

APPENDIX E

MEDIA TYPES AND METHODS OF RECOVERY

Appendix E consists of information on common media types and methods of recovery, emphasizing drying which is the most prevalent records disaster problem. (See Manual, Part III for a related decision chart.)

(1) Media Types

- **Plain paper:** Encountered everywhere in the office environment. Manufactured after the 1850's, usually highly acidic, frequently made of short fiber ground wood, disintegrates easily when either wet, or too dry.
- **Coated Papers:** Glossy papers coated with clay, photographic, film emulsions or fillers. Examples: photographic papers, architectural and engineering drawings on "vellum" papers, magazines, catalogs, annual reports, lithographic and "thermo" treated papers. Leaves of such papers readily adhere to one another when wet or heated.
- **Rag Paper:** Manufactured mostly before 1850, but on a declining scale even to the present day. Long fibered, very durable. Used for fine stationary, official documents and records, well bound books and other records used through the 19th century.

Note: All paper has, or should have, a natural moisture content of 6 – 8 percent. Lower moisture content will cause the paper to become brittle and disintegrate.

- **Linen:** Not a paper, but a coated woven cloth, used through the mid-20th century, for architectural and engineering drawings. Cloth itself is comparatively durable, and is not damaged by water, but many coatings are water soluble.
- **Photographic Films:** Most camera original photographic media consists of a plastic base coated with a silver halide emulsion. Examples of these are microfilm, X-rays, slides, motion picture and still photography negatives. Allowed to dry in contact the emulsions can partially adhere to the opposite film base. If heated above 90 degrees Fahrenheit, the plastic base will warp and the emulsion will become "tacky" and adhere to an adjacent base or another smooth surface such as glass or metal. (See Recovery of Microfilms, Films, Appendix C-3-9.)
- **Electronic Media:** Magnetic tape, magnetic disks, optical disks, CDs and hard drives are all subject to damage. The best defense is prevention, including duplication and backup procedures. Electronic media can sometimes be dried and salvaged. Copy the information onto fresh media. Don't put contaminated disks into systems as further damage may occur to equipment. Drying and restoration are best left to information systems professionals. (See Recovery of Electronic Records, Appendix C-3-10).

(2) Drying Methods:

There are six commonly used drying methods and processes, each with an array of advantages and disadvantages. Some are preferable for drying specific type of media than others. (See Manual Part III for Decision Chart.)

Interleaving:

- **Description:** Document or book leaves are separated and then interleaved with absorbent paper, such as blotter paper or blank newsprint, then weighted. The absorbent paper draws moisture from the wet records. The absorbent should be replaced about every 30 minutes until the documents are dry.
- **Preferred** for small quantities of moderately wet paper materials, photos and clay-coated papers.
- **Advantages:** Can be done by agency staff and/or volunteers locally, in almost any available space with normal room conditions, 70-75 Fahrenheit, 50-55 percent RH. Easy to monitor. Materials stay “at home” and are accessible for reference. No over-drying and limits warping. Considered low-cost.
- **Disadvantages:** Labor intensive. High mold potential.

Air Drying:

- **Description:** Documents are backed with absorbent material and spread out on tables or placed in sorters to dry.
- **Preferred** for small quantities of moderately wet paper materials.
- **Advantages:** Can be done by agency staff and/or volunteers locally, in almost any available space with normal room conditions, 70-75° Fahrenheit, 50-55 percent RH. Easy to monitor. Materials stay “at home” and are accessible for reference. No over-drying. Considered low-cost.
- **Disadvantages:** Labor intensive. Requires large space and tables or shelves. High mold potential. Leaves are often warped and distorted and require flattening.

Note: Interleaving and air drying are the oldest and most commonly used methods of drying. They are often thought to be the same process because they are often used simultaneously. The difference is that interleaving depends on absorption as the primary means of drying, while air drying depends on air circulation as the primary means. These methods are described in further detail in Appendix C-3-6.

Desiccant Drying:

- **Description:** Initially used for drying out buildings, holds of ships and large containers. Employs large desiccant dehumidifiers that pump air into an area under specific air velocity, temperature and humidity (75-80° Fahrenheit, 20 RH), to take moisture out of the air, and, by evaporation, out of documents. Documents are placed on vertical wire racks to permit air circulation. Requires outside commercial firm.

- **Preferred** for large quantities of most paper materials from slight to heavy water damage. Also preferred for photographic materials.
- **Advantages:** Speed, can take as little as 20 days. Scaleable to volume. Can handle large quantities. Records are accessible for reference. No over drying. Can be set up on-site by commercial provider. Does not require cold storage stabilization due to volume.
- **Disadvantages:** Poor results with clay-coated papers. Mold may lay dormant. Considered expensive.

Vacuum Thermal Drying:

- **Description:** Employs a vacuum chamber to batch dry materials at variable temperatures and vacuum levels which draws and expels moisture.
- **Preferred** for moderate quantities, and smoke damaged materials.
- **Advantages:** Effective non-chemical fumigation and smoke removal. Destroys mold. Can be done on site using portable commercial chambers.
- **Disadvantages:** Poor results with clay-coated papers. Over-drying can occur. Not suitable for saturated papers, particularly books.

Freeze Drying: There are three options for freeze-drying, all of which employ “sublimation.” Sublimation is the process of converting H₂O in its solid state (ice) directly to its gaseous state (vapor), by- passing the intermediate liquid state (water). It functions exactly like a self defrosting kitchen freezer, alternating freezing and heating to produce condensation, in combination with pressure to evacuate the vapor. The primary difference between the three is speed or rate of drying.

1. **Cold storage**-Primarily used for stabilizing wet materials to prevent further damage. However, it can also dry the records if left long enough, 4 to 24 months, depending on the level of saturation.
 - **Useful** for voluminous materials that are not required for extended periods of time and when funds for more costly methods are not available
 - **Advantages:** Handles large volumes. Inexpensive. Damage stopped. Will not over-dry. Readily available in many locations. (Public ports often have huge cold storage facilities.)
 - **Disadvantages:** Very Slow. Access for reference difficult.
2. **Freeze Drying Chambers-Large** (grocery store size) self defrosting freezers, specially engineered to achieve temperatures below -50 F to produce ice crystals quickly and rapidly bring the temperature up to near thawing to effect sublimation of ice crystals. Vapor is removed by low level negative pressure.
 - **Preferred** for wide range of materials in small quantities, not needed quickly. Will kill mold.
 - **Advantages:** Damage is stopped. Medium cost, cannot over-dry.

- **Disadvantages:** Limited capacity (under 12 cubic feet in most cases.) Not readily available from commercial providers. Slow; 1 - 4 month cycle, depending on saturation. Documents are not readily available for reference. NOTE: The State Archives has two such units available that can be used by local agencies.
3. **Vacuum Freeze Drying:** Employs ultra low negative pressure and supplemental heat resulting in **rapid** sublimation of ice crystals.
- **Preferred** for coated papers and saturated books...
 - **Advantages:** Fast. Suitable for a wide range of materials. Greater capacity than freeze dry chambers. Will kill mold.
 - **Disadvantages:** comparatively expensive. Not available locally (in Washington State). Requires shipment via refrigerated carrier. Materials not readily available for reference. Over-drying can occur.

(3) Factors to consider in selecting a method of drying:

- **Volume of Media** – Is the volume such that the records must be stabilized by freezing before being dried; or shipped via refrigerator carrier to a large drying facility out of state; or desiccation humidification systems used on site.
- **Type of Media** – Are coated papers, photographs, and linen drawings and books damaged that are best dried by certain methods?
- **State and Degree of Damage** - Is there fire, mud or contamination damage that requires cleaning the records before they are dried? How wet are the records, completely saturated or just wet on one or more edges. Are records moldy?
- **Sensitivity of the Media** – Does the media have coatings or emulsions that may be salvaged only through certain drying processes?
- **Location of the Drying Facility** – Can the drying be done on site or does the material have to be shipped out of state in order to use the selected method?
- **Reference Accessibility** –Is access needed during the drying process?
- **Available Funds** -- Cost may dictate what is possible.

Note: See Manual Part III, Decision Chart, to help select the most appropriate drying method.