Identification and care of Photographic negatives

Mogens S. Koch

Part 6.

Survey and evaluation techniques

I prefer

Condition Assessment and Preservation Plans (DK)

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**Introduction and Background**

- Condition assessment will detect the most vulnerable / degraded / threatened photographs and seek causal relationships
- Documentation of storage history and current state of conservation
- Conservation Plans is about to recommend one or more like priority choices
- Future conservation strategy - meaning and consequences of choices
- Success Criterion: nothing has happened lately!

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**Introduction and Background**

Photo Collections of individual images, is regarded as a meaningful and irreplaceable natural resource that requires permanent maintenance, while the photographs must be available for distribution of inputs, knowledge and ideas

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**Introduction and Background**

A conservation plan based on concrete knowledge about the collection current state of preservation combined with knowledge about the specific storage conditions supplemented with conservation history.

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Introduction and Background

Aim of Conservation management Plan:
- Predict the outcome of the next state assessment under unchanged conditions or under other (improved) circumstances - possibly different scenarios.

Relation between impact and conservation

<table>
<thead>
<tr>
<th>Importance</th>
<th>Priority</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outstanding national importance</td>
<td>High</td>
<td>Active preservation</td>
</tr>
<tr>
<td>Significant national importance</td>
<td>Low</td>
<td>Optimum mode</td>
</tr>
<tr>
<td>Regional or Local importance</td>
<td>Medium</td>
<td>Good magazines</td>
</tr>
<tr>
<td>Less importance</td>
<td>Low / medium</td>
<td>Good magazines</td>
</tr>
</tbody>
</table>

D: Heavy damaged objects
C: Treatment-dependent condition
B: Stabilized condition
A: Dissemination suitable mode

Climate Measurements

![Climate Measurements Chart]

Source: Report on the conservation of kulturarven, KUM 2003, p. 27
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Time-weighted preservation index of 14 photo collections in Norway

Storage of several types of media in an archive

Temperature Fields

<table>
<thead>
<tr>
<th>Descriptions</th>
<th>Temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human comfort</td>
<td>20</td>
</tr>
<tr>
<td>Cool</td>
<td>12</td>
</tr>
<tr>
<td>Cold</td>
<td>+3</td>
</tr>
<tr>
<td>Freezing</td>
<td>-5</td>
</tr>
</tbody>
</table>
Storage of several types of media in an archive

Evaluation of Quality

- Unacceptable - damage will occur within a few years.
- Damage will occur after a longer period. Storage can be accepted in a shorter period.
- Comparable with international recommendations (ISO)
- Long shelf life can be expected

Material

<table>
<thead>
<tr>
<th>Storage</th>
<th>Glass Nitrate</th>
<th>Acetate B/W</th>
<th>Acetate Color</th>
<th>Poly ester B/W</th>
<th>Poly ester Color</th>
<th>Positive photo B/W</th>
<th>Positive photo Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room 20°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cool 10°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold + 5°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freeze -5°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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• By knowing the state of preservation, we can estimate the remaining life span of the film.

A-D Strip evaluation

Storage conditions

Remaining life span

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**A Prediction Tool**

A-D Strip level

Storage conditions

21°C, 50% RH

Time remaining before critical decay takes place

Predicted time from 0.5 to 1 acidity (level 3): 5 years

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**Degradning Film Needs Better Climate for Same Life Span**

A-D Strip level

Degrading Film

Fresh Film

Climate

-1°C, 50% RH

16°C, 50% RH

Will reach critical condition (acidity of 1.0) in about 100 years

---

**Condition Assessment - Approach**

- Recommendations on systematic "surveys" seen in several papers
- Still not have a (standard) method
- Difficult to compare between sessions and in sessions over time
- Reference collections - such collections
- Observations and documentation of natural aging (and comparison with artificial)
- Uncovering new conservation problems and extent
Expectations for damaged images

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Stages</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Some materials (nitrate, acetate, color)</td>
<td>Clump together, where the materials are</td>
</tr>
<tr>
<td>Exposing</td>
<td>By chance together or individually</td>
<td>Spread in the collection</td>
</tr>
<tr>
<td>Storage</td>
<td>Some materials, elders most at risk</td>
<td>Probably by age and materials</td>
</tr>
<tr>
<td>Handling and Use</td>
<td>By chance together or individually</td>
<td>Spread in the collection</td>
</tr>
</tbody>
</table>

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Expectations for damaged images

- 1890
- 1950
- 2006
- Original
- Oldest most sensitive
- Damaged
- Contamination
- Storage

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Collection of information

- General Information
- Description of photo collections
- Description of the stored
- Condition Assessment of Collection
- Analysis and evaluation of the collected information
- Recommendations and Action Plan
Recommendations and Action Plan

• Improvement Areas (buildings, archive room, climate, packaging, presentation) and preferably in relation to international standards or guidelines
• Argued and prioritized action plan with short-term as well as long-term priorities - like so operational / as practical as possible.

Collection of information

General Information:
– Name of Institution
– Address
– Contact
– Time of visit
– Type of institution (museum, library, private collection etc.)
– Use of photo collection

• Priority relative to other task / purpose

Collection of information

Description of photo collections
– Period
– Quantity
– Criteria for collection
– Additions
– Registration System
– Operation (how, who)
– Accessibility (resting or working archive)
– Demand and use
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Collection of information

Description of photo collections
- Offered services (photocopying, scanning, etc.)
- Loans (conditions and practices)
- Image Techniques (analogue / digital, negative, prints, slides, etc.)

Collection of information

Description of the storage conditions
- Building (s)
- Storage (magazine, Archive) and location in the building
- Size
- Climate Measurements
- Air Quality Measurements
- Light
- Heating System

Collection of information

Description of the storage conditions
- Access
- Design / arrangement of the archive room
- Secondary packaging
- Primary packaging
- Risk Assessment
- Disaster planning (water, fire, theft, etc.)
Collection of information

Condition Assessment of collection
– Selection of test method (random, systematic, sampling)
• Condition Assessment
• Categorization or 0-3?

Condition Assessment - negatives

• Category 0: Good Condition
• Category 1: Good Condition, observation, enhanced supervision.
• Category 2: Preservation / restoration, copying (analog / digital), chilling
• Category 3: Preservation / restoration, copying (analog / digital), chilling - urgent

Category 0: Good Condition
• Negatives in perfect preservation
• Residual fixing test <0.03 after the SD method
• A-D strips: No color change
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**Condition Assessment - negatives**

**Category 1:**
- Good Condition, observation, enhanced supervision
- Broken glass plates
- Weak silver mirroring particularly along the edges

**Category 1:**
- Rolled 35 mm film
- Residual fixing test: > 0.03 after the SD method
- A-D strips: Color Changing 0-1

**Category 2:**
- Preservation / restoration, copying (analog / digital), chilling
- Flaking emulsion
- Bleached and discoloration of the emulsion, little silver mirror
**Condition Assessment - negatives**

**Category 2:**
- Little discoloration of the base
- Glass plates with the formation of milk-white surface
- Preservation / restoration, copying (analog / digital), chilling
- Micro-organisms, mold, etc., if RH > 60%

**Condition Assessment - negatives**

**Category 2:**
- Insect damage (silver fish, dust mites, etc.)
- Residual fixing test: < 0.03 after the SD method and yellow discoloration
- Plastic Base uneven and/or smells sour
- A-D strips: Color Changing 1-2

**Condition Assessment - negatives**

**Category 3:**
- Preservation / restoration, copying (analog / digital), chilling – urgent
- Wet, damp, water or fire damaged negatives
- Micro-organisms, mold, etc., if RH > 60%
Condition Assessment - negatives

Category 3:
- Plastic Base with bubbles, starting solution, or smell strongly
- A-D strips: Color Changing > 2
- Broken plates held together with tape.

Condition Assessment - random

<table>
<thead>
<tr>
<th>Confidence</th>
<th>Tolerance</th>
<th>Samples</th>
<th>Confidence</th>
<th>Tolerance</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>99%</td>
<td>±0.5%</td>
<td>66.358</td>
<td>90%</td>
<td>±0.5%</td>
<td>27.060</td>
</tr>
<tr>
<td>99%</td>
<td>±1.0%</td>
<td>66.350</td>
<td>80%</td>
<td>±1.0%</td>
<td>27.060</td>
</tr>
<tr>
<td>99%</td>
<td>±1.5%</td>
<td>66.350</td>
<td>80%</td>
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<td>27.060</td>
</tr>
<tr>
<td>99%</td>
<td>±2.0%</td>
<td>66.350</td>
<td>80%</td>
<td>±2.0%</td>
<td>27.060</td>
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<td>80%</td>
<td>±5.0%</td>
<td>27.060</td>
</tr>
</tbody>
</table>

Condition Assessment - random

- A minimum of 30 single images
- A maximum of 10% of the collection
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Analysis and Report

Analysis and evaluation of the collected information
• The state of the selected sample
• Main causes of deterioration / instability (chemical, physical, biological, or handling damage)
• Quality of storage, climate / environment
Analysis and evaluation of the collected information

- Installation, handling, logistics
- Exhibition conditions (light, climate, mounting, etc.)
- Procedure for Lending
- Need for preservation / conservation / restoration
- Resources for conservation work

Recommendations and Action Plan

- Improvement Areas (buildings, archive room, climate, packaging, presentation) and like in relation to international standards or guidelines
- Argued and prioritized action plan with short-term as well as long-term priorities - like so operational / practical as possible.

Part 7.

Storage of negatives
Storage

• Packaging
  – Envelopes should be of good materials
  – Paper
  – Polyester
  – Polyethylene

• Inventory
  – no chipboard
  – Non-oil painted furniture
  – No fixed carpets
  – Preferably powder coated steel furniture
  – Preferably stainless inventory

• Air
  – The air must be free of ozone
  – The air must be free of sulfur
  – The air must be free of oxidizing gases
  – The air must be free of dust particles
Storage

• Microorganisms
  – The humidity must be <50%
  – The temperature shall be <20°C

• Dehydration
  – The humidity should not be so low that there is a problem with dehydration

• Handling
  – Caring - use white cotton gloves
Storage

• Requirements for rooms
  – Think long-term
  – Stable climate
  – No passage
  – No working space in magazine

Storage

• Requirements for inventory
  – Filing cabinets

Storage

• Requirements for inventory
  – Filing cabinets
Storage

• Requirements for inventory
  – Filing cabinets

Storage

• Primary Packaging

Storage

• Primary Packaging
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Storage

• Inactive archive
• Working archive

Storage

General requirements
• RH <50% and temp. <21°C
• No constant light
• Air free of harmful gases
• No harmful containers
• Proper handling

Material conditions

B / W negatives and positives
• Negatives on paper
• Negatives on glass and plastic
• RH <50% and temp. <21°C
Storage Guides for Acetate Film and Color Materials

- The benefits of cooler and dry conditions has been proven

**Media Storage Quick Reference Wheel (MSQR)**

**Four climates defined by temperature**

<table>
<thead>
<tr>
<th>Climate</th>
<th>Temperature</th>
<th>Relative Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>20°C</td>
<td>30%-50% RH</td>
</tr>
<tr>
<td>Cool</td>
<td>12°C</td>
<td></td>
</tr>
<tr>
<td>Cold</td>
<td>4°C</td>
<td></td>
</tr>
<tr>
<td>Frozen</td>
<td>-10°C</td>
<td></td>
</tr>
</tbody>
</table>
Simplified storage evaluation

<table>
<thead>
<tr>
<th>NO</th>
<th>REASON ABLE</th>
<th>GOOD</th>
<th>VERY GOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will give significant changes</td>
<td>Not correspond to the ISO recommendations but may be satisfactory for long periods</td>
<td>Corresponds to ISO Recommendations</td>
<td>Will give a much extended life</td>
</tr>
</tbody>
</table>

Each environment has a specific Affect

<table>
<thead>
<tr>
<th>Storage Conditions</th>
<th>Glass Plates</th>
<th>Nitrates*</th>
<th>Acetate*</th>
<th>Polyester</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROOM</td>
<td>Fair</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>COOL</td>
<td>Good</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>COLD</td>
<td>Very good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>FROZEN</td>
<td>No</td>
<td>Very good</td>
<td>Very good</td>
<td>Very good</td>
</tr>
</tbody>
</table>

*Must be frozen if there are signs of degradation.

Is the "storage" useful?

<table>
<thead>
<tr>
<th>Storage Conditions</th>
<th>Glass Plates</th>
<th>Nitrates*</th>
<th>Acetate*</th>
<th>Polyester</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROOM</td>
<td>Fair</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>COOL</td>
<td>Good</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>COLD</td>
<td>Very good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>FROZEN</td>
<td>No</td>
<td>Very good</td>
<td>Very good</td>
<td>Very good</td>
</tr>
</tbody>
</table>

*Must be frozen if there are signs of degradation.
**Is “frozen” useful?**

<table>
<thead>
<tr>
<th>Storage Conditions</th>
<th>Photo Prints</th>
<th>Ink Jet Prints</th>
<th>Magnetic Tape</th>
<th>CDs</th>
<th>DVDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>Fair</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Cool</td>
<td>Good</td>
<td>No</td>
<td>No</td>
<td>Fair</td>
<td>Good</td>
</tr>
<tr>
<td>Cold</td>
<td>Very good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Fair</td>
</tr>
<tr>
<td>Frozen</td>
<td>Very good</td>
<td>Very good</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

*Must be frozen if there are signs of degradation.

**Glass plates**

- Room: Reasonable
- Cool: Good
- Cold: Very good
- Frozen: No

**Acetat***

<table>
<thead>
<tr>
<th>B/W</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room</td>
<td>No</td>
</tr>
<tr>
<td>Cool</td>
<td>No</td>
</tr>
<tr>
<td>Cold</td>
<td>Good</td>
</tr>
<tr>
<td>Frozen</td>
<td>Very good</td>
</tr>
</tbody>
</table>

* Can be frozen if there are signs of deterioration
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Positives

<table>
<thead>
<tr>
<th>B/W</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rum</td>
<td>Reasonable</td>
</tr>
<tr>
<td>Cool</td>
<td>Good</td>
</tr>
<tr>
<td>Cold</td>
<td>Very good</td>
</tr>
<tr>
<td>Frozen</td>
<td>Very good</td>
</tr>
</tbody>
</table>

If the collection contains many different media?

<table>
<thead>
<tr>
<th>Storage Condition</th>
<th>Glass Plate</th>
<th>Hygroscopic</th>
<th>Azoide*</th>
<th>Polyester</th>
<th>Photo Prints</th>
<th>JSL</th>
<th>CDU</th>
<th>Safety Tint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cool</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cold</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Frozen</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

*Must be kept if there are signs of red/green

Preservation Assessment

Climate analyzes
• The condition of the assembly determined
• What then?
Stepwise changes

- Small changes often enough
- May be possible not to do more

<table>
<thead>
<tr>
<th>Temperature</th>
<th>RH</th>
<th>PI</th>
<th>% improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>21°C</td>
<td>50%</td>
<td>33 years</td>
<td></td>
</tr>
<tr>
<td>19°C</td>
<td>50%</td>
<td>50 years</td>
<td>52</td>
</tr>
<tr>
<td>19°C</td>
<td>40%</td>
<td>66 years</td>
<td>100</td>
</tr>
</tbody>
</table>

Effect of temperature

<table>
<thead>
<tr>
<th>Temp.</th>
<th>Factor for fading</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°C</td>
<td>⅛x</td>
</tr>
<tr>
<td>24°C</td>
<td>1x</td>
</tr>
<tr>
<td>19°C</td>
<td>2x</td>
</tr>
<tr>
<td>13°C</td>
<td>4x</td>
</tr>
<tr>
<td>7°C</td>
<td>10x</td>
</tr>
<tr>
<td>4°C</td>
<td>16x</td>
</tr>
<tr>
<td>0°C</td>
<td>28x</td>
</tr>
<tr>
<td>-10°C</td>
<td>100x</td>
</tr>
<tr>
<td>-18°C</td>
<td>340x</td>
</tr>
<tr>
<td>-26</td>
<td>1000x</td>
</tr>
</tbody>
</table>

The effect of relative humidity

<table>
<thead>
<tr>
<th>RH</th>
<th>Factor for fading</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>2x</td>
</tr>
<tr>
<td>40%</td>
<td>1x</td>
</tr>
<tr>
<td>15%</td>
<td>⅛x</td>
</tr>
</tbody>
</table>
Methods

- Ceiling vent
- Storm windows
- Moisture blocking
- Insulation
- Weather strips

Need cooler conditions?

- Small collections → Chest freezer
- Large collections → Freezer box (special room)

Freezer

Pro
- Lower startup costs
- Lower energy consumption
- In general, easier to maintain
- Local service is usually easy to obtain
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Freezer

Contra
• Must be packed conditioned with humidity control
• Necessary to keep "casual users" away

Freezer box

Pro
• Moisture Control
• Special packaging is not necessary
• Easier to move individual objects

Contra
• High startup costs
• High operating costs
• More difficult to control
Freezer box myths
Freezing can create gelatin injuries?
• Not like fruit and vegetables
• Even wet photographs can be frozen
• The only technique that can not be frozen is Wet-collodion

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Freezer box myths
Freezing creates condensation?
• Not a problem

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Freezer box myths
Humidity control or expensive packaging required?
• Reuse of existing / poor packing is possible

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Packaging

- Developed by Mark McCormick-Goodhart
- Available as sets or "do-it-yourself"


Materials

- Two freeze appropriate zippered polyethylene bags
- Two pieces of 4-ply good quality cardboard
- A "archival" box
- A humidity indicator

Safe & Verifiable Package Design for Freezer Storage of Photo Materials

The inner and outer bags are made of clear, 2.7 to 4 mil thick, food quality polyethylene.
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Method

- Put the photos in a plastic bag
- Squeeze the air out and seal
- Make a sandwich in a box
- A piece of dried cardboard
- Bag with photographs
- Another piece of dried cardboard
- Close the box

Method (continued)

- Put the box in a second plastic bag
- Add a moisture indicator in the bag
- Squeeze the air out and seal
- The package alone would be good for about 15 years

Oven-dried cardboard

Normal, ordinary kitchen top
- Heat oven to 95°C to 100°C
- Put a single piece of cardboard on a metal grate
- Heat 3 to 5 minutes
- Cool for a few minutes on a metal grate
- Use immediately or put it in a sealed bag
Remember

- All pages must be exposed during heating and cooling
- Wrapping is normal
  - Reduced by keeping all surfaces equally exposed as possible during heating and cooling

Microwave drying

Microwave without turntable
- Place the carton horizontally in the oven, expose as much of the both sides as possible
- For plastic 35mm film can be used normally rack
- Heat on high for about 30 seconds

Microwave drying (continued)

- Remove and allow cooling
- Microwaves can vary and it may be necessary to adjust the time
Cool storage myths

Take in and out of cool storage creates more rapid degradation?
- Maximum degradation caused by conditions of use

Cool storage myths

Freezing allows cold shock damage?
- Cooling is not instant
- For example:
  - Film at 21°C placed in a freezer at – 40°C
    - about 15°C per minute

Thermal contraction

- The contraction is small

<table>
<thead>
<tr>
<th>Material</th>
<th>% changes per F*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gelatin</td>
<td>0.002</td>
</tr>
<tr>
<td>Polyester</td>
<td>0.001</td>
</tr>
<tr>
<td>Acetate</td>
<td>0.003</td>
</tr>
<tr>
<td>Glass</td>
<td>0.005</td>
</tr>
</tbody>
</table>
Cool storage myths

Photographs must be conditioned in space before they come in cool storage?
• The condensation is not a problem when they come into Cool storage myths

At least 24 hours of heating time needed before use?
• Needed only to warm up over the dew point temp. of user space
• Humidity of storage space has no influence on the condensation

Fastest warm-up

• Remove small amounts
  – Low thermal mass
• Water stopping packaging
  – Protects condensation on photographs
• Placed directly in the user rooms
  – Maximize the temperature difference
Sample

- Thought frozen at -16°C
- Thought used at 22°C/50% RH
  - Dew point temperature of the user rooms 11°C

Small amounts

- Time for 140 m roll of 16mm film to reach the dew point temperature

<table>
<thead>
<tr>
<th>Roll (s)</th>
<th>Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
</tr>
</tbody>
</table>

Maximize the temperature difference

- Time to reach equilibrium, depending on the object and space temperature
Identification and care of Photographic negatives 6+7, Hermitage

Sample
50 8 "x 10" negatives in paper envelopes in a document box
- Thermal split half-life time 110 minutes (1 hour, 50 minutes).

Temperature of Negatives

<table>
<thead>
<tr>
<th>Start temp.</th>
<th>1/50</th>
<th>3/40</th>
<th>5/30</th>
<th>7/20</th>
<th>9/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>16°C</td>
<td>19°C</td>
<td>20.5°C</td>
<td>21.3°C</td>
<td>21.8°C</td>
<td>22°C</td>
</tr>
<tr>
<td>-18°C</td>
<td>2.2°C</td>
<td>12°C</td>
<td>17°C</td>
<td>19.7°C</td>
<td>21°C</td>
</tr>
</tbody>
</table>

Sluice contra packing

- -18°C storage
- First gate:
  - - 4°C/30% RH
- Second gate:
  - 12°C/30% RH
- User rooms:
  - 22°C/50% RH
- 50 8 "x 10" negatives

Sluse

- The first sluice:
  - 12 hours, 50 minutes
- Second sluice:
  - 12 hours, 50 minutes
- Total Time:
  - 25 hours 40 min.
Identification and care of Photographic negatives 6+7, Hermitage

Water stopping packaging

• Seal in plastic bag
• Bring in user rooms
• Time to reach the dew point of time:
  – 3 hours, 40 minutes

Psychrometric relationships

• Not easy to read psychrometric curves
• For quick approximation see "Psychrometric Calculator"
  – http://www.termo.unit.no/kkt/grzifik/java/PsychProJava.html
Moisture content

- Constant temperature, moisture content will vary with the RH
- Constant RH, the moisture content will vary with temperature

Achieve low RH in cold storage

- Conditions photographs at moderate RH in room temperature
- Pak into vapor-tight package with minimal air
- Freeze about -18°C
- Behaves as if it is -18°C and low RH

Cool storage with humidity control

Photographs conditioned during a storage at low temperatures to moderate RH
- Taken out for use
  - Behave as the ambient temperature and higher RH
- Is usually not a problem
  - High temperature (e.g., a car in summer) can be problematic
Conclusions

• Cool storage is not as expensive and difficult to handle as you would think!

PBS Online NewsHour

• http://www.pbs.org/newshour/bb/media/jan-june04/bettmann_06-10.html#