Preservation Strategies

Reto Kromer • AV Preservation by reto.ch

On the Materiality of Audio-Visual Heritage
Elías Querejeta Zine Eskola
Donostia (San Sebastián), Spain
4 – 7 October 2022

Prioritise

	quick	longtime
important	1	2
not important	3	4

Bibliography

Peter Z. Adelstein: **IPI Media Storage Quick Reference.** 2nd Edition. Image Permanence Institute, Rochester NY 2009

→ www.imagepermanenceinstitute.org

Dew Point Calculator. Image Permanence Institute, Rochester NY [2008]

→ www.dpcalc.org

Strategy

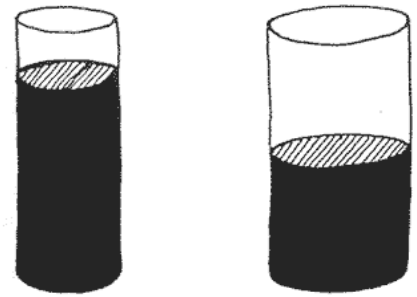
5

Develop a strategy

1. list the ISO standard for each media type which is present in the collection
2. assess the environment inside each vault at least for one year
3. inspect the condition of the collection
4. analyse the results and find the weak link
5. improve the conservation

6

Warming…

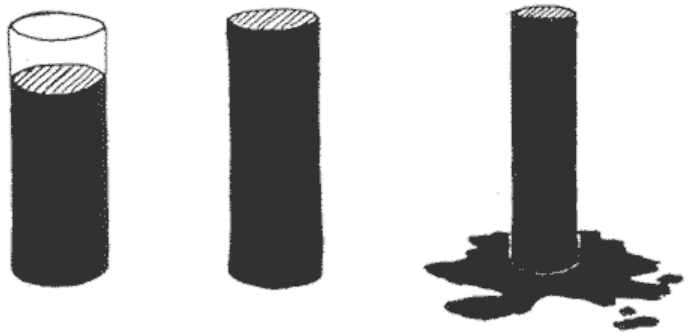


22 °C
80% RH

30 °C
50% RH

7

Cooling…



22 °C
80% RH

19 °C
100% RH

10 °C
100% RH

8

TYPE of DECAY	MEDIA	RECOMMENDED ENVIRONMENT
SILVER IMAGE DECAY	Photographic glass plates Black-and-white film Black-and-white photographic prints	30% to 50% RH
COLOR IMAGE DECAY	Color film Color photographic prints Ink jet prints	Low temperature 30% to 50% RH
COLOR BLEEDING	Ink jet prints	30% to 50% RH
YELLOWING, STAINING	Color photographic prints Inkjet prints	Low temperature 30% to 50% RH
BINDER DEGRADATION	Magnetic tapes	Low temperature 30% to 50% RH
NITRATE DECAY	Nitrate-base film	Low temperature 30% to 50% RH
ACETATE DECAY	Acetate-base black-and-white film Acetate-base color film Acetate-base magnetic tape	Low temperature 30% to 50% RH
GLASS DETERIORATION	Photographic glass plates	30% to 50% RH
LAYER SEPARATION	Photographic glass plates CDs and DVDs	Minimal temperature and RH fluctuations 30% to 50% RH
MOLD	All media	30% to 50% RH

9

Quantify

measured values:

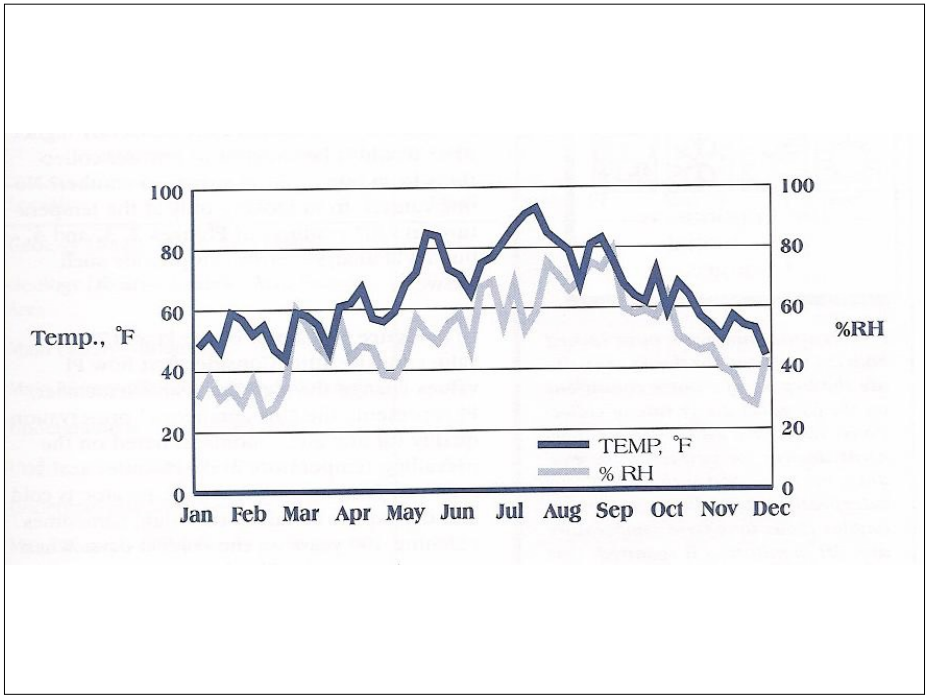
- temperature
- relative humidity

calculated values:

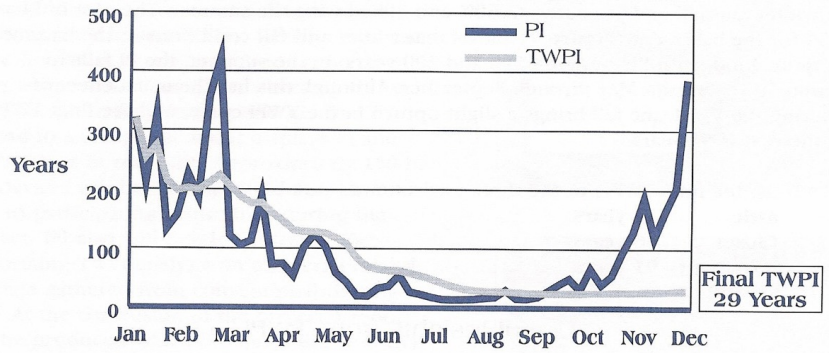
- PI (= «preservation index»)
- TWPI (= «time-weighted preservation index»)

10

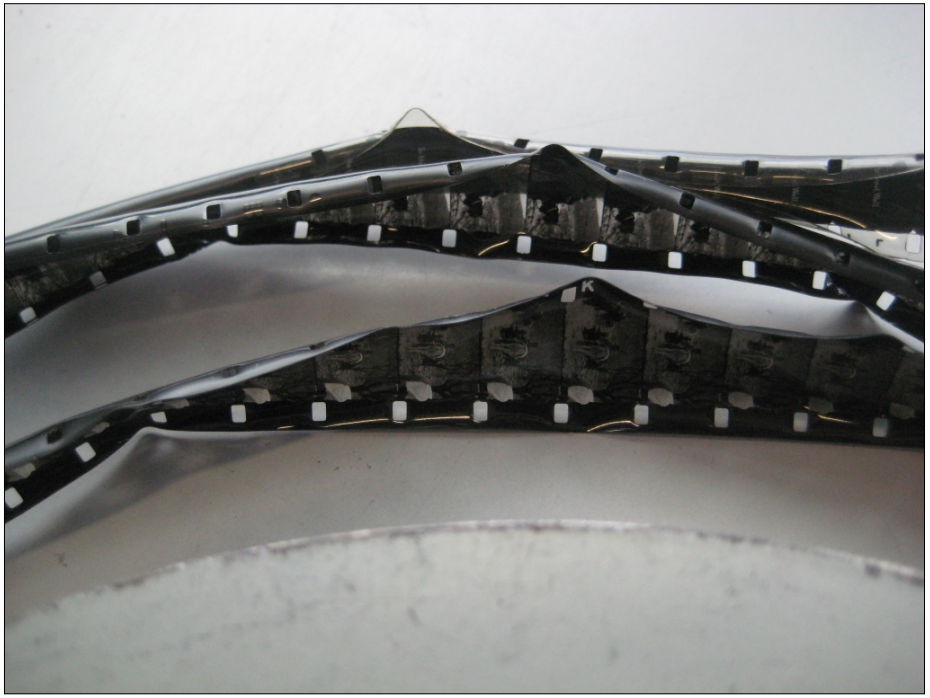
11



12



13



14

Statistical Method

The analyse of a randomly chosen subset of

164 items

of each type of material and in each storage vaults informs about the full collection with the precision of

80% ± 5%

15

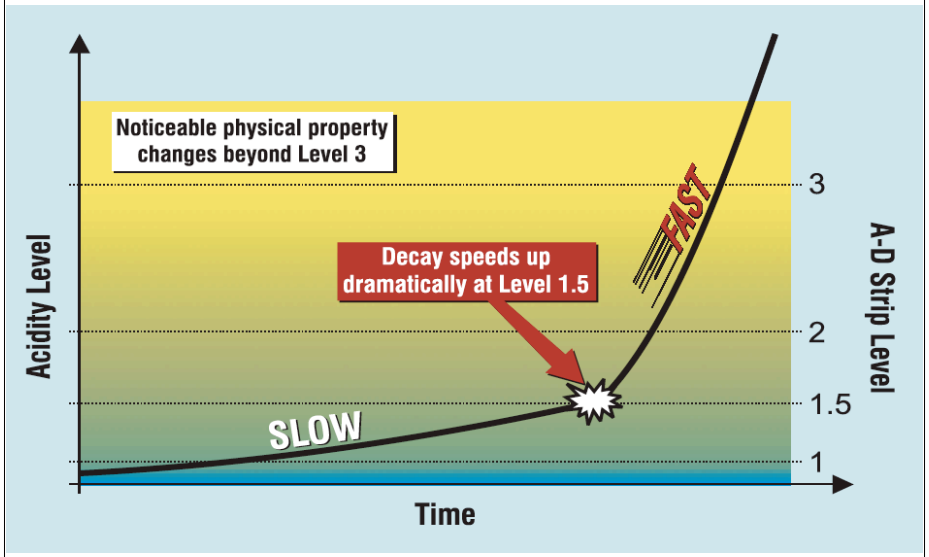
Principle

In order to guarantee the conservation, one must know both the **condition** of the each media type **and** the **climate** in each storage vault:

→ condition of the collection

→ temperature and relative humidity

16



17

Exercice

Is it more efficient to choose

7 °C and 30% RH

or

5 °C and 35% RH

in the film vaults?

18

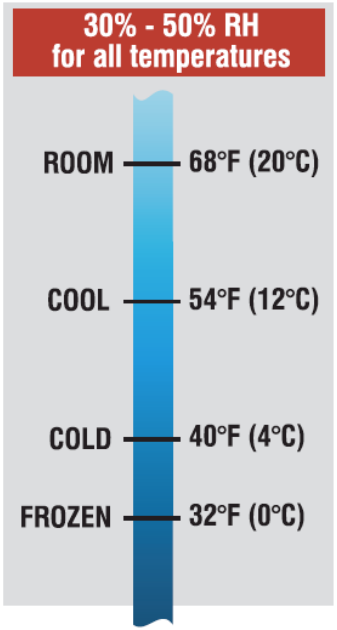
Film

possibilities	life expectancy
7 °C and 30% RH	**100%**
5 °C and 35% RH	**114%**

19

Model

20



21

QUALITATIVE RATING SYSTEM	
NO	Likely to cause significant damage.
FAIR	Does not meet ISO recommendations but may be satisfactory for extended periods.
GOOD	Comparable to ISO recommendations.[12]
VERY GOOD	Will provide an extended lifetime.

22

Storage Conditions	Glass Plates	Nitrate	Acetate		Polyester		Photo Prints		Ink Jet Prints	Magnetic Tape		CDs DVDs
			B&W	Color	B&W	Color	B&W	Color		Acetate	Polyester	
ROOM	Fair	No	No	No	Good	No	Good	No	Fair	No	No	Fair
COOL	Good	No	No	No	Good	No	Good	No	Fair	Fair	Good	Good
COLD	Very Good	Good	Good	Good	Very Good	Good	Very Good	Good	Good	Good	Good	Good
FROZEN	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good	Good	Good	No

23

Four Climate Zones

	T	RH
room	20 °C ± 2 °C	50% ± 5%
cool	16 °C ± 2 °C	35% ± 5%
cold	4 °C ± 2 °C	45% ± 5%
frozen	–8 °C ± 2 °C	microclimate

24

Life Expectancy

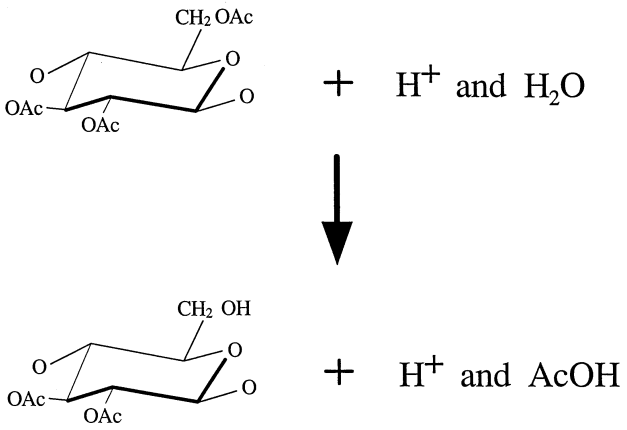
	T	RH	t
room	20 °C	50%	100%
cool	16 °C	35%	250%
cold	4 °C	45%	941%
frozen	–8 °C	50%	4593%

25

1. Cool

26

Acid Catalysed Hydrolysis (Deacetylation)



27

28

Conservation

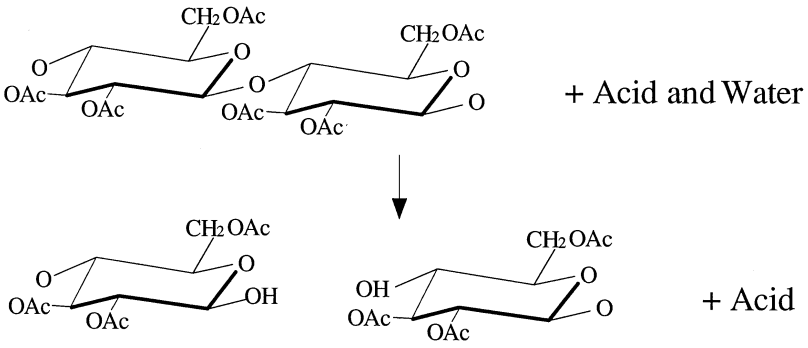
Conservation encompasses all activities for the care of an object, which **delay its further decay** and ensure that it remains in the most intact condition for the future.

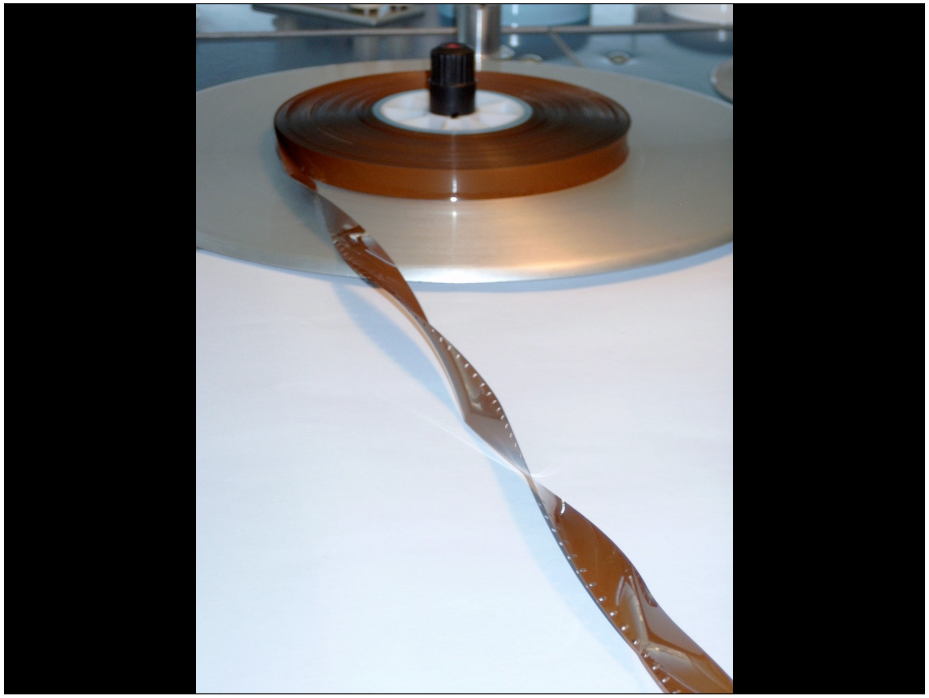
Until Autocatalysis (Acetate)

	T	RH	years
room	20 °C	50%	44
cool	16 °C	35%	110
cold	4 °C	45%	414
frozen	–8 °C	50%	2 021

2. Cold

Glycosic Clevage by Hydrolysis





33

Restoration

Restoration includes all interventions and treatments that serve to **retrieve a certain historical state** and contribute to the legibility, aesthetic integrity or **reuse** of an object.

Restorative actions may be irreversible and require great care in planning, justification, execution and **documentation**.

34

From Autocatalysis on (Acetate)

	T	RH	years
room	20 °C	50%	7
cool	16 °C	35%	18
cold	4 °C	45%	67
frozen	–8 °C	50%	322

35

3. Frozen

36

Emergency (Acetate)

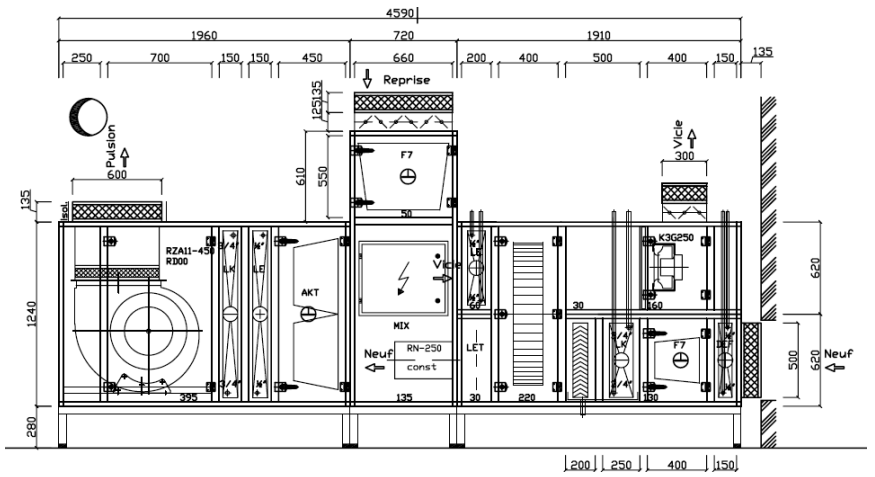
	T	RH	years
room	20 °C	50%	1/2
cool	16 °C	35%	1
cold	4 °C	45%	5
frozen	–8 °C	50%	23

Implementation

Active Measures

Air conditioning:

- refrigerate
- dehumidify
- filter

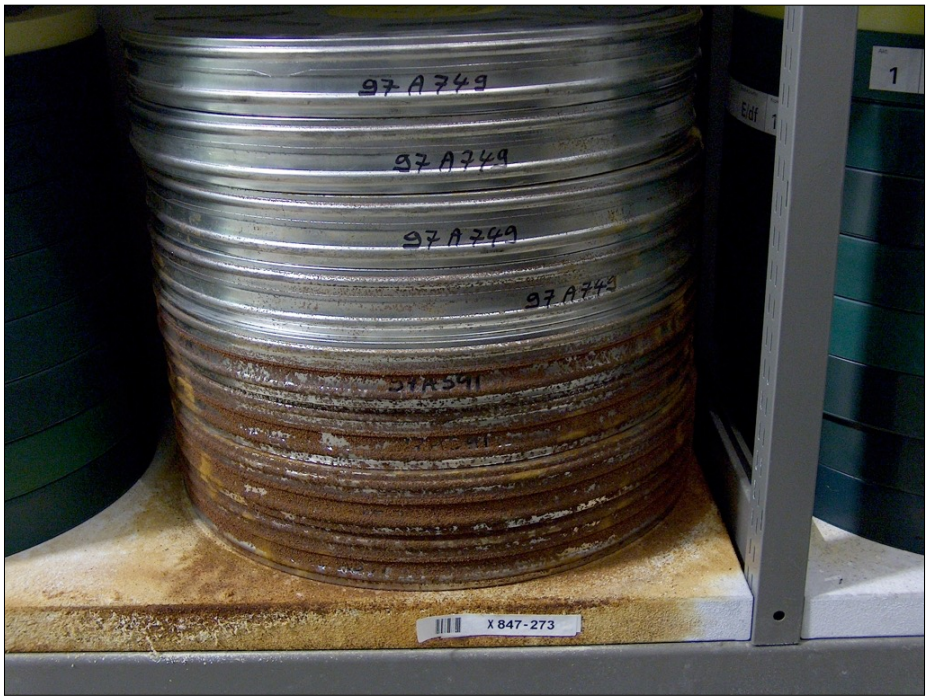


Air Pollutant…

- $SO_2 < 1\ \mu g/m^3$
- $NO_x < 5\ \mu g/m^3$
- $O_3 < 25\ \mu g/m^3$

Outgassed Acids

- $CH_3COOH < 1$ ppm
- $HNO_3 < 1$ ppm



Air Flow (1)

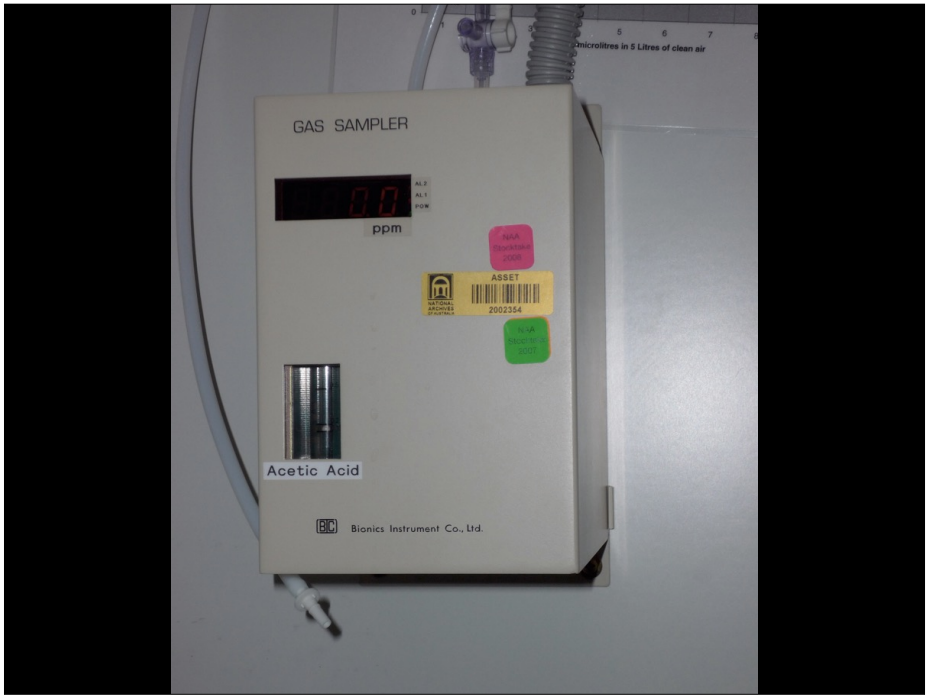
Outgassed nitric acid or acetic acid are heavy gases:

- air supply at the ceiling of one wall
- air exhaust at the bottom of the opposite wall

Air Flow (2)

Nitric acid or acetic acid should nowhere concentrate:

- vented cans
- fixed and open shelves
- air supply and air exhaust on the full length of the opposite longer walls



Passive Measures

- location
- orientation
- exterior paint colour
- shadow
- insulation
- humidity barrier
- apertures (doors, windows, cables)

Interaction

- air conditioning
- insulation
- architecture
- materials

Advantages

Clear and efficient infrastructure:

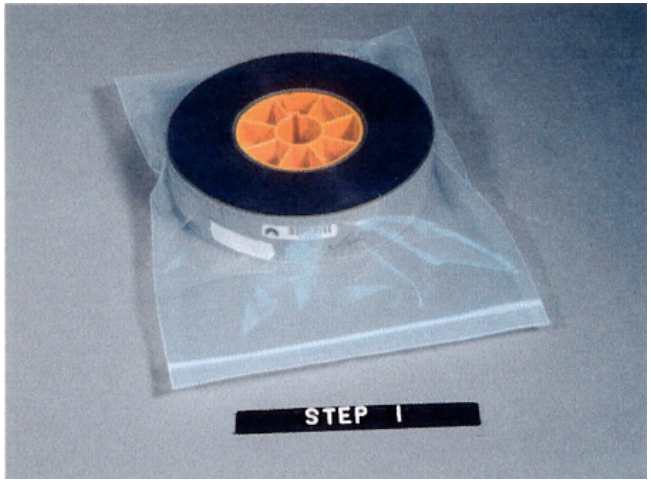
- smaller air conditioning
- lower energy costs
- less maintenance
- limited material requirements

Freezing

Relative Humidity Control

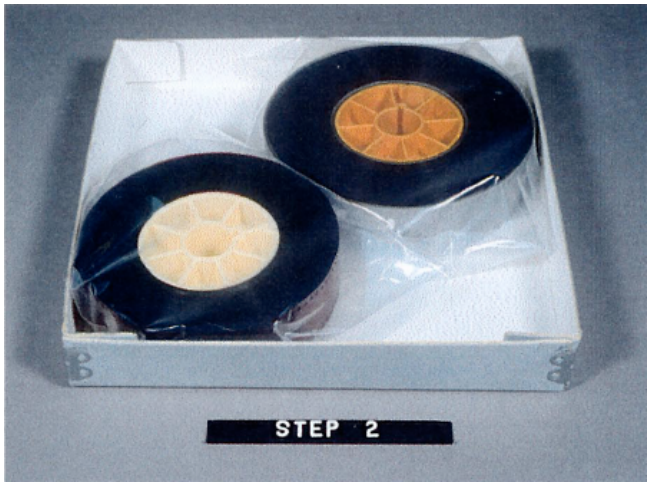
- macroclimate
  → HVAC
- microclimate
  → FICA method
  (Film Conditioning Apparatus)
  → CMI method
  (Critical Moisture Indicator)

Put the reel into a first bag



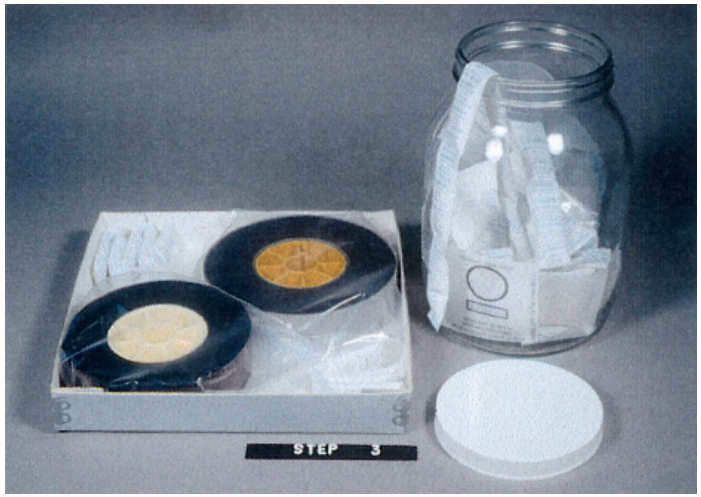
53

Put the bag in a box…



54

… and add some silica gel

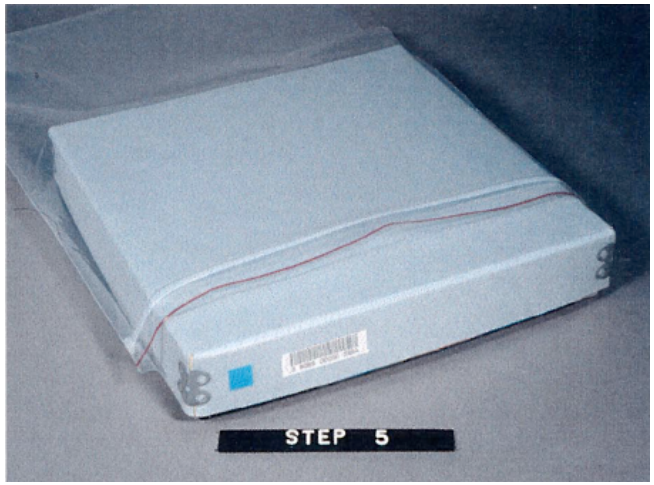


55

Add a moisture indicator

56

Put the box into a second bag



Put the package into the freezer

	open	FICA	CMI
?	HVAC staging room	machine bags	RH indicator desiccant bags
+	simplicity	experience access protection	monitoring access protection
−	energy organisation personnel	personnel organisation material	personnel organisation material

From 16 °C and 35% RH

- The reels can usually be moved from the storage to the workplace and be inspected immediately on a inspection table.
- If there is **more than 25 °C or more than 55% RH**, then the procedure for 4 °C and 45% RH must be applied.

From 4 °C and 45% RH

1. The reels are closed into bags in the cool vault.
2. The temperature is equalised in the workplace during **6 hours** in the closed bags.
3. The bags are removed and the humidity is equalised during **18 hours**.

From –8 °C and microclimate

1. The temperature is equalised during **24 hours** in the sealed bags in the workspace.
2. The bags are removed and the humidity is equalised during:
   - **2 days** for film
   - **6 days** for 16 mm and 17.5 mm magnetic tape
   - **20 days** for 35 mm magnetic tape

AV Preservation by
reto.ch

zone industrielle Le Trési 3
1028 Préverenges
Switzerland

Web: reto.ch
Twitter: @retoch
Email: info@reto.ch

until 31st January 2023

AV Preservation by
reto.ch

Sandrainstrasse 3
3007 Bern
Switzerland

Web: reto.ch
Twitter: @retoch
Email: info@reto.ch

from 1st March 2023