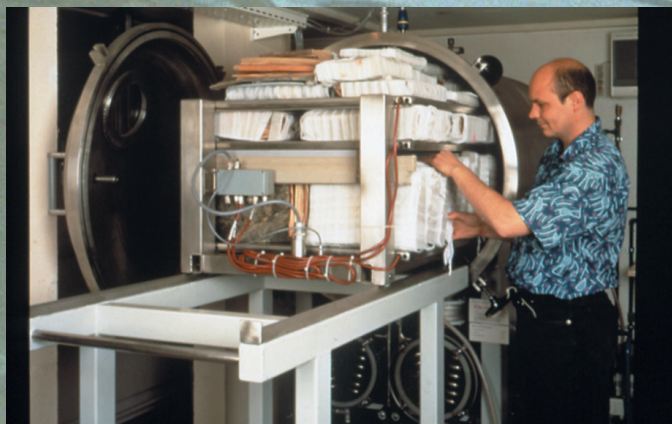
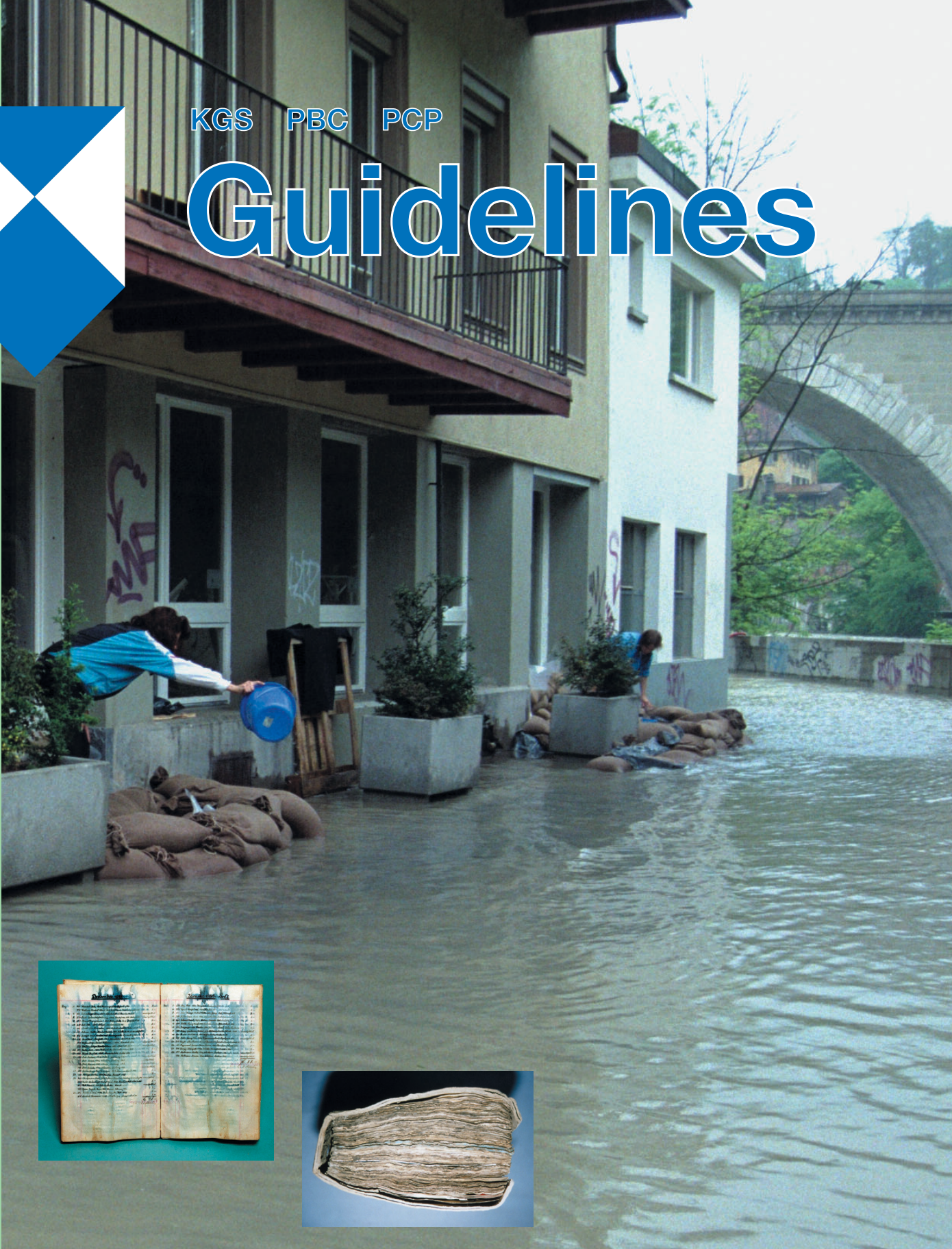




KGS PBC PCP

Guidelines



Protecting archives from water damage

Preventive measures and emergency procedures

Information, advice and support on the treatment of water-damaged archives and books:
a manual for administrative bodies, firms and private individuals.

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1. Foreword

The storms which ravaged the canton of Uri (1987), Brig (1993) and Sachseln (1997), or the serious flooding in Chechnya and Germany (2002) are incontrovertible proof that water can wreak havoc. In many cases cultural institutions, such as museums, libraries or archives were affected. In today's «disposable» times, the long-term storage of archive material has increased in importance. After several years, a municipality's files may become cultural property and it is therefore vital to do whatever necessary to preserve them.



In addition to prevention, it is a question of taking the right action to preserve «the memory of a community» when a disaster occurs. It is vital that all participants – those responsible for archives and libraries, the fire service, the Protection of Cultural Property and Protection and Support services – work together. It should be mentioned that Protection of Cultural Property staff can provide valuable help, although the main responsibility lies with the specialists from the cultural institutions (particularly in compiling inventories).

As experience from earlier emergency situations has shown, there are several shortcomings in this regard. They have been noted and initial measures have been undertaken to improve the situation. In connection with this, the Cultural Property Protection section of the Federal Office for Civil Protection called on Guido Voser (paper restorer and a specialist in the salvage and restoration of water-damaged documents and books). There has long been a need for information relating to possible risks to an archive and procedures to treat water-damaged material.

The aim of this manual is to provide important advice and outline procedures, which should significantly reduce the risk of damage, and ensure that the appropriate steps are taken when damage occurs, to preserve archival property for posterity, and at the lowest possible cost. Guido Voser has dedicated himself to the rescue of archive and library material for over ten years. During his lengthy working life, Guido Voser has saved cultural property both at home and abroad, and rendered damaged legal security documents accessible once again.

Rino Büchel, Head of Cultural Property Protection,
Federal Office for Civil Protection

2. Risks to archives and preventive measures

Archives are facilities, which systematically collect, classify, store, and care for paper, audio and photographic documents, and make them available for consultation. They function as a legal safeguard, as the memory of administrative bodies, firms or private individuals. In many cases, they are sources of information and documentation, and historical research sites. As the medium differs, so do the archives; they can be administrative, company, press, literature- or family-related documentation. An archive and its contents are shaped by the holder's work and the structure which he imposes.

2.1 Climate conditions

The ideal temperature for archive storage is between 14 and 16 °C; the relative humidity should be approximately 55%. **Important:** the temperature should not exceed 20 °C, and the relative humidity should not exceed 60%. A short-term increase in humidity to over 65% can promote mould growth.

Ideally, these conditions should remain constant.

Specific items such as photographs, negatives, glass plates, and film rolls should be stored under special climate conditions.

It is more cost-effective to ensure a stable environment than belatedly refurbish an entire archive.



Frequent causes of damage:

- Room with poor climate conditions.
- Poor material, e.g. recycled paper for long-term safekeeping or water-soluble ink, felt-tip pens and inkjet printers.
- Massive climatic fluctuations within one year.
- Excessive central heating in winter.
- Direct sunshine.
- Water damage.
- Fire damage.
- Mould.
- Insects and rodents.
- Untidiness, dirt.
- Eating and drinking in the archive room.
- Careless handling of items.

Damage caused by mould or infestation should be tackled immediately by proven qualified staff. Prompt action and specialised treatment may limit any follow-up costs.



2.2 Drawing up an inventory

For an archive to fulfil its functions, items must be systematically filed and registered. The latter consists of two elements:

- A **catalogue** (inventory, repertory etc.), which describes and numbers (signature) the archive material, and
- An **archive number / signature**, which is visibly indicated on the given item.

Account should be taken of past filing systems when classifying archive material. Since the administration may modify its filing systems, it is recommended that material be arranged in chronological sections. It is more important, however, to have a (perhaps brief) register of the **entire** archive content, rather than a highly detailed catalogue of individual archive items.

When filing archive material, items which are surplus to requirements (copies, supporting documents etc.) or which do not belong in an archive (office documents, printed papers etc.) should be removed. Legal regulations and directives pertaining to the classification of modern inventories should be observed.

Tips

- Allocation of **simple archive signatures** (e.g. letter and number, but not «BB 7.4.11.3628 (b)», for example).
- **No self-adhesive labels**
- Print the **archive name** on the signature labels (protection against loss).
- Rather than reorganising archive property, «illogical» filing can often be improved by introducing an **inventory reference** (subject «x», see under *p. yy*).
- Document appraisal: **hand written** is more valuable than printed, **local** more valuable than general. When in doubt, contact the State Archives.

Vinzenz Bartlome, State Archives Berne

2.3 Conservation measures

Storage

Trials and experience conducted in a burning building have shown that material which is stored on the top and lowest shelves is at greatest risk and incurs the most damage. It is recommended that the most valuable material be stored in the middle shelves.

Loose sheets

- Elastic bands, plastic document covers and paper clips should be removed. Where possible, the files should not contain any metal or plastic components.
- Loose sheets should be stored together in files and placed in a quarter page made from acid-free paper. Several files should be placed in a cardboard box and marked accordingly.
- Files may be replaced by Dura-Perl document binders, for example.
- Old copy paper, zinc oxide coated paper and carbon paper should be replaced where possible by laser copies.

Storing books

- Large and bulky soft cardboard-backed books should be stored horizontally.
- The following books should be stored in folding boxes:
 - Valuable books.
 - Books with corner fittings, closings and fastenings.
 - Books with coloured paper, velvet covers, or with writing and illustrations on the cover.

Storing maps and plans

Important: all maps and plans which are in long-term storage should **not be rolled**. The two best solutions are:

- Maps and plans no bigger than A0 should be stored in map cases with screw fastenings.
- Maps and plans bigger than A0 should be hung from metal clamps.

Storing glass plates, photos, negatives, films roles and modern media

These materials should be stored in a specially air-conditioned room (more information can be had from the state archives or docuSAVE).

- Photos and glass plates are stored in special acid-free envelopes with top flaps.

Please note: negatives and film roles dating from 1889–1955 contain cellulose nitrate. This material decomposes, is inflammable and can spontaneously combust. This poses a serious risk to archives. Such negatives and film rolls must be copied and the original disposed of. Please consult a photo specialist.

Parchment documents with wax seals

If the climatic conditions are good, storing parchment should not present any particular problems, but wax seals are very sensitive to pressure. These items should be stored in an acid-free box.

Microfilms

Microfilms are used to safeguard the most valuable and often the most used cultural property. The Cultural Property Protection Section of the Federal Office for Civil Protection provides financial support to transfer the most valuable cultural property to microfilm.

2.4 Sources of danger and possible causes of water damage

- Skylights.
- Water pipes.
- River/stream near to the archives.
- Blockage in the sewers.
- Ground water.
- Leaking roofs.
- Construction work on site.

Preventive measures

- Analyse and minimise the sources of danger.
- Develop emergency preparedness plans.

Where are the materials stored?

It is always more cost-effective to find a new room which meets current needs than renovate an existing archive room. In an uninsulated public shelter, damp begins to seep through the walls after ten to twenty years, and may cause mould to form on some material.

It is important to keep temperature and humidity levels as stable as possible.

2.5 Surveying an archive

When surveying an archive with the help of the Cultural Property Protection service, the following checklist may prove helpful:

Survey checklist

- ☐ Contacting the archives.
 - Who is responsible? Who can read old scripts?
- ☐ What is the temperature and humidity in the archive?
 - Ideally, 14–16° C and a relative air humidity of 55%.
Calibrate the equipment beforehand.
- ☐ Is there any infestation?
 - Insects, rodents or mould?
If so, call in specialists.
- ☐ Is there an inventory?
 - Draw up a brief inventory with the help of specialists.
 - Dispose of unimportant material (in arrangement with the person in charge of the archive property and possibly with the relevant cantonal state archives or the Swiss Federal Archives).
- ☐ Clarification of insurance issues.
 - Does the insurance policy cover the damage? Were the repair costs taken into account?
- ☐ Emergency deployment plan.
 - Fire service, Protection of Cultural Property service and specialists.
- ☐ Where are the most important cultural property items located in the archive?
 - Store the most important items mid-way between the floor and the ceiling.
- ☐ Internal risks?
 - Windows, drains, water pipes, building work, electrical wires and equipment.
 - How great is the risk and what preventive measures were taken?
- ☐ External risks?
 - Streams, rivers, nearby building sites.
 - How great is the risk and what preventive measures were taken?
- ☐ Has the archive suffered any damage before?
 - Have improvements been made since?
 - Are there sensitive items (e.g. mould-infested)?
- ☐ Particularly sensitive material:
 - Photos
 - Thermographic, zinc oxide coated paper, which feels slightly soapy (make new laser copies).
 - Old carbon and copy paper (make new laser copies).
 - Transparent paper.
 - Parchment documents, poss. with wax seals.
 - Valuable art books.
 - Leather and parchment books.
 - Modern media.
 - How are the electronic data stored?
 - Is there a double back-up system?



- ☐ Are durable materials used in the archive?
 - Use of acid-free boxes and quarter pages.
- ☐ Is it possible to carry out any conservation work?
 - Pack boxes. (Specialist staff should supervise the packing).
- ☐ Is it possible to carry out longer-term conservation or even restoration work on the item?
 - Establish clear priorities; implement these step-by-step, possibly with the help of specialists.

2.6 Minimum disaster plan

Preventive measures

- Room temperature 14–16° C and a relative humidity of approx. 55%. (Calibrate equipment beforehand).
- Check for infestation of insects, rodents or mould (If so, call in specialists).
- Draw up a brief inventory with specialists.
- Discard unimportant material, having sought prior agreement with the person in charge of the archive property, and possibly with the relevant cantonal state archives or the Swiss Federal Archives.
- Clarification of insurance issues.

Emergency plan

- Important addresses must be to hand (fire service, police, sanitation services, municipal and cantonal cultural property protection staff and specialists).
- Analyse and minimise the sources of danger.
- Procedure: establish the procedure to be adopted in an emergency (important: the fire service informs the Cultural Property Protection service only when an item on the inventory suffers damage).
- Further training of staff. Carry out dummy runs, e.g. with the fire service, the Protection of Cultural Property service and external specialists.

Cf. Cultural Property Protection websites:

www.civilprotection.ch

(Heading: Protection of Cultural Property, Protective Measures)

www.kulturgueterschutz.ch

3. Water damage



The correct and professional salvage, drying and restoration of water-damaged material can greatly reduce costs.

Unfortunately, specialists are often called in too late; in the meantime the damage will have spread. The knock-on effects are soaring costs and a less than successful rehabilitation of the material.



3.1 How water damage affects archive material

When water seeps in, the following damage to an archive room and material may occur:

- Damage due to water.
Swelling of the material due to water absorption and the accumulation of floating debris.
- Running inks and colours.
- Stains due to water soluble colorants on sleeves and dividing material, such as dust covers, coloured inserts or bindings.
- Book bindings.
The swelling of material can cause the bindings and text blocks to warp, particularly if the material is left wet or damp for too long; the grain direction of paper, fabric or covers may also become deformed.
- Loss of water-soluble sizes such as paste and hot-melt adhesive.
This damage can only be assessed after drying.
- Damage to parchment from dissolved animal collagen.
Flexible parchment bindings are at particular risk. Parchment books may suffer shrinkage.
- Damage to leather bindings.
Old, delicate and brittle book bindings are at particular risk. The absorption of water will alter the internal chemical balance of leather. Consequently, the colour may change or the leather may become brittle. Swelling may also cause the leather to tear.
- Corrosion of staples and metal file components.
Thermographic paper (zinc-oxide coated photocopy paper). The top layer of the paper can come away.
- Carbon paper, non-carbon copy paper (NCR).
Carbon paper can turn black on exposure to water.
- Transparent paper
White, cloud-like shapes may form due to water exposure.
- Infestation and destruction caused by micro organisms
There are approximately 200 different types of paper mould. Some can potentially affect the health of individuals, particularly those with a weak immune system. Mould spores can lodge in air conditioning systems, which may be very dangerous. Water-damaged archives in hospitals, old people's homes and similar institutions must be tackled swiftly by specialists.



- Loss of archive filing system
This can sometimes lead to huge additional expenses. If documents are not salvaged by experts, the filing system may be lost.

3.2 First step – stabilise the material

Water-damaged archives should be tackled on site by a proven specialist team to ensure the professional salvage of material.

Cultural property cannot be protected properly by goodwill alone. Much of the damage occurs only after the event, i.e. the use of unsuitable procedures.

Procedure

- Inform insurers, the PCP and docuSAVE (**Emergency no.: 079 204 88 08**)
- **Stabilise the temperature and humidity.**
Be careful! Immediately after the water has been pumped out and the room begins to dry, the general drying process starts (particularly important for photos and art/chromo paper). Optimally, specialists should be on site before drainage work begins.
- Wet small and medium-sized items can be brought directly or transferred to docuSAVE. If they are badly damaged, they may be temporarily placed in cold storage.

Files, books and items that are now redundant (expiry of legal storage time or existing duplicates) are disposed of on site.

- Damage to books, brochures, files and boxes from sprinklers can be dried conventionally
- Material with medium to severe water damage may be vacuum freeze-dried.

3.3 Packing damaged material

A clear photo or video must be taken of the material before it is removed, and an inventory drawn up.

Every book, file or box is first numbered. For the inventory, the original location of each item must be noted (storey, room, rack, shelf etc.) as well as where it is to be stored (boxes, plastic crates or pallets). Each object must be marked (folders and boxes) or have a label (books and brochures). How exhaustive the inventory is will depend on the number of persons involved in compiling it and the scale of the damage.

Please note:

Salvage work must be done swiftly to prevent the appearance of mould, as it would dramatically add to the existing damage. Documents that should be rapidly available again, ought to be specially designated.

Freezing items with medium to severe water damage

The books, records, files etc must be wrapped in plastic and placed horizontally in plastic transport crates, then frozen to at least -22 °C. Larger items must be separated with freezer paper and placed on a double-sided pallet (frame height: 40 cm max.). Stack a second pallet on top and fasten together (e.g. hire Euro pallets and frames from removal firms). They should not be stacked more than three high (height approx. 165 cm.).

Same-size files or bound material may be stacked one on top of the other.

When they stand 15 cm high, insert a plastic dividing sheet.

Special items

- Files contaminated with heating oil or diesel must be placed in thick plastic bags and fastened tightly.
- Any creases in transparent paper rolls should be smoothed out **prior** to freezing (white, cloud-like shapes may appear on the paper after any drying process).
- Depending on the size of the item and space restrictions, **all photos** should be dried conventionally. **Important:** photos will quickly stick together due to their gelatine coating. The photo layer of old photographs is very unstable, which may make it difficult to save them.
- Illustrations, parchment documents and maps can be dried conventionally. If the item is oversized or if space is confined, it can be frozen (max. 10 cm thick, 90x150 cm). Larger maps should be conventionally dried.
- Files and materials, which must be quickly made available again for consultation, should be set aside and given priority.
- Similar-sized thin books and brochures may be stacked no deeper than 15cm.
- For parchment and leather-bound books, one or two plastic sheets should be inserted between the pages. If only one sheet is inserted, it should be placed in the middle of the book.

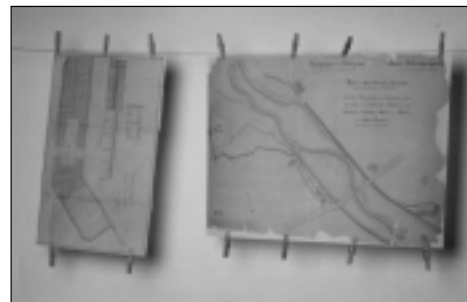
All items are frozen to at least -22° C. The general rule: is the shorter the freezing time and the lower the temperature, the better the final result.

Care should be taken to freeze all items horizontally so as not to crush them. This has an important bearing on the success of the drying process.

PCP check-ups on salvaged material

If the PCP and Protection and Support services were on site to salvage material, they should supervise it until its return to the archive.

4. Drying methods



4.1 Conventional drying

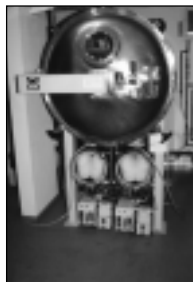
In the main, individual items such as illustrations, maps, plans, photos and parchment documents can be dried conventionally. For valuable items, specialist restorers may undertake the necessary conservation steps during the salvage operation.

Books and archives which have been slightly water-damaged from sprinklers may be fanned out and left to dry normally. However, professionals should carry out this procedure, since different factors must be taken into account (room size, number of damaged objects, humidity, temperature, weather, condition of the material etc.).

Risks associated with conventional drying

Conventional drying can lead to subsequent additional costs, which may be greater than the total cost of vacuum freeze-drying. For example, restoration work may be necessary due to the development of mould in very damp conditions; book covers which have been conventionally dried may suffer from cockling, or text blocks may become misshapen as a result of being fanned out.

4.2 Vacuum drying/Vacuum freeze-drying



Vacuum drying is used for items with minor to medium damage. The damp material is dried in a vacuum chamber or machine. Mould is unable to form due to the lack of oxygen.

Vacuum freeze-drying is used for items with medium to severe damage. The water-damaged material is first frozen (-22° C.). No additional damage can occur:

- There is no mould; the metal components do not rust; the ink does not continue to run.
- The frozen documents are removed from the freezing chamber and placed in a vacuum tank.
- Here the ice is sublimated (i.e. it evaporates).

With the freeze-drying method, the pages do not further absorb water since the ice directly passes directly to the «steam phase». This technique is perfectly suited to drying saturated or bulky items.

If used properly, vacuum freeze-drying is the least invasive drying method for books and archives with medium to severe water damage.

Important: Some water or humidity damage to material may be irreversible, with files and books never regaining their original appearance. Vacuum or freeze-drying may save a document from total destruction (e.g. mould or sticking of the text blocks) and render them usable again. Depending on the extent of damage, bookbinding or restoration work may also be necessary.

5. Follow-up treatment

5.1 Cleaning and sterilising mould-infected material

As a rule, if water damage is treated properly and promptly, mould should not form. Mould is a very serious problem for the long-term storage of documents and for cultural property; it requires specialist intervention.

Why should mould be treated?

In the right climatic conditions, mould is inactive and does not cause any further damage. Nevertheless, if the humidity should rise, mould can present a risk to humans and to both mould-damaged and «healthy» material.

When working with infected material it is important to wear disposable gloves and a protective mask. Hands and clothes should be thoroughly washed.

There are three types of treatment:

1. Liquid
Generally, a combination of ethanol and other active agents
2. Fumigation
Generally, using ethylene oxide
3. Gamma rays
At present, only available abroad

Whatever the treatment, the most important aim is to prevent mould from forming. The above methods are costly because they are labour-intensive. Since old mould spores can provoke allergic reactions, they should be removed using a special vacuum cleaner. Additional transport costs and specialists' fees should also be anticipated. Mould may also present a health risk. For example, mould spores in air-conditioning systems, hospitals and old people's homes is a potentially serious risk to humans and material. The issue of who pays for the treatment of mould due to water damage remains unresolved.

Note: The company responsible for salvaging and drying the material should confirm in writing that no mould can form or that additional costs will be covered.

Insurance companies reluctantly pay for the treatment of mildewed material, because it is expensive (as much as double the cost of damage) and could be prevented if the correct procedures were used.

5.2 Cleaning mud deposits

When streams and rivers overflow, material can be contaminated with mud. There are two cleaning methods: surface and thorough.

In the surface cleaning procedure, the material is cleaned to render it usable, but some damage may remain, i.e. small traces of sand and mud which will fall out when later used. In general, this mud is made up of minute particles, which are often firmly attached to the paper's surface.

With thorough cleaning, as much mud as possible is removed. Nevertheless, the mud may have permanently discoloured the paper.

5.3 Treating material contaminated with heating oil

Drying this material is straightforward. However, important documents which are used daily should be copied, since there is currently no technique which completely neutralises the odour.

5.4 Removing rust

To achieve the best results, a series of procedures must be used. A wrong procedure may bind the rust particles even further to the paper fibres. The results vary according to the type of paper and rust particles to be removed. The items must then undergo an odour neutralising procedure.

5.5 Neutralising odours

Normally odours are neutralised through ionisation or the use of scents. Each of these procedures carries its own risks to cultural property. Currently, a multi-stage odour neutralising procedure is being tested; the results are promising.

5.6 Adhesive removal

The removal of adhesives from glossy paper or photos is very difficult, time consuming and not wholly successful. As a general rule, this kind of damage can be avoided by correct and swift action on-site.

5.7 Bookbinding and restoration work

The material must first be dried before decisions on further work can be taken. This work should only be carried out at the behest of the client or once the insurer has agreed to cover the cost.

Whether an item requires further work will depend on the initial treatment given.

Correct and swift on-site treatment by specialists can greatly reduce the need for further work.

6. Insurance – important information

According to statistics, policyholders on average are 20% underinsured.

Recommendation: compile a detailed inventory (possibly with photos and price estimates) for the insurer; the PCP can help draw up a list of important items. This will enable a precise estimation of the insurance cover required.

6.1 Underinsurance in the private domain

Example: Mr. B. has taken out house insurance cover worth a total of CHF 100,000. Mr. B. has purposely chosen to underinsure his belongings, even though he has recently inherited some valuable objects. Later, Mr. B. incurs damage of CHF 60,000 to his property, most of which is insured at replacement value. If this value can no longer be estimated (e.g. for antiques), the market value is used.

The insurance expert establishes that Mr. B. should have taken out insurance cover worth CHF 300,000. He has underinsured his property by 2/3, and the insurer only pays out: CHF 20,000, rather than the actual cost of CHF 60,000

Underinsuring by authorities and firms

Much of the material in an archive, such as important day-to-day business documents, company papers, contracts, minutes, and administrative files, does not have a market or replacement value. Insurers place these items under **Costs**. The limit of indemnity is partially entered as a percentage of the sum insured (10–20%) or as a fixed sum. Disposal and restoration are also considered as **Costs**.

Underinsuring can have drastic consequences should damage occur.

It is essential that all businesses should have a high limit of indemnity in order to be able to replace these important documents, if necessary.

6.2 Costs of restoring important documents and files

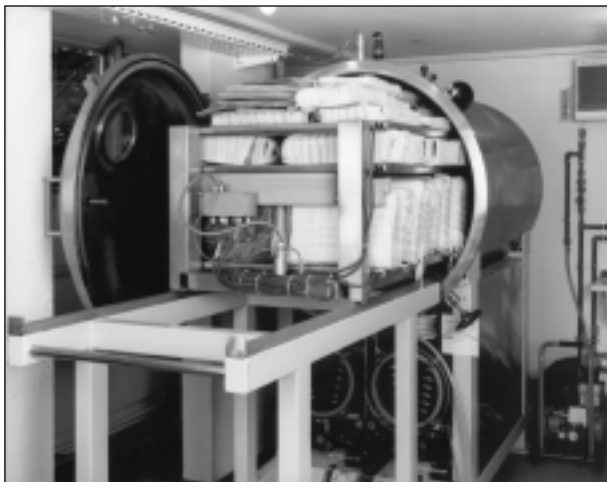
It is difficult to pre-determine the cost of damage to archival property. Calculations are based on mean values and can prove much higher, if the property is severely damaged. These figures are registered „without engagement“ and serve as indicator values, calculated under the assumption that methods used after the damage has occurred are professionally sound and in accordance with docuSAVE procedures. If this is not the case, much higher costs must be anticipated. The policyholder must first determine how much cover for restoration purposes he wants. Only then can the indemnity be calculated.



6.3 The four levels of archive salvage and restoration and their average or maximum costs per running meter

1. Stabilising, salvaging and drying per item: from approx. CHF 300 (minor water damage) to CHF 800 (severe water damage) per running meter.
2. Stabilising, salvaging, drying and cleaning after flooding or fire, incl. odour neutralising, from approx. CHF 800 to CHF 2,000 per running meter.
3. Stabilising, salvaging, drying, cleaning after flooding or fire, incl. odour neutralising as well as bookbinding and restoration work from approx. CHF 1,200 to CHF 3,000 per running meter.
4. Restoration work. If additional restoration work is requested, the costs can quickly increase tenfold. A profession restorer must be contacted to ensure an exact declaration of the sum insured.

7. The docuSAVE method



After years working as a professional restorer, advisor and expert, Guido Voser recognised the need for a tailor-made, cost-effective restoration of water-damaged documents. This gave rise to the docuSAVE method. It involves damage analysis and assessment, selection of drying techniques, corresponding pre-drying procedures, conventional and vacuum freeze-drying as well as the necessary follow-up treatment measures. The new and improved vacuum freeze-drying procedure enables large quantities of files and other documents to be dried immediately with an optimal cost-benefit ratio. The specially developed high performance machine, chambers and expertise guarantee cost-effective drying and top-quality treatment of water-damaged material.

docuSAVE will work free of charge (a maximum of one half-day) at the scene anywhere in Switzerland for the Civil Protection/Cultural Property Protection services, for all municipal, cantonal and federal authorities. This can help to assess the damage immediately and deploy the first stabilising measures. For advice on a large-scale disaster, either at home or abroad, docusave can be contacted by telephone.

Should you require further information, consult the specialist literature «Konservierung und Restaurierung von Schriftgut, Grafik und Fotografie» of the City and University Library, Berne (<http://www.stub.unibe.ch/html/haupt/dienstleistung/rest/index.html>) or contact docusave directly.

Thanks

I'd like to thank Mr. Rino Büchel and Mr. Hans Schüpbach (Federal Office for Civil Protection, Protection of Cultural Property), Mr. Vinzenz Bartlome (state archives Bern), my wife Barbara Mordasini Voser, Mrs. Cornelia Masciadri (Translation into French), Mrs. Elaine Sheerin (Translation into English) and Mrs. Caroline Winiger (Translation into Italian) and all the other persons, who participated in producing this booklet.

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- GE Archives d'Etat**, Case postale 3964, 1211 Genève 3, 1 rue de l'Hôtel-de-Ville, 1204 Genève
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- JU Archives de la République et Canton du Jura**,
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- VD Archives cantonales vaudoises**, Rue de la Mouline 32, 1022 Chavannes-près-Renens
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