The ABC of Preventive Conservation in Museums

Contents

Introduction

Concern about the state of objects is one of the fundamental tasks of all employees of museums, and a commitment incumbent on the institution. This care, beyond the economic issue, is often an organizational challenge. The difficulties in managing the maintenance of a museum are largely explained by objective factors such as the location of the museum itself, often at a distance from universities and training centres for conservators-restorers, or a limited access to basic information. A problem faced by conservators-restorers or guardians of collections can also be the complex and heterogeneous nature of the material they contain. Unlike those museums that house works of art, institutions in which the collections contain examples of craftsmanship, natural objects or technical equipment often do not have the ability to employ specialized graduates, trained to deal with these special collections.

The maintenance of objects in museums is part of the wider process of managing collections, which goes far beyond the dictionary definition of "conservation". The museum as "an institution intended for the long term" must take special care to properly document any work performed by its employees. The "organizational culture" of such institutions is especially important for the curators of collections, for whom the careful documentation of objects is a guarantee of the preservation of knowledge about the objects entrusted to their care, regardless of changes in and around the institution.

Museum conservation is also organically linked to concern for the wider environment of the collections, that is the museum building, which itself is sometimes a historical structure. This fact determines the working methods of museum conservators-restorers and forces them, as well as museum managers, to apply a variety of conservation strategies, primarily in activities related to the management of the microclimate within the museum.

Do we know what climate prevails in our museum? The term is usually used in everyday speech to refer to the atmospheric conditions existing in different parts of the globe. Heat or cold prevail in the various geographical zones, the air is damp or dry, there are strong winds or the air remains immobile. These are widely known phenomena. But what is the climate in the interior of the museum? For many people this question may be associated with a nice atmosphere at work, but for conservation of collections, this phrase means, above all the right conditions for the best long-term preservation of museum objects. The question may also be a daunting one for many readers, in that only the better-off institutions which can get funding for the installation of expensive equipment can afford air conditioning for their exhibition spaces and storerooms.

One might ask what climate may exist in a museum where there are only three small rooms? Well, what is the answer to that question? Are temperature and humidity systematically measured? In which places, at what height above the floor? Are the readings conducted regularly? Are they written down and stored for many years, so that one can analyse them an draw any conclusions? Even the climate of large geographical areas can be described only after comparing data from multiple years, including annual cycles.

In every museum there is an annual cycle. Whether in winter the building is heated with stoves or fireplaces, or whether central heating keeps the interior warm, the annual cycle of temperature and humidity is important. Also important is the location of each interior in relation to the cardinal directions. It is obvious that south-facing windows let in more sunlight than the north ones , which means that the various objects in such rooms get differing degrees of harmful ultraviolet radiation. Before any action is taken to adjust the exhibition arrangement, the nature and characteristics of the interior where there are exhibits needs to be thoroughly understood, and notes of the varying conditions taken throughout at least one year need to be analysed to determine the picture of the climate within the museum.

Various types of museum objects require special conditions. For the sensitive collections we should choose places for their display and storage where they will be least exposed to changing climate conditions change. In addition to the determinants of the location of the museum spaces and the interpretation of temperature and humidity measurements, we should also add the issue of the management of human activities. For example, who opens windows in the interiors and when, and is this related to the needs of people, or to the care of the collections? Can visitors enter the exhibition rooms in wet coats, bringing moisture from the wet street and park on their shoes, or, do they leave wet coats in the cloakroom by entering the museum, and their wet hats and hair are given a bit more time to dry slightly?

Museum conservation must give special emphasis to preventive conservation, in which so very important issue is the method of storing the collections. Museum storage rooms contain objects which at a given moment the collection managers do not want to, or cannot (and most often do not have space to) exhibit. This may be due to the limitations of the exhibition space, or to the nature of the items that do not fit in with the current concept of the exhibition, or it might be due to the poor condition of the exhibits. Some objects will not leave the storage rooms during our lifetimes, others may never leave them. Regardless of the reasons for their placement in the reserve store, each object held there should be ensured the best conditions, because the assessment of their value or validity for the collection by future generations may be different from ours.

For this reason, the storage room should fulfil some basic conditions. An important factor is the location of the room in the building – It should be suited to the long-term storage of the specific

types of the collected works. Attic rooms, for example, are usually exposed to extreme temperatures, so vulnerable objects should not be placed there. The attic is also not a good place for storing heavy objects which may place undue demands on the strength of the floor. On the other hand, the basement is often cold, moreover, objects held in such place may be exposed to moisture, and in some areas, also to the risk of flooding. Another factor of potential importance is the condition and size of the windows in storage rooms, and the direction they face. Attention should also be paid to the state of the walls and the materials which they are made of.

All the above factors will be crucial for maintaining suitable levels of temperature and humidity of the rooms (conventionally called the climate of the interiors) which are the prerequisites for the good condition of the collections. They also the factors influencing the policy of the systems utilised for maintaining the microclimate in the museum, and the measuring devices for monitoring it, and therefore the economic dimension of the care of the collections.

The stores in which collections are to be kept require proper furniture, suitable for various types of objects. Racks for storing documents are different from those in which images are collected, these will differ from the cabinets for storing glass or porcelain. What is important is not only the shape but also materials used for their preparation. Objects should be stored separately by type, different types of collections should not be stored together. Also, the overcrowding of the stores can be very dangerous. If the objects are crammed in too small a space, it is not only difficult to move the objects, but this also hinders their availability for a periodic survey of the state of preservation of objects or for the necessary periodic cleaning.

Although restoration of a specific object is an activity that gives the most personal satisfaction to conservators-restorers and curators of collections, they also need focus – and perhaps primarily – on preventive conservation which allows to protect the greatest number of objects simultaneously. Due to the number of museums and different categories of objects stored in them, it is difficult to create a single uniform strategy for all of them, nor even standardise them in detail. However, it is worth remembering that each museum institution takes care of both the objects and the collection's storage space, in other words of the entire building in which they are housed. In each museum, the collections are moved around and each of them has visitors. The analysis of all these factors should precede the design of a professional programme of the care for the collections.

We began our work at the Institute on the issue of conservation in Polish museums by collecting information on the state of conservation care within them. In 2011 a questionnaire was sent out in which we asked for data on the state of conservation personnel employed in all institutions listed in the National Register of Museums. This revealed that in many institutions, there are excellent conservation workshops which employ many well qualified and specialized conservators-restorers. However, more than half of those museums who agreed to take part in

this study declared that there was no permanent conservation staff to take care of their collections. One thing often pointed out was that there was a lack of information on the place where one could find even the most simple information or learn how to deal with problems of collection maintenance.

In 2012, the Institute began systematic collaboration with a team, which included conservators-restorers of the national museums in Cracow, Warsaw and Poznan. They assumed that the special status of the national museums involves a kind of commitment to the milieu to share their accumulated experience and knowledge. The chief conservator of the Zamoyski Museum in Kozłówka was the spokesperson for the group of institutions, which, despite staffing levels or distance from academic centres, effectively demonstrate that the care of the collections can be professionally and impeccably performed in all conditions. The authors of this introduction were the coordinators of the work.

The conclusion of the meeting of the above mentioned group was the decision to publish this guide. The material collected here can serve as guidelines, an "ABC" for all managers of museums or collections guardians who do not employ conservators-restorers, and feel the need to organize professional care of the collections. For qualified conservators-restorers, the material contained in this short work may seem rather obvious. However, mindful of the results of the survey, we decided to publish a collection of practical information for all who wish to begin the process of organizing procedures related to the care of conservation of the collections in their institutions.

We focused on fundamental issues, from which systematic conservation care should start – we have described, therefore, the principles for documentation of the state of the collection, storage and movement of objects in the museum, as well as for their loans. We believe that these tips will be useful and practical for everyday use in institutions that currently do not employ professional conservators-restorers.

At this point we would like to thank the members of the working party who took part in our discussions, all museum conservators-restorers involved in this work, and the directors of the National Museum in Warsaw, the National Museum of Cracow, the National Museum in Poznan and Zamoyski Museum in Kozłówka for their willingness to share information on their valuable achievements and experience, as well as for the kindness shown to our efforts.

Ewa Święcka, Marek Rogowski

Ewa Święcka

Documenting the state of preservation of the objects

In general, except in the specific case of contemporary art works, objects in museums are not new. Even if fate and people have handled them kindly, they have still undergone and continue to undergo numerous changes. Even the provision of almost ideal conditions for storage and display does not fully protect against the aging of the material substance. The varnish on paintings yellows, boards split and crack. Therefore, the progress of these changes should always be thoroughly described, photographed and documented. In the long-term care of objects, the comparison of the descriptions of these alterations over time allows us to draw important practical conclusions that determine further action to effect better preservation.

The condition of the object can be improved both by carrying out appropriate conservation treatment, and by improving the ambient environmental conditions. If it is observed that adverse phenomena occurred, for example, after a change in the place of exhibition, it means that the climatic conditions or improper lighting prevailing there may have been the cause. Changes can be divided into several types. There are natural alterations such as cracking or colour changes caused by ageing of materials. Other causes of damage are random events such as mechanical abrasions, scratches, tears.

Change may occur even in the almost perfectly designed and systematically controlled storage and exhibition conditions. The entire collection should therefore be documented and photographed from time to time. Data on the state of many similar objects accumulated over a long time will in the future help to determine the optimum environmental conditions for different groups of museum objects and – if needed – quickly apply necessary first aid conservation.

A particular situation in which the state of the object should be carefully documented is when it is to be loaned to another museum. During such a trip the object may experience accidental damage – through insufficiently careful unpacking, hanging or display. . With the existence of detailed documentation of the original state of preservation, the owner will then have le-

gitimate grounds for claiming compensation and for recovering costs of the treatment. A company insuring the transportation will require precise documentation of the state of the work made prior to the event. The more accurately the changes and damage can be described, the more precisely can the scope and extent of the damage caused be defined. Particular attention should be paid to this in the case of loans to institutions which are not museums where with the lack of specialised professional care the objects may be exposed to many dangers. In such cases especially, a periodic check should be made of the conditions in which borrowed items are being kept.

Museums use various forms of detailed documentation of the states of preservation. There is no uniform, binding form or document templates, but there are certain principles. In the beginning detailed verbal descriptions of the object were composed, then forms were developed for making systematic records, changes can also be recorded by marking them on photographs of the works. No matter in what form the records are kept, such documentation is necessary in every museum.

FIG. 1: Examples of different manners of documenting the condition of museum objects.

Muzeum Narodowe w Krakowie

DK3 Pracownia Konserwacji Tkanin w Gmachu Głównym / Jolanta Żuber, al. 3 Maja 1, 30-062 Kraków

Nr inw – inv no

MNK XIV-754

OPIS STANU ZACHOWANIA OBIEKTU – CONDITION REPORT

Tkaniny/Textiles

rodzaj obiektu – object

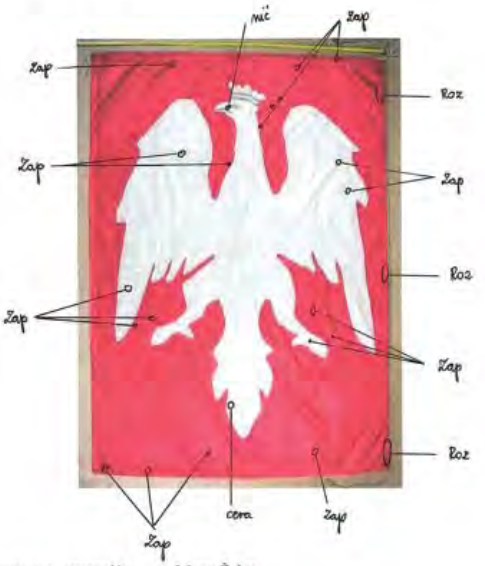
autor – autor

tytuł – title **Bandera dla okrętu polskiego (mającego reprezentować walczącą o wolność Polskę), nabytego w r. 1863 za pieniądze Czartoryskich i Zamoyskich, przeznaczonego do działań kaperskich, przeciw Rosji, na Morzu Czarnym.**

tworzywo, technika – technique

wymiary – dimensions **wys. 211 cm, szer. 192 cm**

Def	(deformacja)	**Def**	(déformation)	**Odb**	(odbarwienia)	**Dec**	(decolorisations)	**U**	(uszkodzenie)	**Dem**	(dommage)
Dz	(dziura)	**H**	(hole)	**Pu**	(pęknięcie nici)	**Ct**	(cracks of thread)	**Ub**	(ubytek)	**L**	(loss)
K	(konserwacje)	**C**	(conservation)	**Prz**	(przetarcie)	**Ab**	(abrasion)	**Zab**	(zabrudzenie)	**D**	(dirt)
Odp	(odprucia)	**Tr**	(torn)	**Rez**	(reserwacje)	**T**	(tint)	**Zap**	(zapłamienie)	**St**	(stains)
Zgn	(zawinienie)	**Ma**	(mounting)	**Inne**	(.....)	**Others**	(.....)				



opracowane przez – prepared by **Jolanta Żuber**

2013-01-10

Dorota
Ignatowicz-
Woźniakowska

Principles of Good Practice During the Movement of Museum Objects and Works of Art

These principles have been developed by the Conservation Department of the National Museum in Warsaw, taking into account the guidelines contained in publications of ICOM.

The most important rule of conduct with any exhibit is to plan the work to be performed on it, as well as to coordinate the activities of the persons responsible for this task by a designated leader. It should be remembered throughout the operation that after any mishap the insurance company only provides monetary compensation, which is no substitute for the damaged artwork. Therefore, when working with a historical object, haste is in no way desirable, and historic objects should always be treated as unique and irreplaceable. Works of art and museum objects require specific manner of handling, and suitable means of protection both during display as well as during all activities connected with their movement both within and outside the institution.

GENERAL RULES FOR MOVING ARTWORKS WITHIN THE INSTITUTION

1. All activities associated with the movement of the artworks should be carried out only by persons trained in handling them.
2. Objects must be moved individually, using both hands.
3. Hands must be clean and thoroughly dried. Objects should not be touched with bare hands. Protective gloves must be used, especially to prevent slipping of the work.
4. When objects are moved even on a short distance baskets, boxes or special trolleys should be used.
5. Containers should not be overloaded – two people should be anough to lift them.
6. When a box contains several items, cushioned inserts should be used to prevent movement of the objects inside the container .

7. Objects unsecured by belts to a platform or trolley must be secured by two people. In the case of large and heavy items, they should always be secured by two people, whether they are attached by belts or not. Objects should not protrude beyond the edges of the trolley.
8. The movement of objects carried in the hands should be minimized, and taking them up or down the stairs should be avoided.
9. Objects made of different materials should not be moved at the same time, for example, sculptures should not be moved together with paintings and other exhibits.
10. Light and heavy objects should not be placed together in the same container.
11. Before moving any object it should be determined where it is going to be moved to and how, in order to get the job done with a minimum amount of movement. This reduces the risk of accidental damage. It is necessary to look at the properties of the material, construction, weight, determine the strong and weak parts of the work and to protect it from knocks. Particular attention should be paid to every large and heavy items, because the risk of damage during handling is higher.
12. The personnel performing these activities must have appropriate equipment that will allow the use of the least possible physical force and replace it with the work of machines. They should also have the appropriate amount of clean protective materials, for example, different kinds of films, soft materials permeable to air, sponges, paper, adhesive tapes, gloves, etc. The materials used in direct contact with the surface of artworks cannot be rough, sharp or friable and must be chemically neutral and microbiologically clean.
13. Transport inside the buildings should be by means of specially-adapted trolleys, platforms or fork-lift trucks equipped with the appropriate wheels and brakes, along specially- prepared passageways with protected surfaces and with the use of elevators.
14. When moving artworks, rapid movements, sudden stopping and jerking should be avoided.
15. Objects intended for loan should first be gathered in a separate space with stable climatic conditions and a moderate air circulation.
16. Any, even the most minor actions classed as conservation treatment, for example vacuuming or the securing the damaged artworks, should be carried out by a competent person exclusivelly.
17. If, during the movement of a museum object, it is damaged, the object should first be made safe and then superiors should immediately be notified.

RECOMMENDATIONS FOR MOVING THE WORKS WITHIN INSTITUTIONS – GUIDELINES FOR MOVING OBJECTS OF DIFFERENT KINDS

Paintings

1. The surface of the work should not be touched with bare hands or other objects.
2. No more than one object should be moved manually at a time. Before an object is grasped, it must be ascertained that neither the picture nor its frame are damaged.
3. A big picture should never be carried by one person alone, even if it is not too heavy. A

picture should be held vertically with one hand supporting it from below and the second hand holding its side.

4. When paintings are visibly cracked and peeling, they must be moved in a horizontal position with the painted surface up, to prevent the exfoliating paint from flaking off .
5. Metal and other elements used for suspending the painting (wires, hooks and eyelets) should be carefully covered with tape to prevent them doing damage to other paintings or frames.
6. Paintings should not be placed directly on the floor. They should be set on padded racks or stands, strips, pads (sponges or rubber), foam pads, and secured so that they do not slide or topple. Painting should not be leant on each other, where this cannot be avoided, then they must arranged face to face, and separated by sheets of rigid cardboard.

Watercolours, engravings, drawings, prints, posters, documents

1. Works in mounts must only be moved in a special folder. In each mount, a spacer of acid free tissue paper must be an insertedbetween the work and the "window". One should not try to fix this by oneself. In case of damage to the work during mounting, the help of a qualified conservator-restorer or a trained person should be sought for remounting.
2. Unmounted works must be packed in folders before moving.
3. Cotton gloves should be used – with special care while handling unmounted works (e.g. albums, documents, photographs).
4. When moving objects, care should be taken to avoid direct contact between the surface of drawings done in crayon, charcoal, pencil, pastel or watercolours with other papers, with new prints or with printed packaging materials – because of the risk of contamination and microbial infection.

Library collections

1. Historic books with ornate bindings should be wrapped in tissue paper and placed flat, on their back cover in a cardboard box or conservation box.
2. Maps, framed in mounts with a tissue spacer between the work and the "window", as well as unmounted ones separated by tissue, should be moved in fitted folders.

Scrolls

1. Each scroll should have a case in the form of a conservation box for storage and moving around.

Sculptures

1. Before moving sculptures, regardless of size, the manner and method of transport should be carefully considered. Moving heavy and unstable works often requires the use of special technical equipment, for example a fork lift, a protective frame or local supports.
2. In case of doubt as to how to move the sculpture a specialist should be consulted, even if the sculpture is not heavy.

3. Marble, alabaster, limestone, terracotta, plaster and many other porous materials absorb dirt, therefore clean cotton gloves should be put on before touching sculptures made from such materials.
4. When moving a work consisting of several elements, only one part must be moved at a time.
5. The shape and material of sculpture usually determine in which position it can be moved – usually the safest is the position in which the sculpture was exhibited. Special attention should be paid to the projecting parts and weaker elements, especially while moving bulky sculptures or those composed of several elements.
6. When placing sculptures on bases, care should be taken to establish that they are strong and stable.

Furniture

1. It is important to examine each object carefully before it is moved. Before moving the furniture attention needs to be paid to any damage, especially that which is visible and that which seems recent.
2. Furniture should not be turned upside down.
3. Chairs should not be placed on other chairs and sofas, as this may cause deformation of the upholstery or damage to the wicker .
4. Antique furniture should not be dragged or slid across the floor.
5. Antique furniture should never be carried on one's shoulders or back.
6. Only one piece of furniture or one part of it should be carried at a time.
7. Before moving any piece of furniture, drawers and shelves should be removed from the body and moved separately.
8. During lifting or carrying pieces of furniture should not be held by any protruding parts. No decorative and protruding furniture element was intended for gripping and lifting.
9. Furniture should not be lifted by the legs, backs or armrests. Chairs should be carried with one hand placed under the seat, and the other supporting the back.
10. Before moving furniture any doors and drawers that are not locked with a key should be tied shut to prevent damage during movement. For this purpose a rough, hard cord should not be used. Bands or strips of soft material are the best.
11. Nothing should be leaned on fabric upholstery, as it can be damaged.
12. Airtight foil should not be used to cover painted or varnished furniture.
13. Glass and stone parts of furniture must be moved separately.
14. Any decorative elements of furniture that can easily suffer damage due to a sudden blow or pressure should be protected. Movable decorative elements must be taken off before moving because they can fall off.
15. Special care should be taken with the legs and bases of cabinets, legs of chairs and tables, backrests and armrests of chairs which are often prone to fracture.

Craft Objects

1. To hold items with glazed, metallized or any other delicate and carefully-finished surface, clean white gloves should be worn to prevent slipping, or a soft material which does not have a slippery surface should be used. Removal of fingerprints from the surface of a work is difficult, and sometimes even requires intervention by a conservator-restorer. In addition, fingerprints accelerate the corrosion process.
2. Objects should be lifted with extreme caution. Delicate objects of glass, ceramic or other brittle materials should never be carried by the handles, edges or other protruding parts. Although usually handles were designed for gripping and lifting, no museum object should be moved in this way, as in such items they are often structurally weakened, damaged, glued or reconstructed.
3. Even when handling small works, one hand should be placed under the bottom, and the other should protect the item from the side or from above.
4. Objects must be moved individually.
5. Light and fragile objects must be moved in special boxes with a soft padded interior to prevent chafing, bruising and knocking. They must be so arranged that they can not move during the transfer.
6. A box in which museum objects are carried should never be over-filled.
7. Objects in transit should never extend beyond the upper edges of the box or crate.
8. Self-adhesive labels and adhesives tapes should not be used for securing lids and other moveable parts of objects of metal, wood, terracotta, ceramic or the ones with poly-chromy.

Textiles and clothing

1. Textiles which are framed or mounted should be moved on flat supports of hard cardboard or other rigid material. This should not be smaller than the object on its mount, in order not to exert stress on weak fabric.
2. Small and medium sized fabric objects should be moved when unfolded and kept horizontally in containers with a cardboard bottom.
3. Fabric and clothing should not be crammed into a container, they should lie loose on the base.
4. Folding the fabric should be avoided where possible, if this is unavoidable, there should always be several layers of tissue paper between any such fold.
5. When moving fabric items, attention should be paid to removing or covering any sharp objects that may damage the object. In holding and moving framed or mounted fabrics, the same precautions that are applied to framed and mounted paintings, prints and drawings should be applied.
6. Textiles must be protected against insects. In cases where the presence of insects is discovered before moving the fabric, it must be tightly packed to protect other items.

Carpets, wall fabrics and upholstery

1. Carpets should not be folded, they should be wound on the rollers in a direction perpendicular to the warp direction, the upper face outside. If the carpet is very large and has to be folded, specialist's advice should be sought because such an action is complicated.
2. The roller should be well-dried hardwood having a diameter of at least 10 cm. It is unacceptable to use metal rollers because stains caused by contact with the metal are difficult to remove. The rollers must be sufficiently long so as to protrude from both ends of the rolled carpet.
3. Carpets should be carefully rolled to avoid the creation of folds, wrinkles or creases.
4. Small rugs are best moved in a horizontal position on a rigid backing, for example of foam board.
5. Fabrics must be protected against insects. In cases where the presence of insects is discovered before moving the fabric, it must be tightly packed to protect other items.

Packaging for works

1. Packaging should take into account the type of material from which the work was made. It should be considered whether it is of a homogeneous material, or a work made of multiple materials with different properties.
2. Allowance should be made for the structure and shape (from simple to very complex) and the size and condition of the work.
3. In an ideal situation, the choice of packaging and transport techniques should involve collaboration with experienced specialists.
4. Packaging should be adapted to the weight of the packaged object. It should be clean and clearly labelled (e.g. "Do not drop", "Protect from moisture", "top of the package", "fragile").
5. Packing materials (such as: blankets, sponges, fleece, foils, etc.) must be clean and chemically inert, anti-static, appropriately durable; their use should not cause ill effects in case of climate change and should not expose the objects to any damage.
6. The softness and elasticity of the cushioning material must be adapted to the characteristics of the work.
7. Adhesive tape should not be used for direct attachment of lids or other movable parts of the work.
8. Raised and fragile elements should not have any direct contact with the cushioning material of the package.
9. If necessary, in the case of particularly sensitive, delicate, fragile or crumbly works, the package must be additionally surrounded by shock-absorbent material.
10. Packaging must prevent the movement of the objects. Each object should have its own rigid container, if necessary with the use of rigid baffles.

Packaging must protect the objects from:

- mechanical, chemical, and biological damage

- microclimate change (fluctuations in temperature and relative humidity RH), faulty air-conditioning (overheating or overcooling)
- contamination,
- dampness.

When packing artworks, these principles should be given attention:

- Works made in different techniques should not be placed in crates together (e.g. sculptures along with paintings or other objects),
- Objects of disparate weights should not be placed together in a case, and the weight should be evenly distributed in the chest,
- Objects should not be touched directly with the hands – gloves should be used (the types depending on the specific material). Hands should always be clean, even if working in protective gloves,
- An individual approach should be adopted – depending on the structure of the object (often very delicate, or spatially complex). The packing methods chosen must take into account not only the material of the object but also any previous conservation treatments,
- Objects should be immobilised within the case only by restraining their strongest areas,
- Objects should be packed in such a way that the person unpacking them cannot accidentally cause them any damage; in certain cases a diagram demonstrating how the transported objects are packed should attatched.,
- Objects should be packed in appropriate conditions – this should take place on a table covered with soft cloth, or (in the case of larger objects) in a separate safe place large enough to allow freedom of movement when carrying out the operation.

RECOMMENDATIONS ON PACKAGING – GUIDANCE ACCORDING TO THE MATERIAL AND TECHNIQUES OF THE OBJECTS

Paintings

1. Before paintings are packed they should not be placed directly on the floor, but on pads of sponge or similar material. It is important that the corners are evenly supported.
2. If several paintings are to be leant on each other, then they should be set alternately – face to face, and back to back.
3. Pictures in frames should be wrapped gently with permeable materials, for example fleece or paper, not touching the paint layer.
4. Metal and other elements used for suspension of the painting (wires, hooks and eyelets) should be removed before packing because they can cause serious damage to other paintings or frames.
5. Wedges in stretchers should be covered with an adhesive tape to prevent them from falling out.

6. When objects are framed with glass the latter should be secured by an adhesive tape (the one which can later be removed by peeling off easily without the use of water or solvents).
7. It is best to place the paintings individually in boxes. This applies particularly to large pictures.

Watercolours, engravings, drawings, prints, posters, documents

1. Works should be moved in their mounts: , in an acid-free passe-partout, framed (with or without glass); with a space between the work and the glass, , and in the case of especially large objects made in durable techniques – behind plexiglass.
2. Works in passe-partout mounts should be separated with acid-free tissue or paper.
3. It is unacceptable to pack works made in particularly sensitive techniques (such as crayon, charcoal) without being mounted behind glass with a proper distance between the surface of the work and the glass.
4. Works in frames must be packed in boxes. Before packing them, any eyelets, wires and hooks should be removed from the frames.
5. When objects are framed behind glass (not Plexiglas) the latter should be securely taped (with a tape, which can later be removed by peeling off easily without the use of water or solvents).
6. If the works are not framed, they must be packed in fitted conservation-grade folders. The surface of the work should not be touched and the object must not be held directly with the hands.

Sculpture

1. Objects must be wrapped in a soft material, tissue, fleece, or other fabric before being secured in the crates.
2. Sculptures must be transported in crates or cages with crossbars which prevent movement within the chest.
3. Each sculpture should be in a separate box, and in the case of small sculptures in a separate compartment in a larger box.
4. Depending on the type of work, on placing the object in the box or crate and covering it, the spaces around it should be filled with polystyrene foam or polystyrene beads, or a free space can be left.
5. If belts are used for securing, there should be a soft pad underneath them to protect the work.
6. The shape, material and condition of the sculpture will determine in what position it can be safely transported. In general, the safest is the position in which the sculpture is exhibited.
7. Special attention should be paid to the part of the weaker and projecting parts of sculptures as well as the manner in which the work is connected to the base, especially in the case of bulky objects or those composed of several elements.
8. When placing sculptures on bases, ensure first that they are strong and stable.
9. If the sculpture is composed of several elements, they should be packed separately.

Furniture

1. Furniture should not be turned upside down.
2. Drawers and doors that cannot be locked shut must always be secured with bands or strips of soft cloth (rough, hard cord or duct tape should not be used for this purpose).
3. Stone and glass elements of furniture (the latter secured with adhesive tape) must be moved in a vertical position and packed separately.
4. Any decorative pieces of furniture that can be damaged by sudden impact or pressure should be protected. Movable decorative parts must be removed before packaging as they may fall off. In the case of clocks, pendulums should be removed and packed separately.
5. Care should be taken with the legs and bases of cabinets, the legs of chairs and tables, the backs and armrests of chairs and armchairs, which may easily break.
6. During transport, each work must be attached to the side of the vehicle, isolated from others by blankets, foam, cardboard or other dividers.

Handicraft Items

1. Before packing, it is necessary to take into account the following features of the works:
   a. the type of material – whether it is uniform or consists of a variety of materials (with different properties)
   b. weight – from very small to several tens of kilograms,
   c. the construction and design – from the simple to the very complex (including mechanisms),
   d. a very broad range of dimensions,
   e. the state of preservation.
2. Each work should have its own rigid packaging.
3. Adhesive tape should not be used for direct attachment of lids or other movable parts of the work.
4. Projecting and delicate parts should not have contact with supporting packaging materials.

Textiles and clothing

1. Avoid creasing the fabric, if it needs to be folded this should be interleaved with several layers of (Japanese) tissue so that the inside of each fold is lined with tissue.
2. Objects of three-dimensional form (for example clothing) should be additionally filled with soft filler, such as crumpled acid-free tissue paper.
3. Any pins should be removed before packing objects.
4. It is important to pack together only items of the same type.
5. Containers with clothes or fabrics should not be opened with sharp tools.
6. The tissue paper and other packing materials used should always be carefully examined after unpacking clothes or fabrics (these may contain lost buttons or other accessories).

Carpets, wall fabrics and upholstery

1. Before fabric is placed in the package, it must be wound on a roller, the ends of which protrude from both sides.
2. In addition, fabric items which have sleeves or Velcro tapes sewn onto them for display purposes should have another soft piece of cloth (such as flannel) sandwiched between the rolled layers to even out the difference in thickness.

TRANSPORT OF WORKS OF ART

1. Transport of works of art should be accompanied by a person authorized under the terms of the Regulation of the Minister of Culture and National Heritage of 15th May 2008, on the conditions of transfer of museum exhibits (Journal of Laws No. 91).
2. Works for loan should first be stored in a separate room with stable climatic conditions, moderate air circulation and protected from dust.
3. Movement of works may be carried out only after they have been properly prepared for transport.
4. Each work sent on loan must have a recent photograph (in the case of complex works – more extensive photographic documentation), and a conservators' opinion on the state of preservation taking into account the purpose of the movement issued in duplicate. and. This opinion is attached to protocols documenting the loans.
5. The principle is for loaned works to be in a good state of preservation, microbiologically stable and dust-free. Particularly vulnerable objects and those in a bad state of conservation, microbiologically contaminated, sent out of the institution to another for conservation or disinfection require to be specially packed: they should be isolated from other objects or at least covered in paper before being transported.
6. When transporting works of art the various potential risks must be taken into account, in each mode of transport there is a risk of accidents and damage to other works.
7. The transport company chosen must be specialized in handling museum objects.
8. In the case of loans of objects to non-museum institution, special care should be taken of them, and attention should be paid to the conditions in which they will be kept..

Threats to objects during transport of works of art

The primary risks in transport arise from:

1. Knocks, shock and microshocks:
   a. Mechanical damage: cracks, tears, fractures, bruises, splinters, crumbling,
   b. Loosening of the structure and bonding between the layers that sometimes reveals in a work long after a journey (the damaging effects of multiple journeys are cumulative)
   c. damage caused by improper packaging such as dents and abrasions (e.g. through direct contact of paper with the surface of the work) or improper preparation before transport (e.g. bad insertion of a painting in a frame, the loss or shifting of wedges in a stretcher).

2. Changes in microclimate which will result in:
   a. Changes in linear dimensions and volume of materials, depending on the type of material. As a result of this, the object can become unstable, there may be a loss of adherence of joints, splitting or cracking, loss of adhesion between the layers of the object, for example blisters, holes, the disintegration of binders,
   b. condensation of moisture during rapid temperature changes (for example, on the metal parts of objects),
   c. dissolution or softening of some materials (e.g. the linings of paintings, wax fillers),
   d. the microbiological growth.

General rules:

1. Unpacked objects and objects in boxes should not be carried at the same time by the same means of transport.
2. Objects should not be carried in the same baggage compartment along with other things.
3. Crates should not be stacked on each other.
4. Paintings, prints and drawings should be carried vertically (except pastels), parallel to the direction of travel, other objects – in a correct position for each object type.
5. Works which are not packed in crates after adequate protection should be attached to the side of the vehicle with bands, and isolated from each other with appropriate separators, such as blankets, foam, cardboard. In addition, in order to prevent damage, it is necessary to place cushions under securing belts and their buckles.
6. In the case of large and heavy works or crates, loading should be done with the help of jacks or hydraulic platforms.
7. Rapid movements, jerking or sudden stops during the journey should be reduced to a minimum.
8. It is important for all persons involved in the packaging and transportation of museum objects (drivers, couriers, technical staff) to pay proper attention during the loading of vehicles (not to overload the vehicle, to secure of the load correctly, to maintain access to the boxes for checking during the trip), to drive at the proper speed, to be awary of the dangers of theft during the journey.

Transport by road vehicle:

1. When lending works of art, attention should be paid to the proper selection and preparation of transport, which should include:
   a. Good suspension of the vehicle, with the cargo area with adjustable temperature, properly insulated and weatherproof, provided with equipment for immobilizing the works in the correct position (belts, fittings on the walls for engaging straps)
   b. A flat floor (flat wheel hubs)
   c. The necessary protective materials,

d. A hydraulic platform-lift for lifting and loading heavy works
e. The condition of the roads, which can cause dangerous shocks in case of poor road surface and improper suspension.

2. It is also important to select the correct stopping places. Avoid locations in direct sunlight, near flammable material, such as vehicles carrying such cargo and petrol stations. If the objects are being transported in two vehicles, at a stopping place, for security reasons they should be parked back to back.

Risks for other modes of transport:

1. Aviation:
   a. Drastic temperature change in the case of cargo holds without air conditioning,
   b. A lack of devices to immobilize the crates inside the cargo hold, preventing shifting, colliding and toppling of objects
   c. Strong vibrations, shocks during the take off and landing,
   d. Pressure differences,
   e. The difficulty or impossibility for the courier of the transport to supervise the loading and unloading of boxes in airline warehouses before departure and after arrival,
   f. The need for intermediate transport (plane, car, train, ship) and the additional handling and movement of objects as a result
   g. The danger of theft.

2. Rail:
   a. No insulation, causing microclimate change, leakage of wagons (possibility of intrusion of dust, rainwater)
   b. The lack of sufficient protection against shocks,
   c. The difficulty or impossibility to monitor the boxes during the journey (e.g. in a sealed train)
   d. The danger of long stops or unhooking of the wagon
   e. Difficult access of the person accompanying the objects to the wagon where they are actually being transported,
   f. The danger of theft.

For these reasons, works transported by rail transport should be escorted by two people.

3. Transport by ship:
   a. Prolonged journey
   b. The necessity of intermediate transport (car, train, plane), additional need for transhipment,
   c. The breakdown or the sinking of the ship,
   d. The possibility of a box falling into the water during loading,
   e. Incorrect loading and securing of boxes,
   f. The danger of theft.

GENERAL INSTRUCTION FOR A COURIER CARRYING MUSEUM OBJECTS

1. A courier carrying museum object must know beforehand of all the relevant activities, as well as the various risks, associated with the movement of works that are entrusted to their care.
2. A courier delegated by the director of an institution to take decisions on their behalf should have the ability to take quick and decisive action concerning the objects entrusted to their care and the ability to engage during the conducting of their duty in appropriate interaction with people at different levels of the administrative hierarchy and on meritorial matters.
3. The travel arrangements of the courier, the period of their stay in the destination location of the objects as well as matters related to the organization of the loan should be specified in detail in the arrangements made prior to the loan and given to the courier before they begin the journey.

The duties of a courier include:

a. Watching carefully over the objects during the journey and executing the appropriate response in the event of unforeseen difficulties in the program,
b. Supervising the packing and unpacking of the objects, checking their state of conservation and comparing it with the reports on the state of conservation compiled before the journey,
c. Supervising execution of the formalities connected with the loan – the signing of the protocols of loan and receipt,
d. In case of any changes in the state of preservation, adding a note of the alterations to the existing opinion made at the time of the loan, or in specific cases, the drafting of a new opinion (in duplicate),
e. If necessary, making photographic documentation, informing superiors about any doubts or irregularities and unforeseen events identified. If any damage has occurred, determining the reasons and take measures to ensure the safety of the objects.

The equipment of a courier should include:

a. The necessary documents (including protocols of transfer and receipt, authorization, opinions on the state of conservation of the objects),
b. The telephone and fax numbers, addresses of institutions involved,
c. Photographic camera, ore a mobile phone t with the possibility of taking photographs, a measuring tape, sheets of paper to make any necessary notes, pencil,
d. Toolbox with necessary materials for first aid conservation (when the courier is a trained conservator).

Anna Fic-Lazor

Storage of collections: Recommendations for smaller museums

There are many local museums in Poland. They may be regional museums collecting items from a specific region, they may be specialized ones, often devoted to a historical figure or event relating to the place, and recently an increasing number of private museums. In addition to the collections on display to the public an important element of these institutions are storage facilities for objects not on display. The storage rooms may contain items that are not in such a good state of preservation to put on display, or items that cannot be exhibited for the lack of space or because they do not fit the concept of the exhibition at the time.

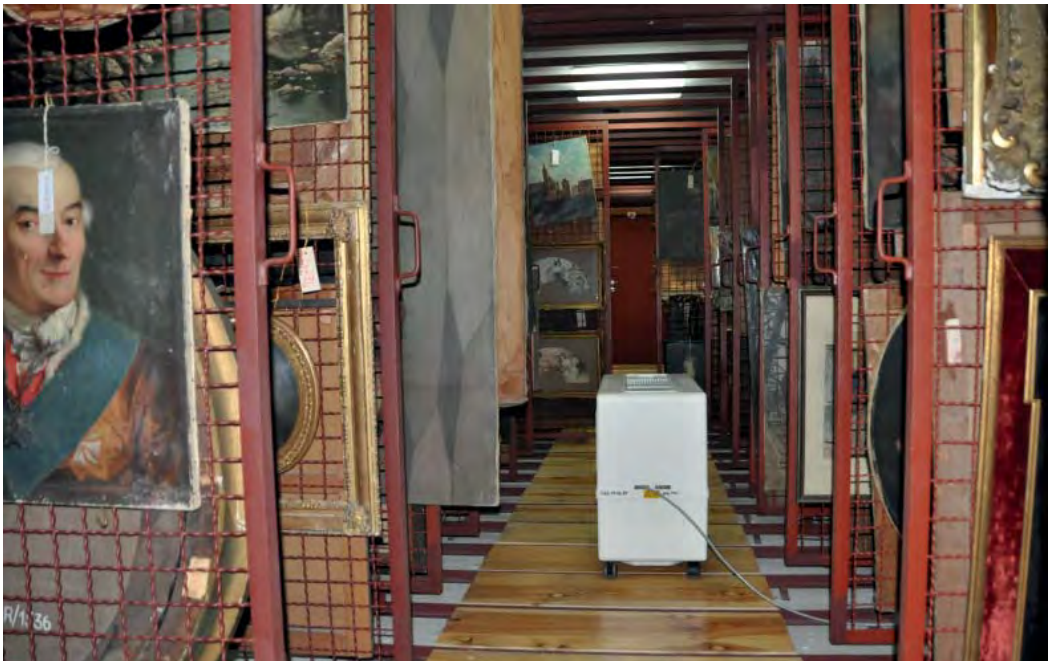


Fig. 2: Museum storeroom, paintings on sliding wire netting racks

The museum storage room should provide the objects it contains with a high degree of long-term protection. An important factor in achieving this is to supply the appropriate microclimatic conditions inside it: the temperature, humidity and amount of light should be kept at appropriate levels and dust should be eliminated. The premises should be monitored to ensure the maintenance of the appropriate storage environment within the acceptable range of tolerance. This will aid the conservation and protection of objects by creating conditions that actually prolong their existence as a result of slowing down the rate of their destruction.

Another threat to collections are various zoological pests – insects and animals. Their presence must be controlled and preventive measures should be systematically taken to eliminate them or reduce their population.

Museum storage facilities must also meet the necessary requirements for providing appropriate safeguards against theft and fire.

In addition to providing adequate facilities and conditions, the human factor is extremely important. Museum objects need the care of a conservator or appropriately trained personnel, who monitor and ensure the proper parameters of the microclimate, and who periodically review the stored objects, draw up a schedule for necessary maintenance work and conservation, and also take care of the cleanliness of the premises and objects, which will help to extend the life of museum objects held in storerooms.

STORAGE AREAS – MICROCLIMATE AND LIGHTING

The location and condition of the premises for the storage of historical objects are determined by the space available to museums. The specially designed storage facilities may be modern constructions in newly built or renovated museum buildings, or they can be housed in adaptations of existing rooms. The storage conditions and different threats they may pose to stored objects depend on the location of the museum storage room within a building. The technical condition of the museum building, the type of materials used in its construction affecting the access of light and the ability to control the temperature – all these factors have an impact on the state of conservation of the stored objects.

Knowing the potential risks, it is often possible to eliminate or reduce their harmful effects by low-cost means.

The storage area should have adequate thermal insulation (preventing freezing in winter, overheating in summer), which provide a relatively stable thermal conditions. Small windows, or the absence of windows will reduce heat gain resulting from sun exposure and prevent exposure to harmful ultraviolet radiation. The proper sealing of premises will allow a reduction of the

penetration of particulate matter, as well as hinder access to the storage rooms by pests such as rodents. Windows used to ventilate the rooms should be fitted with a mesh impeding access to the interior by insects, rodents, but also larger windblown objects.

It is inadvisable to situate museum stores in attic rooms, where – when poorly insulated – they may be exposed to large fluctuations in temperature and humidity. Likewise, located in the basement, with faulty – or absent – insulation of the walls from humidity, they may be at risk of moisture and biological hazards.

Museum storerooms should also not be placed near water, sewage or central heating pipes, or near heaters or in draughty places.

MICROBIOLOGICAL AND ZOOLOGICAL CLEANLINESS

In certain conditions, museum storage facilities may become a hotbed of different species of bacteria, fungi, viruses, algae, protozoa and insects which will attack objects of wood and other organic materials. Unsuitable parameters may cause a microclimate suitable for the settlement, growth, development and reproduction of many micro organisms.

The most common operational errors that encourage the growth of fungi are: excessive humidity, inefficient ventilation of rooms, saving money by turning down heating, over-airtight plastic window frames and airtight doors. These factors should be watched particularly in storage rooms in new or recently renovated buildings. It is not only in old unheated buildings that mould will grow, but also in those new ones which create an environment suitable for the development of micro-organisms.

The growth of fungi under favourable conditions in a short time can cause significant damage to the wooden components in buildings. They are particularly dangerous in the case of the infection of wooden structures and buildings with structural members made of wood.

It should be noted that the museum is a very specific environment in which the danger of microbiological attack is high because of the movement of a variety of micro organisms along with the flow of visitors as well as the character of the materials present in this type of public building – such as wood, metal, elements of books and paper. These can all promote colonization and growth of micro organisms.

To prevent the development of fungi, storerooms should be provided with adequate ventilation involving both the provision of fresh air from the outside and the discharge of exhausted air to the outside, with constant monitoring of the indoor microclimate and outdoor weather conditions. Objects should not be placed in the corners of rooms or pressed up close to gable walls.

While designing new and repairing old storerooms, it is important to include appropriate ventilation systems and use building materials containing ingredients that impede the development of potential colonies of mould and mildew (such as a pH below 2 or above 8, the presence of water glass, lime or cement in the composition, a micro-porous structure facilitating free migration of gases and water vapour while at the same time exhibiting hydrophobic properties).

In certain conditions storage facilities can become a habitat of animal pests. Different types of insects can attack the wood, paper and fabric in collections, and rodents (for example mice) can do irreversible damage to museum objects. To avoid this, the collections should be regularly monitored, using the appropriate rodenticides and the preventive use of various kinds of products for fighting insect pests such as pheromone trapping, or various chemicals (or their mixtures, often with one dominant component). Pheromone traps work by luring certain species of insects, they are ecological and do not contain active ingredients.

MICROCLIMATE

One of the factors that determine the rate of deterioration of historical objects is the ability to create the right microclimate for their storage and display. Maintaining the right level of microclimatic parameters – especially temperature, relative humidity, air velocity and purity – often poses problems that arise not only from the state of the building or the material properties of the objects concerned. They are also the result of a compromise between the conditions relevant for the objects and the comfort of visitors and employees caring for collections.

The optimum microclimatic parameters of a storeroom should be determined after a thorough analysis of its situation and the properties of the material to be kept there – the material they are made of and the time of their origin and so on. On these depend the optimum conditions for the air surrounding them.

The air temperature in the room has a significant impact on the value of relative humidity. For most materials, it is advisable to maintain a constant level of 18-20°C, because higher values favour the development of fungi, moulds and other organisms with a destructive influence on historical materials. Too low a temperature may increase the fragility of the material and contribute to the danger of mechanical damage.

The parameters of relative humidity in the room have the greatest influence on the preservation of many types of historical objects. These parameters are particularly important in the case of complex objects incorporating hygroscopic materials, and changes in RH have extremely adverse effects on objects made of materials such as paper, papyrus, parchment, animal skin, fabric, wood or ivory. Each disturbance of the equilibrium between the air and the object begins the process of moisture exchange between them, leading to a change in the linear dimen-

sions of the absorbent material, and consequently the deterioration of the state of the historical object.

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An undesirable range of relative humidity in the case of objects of metal and stone promotes the processes of corrosion or chemical decomposition.

In museum objects of paper, relative humidity fluctuations cause the migration of products of degradation of paper and writing media such ink from one sheet to another. There are then local colour changes and yellowing.

Excessively high relative humidity (above 65%) and temperatures (above 25°C) are to be avoided because of the possibility of creating a favourable climate for the growth of micro organisms.

The suggested parameters for the environment of various types of historical objects reported in many publications form the basis for the creation of the most appropriate microclimate conditions in museum storerooms.[1] Attention should however also be paid to the conditions under which objects were stored earlier in order to avoid them experiencing a shock due to a sudden change of climate (even if it is to climatic conditions which are theoretically better). The best approach would be to establish, on the basis of long-term observation, and maintain the average microclimatic conditions for the collection kept in a particular storeroom.

It is recommended that sensitive or valuable objects are stored in a separate room or are placed in display cases. This would facilitate the monitoring of the microclimate conditions, and ensure the maintenance of the relevant parameters through the use of moisture-absorbing gels, and special corrosion-preventing fabrics, etc.

In the winter, if the required parameters of relative humidity cannot be maintained, there should be a round-the-clock humidification of the air and the room temperature should be lowered (the minimum safe internal air temperature is + 5°C). It should also be noted that rooms cooled during winter should not be ventilated during a thaw or when there is a heat wave when, be-

[1] See the text by Janusz Czop in this volume.

fore or after a rainstorm, the humidity reaches 100%. This can cause water condensation on the walls, floors and – in extreme cases – on the objects.

There are currently on the market many devices to measure the microclimate – from simple mechanical thermo-hygrographs to more advanced instruments, allowing continuous recording of the parameters in a database through connection to the computer. Systematic entry of information about changing climatic conditions in a database (paper or electronic one) will allow extensive analysis of the occurring changes and detect anomalies in seasonal cycles.

In order to maintain optimum microclimate conditions in storage areas, the best solution is to install air-conditioning or individual wall-mounted air conditioners. The use of mobile humidifiers and dehumidifiers, which are activated as needed, has also been successful.

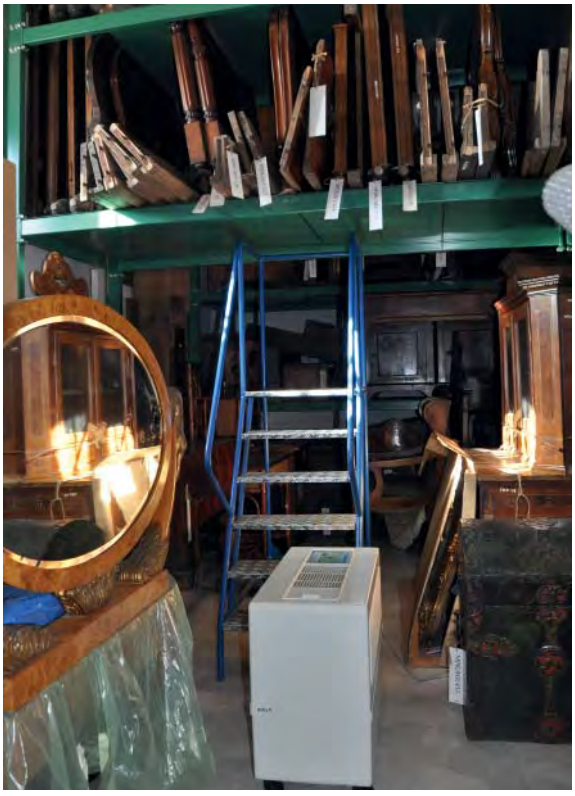

Fig. 3: Mobile humidifiers are excellent when used in various storage spaces, allowing humidification where needed

In choosing a humidifying apparatus, care should be taken that its parameters are suited to the size of the rooms where it is intended to use it so that the humidification is regulated and occurs through diffusion. They should have the appropriate air filters and ensure microbiological purity (eg. through an UV lamp). In the mobile humidifiers of parameters matching the needs of the rooms condensation of dampness should occur on the cold surface of a heat exchange apparatus and be regulated by a hygrostat. It is important to make sure there is an effective means of preventing leaks. The air grilles of air conditioning equipment as well as mobile humidifiers should be at a safe distance from any museum objects.

In storage areas, as in the case of museum exhibitions, the concentrations of air pollutants, especially particulate pollutants (dust) should be mininised as much as possible. In order to reduce the pollution brought from outside, there should be a doormat at the entrance to the storage place, it is important to clean boots and shoes, and employees should not enter the stores in outdoor clothes (coats, jackets).

Another type of very harmful pollution results from the secretion of various products by the materials used for construction and interior trim, and those used to store the objects. In many cases wood, wood-based materials (chipboard and fibreboard, MDF), paint, acidic papers and fabrics emit volatile organic compounds, such as formic acid, acetic acid, formaldehyde. All of these cause the acceleration of the degradation process, especially of glass and stone. To reduce the concentration of pollutants, the premises must be reasonably airtight and the ventilation systems or air conditioning must be fitted with various anti-dust and active charcoal filters. Harmful pollutants can be reduced through the careful choice of the materials used for the interior finishing of the building and the selection of equipment and material to store the objects, paying attention to their chemical composition.

LIGHTING

Visible and invisible rays of natural and artificial light can have a destructive influence on museum objects. The harmfulness of light increases with the length of exposure to radiation, and with the increased power of the light source, the non-uniformity of radiation, and the spectral content of the light (particularly blue, violet, ultraviolet and infrared), and when the microclimate parameters – temperature, humidity and air pollution – are in excess of the safe limit. The degree of illumination recommended varies due to the type of illuminated objects.[2] Many materials are sensitive to photo-oxidation induced by light radiation, in particular that in the ultraviolet (UV) and infrared (IR) ranges of the spectrum. Light reduces the integrity of the material and causes yellowing. It often adversely affect the dyes, accelerates the aging of objects, causes the disintegration and cracking of layers of paint, and can lead to tearing of the fibres of textiles. This makes the object more sensitive to microbial attack.

Windows should be fitted with UV filters or foils to eliminate ultraviolet radiation entering the interior. In their absence, windows should be covered by curtains, shutters or blinds. In museum exhibitions lighting should be maintained at a level of 50-200 lux, in storerooms, depending on the type of objects kept there, it could be up to 150 lux. It is recommended to keep the museum store in darkness when not in use and to cover the objects kept there.

The light sources in store rooms should be placed at a safe distance from the stored objects. Light sources should not emit harmful radiation or the lights should be fitted with UV and IR filters. The use of bulbs marked 'UV STOP' is recommended. Avoid excessive levels of illumination.

[2] See the text by Janusz Czop in this volume.

STORAGE EQUIPMENT

Proper care of the collections in museum stores requires the optimisation of conditions and the application of modern techniques of storing objects. Often collections within the institutions themselves are very diverse, and therefore each group of objects requires a slightly different technique of storage and the storage equipment should be adapted to the material, technique of the making and dimensions of the exhibits.

THE LOCATION OF OBJECTS

Furniture for storing historic artefacts should be placed in such a way that there is free and safe access to objects, and passageways should be left clear. A museum store should not be used as a place to keep other objects or materials, for example those used for the packaging or transport of objects. Potted plants should not be placed in a museum store, the objects and equipment intended to be placed in the store should be microbiologically clean.

The system of arrangement of the exhibits in the storeroom should be transparent – shelf units, shelves, racks should be labelled in accordance with the museum's internal system, and each time an object is moved within the museum, the change of location should be properly recorded. If the label identifying an object is not visible because of the location or is under a cover, there should be a duplicate label in a visible place, securely attached to the object.

Fig. 4: Safe storage facilities involve a transparent system, proper storage equipment, adequate labelling and dust protection

All furniture for storage of exhibits should be stable. The shelves should not be placed too low (approx. 15-20 cm from the ground), the drawers should not be too deep, and their bottoms should be stiff and not sag. Objects can be stored in lockable cupboards, drawers and shelves. Those of solid wood are the most suitable if it is of a non acidic pH, unpainted inside.

Wood protects against adverse fluctuations in microclimate, assuming the role of a buffer, provided that the room is not constantly damp. However, one should be careful with plywood

and chipboard, and also with painted and impregnated materials that emit various pollutants – by-products of the aging of resins, plasticizers, adhesives, varnishes and paints.

Metal equipment to store museum objects is appropriate only in areas with stable microclimate, because an increase in humidity can cause condensation of water vapour on the metal and its absorption by the object.

Shelves for paintings and framed artwork are the most common form of storage of this type of object in museum stores. Especially recommended are professional racks, made of wire netting so the objects are accessible from both sides and there is an adequate airflow. These are built to slide along special rails, to avoid vibrations during their movement. They fulfil their role perfectly, ensuring the safety of objects and efficient use of storage space.

Paintings can also be stored in wooden shelving units with diagonal strips mounted from the inside. Contact between surfaces should be padded with sponges, rubber or foam pads and properly secured to prevent paintings falling over.

Fig. 5: Furniture made of solid wood is the most suitable for the storage of museum objects

Fig. 6: Picture frames can be stored in metal racks

Fig. 7: Racks for hanging paintings and framed graphic works. The wire netting means they are accessible from both sides. They are moveable along special rails. This is the most common form of storage of these objects.

Paintings should not be stood directly on the floor. Leaning them against walls, especially external ones, is not recommended, nor should they be leant one against another. If the latter cannot be avoided, they should be placed together face to face and separated by rigid spacers.

Paintings with no stretchers are best stored flat in drawers, large-format paintings should be wound on rollers face out and together with the appropriate protective material as an interleave. The rollers – with a diameter matched to the size of the object (not less than 30 cm), with a rigid mandrel to prevent any distortion – are placed in holders on special racks. Similar racks can be used for the storage of rolled fabrics and carpets (rolled in a direction perpendicular to the warp direction, with the outer face outside). Any elements sewn to the object (loops or velcro strips) will cause a difference in thickness which should be evened out by the use of a soft cloth inserted between the layers.

Fig. 8: Racks of rollers are the most suitable way for storing textiles, carpets and paintings with no stretchers.

The rolled-up object should be protected by a covering or sleeve. For safe removal of the rollers from the racks, it is advisable to supply them at the ends with wheels of a larger diameter than the roll, or use stands, to avoid putting a roller with the wound object directly on the ground.

Specialist archival cabinets are a good option where there is a problem with the storage of large-size flat objects. They can be ordered to size, made of sheet metal and steel profiles covered with high quality powder paint, fitted with drawers on runners.

Fig. 9: The safe rolling of a large painting

Various types of stationary shelving units may be used for storage of handicraft items, numismatic, ethnographic, archaeological items, sculptures, etc. Cabinets with pull-out drawers, often specifically tailored to specific items are also used for museum storage.

The shape and condition of the material determine in what position the object should be stored. In general, the safest is the position in which the subject is displayed. Attention should be paid to the protection of protruding parts and vulnerable areas. In particular attention should be paid to the manner an object is connected to a display base, particularly in the case of a bulky form. If the object is composed of several elements which are not stable, it is better to store them separately, labelling them appropriately.

Packing material: objects made of paper, books, maps etc., in storage require appropriate packaging (boxes, folders, envelopes) made of archival acid-free and lignin-free paper and cardboard boxes. They are a long-term protective measure that is very easy to apply.

The use of plastic folders containing plasticisers is to be discouraged. Cardboard binders and boxes containing acid and lignin (wood pulp) should also be avoided. All paper clips and metal staples must be removed from archival material, since they will rust and damage the paper.

All mounts of objects on paper should be made of acid-free materials or at least separated from the object by acid free spacers. The mounts of drawings in colored pencils and pastel technique must ensure an appropriate space above the surface so that it has no contact with other materials.

If books stand vertically, there should be a bookend to support the outer volumes so they do not fall over. Also, do not pack the books on shelves too tightly. Artefacts in the

Fig. 10: Archival cabinets can be used to contain large format flat objects and unmounted graphic works. In the drawers they are additionally covered by acid-free paper.

Fig. 11: Handicraft items and other three-dimensional objects are best stored on stationary shelving units

Fig. 12: Objects on paper and maps should be stored in separate acid-free boxes. These must be properly labelled

form of scrolls should be held in archival boxes for storage and transit, allowing them to be moved without directly handling the object.

Particular attention should be paid to the storage of photographic collections. To slow down the aging processes (discoloration, fading), as well as to protect the photograph from external factors, it is essential to pack it appropriately, for example in envelopes and boxes made from acid-free paper and cardboard or plastic packaging (such as wrappers of transparent polyester). Paper used to store black and white photographs should have a neutral or alkaline pH with an alkaline reserve not exceeding 2%. In the case of colour photography, papers with a neutral pH or without an alkaline reserve are most appropriate. Properly packed photographs are best stored in metal cabinets. Do not store the photos together with paintings. It is recommended to store photographs in rooms with a low air temperature.

Proper storage is currently supported by various types of anti-corrosion packaging, e.g. polyethylene film with a coating of copper particles. Packaging in such a film protects objects against atmospheric, galvanic and biological corrosion. These films can be used to protect objects of metals (copper, silver, brass, iron and non-ferrous metals), CDs, videos and photos, textiles (for example those containing silver thread), paintings (for example the protection of metallic pigments from sulphur compounds). A special cotton fabric containing silver particles resulting in absorption of harmful gases can be obtained for the storage of silver. Other fabrics woven with activated charcoal are an excellent absorber of gaseous pollutants. An interesting solution to this problem is storing objects in an atmosphere where access of oxygen is reduced by the use of currently available special packaging systems, but the choice of exhibits for such form of storage should always be consulted with a conservator because it is not appropriate for all objects.

Fig. 13: Additional specialist packing material may be used for the storage of objects sensitive to moisture and air pollution

In order to stabilize the internal climate in locked cabinets and drawers, various types of moisture absorbents in the form of silicate or silica gels should be used.

When storing textiles to avoid creasing any folds should always be lined (filled) with layers of sheets of tissue paper. Textile objects of three-dimensional form, for example clothing, should also be further filled with a soft, acid-free filler. Fabrics and clothing should not be crammed into a container or drawer, they should lie freely in them.

Museum objects kept in storage rooms need to be protected from dust. They need to be provided with a protective cover – acid free papers, filter papers, Japanese paper.

It is also recommended that the objects also are placed on acid-free materials. Cotton sheets can also be used, for example on furniture or textiles. All of these materials should be highly permeable so that no condensation of moisture occurs beneath them. Periodic measurement of the ambient climate parameters and microclimate under the covers will detect any undesirable effects.

PREVENTIVE CARE

The basic prerequisites for proper storage of collections are:

a. The assignation of an appropriate place,
b. The control of access to the storeroom,
c. Appointment of a person responsible for the storage of museum objects and for the processing of data on storage conditions, for example the readings of temperature and humidity recorders,
d. The proper storage conditions (suitable furniture and packaging materials, safe location of objects),
e. Segregation of objects of different materials and techniques,
f. Systematic monitoring of microclimate conditions,
g. Monitoring the state of preservation of objects,
h. Periodic cleaning of storage rooms.

Adherence to these principles will allow spotting adverse effects in good time and the immediate application of appropriate remedies.

Fig. 14: When storing pottery, individual objects should be separated by soft dividers

Fig. 15: Soft cotton covers on upholstered furniture protect them against dust

Fig. 16: The segregation of objects in terms of technique and material help to identify and select the appropriate storage conditions

Museum stores have similar procedures in the storage, handling, treatment and cleaning objects as the exhibition spaces. The most important are:

a. Historical objects should be treated as unique and irreplaceable,
b. Employees who come into contact with museum objects should be periodically trained; this should cover the rules of procedure with objects of various types, principles of their handling, packaging and care,
c. Systematic monitoring of the state of preservation of objects is required,
d. The most important rule of conduct in the case of each museum exhibit is the planning of individual steps of work, the co-ordination of the activities of the group responsible for the task, preparation of the working area,
e. Work with museum objects should never be carried out in haste,
f. There should be no smoking, eating, drinking, etc. during the handling of museum objects,
g. Hands must be clean and dry, even when working in protective gloves. When moving objects, cotton, cotton with rubber perforations, vinyl or nitrile gloves should be used,
h. When moving exhibits, both hands must be used,
i. When moving objects, even for short distances, baskets or boxes must be used.

CLEANING OF STORAGE ROOMS

The periodic, systematic cleaning of museum store rooms is recommended. This work should be performed carefully and safely by appropriately trained personnel. For dusting, use a vacuum cleaner with a High Efficiency Particulate Air (HEPA) or a water filter. The entire room, the floors, walls, ceilings, windows and their coverings should be periodically vacuumed. Care should be taken to frequently remove accumulated dirt and dust from external doormats. If floors need polishing, they should first be washed using suitable solvents to remove the build-up of dirt. When using a floor polish, attention should be paid to its composition; preparations based on natural or synthetic wax are recommended. When using water, it should not be used in excess. Small portions of the floor should be washed at a time and quickly wiped dry to avoid increasing the humidity in the room.

CLEANING THE STOREROOM EQUIPMENT

The furniture for the storage of exhibits should be periodically cleaned. The use of water should be limited, vacuum cleaners with appropriate filters and electrostatic cloths to remove dust reduce the necessity to use detergents. If it should be necessary to clean the inside of storage room furniture with water, it should be well dried and then carefully checked for moisture by inserting a hygrometer inside.

CLEANING OF OBJECTS

When cleaning, attention should be paid to the state of the object. Cleaning should be done on a table covered with a soft cloth or – in the case of larger objects – in a separate secure place, allowing freedom when working.

Objects should not be picked up by the handles, edges and protruding parts.

The best way to remove dust is with a soft brush, and removing it at once using the suction of a vacuum cleaner. Dusting should take place from top to bottom. It is good to use electrostatic materials, for example with nano-silver particles. Cloths should be smooth so that the fibres do not catch on the surface irregularities of the object. They should be changed often and not shaken out in the storage room, and after each use they should be washed and dried.

Fig. 17: Using a soft brush and a vacuum cleaner is a safe way of cleaning objects

In the case of paintings on a stretchers, monitoring of the tension of the fabric is recommended and if necessary adjusted through the use of the stretcher's wedges.

When cleaning a book on a shelf, the volume should be pulled out to the front, pushing it forward from behind with the fingers, or isolating it by moving the neighbouring volumes, pushing them slightly toward the back. When removing paper objects from a drawer, they should not be held by the corners or edges or dragged across the surface of another object.

The cleaning of glass in frames should not be done with the use of detergent; ethyl alcohol is to be preferred. The reassembly of any object in a glazed frame should only be done after the complete evaporation of cleaners.

Bone objects should not be treated with water.

Objects made of materials such as marble, alabaster, limestone, plaster, terracotta, metal, readily absorb dirt and moisture – gloves should be worn during any work with them and the use of damp cloths and water should be avoided.

Textiles should be dusted gently, with the work of the vacuum cleaner aided with soft brushes of natural bristle. After this work, the brushes should be washed and dried.

Furniture should not be dragged or slid across the floor. It should be moved one piece (or one part of it) at a time. It should not be lifted by protruding parts. It should not be turned upside down. One piece of furniture should not be placed on another, as this may cause deformation of upholstery or damage to the wicker. Painted or varnished furniture should never be covered with an airtight film.

SUMMARY

The long-term protection of the stored collections is assured by the proper selection of premises, equipment and protective materials, also by properly defined, safe microclimate conditions and appropriately designed and implemented principles of preventive conservation. An extremely important factor affecting the viability of stored museum objects is also an active preventive conservation systematically carried out by trained personnel.

The Zamoyski Museum in Kozłówka (southeast Poland) is a good example of a museum in which conservation care is properly implemented in the storage of museum objects. In this institution, located in several historical buildings, in the past few years it has been possible to upgrade the storage facilities, adapting for the purpose the interiors of various buildings and moving the collections to separate storage rooms. Currently in Kozłówka there are the following storage rooms: old paintings, two storage rooms for contemporary art – most from the period of the so-called 'Socialist Realism' (paintings and sculptures, but also a specialist collection of graphic art stored separately in metal cabinets with drawers), a storage room for antique picture frames, for furniture, and for craft works (mainly metal objects), for ceramics, for textiles, and one containing musical items, including a large collection of music rolls for player pianos and organoli (approx. 1500 objects) and a unique research storage room with a collection of sculptures of the period of 'Socialist Realism', visible to the public thanks to the glass door.

Fig. 18: Storage area visible to the public by installing glass doors – an interesting and innovative solution introduced in the Gallery of Socialist Realism Art in the Zamoyski Museum Collection in Kozłówka

The storage rooms are in areas adapted to the purpose in the attic storeys of old farm buildings, after making the necessary repairs, the majority at the expenditure of the museum's own funds (partition walls, insulation, ventilation, etc.). They are equipped with specially designed sliding wire netting racks and rollers (for paintings), shelving units (sculpture, frames) and a roller rack system (textiles). A system of racks was designed and made for the storage of furniture in the relatively small storeroom available and for the storage of the musical collection. All rooms have adequate fire alarm systems and burglar alarms, and each entrance to the storage area and each movement of objects is recorded in accordance with the established procedures. The microclimate parameters are monitored in each of the rooms, and systematic monitoring by the employee responsible for the storage and by the conservation workshop staff allows to determine the need for a controlled humidification of a room, its cleaning, or the application of pest control measures.

Analysing all the actions taken towards the better storage of collections at the Zamoyski Museum in Kozłówka, where for over 25 years I have worked as a conservator, I can say that it is possible to achieve similar effects in all institutions similar to our museum, as well as in various types of small and medium-sized museums. It is important to identify priorities for the protection of the collections, to engage in appropriate planning in order to determine the institution's own and external resources needed for the organization of storage, to designate the responsibilities and to train the personnel properly as well as to implement all preventive measures systematically.

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Janusz Czop

Microclimatic conditions in museums – new recommendations

Why has the conservation and preservation of historic objects in the last few decades focussed mainly on ensuring the proper climatic conditions at their place of storage and display? The answer is simple and comprehensive: the museum microclimate, that is the climate of the ambient environment of exhibits directly affects the physical, chemical and biological processes taking place, in other words all those processes that cause changes and damage to historic objects.

The primary factors influencing the microclimate include temperature (T) and relative humidity (RH) – both of these components of the environment have a direct impact on the state of preservation of museum objects. The matter is being complicated by the fact that this effect – depending on the parameters – can be positive or negative. A suitable microclimate protects museum objects, while inadequate microclimate conditions cause serious threats to objects in the collection, including physical changes – mainly mechanical damage (for example shrinking or swelling, which lead to delamination and cracks), chemical degradation (such as fading, corrosion) and biological attack (including fungi, moulds).

At this point the fundamental question arises: what constitutes an appropriate and safe microclimate for museum objects? In order to better understand the modern approach to this subject, we must first summarize the historical context of the creation of conservation recommendations regarding microclimate.

HISTORY

For several years so-called conservation standards have functioned in museological practice. These prescribe exact parameters for T and RH together with their permissible fluctuation for different types of objects. Although these conservation standards have never been registered in the form of an official standard, they became widely applicable through publications and

their widespread use in practice, especially in the case of loans of objects between museums. The first such standards were proposed in the 1960s – at a time when there were new technical possibilities for advanced control of the microclimate in museums. Although since then, a number of successive versions of conservation standards have been proposed, in fact they all are characterized by a narrow band of acceptable ranges of stability and their fluctuations, for example: T = 20°C (±1°C) and RH = 50% (±5%).

This happened because in the development of standards, a basic premise was that the control of these parameters would always be the task of air conditioning systems within appropriately designed buildings. This led to the recommendation of highly stable, ideal parameters of conditioned air, as if forgetting that most museums do not have air conditioning or they are located in historical buildings where one cannot maintain a stable climate, even if they had an air conditioning system. In addition, very narrow bands of control of the climate were recommended as being the most secure, without giving information about the dangers in a situation where such standards are not met. In addition– on the assumption that the only good solution was to provide the recommended parameters at any price – no thought was given to the economic aspects of the subject. No estimate was ever made of the relationship between the cost effectiveness of spending in relation to the degree of reduction of the risks to the objects. This approach resulted mainly from the fact that in the 1970s and even 1990s, access to energy resources, and their price was not yet seen as a global problem. Time and changing conditions led to a modification of such a single-minded approach to these issues.

Firstly, the analysis of the activities of the majority of museums in this area clearly showed the great distance between the theory of the "narrow" conservation standards and actual daily practice that has existed in the past and continues to exist today (for more on this, see the section: Museum Practice).

Secondly, the responsible management of natural resources today has become a global priority, and international standards and directives now require reducing energy consumption and carbon dioxide emission. While this may seem a distant prospect for many Polish museums, this is a false impression. Energy efficiency is also important for Poland (which since 2013 has begun to implement the Directive of the European Commission COM (2008)30 intending to reduce carbon dioxide emissions by 20% by 2020). In connection with this, as in other EU countries that have already begun to implement the Directive, we should expect a significant increase in energy costs over the next few years. This means that every museum in the country – from the smallest to the largest – will have to look for savings to balance the constantly rising costs with the budgets they have (usually too small to fulfil every need) in order to continue to be able to meet their basic obligation, which is to adequately protect and safeguard collections for future generations.

In this context, the implementation of a new approach to managing the microclimate in museums is very important. Knowing that all measures aimed at ensuring a suitable and stable microclimate are always energy-intensive and thus imply considerable costs, the optimisation of the management of microclimate and adaptation of the standards required to ensure the good condition of the objects to our real possibilities, this will almost always result in bringing savings in energy and other costs, without decreasing the current level of protection of our collections.

MUSEUM PRACTICE

Museum practice confirms that only the world's largest (or more accurately, the richest) museums can provide a stable microclimate in line with the "narrow" standards. Modern air-conditioning system with adequate thermal insulation of the building allows, of course, the maintenance of a stable climate throughout the year at RH = 50% (± 2%), but in the case of a large museum the operating costs (energy and maintenance) are then from several hundred thousand to several million euros per year.

Unfortunately, precisely for financial reasons and the nature of the premises in most cases, it has not proven feasible to meet existing conservation standards neither in Poland nor abroad, and not only by small or medium-sized museums, but also by the large national museums. If it ever proved possible temporarily to achieve stable performance using a variety of technologies, in practice it is hardly ever possible to be able to maintain the prescribed, narrow band of T and RH continuously throughout the year. The most frequently met example of this is a drastic drop in the RH in the winter (down to several percent) during the period when the heating system is operating inside and at the prevailing low outdoor temperatures. It is known that there is a risk for objects, there is a process of contraction of the materials, as a result of which deformation, loosening, and often cracks appear, and this is despite the fact that in the building throughout most of the year, the microclimate of the building had been successfully maintained in the appropriate climatic conditions (for example RH was maintained at a level of 45-55%).

The graph (Fig. 19) shows the microclimatic conditions for a period of 12 months in a gallery in the Main Building of the National Museum of Cracow. Although the room was air-conditioned, and internal conservation standards advocated maintaining a RH of 50% (± 5%), we note that in the winter the relative humidity decreased down to 30%.

What should we do in such a situation?

First of all, we should objectively and realistically assess our options (such as the museum premises, and organizational, technical as well as financial factors) and determine what they allow us to achieve. We should remember that even in situations where they fail to meet the recommended standards, any, even the smallest, improvement in conditions will always result in

a reduction of risk to the objects. We should also try to estimate whether our efforts and costs involved are able to achieve the desired results, and above all to meet the actual needs.

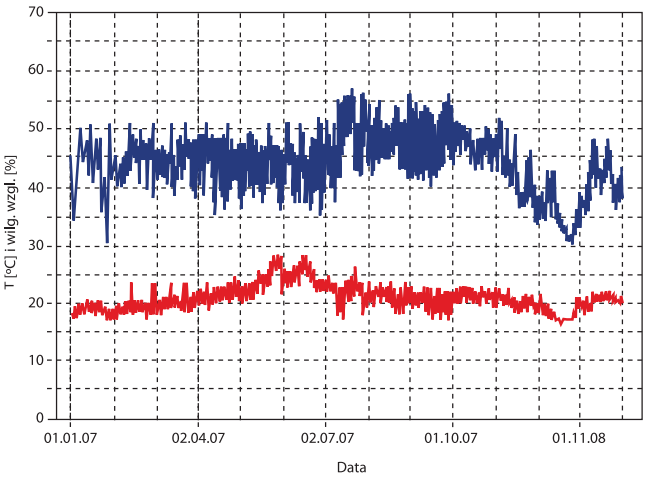

Fig. 19 National Museum in Cracow, Main Building. Microclimate monitoring for 2007–2008.

Data on the "historical climate" and "confirmed fluctuation," or the conditions under which an object or collection has been kept for the last few years and to which conditions they have become acclimatized are very useful. Of course the acclimatization of an object must be confirmed by a positive assessment of the state of preservation. If we possess historical data (at least for a period of one year, but the more data we have, the more accurately we can determine the parameters) and the condition of the object may be assessed as stable, with no apparent new damage, we may be sure that ensuring better microclimate conditions than the worst which the object has so far experienced will provide secure protection. Thus, if historical data show that the RH fell in the winter below 30%, and one cannot see any traces of new damage on the object, we should focus not so much on ensuring a RH of 45-55% (dictated by the currently accepted standards) at all costs but on ensuring that in future there are no such large periodic declines and maintain a minimum of 35% relative humidity at the worst of times. Such activities will significantly increase the level of safety of our collections, and at the same time will help reduce energy consumption and other costs.

How to achieve that?

Above all, we need to humidify the air effectively. The use of different methods of raising humidity – from the containers of water placed near radiators used in the past to the currently more popular mobile humidifiers used in many museums – always brings results. These activities will be even more effective if the goal we set ourselves will be to prevent the decline in the relative humidity below 35% instead of attempts at any price to reach the level of at least 45%.

Another effective technique is to limit the degree of air exchange, for example. This would include not opening the windows, making the door and window frames more air-tight, reducing the amount of time doors are opened, installing additional curtains at the doors, or – in the case of air conditioning systems –reducing the frequency of air change mechanically. Reducing the supply of new and dry air makes it easier and more efficient to maintain the set parameters.

It is very important to control the temperature – its reduction in the winter to a maximum of 19°C can in most situations allow to maintain the RH above 30%. In addition, keeping lower temperatures slows down the activity of insects and other pests, as well as reduces energy costs. If this does not help, one should still lower the temperature, because each reduction by 3°C during periods of severe frost causes an average increase in relative humidity by 10%. Although sometimes a temperature below 19°C may be a problem for people working in such conditions (today we are accustomed to feeling comfortable at approx. 22°C), certainly, from time to time – in order to reduce the risk to the objects – one can lower the temperature, especially in storerooms. If museum employees, who after all are aware of their duties in the protection of heritage, are informed beforehand of the reasons for such measures, they certainly will support them and they will help to find a solution, like wearing warmer clothes for work or taking more frequent breaks.

NEW RECOMMENDATIONS

The changing world and the development of science and technology have in recent years led to the verification of past positions on the parameters of microclimate in the museum. As a result of many years of international cooperation between conservators, scientists and engineers, new 'broader' recommendations have been developed. These are based not on the technical possibilities of air-conditioning systems, as was the case previously, but mainly on research and scientific experiments, taking into account the properties of the physical substance of museum objects, to understand the deterioration process of various objects, their resistance to change etc. The new recommendations also take into account the economic aspect, the principles of energy efficiency and sustainability, which gives a chance to manage the microclimate in the museum in a responsible, efficient, and environmentally friendly manner.

Adapting the new recommendations to the individual conditions in a specific museum is assisted by the European standard BS EN 15757: 2010 (CEN TC 346: 2011) on '*Conservation of cultural property: Specifications for temperature and relative humidity to limit climate-induced mechanical damage in organic hygroscopic materials*' which was also adopted by the Polish Committee for Standardization in 2011. This standard establishes appropriate climatic conditions conducive to the protection of historic objects based on two criteria – environmental and the type of material.

The environmental criterion is based on the historical climate (monitored for a minimum of 12 months) and the theory of acclimation of objects, which defines the object as acclimatized to the given conditions, if within at least the year no new traces of damage are observed. Analysis of historical climate within a gallery also allows for differentiation of recommendations depending on the season. The definition of seasonal ranges (in the warm and cold seasons, when heating is used) of the stabilization of T and RH in practice creates a realistic chance of

meeting these standards, among others by taking action to reduce extreme fluctuations in RH: the episodes of fall below 30% in the winter or of rise above 65% in the summer.

The criterion of material allows short-term fluctuations of the amplitude of relative humidity not exceeding ± 10%. This criterion is based on the analysis of the physical characteristics of objects, without reference to historical conditions in a particular historic building.

This standard includes mathematical procedures permitting the calculation from the known historical conditions of the recommended three parameters of the microclimate: the long-term average, the series of annual changes and short-term fluctuations. At the same time, the importance of assessing the risks to objects by the appropriate professionals when determining the recommended conditions is repeatedly stressed.

In response to the question posed in the introduction to this text, concerning the microclimate appropriate and safe for museum objects, it can be stated that:

1. On the basis of existing knowledge and the practice in many museums and institutions, the most suitable microclimate parameters for most of the objects should be within the following ranges: temperature (T) 16-25 °C, relative humidity (RH) 40-60%. These parameters must always be adjusted individually to suit the location and type of collection, and the process of their determination should be based on environmental criteria and the material concerned.
2. Temperature (T) is a secondary parameter in the practice of preventive conservation, as in most museums it is primarily adapted to the comfort of visitors and employees. Based on data from a variety of museums, it is known that (depending on the time of year) in Poland the temperature inside the museum is kept on average at 18-22°C in winter, and 20-25 °C in summer, which is a safe level and does not increase the risks to collections.
3. Relative humidity (RH) is the primary parameter of microclimate that determines the increase or reduction of the threat to collections. For most materials, the optimum RH level is the median interval of 50% and the achievement of this should be attempted. However, based on the results of research and analysis of the physical characteristics of sensitive objects (wood with polychrome decoration was the subject of the research), it was found that short-term fluctuations in relative humidity with an amplitude exceeding ± 15% does not represent much of a threat. Thus, the acceptable range of RH fluctuation for most objects is in the range of 35-65%. However, one should always keep in mind the risk of approaching the upper limit of 65% as this is the level at which the microbiological risk begins, and then afterwards significantly increases. At the same time the standard PN-EN 15757: 2011 gives the material criterion, which allows for short-term fluctuations of ± 10%. Therefore the new recommendation sets a new RH range 40-60% as a standard, although often the analysis of historical climate records shows this may be expanded to, for example, 35-65% without much risk of damage.

4. Although the above recommendations apply to most types of objects (wood, canvas, cloth, paper, leather, etc.), there are groups of objects that require more strict individual microclimate conditions (eg. metal, "sick" glass, certain types of artificial fibres). A good example is the rational division of material, which has been used in a newly built storeroom for the collections of the Danish Nationalmuseet in Copenhagen:
   a. Typical Microclimate (most materials) T <22 °C, RH 40-60% (optimum 50%),
   b. Dry Microclimate (metal) T <22 °C, RH <30%
   c. Cold and Dry microclimate (artificial polymers) T <6 °C, RH 30-40%.

In 2012, the National Museum in Cracow carried out a verification of previously existing internal standards of conservation in a research project "*Zarządzanie kolekcją muzealną w oparciu o komputerowe modelowanie wpływu wahań mikroklimatu na obiekty zabytkowe*", [Museum collection management based on computer modelling of the impact of fluctuations in microclimate on historic artefacts], implemented by the National Museum in Cracow, the National Museum in Warsaw and the Jerzy Haber Institute of Catalysis and Surface Chemistry of the Academy of Sciences. This was based on standard PN-EN 15757:2011 (the Polish-language version of the above-mentioned EN 15757:2010 on temperature and relative humidity) as well as analysing historical climate in the museum in the period 2007-2011. The results of this project allowed the expansion of the existing ranges of stability and fluctuation of microclimatic parameters and identified the following conservation recommendations for the storage and display of exhibits:

1. Temperature T [˚C]:
   a. in the cold months: +18˚C ≤ T ≤ +21˚C, the heating operates when T < +18˚C,
   b. in the warm months: +18˚C ≤ T < +25˚C, air conditioning operates when T ≥ +24˚C.
2. Relative humidity RH [%]:
   a. in the cold months: 35% ≤ RH ≤ 55%,
   b. in the warm months: 40% ≤ RH ≤ 60%,
   c. when RH falls below 25%, T can be reduced to +15˚C.
3. These parameters of microclimatic conditions (T and RH) apply to most types of objects.
4. In the case of sensitive objects or those requiring special conditions, individual norms should be established by a conservator.
5. Fluctuations in T and RH should be minimalised. The daily fluctuation should not exceed T ±2˚C and RH ±8%.

SUMMING UP

1. The new recommendations do not negate the fact that the existing standards, which recommend a "narrow" range of stability and fluctuations of parameters T and RH, are very safe. At the same time more recent research provides evidence that the proposed "broader" and more general ranges do not present an additional risk for most types of objects.

2. The new recommendations are not a mandatory standard, however the method of their development (based on the results of modern research and historical climate analysis taking into account the aspect of energy efficiency) provides a strong argument for their wide adoption in museum practice.
3. The new recommendations are more liberal, and may be common to most types of objects, which – compared to previous standards – is the reason why they are still the subject of debate and various doubts in the conservation and museum communities. It is necessary to continue research and experiments, including those regarding the tolerance of different materials to changes in the microclimate. There is also a need for the widest possible consultation and exchange of information on these topics between interested professionals.
4. Daily practice unfortunately confirms that today most of the institutions that hold historical buildings cannot meet either the old nor the new standards for microclimate. Therefore, the implementation of the new "wider" standards will be a much more achievable goal for most museums and their effective implementation without doubt will significantly increase the level of conservation protection of collections.
5. Any action for the conservation of museum collections, including the determination of strategies and climate control, should always be based on knowledge and common sense.

APPENDIX: LIGHT IN MUSEUMS

Although the main focus of this chapter is museum microclimate, in discussing the conditions of storage of museum objects, one cannot omit the subject of light – another very important factor that has a direct impact on their state of preservation. Without light there is no possibility of exhibiting and admiring the exhibits, but the light is also a factor that is always a threat to them. It is a very dangerous threat because in practice each type of light (invisible ultraviolet UV from 100 to 400 nm, visible white light VIS from 400 to 780 nm and invisible infrared radiation from 780 to 1400 nm) causes damage or changes in the original material of artworks, eg. paper yellowing, colours fading, deterioration of adhesives and varnishes, cracking and crumbling of paper and fabrics. What is worse – these changes are always irreversible. It should be remembered that the greatest danger is radiation in the near ultraviolet range (315-400 nm), which is not visible to the human eye. Being aware of the negative effects of light on objects, while taking into account the need to share and display them, which undoubtedly represents the sense of the existence of a work of art, it is necessary to come to some kind of a compromise. Therefore, in order to ensure the most secure conditions of display and to minimize the negative changes caused by light objects may be divided into three groups with reference to their sensitivity to light exposure. Standards have been developed for each group concerning the parameters of lighting and period of exposure in displays. As in the case of the microclimate, there are no official standards defined by some national decree. There are however some broadly-agreed international standards which are used in most museums, including in the National Museum in Cracow.

Lighting standards for museum objects

1. Insensitive objects (including metal, stone, ceramics, glass): light intensity: 300-500 lux, exposure time: no restrictions.
2. Medium sensitive (including oil paintings, tempera, lacquer, bone): light intensity: 150-300 lux, exposure time: 3000 hrs annually.
3. Highly sensitive objects (e.g. water colours, paper, fabric): light intensity: ≤ 50 lux, exposure time: 1000 hrs annually.

Comment

The standard light intensity and exposure time relate to lighting the objects with a light source with a filter blocking UV radiation. The total allowable intensity of UV radiation should not exceed 20 [mW / m^2] or 75 [µW / lm].

In order to ensure adequate lighting parameters it is additionally recommended to:

a. minimize access of sunlight by the use of shutters and blinds on windows, and covering window-panes with UV-blocking and IR radiation-reflecting foil,
b. light the buildings with a controlled artificial light source,
c. use the LED lighting, which emits no UV and IR radiation, and is up to 80% more energy efficient than halogen lamps,
d. place objects as far away from the light source as possible,
e. place objects very sensitive to light in a frame behind glass or in a cabinet, the glass should have a UV blocking film,
f. take care not to illuminate objects needlessly (among other things curtains can be used on display cases containing particularly sensitive objects, sensors can be mounted to turn off lights when there are no visitors in rooms, lights in the storerooms should always be extinguished if not in use),
g. reduce light intensity if extending the controlled exposure time is desirable; for example illuminating an object with light of an intensity of 100 lux for a month causes the same degree of changes as light intensity of 50 lux falling on the object for two months.

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9. Thomson Garry, *The Museum Environment*, London 1986.
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Anna Fic-Lazor

And when the museum does not have a conservator ...

In many institutions there is no conservation workshop or qualified conservator. In such cases, how should the primary care of objects be organized? In most cases, the responsibilities of conservators are taken on by the curators responsible for the various departments. Many of them, due to their academic background, will have at least some theoretical knowledge about preventive conservation. This chapter attempts to define basic standards for the safe-keeping of museum objects.

THE RECOMMENDED RANGE OF ACTIVITIES RELATED TO THE PRESERVATION OF MUSEUM COLLECTIONS

I. Periodic monitoring of displays and storerooms:

1. Assessment of the state of conservation of museum objects. It is proposed to apply the scale determining the state of the object, used in the National Museum in Cracow[1] which is applied in different systems used for recording the museum collections. These data are recorded on record cards which facilitates the planning of future work on the item.
   Grading Scale:
   - **a. very good (5):** stable object, no visible damage and / or object after conservation; does not require any conservation; suitable for display and transport,
   - **b. good (4):** object sensitive, no active deterioration processes and / or minor visible damage or changes; suitable for exposure and / or conditionally for transport; possibly needs conservation treatment, for example, protection before transport or aesthetic treatment before display,
   - **c. satisfactory (3):** unstable object, slow, but active deterioration processes visible and / or visible damage; conservation treatment recommended; conditional consent to display and transport; conservation treatment necessary prior to display and transport,
   - **d. poor (2):** object very unstable, showing active deterioration processes and / or significant damage and / or poses a threat (e.g. biological) to other objects; not suitable for display or transport; conservation treatment necessary,

[1] Information courtesy of Mr. Janusz Czop, the chief conservator of the National Museum in Cracow

e. very bad (1): object very damaged; not suitable for display or transport; only protective measures recommended; object essentially undisplayable, even after conducting protective treatment.

2. Assessment of the state of the rooms. Systematic checking for cleanliness, e.g. the state and number of doormats, ventilation, heating, etc.. The building should be periodically examined,[2] evaluating the state of the structure and identifying individual rooms for necessary repairs and renovation.
3. Attention should be paid to ensuring proper storage conditions for museum objects. Designation of a person responsible for activities related to environmental monitoring will improve the effectiveness of the activity, and the entry of the information about the parameters into a database (paper or electronic) will allow extensive analysis of change and allow the identification of anomalies in seasonal cycles.
4. Determination of the frequency of measurement, the conducting of measurements and data transfer from instruments[3] to the database.
5. Supervision of control and measuring devices.
6. Appropriate response to the effects of climate change through proper humidification and drying of the rooms.
7. Control of lighting parameters.[4]
8. Control of microbiological purity - observation of any discoloration or moisture emerging on objects; if necessary, have microbiological investigations performed.
9. Inspection for threats from animal pests, counteraction through, for example, the use of sticky, and/or pheromone traps , or other chemical substances or mixtures, acting against certain species of insects.

II. Developing conservation plans for museum collections, including the selection of objects for conservation and technological analysis.

III. Preparation of museum objects for loans and transport:[5]

1. The preparation of a description of the current state of preservation (taking photographs is recommended).
2. Cleaning.
3. Packing (or supervision of packing) by the lender.

IV. Preparation of documentation (descriptive and photographic) of conservation work carried out.[6]

2 See the text on preventive conservation by Anna Fic-Lazor in this volume.
3 See the text by Janusz Czop in this volume.
4 See the text by Janusz Czop in this volume.
5 See the text by Dorota Ignatowicz in this volume.
6 See the text by Ewa Święcka in this volume.

V. Giving opinions in terms of conservation of objects selected by the museum for purchase.

VI. Participation in the organization and execution of museum permanent and temporary exhibitions advising on compliance with the principles of conservation.

STANDARDS FOR PREMISES AND EQUIPMENT FOR PREVENTIVE CONSERVATION

I. Working Space.

In order to properly care for museum objects, it is a good idea to have separate areas of the workshop for different activities: cleaning, preparation for transport, mounting and framing, carrying out necessary protective procedures, inspection, etc...

II. Storage space.

Allocation of storage facilities for the storage of exhibits will significantly improve their care by reducing the harmful effects of the external environment and allow internal monitoring of microclimate conditions. Museum storerooms should be equipped with furniture, allowing the proper storage of historical items and should meet the necessary requirements in terms of security against theft and fire.

III. Equipment for monitoring and regulation of microclimatic conditions.

1. Instruments for measuring temperature and humidity (mobile or stationary mechanical or electronic meters, software).
2. Instruments for measuring the intensity of visible light and ultraviolet radiation.
3. Apparatus for moistening and purifying that work on the principle of "cold evaporation" (air from the room passes through a dampened filter to achieve both purification and humidification, without an increase in temperature and accumulation of pollutants): electronically controlled, mobile. Humidifiers of other types must be operated at a safe distance from the historic objects. If humidification is done using the evaporation of water in containers, it is essential to ensure their cleanliness.
4. Equipment for dehumidification of air in interiors: electronically controlled, mobile.

IV. Health and Safety Equipment:

1. Aprons made of natural fabrics.
2. Protective face masks for use in dust and air pollution, as well as when working in oxygen-depleted conditions.
3. Gloves: white cotton ones to work with the archives, old prints, books, records; records and other objects requiring protection against direct contact with a human hand; gloves made of special cotton jersey with anti-slip coatings on the palms, which significantly improve the reliability of the grip; also gloves of latex, vinyl, stretch vinyl, nitrile rubber (less allergic reactions).

4. Antistatic wipes to remove dust from surface which can easily be charged with static electricity.
5. Dry disinfecting wipes for cleaning different surfaces and small objects, and to combat bacteria and most viruses, fungi and other micro organisms.

V. Cleaning Equipment.

The means and methods of cleaning an object are dependent on the assessment of its conservation status.

1. Vacuum – a basic procedure with objects is their periodic cleaning. To have this done properly, one must obtain a water vacuum cleaner or one with mechanical and biological HEPA filters, an adjustable suction power, and collector ends with a soft brush.
2. Brushes - work with the vacuum cleaner should be assisted by lifting dust off the objects with soft natural bristle brushes of various sizes. Gently sweep the object, brushing the dust into the vacuum cleaner.
3. Cloth-brushes of natural bristles with a handle for cleaning delicate fabrics and objects.
4. Gloves or cloths for dry and wet cleaning (without the use of detergents), of fabric with microfibre structure for absorbing dirt from all objects. Cloths made of paper, with bacteriostatic properties.

VI. Equipment, tools and materials useful for a variety of preventive conservation works.

1. Table.
2. Scissors, knives with interchangeable blades, pincers for pulling out nails, pliers, hammer, screwdriver set, ruler, etc.
3. Lamp with daylight (colour temperature: 5500 K, colour rendering index of light: above 90).
4. Daylight Lamp with a magnifying glass.
5. Magnifying glass.
6. Photographic camera.
7. Access to a computer.
8. Safe permanent pens for marking objects.
9. Additional materials and equipment necessary for protective treatment of objects, as defined with the help of a qualified conservator-restorer and specific to the nature of the collection.

VII. Packaging materials recommended for the transport and storage of exhibits.

1. Fibrous and fleece packing materials.
2. Acid free paper and card.
3. Sponges.
4. Bubble wrap.
5. Space fillers in the form of airbags (of Low-density polyethylene LDPE or the stronger High-density polyethylene HDPE), air-filled mats.
6. Space fillers of soft fabric.

7. Polystyrene packing elements, polystyrene beads, polyethylene foam sheets and shaped elements.
8. Self-adhesive tape of paper and polypropylene.
9. Grip-seal polythene bags.
10. Corrugated cardboard for the outer packaging.
11. Acid-free packaging materials (boxes, tubes, folders, envelopes) for archival documents and objects of paper.
12. Polyester and cotton wrappers, and boxes for photographs.
13. Special textiles and packaging, preventing all forms of corrosion (i.e., atmospheric corrosion, galvanic corrosion and biological corrosion), for the protection of metal - such as copper, silver, brass, iron and non-ferrous metals - CDs, films and photos, textiles containing silver thread, images with metallic pigments.
14. Metal containers or boxes for exhibits.

PREVENTIVE CONSERVATION ACTIVITIES

The main activities involved in the preventive conservation of exhibits are concerned with providing the best storage conditions in accordance with the broader principles of preservation and care of works of art during temporary exhibitions and transport. Often the diverse nature of historic objects that make up the whole collection requires the development of appropriate procedures. The basic principle should be a minimum of interference with the structure of the object. Conservation treatments, such as removing ingrained dirt, reattaching delaminated elements etc. can be carried out only after consultation with the conservator-restorer. Particular emphasis should be placed however on preservation and preventive conservation, for example through maintenance of appropriate storage and display conditions, constant monitoring and documentation of the condition of objects, regular dust removal from objects, shelving, cabinets and spaces in which they are kept, specialized transport.

Anna Fic-Lazor

Museums in Historical Monuments

In Poland, the *Building Law* says that the owner or manager of a building is required to use it in accordance with any principles arising from the need to protect a historical building as a historical value. Buildings which are included in the register of historical monuments, as well as those under conservators' protection should be subject to these measures.

Specific responsibilities for the maintenance of the technical and aesthetic aspects of historical buildings are defined by the *Act of 23 July 2003 on the Conservation and Care of Historical Monuments* (Journal of Laws of 2003, nr 162, item 1568, as amended by later changes). This Act, among other things, requires owner or holder of a historical monument in Poland to facilitate conducting of scientific research and documentation of the monument, its conservation, restoration and construction work, to provide security and maintenance of the monument and to keep its surroundings in the best possible condition. It also imposes the owner or holder with an obligation to use the monument in a way which ensures permanent preservation of its values as well as to propagate and disseminate knowledge about the monument and its significance for history and culture.

In particular, it is the responsibility of the owner or holder of a historical building or site to conduct conservation and restoration works, and to carry out any construction work only in a manner consistent with the terms of the *Regulation of the Minister of Culture on Conducting Conservation, Restoration Work, Building Works, Conservation Research, Architectural Studies and Other Activities at a Historical Monument Inscribed the Register of Historical Monuments and Archaeological Research* (Journal of Laws of 2011, nr 165, item 987). The authorization of the provincial conservator of historical monumensts for the undertaking of work at a structure inscribed in the register of historical monuments does not exempt the owner or occupier from the requirement to obtain a building permit or provide notification of work in progress in those cases where this is specified in the Building Law.

Many Polish museum are located in historical buildings, such as manor houses, palaces, old town-houses, factories, most of them are entered in the register of monuments. They all require constant care and control.

According to the *Building Law* (Journal of Laws of 2010, nr. 243, item 1623, as amended by later changes), the owner or manager of each building structure is required to use it in a manner consistent with its purpose and requirements to protect the environment and keep in good technical and aesthetic condition, not allowing excessive deterioration of its fuctionality and technical state.

As a consequence, museum buildings should be subject to periodic inspections. At least once a year one should check the condition of the various elements of building, structures and installations which are exposed to harmful weather conditions and the destructive action of various factors occurring during the use of the building, equipment, those elements protecting the environment, as well as installations and flues. At least once every five years, a full inspection of the technical condition, suitability for use and the aesthetics of a building and its surroundings should be carried out. Detailed guidance on the scope and frequency of inspections are specified in Chapter 6 of the Building Law. Here also are guidelines concerning the obligation to keep record books for each building for entering records of inspections, repairs, and to include all reports on work carried out, surveys, energy performance certificates, etc. One should also keep all project designs and documentation of the works carried out in the facility during its use.

The systematic application of all of the requirements included in construction law will allow full monitoring of the state of preservation of the building. This is particularly important when dealing with historical material. One can then spot any danger in time, and therefore plan preventive measures and repairs accordingly.

The Zamoyski Museum in Kozłówka carries out a systematic, annual and 5-year inspections of the state of preservation of individual buildings and their surroundings, the results of which are recorded by writing protocols which may contain comments and recommendations. Under the current rules, all the existing installations and flues are checked. In the building record books, annotations are made concerning all maintenance and repair work performed, e.g. painting woodwork or walls, and any restoration or conservation work carried out. The documentation of such work and test reports, expert opinions, etc. are separately stored.

An example of the protocol of a periodic inspection

PROTOCOL
of the periodic inspection (general inspection, 5-year) of the PALACE being a part
of the Zamoyski Museum in Kozłówka carried out on ..... [date]
The audit was conducted by ..... [name].., building license No. ..... with the participation
of a representative of the Zamoyski Museum in Kozłówka ..... [name] .

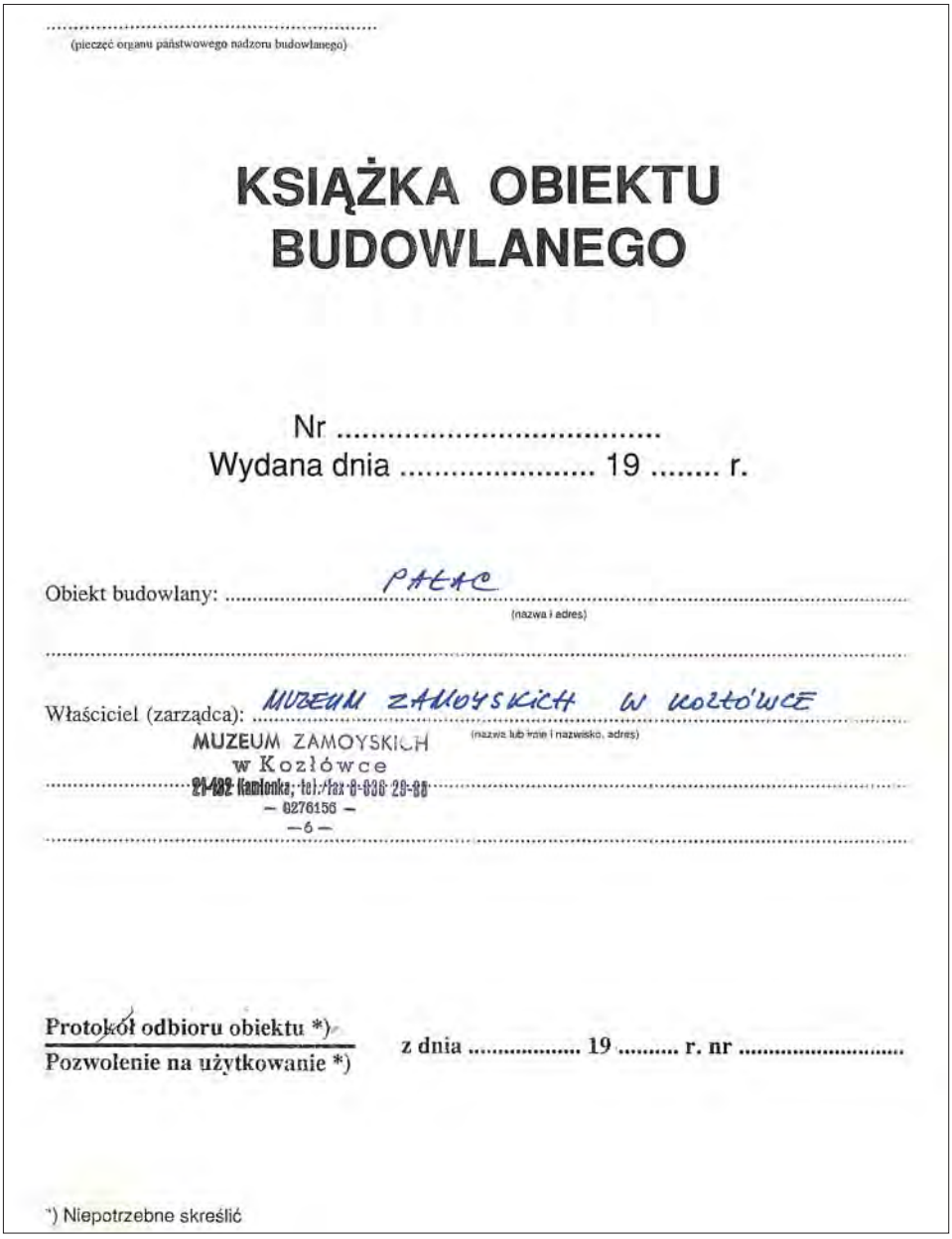
The above-named made a visual inspection of the individual elements of the building construction and installation in accordance with the provisions of Art. 62.1, paragraph. 2 of the Buildings and Construction Law (Journal of Laws of 2010, nr. 243, item 1623, as amended by later changes).
It was found that:
(Specify state: very good/ good/ fair/ poor, and enter additional comments about the work carried out or repairs that must be undertaken)

1. Foundations
2. The walls of the underground portions of the building
3. Walls
4. Ceilings
5. The roof structure
6. Partition walls
7. The walls of the chimney in the attic
8. Chimneys above the roof
9. Smoke and ventilation ducts (according to the protocols of verification)
10. Joinery of windows
11. Joinery of doors
12. Floors, floor surfaces
13. Internal plaster
14. Exterior rendering
15. Roofing, flashings
16. Gutters, downspouts
17. Electrical installation (installation survey according to inspection protocol)
18. Plumbing
19. Gas installations
20. The heating system
21. Alarm system
22. Lightning protection
23. Other elements of the building needing monitoring (the aesthetic apperarance of the structure, landscaping of the surroundings)

Recommendations and conclusions:

Conclusions:

With this the protocol was completed and signed.



.....
(pieczęć organu państwowego nadzoru budowlanego)

KSIĄŻKA OBIEKTU BUDOWLANEGO

Nr .....
Wydana dnia ..... 19 ..... r.

Obiekt budowlany: PAŁAC
(nazwa i adres)

Właściciel (zarządca): MUZEUM ZAMOYSKICH W KOZŁÓWCE
(nazwa lub imię i nazwisko, adres)

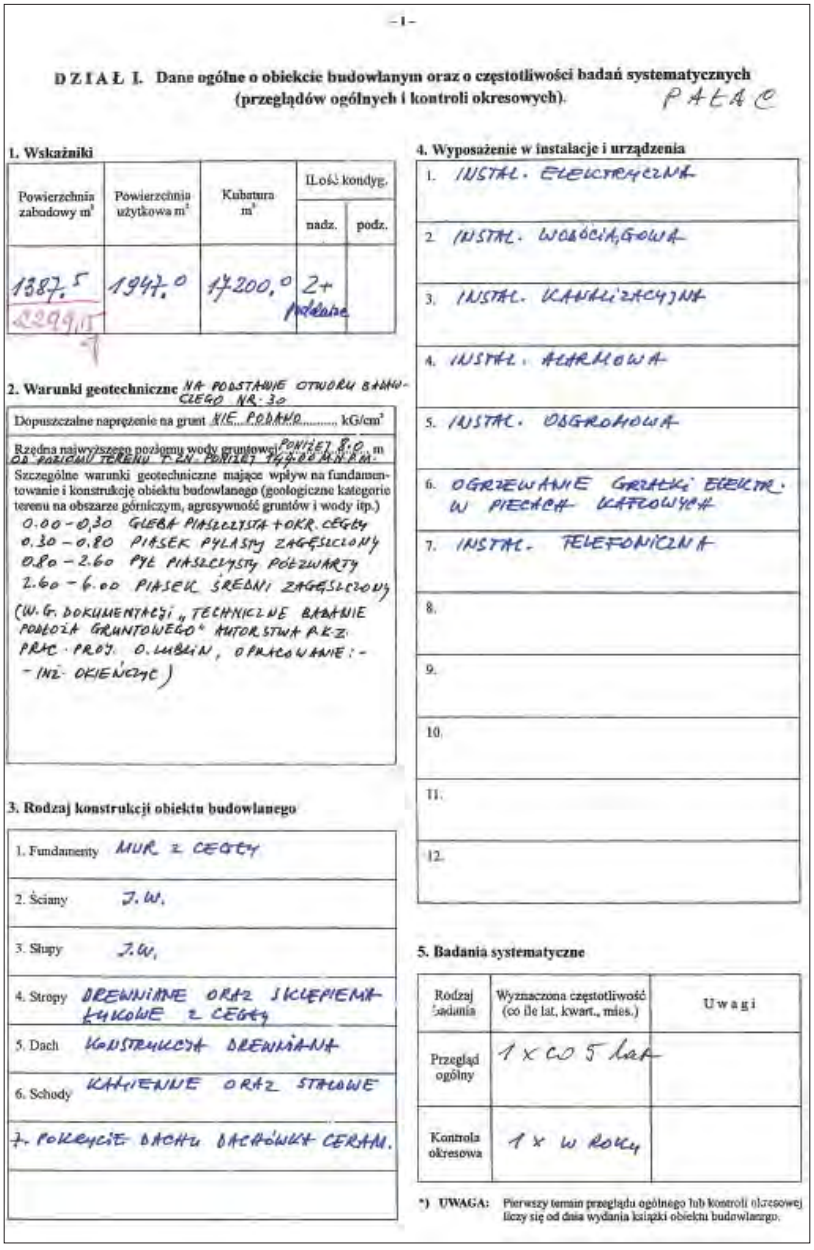
MUZEUM ZAMOYSKICH
w Kozłówce
21-082 Kamionka, tel./fax 0-038 29-88
— 0276156 —
—6—

Protokół odbioru obiektu *)
Pozwolenie na użytkowanie *)

z dnia ..... 19 ..... r. nr .....

*) Niepotrzebne skreślić

Fig. 20: The building work record book for the Palace in the Zamoyski Museum palace-park complex in Kozłówka: title page.



– 1 –

DZIAŁ I. Dane ogólne o obiekcie budowlanym oraz o częstotliwości badań systematycznych (przeglądów ogólnych i kontroli okresowych). PAŁAC

1. Wskaźniki

Powierzchnia zabudowy m²	Powierzchnia użytkowa m²	Kubatura m³	Ilość kondyg. nadz.	Ilość kondyg. podz.
1387,5 2299,15	1947,0	17200,0	2+ poddasze	

2. Warunki geotechniczne NA PODSTAWIE OTWORU BADAWCZEGO NR. 30

Dopuszczalne naprężenie na grunt NIE PODANO ..... kG/cm²

Rzędna najwyższego poziomu wody gruntowej PONIŻEJ 8,0 m OD POZIOMU TERENU C.N. PONIŻEJ PODŁOGI PIWNIC.

Szczególne warunki geotechniczne mające wpływ na fundamentowanie i konstrukcję obiektu budowlanego (geologiczne kategorie terenu na obszarze górniczym, agresywność gruntów i wody itp.)

0.00 – 0,30 GLEBA PIASZCZYSTA + OKR. CEGŁY
0.30 – 0.80 PIASEK PYLASTY ZAGĘSZCZONY
0.80 – 2.60 PYŁ PIASZCZYSTY PÓŁZWARTY
2.60 – 6.00 PIASEK ŚREDNI ZAGĘSZCZONY

(W. G. DOKUMENTACJI „TECHNICZNE BADANIE PODŁOŻA GRUNTOWEGO" AUTOR STWA P.K.Z. PRZ. PROJ. O. LUBLIN, OPRACOWANIE: – INŻ. OKIEŃCZYC)

3. Rodzaj konstrukcji obiektu budowlanego

1. Fundamenty	MUR Z CEGŁY
2. Ściany	J. W.
3. Słupy	J. W.
4. Stropy	DREWNIANE ORAZ SKLEPIENNE CEGLANE Z CEGŁY
5. Dach	KONSTRUKCJA DREWNIANA
6. Schody	KAMIENNE ORAZ STALOWE
7. POKRYCIE DACHU DACHÓWKA CERAM.	

4. Wyposażenie w instalacje i urządzenia

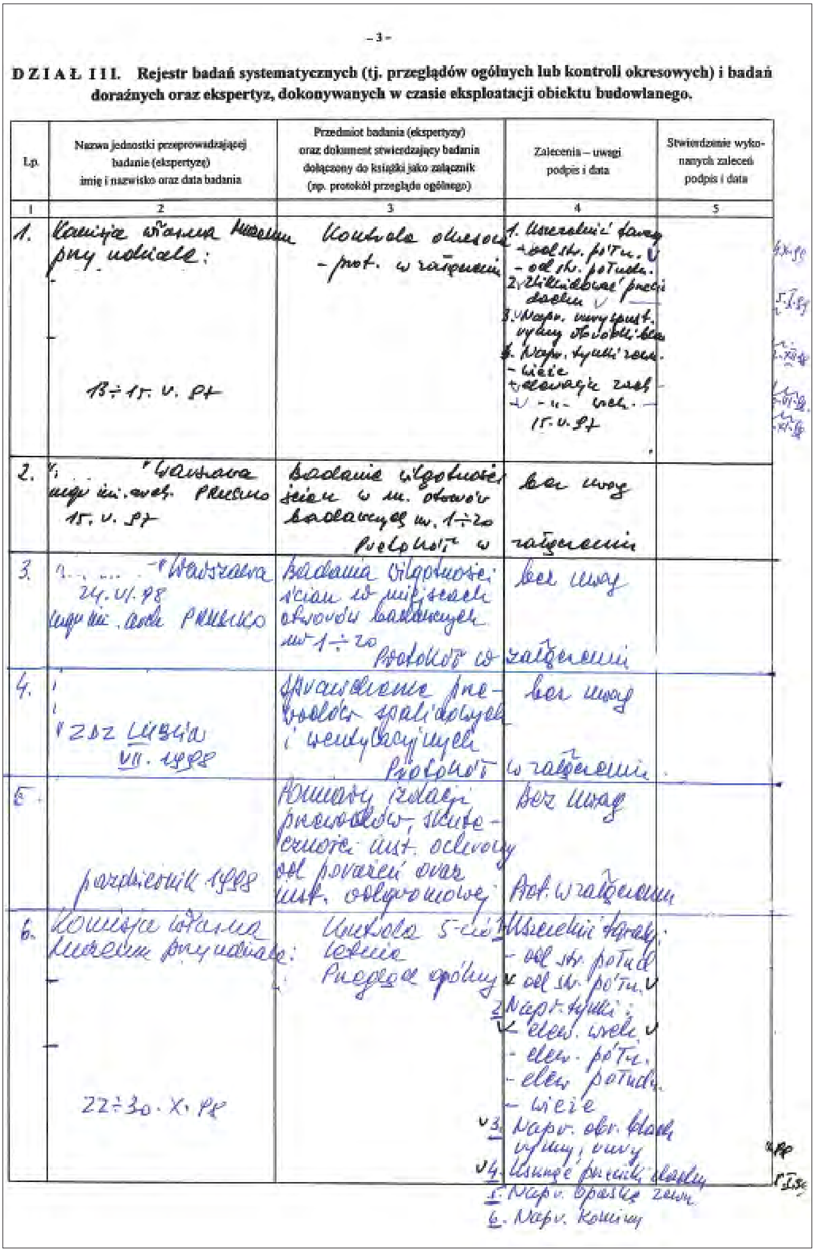
1.	INSTAL. ELEKTRYCZNA
2.	INSTAL. WODOCIĄGOWA
3.	INSTAL. KANALIZACYJNA
4.	INSTAL. ALARMOWA
5.	INSTAL. ODGROMOWA
6.	OGRZEWANIE GRZEJKI ELEKTR. W PIECACH KAFLOWYCH
7.	INSTAL. TELEFONICZNA
8.	
9.	
10.	
11.	
12.	

5. Badania systematyczne

Rodzaj badania	Wyznaczona częstotliwość (co ile lat, kwart., mies.)	Uwagi
Przegląd ogólny	1 x CO 5 lat	
Kontrola okresowa	1 x W ROKU	

*) UWAGA: Pierwszy termin przeglądu ogólnego lub kontroli okresowej liczy się od dnia wydania książki obiektu budowlanego.

Fig. 21: The building work record book for the Palace in the Zamoyski Museum palace-park complex in Kozłówka: general data defining the geotechnical conditions, the type of construction of the structure, installations included and frequency of inspections

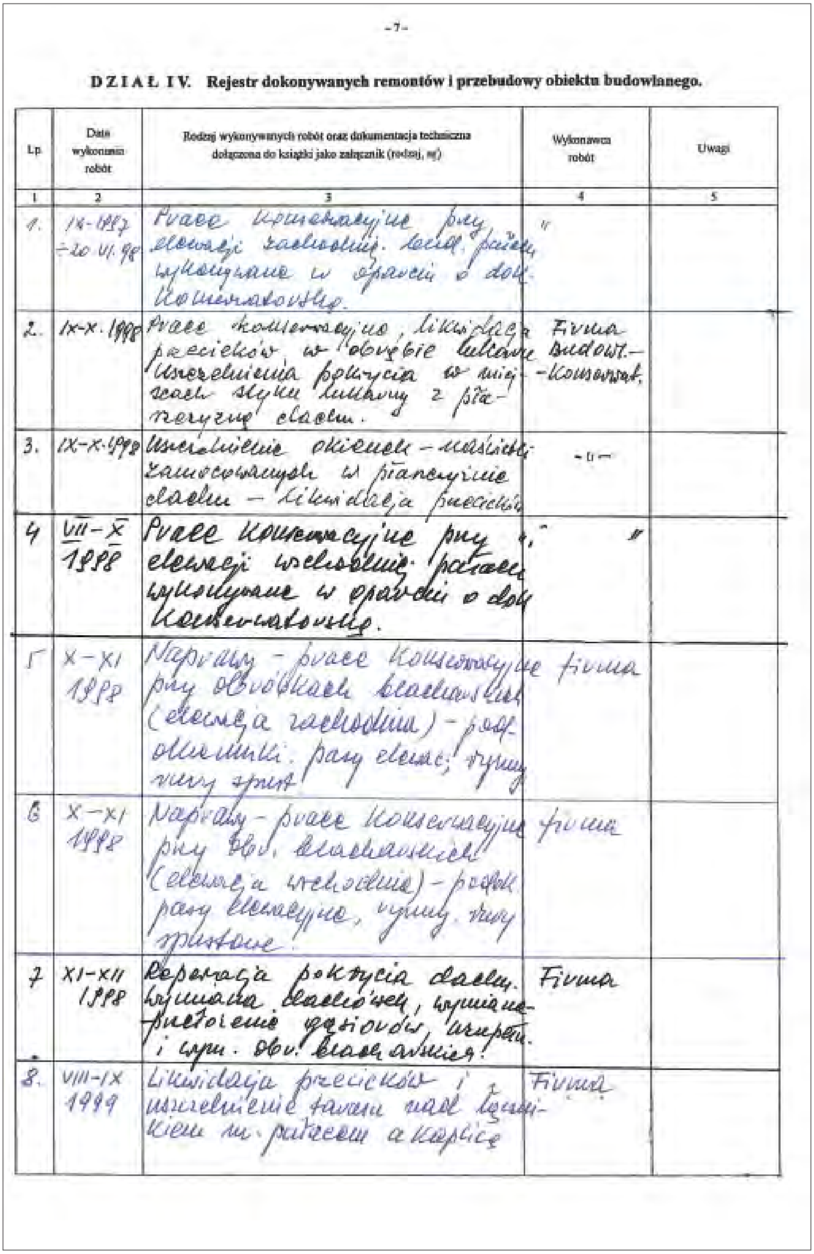


– 3 –

D Z I A Ł I I I. Rejestr badań systematycznych (tj. przeglądów ogólnych lub kontroli okresowych) i badań doraźnych oraz ekspertyz, dokonywanych w czasie eksploatacji obiektu budowlanego.

Lp.	Nazwa jednostki przeprowadzającej badanie (ekspertyzę) imię i nazwisko oraz data badania	Przedmiot badania (ekspertyzy) oraz dokument stwierdzający badania dołączony do książki jako załącznik (np. protokół przeglądu ogólnego)	Zalecenia – uwagi podpis i data	Stwierdzenie wykonanych zaleceń podpis i data
1	2	3	4	5
1.	Komisja własna Muzeum przy udziale: – – 13÷15. V. 97	Kontrola okresowa – prot. w załączeniu	1. Usunięcie… 2. … 3. Napr. … 4. Napr. … 15. V. 97	
2.	Warszawa mgr inż. arch. … 15. V. 97	badanie wilgotności ścian w m. otworów badawczych nr 1÷20 Protokół w	bez uwag załączeniu	
3.	Warszawa 24. VI. 98 mgr inż. arch. …	badania wilgotności ścian w miejscach otworów badawczych nr 1÷20 Protokół w	bez uwag załączeniu	
4.	ZDZ Lublin VII. 1998	sprawdzenie przewodów spalinowych i wentylacyjnych Protokół	bez uwag w załączeniu	
5.	październik 1998	Pomiary izolacji przewodów, skuteczności ochrony od porażeń oraz inst. odgromowej	bez uwag Prot. w załączeniu	
6.	Komisja własna Muzeum przy udziale: – – 22÷30. X. 98	Kontrola 5-cio letnia Przegląd ogólny	1. Usunięcie … 2. Napr. … 3. Napr. … 4. Usunięcie … 5. Napr. … 6. Napr. …	

Fig. 22: The building work record book for the Palace in the Zamoyski Museum palace-park complex in Kozłówka: sample page with the record of inspection, expert opinions and recommendations



-7-

DZIAŁ IV. Rejestr dokonywanych remontów i przebudowy obiektu budowlanego.

Lp.	Data wykonania robót	Rodzaj wykonywanych robót oraz dokumentacja techniczna dołączona do książki jako załącznik (rodzaj, nr)	Wykonawca robót	Uwagi
1	2	3	4	5
1.	IX-1997 ÷20 VI. 98	Prace konserwacyjne przy elewacji zachodniej [illegible] pałacu, wykonywane w oparciu o dok. konserwatorską.	″	
2.	IX-X. 1998	Prace konserwacyjne, likwidacja przecieków w obrębie lukarny. Uszczelnienia pokrycia w miejscach styku lukarny z płaszczyzną dachu.	Firma budowl.-konserwat.	
3.	IX-X. 1998	Uszczelnienie okienek – [illegible] zamocowanych w płaszczyźnie dachu – likwidacja przecieków	–″–	
4	VII–X 1998	Prace konserwacyjne przy elewacji wschodniej pałacu wykonywane w oparciu o dok. konserwatorską.	″	
5	X–XI 1998	Naprawy – prace konserwacyjne przy obróbkach blacharskich (elewacja zachodnia) – podokienniki, pasy elewac., rynny, rury spust.	firma	
6	X–XI 1998	Naprawy – prace konserwacyjne przy obr. blacharskich (elewacja wschodnia) – podok., pasy elewacyjne, rynny, rury spustowe.	firma	
7	XI–XII 1998	Reperacja pokrycia dachu. Wymiana [illegible], wymiana-uzupełnienie gąsiorów, [illegible] i wym. obr. blacharskich.	Firma	
8.	VIII–IX 1999	Likwidacja przecieków i uszczelnienie tarasu nad łącznikiem m. pałacem a kaplicą	Firma	

Fig. 23: The building work record book for the Palace in the Zamoyski Museum palace-park complex in Kozłówka: sample page from the records of renovations of the exterior of the building. Entries may also cover all maintenance and repair work inside – noting, for example, the painting of rooms, replacement of the electrical system, etc. In addition, if any documentation of such work was made it would be listed in the inventory book of the technical documentation.