-standard qualifications as part of its Heritage Engineering Apprenticeships programme, tailored to the specialist automotive restoration industry.



The Federation of British Historic Vehicle Clubs (FBHVC) is actively involved in the development and promotion of the Heritage Engineering Apprenticeship programme. Part of the Government's Trailblazer scheme, it encompasses vehicles, steam, marine and aviation, based on common training modules in the early years and more specialist training in the final year of apprenticeship.

4 Maintenance

The continuous protective care of an object, static or in operation, is probably the most important factor to make sure an object is kept in good condition and that the amount of wear is minimised. The fundamental principles of good maintenance are the same whatever the object:

- Every maintenance activity should be done according to the object's **maintenance plan**. The plan should describe in clear detail exactly what should be done at each maintenance interval to ensure consistency.
- Good maintenance practice requires regular routine inspections, critical in identifying wear of key components that may mean that the **cut-off point** in operation has been reached. The frequency should be proportionate to the amount of use.
- All maintenance activity should be recorded in a consistent style, and should include who did the work, when, and where the work was carried out (for objects that move around).
- All maintenance work should be carried out by people with the competence to do each task.
- Maintenance should be preceded by consulting operational records to check whether additional work may be required.

In some cases, components commonly found in working objects are the subject of statutory regulation which includes regular conduct and recording of maintenance. Examples are steam boilers (Pressure Systems Regulations), cranes and other lifting equipment (LOLER: Lifting Operations and Lifting Equipment Regulations) any machinery used for 'work' (PUWER: Provision and Use of Work Equipment Regulations) and flying aircraft. There are many others. Evidence of maintenance may also be required for insurance claims or litigation.

Relevant manufacturers' service schedules, where these exist, should be used in the preparation of a maintenance plan but will need considerable augmentation.

Headings for a maintenance plan could include:

- Refuelling – when, what to use, how much to use, safety precautions to be taken.
- Lubrication – where to lubricate, what to use and how often.
- Visual inspection – checking for signs of wear, cracking, loose fixings, scorched or blistering paint as signs of overheating, dampness as evidence of leakage.
- Replacement of consumables (see 4.3).
- Cleaning (see 4.2).
- Tyre pressures and wheel rotation (where appropriate).

4.1 Movement as a Preventive Measure

Where possible, objects with moving parts should be preserved in a state capable of partial or unpowered operation. Movement should be factored into the maintenance regime of mechanical objects (e.g. plant machinery) where there are benefits in doing so. For example:

- To allow distribution of loads and rotation of pressure points.
- To allow distribution of lubricants and anti-corrosive fluids through movement.
- To reduce the development of electrochemical corrosion between adjacent metal components.
- To reduce the development of flat spots on pneumatic and solid tyres by periodic rotation where wheels are not supported on axle stands.

4.2 Cleaning

Cleaning is an important part of a maintenance regime and the frequency and methodology should be part of the object's maintenance plan. Depending on the circumstances, cleaning may be described as:

- A **preventive conservation** measure to protect an object from further damage. For example, regular removal of dust will prevent surfaces from becoming encrusted over time due to the potentially corrosive, abrasive and absorbent nature of the dust.
- A maintenance activity required to keep a working object free from by-products of operation such as fumes, oil leaks, soot or smoke.
- A **remedial conservation** activity such as the removal of corrosion products using powered equipment or chemicals.
- A condition assessment, since regular cleaning helps to ensure that regular inspections of an object are made, enabling early detection of wear, damage, pests or vandalism.

Cleaning requires caution as it may cause damage if undertaken incorrectly. Too frequent cleaning can lead to increased wear or risk of damage. Dusting can scratch surfaces, stir up dust or disturb sensitive or hazardous surfaces. Use of solvents, detergents or water-based solutions may cause irreversible damage to surfaces. Therefore, specialist advice,

training and adoption of appropriate safety measures must be factored into a plan for effective cleaning practice.

4.3 Materials or Components with Limited Lifespan

With a few exceptions, most larger/working objects can be described as composite; consisting of many different parts and a variety of materials. Many of these parts would be considered consumables during the **working life** of an object and would be replaced at frequent intervals as part of their **maintenance**. To name a few examples, tubes in steam boilers, batteries, spark plugs and tyres in road vehicles, sails and rigging in historic vessels, doped fabric in early aircraft or upholstered interiors (particularly those made of synthetic materials such as latex or PVC) will all eventually need to be replaced to maintain the functionality of an object. Preventive measures can be applied to extend the lifespan of certain materials but ultimately their long-term preservation is in conflict with standard maintenance practice and operation. Where identified in the **conservation plan**, components of limited lifespan can be replaced to allow operation of the object as a whole and, if considered to be of historic interest in themselves, kept separately in appropriately controlled conditions.

Since the late 1970s, non-serviceable electronic components have been increasingly used in vehicles and other machines. Modern vehicles are equipped with engine control units, and their maintenance and operation are dependent on the availability of spare parts should they develop a fault. Such spare parts can become obsolete relatively quickly, thus increasing the challenges of preserving the functionality of contemporary vehicles. Proactive sourcing of components while they are still available can prolong the operational capability of contemporary vehicles, although it may become necessary to collect the diagnostic equipment associated with these too.

Historic seats from road vehicles in the London Transport Museum. Those sears are made with foam rubber padding with moquette covering. The foam has hardened over time to the extent that the seats can no longer be used, while the moquette in some cases, is very delicate. The Museum is exploring options that will allow preserving the historic material of the seats while allowing the occasional use of the vehicles that are still in roadworthy condition.

Seat from 1930 LT-type AEC double deck motor bus No LT165

Seat from 1939 TF-type Leyland single deck motor coach fleet No TF77

4.4 Maintenance of Certain Materials, Aspects and Object Types

There are a number of specialist organisations who provide detailed guidance on the proper care and operation of working vehicles and machinery:

The Heritage Railway Association (HRA) represents the majority of heritage and tourist railways, tramways and railway preservation groups in the UK and Ireland. The Association has published a series of guidance notes giving detailed information on the proper maintenance and operation of steam locomotives and boilers, which are available online.

The Office of Rail and Road (ORR) is the national regulatory body responsible for health and safety on the national railway network and on heritage railways over 350mm in gauge across Britain. ORR produces guidance on the management arrangements that are expected of those undertaking railway operations, including topics such as competence and risk assessment.

The National Traction Engine Trust (NTET) is the advisory body for owners and drivers of all kinds of steam traction engines. The NTET Engine Owner's Codes of Practice are available on the NTET website and give useful guidance on all aspects of maintenance and operation of traction engines, portable engines and similar vehicles.

The primary specialist organisations for the care and operation of historic vehicles are the Federation of British Historic Vehicle Clubs (FBHVC) and the Federation Internationale Vehicules Anciens (FIVA).

Air Publications (APs) and Tech Orders (TOs for US military aircraft) are made available through national museums or specialist technical documentation websites.

The following is a more general list of common issues related to the maintenance of larger and working objects; but is by no means a definitive list. Working machinery and vehicles can be maintained in a temporary inoperable state ('mothballing' or laying up) while preserving all their functions for scheduled operation. This approach can promote the preservation of historic materials while future operation is not compromised.

- Vehicle frame and suspension. Underbody areas should be properly cleaned to remove salt residues or corrosion, and moisture should be displaced with organic solvents before being treated with commercially-available protective materials (usually formulations of wax, organic solvents and corrosion inhibitors).
- Hinges and mechanical junctions. These should be lubricated regularly and excess lubricant wiped from adjacent surfaces.
- Wooden car, coach and carriage bodies. Environmental control is critical for the correct maintenance of wood. Excessive humidity can lead to mould growth and dry rot while dry conditions will cause shrinkage and cracking of wooden panels. Wood should be regularly monitored for evidence of pest activity (wood boring insects). Exposed wooden surfaces should be dusted and protected with a wax-based product. Removal of stains, rust marks or mould usually requires specialist treatment.
- Painted Surfaces. Paintwork can be washed with a mild conservation grade detergent and minimum amount of water. Once dried, surfaces can be protected with a wax-based product. Surfaces that have developed delamination or paint loss usually require specialist treatment.

- Polished or plated metalwork. Polishing should be carried out with caution and with low-abrasive products free from harmful chemicals. Polished surfaces can be lacquered or waxed to reduce the need for recurring polishing although all protective coatings will have to be reapplied at some point. Corroded surfaces will require conservation treatment (by chemical or mechanical means) before any protection is applied.
- Interiors. Sensitive materials can be protected by keeping light levels low and careful cleaning using vacuum cleaners with padded nozzles and soft bristle brushes. Wet or solvent cleaning methods should be avoided, while degraded materials such as PVC, leather or latex will require specialist treatment. Interiors should be regularly monitored for evidence of pest activity (e.g. moths, rodents).
- Grease fittings and oilers should be cleaned and regreased with synthetic grease or heavy oil, as appropriate, at scheduled intervals
- Gearbox and axles. Old oil should be drained and the gearbox should be refilled with synthetic gear oil. Once a year, the oil can be redistributed by manually rotating a drive wheel while a second person is going through the transmission gears. Automatic transmissions require drainage and refilling with fresh fluid. Air vents should be sealed off to keep out moisture.
- When running an engine, it is important to follow a structured re-commissioning procedure and avoid running the engine for only a short period of time. Engines should be started in a warm environment, run for long enough to achieve full working temperature and stopped in a dehumidified environment wherever possible. This process helps prevent corrosion inside the cylinders that can otherwise can cause severe damage to the engine.
- Hydraulic systems, particularly those whose job it is to support an object (e.g. aircraft undercarriages) need regular attention and topping up, and inspection for leakage. It is worth considering secondary support to take at least some of the load off such systems.
- Road tyres. If possible, tyres should be kept off the ground with the use of axle stands. They should remain inflated at low pressure to retain their shape and away from ultraviolet light. Inflation with nitrogen can slow internal degradation. If axle stands are not permitted, tyres should be kept slightly over inflated and rolled a quarter turn every two months to prevent development of flat spots.
- Historic batteries should be removed, drained and neutralised for static display. Replacement modern batteries should be kept maintained and charged separately from the object.
- Vehicle braking systems. Whether compressed air, hydraulic or mechanically operated, braking systems require close inspection and regular maintenance before any vehicle is placed in service. DOT-3 and DOT-4 specification fluids should be drained and replaced with new fluid where required. Although hygroscopic in nature, new fluid should not be contaminated by water and a properly sealed system should not allow the absorption of atmospheric water. Suitable rubber brake grease can be used under operating cylinder dust covers to improve sealing.
- Electrical components and gauges. Close attention needs to be paid to cable terminations and cable runs where they pass close to moving components. Electrical warning, braking and stopping circuits should be checked closely before operation of the item they protect. Gauges should be checked regularly for accuracy of reading.

4.5 Sources of Further Guidance

Aircraft

- Mikesh, Robert C, *Restoring Museum Aircraft*, (Ramsbury: The Crowood Press Ltd, 1997).
- *Stopping the Rot*, Conference proceedings, British Aviation Preservation Council, 1990-2012.

Clocks

- Betts, Jonathan, *Problems in the Conservation of Clocks and Watches*, The Conservator, Vol. 9, 1985- Issue 1, pp. 36-44.
- McKay, Chris, *The Maintenance, Repair, Restoration, Conservation and Preservation of Turret Clocks* (CreateSpace, 2016).

Historic Machinery

- Hallam, John, "Conservation and Storage: Machinery", in *Manual of Curatorship, A Guide to Museum Practice*, ed. by Thompson, M. A., John (Oxford; Boston: Butterworth-Heinemann, 1992).
- *Safe in the Shed, Caring for Historic Farm Machinery*, The New South Wales Office of Environment and Heritage, 2001. Retrieved from **www.environment.nsw.gov.au**
- Wallis, Geoffrey, *Keeping the Wheels Turning*, The Building Conservation Directory 2006. Retrieved from **www.buildingconservation.com**

Historic Vessels

- *Conserving Historic Vessels: Understanding Historic Vessels Volume 3* (London, National Historic Ships, 2010).

Motor Vehicles

- Collum, Mark, *The Care and Preservation of Historic Motorised Vehicles*, Benson Ford Research Centre, 2016. Retrieved from **www.thehenryford.org**
- *Guidance Note on the Operation of Free Bus Services*, National Association of Road Transport Museums – Issue 5, April 2015.
- Hallam, David, Thurrowgood David, and Ogilvie, Col. *Corrosion, Wear and Corrosive Wear; The Story of Lubrication Systems in Large Technology Object Storage and Use*. In unpublished proceedings of Big Stuff conference, Australian War Memorial, Canberra, Australia, 2004. Retrieved from **bigstuff.omeka.net**
- *The Charter of Turin*, Federation Internationale Vehicules Anciens (FIVA), 2016. Retrieved from **www.fiva.org**
- Ware, E., Michael, *Restoration of Motor Cars*, Yearbook of the International Association of Transport Museums 1980, 7, pp. 21-34. Conference at Smithsonian Institution, Washington, USA, 20-24 October 1980.

Steam boilers

- *Engine Owner's Code of Practice*, National Traction Engine Trust, 3rd Edition, 2007. Retrieved from **www.ntet.co.uk**
- L122-*Approved Code of Practice and guidance, Safety of Pressure Systems* (Second Edition) - Health and Safety Executive, 2014. Retrieved from **www.hse.gov.uk**
- The HRA Guidance Note, HGR-B9000-Is01 – Steam Locomotive Boilers – Introduction and the further 25 guidance notes to which it refers. Retrieved from **www.hra.uk.com**

Tramcars

- *Tramcar Maintenance and Commissioning Examination Records*, The National Tramway Museum, Crich.

5 Documentation and Record-Keeping

Documentation and record-keeping is important, even for private collectors (where it can help to meet legal and insurance requirements). These records ensure that a full history of the object, throughout its existence, is available for use when displaying or demonstrating the item or when transferring it to a new owner.

Original and subsequent documentation relating to an object, e.g. plans, drawings, manuals and instructions, should be treated as an essential part of the object's history and considered as archive material in their own right. Working copies will be needed by those repairing, maintaining and operating the object but the originals should be preserved separately for future reference.

In addition to the records generated about the object by the current and recent owners (i.e. since the object was preserved), it is equally important to gather and care for past records, which help us to understand what has happened to it from the moment of conception to the present. Examples might be past logbooks and service records for motor vehicles, railway company workshop, boiler repair and mileage records, correspondence, magazine articles and press cuttings, all of which can be hugely helpful in forming a picture of an object's past.

Records may also be required for statutory purposes in some cases, for example, recording items that contain asbestos or radioactive substances.

The Collections Trust's collection management standard, Spectrum, is for museums of any size and applicable to any collection and may also be useful to other groups and individuals with collections of historic objects. Spectrum is free to download and use non-commercially.

Spectrum provides tried-and-tested advice on documenting the things most museums do when managing their collections, including regular activities (such as moving objects around and updating location records) or occasional ones (like updating insurance cover). These activities are covered by 21 procedures in Spectrum. Museums which are part of the Arts Council England Accreditation scheme (see chapter Accreditation and Good Practice), are expected to follow the Spectrum standard and must meet its nine primary procedures as a minimum. These primary procedures with corresponding documentation for Larger/ Working objects are listed below.

PROCEDURE	EXAMPLE DOCUMENTATION
1. Object entry (Used to log all objects coming into your care, including by purchase, gift or loan)	Correspondence, photographs, receipts, previous ownership records, MOT and other certification, loan agreements, contact details, manufacturers' archives, records of marque/enthusiast societies
2. Acquisition and accessioning (Transfer of ownership)	Title deed, vehicle registration document, purchase invoice, receipts, correspondence relating to the transfer of ownership, asset register or inventory.
3. Location and movement control (Recording where your objects are and how they got there)	Transport contracts, journey plans, agreements. Risk assessments, insurance information. Photographs of object in situ Information about the locations and transport companies used.
4. Inventory (The maintenance of an inventory of up-to-date information accounting for and locating all objects for which you have a legal responsibility)	A ledger and/or spreadsheet or database listing every object, giving a unique identifying number, description of the object, valuation, location and any other information about the object.
5. Cataloguing (A catalogue system that allows you to record information needed for the Inventory procedure)	Catalogue information can be held in a series of individual records: – in a computerised database; – on pre-printed catalogue cards; – on loose-leaf sheets, which are filed numerically.
6. Object exit (A record of when objects leave your premises)	Correspondence, condition reports, collection receipt, dispatch note, exit form, photographs of the object leaving your premises and in new location.
7. Loans in (Records of all the objects you have borrowed)	Written loan/hire agreement, insurance cover notes and policy information, photographs of the objects on your premises, records of the condition of the object on receipt and of the environment in your premises during the loan.
8. Loans out (Ensuring that proper arrangements are in place if you agree to lend an object to a third party)	Signed loan agreement, contract, correspondence, insurance and indemnity certificates provided by borrower, condition reports, photographs, copies of any publicity/interpretation/information associated with the loan.
9. Documentation planning (Ensuring that your documentation and record-keeping processes remain fit for purpose)	Plan detailing your recording system and outlining what actions are needed to bring your records up-to-date.

The documentation for working objects should also include the following:

- Significance statement
- Conservation plan (for an individual object, or for a collection of similar type of objects)
- Treatment records
- Operating manual/maintenance plan
- Operating log

All documents should be kept together in an object file, along with any other relevant information including photographic evidence, drawings and other documents. The object file is usually physical as it may also contain original manuals and related records. Digital records can be printed and added to an object file; or a digital copy of the object file can also be created and stored.

The body of information relating to objects and collections is a valuable asset and as such, is worth looking after as rigorously as the object itself. The information should be stored in a safe and stable environment so that it remains in good condition and filed carefully for easy retrieval. Electronic files should be regularly backed up and paper documents should ideally be stored in a fire-resistant cabinet.

Colleagues, family members, or members of special interest groups relating to the object should be notified of the location of the records as appropriate, so that they can access collection information if required.

5.1 Sources of Further Guidance

- Arts Council England UK Museum Accreditation Scheme guidance, **www.artscouncil.org.uk**
- *Spectrum 5.0*, Collections Trust, **collectionstrust.org.uk**

6 Understanding the Environment

The environment in which objects are kept can have a significant effect on their condition and therefore needs to be managed as effectively as possible. In this context, the environment consists of a complex combination of light, temperature, humidity, pollution and pests.

The variety of materials, such as drawings and other documents, which may be associated with larger and working objects also require an appropriate environment for their long-term care and future access.

The primary aim is to identify the environmental conditions in the storage or display area and to understand the ideal conditions for the particular object type, and to match the two as closely as possible. More specifically:

- Temperature and relative humidity (the percentage of moisture the air can hold) should be regularly measured.
- Light falling on light-sensitive objects should be regularly measured.
- Buildings housing objects should be properly maintained.
- Objects should be housed under cover where at all possible and stored outside as a last resort only.
- Ideally only the most robust objects should remain permanently in the open. Even objects that are designed to work in all weathers will deteriorate more rapidly when kept outside.

6.1 Environmental Monitoring

'Monitoring' is the term used for the regular measurement of the important parameters of temperature, relative humidity and light to plan how to control the environment and protect objects from harm. A good record of the environmental conditions surrounding an object or collection is the best aid to enabling effective control. Measuring the environment can be carried out as follows:

- Temperature and relative humidity can be measured with:

Mechanical devices (whirling hygrometer and thermohygrographs). These instruments can offer accurate readings if used and calibrated properly, although their use has been largely superseded by electronic devices.

Electronic data-loggers. Remote sensors placed around the building can record and send results back to a central computer or handheld devices can take spot readings.

- Light can be recorded with:

A light meter measuring light intensity (lux).

An ultraviolet (UV) light meter.

Multifunctional handheld data logging devices that can record all of the environmental factors are commercially available and can be a cost-effective solution for an individual or small organisation.

Monitoring equipment, mechanical or electronic, should be calibrated according to the manufacturer's specification and calibration logs should be kept together with the recorded environmental readings.

Data gathered from monitoring over at least one year (all seasons) should result in an accurate assessment of the environmental conditions surrounding the object. This assessment can then be used to determine the need for environmental control measures.

6.2 Temperature and Humidity

There is no ideal set of conditions for larger and working objects since they are invariably made up of a mixture of different materials, each of which responds differently to temperature and humidity. Recommended levels of temperature and humidity may be found in published sources but they should be used with caution since objects made of organic materials such as wood or leather can become acclimatised to their existing environmental conditions, and attempts to `correct' the conditions to a theoretical ideal could do more harm than good.

Changes in temperature and humidity can cause expansion, contraction, absorption of water or drying out, all of which create stresses in the object leading to damage and decay. It is important to maintain stable conditions to reduce the likelihood of these potential shocks to the object.

6.3 Light

Both natural and artificial light can cause change and damage to all kinds of objects. Exposure to light can cause paints to fade and lose their protective properties, wood to discolour, other organic materials and plastics to become brittle or weak. If temperature and humidity conditions are favourable, light may promote the growth of algae.

The effects of light on objects depends on:

- The nature of the light (e.g. daylight, tungsten lamps).
- The intensity of the light reaching the object.
- The duration of the exposure.

These three parameters should be carefully monitored and solutions sought which minimise their damaging effects.

It is important to bear in mind that objects which appear not to be light-sensitive may be vulnerable to the effects of heat which can be emitted by some light sources.

There are a number of ways in which light can be controlled:

- Automatic electronic controls balancing daylight and artificial light, although these are expensive and not always appropriate in traditional and domestic buildings.
- Curtains, blinds, screens and opaque dust sheets to block or reduce light are the simplest and most cost-effective methods.
- Background lighting can be reduced by using spotlighting for key areas, lighting controlled by movement sensors or push-type time-delay switches which are operated by people but which switch off automatically.
- Special UV filters, film and varnishes for windows and lamps can be used to control ultraviolet light but degrade over time and should be regularly checked and replaced when necessary.
- LED technology is a viable alternative to conventional lighting (e.g. halogen, fluorescent tubes, tungsten) which delivers no UV exposure and limited heat production.

6.4 Pollution

Working objects themselves may produce pollutants which can be damaging. For example, steam locomotives produce smoke, soot, ash and dust, which can be abrasive and corrosive. Many types of engines can produce oil leakages which can pollute ground and water courses. There are also many less obvious pollution dangers created by materials and equipment used within the building environment, such as ammonia in floor cleaning preparations and ozone produced by photocopiers and laser printers. Building and decorating materials emit particles, such as sawdust and brick dust, and vapours, such as ammonia and water, especially when newly applied. The best way to address this is to maintain a regime of regular cleaning and good housekeeping, but the surfaces of objects may be protected from pollutants with microporous sealants, which exclude the dust while allowing the surface of the object to breathe.

Display and storage materials can be tested for possible harmful effects – for example, manufactured boards, natural fibres such as wool felt, fire-retardant coatings, recently-applied adhesives, cleaning materials and some hardwoods such as oak can give off potentially harmful gases and organic vapours. Inert conservation grade materials are available from specialist suppliers.

Air quality can be tested for harmful pollutants which might be damaging to both people and objects.

6.5 The Impact of People

One of the most damaging factors for historic objects is the interaction of people with them. People produce heat and moisture as a result of breathing and normal metabolism and they also bring in dirt, dust, organic particles, and vapours from everyday products. Over time, the accumulation of these can cause direct or indirect damage. The opening and closing of doors and windows as people enter and leave can introduce changes in temperature and humidity and allow the ingress of pollutants and pests. The regular handling of objects can lead to the risk of damage from dropping, abrasion or chemical damage from dirt and fluids on fingers.

However, access to objects for users, researchers, visitors and staff is essential and therefore it is useful to put simple measures in place to mitigate against some of these effects.

These might include:

- The restriction of access to storage areas and to delicate vehicle interiors.
- Air locks or draught curtains on doors.
- The use of gloves for handling metal objects.
- The prohibition of cooking or eating food in the vicinity of the object.
- The restriction of access for equipment, bags and coats.
- Explaining to visitors that care should be taken and why, giving them an understanding of the need to care for historic objects and involving them in the conservation process.

6.6 Buildings

The best protection from the environment is the building, which shelters objects from the weather and provides security from human damage. The buffering effect is improved even more if walls, roofs and other structural elements are well insulated and maintained. The environment in existing buildings can be improved quite effectively at relatively low cost with the introduction of draught-proofing, thermal insulation and multiple glazing although care should be taken not to exclude ventilation or add flammable materials.

The space requirements of larger and working objects can result in them being accommodated in less than ideal buildings. Where multiple spaces are available it is sensible to house the most significant or the most sensitive objects in the areas with the most favourable conditions, with the more robust objects stored where the environment is less favourable.

The environment should be monitored regularly and any changes to the condition of an object observed so that it can be moved into a more appropriate space should deterioration be noticed. Creating zones within these spaces may make it possible to control the environment in areas where more vulnerable objects are housed, rather than trying to control the whole building.

Buildings offer the best environmental protection when they are well maintained and operate effectively. Building services – heating, lighting, ventilation, water and power supplies – should be regularly serviced and efficiently used. Buildings themselves may present hazards which impact on the ability to work on or visit the objects they contain. A common issue is the presence of hazardous substances in the fabric of the building or enclosure. Specific restrictions may apply due to legislative requirements, such as the Control of Asbestos Regulations 2012.

Concorde 'Alpha Foxtrot' being moved into a specially built hangar, at Aerospace Bristol. The hangar was constructed with a movable end wall in order to allow this large aircraft to be placed inside.

6.7 Objects Kept Outside

Many owners choose to house large and robust objects outdoors. This may be because the object was acquired in anticipation of resources being available to provide suitable protection indoors, or the object might be considered suitable for outdoor display, for the time being at least. Whatever the reason, some basic preventive measures will help reduce the rate of deterioration by:

- Providing a well-drained site.
- Constructing a simple base-pad of concrete, gravel or stone that can support the weight of the object and keep it from contact with damp soil.
- Providing a temporary cover if possible, such as a tarpaulin or reinforced plastic sheet fastened over a scaffolding framework. This is only really suitable as a temporary solution while better measures are identified and implemented.
- Protecting areas where rainwater may collect.
- Blocking openings where rubbish may collect or which may offer a home for birds, rodents or other creatures.
- Mounting machinery on concrete blocks or treated wood such as old railway sleepers to lift it off the ground, cushioning the contact points with wood or rubber.
- Raising vehicles with wooden wheels or rubber tyres on axle stands.
- Keeping all moving parts oiled.
- Coating the object with a protective wax, such as those developed for the protection of military or agricultural equipment.
- Keeping sump oil fresh while ensuring that old oil is disposed of correctly.
- Coating internal parts by occasionally turning over the mechanism if possible.
- Ensuring that internal spaces with moving parts are air-tight and protected with vapour phase inhibiting oils.
- Protecting or removing absorbent material such as upholstery or lagging, making sure that any parts removed are labelled and recorded in the object file and location records. Note that some forms of lagging, such as asbestos, can be hazardous. This should be checked prior to removing any material.
- Removing to a secure place objects or components that might be attractive to vandals or opportunist thieves, particularly non-ferrous metal items such as identification plates, brightwork, decorative elements, gauges, knobs. If required, polymer replicas can be made to look like brass/bronze so as not to detract from the appearance of, or information provided by, the object.
- Removing coal, wood or the remains of other fuels or cargo.
- Labelling the object with warning of hazards which may be present.
- Marking objects, or metal parts thereof, that are liable to theft using an asset marking system.

It is not possible to prevent the deterioration of objects housed outdoors but these measures, combined with a programme of regular inspection and maintenance, offer the best option for robust objects if satisfactory indoor storage is not possible.

© Canal & River Trust.

Components from historic vessels stored clear of the floor in the stores of the National Waterways Museum.

© Canal & River Trust.

An Engine stored on damp floor prior to the storage improvements at the National Waterways Museum in 2017.

© Canal & River Trust.

Components of a hydraulic warehouse hoist stored outdoors prior to the storage improvements at the National Waterways Museum in 2017.

© Canal & River Trust.

Outdoor storage of the boiler from the grab dredger Perseverance, prior to the storage improvements at the Museum.

© Canal & River Trust.

Boats previously displayed in the Upper Basin in poor condition due to environmental factors, National Waterways Museum 2017.

© Peter Meehan, ACR.

Wheal Martyn Museum's mobile crane before conservation, viewed from the jib end. The crane, once conserved, will be displayed in the open, alongside other historic objects relating to the china clay industry. The conservation treatment, overseen by a metalwork conservator and undertaken by volunteers, has been designed to provide the appropriate level of protection to the crane, allowing for its continued outdoor display. It will be inspected and maintained regularly by Wheal Martyn's staff and volunteers, in order to ensure that any signs of deterioration are spotted and treated immediately. There will be no time limit placed on its ongoing display.

6.8 Housekeeping and Pest Control

Poor environment and housekeeping can lead to infestations by a variety of pests, including rodents, feral cats, birds, moths and other insect pests, fungi, algae and bacteria. A pest control strategy should be put in place to eliminate any causes of potential infestation.

The elements of a successful pest control strategy are:

- Good housekeeping practice, including regular cleaning programmes, removal of rubbish and general tidiness.
- Regular inspection of the building for signs of pests supplemented with a trapping programme.
- The inspection and potential quarantine of all incoming objects and associated packing materials.
- Rapid response to any infestations which should be undertaken or supervised by trained and experienced people. Many traditional pesticides are now regarded as unsafe, and are being replaced by safer alternatives such as freezing. The use and storage of hazardous chemicals is governed by law, so it is advisable to employ specialist contractors for the eradication of pests.

6.9 Sources of Further Guidance

- BSI PAS 198:2012 *Specification for Managing Environmental Conditions for Cultural Collections* (London: British Standards Institution, 2012).
- BSI PD 5454:2012 *Guide for the Storage and Exhibition of Archival Materials* (London: British Standards Institution, 2012).
- *The National Trust Manual of Housekeeping* (National Trust, 2011).

7 Health and Safety

Large objects can present many dangers in terms of their size, weight and materials. Working objects can greatly increase the range of potential hazards. Organisations or individuals with collections accessible to the public have a duty of care to their staff and visitors, and attitudes towards safety should be equivalent to that of their industrial counterparts.

- An organisation must comply with both the letter and the spirit of all legislation designed to protect the health and safety of people on site.
- A safety policy covering all aspects of the organisation's work should be produced.
- All staff and volunteers should receive regular training in health and safety, and be fully familiar with the organisation's safety policy.
- If objects are operated, the safety policy should set out arrangements for dealing with any hazards likely to arise from their operation.
- All working objects should comply with all relevant statutory requirements.
- Objects should only be operated by designated personnel fully trained in safety and operating procedures.

The safety policy will apply equally to the wellbeing of the public, visitors, staff and volunteers. The safety policy, which must be regularly reviewed, should make at least minimum provision for the following:

- The identification and monitoring of actual and potential hazards associated with both existing objects and new acquisitions, including incoming loans, and the maintenance of registers for asbestos and other hazardous materials.
- The adoption of practices and measures that eliminate or reduce identified hazards.
- Safety information for public and staff, including the labelling of hazards.
- Safety equipment and appropriate protective clothing for staff and volunteers.
- Sufficient first aid materials and first aid training for designated members of staff.
- Measures to deal with general emergencies (such as fire evacuation procedures).
- Measures to deal with types of emergency specific to the collection (e.g. a derailment on a preserved railway, or a capsized boat).
- Appropriate training for staff and volunteers in safety procedures and the safety policy itself.

© Bristol Aero Collection Trust.

The Bristol Type 173 twin rotor helicopter wrapped in protective material and lifted by two cranes, arrives at Aerospace Bristol.

There are many types of potential hazards, including unsafe or unstable mountings and supports, dangerous substances (such as asbestos, heavy metals, polychlorinated biphenyls (PCBs), solvents and chemicals, lead-based paints, radioactive substances including luminous paint), and high voltages in electrical or electronic equipment.

Other safety risks are access related such as the provision of handrails, fences and adequate lighting. Effective safety management is necessary, e.g. first aid training for staff or volunteers is good practice, but its value depends on whether a qualified first aider is on duty at all times.

The safety policy should include information about hazardous substances including risk and COSHH assessments with specific mention of accidental release and first aid measures. Hazardous chemicals and other dangerous substances must be removed unless their presence is essential or removal is impractical. Hazardous waste must be disposed of according to the legal requirements set by the Health and Safety Executive (HSE) and with the use of licensed companies. Hazardous substances that cannot be removed must be clearly labelled and managed.

7.1 Working Objects

Moving machinery is an obvious danger: crane jibs, tank turrets, working locomotives or road vehicles, textile machinery and other large or heavy items in motion can cause serious injury or death. A further problem is that historic machinery was often designed and built with scant regard for safety, at least by modern standards: exposed drive belts, gearing and reciprocating parts are common. Care should be taken to ensure that ropes, cables and other moving parts of objects do not damage adjacent objects or cause harm to people.

The safety of working objects in a collection depends on:

- Fully specified and documented working procedures.
- The organisations own comprehensive and regularly reviewed safety policy.
- Compliance with all relevant legal requirements.
- Safe operation by trained operatives, whose competence is tested and reviewed regularly.
- Keeping visitors away from potentially hazardous operations, using fences, guards and distance.
- Careful management of people riding on, and moving in, the vicinity of items such as historic vehicles, fairground rides, agricultural machinery.
- The careful management of visitors in hazardous surroundings, including the provision of personal protective equipment (PPE) where necessary.

The safety policy should include a code of practice for each (or each type of) working object in the collection. This will specify how the object is to be operated, and who will operate it - either stating named individuals or detailing the training and experience of approved operators. Some operators (such as drivers and pilots) must hold appropriate licences. Any necessary emergency drills or evacuation procedures should be included in the code of practice.

Older road or agricultural machinery may be animal-powered. An animal such as a draught horse may be slow-moving in normal circumstances, but this does not mean that visitors can be allowed unrestricted access. Only trained staff should handle animals, e.g. horses harnessed to agricultural machinery. Animals can be unpredictable, especially if they are unfamiliar with their surrounding environment. Animals may be essential for the demonstration of animal-powered vehicles or machinery but it must be recognised that they can cause severe damage to the object, quite apart from the danger they can present to people.

Finally, it is worth mentioning the necessity of adequate insurance to cover the full range of risks, including third party and public liability, associated with the site.

7.2 Legislation

Caring for larger objects, and working objects in particular, is subject to a significant amount of legislation, mostly concerned with safety. Among the most important pieces of statute law are:

- Control of Asbestos Regulations 2012.
- Control of Substances Hazardous to Health 2002 (COSHH).
- Environmental Protection Act 1990.
- Factories Acts 1961.
- Health and Safety (General Provisions) Regulations 1992.
- Health and Safety at Work Act 1974 (HSWA).
- Lifting Operations and Lifting Equipment Regulations 1998 (LOLER).
- Management of Health and Safety at Work (Amendment) Regulations 1994.

- Manual Handling Operations Regulations 1992 as amended (MHOR).
- Offices, Shops and Railway Premises Act 1963.
- Personal Protective Equipment at Work Regulations 1992.
- Registration, Evaluation, Authorisation and Restriction of Chemicals 2006 (REACH).
- REACH exemption certificates:

Museum sector 13/02/2015. To enable the 'placing on the market' of artefacts that contain asbestos for exhibitions etc.

Heritage vehicles 23/12/2015. To enable the 'placing on the market' of heritage vehicles that contain asbestos.

- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR).
- Road Traffic Act 1988.
- The Construction (Design and Management) Regulations 2015.
- The Control of Pesticides Regulations 1986, as amended 1997 (COPR).
- The Health and Safety (Safety Signs and Signals) Regulations 1996.
- The Provision and Use of Work Equipment Regulations 1998 (PUWER).
- The Railways and Other Guided Transport Systems (Safety) Regulations 2006 as amended October 2014 (ROGS).
- The Road Vehicles (Registration and Licensing) Regulations 2002.
- Transport and Works Act 1992.
- Workplace (Health, Safety and Welfare) Regulations 1992.

7.3 Sources of Further Guidance

- The Health and Safety Commission and the HSE publish a great deal of information which is of interest to collection managers. Many publications are available free of charge from the HSE website **www.hse.gov.uk**.
- Heritage groups and sector bodies often offer specialist safety guidelines, for example, the National Traction Engine Trust publishes a code of practice on the safe management of traction engine rallies, while the Heritage Railway Association (HRA) provide a series of Guidance Notes on operating and safety matters for all heritage railways.
- Local authority environment officers may be able to help with contact names for local experts in hazardous chemicals, and the local Waste Regulation Authority will offer advice on the disposal of hazardous materials.

8 Emergency Planning

An important element of collections care is to ensure that objects are protected from major events which have the potential to damage or completely destroy collections, individual objects and/or all the associated records and evidence. For example, a major fire could reduce a collection to ashes and place it beyond the reach of remedial conservation.

The most common such disasters are fire, flood, vandalism and theft.

When devising an emergency plan for a collection of larger or working objects, the three key objectives should be:

- Safety of people.
- Prevention of damage.
- Minimising damage.

The safety of people is of paramount importance and is laid down by law. No matter how valuable or rare an object is, its recovery during an emergency must never jeopardise the life or health of the people involved.

Although it is impossible to completely avoid any risk or natural phenomena, many disasters can be averted by effective planning for prevention of damage, including:

- Identifying and remedying potential vulnerabilities in the storage facility and surrounding environment such as weak security areas or susceptibility to flooding.
- Establishing and following procedures that will reduce risks associated with unauthorised access, fire, demonstrations in public and operation of historic objects. In many cases, lapses in procedure or poor organisational culture can escalate to a disaster that could have been otherwise avoided.
- Identifying areas of concern specific to the object or collection. For example, a large object in store or display may be impossible to move at short notice and without specialist equipment. Therefore, knowing in advance how to move something can be crucial during an emergency.

Emergency planning includes steps to minimise damage such as:

- Knowing what is in the collection and where it is located can speed up removal or recovery and help to prioritise actions according to object or collection significance.
- Knowing the location of hazardous materials in the collection that can cause exposure or contamination during an emergency. This type of information will need to be communicated to the emergency services and may accelerate the recovery process.
- Developing contacts that can help during an emergency by providing specialist equipment, temporary storage space or logistical help. Being a member of a wider network can be crucial during an emergency as others might be able to offer help and advice.
- Having an up-to-date contact list including emergency services, specialist haulage or salvage or conservation contractors, suppliers and insurers.
- Ensuring that adequate training is in place for all staff and volunteers working with and operating machinery.

8.1 Fire

Fire is potentially the most dangerous emergency, for both collections and people. Fire safety is founded upon effective fire prevention measures - not letting fires start is the best way to ensure the safety of people and the collection.

The most crucial aspect of fire prevention is the identification of fire risks. It is important to identify both actual and potential sources of ignition in the presence of combustible materials and fire-supporting oxygen. Not all ignition sources are immediately obvious - fires can be lit by sparks from short circuits or high-voltage discharges, heat from seized bearings, burnt-out electric motors, exposed exhaust pipes, by embers and cinders in steam engine exhausts and ash pans, by sunlight focused through glasses and lenses, by chemical reactions, and so on.

Working with local fire station staff can ensure that they know the nature and location of the collection and understand the risks will ensure that they can react appropriately in an emergency.

8.1.1 Common fire risks associated with larger & working objects

Larger and working objects can introduce additional fire risks and a documented assessment of potential hazards associated with an object following guidance by HSE and other relevant bodies should form part of the formal process of acquisition. This will identify the necessary controls that must be applied at the different stages in the lifecycle of the object. In most cases, these risks can be substantially reduced by careful management, maintenance and operating procedures.

8.1.1.1 Steam-powered vehicles

- An engine in steam should never be left unattended or without appropriate controls identified and implemented.
- Spark arrestors should be installed and should be regularly checked and cleaned, where risk from operation is assessed as high and where fitting does not prejudice historical accuracy or integrity.
- Ash pans should be regularly cleaned and kept in good condition.
- Drivers must take extreme care when operating near dry vegetation, thatched or wooden buildings and other easily-combustible materials.
- Hot ash should only be disposed of in a designated safe place.
- The fire should be completely cleared before the engine is left unless the engine is scheduled to be steamed the following day, when appropriate measures can be taken to maintain a light fire in the back corners of the firebox and a full boiler. Such action can also help prevent stress to the boiler.
- An engine should be allowed to cool before being covered.
- Oil lamps should not be overfilled.
- Oily rags should be properly disposed of.
- Lubricants and rags should be kept in a safe cabinet.
- Deposits of lubricants, coal dust etc. should be removed from the firebox, ash pan and foundation ring.

- Lagging that will come into contact with hot surfaces, such as the smoke box, should be non-combustible.
- All combustible materials should be cleaned out before taking the vehicle into the building.

8.1.1.2 Stationary steam engines in use

- Gravity-feed lubricators should be turned off whenever the engine is stopped.
- Drivers should be trained and certified as competent before operating engines.
- Where the steam raising plant is itself historic, detailed operating procedures, including safe shutdown procedures, should be laid down in the operating manual.
- Where the steam raising plant is modern, a historic engine may impose unusual operating conditions on it that need to be factored into the safety operating procedures of the plant.

8.1.1.3 Motor vehicles

Most of the risks are associated with sparks from the electrical system or hot exhaust components igniting fuel or lubricants.

- Care should be taken when inspecting the fuel system and any electrical wiring or apparatus in close proximity to it. There should be a process for draining and re-filling that ensures this is done outside the building.
- Ensure that smoking or naked flames are not permitted in close proximity to the fuel system or electrical wiring.
- Ideally a stop valve or tap should be fitted to the fuel line.
- Battery terminals and connections should be isolated to prevent short circuits.
- Batteries should be switched off, disconnected or removed and stored when the vehicle is not in use. They should be charged periodically to avoid deterioration.
- Wiring should be checked regularly and faulty wires replaced.
- Fuses of the correct rating, as specified by the manufacturer should always be used.
- The ammeter should be checked regularly as unexpected discharges may indicate wiring faults.
- Appropriate fire extinguishers should be kept in the vehicle and nearby.
- Any vehicle housed indoors on static display or storage should be drained of fuel.
- Fuel lines should be flushed or blown through to disperse fuel vapour.
- Fuel pumps, carburettors and filters should be emptied.
- Magnetos should be earthed.

8.1.1.4 Wooden-bodied vehicles

- Hot works associated with restoration or reconstruction should be carried out according to a carefully thought out risk assessment, which takes into account the surrounding environment, and should allow sufficient time for cooling before the vehicle is left unattended.

- Blow torches and other tools which produce naked flames should not be used near wooden-bodied vehicles.
- Workshop areas should be kept clean and free of dust and wood shavings which can easily ignite.

A 1942 Sunbeam Trolleybus, with its exterior panelling restored and primed, awaiting repainting.

8.1.1.5 Boats

- All boats should be equipped with dry powder or CO2 fire extinguishers.
- Larger vessels should be fitted with smoke and fire detection and alarm systems.
- An emergency evacuation plan must be written for any large vessel that is open to the public as such vessels constitute a significant indoor space that is usually compromised by small exits and passageways.
- Distress flares and other pyrotechnic items must be regularly renewed, or removed altogether if they are not required.
- Bilges should be frequently ventilated to avoid the accumulation of heavier-than-air gas or fuel vapour. Bilge-gas explosions cause a large proportion of boat fires. Bottled gas and petrol are the principal dangers.
- Wherever possible gas bottles should be housed in a sealed enclosure that vents over the side of the vessel.
- Any gas bottles that are not required should be removed and those that remain should be switched off at the bottle when not in use.
- A gas detection and alarm system should be installed.
- Where a boat is powered by a diesel or petrol engine but not in use, all fuel should be removed from tanks and fuel lines and the tanks should be ventilated.
- When filling tanks, spillage into the bilges or onto adjacent water should be avoided. If fuel is spilled in the boat, the hull should be ventilated immediately.
- Smoking or naked flames should not be permitted in the vicinity of the boat.

- Electricity should be supplied to water-borne craft only through an isolating transformer and an earth leakage circuit breaker. Use the lowest possible fuse ratings for the anticipated load, particularly where the historic wiring is still in use.

8.1.1.6 Aircraft

Maintenance and fire safety procedures for live aircraft are very strictly controlled by the UK's Civil Aviation Authority or an equivalent body, such as the US Federal Aviation Authority.

- Wood and fabric aircraft are high-risk items that need special care, for example, if work carried out nearby produces sparks.
- The fuel system of any aircraft on static display or in store should be drained and purged with air or nitrogen to remove pockets of fuel or vapour.
- Batteries should be removed as for motor vehicles.
- Where grounded aircraft are fitted with magnetos, pressure vessels, such as oxygen cylinders should be drained and all pyrotechnic devices removed, such as the cartridges from ejection seats, engine starters and flare guns.

8.1.1.7 Electrical and electronic equipment

This broad category, which ranges from old electromechanical machinery to very recent computer hardware, creates a range of fire risks, but most derive from ignition via heating or the production of a spark. As always, good management and operating practices should reduce risks.

- Electrically-operated machinery includes components such as electrical resistance banks in control systems that can remain hot for a long period of time. Therefore, they will need sufficient time to cool off completely before cleaning and maintenance activities or return to store.
- Electrical equipment should be installed by suitably-qualified electrical engineers.
- Installations should be provided with BS 7671 specified switchgear that reduces the danger of arcing or overheating.
- Exhibits and displays should be arranged so that any heat generated does not reach combustible materials.
- Where overheating is possible, equipment should be force-ventilated and a thermal cut-out placed in the supply line.
- Only lamps that comply with BS 4533 and BS EN 60335 should be used and they should be adequately ventilated.
- Comprehensive precautions against unauthorised switch-on should be created.

8.2 Flood

In the case of natural flooding caused by storms, the sea, lakes, ponds or rivers, prevention may not be possible. However, careful assessment of the risks and proper planning of mitigation can minimise the damaging effect. Where possible, collections should be housed away from high-risk areas.

Appropriate precautions should be taken in buildings or on sites liable to flood and advice sought from the local council and/or Environment Agency where possible. It may be possible to install flood defences, such as stop boards in doorways, flood channels and sandbags. Where water is managed with the aid of sluices, gates or other measures, it is important to know who controls them and to maintain contact with them to ensure that adequate protection can be provided for the collection. If a collection is housed in an area prone to natural flooding it may also be useful to acquire one or more portable pumps to help to remove water quickly from the building.

A more common cause of flooding is failure of equipment, such as water pipes and drainage systems. As far as possible, every effort should be made to exclude water pipes and tanks from areas where objects are housed and adequate drainage should be provided in buildings where there is a possibility of flooding.

Drain pipes, drains and gullies should be well-maintained and cleaned regularly to ensure that they do not get silted up. Pipework, joints and lagging should be checked regularly for damage and repairs implemented in a timely manner. Lagging may contain asbestos in which case it must be managed according to current legislation.

Roofs should be properly maintained to avoid the ingress of rainwater and roof insulation and roofing felt should be checked from time to time to ensure it is not decaying, or concealing degraded roofing tiles that might eventually give way and let water into the building.

As a precaution, where practicable, objects should be raised 150mm (6 inches) off the floor and special measures should be taken to prevent flooding in larger objects kept outdoors. In particular, special precautions are needed to prevent flooding in ships and boats kept afloat.

Leak detectors and automatic cut-off valves can be acquired commercially and are valuable aids, and sink taps should be of spring-loaded automatic type to prevent them being left on. Battery- powered suction floor cleaners are useful to mop up large areas of flooded floors and fans can aid the drying process. The emergency plan should include information about all pipework, valves, taps, stop-cocks and sprinkler systems. Stop-cocks should be labelled in accordance with BS 1710:2014 Specification for identification of pipelines and services.

Electrical service information should also be included in the emergency plan and the risk of electrocution in floods highlighted to people working in the area. If electrical or electronic equipment is standing in water, no attempt should be made to switch on or off anything connected to the mains electricity supply.

Parts of working objects that use or store water - such as the tanks and boilers of steam plant - should be drained before they are brought indoors.

An aspect of flooding that is easily overlooked is the water damage associated with fire fighting and the emergency plan should include instructions to the Fire Services about collections where the use of water hoses should not be applied.

8.3 Security

The best means of preventing theft and vandalism is to provide adequate security, appropriate to the situation. A good quality intruder alarm, well-placed sensors and good locks on all doors and windows are a minimum requirement and will help to keep insurance premiums down. Professional advice on security can be obtained from Police Crime Prevention teams or for museums, from the National Security Adviser at Arts Council England.

High-definition recordable CCTV is also recommended with real-time, remote access to the camera images made available to authorised personnel.

8.4 Wind and Lightning

High winds can be a danger as they can damage structures in exposed situations, cause havoc with boats however secure the moorings, and in addition debris carried by the wind can damage objects and injure people.

Lightning has the potential to cause damage to large structures and they should be protected by a conductor that diverts electrical current to the ground.

Power should be removed from overhead cables (power supplies and tram wires) before leaving an area unattended.

8.5 Sources of Further Guidance

- The Collections Trust offers a range of guidance on security and emergency planning, **www.collectionstrust.org.uk**.
- Metropolitan Police, Crime Prevention Advise website, **www.met.police.uk**
- Arts Council England, Security Resources webpage, **www.artscouncil.org.uk**.

9 Accreditation and Good Practice

Arts Council England (ACE) manages the UK Museum Accreditation Scheme, which sets nationally agreed standards for museum management, collections management and visitor services relating to access to museums and their collections. For those non-museum users who are familiar with other management standards, there are some parallels between the Accreditation standard and BSI ISO 9001:2015 Quality Management Systems.

The Accreditation scheme defines good practice and identifies agreed standards, enabling museums to assess their current performance, as well as supporting them with forward planning and developing their services.

Although it was developed initially for museums, Accreditation can provide a practical guide to the sustainable management of any type of collection. Despite being a national standard, it is not a 'one size fits all' model and the expectations vary for organisations of different types, sizes and scopes. It is a baseline quality-standard that can help organisations to be the best they can be, for current and future users. The standard looks at:

- Organisational health.
- Collections.
- Users and their experiences.

For organisations applying for funding from grant-giving bodies such as the Heritage Lottery Fund and Arts Council England, it can be useful to be Accredited as it promotes confidence in the standard and quality of the applicant's collections and collections management practices.

Registered charities or other organisations with charitable objects may wish to consider applying for Accredited status for their collection. Others may wish to think about the status of their collection and consider transferring it into a charitable trust to be eligible for Accreditation.

Accreditation advisors and regional museum development officers can provide advice on whether to consider working towards Accreditation.

Simply adopting all or some of the principles of Accreditation, without making an application, will help to ensure good practice is followed. The collections section of the Accreditation guidance is particularly useful in helping to achieve good practice in caring for historic objects, since it includes the procedures shown in the following table:

PROCEDURE	WHY THIS IS IMPORTANT
2.1 Satisfactory arrangements for the ownership of collections	You can prove ownership of the items in your care and maintain records of what you own.
2.2 Collections development policy (includes statement of purpose, background to the collections, themes and priorities for future collecting and for disposals, information about the legal and ethical framework for collecting and disposing of collections)	It gives a framework for collecting and disposing and helps with making considered decisions. Helps to guard against impulse acquisition.
2.3 Documentation policy (outlines your approach to documentation and record-keeping)	This helps to ensure consistency of documentation and record-keeping and acts as a reminder of what needs to be done each time you acquire, dispose or work on an object.
2.4 Care and conservation policy (explains the choices you have made on how you care for and operate your collections)	This helps you to make decisions about how you use your collection and explains to others your rationale for the interventions that you make.

2.5 Documentation plan (a plan of the things that you will do to improve your documentation and sets out a timetable for doing so)	This helps to identify gaps in your records and acts as a framework to creating new records, compiling existing documentation and upgrading records.
2.6 Care and conservation plan (a prioritised plan of work that needs to be carried out to ensure the proper care of your collection and sets a timetable for completion)	This helps to prioritise tasks and expenditure. It can be used to ensure that you remember any legal requirements such as certification, MOT, etc. It helps to minimise risk of damage to and deterioration of the collection.
2.7 Documentation procedures (an explanation of your processes for documentation and record-keeping)	This helps to ensure that a consistent record is available for each of the objects in your care. It can be particularly useful for others who help you to maintain and manage your collection and to potential future owners who will need to understand the work you have done.
2.8 Expert assessment of security arrangements	This is often a requirement for insurers but is also useful in ensuring that your collection is safe from damage and vandalism.

9.1 Sources of Further Guidance

- *Accreditation Scheme, Guidance Documents*, Arts Council England, 2011-2016 Retrieved from **www.artscouncil.org.uk**
- Collections Management Processes (BSI PAS 197:2009, p.24).
- *BS EN ISO 9001:2015 Quality Management Systems, Requirements* (London: British Standards Institution, 2015).
- *Accreditation Resources*, Collections Trust, Retrieved from **collectionstrust.org.uk**

10 Useful Information

Further sources of information and guidance will be added to the Guidelines from time-to-time and as they are updated. Suggested sources for inclusion can be forwarded to the ABTEM Guidelines web site at: **www.abtem.co.uk**

10.1 Bibliography

10.1.1 Acquisition and first steps

- *Acquiring Objects – Due Diligence Checklist*, Collections Trust, 2015. Retrieved from **collectionstrust.org.uk**
- *Conservation Principles, Policies and Guidance*, Historic England (formerly English Heritage), 2008. Retrieved from **historicengland.org.uk**
- *Convention for the Safeguarding of Intangible Cultural Heritage*, UNESCO, 2003. Retrieved from **ich.unesco.org**
- Cossons, Neil, *Sustaining England's Industrial Heritage*, A Future for Preserved Industrial Sites in England, A Study for English Heritage (English Heritage, 2011). Retrieved from **historicengland.org.uk**
- Hillhouse, Susanna, *Collections Management: A Practical Guide* (Cambridge: Collections Trust, 2009).
- Pantalony, E., Rina, *Managing Intellectual Property for Museums*, WIPO, World Intellectual Property Organization, 2013. Retrieved from **www.wipo.int**

10.1.2 Understanding significance

- Beet, Chris and Coulls, Anthony, 'Is it Safe? Balancing Conservation, Operation and Display of Rail Vehicles at the National Railway Museum', *Big Stuff* (unpublished conference proceedings, 2010). Retrieved from **bigstuff.omeka.net**
- *Conservation Plan Guidance*, Heritage Lottery Fund, 2012. Retrieved from **www.hlf.org.uk**
- Gibbon, Richard, *Railway Carriage Significance, A Methodical Approach to Assessing the Significance of 'Preserved' Railway Carriages and Other Artefacts with a View to Advising Potential Funding Bodies*, Railway Heritage Register Carriage Group, 2003. Retrieved from **www.vintagecarriagestrust.org**
- Kerr, James Semple, *The Conservation Plan*, 7th ed. Australia ICOMOS 2013. Retrieved from **australia.icomos.org**
- Thurrowgood, David and Hallam, David, 'Preserving Significance: Why the Journey Mattered more than the Car', *Big Stuff* (unpublished conference proceedings, 2004). Retrieved from **bigstuff.omeka.net**

10.1.3 Conservation processes

- Knapp, Chris, 'Suspending Museum Objects', *Big Stuff* (unpublished conference proceedings, 2010). Retrieved from **bigstuff.omeka.net**
- Kühn, Hermann, 'The Restoration of Historic Technological Artefacts, Scientific Instruments and Tools', *The International Journal of Museum Management and Curatorship*, Vol. 8, 1989- Issue 4, pp. 389-405.

- *NHIG Conservation Principles for Heritage Forged & Cast Ironwork*, National Heritage Ironwork Group, 2013. Retrieved from **nhig.org.uk**
- Porter, S. John, 'Restored to Working Glory: To Work or Not to Work?' *Big Stuff* (unpublished conference proceedings, 2007). Retrieved from **bigstuff.omeka.net**
- *Preparing Historic Motorized Vehicles for Storage or Exhibit*, Conserve-O-Gram 10/3, 1999. Retrieved from **www.nps.gov**
- Pye, Elizabeth, *Challenges of Conservation: Working Objects*, Science Museum Group Journal, Autumn 2016, Issue 06. Retrieved from **journal.sciencemuseum.org.uk**
- Romanos, Joanna and Russell, Allison, 'A Conservation Management Tool for Functional Objects', *Big Stuff* (unpublished conference proceedings, 2010). Retrieved from **bigstuff.omeka.net**
- Tanner, Matthew, *Ship and Boat Preservation-A Place for Original Fabric*, National Historic Ships, 1994. Retrieved from **www.nationalhistoricships.org.uk**

10.1.4 Maintenance and operation

- Hallam, David, 'Ethical and Philosophical Issues of Operating Functional Objects: A Developing Approach', *Big Stuff* (unpublished conference proceedings, 2007). Retrieved from **bigstuff.omeka.net**
- Hallam, David, Greiner, Ainslie and Brunott, Michiel, 'Significance, Risk and the Maintenance of Engineering and Industrial Objects: A Continuing Conversation', *Big Stuff* (unpublished conference proceedings, 2010). Retrieved from **bigstuff.omeka.net**
- Hallam, David, Thurrowgood David, and Ogilvie, Col. 'Corrosion, Wear and Corrosive Wear; The Story of Lubrication Systems in Large Technology Object Storage and Use', *Big Stuff* (unpublished conference proceedings, 2004). Retrieved from **bigstuff.omeka.net**
- Leskard, Marta, 'Developing a Policy & Procedure for Selecting & Operating Historic Objects from the Collections of the Science Museum', *Incredible Industry, Preserving the evidence of industrial society. Conference Proceedings* May 2009 Denmark (Copenhagen: NKF, 2009).
- Mann, Peter, Robert, 'Working Exhibits and the Destruction of Evidence in the Science Museum', *The International Journal of Museum Management and Curatorship*, Vol. 8, 1989- Issue 4, pp. 369-387.
- *The National Trust Manual of Housekeeping* (National Trust, 2011).
- Wain, Alison, 'The Importance of Movement and Operation as Preventive Conservation Strategies for Heritage Machinery', *The Journal of the American Institute for Conservation*, Volume 56, 2017- Issue 2: Collection Care, pp. 81-95.
- Wain, Alison, 'Organising an Effective Maintenance Plan for Big Stuff', *Big Stuff* (unpublished conference proceedings, 2004). Retrieved from **bigstuff.omeka.net**
- Wallis, Geoffrey, *Keeping the Wheels Turning*, The Building Conservation Directory 2006. Retrieved from **www.buildingconservation.com**

10.1.5 Understanding the environment

- *BSI PAS 198:2012 Specification for Managing Environmental Conditions for Cultural Collections* (London: British Standards Institution, 2012).

- *BSI PD 5454:2012 Guide for the Storage and Exhibition of Archival Materials* (London: British Standards Institution, 2012).
- Cassar, *May, Environmental Management: Guidelines for Museums and Galleries* (London: Routledge, 1995).
- Deck, Clara, *The Care and Preservation of Historical Brass and Bronze*, The Henry Ford Museum, 2016. Retrieved from **www.thehenryford.org**
- Hallam, John, 'Conservation and Storage: Machinery', in *Manual of Curatorship, A Guide to Museum Practice*, ed. by Thompson, John M. A. (Oxford; Boston: Butterworth-Heinemann, 1992).
- Kite, Marion and Thompson, Roy, *Conservation of Leather and Related Materials* (Oxford: Butterworth-Heinemann, 2006).
- Pinniger, David, *Integrated Pest Management for Cultural Heritage* (London: Archetype, 2014).
- Shashoua, Yvonne, *Conservation of Plastics: Material Science, Degradation and Preservation* (Oxford: Butterworth-Heinemann, 2008).
- *Stopping the Rot, Conference Proceedings* (unpublished conference proceedings, British Aviation Preservation Council, 1990-2012). Retrieved from **www.bapc.org.uk/html/stopping_the_rot.html**

10.1.6 Health and safety, security

- Health and Safety Executive website, **www.hse.gov.uk**
- *L122-Approved Code of Practice and guidance, Safety of Pressure Systems* (Second Edition) - Health and Safety Executive, 2014. Retrieved from **www.hse.gov.uk**
- Metropolitan Police, Crime Prevention Advice website, **www.met.police.uk**
- Rae, Allyson, ed. by Dawson, Alex and Hutcheson, Natasha, *Hazards in Museum Collections: A Collections Care How to Guide*, Norfolk Museums and Archaeology Service, 2012. Retrieved from **collectionstrust.org.uk**
- *The Management of Steam Locomotive Boilers*, Railway Safety Publication 6, 2nd ed., Office of Rail Regulation, 2006. Retrieved from **webarchive.nationalarchives.gov.uk**
- Arts Council England, Security Resources website, **www.artscouncil.org.uk/protecting-cultural-property/security-resources**

10.1.7 Accreditation and good practice

- *Accreditation Scheme, Guidance Documents*, Arts Council England, 2011-2016. Retrieved from **www.artscouncil.org.uk**
- *BS EN 15898:2011 Conservation of Cultural Property-Main General Terms and Definitions* (London: British Standards Institution, 2012).
- *BS EN ISO 9001:2015 Quality Management Systems, Requirements* (London: British Standards Institution, 2015).
- *BSI PAS 197:2009, Code of Practice For Cultural Collections Management* by Collections Trust (London: British Standards Institution, 2009).

- *Code of Ethics for Museums*, Museums Association, 2015. Retrieved from **www.museumsassociation.org**
- Dawson, D. Alex, Ed., *Benchmarks in Collection Care 2.0*, The Museums, Libraries and Archives Council, 2011. Retrieved from **collectionstrust.org.uk**
- *ICOM, Code of Ethics for Museums*, International Council of Museums, 2013. Retrieved from **icom.museum**
- *Spectrum 5.0*, Collections Trust, Retrieved from **collectionstrust.org.uk**
- *The Institute of Conservation's Professional Standards*, ICON 2014. Retrieved from **icon.org.uk**

10.1.8 Collections care and standards

Large and working objects

- Andrew, Patricia, Ball, Stephen, and Winsor, Peter, *Larger & Working Objects: A Guide to Standards in their Preservation and Care* (London: Collections Trust, 2009). Retrieved from **collectionstrust.org.uk**
- Ball, Stephen and Winsor, Peter ed., *Larger & Working Objects: A guide to their preservation and care* (London: Museums and Galleries Commission, 1997).
- Mitchell, J. S., *Collection, Curatorship and Conservation of Large Objects*, STICK, Industrial Museums Scotland, 2014. Retrieved from **www.stickssn.org**
- Paine, Crispin ed., *Standards in the Museum Care of Larger & Working Objects 1994* (London: Museums and Galleries Commission, 1994).
- *The Burra Charter*, The Australia ICOMOS Charter for Places of Cultural Significance, 2013. Retrieved from **australia.icomos.org**

Aviation

- *Air Force Instruction 84-103*, United States Air Force Heritage Program, rev. 22 May 2015. Retrieved from **www.e-publishing.af.mil**
- Lee, Russ, *Restoring and Preserving Aircraft*, Smithsonian National Air and Space Museum, 2010. Retrieved from **airandspace.si.edu**
- Mattocks, James, *30 Years of Aviation, Preservation at East Fortune Airfield*, The Scottish Aviation Preservation Society, APSS magazine Fortune Teller, Issue 11, Summer 2003. Retrieved from **www.apss.org.uk**
- Mikesh, Robert C, *Restoring Museum Aircraft* (Ramsbury: The Crowood Press Ltd, 1997).
- Morris, David, *Corsair KD431: The Time Capsule Fighter* (Stroud: Sutton Publishing Limited, 2006).

Clocks, watches and musical instruments

- Andrew, Patricia, ed., *Standards in the Museum Curation of Musical Instruments*, The Museums, Libraries and Archives Council, 2005. Retrieved from **collectionstrust.org.uk**
- Betts, Jonathan, 'Problems in the Conservation of Clocks and Watches', *The Conservator*, Vol. 9, 1985- Issue 1, pp. 36-44.

- *Care and Conservation of Clocks*, The Conservation Register, The Institute of Conservation. Retrieved from **www.conservationregister.com**

Historic Vessels

- *Conserving Historic Vessels: Understanding Historic Vessels Volume 3* (London, National Historic Ships, 2010).
- Cunliffe, Hannah, 'Conserving Historic Vessels', *RINA Conference – Historic Ships - December 2012*. Retrieved from **www.nationalhistoricships.org.uk**
- Dunn, Matthew, *Conservation and Restoration of Heritage Timber Vessels* (Camberwell, ISS Institution Inc., 2009). Retrieved from **issinstitute.org.au**
- Kentley, Eric, Stephens, Simon and Heighton, Martyn, Recording *Historic Vessels: Understanding Historic Vessels Volume 1*, National Historic Ships, 2007. Retrieved from **www.nationalhistoricships.org.uk**
- Kentley, Eric, Stephens, Simon and Heighton, Martyn, *Deconstructing Historic Vessels: Understanding Historic Vessels Volume 2*, National Historic Ships, 2007. Retrieved from **www.nationalhistoricships.org.uk**
- *The Barcelona Charter, European Charter for The Conservation and Restoration of Traditional Ships in Operation*, European Maritime Heritage Working Group, 2003. Retrieved from **european-maritime-heritage.org**

Motor vehicles and trams

- Collum, Mark, *The Care and Preservation of Historic Motorised Vehicles*, Benson Ford Research Centre, 2016. Retrieved from **www.thehenryford.org**
- *Engine Owner's Code of Practice*, National Traction Engine Trust, 3rd Edition, 2007. Retrieved from **www.ntet.co.uk**
- *Guidance Note on the Operation of Free Bus Services*, National Association of Road Transport Museums – Issue 5, April 2015.
- Jefford, Paul, *Our Southdown Tigers: ... and Pictures of Many More* (Paul and Joyce Jefford, 2015).
- Michell, Richard, *Which Oil? Choosing the Right Oils & Greases for your Vintage, Antique, Classic or Collector car* (Poundbury: Veloce Publishing Ltd, 2011).
- *The 2016 National Historic Vehicle Survey Structural Report*, FBHVC, Federation of British Historic Vehicle Clubs, 2016. Retrieved from **www.fbhvc.co.uk**
- *The Charter of Turin*, Federation Internationale Vehicules Anciens (FIVA), 2016. Retrieved from **www.fiva.org**
- 'The Trams Report, 2008 Edition', The Tramway Museum Society, Crich, 2008.
- 'Tramcar Maintenance and Commissioning Examination Records', The National Tramway Museum, Crich.

Steam engines and locomotives

- *Guidance Notes*, Heritage Railway Association. Retrieved from **www.hra.uk.com**
- Hayes, Geoffrey, *The Guide to Stationary Steam Engines*, 2nd ed. (Ashbourne: Moorland Publishing, 1990).
- *MT/276, Examination Schedule for Preserved Steam Locomotives Running on B.R. Lines*, Director of Mechanical and Electrical Engineering, British Railways Board, Railway Technical Service, Derby, Issue 1, August 1984.
- *The Riga Charter*, FEDECRAIL, European Federation of Museum & Tourist Railways, 2005. Retrieved from **www.fedecrail.org**

10.2 Contacts

Arkwright Society

The Arkwright Society is a registered charity engaged in the conservation of industrial monuments in Derbyshire, focusing on the water mills of Lumsdale, Ashford, Cromford and Slinter Wood. It also engages in publishing and educational activities.
www.cromfordmills.org.uk

Arts Council England (ACE)

Arts Council England is a government-funded body dedicated to promoting the performing, visual and literary arts and is responsible for supporting and developing museums. It is one of the bodies responsible for distributing lottery funding for the arts.
www.artscouncil.org.uk

Association of British Transport and Engineering Museums (ABTEM)

ABTEM exists to provide a forum for the discussion of matters of common interest to transport and engineering museums and to provide a means of representing their views on issues of national and regional concern. The organisation holds regular meetings and seminars at museums and heritage sites throughout the UK.
www.abtem.co.uk

Association of Independent Museums (AIM)

AIM is a national charity which connects, supports and represents museums, art galleries and heritage sites providing a network of expertise, knowledge-sharing and grants for museums.
www.aim-museums.co.uk

Association for Industrial Archaeology (AIA)

AIA is a national organisation for people who share an interest in Britain's industrial past. It brings together groups and individuals with an interest and expertise in identifying, recording, preserving and presenting the remains of the industrial past.
www.industrial-archaeology.org

Aviation Preservation Society of Scotland

APSS is a group of aviation enthusiasts helping to preserve the history of aviation and associated skills. Over 30 working members are actively involved in various projects.
www.apss.org.uk

Big Stuff

Big Stuff is a group for people interested in the preservation and display of large technology and industrial heritage. The Big Stuff conference is a triennial conference that brings together the community of museum professionals, academics, consultants/ contractors, volunteers and private owners to talk about the challenges of large technology conservation and present ideas and innovations for solving them. Past conference proceedings are available on the group's website.
www.bigstuff.omeka.net

British Aviation Preservation Council (BAPC)

BAPC has held a series of seminars on historic aircraft. The conference papers are free to members or available on request. They cover issues such as maintaining aircraft outdoors, finding equipment for environmental monitoring and aviation materials.
www.bapc.org.uk

British Safety Council (Britsafe)

The British Safety Council is a registered charity and professional membership organisation which provides health and safety consultancy, awards and training.
www.britsafe.org

British Standards Institute (BSI)

BSI is a service organisation that produces standards, codes of practice and specifications across a wide variety of industry sectors.
www.standardsuk.com

Cadw

Cadw is the Welsh Government's historic environment service, working for an accessible and well-protected historic environment for Wales. Its aims are to conserve Wales's heritage, help people understand and care about their history and to help sustain the distinctive character of Wales.
www.cadw.gov.wales

Canadian Conservation Institute (CCI) Notes

CCI Notes deal with topics of interest to those who care for cultural objects. Intended for a broad audience, the Notes offer practical advice about issues and questions related to the care, handling and storage of cultural objects. Many Notes are illustrated and provide bibliographies as well as suggestions for contacting suppliers. Written by CCI staff, there are currently over 100 Notes in this ever-expanding series.
www.canada.ca

Cinema Organ Society

The Cinema Organ Society aims to promote the highest standards of theatre organ performance, presentation and technical skill. It advises on theatre organ installation and encourages the use of the instrument in public places.
www.cinema-organ.org.uk

Collections Trust

Based in the UK but with international scope, the Collections Trust helps museums capture and share the information that gives their objects meaning. Collections Trust standards and advice are used around the world to make museum collections accessible. A variety of resources on conservation and collections care are available on their website.
www.collectionstrust.org.uk

Computer Conservation Society (CCS)

CCS is a co-operative venture between the British Computer Society, the Science Museum Group, the National Museum of Computing and the Bletchley Park Trust. It aims to promote the conservation, restoration and reconstruction of historic computers, to identify existing computers which may need to be archived in the future and to share expertise on historic computers with the wider public. Guidelines for the project are published on the website.
www.computerconservationsociety.org

Conservation Register

The Conservation Register makes available information on conservation-restoration practices providing commercial services in a variety of specialisms. The information for each practice is reviewed approximately every two years to ensure that it continues to meet the criteria for inclusion and remains up to date. The Conservation Register is owned and operated by the Institute of Conservation (ICON).
www.conservationregister.com

Department of Culture, Arts and Leisure, Northern Ireland

Heritage and Culture functions and services formerly delivered by the Department of Culture, Arts and Leisure (DCAL) have been transferred to new departments. Relevant links for Arts, Culture, Museums and Libraries are shown on the DCAL website.
www.dcalni.gov.uk

Duxford Aviation Society (DAS)

DAS is a voluntary organisation which came into being in 1975 and is a partner organisation of the Imperial War Museum (IWM). The Society exists to preserve historically important British civil airliners, support the IWM and promote knowledge of the development of British civil aviation through a policy of acquisition and restoration.
das.org.uk

Dynamic Objects Network (of ICON)

The Dynamic Objects Network was initiated by conservators of horological objects, with the aim of involving others in the care, maintenance and conservation-restoration of all types of mechanical device meant to have or have had moving parts.
icon.org.uk/groups/dynamic-objects-network

Fairground Heritage Trust

The aim of the Fairground Heritage Trust is to preserve historic fairground equipment, imagery and memorabilia for future generations. It works with volunteers to clean, conserve and restore fairground equipment for demonstration to the public.
www.fairground-heritage.org.uk

Fair Organ Preservation Society (FOPS)

FOPS is a society dedicated to the appreciation and preservation of the fairground organ and other related mechanical musical instruments and their music.
www.fops.org

Federation of British Historic Vehicle Clubs (FBHVC)

FBHVC exists to uphold the freedom to use historic vehicles on the road. It achieves this by representing the interests of owners of such vehicles to politicians, government officials and legislators, both in the UK and (through the Federation Internationale des Vehicules Anciens) in Europe.
www.fbhvc.co.uk

Federation Internationale Vehicules Anciens (FIVA)

FIVA was founded in 1966 and represents the historic vehicle movement globally, working with UNESCO to formally recognise historic vehicles as part of world heritage. The key output is the Charter of Turin. Recognised by UNESCO, the charter - with associated glossary and handbook - is the predominant international document with respect to the preservation of historic vehicles. The charter, which has been recognised by UNESCO, is based on and inspired by UNESCO's Venice Charter (1964), the Barcelona Charter (2003, historic ships) and the Riga Charter (2005, historic rail vehicles). Copies of the documents Handbook can be downloaded from the FIVA website or obtained via the FBHVC.
www.fiva.org

Fire Service Preservation Group

The Fire Service Preservation Group is a membership organisation that aims to preserve the equipment and appliances of the national and auxiliary fire services. It enables members to share views and information on fire appliances and fire service equipment and history.
www.fireservicepreservationgroup.org

Fire Heritage Network UK (FHNUK)

FHNUK serves to bring together all those organisations dedicated to the study of Britain's fire service history and provides advice and support for its member organisations.
www.fireheritage.org

Health & Safety Executive (HSE)

HSE is the national independent watch-dog for work-related health, safety and illness. It acts in the public interest to reduce work-related death and serious injury across Britain's workplaces, through advice, guidance, regulation and inspection.
www.hse.gov.uk

Heritage Railway Association (HRA)

HRA represents the majority of heritage and tourist railways and railway preservation groups in the UK and Ireland and provides technical advice for members on its website.
www.hra.uk.com

Historic Commercial Vehicle Society (HCVS)

HCVS is the largest enthusiasts' organisation in the UK for historic vans, lorries, buses, military and steam vehicles and represents its members regarding developments and legislation relating to historic commercial vehicles.
www.hcvs.co.uk

Historical Metallurgy Society (HMS)

HMS is a forum for the exchange of information and research in historical metallurgy. Members' interests range from processes and production through technology and economics to archaeology and conservation. The Society provides conferences and meetings for information sharing, a scholarly journal and a range of datasheets. It takes an active role in the conservation of metallurgical sites.
www.hist-met.org

Industrial Railway Society

The Industrial Railway Society is the leading organisation in Britain devoted to the study of all aspects and all gauges of privately owned industrial railways and locomotives.
www.irsociety.co.uk

Inland Waterways Association (IWA)

IWA campaigns for the use, maintenance and restoration of Britain's inland waterways. The website includes policy and guidance including the environment, trees and the management of waterways, as well as standards for construction and health and safety. There is also a practical restoration handbook available to members.
www.waterways.org.uk

Inland Waterways Heritage Network

The Inland Waterways Heritage Network is a loose association between the museums in the UK whose collections are wholly or partly based on the country's inland navigations, for sharing information, experience and best practice.
www.canaljunction.com

Institute of Conservation (ICON)

ICON is a registered charity and the professional body for the conservation of cultural heritage in the UK. Its membership embraces the wider conservation community, incorporating not only professional conservators and conservation scientists but many others who are committed to improving our understanding of and access to our cultural heritage.
www.icon.org.uk

International Stationary Steam Engine Society (ISSES)

ISSES provides an international forum for those who wish to pursue their interest in stationary steam history.
www.internationalsteam.co.uk

Light Aircraft Association (LAA)

LAA is a membership organisation with the depth of knowledge and experience to oversee the airworthiness of light aircraft and aircraft build projects. The Association provides engineering skills training and publishes technical and flying information in its monthly magazine.
www.lightaircraftassociation.co.uk

Maritime Heritage Trust (MHT)

MHT is a member organisation that aims to represent and promote the interests of owners and operators of traditional and historic vessels. There is a focus on operational vessels, but the Trust also provides limited support to those trying to bring vessels back into service. MHT also works with national and regional government departments, heritage bodies, educational groups and the tourism industry to promote increased networking opportunities for all UK maritime heritage.
www.maritimeheritage.org.uk

Museums Association

The Museums Association is the professional membership body for museum practitioners. It campaigns and advocates for museums to change lives, represents and develops the workforce and provides a dynamic network for members.
www.museumsassociation.org

Museum of English Rural Life (MERL)

Based at the University of Reading, the Museum of English Rural Life exists to capture and record the changing countryside. It uses its rich collections of agricultural equipment to explore how the skills and experiences of farmers and craftspeople shape our lives.
www.merl.reading.ac.uk

National Association of Road Transport Museums (NARTM)

NARTM is a network representing the majority of museums and other collections containing publicly-accessible historic buses, coaches, trams and trolleybuses in the four countries of the UK. In 30 years NARTM has grown from an informal group to a registered charity and limited company with almost 100 members, ranging from large public-sector museums to individual collectors. Between them they hold over 3,000 historic vehicles.
www.nartm.org.uk

National Heritage Ironwork Group (NHIG)

NHIG was set up with the objective of advancing public awareness and knowledge of ironwork and is currently leading the way worldwide in creating a representative body for the conservation of heritage ironwork through discussion, formalisation, lobbying and distribution of information.
nhig.org.uk

National Historic Ships UK

National Historic Ships UK is a government-funded independent body that gives advice on all matters relating to historic vessels in the UK. It has published valuable guidance on understanding and conserving historic vessels.
www.nationalhistoricships.org.uk

National Preservation Institute (NPI)

NPI offers continuing education and professional training for those involved in the management, preservation and stewardship of cultural heritage.
www.npi.org

National Traction Engine Trust (NTET)

TNTET represents owners and enthusiasts. It looks after the interests of engine owners and drivers and promotes the safe ownership and operation of steam traction engines, through the pooling of their combined experience and sharing of skills.
www.ntet.co.uk

National Vintage Tractor and Engine Club (NVTEC)

NVTEC provides a focus for people with a common interest in rescuing, repairing, restoring and exhibiting tractors and engines in action. Changes in legislation, health and safety requirements are negotiated by the national executive so that individual enthusiasts can enjoy their hobby with a minimum of interference.
www.nvtec.co.uk

Newcomen Society

The Newcomen Society specialises in the history of engineering and technology. It produces papers on all aspects of engineering from ancient times to the present.
www.newcomen.com

Road Locomotive Society

The Road Locomotive Society aims to enhance education and research into the past history of all types of self-propelling steam engines (other than those running on rails) and those types of stationary engines known as portable engines. The results of this research are made available through the Society Journal and other publications.
www.roadlocosociety.org.uk

Scottish Industrial Heritage Society (SIHS)

SIHS is dedicated to the protection, preservation, study and appreciation of Scotland's historic buildings. It aims to bring together people interested in discovering and understanding Scotland's industrial heritage and explores a wide range of industries from mills to foundries, heavy engineering to distilling.
www.sihs.co.uk

SHARE Conservation Network

A network which supports conservators in their work by facilitating information sharing and skills development. This regional programme compliments national opportunities such as those provided by ICON and works in partnership with the East Anglian Conservators Forum.
sharemuseumseast.org.uk/networks/conservation-network/

Society for the Protection of Ancient Buildings Windmills and Watermills Section (SPAB)

SPAB is involved in all aspects of the survival of historic and interesting buildings. Its principal concern is the nature of their restoration or repair, with the aim that buildings should be repaired with minimum loss of fabric and of authenticity.
www.spab.org.uk

Steam Boat Association of Great Britain

The Steam Boat Association of Great Britain exists to promote the enjoyment of steamboats and steam-boating and to represent the interests of steamboat owners. It organises rallies and technical seminars and publishes a quarterly magazine The Funnel which includes technical information, reports on steam-powered ships and boats and information on the association's activities.
www.steamboatassociation.co.uk

Scottish Transport and Industrial Collections Network (STICK)

The network aims to promote care and enjoyment of industrial and transport collections through research, stewardship and advocacy. STICK encourages wider engagement with technological and industrial history collections across Scotland organises meetings and produces resources.
www.stickssn.org

The Transport Trust

The Transport Trust is a national charity established to promote and encourage the preservation and restoration of Britain's unique transport heritage. The website includes links to many other transport sites and museums.
www.transporttrust.com

Veteran Car Club of Great Britain (VCC of GB)

The Veteran Car Club of Great Britain exists to encourage the use of, and to assist in, the acquisition, restoration, preservation, exhibition and maintenance of Veteran and Edwardian motor vehicles.
www.vccofgb.co.uk

Vintage Carriages Trust (VCT)

VCT is a charity based at Ingrow (West) railway station on the Keighley and Worth Valley Railway in West Yorkshire. Founded in 1965, it became a registered charity in 1981 and opened in 1990. The Trust operates the Museum of Rail Travel and the Railway Heritage Register internet databases that list: over 7,500 wagons; over 5,600 carriages; over 300 trams, over 60 horse drawn vehicles, over 40 turntables.
www.vintagecarriagestrust.org

World Forum for Motor Museums

An international biennial meeting for motor museum professionals, principals, owners and collectors. Published conference proceedings are available.
www.worldforumformotormuseums.com

10.3 Grants

A number of bodies provide grants for the acquisition and conservation of industrial, technological and scientific material, including:

The Preservation of Industrial and Scientific Material Grant Fund (PRISM)

Arts Council England (and Wales).
www.artscouncil.org.uk/funding/prism

National Fund for Acquisitions, National Museums Scotland

www.nms.ac.uk/about-us/services-and-expertise/national-fund-for-acquisitions

Northern Ireland Museums Council Acquisitions Fund

Northern Ireland Museums Council.
www.nimc.co.uk/grants

The Heritage Lottery Fund (and the National Heritage Memorial Fund) are able to support the cost of acquisition and conservation projects in the UK. Details can be obtained from: **www.hlf.org.uk**

11 Definitions

Adaptation means changing an object to suit the existing use or a proposed use.

Associations mean the connections that exist between people and an object.

Competent person means an individual who through the relevant training and experience can undertake tasks in compliance with relevant regulations pertaining to the work being undertaken.

Conservation means all the processes of looking after an object to retain its cultural significance. Conservation encompasses maintenance and the processes of preservation, restoration, reconstruction and adaptation.

Conservation plan means a document which outlines the significance of a historic object and describes how any activities such as operation, conservation processes or maintenance can be developed and managed appropriately and without diminishing the object's significance. A conservation plan for an individual object should not be confused with the overall Collections Care and Conservation Plan as described in Section 9.

Conservation route means an informed approach to preserve the significance of the object. This may be achieved either by mainly conserving the fabric the function or the form of an object. It is understood that a route towards one aspect of the object's significance may require compromises made in other aspects.

Conservation treatment means a practical action applied directly to an object.

Cut-off point means a point in the future where the operation of an object may have to cease to prevent the loss of a high percentage of its historic state.

Fabric means all the physical material an object is comprised of, including fixtures, fittings and contents.

Form means the visible shape or configuration of an object.

Function means all the actions that define the purpose for which an object was made.

Historic state describes the concept of material integrity of a functional object. This concept recognises the significance of a perceived 'original condition' (i.e. an object that appears to maintain the fabric and the form it had when it was produced). At the same time, this recognises that 'original condition' is usually uncertain to a greater or lesser extent, and historic state allows the object to speak for itself, encompassing the value of the complete historical evidence such as upgrades and other valid technical, functional and/or aesthetic alterations during an object's life.

Interpretation means all the ways of presenting the cultural significance of an object to aid understanding of the object and educate the public.

Maintenance means the continuous protective care of an object, and its setting. Maintenance is to be distinguished from repair which involves restoration or reconstruction.

Maintenance plan is a document that sets out all the required routine tasks and inspections necessary to ensure the continuous protective care of an object, static or in operation.

Operating log is a document recording details of every occasion on which an object is operated.

Operating manual is a document setting out the procedures, requirements and conditions required for the operation of a working object.

Preservation means maintaining an object in its existing state and retarding deterioration. Throughout the Guidelines, this definition will be used as one of the four conservation processes but also to describe the wider heritage preservation movement.

Preventive conservation means all conservation activities designed and applied indirectly to an object to prevent or minimise future damage or deterioration or decay. Examples are environmental control and pest management.

Reconstruction means returning an object to a known earlier state and is distinguished from restoration by the introduction of new material.

Remedial conservation means all conservation activities designed and applied directly to an object aiming to limit damage and halt deterioration and decay.

Repair means all activities designed and applied directly to an object aiming to recover its form or its function.

Replication means starting from scratch to build a copy of an object. Replication is a legitimate means of a wider conservation process to establish the appearance, nature and form of a historic object without harming the preservation of the fabric that can remain in a protected environment. There are differing levels of replication such as true, operational or hypothesis replicas depending on the level of accuracy, functionality and availability of historical and technical information related to its historic counterpart.

Reproduction means building a copy of an object using concessions such as modern manufacturing methods, substituting with alternative materials or adaptations to meet current regulations to allow the copy to operate.

Restoration means returning an object to a known earlier state by removing accretions or by reassembling existing elements keeping to a minimum the introduction of new material.

Significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the object itself, its fabric, setting, use, associations, meanings, records, related places and related objects. Objects may have a range of values for different individuals or groups.

Significance statement means a document that includes the opinions of all those consulted and provides details of the research methodology followed to assess the significance of an object.

Stabilisation of an object means all activities necessary to temporarily halt decay without extending beyond the minimum intervention required.

Treatment record is a document that describes a conservation treatment carried out on an object in detail, describing the decision-making process, the methods and materials used. Photographic records are used to illustrate the condition of the object before, during and after treatment.

Use means the deployment of an object for its function, including activities and traditional and customary practices for which it was created.

Working life means the life of an object being used commercially before entering preservation.

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