Section 3: Disaster Recovery Services & Supplies

There are a wide variety of recovery technologies and services available in the marketplace, yet sometimes it is difficult to get detailed technical descriptions of these services. Also, recovery companies may use different names for similar techniques. The following definitions are provided to help librarians and archivists become educated consumers of recovery services.

Users of this guide should identify their own specific needs and then carefully evaluate the suitability of these services and products. For example, while odor removal can be useful for circulating collections, it may damage photographs and may not be suitable for permanent archival collections. Also, be aware that some of these services are proprietary, and therefore the vendor will not divulge technical details. Be wary of any service that uses chemicals, and always request a Material Safety Data Sheet (MSDS).

These services apply primarily to wet books and paper. For a more thorough discussion of these technologies, with information on photographic materials, magnetic tape, leather, vellum, etc., see *Disaster Planning and Recovery: A How-to-do-it Manual for Librarians and Archivists* by Judith Fortson-Jones (New York: Neal-Schuman, 1992).

Definitions of basic salvage techniques can also be found on the Emergency Response and Salvage Wheel™ (© 2005, National Institute for the Conservation of Cultural Property, Inc.). Also, consult the National Park Service's series of "Salvage at a Glance" Conserve-O-Grams online for a quick overview of drying methods by collection format.

- AIR DRYING
  Materials are dried in ambient environmental conditions – 70° -75º Fahrenheit and 50 - 55% (or lower) relative humidity (RH). Air circulation in the space should be increased using fans. Spread damp or wet materials out on tables or surfaces covered with absorbent material such as blotter paper, kraft paper or unprinted newsprint. Paper documents can be dried flat in small stacks or upright in racks. Increase evaporation rates by interleaving book pages with absorbent paper to wick moisture from pages and gutters of bindings. Interleaving should be changed when wet, and materials should be frequently monitored for possible mold growth. Circulating fans can be directed to blow gently over groupings of wet materials. Items should be placed under weight when nearly dry to minimize cockling. Drying will take from a few days to several weeks depending on degree of saturation and environmental conditions. See VACME and ZORBIX.

- ANTI-MICROBIAL
  This may refer to a variety of vendor services used to eliminate or eradicate mold or biological contamination. The "treatment" may be applied by exposing contaminated or moldy materials to a chemical spray or mist. *These solutions could be harmful to collections materials, so it is critical to request a MSDS before agreeing to any type of spraying or fogging.* Keep in mind that the best way to remove mold is to dry it out and then remove residual by cleaning or

vacuuming. For more information on acceptable mold removal methods, see the mold remediation online guidelines in Mold Remediation in Schools and Commercial Buildings by the Environmental Protection Agency. See HEPA FILTER/VACUUM.

- BLAST FREEZING
  The size and formation of ice crystals is governed by the rate and temperature of freezing. Blast freezing, used for certain types of food-stuffs, is designed to quickly freeze in a few hours, often involving temperatures in excess of -50° Celsius. The advantage of quick freezing for water-damaged collections is that ice crystals are kept very small, resulting in a limited amount of swelling. See FREEZING.

- DESICCANT DRYING / DEHUMIDIFICATION
  Desiccant dehumidification is a contracted service used to rapidly dry out a building and its contents after a water disaster. Rapid and thorough drying of building materials (without high heat) is imperative to the prevention of mold growth. The process replaces humid air with controlled low humidity air (less than 20% RH). Atmospheric pressure, air movement and temperature control are manipulated to speed up the drying process. An entire building can be dried in this manner while leaving damp collections out on shelves; or a room or area of a building can be converted to a drying chamber. This process is for onsite drying of damp to slightly wet books and records, equipment, and furnishings. It is not suitable for drying coated paper.

- DISINFECTANT
  Disinfection is likely not necessary. If the materials have been exposed to hazardous or toxic substances, all affected paper (or porous) materials will need to be reproduced or replaced. *In general, do not allow application of disinfection agents, solutions, vapors, or mists. Use of chemicals could cause paper to weaken, inks to run or fade, and harm to photographic materials, and damage to metal surfaces.* Vendors might have proprietary mixtures and may not reveal all the ingredients of their disinfectants. If chemicals must be used, keep a record of the type, quantity and use location of each chemical and cleaning agent used, along with the MSDS for each (must be provided to you by the vendor). Materials also should not be exposed to radiation, ozone, or microwaves.

- DOCUMENT CLEANING
  Documents and books should only be cleaned by brushing with a soft bristle brush or vacuuming with a HEPA-filtered vacuum. Mud and debris can be rinsed from books and papers prior to drying. Most objects should not be cleaned with chemicals or cleansers.
  See DISINFECTANT.

- FREEZE-DRYING
  Batches of damp to slightly wet materials can be dried in a specially engineered

self-defrosting blast freezer (one that quickly lowers the temperature). Very cold freezer coils draw out and condense the water vapor from the air. The water is drawn away from the wet material toward the drier air, thus drying the materials. Materials dry more quickly with less distortion if the temperature is kept between -10° to -40° F.

There are freezers that can be adapted for in-house use, but most likely freeze-drying would be contracted through a recovery vendor. This method is good for a variety of materials, after a small disaster if the institution has access to a freeze-dryer. Otherwise, this is not a very practical option since it is not easily scalable and the drying process is very long, from 2 –18 months. See BLAST FREEZING.

- FREEZING
  If items cannot be dried within a few days, freeze them until further action can be taken. Freezing helps to stop mold growth, prevents inks from running and offsetting, and limits swelling. Blast freezing is best because smaller ice crystals are formed, but any commercial freezer will do. Pack materials loosely in cardboard or plastic boxes to allow air flow.

- HEPA FILTER/VACUUM
  HEPA is an acronym for "high efficiency particulate air filter", as defined by the US Department of Energy. This type of air filter can remove at least 99.97% of airborne particles, down to 0.3 microns (µm) in diameter. Most dust and mold particulates are too small to be trapped by regular vacuum filters, but are larger than 0.3 microns and so are trapped in a HEPA filter. Therefore, an air purifier, respirator, or vacuum with a HEPA filter is preferred for use with moldy materials.

- MOLD/MILDEW REMEDIATION/REMOVAL
  This phrase can mean two things: usually all it refers to is stopping fungal growth, but it can mean the application of chemicals. Molds (fungi) grow on organic materials (particularly cellulose-containing materials) in the presence of high humidity conditions. Fungi can grow in a broad temperature range, including temperatures comfortable for building occupants, so maintaining or lowering humidity is crucial to stopping and preventing mold growth.

  The best method for “removing” mold is removing the moisture it must have to grow. *Application of chemicals or “treatment with a sanitizing agent” is not recommended.* See DISINFECTANT, DOCUMENT CLEANING, HEPA FILTER/VACUUM.

- ODOR REMOVAL (deodorization)
  Odor removal chemicals are available in, liquid, dry and gaseous form: Liquid deodorants are available in water, oil, cream and gel form, and are generally dispensed using foggers or direct application. Dry deodorants are

available in cube and crystal form. They are placed in within proximity to the items but not touching them. Gaseous deodorants are produced from ozone generators.

Deodorants should not be used to mask toxic substances, or used to fool one's sense of smell, especially when toxic substances may exist. The safest way to reduce odor in materials after a disaster without using chemicals, is to let the items air out in a well-ventilated space with a high rate of air exchange. Be aware that it is a slow process.

- OZONE
  Ozone is a very reactive form of oxygen. It is a colorless gas with a sharp characteristic odor often used by restoration contractors for the deodorizing treatment of fire, smoke, and water damaged materials. However, *there is little scientific data concerning the proof that ozonation destroys odors. It is a powerful oxidizing agent and accelerates the breakdown of organic materials, especially paper.* Disaster recovery services typically do not have any way to measure ozone exposure, nor therefore, the damage they are inflicting on collections. *Use of ozone is not acceptable for materials of permanent value;* however it may be a strategy to deodorize materials for short-term use or that will be reformatted. If using ozone equipment, follow the manufacturers' use procedures, safety precautions and ventilation recommendations.

- REFRIGERATION STORAGE
  Cold, refrigerated storage of wet materials, at a temperature above freezing, is the second best choice for stabilizing wet materials if freezers are not available. However, this should only be an interim solution until materials can be transferred to a freezer.

- REFRIGERATION TRANSPORT, "REEFER TRUCK" – A refrigerated truck used to transport wet materials to cold storage or to a freeze drying facility.

- SHOCKWAVE™
  This is an EPA registered disinfectant, sanitizer and cleaner designed for mold remediation. It is formulated to be used on both porous and non-porous materials. It is marketed to be used in water damage restoration especially when contamination is present. *This chemical may be useful for cleaning floors and shelving, but it should never be used directly on books or any collections materials.*

- SMOKE/SOOT REMOVAL
  Smoke and soot residue can be wiped off materials with a natural rubber sponge. Dry ice blasting has also proven effective in removing smoke and soot residue. This should be done by a specialized vendor only. See DOCUMENT CLEANING.

- STERILIZATION (GAMMA RADIATION, ETHYLENE OXIDE)
  Sterilization methods used by recovery vendors to eradicate biological or microbial agents may include gamma radiation or ethylene oxide treatment. In fact, the US Postal Service uses gamma radiation to irradiate mail suspected to be infected with agents such as Anthrax. While these agents do render the materials sterile, they can cause permanent damage to cellulose. *Research has found that gamma radiation can result in decreased paper strength, and ethylene oxide is a serious health hazard. Use these services only when absolutely necessary.*

- VACUUM FREEZE-DRYING
  A process employing a combination of low temperature, low vapor pressure, and uniformly controlled heat in a vacuum chamber to dry materials. Frozen materials are placed in a vacuum chamber.
  At 32° F in a vacuum freeze-dryer, the ice in the materials vaporizes; i.e., H_2O goes directly from a solid to a gaseous phase through a process called *sublimation*. Vaporization absorbs heat and the temperature of the materials must be maintained at 32° F; accordingly, a small amount of heat must be applied to maintain the temperature. Swelling and distortion are greatly reduced with this process, since the ice in the frozen materials does not pass through a liquid state. Coated paper may be dried using this process if frozen within 6-8 hours after the disaster. Suitable for a wide variety of materials, this is the preferred method for salvaging saturated books and paper that are not easily replaced. (In most cases, it is actually much cheaper to replace materials than have them transported off-site and freeze-dried.) This is a specialized process that can only be done by a few recovery vendors. Materials will have to be dried offsite, and will be inaccessible for a period of time.

- VACUUM THERMAL DRYING
  Also called *vacuum drying* or *thermal drying*.
  Non-frozen, wet materials are placed in a vacuum chamber. During the drying cycle, the material is warmed by heated gas introduced into the chamber. When the material is heated, it thaws, which can increase damage: water soluble inks, adhesives, and colors will run; coated paper will stick together; book boards will likely become more warped; book cloth will bleed and blister. This technology may be suitable for wet, unbound materials, especially if they are to be photocopied or microfilmed after they are dry. It can be effective in smoke odor removal and in non-chemical fumigation. *This process is not suitable for coated paper or saturated materials.*

- VACME PRESS DRYING
  This patent-pending technology developed by Artifex Equipment, Inc. employs atmospheric pressure by creating a vacuum in a translucent pliable plastic bag. It can be used for a variety of procedures such as pressing books too large for a screw press. It may have application in drying wet books when combined with Zorbix™ (see below). Preliminary testing has found that wet books can be effectively dried, quickly and with little distortion, if interleaved witih Zorbix™

and placed in a Vacme press. This could prove an alternative to air drying; but since only a few books can fit inside each Vacme bag, its use may be limited to small disasters.

- ZORBIX™
  Zorbix™ is a patent pending flat blotter-type sheet containing a super absorbent polymer designed to dry wet books and records. It was developed by Artifex Equipment, Inc, and the USDA's National Agricultural Library. It soaks up to 50 times its weight in water and can be re-used multiple times. Sheets of Zorbix™ can be used to interleave wet books while air-drying to speed up the drying process. The super absorbent polymer can leak out of the sheet if cut or torn, or punctured. *As with any chemical, consult the MSDS before use.*