

Evaluation of the Climate in a New Shared Storage Facility Using Passive Climate Control.

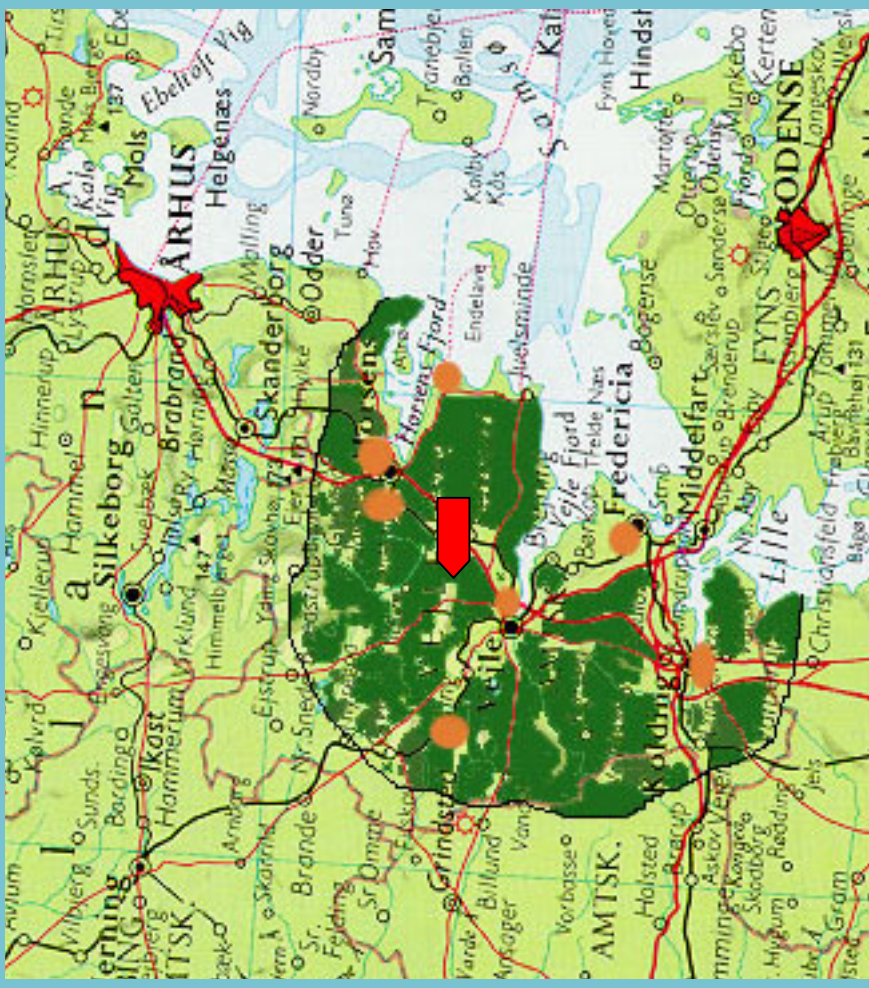
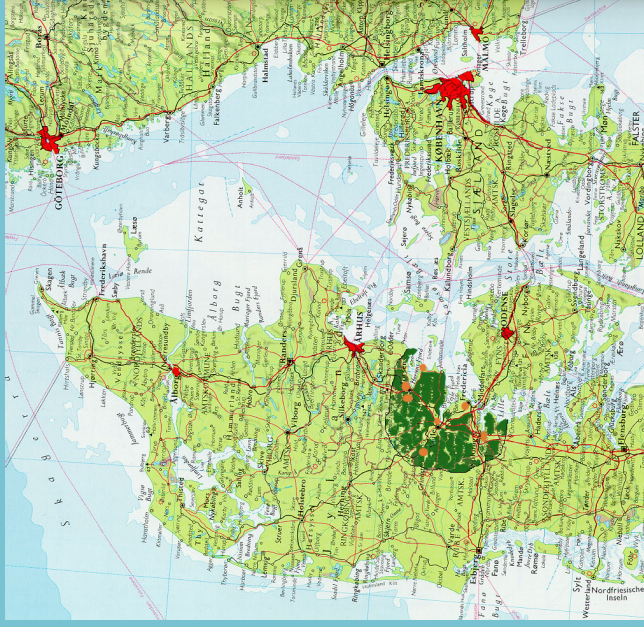
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Vejle Cultural Heritage Centre

Denmark

Museum Microclimates Copenhagen November 2007

The Cultural Heritage Centre and the main museums around Vejle



Organizational structure

Centre for the Preservation of Cultural Heritage in Vejle

2 institutions

Conservation Centre Vejle

(est. 1975)

Board and Assembly of users

7 historic museums of former Vejle County

The Shared Storage Facility in Vejle

(est. 2004)

Board and Assembly of users

7 Historic museums

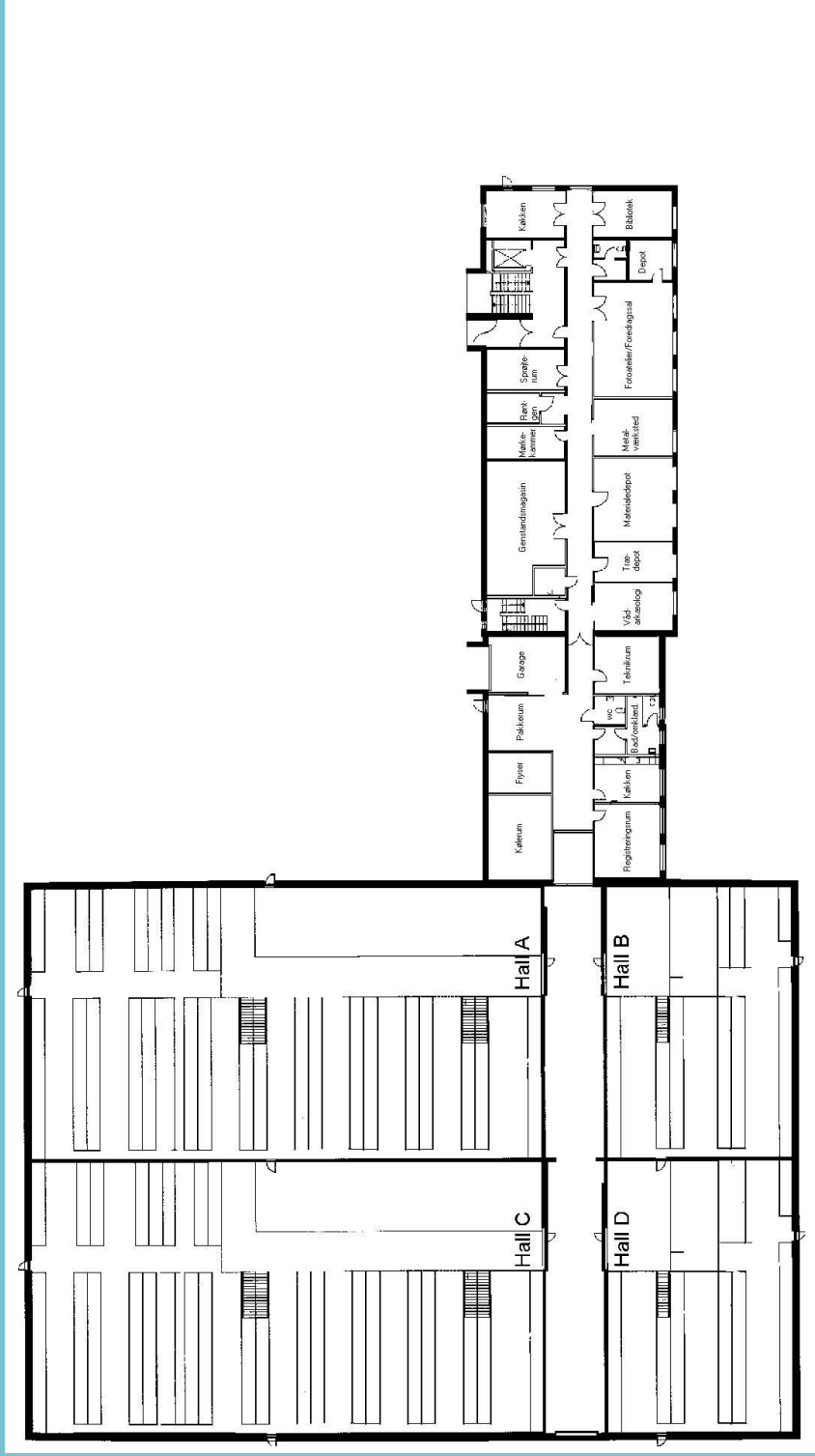
2 Art museums

16 local archives

Focus will be on the running of
the Shared Storage Facility :

- The technical aspects - climatization
- The administrative aspects

The 2 institutions form a unit:



Vejele Cultural Heritage Centre







36-42



Passive Control

- A building is passive, when no or limited mechanical climatization is needed to maintain a stable environment for preservation of Cultural Property
- Certain old buildings with a huge mass can offer a stable climate where fluctuations in T and RH are very slow and relatively even
- These characteristics are used in a modern industrial storage building

Factors supporting passive climatization:

- Materials with high thermal and hygroscopic capacity
- good insulation capacity
- no unwanted transportation of moisture
- a minimum of mechanical climatization such as supportive heating or dehumidification

Premises:

- The building is kept tight and closed
- All human traffic and work in the stores is kept to an absolute minimum
- Thus the air change rate will be kept low.

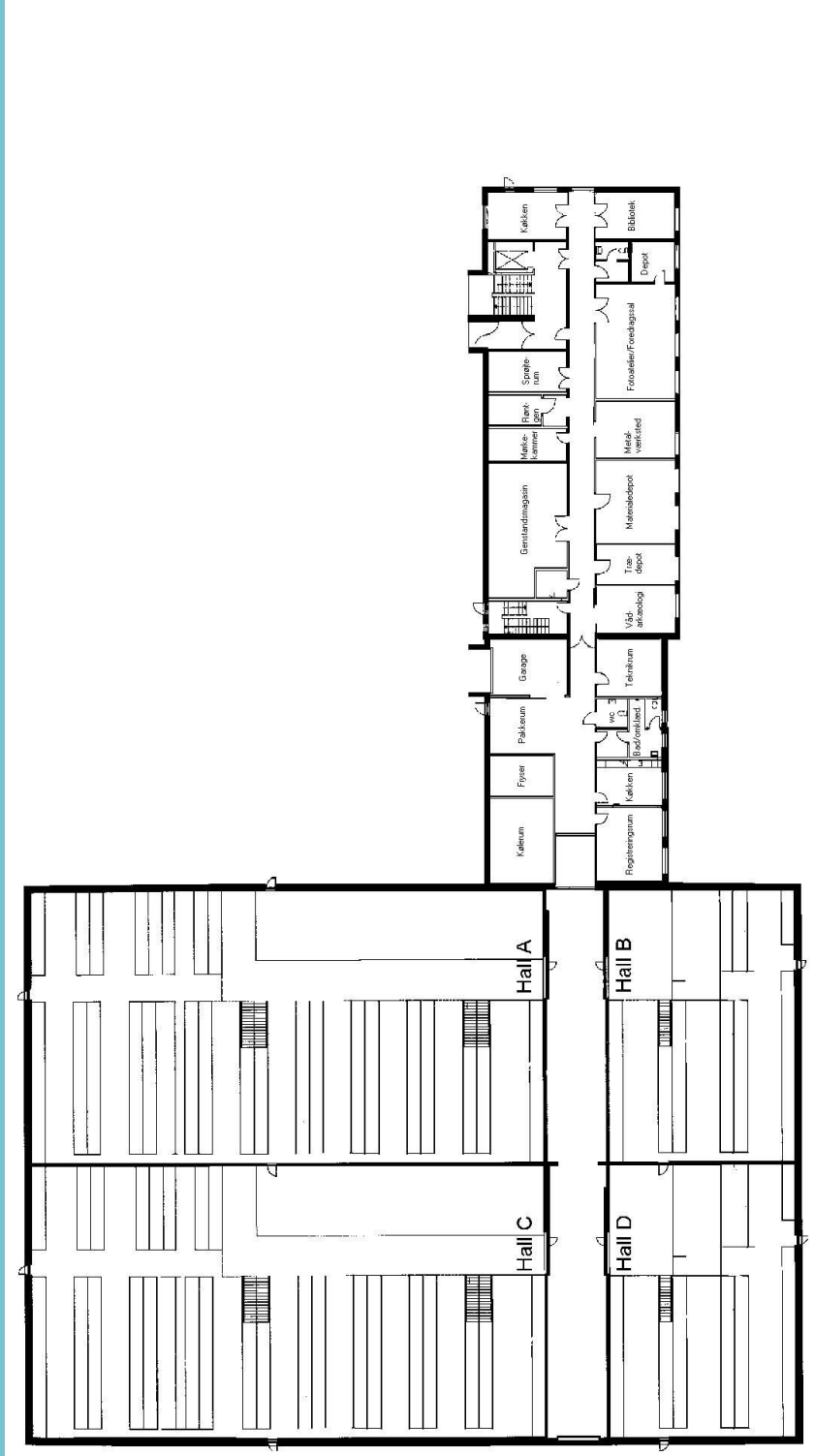
Intensions:

- Finance was a key issue – low costs
- Expected stable RH between 40 and 60 % with +/- 5 % fluctuations per day
- Temperature allowed to fluctuate between 7° and 25° C
- Estimated air change ratio about 1 per day

Technical specifications for the stores:

- 5.432 m² floor space in 4 halls
- $\frac{3}{4}$ of the space there is a mezzanine floor
- Connected to the Conservation centre through
- A building with shared facilities: office, canteen, cold store and freeze desinfection compartment etc.

Shared facilities





Users handbook



Construction

- Walls of light weight concrete elements
- 250 mm outside insulation covered with plating
- Walls painted inside with cement based paint of relatively high permeability
- Flat roof with a slight slope
- 300 mm insulation covered with asphalt roofing
- No thermal insulation in the floor
- Floor painted with heavy epoxy paint
- Automatic light switch system

Instalations

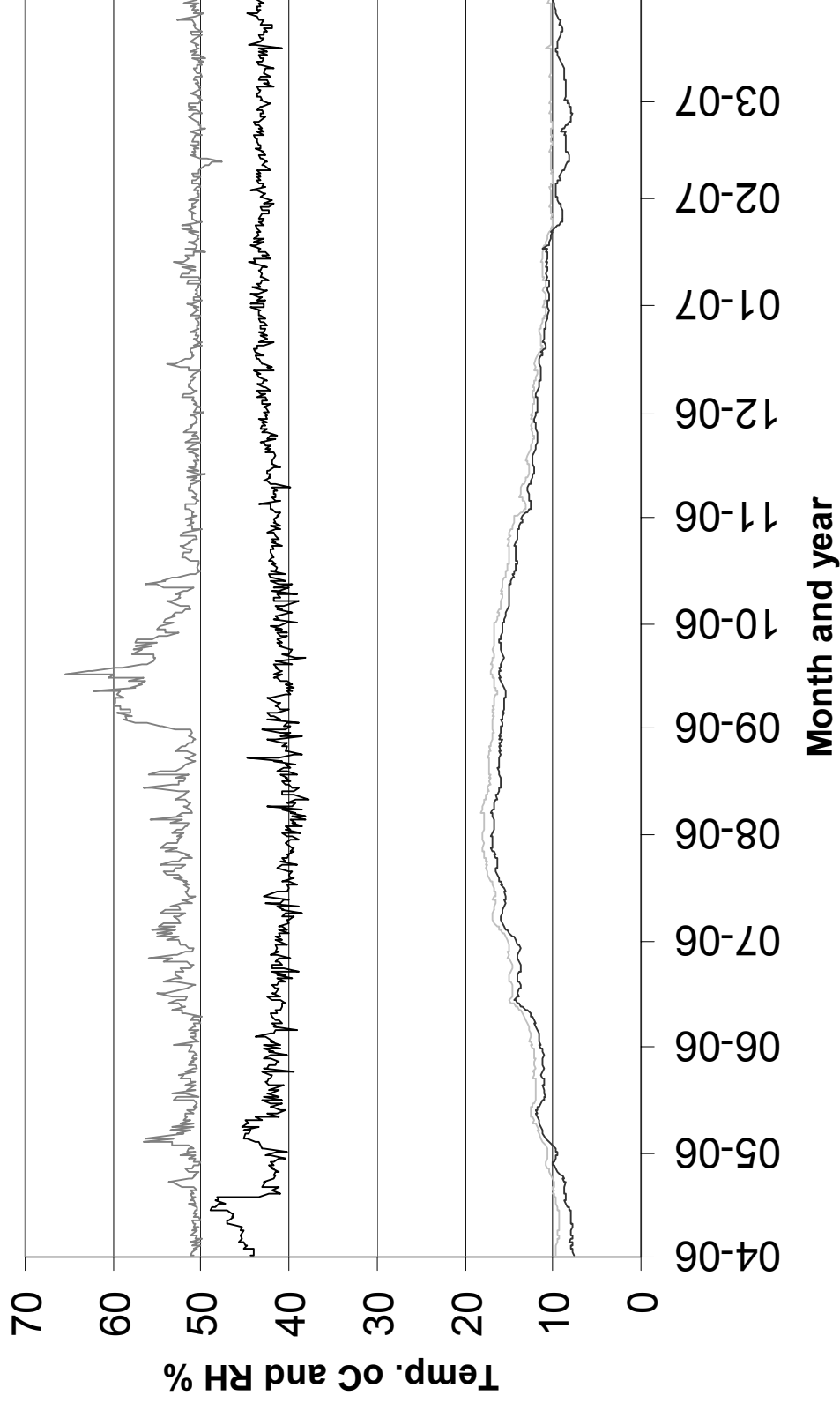
- A couple of Munters MLT800 dehumidifiers connected to ventilation system
- Dehumidifiers set at 50 % RH in halls A, C & D and 40% RH in hall B
- A small heating device in hall B to support dry climate for archaeological objects.

Monitoring

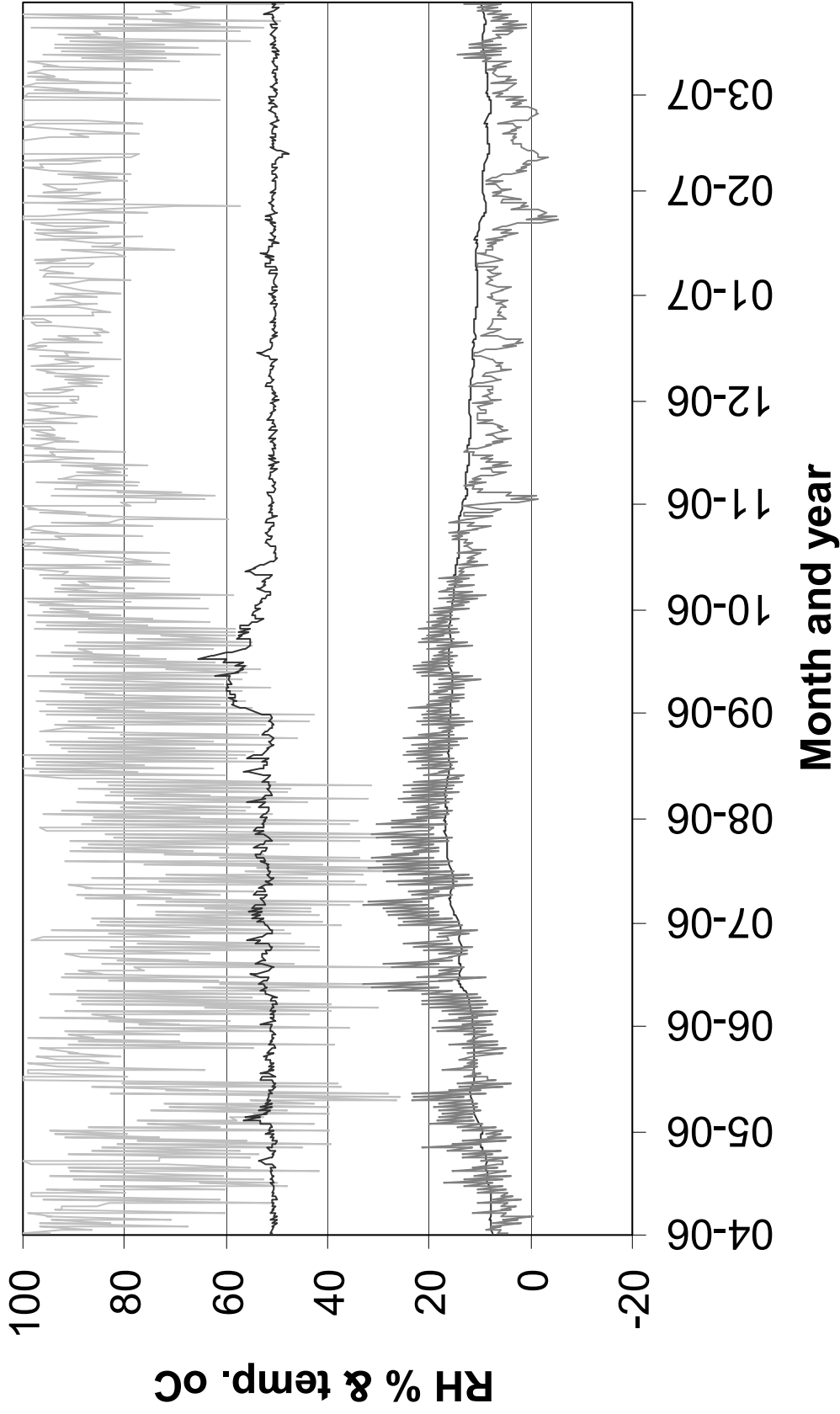
- There is no BMS for central control
- From 2005 continuous monitoring of the climate using Hanwell radio loggers.
- From 2006 power consumption readings
- From 2006 pest management programme

Two different climatic zones

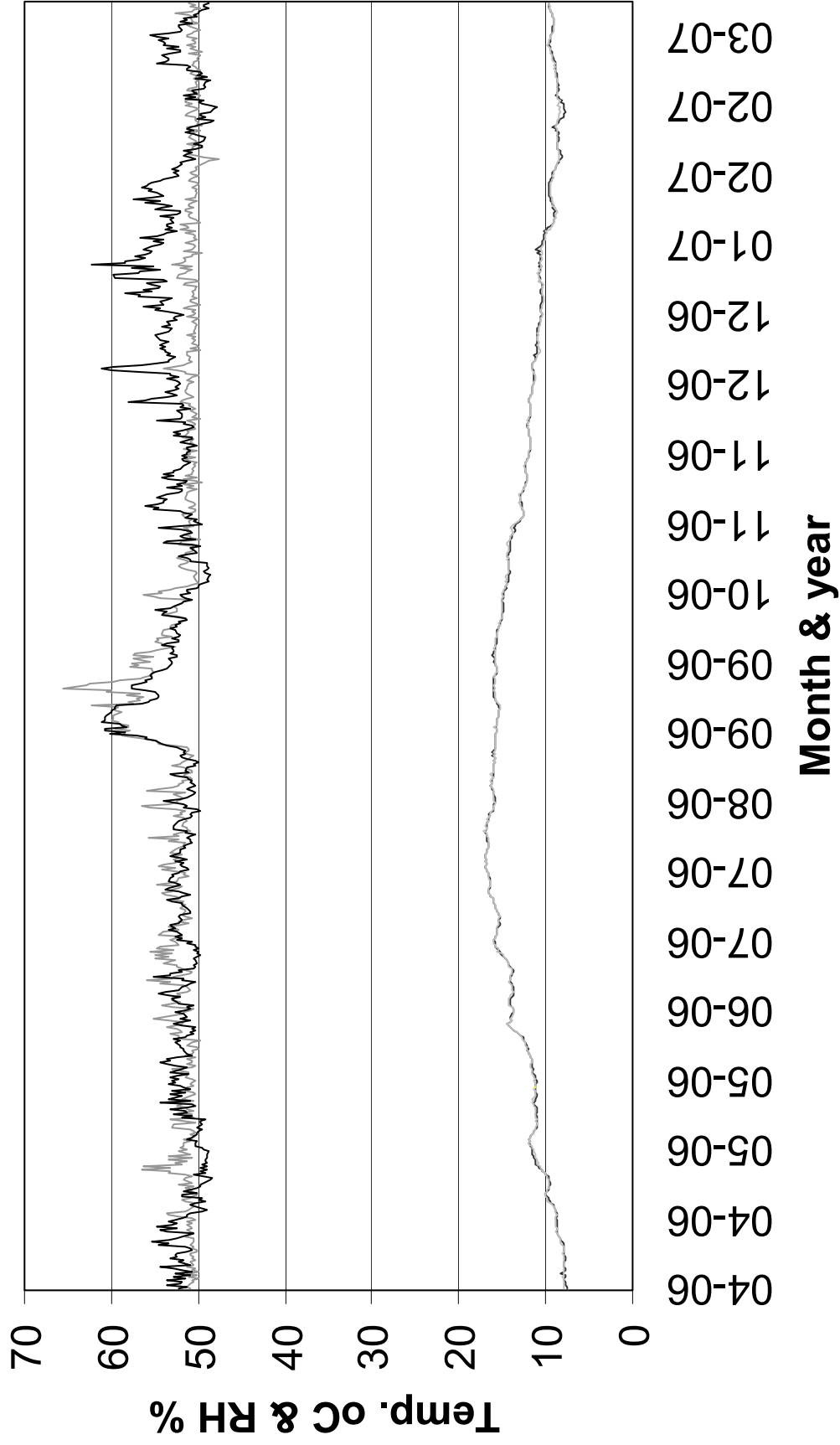
Halls C (grey trace) & B (black trace)



Hall C (black) compared to outside climate (grey)



Comparison of Halls A (black trace) and C (grey) – difference suggests more traffic i hall A



Problems:

- Impossible to recognize if the building materials offer any buffer capacity
- We don't know the actual air change rate when traffic is low
- We don't know the leakage ratio

Power consumption

- Power consumption is 38.000 kWh per year for dehumidification
- Total storage space is 19.662 m³
- Consumption per m³: 1,9 kWh/year
- For comparison: Moesgård Museum cold store controlled by dehumidification is 6,7 kWh/m³/year

The dehumidification was meant to:

- remove moisture from the building process
- to support the buffering capacity of the building

Passive climatization?

- Indication that the dehumidifiers is a permanent solution
- Indication that the leakage is greater than expected
- Indication that the leight weight concrete is not buffering due to excess of moisture

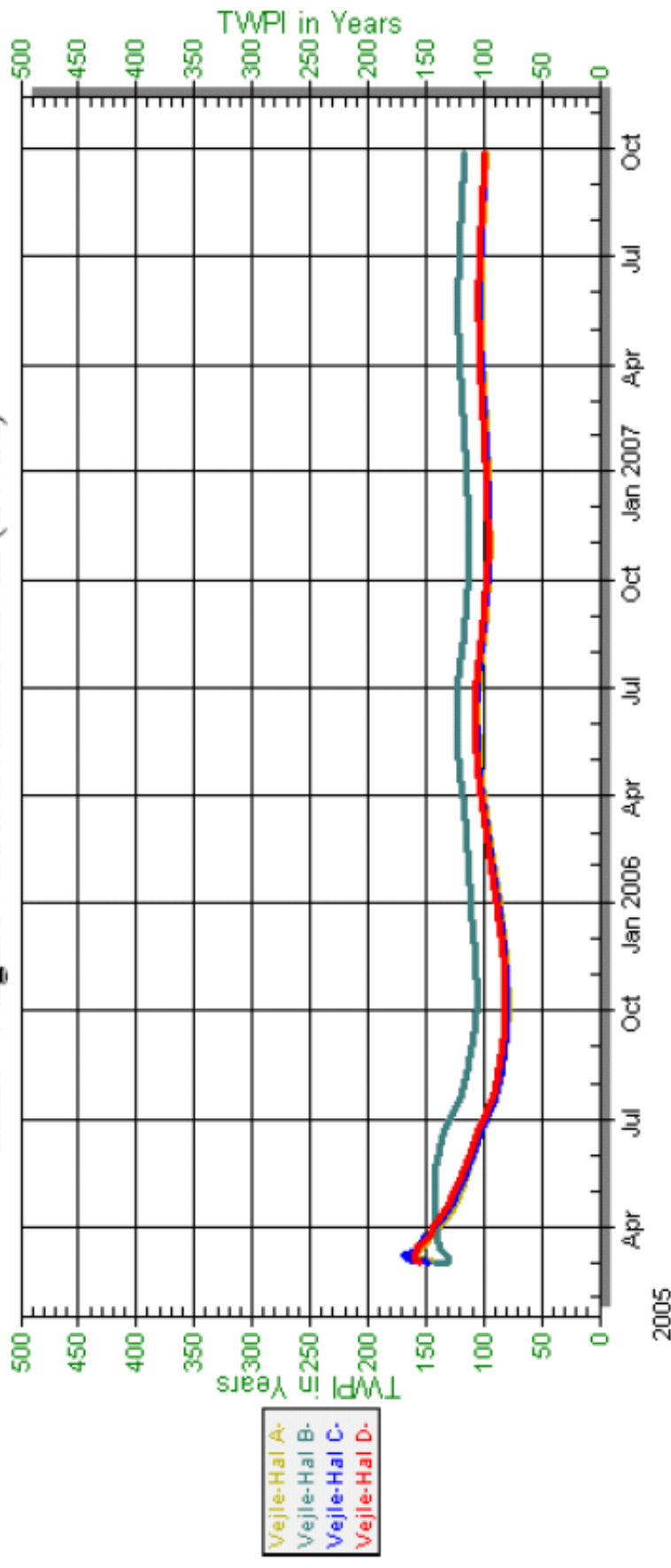
Possible explanations:

- Too much traffic in the stores
- Increase of RH due to low average temperature - the stores are too cold

- Low average temperature is preferable
- TWPI is an index indicating how long time a material will remain chemically stable under certain climatic conditions (Climate Notebook software from Image Permanence Inst., Rochester, USA)
- The Time Weighted Preservation Index (TWPI) is high - about 100 for halls B,C & D and 117 for hall A

TWPI for the Vejle Stores

Time-Weighted Preservation Index (TWPI)



Financial aspects of the stores:

- Building costs (2003): 13.206.000 DKK ~
1.760.800 € (excl. site and shared facilities)
- Running expenses per year: 236.000 DKK ~
43,35 DDK/m² or 31.466 € ~ 5,8 €/m²

Administrative aspects

- The Shared Storage Facility in Vejle is a selfgoverning body
- Owned by the shareholders or users
- The users are responsible for the objects
- The running of the stores are based on selfservice – and trust
- The conservation staff act as caretakers and consultants
- Cleaning is part of the service

The principle of self-service works
because:

- Strickt and common rules were set from the beginning in a User's Handbook
- There is a constant and positive dialogue between conservators and museum staffs

The User's Handbook

- Was written by the conservators
- Was acknowledged by the board
- Was issued before the collections were moved into the stores
- Is continuously evaluated and revised

The handbook and the dialogue have helped
raise the user's consciousness of preservation
and the working standard

Difficulties

- Many procedures are difficult to get used to
- The amount of time needed for moving and registering objects was underrated
- Thus the moving process is prolonged and some users are still not in place
- The climate will not settle for a longer period due to traffic

Conclusions:

- In general the climate is good – stable RH and slowly fluctuating temperature
- The quality of museums stores has improved considerably
- The consciousness of preservation is raised

Conclusions:

- The graphs suggests that traffic and power failures are main reasons for disturbance of the climate
- We fear that dehumidification is a permanent need
- We doubt the importance of the buffering capacity of the building
- The stores are too cold to ensure a 100% passive controlled climate
- The TWPI indicates that low temperature is preferable for long time preservation

Conclusions:

- Running expenses are very low
- Agreement on the User's Manual before moving in was essential
- Positive dialogue between conservators and users has raised the quality on all levels

Acknowledgements:

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- See www.konsv.dk and www.collectionsmanagement.dk