

## BASIC PAPER TREATMENTS FOR PRINTED BOOK MATERIALS



### WORKSPACE CONSIDERATIONS

climate control

separate room for paper treatment

HUMIDITY - always a problem with wet treatments

Monitor it

recording hygrometers (expensive, reliable?)

thermo hygrometers (less expensive, reliable?)

humidity indicator papers (inexpensive, reliable)

cards can hang pieces of it about the room

good range 50s

tape Light Impressions or Tales

40s-50s

Modify it

air conditioners (summer)

needs to be constant

dehumidifiers (summer)

humidifiers (winter)

exhaust fans - window

LIGHT - UV considerations ultra violet rays blue + green wave lengths shorter and more active.

Natural

windows - shades, filtering plastics

south (sun)

north (north light) blue light not good

Artificial

fluorescent - filtering plastic sleeves over lights

incandescent (OK) does not cause a blocking problem

WATER - not just H<sub>2</sub>O

Content - test professionally

Metals (bad)

iron

copper

Minerals (good)

calcium

magnesium

Contaminates (bad)

bacteria

particulate matter

Additives (bad)

chemicals

chlorine

soft water out to be tested

hard water good for paper

Source

well (low metals, high minerals, contaminates?)

spring (low metals, high minerals)

city (high metals, minerals?, contaminates? additives?)

rain (pure but pH?)

Filters

charcoal (contaminates? additives?)

deionized (no bad, no good, pH?) similar to distilled water but is slightly acidic

distilled (no bad, no good, pH?) acidic

pH - monitor & adjust

lower: acidic

0 7 14

↓

acidic to basic

## HAZARDS

Bench - tools & liquids  
in box on surface  
separate table, or below, not above

bare work surface  
walls should be clear so they don't fall  
per them all in a tray so they can be moved  
art cart type

## Miscellaneous

pets (cats) *use another*  
children

## Personal

coat & apron - reserved for paper *use different apron for paper*  
jewelry (rings, bracelets, necklaces, watch clasps)  
make-up (lipstick, finger polish, face powder)  
food & drink (coffee rings)  
hands clean (grease) *check to see if your hands excrete grease*  
*sponge check*

## EXAMINATIONS & TESTS

### PURPOSE

- to analyse the papers for  
fiber content  
sizing
- text, fibers, analyze all 3  
endpapers, analyze all 3  
pH meters
- to establish the factors that  
contribute to the problems of deterioration  
physical  
chemical
- set the parameters of treatment

BOOK PAPERS - several types likely

- text paper
- illustrations, frontispiece, maps
- endpapers

HISTORICAL GUIDELINES - "progress" means trouble

- 1330's - gelatin used as size
- 1650's - alum added to gelatin
- 1770's - chlorine bleach discovered
- 1830's - alum-rosen sizing
- 1840's - undigested ground wood
- 1850's - sulphate & sulphite
- 1870's - clay papers
- 1960's - acid free paper

### TESTS

pH - acidity

Contact (surface) not extraction (destructive)

pH meters (expensive, complicated)

pH indicator strips (inexpensive, convenient)

0-14 (liquid solutions)

0-6, 5-10 (papers) to test paper

method

mylar sandwich

tide lines? remove by "walking out"

do test on back pages  
(book picture)

Phloroglucinol - undigested wood pulp & lignin

newsprint <sup>unpermaments stain of the page</sup> will act unfavorably

read while still  
damp

book materials take a staining of the page

Ann Clapp says 15

stain (permanent)

unreliable (over 20%) <sup>better not if use a q tip or  
under blotter</sup>

Betsy a minute or

Solubility - solvents (water, other)

types

can use a hair dryer

above 6.5 is accept

watch under a  
magnifying glass

signatures

close book to keep

anything below 5 is a

inscriptions

flat

serious problem

colored illustrations

can also use a packing

Betsy works on anything

methods

iron with blotter over

below a 6

Q tips, blotters

and under after dry

Betsy works on anything

Sensitivity - pH solutions

below a 6

papers (endpapers)

some papers if stable you might

inks (written)

even at a 4

colors (illustrations)

can use a fixative

paraffin was dissolved in hexan

1 If something turns pink use weak vinegar solution  
2 to turn it back

## REPORTS & DOCUMENTATION

### PROPOSAL

Purpose - realistic expectations - no surprises

Written - brief but with limiting phrases

e.g. "staining reduced if possible"

Includes

identification of item (title, author, etc.)  
value  
description (size, etc.)  
treatments proposed  
estimated date of completion  
estimated costs

Signed by owner

### DOCUMENTATION

Purpose - to provide a record

Written - form &/or prose (word processor)

Condition

information from examination & tests  
paper content  
sizing  
pH  
solvent solubility & sensitivity  
complications  
mold  
tape & old repairs  
losses - pages, corners, tears

Treatments (follows same format)

methods  
materials used

Photographic - before & after (in process?)

Equipment

35 mm slides (color) &/or prints

tungsten or daylight (film & lights)

copy stand or tripod

color & size guides

*buy a size and color guide in each photo  
book*

Shots - views

front endpapers  
back endpapers  
title page & frontispiece  
text - sample  
illustration - sample  
other? - damages

### PRE-TREATMENTS

LABEL - paginate any un-paginated pages 1, 2, 3, etc. also I, II, III at back

Types

endpapers

fly sheets

blank endleaves

illustrations, maps etc. *put most change next to ill if there is no #*

Methods - pencil, reverse lower corner

front - letters

back - numbers

in the middle - opposite leaves

## SPECIAL CONDITIONS & COMPLICATIONS

MOLD - Three levels of involvement

Invisible mold

spore filled world

control by controlling environment (low humidity) *keep it down, down, down*

Visible mold

remove alive (to prevent collapse)

vacuum suction into bottle with alcohol

Q tips, toothpicks, brushes, knives, cloths etc.

kill?

sunlight - ultraviolet (spores? discolors paper?)

freezing (spores?)

alcohol (spores?)

Heavy mold - kill first? then remove manually

✓ Thymol - chamber, crystals over light bulb, 1-3 weeks, etc.

solutions protein disadvantages

slow

uncertain

degrades paper

Formaldehyde - vapor (liquid in glass) in humidifier, 12 hours

disadvantages

a protein hardener will harden leather and sizing makes it more difficult to get out stains

toxic

hardener of protein (photography, fixative)

may set discoloration, tide lines, stains etc.

TAPE - consists of carrier & adhesive

Freezing

freezer for 1 hour good w modern tapes

reduces tack

effective on new tape (double sided, etc.)

Heating

hot spatula or tacking iron - silicone release paper

softens adhesive

Solvents

Types

water?

Hexane?

Toluene? *test tube*

Acetone?

Vapor - avoids washing adhesive into fibers (translucency)

micro-climate - blotter in jar

poultice - blotter or Gore-tex in mylar sandwich

Liquid - tide lines? toxic? *Dont let sticky stuff go into paper*

Q tips, cotton ball, paper towel *blotter*

DOG EARS only open damp

Humidify *moisture on Q tip on edge*

steam - dry will break fibers

water on brush (tide lines?)

Bone folder between mylar to reduce crease

Press with book block

TEARS & REPAIRS - treated elsewhere

FIXATIVES -

PARAFFIN IN HEXANE

CELLULOSE ACETATE IN ACETONE

## DRYCLEANING

Purpose: to remove surface dirt before wet treatments embed it in paper fibers. Only if necessary.

TREATMENT - depends on dirt & paper surface

### Materials

bread - traditional (residues?)  
synthetic powders - Skum-X, Drafting powders (residues?)  
grated eraser - plastic, vinyl  
bags, pads - Opaline, etc. (dirty covers?) *keep hands off paper*  
erasers - plastic & vinyl (abrasion?)

### Methods

circles - powders & pads (avoids lines)  
one direction - never scrub back & forth (wrinkles)  
off edge (prevents tears)  
brush thoroughly (residue)  
shield (mylar or bristol) to protect notes etc.  
gloves or paper towel pads - no bare hands (oil)

## NON-AQUEOUS ALTERNATIVES

### MYLAR ENCAPSULATION

A housing not a treatment  
Dealt with elsewhere

### WEI T'O - Richard Smith's developments

#### Comments

Useful when necessary  
Can be done in book  
Improves health of paper but not appearance

#### Types

various deacidification agents  
various deacidification solvents (not water)

#### Methods

spray  
liquid - dipping

## NEUTRALIZATION - WASHING

### PURPOSE

- to improve health & appearance
- to wash out degradation products
- to neutralize acids
- to bring pH. closer to neutral 7

### EQUIPMENT

- Trays - flat bottomed, of various sizes
  - plastic - photographic (Cesco-lite)
    - light weight
    - white (see discoloration)
  - stainless steel (sinks mostly)
  - glass - pyrex pans for small items

### Supports

- glass - traditional (breakable? non-porous?)
- Plexiglass (non-porous?)
- screening, nylon or fibreglass (slippery?)
- nylon or dacron mesh (slippery?)
- wet strength paper (porous?)
- Remay (hairy?)
- Pellon (stretchy?)
- Hollytex (slippery?)
- Mylar - non-porous but indispensable

### Other

- rods - glass or plastic, 1" diameter *- to pick up paper*

*Sacra cloth  
remay gets scuffy  
good to have a self  
seal tape*

### METHOD

- Wash on chosen support
- Submerge with rod
- Remove with support backing or mylar on front
- Change rinse water - 3 times (30 min?) or "til clean"
- Cold water first, then hot if needed

### OPTIONAL TREATMENTS:

#### FLOAT WASHING - first rinse

##### Purpose

- to observe size condition
- to determine further treatment

#### WETTING DOWN AGENTS

##### Purpose

- to break down size
- to allow better penetration of fibers

##### Material

- alcohol - as needed, 1:1 (Hey) or 1:16 (1 cup in 1 gallon)
- Ethanol *if the size does not break down*
- Isopropanol

##### Method

- spray - beforehand
- in first rinse (remove paper first)

*use 3 cold water washes*

? hot water

*use mylar to pick up and turn over* 8

## LIGHT TABLE - on mylar support

### Purpose

- to remove old repairs & adhesive
- to make inlays

### Equipment

- plexiglass back lighted in some manner
- light sticks & plexiglass (translucent)

### Method

- Old repairs & adhesives removal, use combination of reflected light - overhead (repairs? carriers?)
- transmitted light - back lighting (fiber loss?)
- raking light - 45 degree angle (adhesive residue?)

### Inlays

- mylar on top of wet object on mylar
- inlay paper - dry
- water pen to trace outline
- tear

float into position in missing area *pour water right on mylar  
and page twice and get them  
lined up*

## SPOT TREATMENTS

### Purpose

- to remove or reduce localized stains &/or dirt

### Supports

- Pellon or Hollytex (porous) *Orvus stay off the type + illustrations*
- screen for firmer support

### Surfactants - to remove dirt (type too?!?) & finger marks

- Orvus

- textile detergents

*too harsh to pour a concentrated stream of water  
over the surface*

### Solvents

- alcohol, etc. depending on stains

### Method

- soft brush & froth
- rinse with beaker or tea kettle to control
  - flow
  - force

## ENZYMES

### Purpose

- to soak apart laminated endpapers, etc.
- to remove protein or starch sizes

### Materials

- Protease - protein

- Amylase - starch

### Method - add to warm water rinse (denatured above 40 C.)

## ALKALIZED RINSES

### Purpose

- to further neutralize the acids

### Method

- add

calcium hydroxide? *don't throw up garbage*

magnesium bicarbonate?

ammonia (swells fibers)?

*leave a piece of screen laying on top to prevent cutting*

## ALKALIZATION

The difference between "Neutralization" and "Alkalization" is only a matter of degree and of the concentration of the solutions used.

### PURPOSE

- to bring the pH above 7
- to provide an alkaline "reserve" or "buffer"
- to prevent future deterioration from acid contamination

### MATERIALS

Minerals, salts of metals

Calcium

Magnesium

#### Form

Hydroxide - water

high pH in solution (dangerous?)

lower pH in dried precipitate on paper

Bicarbonate - water & carbon dioxide

lower pH in solution (carbonic acid)

### SOLUTIONS

#### Barrow Two Step

Calcium Hydroxide (limewater)  $\text{Ca}(\text{OH})_2$  Saturated solution

calcium carbonate or calcium hydroxide (faster) powder

mixed into water 2g/l<sup>1/2</sup> (PCC) (Hey), 4g/l (Clapp)

shake several times - let settle

pH 12+ in solution

pH 8+ dried in paper

use 1:1 (Hey), 1:6, 1:16 as required or desired (ck pH)

Calcium Bicarbonate  $\text{Ca}(\text{HCO}_3)_2$

calcium carbonate or calcium hydroxide (faster) powder

mixed into water 7.3g/l (PCC)

bubble carbon dioxide through 'til clear

2nd step rarely used now as carbonate precipitates on drying

#### Barrow One Step

Magnesium Bicarbonate  $\text{Mg}(\text{HCO}_3)_2$

magnesium carbonate (8.4g) or magnesium hydroxide (5.8g) powder

mixed into water 8.4g/l, 5.8g/l (PCC), 2 ozn./l gallon (Clapp)

bubble carbon dioxide through 'til clear

pH 6.5 - 8.0 in solution

pH 7.5 - 8+ dried in paper

use straight, 1:1, 1:8 as required or desired (ck pH)

### DECISION - arguments for and adherents of both

Calcium hydroxide

easier to make

better neutralizer of acids

less hospitable to mold growth

problems - high pH discolors lignin

precipitate on surface?

Magnesium bicarbonate

better stabilizer of metal particles

lower pH less of a shock to paper

discolors lignin less

## BLEACHING

starts with CH.  
Note back w M.B.

### PURPOSE

- to improve appearance
- to lighten overall discoloration
- to reduce stains

### LIGHT - aqueous light bleaching

#### Advantages

- safest - on rag paper (no lignin? no alum rosen size)
- easiest - on object & conservator
- best result - natural color (not stark white)

#### Natural - sun light

##### method

- place in deacidification bath/(mg. bicarb.)
- put in tray with plexiglass cover, sponges at corners
- place in sun or open shade *lift glass*
- time - as long as required or desired, depending on  
latitude  
time of year

#### Artificial - banks of fluorescent light tubes

- method - same as above
- time - longer (slower)

### CHEMICAL

#### Disadvantages

- complicated
- hard on object & conservator
- result - dead white

#### Methods - read Margaret Hey

## LINING

### PURPOSE

- to add strength (title pages, maps, fly leaves)
- to add dimensional stability (board papers, end papers)

### ADHESIVE

#### Starch

wheat  
rice

Cooked & thinned down  
→ thin - skim milk  
medium - heavy cream  
thick - sour cream

### LINING

Silk - no longer used

Lens tissue - by some

Japanese tissue - by most depending on weight  
color

Kozo - longest fibers

Mitsumata

Gampi - thin but too much pull

### METHOD

Dampen both object & lining tissue 'til relaxed

#### Paste

lining tissue - object placed face down

object - object placed face up

both - object placed either face up or down

take spine side of  
blotter and fold over so  
edge of paper overlap  
to form the hinge  
then lay down paste  
edge

#### Dry

press dry - sandwich under glass (see below)

stretch dry - on drying board, Plexiglass or Arborite

object face up on lining

blot excess water

rub down through paper

paste edges to surface

slow down drying if pulling occurs

blotter

Gore-tex

"breaks" in paper fiber & mends

burnish to consolidate fibers

bone folder through mylar

## DRYING & HUMIDIFICATION

### PURPOSE

- to remove the moisture from the paper
- to leave the fibers in one plane without cockling
- to flatten without losing type "punch" & plate lines

### HUMIDIFYING

#### Direct water

- spray - Dahlia or finger pump plastic bottle <sup>windex</sup>
- brush - on reverse
- ultrasonic humidifier

#### Vapor

- humidity chamber
- double garbage can
- tray with water (wet blotter?), rack (screen?) & plexi on sandwich - "marinate"
- mylar
- blotter - damp or wet
- interleaving sheet - Pellon, Hollytex or Gore-tex
- object
- interleaving sheet - "
- blotter - damp or wet
- mylar - vapor barrier
- NO WEIGHT (object must expand without wrinkling)

### DRYING

#### Air drying - "unrestrained"

##### Method

remove free standing water

drain

paper towel

blotters

place on drying racks

with or without supports (depending on racks & object)

Pellon or Hollytex

blotters

screen on top - optional

cockling is due to uneven

distribution of moisture

control the humidity

use gortex

can use lined gortex to  
wet down unlined to dry and control  
humidity

##### After drying

dampen, or humidify when completely dry (see above)

flatten under blotters & glass (see below)

#### Wet press - "pressure drying"

##### Method - dry sandwich (see above)

use "wicks" to remove moisture

blotters <sup>then go to the bl.</sup>

felts <sup>first couple</sup>

change until dry (warm to touch)

three times? (1/2 hr., 2 hr., overnight?)

weights - under, or between, depending

Plexiglass

plate glass

litho stone

press

~~because counters are~~

not straight

#### Stretch drying - "restrained"

(see Lining above)

blotters + glass as opposed to a press

13 because of losing type

## RE-SIZING

Often not necessary. Washing alone strengthens paper  
re-activates fiber bonding  
re-activates old size

### PURPOSE

- Strength to fibers
- Protection for the surface
- Media support(feathering of inks, colors etc.)

CRITERIA - compared to the rest of the book

- Rattle
- Drape
- Feel (blotter like quality?)

### CONSIDERATIONS

- Future use & housing
- Past treatments (hot water rinses? bleaching?)

### TYPES

- Protein *dipped*
  - hot animal glue - diluted (acidic)
  - gelatin - food, photo (acidic)
  - vellum - parchment, vellum scraps boiled (alkaline)
- Starches - dilute pastes
  - wheat *& brushed*
  - rice
  - corn
- Cellulosic ethers
  - methyl cellulose etc.
- Synthetics
  - soluble nylon - not used now
  - not reversible - cross-links with age
  - discolors - gray

### METHODS

- Paper should be
  - wet?
    - prevents penetration?
    - aids penetration?
    - size - thicker?
  - dry?
    - carbonate has precipitated
    - size - thinner?
- Surface sizing
  - dip - immersion
  - brush (uneven?)
  - spray (uneven?)

### DECISION

- Depends totally on
  - paper
  - desired result

RE-ASSEMBLE SECTIONS - FORM BOOK BLOCK - PRESS  
AND BIND THE BOOK!

'The end is but the beginning...

## SOURCES OF USEFUL INFORMATION

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