

PAPER CONSERVATION CATALOG PROTOTYPE

22. Humidification

Introduction of moisture directly or indirectly into the design and/or paper support.

22.1. Purpose

Conservation of support to realign paper fibers in order to reduce sheet distortions such as cockles, strain or rolling; realign deformations in the sheet such as creases, folds and ridges; reestablish original configuration of the paper, such as original flatness, platemark or embossing.

Conservation of media to consolidate pigments by reviving aqueous binders; relax dessicated gums and resinous lakes, etc. Restore moisture content of solvent treated papers. Soften support so that a new dried configuration can be achieved. Relax sheet in preparation for dry-lining or washing, or suction table work, or expand sheet for stretch drying with edges weighted or confined.

22.2. Factors to consider when deciding whether or not to humidify and in choosing humidification technique

22.2.1. Sensitivity of Support and Media\*

- A. Sensitivity of inks, dyes, media, gums, paper coatings, surface finishes to vapor or liquid moisture\*
- B. Paper hygroexpansivity\*
- C. Inherent memory of paper which might be necessary to retain plate mark and/or embossing: hard, calendared surfaces may disturb the surface of some modern papers\*

22.2.2. Tendency of support or media to water stain\*

- A. Presence of foxing spots\*
- B. Presence of active mold: mold can be expected to proliferate in a humid environment\*
- C. Presence of adhesive residues: when damp the adhesive may be reactivated or possibly move through paper support\*

\* This subject requires expansion.



Category II: Very fine uniformly atomized spray. Water droplets finer than dust. Use higher pressures--20-40 psi:

1. Standard air brush: All tips use larger tips to achieve broad spray; no fan control
  - a. Paasche H, VL 1-5
  - b. Thayer and Chandler
2. Precision Sized Spray Gun:  
Use smaller tips and needles; use no or moderate fan control; flow of the water is controlled by the trigger, bar or button; the air supply is adjusted to between 20-40 psi. The air flow is generally turned on at the very start of the travel of the triggering device used as the flow control. The force of the air atomizes the water as it emerges around the needle, through the opening in the fluid tip, where it is also thoroughly mixed with the air. The relatively high pressure will move the small, low mass (lighter than dust) droplets out so they will not coalesce.
  - a. DeVilbis EGA series
  - b. Binks;
  - c. Paasche Au series and BU series

Category III: fine, slightly less than uniform, spray; Water droplets larger than dust, some will fall to ground; generally use medium sized tips and needles; 15-25 psi; fan controls to adjust spray pattern.

1. Precision sized spray guns: medium sized tips. Strong fan control.
  - a. DeVilbis EGA series
  - b. Binks
  - c. Paasche BU or CU series
2. Normal spray guns: use small tips and needles on larger guns and large tips and needles on smaller guns. Moderate fan control
  - a. DeVilbis EGA series
  - b. Blinks 18 series
  - c. Paasche 211 series
3. All-in-one (diaphragm) spray units: Noisy and cumbersome. Easy to purchase, inexpensive. Some can produce very nice spray.

Category IV: Non-uniform spray, large to very large droplets present. Water droplets much larger than dust, which may produce 1/16" to 1/4" wet spots.

1. Dahlia sprayer:  
Keep pumped up; watch out for corrosion.
2. Finger pump mister:  
Use strong, even strokes.
3. Hand pump sprayers:  
Use "tightened-down" tip settings.

Category V: Non-uniform spray, very large droplets always present in sizable quantities, which may be up to 1/8" to 1/4" in diameter. Extremely large droplets at end of pump or spray stroke as pressure drops off.

1. Power pak sprayers: use small can of case usually freon. Heat cans in warm water to keep pressure high.
  - a. spra-tool
  - b. others
2. Hand pump sprayers:  
Use strong even strokes.  
"Tightened-down" tip settings best for fine even spray.

Category VI: Extremely large droplets common. Requires special skill to use. Non-uniform spray pattern.

1. Mouth atomizer

D. Brushes

1. Japanese water brush
2. Smaller brushes for local use

22.4. Humidification-Treatment Variations

22.2.3. Speed of Humidification

- A. Degree of paper degradation: faster or direct humidification may cause damage to degraded, brittle paper fibers than slower methods\*
- B. Possibility of uneven expansion of supports: multiple sheet constructions, such as chine colle may expand at varying rates and to different degrees and if done, slower humidification may be more controllable\*
- C. Condition of media and relationship to support: media such as oil paint, distemper or heavy gouache on paper may not be well bonded to the support and may expand differently from it\*

22.2.4 Degree to which humidification is desirable\*

22.2.5 Efficiency in accomplishing humidification\*

22.3. Materials and equipment

22.3.1 Water

- A. Should be free from contaminants deleterious to paper such as chlorine, iron, copper, and debris, etc.
- B. Should not be allowed to stand for long periods without a fungus inhibitor

22.3.2. Equipment should not provide sources of iron, copper, chlorine, etc. which may be dissolved into water used for humidification.

A. Container or tray

- 1. The container or tray must be sufficient depth that water or damp blotters may be placed at the bottom and a rack suspended above the cover over the container to seal the environment from loss of humidity. Containers may include sinks, heated sinks, enamel trays, photographic trays, wood slats adjusted to the desired size and covered with polyethylene or aluminum battons.

\* This subject requires expansion.

2. A rack is secured above the base of the tray so that it does not come in contact with the water supply yet maximizes the circulation of air within the chamber. Care must be taken that water does not reach the surface of the rack. Racks may be made from light diffusing grates or floating screens.
3. A tray cover is required to seal the environment. The more complete the seal the higher the relative humidity. A transparent cover enables observation of the object during humidification. Covers may be made from glass, polyethylene or polyester film, plexiglas, or other clear, rigid plastic sheet.
  - a. A garbage can utilizes the same components as a tray chamber, however is an upright system, particularly suitable to rolled items. A plastic garbage can will avoid rust problems and is lightweight
  - b. Additional variations of the above include jars, domed chambers that traverse the container for hanging folios on threads

B. Steamers

1. Jiffy type steamer
2. Hand held steamer

- C. Spray Equipment: Generally designed and sold for spraying paint, though may be adapted for spraying water; sprays may be categorized according to droplet size ranging from fine mists (category I) to coarse sprays (category VI)

Category I: extremely fine, uniform, tight spray. Circular or oval spray pattern; cannot be adapted to a general misting procedure due to tight spray pattern. Water droplets lighter than dust. Low flow rate

1. Turbine Air Brush:
  - a. Thayer and Chandler Turbine Brush;
  - b. Paasche AB

#### 22.4.1. Humidity Chamber Techniques

Overall introduction of moisture through vapor phase in contained environment. Generally slower and more controllable than direct humidification. Speed of humidification will be influenced by: ratio of air volume to water volume; exposed surface area of moisture source; temperature of contained environment (warm water will speed process as well as increase chance of condensation in chamber); quantity of hygroscopic materials in contained environment; moisture content of hygroscopic materials in environment.

- A. Water is introduced at the bottom of the chamber either by creating a pool or laying down a damp or wet blotter
- B. The object is placed in the contained environment generally resting on a blotter or screen or both. It may be necessary to put the object in a rolled or folded state until it becomes sufficiently limp to allow opening
- C. The length of safe and necessary humidification is dependent on the characteristics of the object, as indicated in 22.2; however longer periods of exposure may cause the growth of mold within the chamber. Thymol, ortho-phenyl phenol or borax in the water supply may diminish this threat. Non-soluble media may eventually bleed or soften after long exposure to very high humidity.
- D. Condensation of water within the chamber may be a danger to object being humidified. This danger may be minimized by avoiding liquid liquid water which is warmer than the outside environment. The sealing cover can be lined with a blotter or the object can be placed between blotters, although this reduces visibility

#### 22.4.2 Steam Technique

Introduces hot to warm water vapor. This is generally a local treatment which may be used to soften adhesive, but it is also use humidfy difficult papers quickly.  
General Treatment Steps\*

#### 22.4.3 Humid Suction Table Technique

General Treatment Steps\*

\* This subject requires expansion.

#### 22.4.4 Spray Techniques

To achieve slow or quick and efficient wetting with control over the amount of moisture. Need to consider droplet size, uniformity of droplet size, and speed of application.

##### A. Misting:

The mist should be played out over the support in a cloud; not in a fan (created by allowing air to flow through the fan adjustment valve) as a varnish would be sprayed onto a painting. The density of the cloud can be controlled by the size of the spray equipment, after overall evenness of the cloud has been achieved. Air pressure and water flow can be altered to achieve desired results. Categories II and III equipment is generally used.

##### B. Spraying Water

Water is usually sprayed in alternating layers (obverse and reverse; with design across design) in whatever scheme is required. Category III, IV and V equipment can be used. Fan controls are used to develop a longer, narrower spray pattern.

General Treatment Steps:

1. The spray is applied in overlapping rows until the first coat of moisture has been applied to the objects.
2. The support is then turned over and the other side is sprayed.
3. The third coat (layer) is applied to the obverse (front) or reverse (back) depending on which side the spray started. Spraying from the back first may reduce the amount of times the front must be sprayed as well as reduce the number of times the wet media is turned face down. It is suggested that the spraying be divided into several coats, 6-2 to aid in control; Humidification may need to stop after the second or fourth coat of water.
5. Continue as above until the support has become as limp as required.



- 22.4.4 Brush Application Techniques\*
  - a. Brush pattern. Amount of liquid used. Type of liquid.
- 22.4.5 Blotter Technique\*

May be used locally or overall
- 22.4.6 Marination Technique\*

Treatment Steps
- 22.4.7 Poultice Technique\*

Treatment Steps
- 22.4.8 Bath Technique\*

Treatment Steps

22.5 Bibliography

Compiled by: Doris Hamburg, Dianne van der Reyden, and Tim Vitale

Contributers:

\* This subject requires expansion.