

# ABOUT ENVIRONMENTAL CONTROLS IN THE ARCHIVE OF THE CROWN OF ARAGON

**Presentation WG1 COST-D42  
ENVIART**

**Vienna 16 April 2008**

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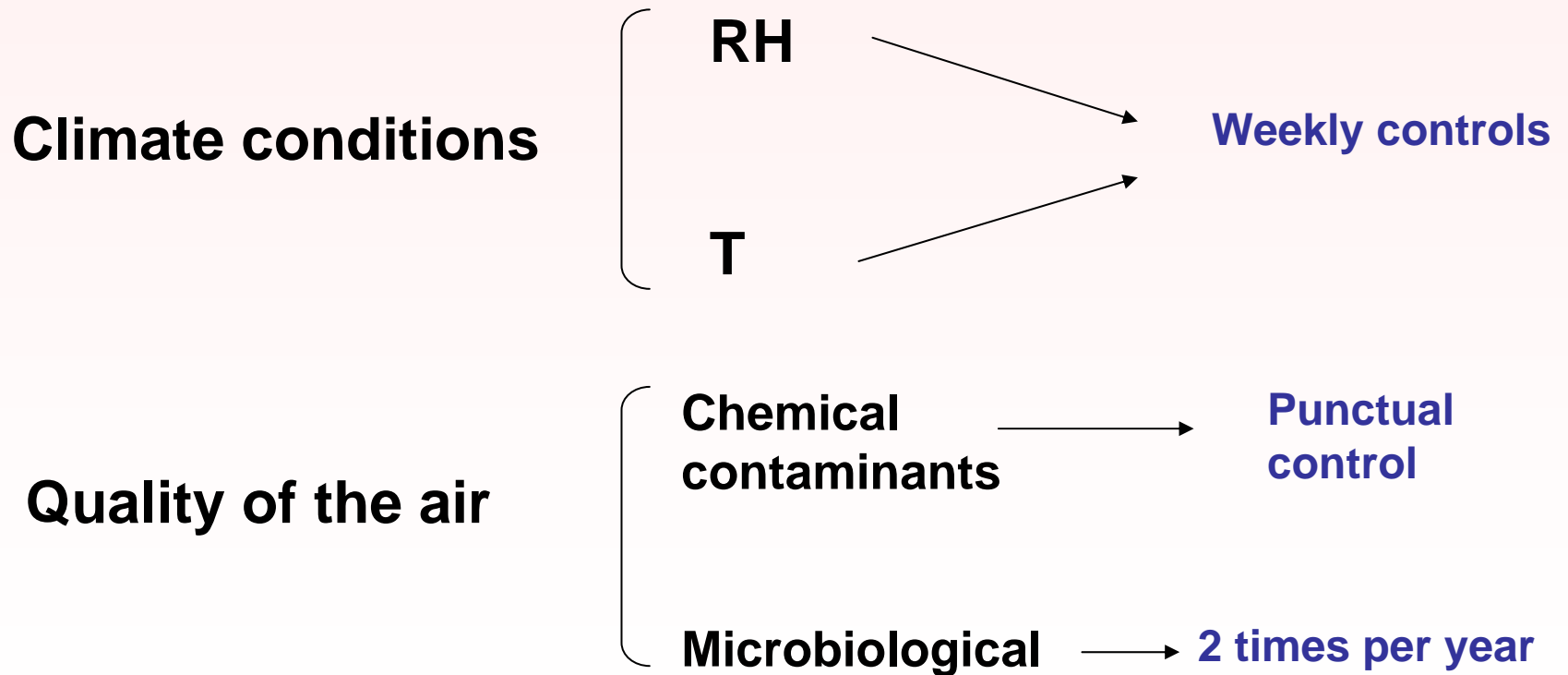
Archive of the Crown of Aragón

Barcelona, Spain

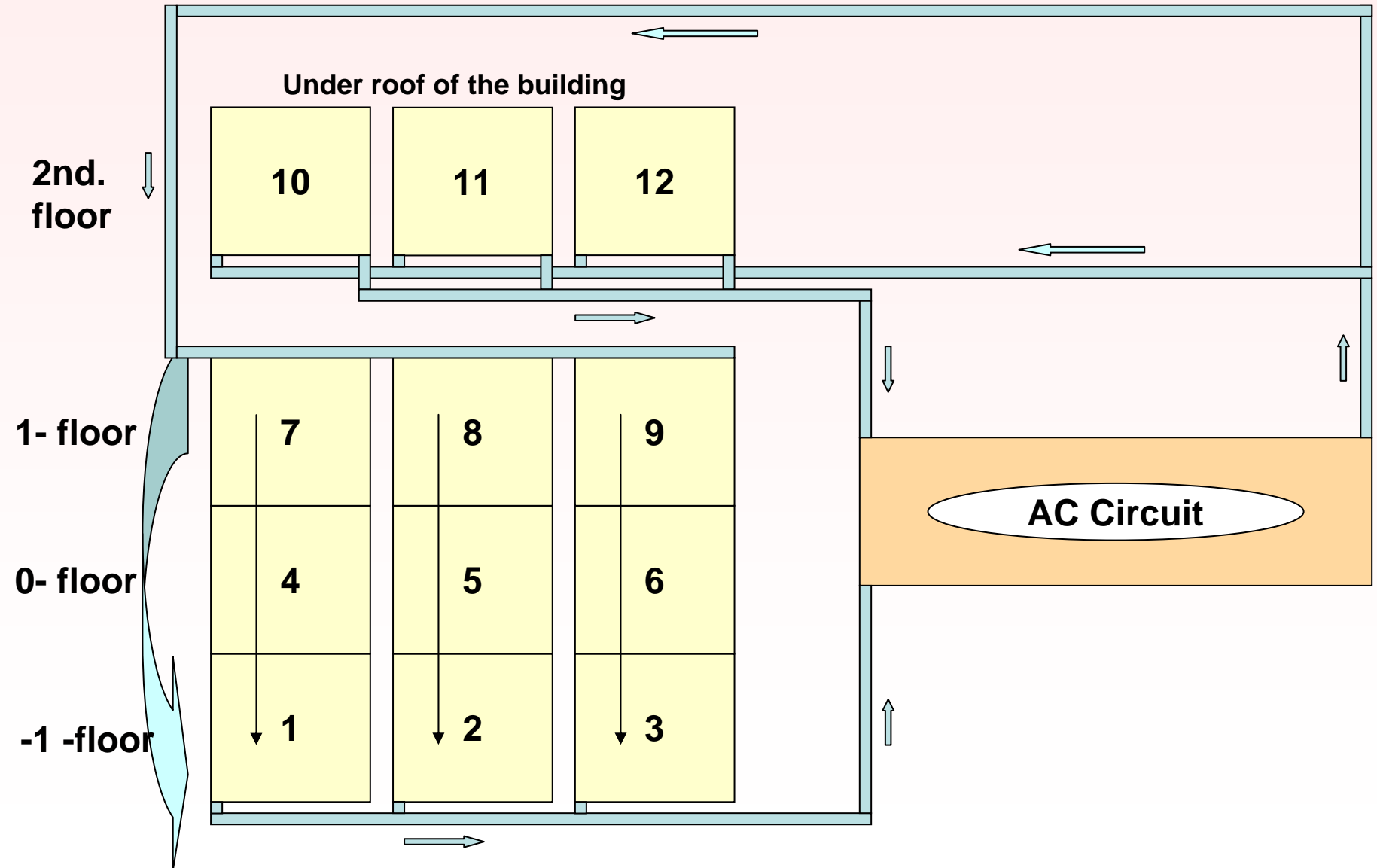
e-mail: [csistach@telefonica.net](mailto:csistach@telefonica.net)



# Independent air conditioned circuit in storage rooms



# Distribution of air in storage rooms



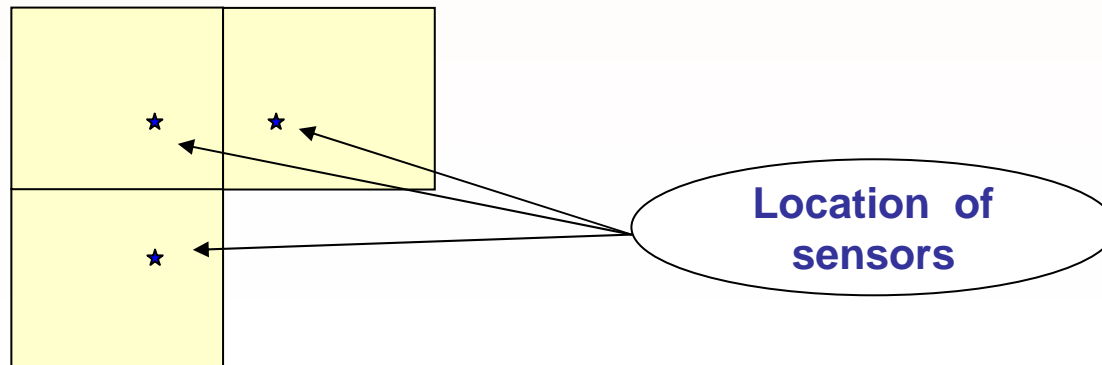
# REMARKS

**Conditions when applying assays**

**Consider required parameters for correct and complete evaluation of controls**

**Consider improvement of conditions and results**

**The same homogenous shape and size for every one of 12 storage rooms (500 cm<sup>3</sup>)**




# Climate controls

**Data logger sensor in every storage room**

**Sensors placed in the same relative position**

## Parameters to take into account

- Isolation of building from external climate conditions
- Variability of data in graphics – stability or instability for each variable
- Statement of period of time (12 h) in graphics, that shows remarkable changes in variables for climate data (RH and T)  condition for stability or instability

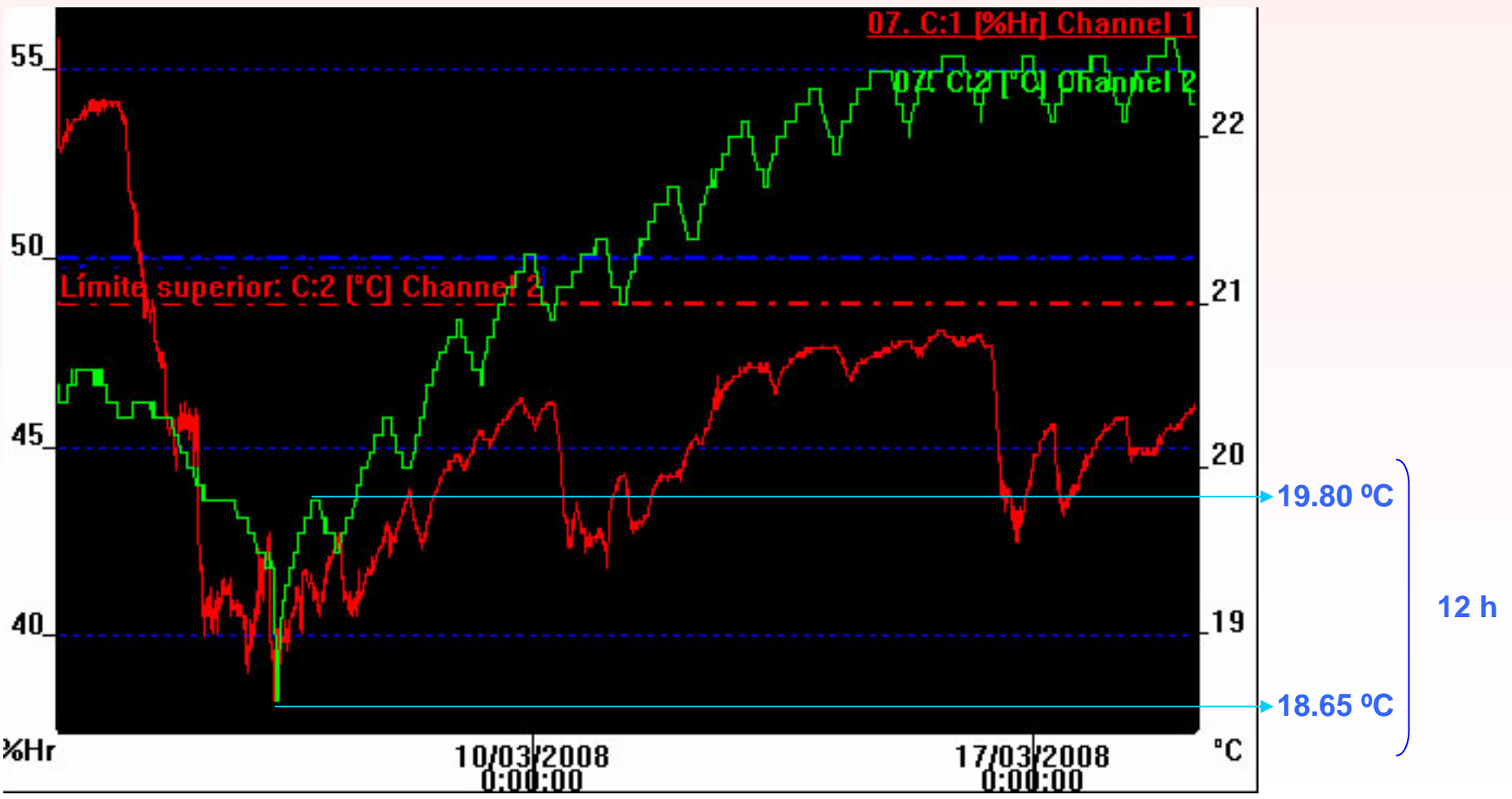


March 2008

Increment T (°C)

- 0 - 1°C → stable
- 1 - 1.5°C → medium
- 1.5 - 2°C → Instable

In 12 hours

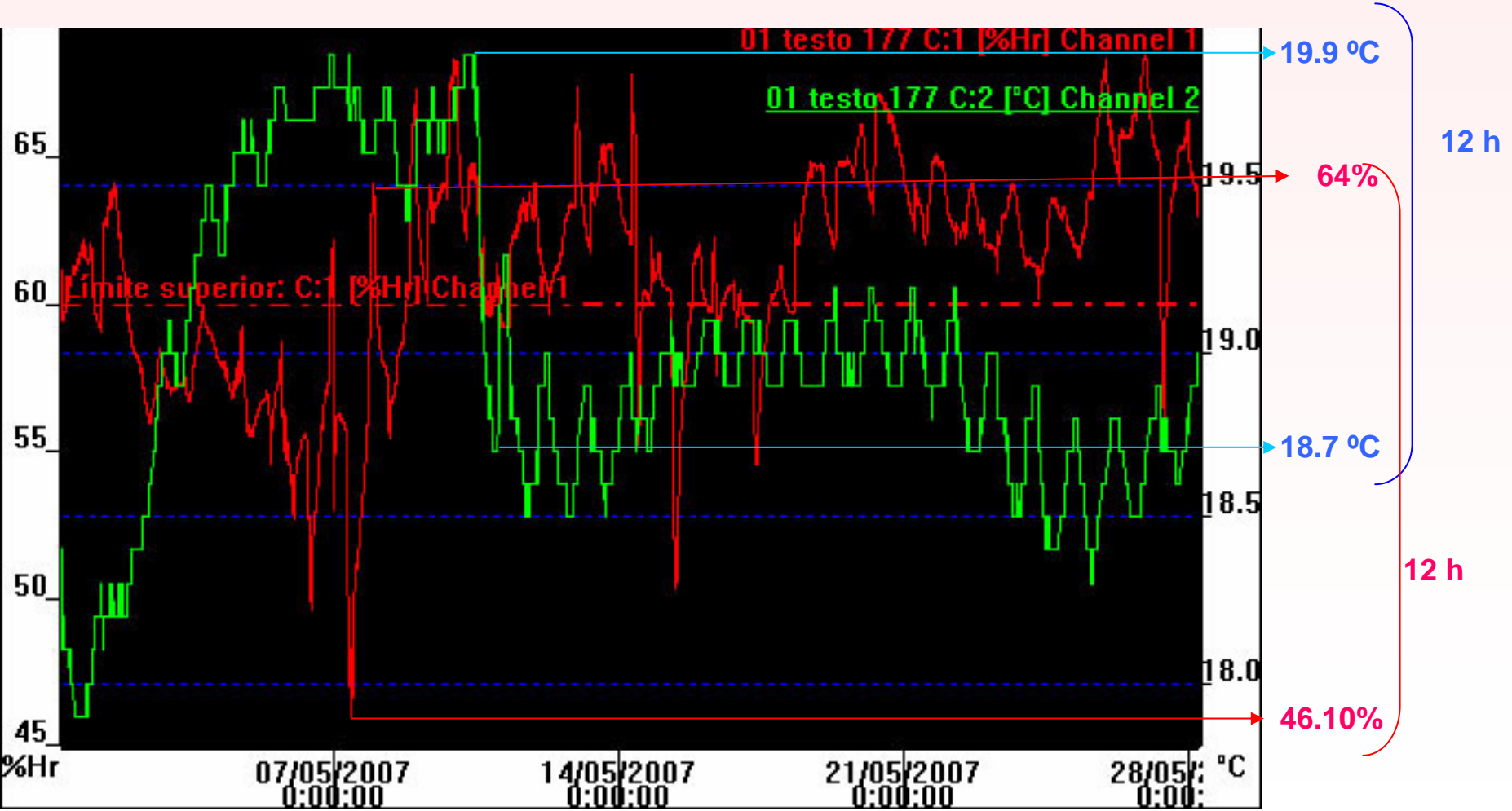


May 2007

Increment RH (%)

- 0 – 5% → stable
- 5%- 10% → medium
- 10% - 15% → instable

In 12 hours



## Evaluation of results



**From data that shows stable or instable oscillations during one month**

**From reasons for instability —→ external climatic oscillation or mechanical failure**

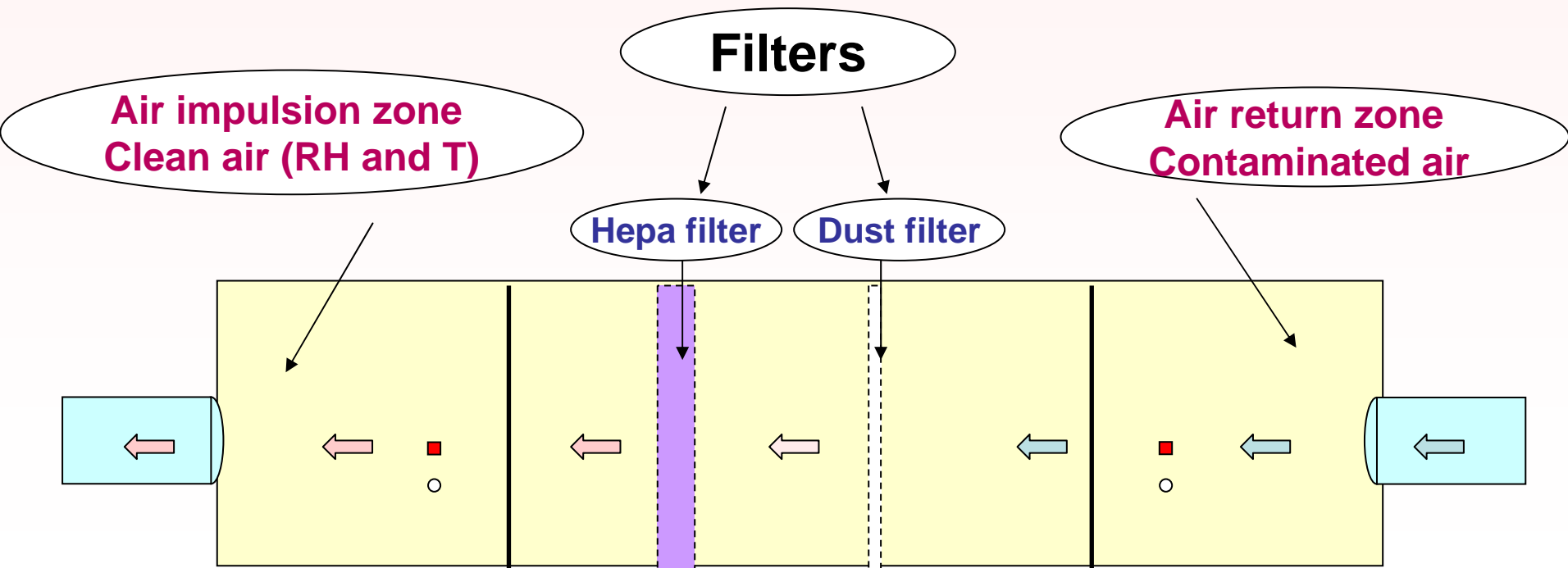
**Considerations for improvement of AC climatic conditions in storage rooms, linked with seasonal changes and device answer**

# AIR QUALITY - Chemical corrosion (PURAFIL Coupons)

In 12 storage rooms

Out of the building

Into AC circuit (before and after filters)



# AIR QUALITY in storage rooms

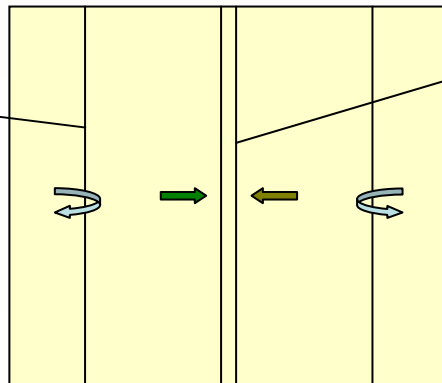
## Chemical corrosion and contaminants

### Reactivity for coupons

Silver and copper coupons  $\Rightarrow$  sensible to  $\text{SO}_2$ ;  $\text{NO}_2$ ;  
Chlorine compounds, and  $\text{O}_3$

90 days of exposition (10 july – 10 october 2006)  $\longrightarrow$  punctual  
test

$\text{O}_3$   $\longrightarrow$  Promotes and raises  $\text{SO}_2$  and  $\text{NO}_2$  activity over  
Ag and Cu



# AIR QUALITY – silver and copper coupons (Purafil)

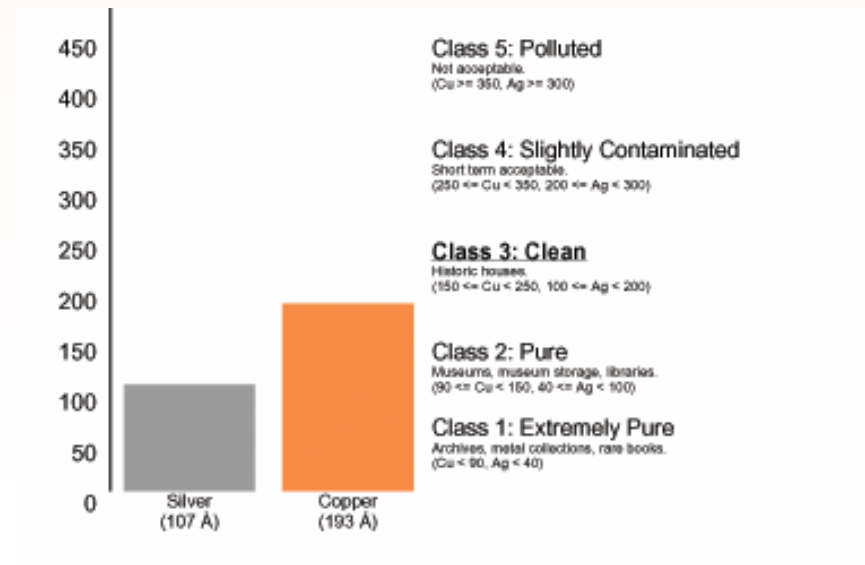


Level of corrosion in air



Thickness of layer of corrosion in coupons

- For copper sulphur and oxide
- For silver Chlorine and oxide



# Air Quality - Results

Purafil classification

C1- Extremely pure

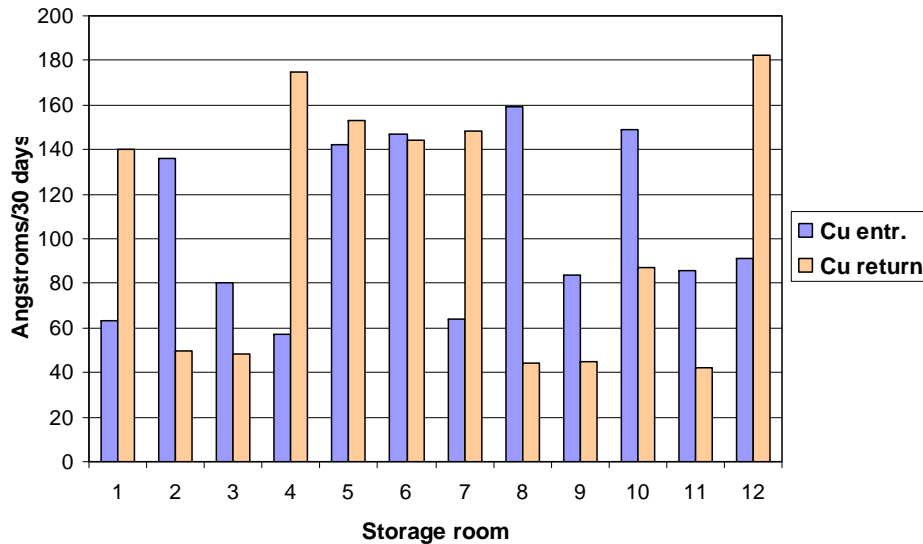
C2- Pure

C3- Clean

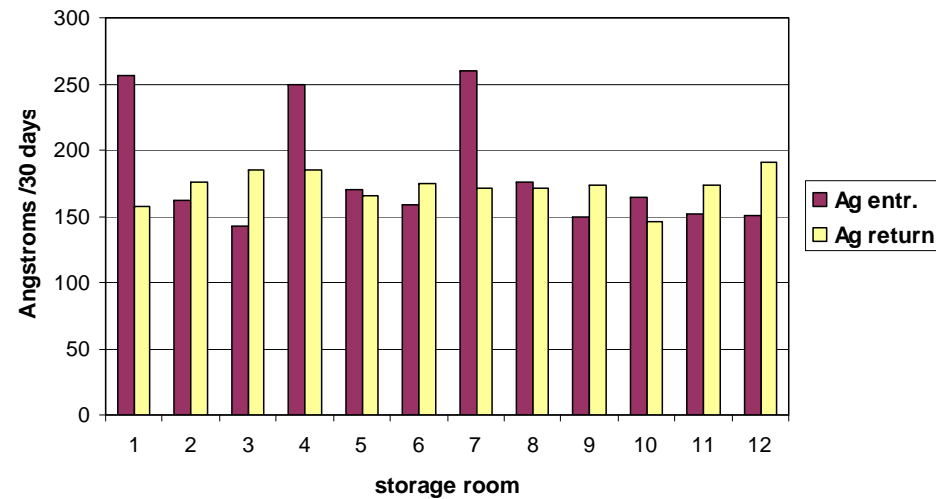
C4- Slightly contaminated

C5- contaminated

Cu corrosion in air



Ag corrosion in air



## Experimental

150 Å/30 days  $\leq$  Cu < 35 Å/30 days

100 Å/30 days  $\leq$  Ag < 200 Å/30 days

C3

## Recommended in Archives

Cu < 90 Å/30 days

Ag < 40 Å/30 days

C1

# EVALUATION

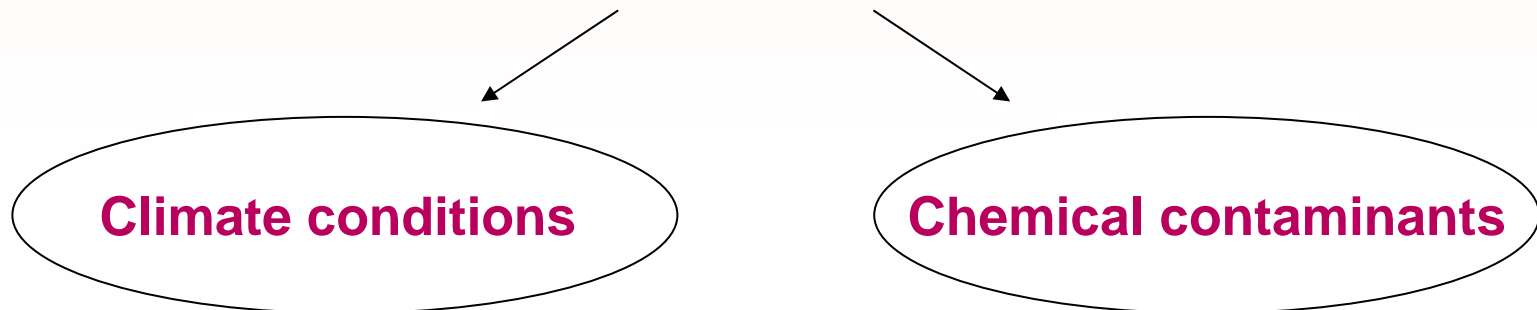
**Out of the building air shows C5 (contaminated ) level of contamination**

**Into AC circuit,**

**after filters and with stated climatic AC parameters, level of corrosion shows C4 (slightly contaminated)**

**In storage rooms copper reactivity is largely depending on RH and with C3 (clean) classification**

**Synergic development of air quality depends on**



# MICROBIOLOGICAL CONTROLS

- Laboratory of restoration
- Research room
- Storage rooms

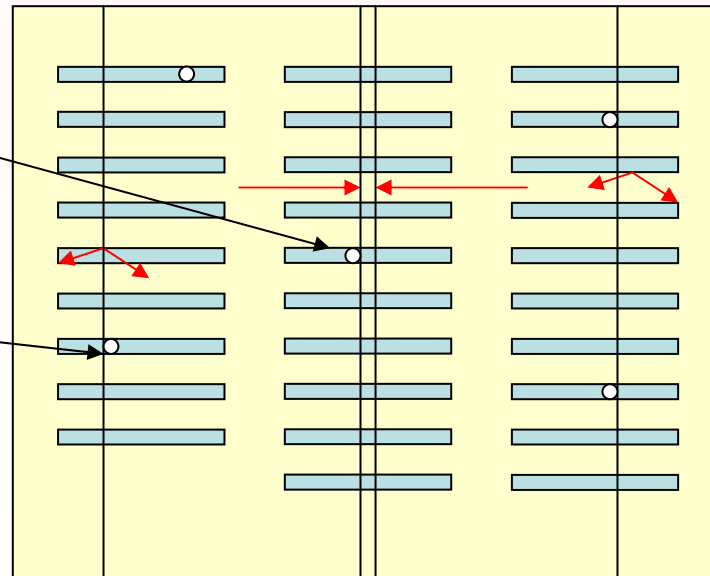


- Air conditioned circuits – RETRAINING AREA** (before and after filters). Free cooling closed and with usual working conditions

## **Seasonal controls in Spring and Autumn**

- **2 couple of Plates per zone : Fungus and Bacterium**
- **10 minutes exposition of plates**
- **8 days for growing conditions**
- **Recount of colonies per plate**

# AIR QUALITY- microbiological controls

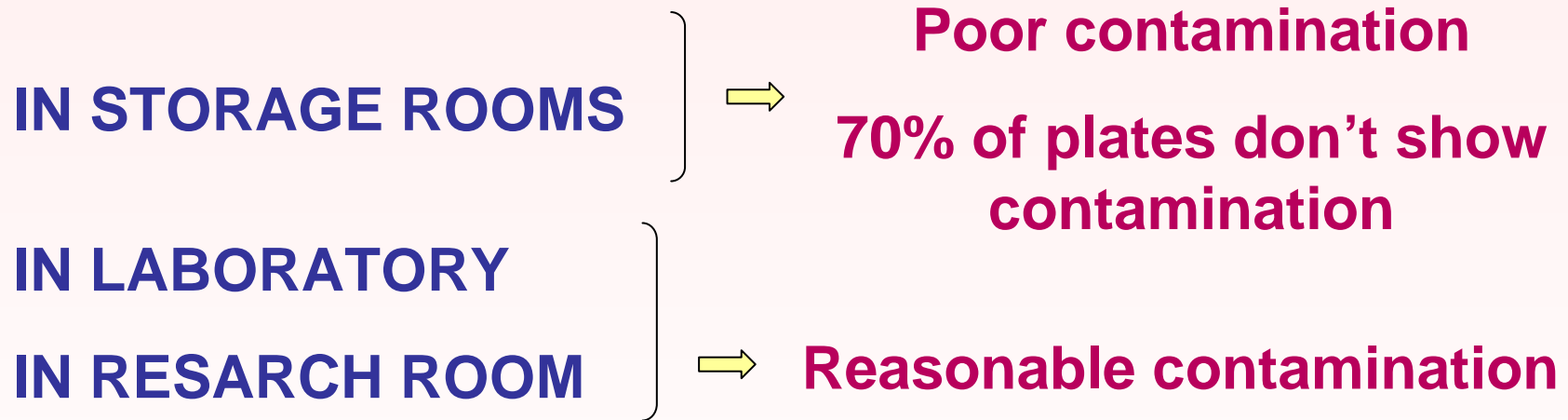


## Emplacement of plates

- In the middle part of shelves
- In the top of shelves

# Results

Improvement of results when applying periodical revisions, cleanness and renovation of filters



**IN RETRAINING AREA OF AIR IN AC CIRCUITS**



**Efficiency of filters**

**Different seasonal results**

# CONCLUSIONS

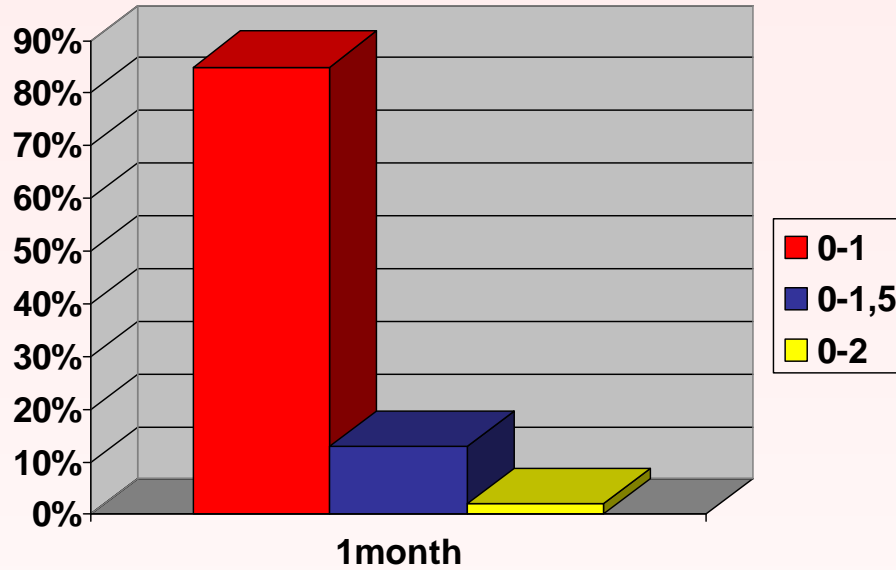
**New technologies focus efforts to consider and apply improvements in preservation after getting results with controls**

**Good preservation conditions is the most important priority to take into account in the Archive**





% of data

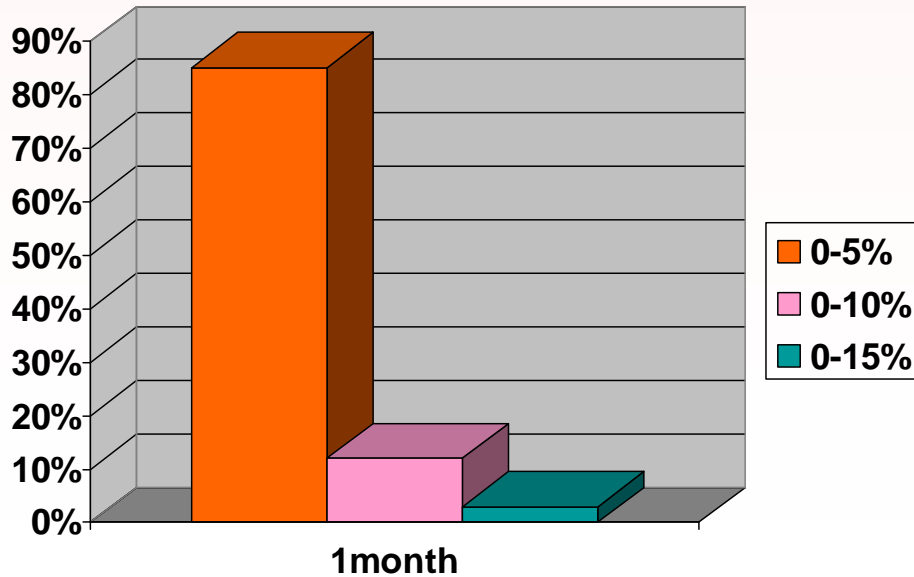


$\Delta$  T°C/12 h

Instability and stability

Degree of increment for variables RH and T in 12 h.

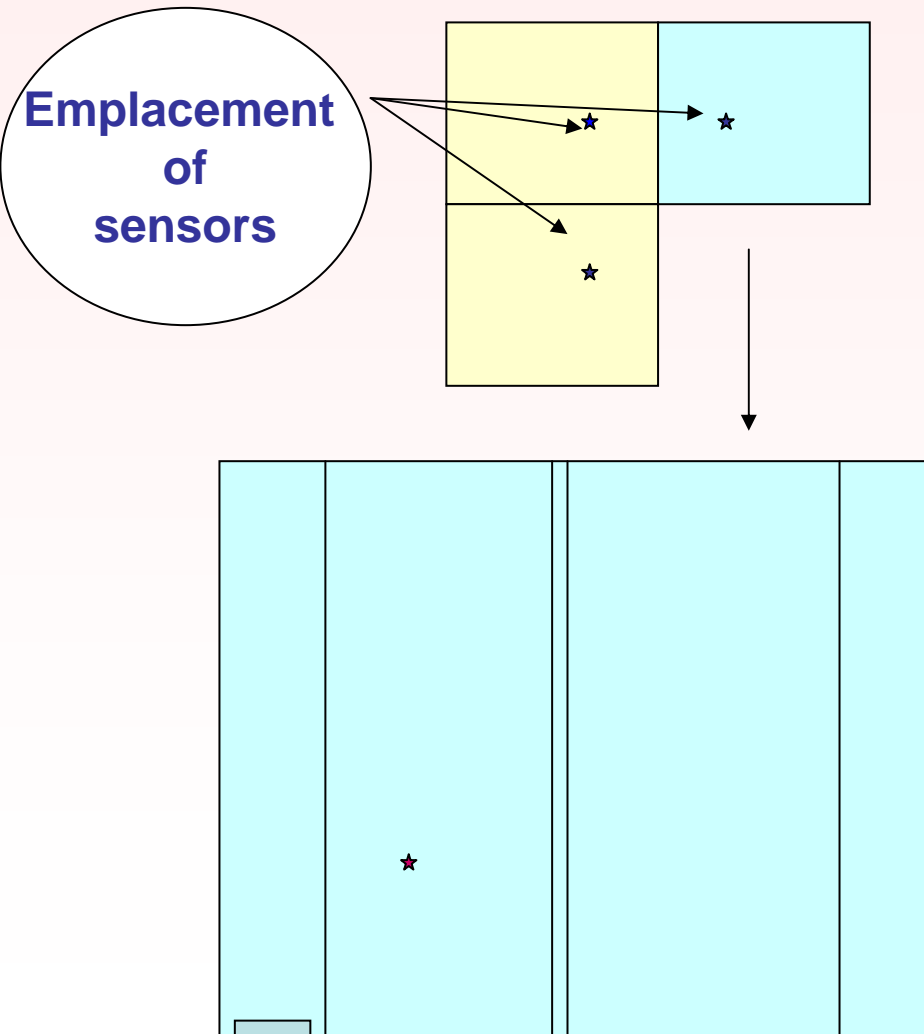
% of data



$\Delta$  %RH /12 h

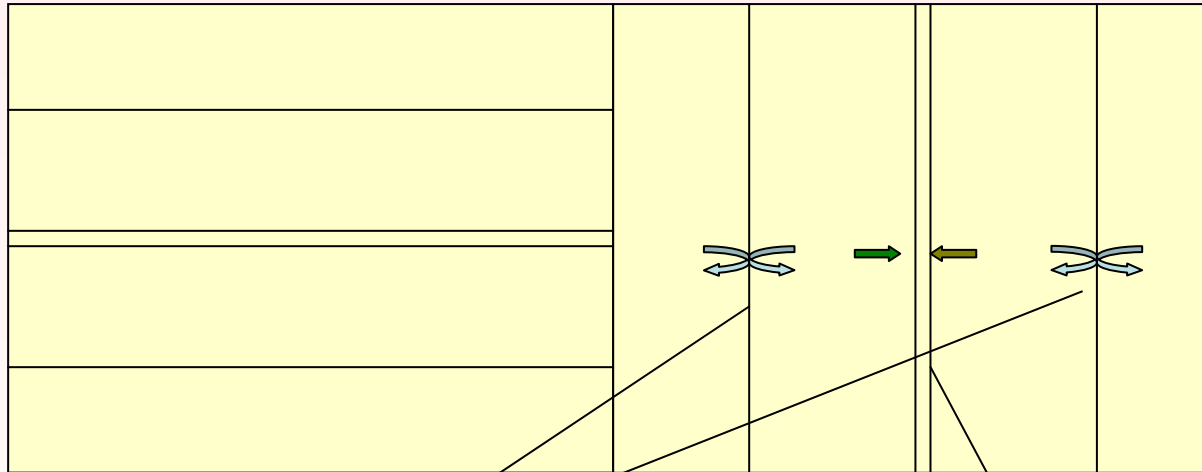
# CLIMATE CONTROLS

## Distribution of sensors in storage rooms



# Air quality (chemical contaminants)

With copper and silver coupons (Purafil)



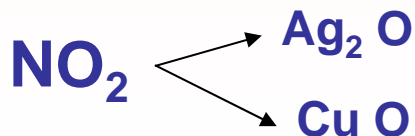
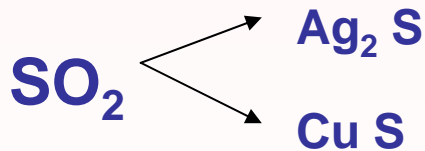
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and  $\text{NO}_2$  activity against  
Ag and Cu

Chlorine and chloride  $\longrightarrow$  Ag Cl