LYRASIS

Preservation Services Leaflet

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Drying Wet Books and Records

The five methods for drying wet books and records described in this leaflet have all undergone at least some minimal level of testing under emergency conditions; several have been used extensively. The descriptions are provided to assist you in making the best choice given your circumstances: cause of damage, level of damage, number of volumes involved, rarity/scarcity, personnel available, budget available, drying services available. Advice from a conservator or preservation administrator experienced in disaster recovery is recommended before the final selection is made. It is common to employ more than one drying method depending on the type and degree of damage. Remember that no drying method restores materials to their original condition. They will never be in better condition than before they sustained water damage. Water-damaged books and records typically require 20% more shelf space after drying because of permanent swelling of paper fibers. If time must be taken to make critical decisions, or to remove large numbers of materials from the site, books and records should be frozen to reduce physical distortion and biological contamination. Freezing also halts the bleeding of fugitive dyes and inks. Consult a book or paper conservator about the drying of rare or unique materials.

Several of the methods described below (dehumidification/desiccant drying, vacuum drying, and vacuum freeze drying) are only available through a commercial disaster recovery firm. Choose a company with experience in drying library or archival collections. Ask for references and carefully inspect the materials after drying. Be sure that the drying procedures do not include any treatment, such as ozone odor removal or fumigation that may cause permanent damage to paper- based materials. It is advantageous to contact these services during disaster planning and to set up a customer profile. In the event of a disaster, the firm is familiar with your collections and can begin recovery efforts more quickly.

Keep in mind that after the materials are dried, work still needs to be done before the materials can be made accessible again. Common rehabilitation activities include removing residual dirt and debris, rebinding, repair, applying new labels, re-foldering and boxing of documents, and re-shelving.

Air Drying

Air drying refers to drying materials under normal indoor environmental conditions, generally 70-75 degrees F, 40-55% relative humidity. It is the most frequently used method of drying wet books and records, although not always the most appropriate. Air drying can be employed for one item or many, but is most suitable for small quantities of damp or slightly wet books, documents, and photographs. Because it requires no special equipment, it is often seen as an inexpensive method. However, air drying is extremely labor-intensive (if carried out properly), can occupy a great deal of space, and usually results in badly distorted bindings and text blocks if the damage is more than superficial. While drying, the materials must be carefully monitored for mold growth. Air drying is seldom if ever successful for drying bound coated paper.

Correct procedures for air drying books and records should be understood before beginning. The materials to be air dried should be spread out onto tables to facilitate drying. The pages of damp books can be interleaved with an absorbent paper such as unprinted newsprint or paper towels. The interleaving material absorbs water that has soaked into the text block and speeds up the drying process. The interleaves must be changed often. When books are almost dry, but still cool to the

touch, remove the interleaving, close book gently, and continue drying under a light weight to minimize distortion. Documents can be spread out in small stacks on absorbent paper. Air drying is the method of choice for small quantities of moderately wet books and documents, and especially for photographic materials. Large quantities of wet materials can be frozen for stabilization and then thawed and air dried in batches.

Dehumidification/Desiccant Air Drying

This is the newest method to gain credibility in the library and archival world, although it has been used for many years to dry out buildings and the holds of ships. Large, commercial dehumidifiers are brought into the facility with all collections, equipment, and furnishings left in place. Temperature, humidity and air velocity are controlled to user specifications and to facilitate drying. In desiccant air drying the dehumidifier uses a desiccant chemical which can lower the relative humidity to below 20%, thus speeding up the drying process. Refrigerant dehumidifiers are unable to reach humidity levels as low as desiccant dehumidifiers, resulting in a longer drying time.

Dehumidification/desiccant air drying is successful for drying damp to moderately wet books and records, equipment, and furnishings. It must be initiated before swelling becomes a problem or mold appears, i.e., within 24 hours of the emergency. It is not successful for drying bound, coated paper. The size of the facility is limited only by the amount of equipment available and the expertise of the equipment operators. If circumstances do not allow for drying onsite, materials can be packed out and dried offsite in another building, temporary drying chamber, or at a disaster recovery firm. This is the method of choice for large quantities of damp books and records, with the advantage of leaving the materials in place on the shelves and in storage boxes, eliminating the costly step of removal to a freezer or vacuum chamber. In addition, the materials remain accessible while drying.

Freeze Drying

Books and records that are only damp or moderately wet may be dried successfully in a self-defrosting, blast freezer, if left there long enough. For this method, also known as freezer drying, materials should be placed in the freezer as soon as possible after water damage. Books will dry best if their bindings are supported firmly to inhibit initial swelling. The equipment should have the capacity to freeze very quickly, and the temperatures must be -10 to -40 degrees F to reduce distortion and facilitate drying. Documents may be placed in the freezer in stacks or may be spread out for faster drying. In very large commercial freezers they may be left in their storage boxes, although this will slow drying. Expect this drying method to take several months, depending upon the temperature of the freezer and the extent of water damage. Coated paper may adhere with this technique depending on degree of wetness and length of time before freezing. An ordinary blast freezer is adequate, but there are specially engineered self defrosting freezers designed specifically for books and documents that have precise controls, timers, and instruments to monitor the moisture content of the items being frozen. Freeze drying can be carried out at a low cost per item presuming that the necessary equipment is available. However, it can only be employed for a limited batch of items at a time, and the drying cycle is quite long (average of 4-18 months). This service is not typically provided by disaster recovery firms; it is up to the library or archive to purchase or secure use of a freezer.

Vacuum Drying

This method is also referred to as vacuum thermal drying. Books and records are dried in a vacuum thermal-drying chamber into which they are placed either wet or frozen. The vacuum is drawn, heat is introduced, and the materials are dried, either in cycles of freezing and thawing, or slightly above 32

degrees F. This means the materials stay wet, not frozen, while they dry. It is a very acceptable manner of drying wet records if cockling is not a problem, but it often produces extreme distortion in books, and causes adhesion of coated paper and photographic materials. Water-soluble inks or pigments will also be affected. For large numbers of materials it is easier than air drying, and almost always more cost-effective. This method is not a good choice for saturated books; expect extensive rebinding or recasing of bound materials. This method can be a good solution for moderate quantities of general records, unbound materials, and documents that have suffered extensive water damage.

Vacuum Freeze-Drying

Small batches of frozen or wet books and documents are dried in a low pressure vacuum chamber. The vacuum is pulled, a source of low heat is introduced, and the collections, dried at temperatures below 32 degrees F, remain frozen until dry. The physical process known as sublimation takes place, i.e., ice crystals vaporize without melting. This means there is no additional swelling or distortion beyond that incurred before the materials were placed into the chamber. Coated paper will dry without the pages blocking, or becoming fused together, if it has been frozen or placed into the chamber within the first 6-8 hours. The process calls for sophisticated equipment and is especially suitable for large numbers of very wet books and records, as well as for coated paper. Rare and unique materials can be dried successfully this way, but leather, vellum, and photographic materials may not survive. Water soluble inks and pigments will not be damaged further. Although this method may initially appear to be more expensive due to the equipment required, the results are often so satisfactory that additional funds for rebinding are not necessary, and mud, dirt, and soot are lifted to the surface, making cleaning less time-consuming.

This process is available through disaster recovery firms only and, therefore, cannot be done on-site. The materials will be transported in a refrigerated truck to the recovery firm's nearest plant with a vacuum freeze drying chamber. Vacuum freeze drying is suitable for a wide range of materials and is very effective for saturated books and coated paper. It takes quite a while to dry a large volume of materials since the chambers are limited in size and each batch requires an average 6-10 weeks to dry, and the collections are inaccessible while drying.

An added benefit to vacuum drying is that the vacuum draws dirt and particles to the surface, which can be brushed off after drying. Also, it has found to be effective in non-chemical fumigation and smoke-odor removal. The vacuum draws out some of the air and moisture from the materials, some of the odor causing particles are removed.

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Original by Sally Buchanan, 1992