Innendørsklima i historiske bygninger i museene i Rogaland

- Kan man spare strøm og samtidig bevare bygninger og deres gjenstander?

Stina Ekelund Erlandsen
Leder, Seniorkonservator
Head of conservation

Museumstjenestene
i Rogaland

toriske bygninger i Rogaland

n og samtidig bevare es gjenstander?

Stina Ekelund Erlandsen
Leder, Seniorkonservator
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Museumstjenestene
i Rogaland

Museumstjenestene i Rogaland

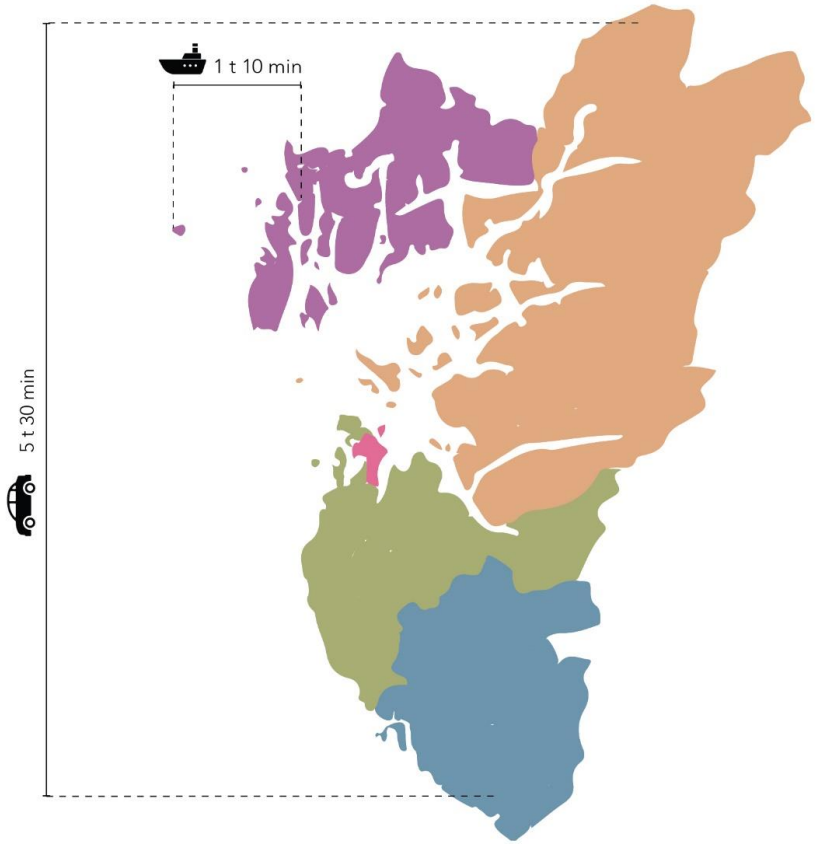
MUSEUMSTJENESTENE
(2012-)

Består av

- Fotoarkivar (2012-)
- Bygningsantikvar (2016-)
- Konservatorer (2020-)
- Samlingsteam (2014-2019)

Utfører arbeid for

MUST Museum Stavanger · Norsk Oljemuseum · Jærmuseet · Hauga Land Museet · Ryfylkemuseet · Dalane Folkemuseum

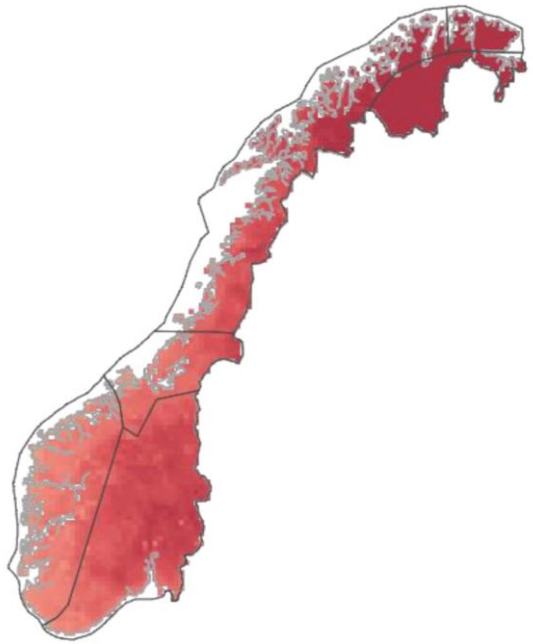


Bygningsvernundersøkinga

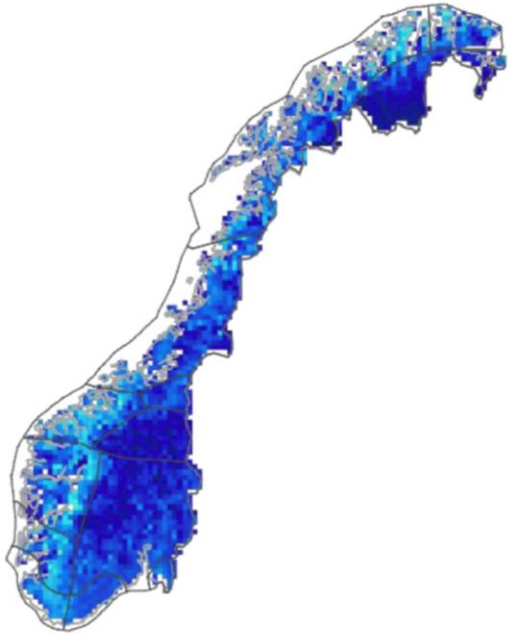
Bygningsvernundersøkelsen fra 2019 viste at størstedelen (86%) av bygningene museene forvalter er tilrettelagt for bruk – med miljøutstillinger og publikumstilbud. I tillegg til at disse bygningene (med sine interiør) er en del av samlingene, inneholder de andre deler av samlingene, slik som foto, kunst og gjenstander.

https://museumstjenestene.no/2020/01/24/ny-rapport-om-bygningsvern-pa-musea-i-rogaland/

Rapport om museas møte med klimautfordringane



Figur 1: Endringar i middeltemperatur om vinteren frå perioden 1971-2000 til 2071-2100.



Figur 2: Endring i nedbørsum (%) frå perioden 1971-200 til 2071-2100. Kjelde: Meteorologisk Institutt, Norsk klimaservicesenter.

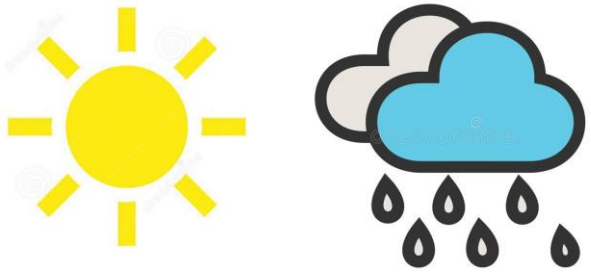
Klimadata Stavanger 1999 - 2021

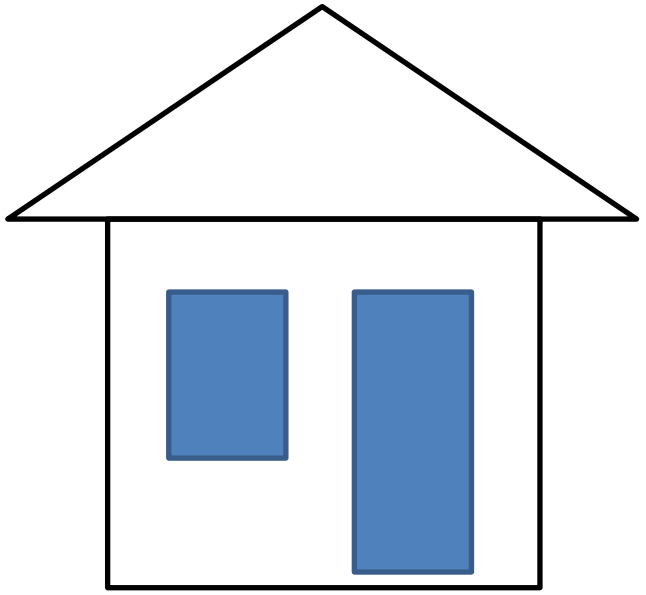
	Januar	Februar	Mars	April	Mai	Juni	Juli	August	Septem-ber	Oktober	November	Desember
Gjennomsnittstemperatur (°C)	2.2	1.6	2.9	6.1	9.3	12.1	14.6	14.9	12.7	9	5.8	3.3
Min. Temperatur (°C)	0.7	-0.1	0.9	3.6	6.7	9.6	12.3	12.8	10.9	7.4	4.2	1.8
Maks. Temperatur (°C)	3.5	3.2	4.8	8.4	11.5	14.1	16.6	16.8	14.5	10.6	7.1	4.7
Nedbør (mm)	203	162	144	102	96	108	126	180	207	229	207	216
Luftfuktighet(%)	80%	81%	80%	78%	77%	79%	82%	80%	81%	80%	81%	81%
Regnfulle dager (d)	14	13	13	11	10	11	12	13	13	14	13	14
Timer med solskinn (t)	3.1	4.3	5.8	8.1	10.0	10.1	9.5	8.7	6.8	5.3	3.9	2.8

https://no.climate-data.org/europa/norge/rogaland/stavanger-647/#climate-graph

Temperatur & luftfuktighet

Klima

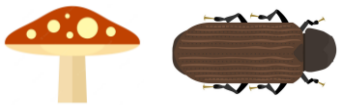


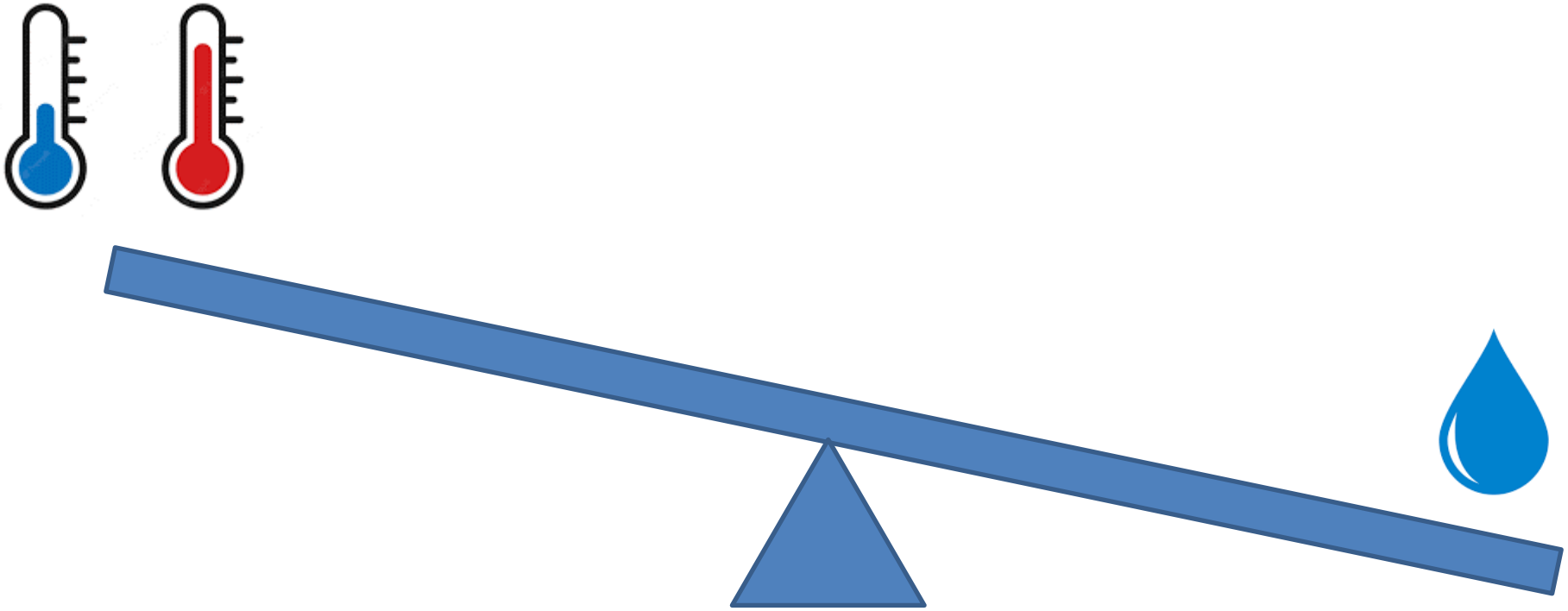


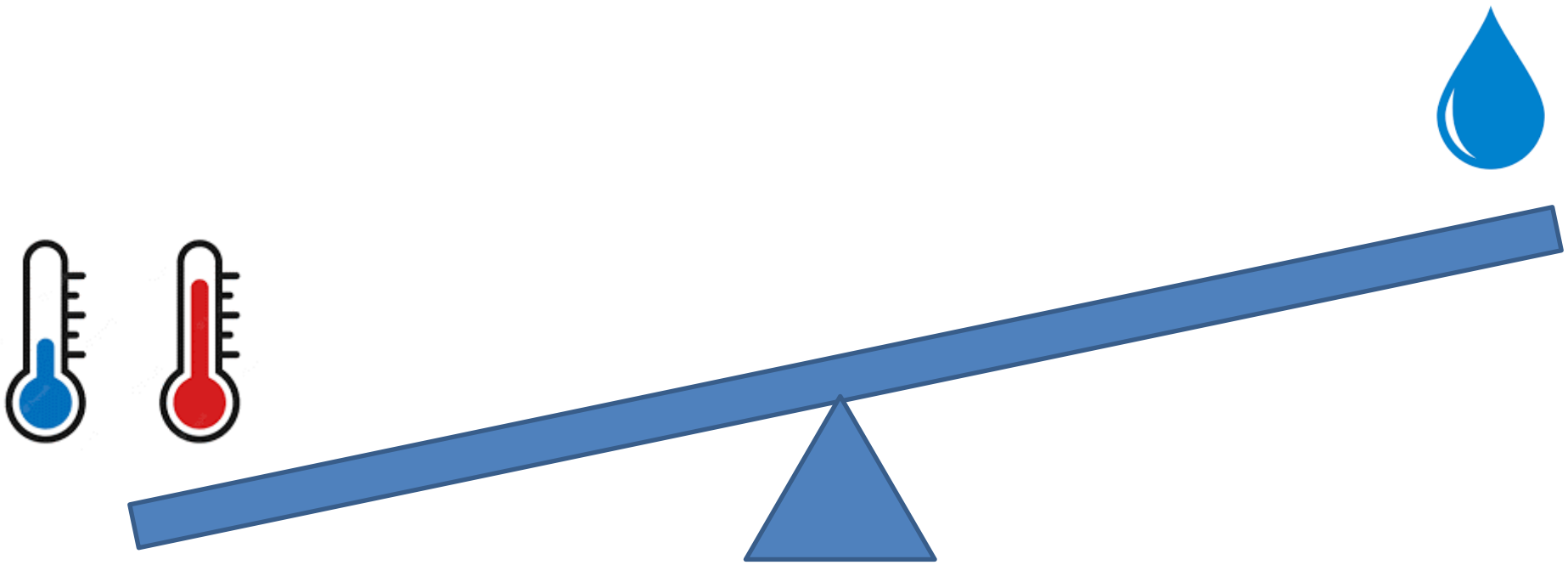
Innendørsklima

Styring

Uten styring







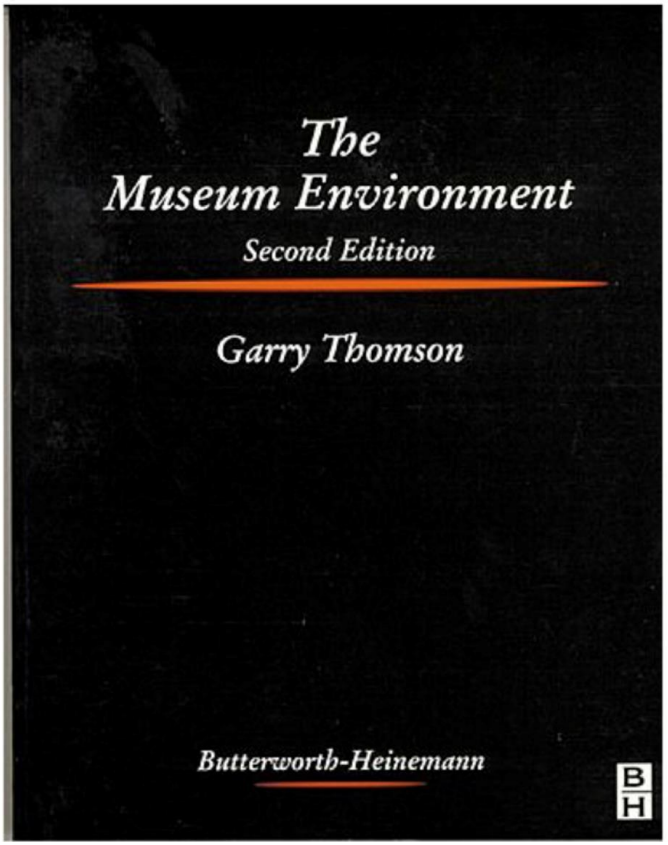
Fellesprosjekt

Interiør

Mål med prosjektet:	Øke kompetansen ved museene innen forvaltning og formidling av interiør slik at publikum kan få en god opplevelse, samtidig som samlingene sikres for fremtiden.
Aktuelle tema/ problemstillinger som prosjektet kan omfatte:	▪ Preventive tiltak (IPM, lys, klima m.v.) ▪ «Historien sitter i veggene» - formidling av interiør ▪ Utstillingsdesign og materialalg i utstillinger ▪ Vern eller bruk (rekvisitt vs samlingsobjekt)
Bidrag / roller i prosjektet:	▪ Fotoarkivaren: Tidsbruk i prosjektet ca 1-2 uker ▪ Bygningsantikvaren: Tidsbruk i prosjektet ca 4 uker ▪ Konservatorene: Tidsbruk i prosjektet ca 4 uker (1 person). Prosjektlederansvar. I tillegg kommer bidrag fra museene. Blant annet gjennom referansegrupper og fagdager.


REMOTE CONTROLLED
UNDERWATER VEHICLE
IKU

Rett inneklima i museum?



Environmental Guidelines ICOM-CC and IIC Declaration

ICOM-CC

At the IIC congress in Hong Kong and the ICOM-CC conference in Melbourne in September 2014 the delegates discussed and agreed the following declaration:

Museum environment

- It is acknowledged that the issue of collection and material environmental requirements is complex, and conservators/conservation scientists should actively seek to explain and unpack these complexities.
- Guidelines for environmental conditions for permanent display and storage should be achievable for the local climate.

Bizot Interim Guidelines for Hygroscopic Materials

For many classes of object[s] containing hygroscopic material (such as canvas paintings, textiles, ethnographic objects or animal glue) a stable relative humidity (RH) is required in the range of 40–60% and a stable temperature in the range 16–25°C with fluctuations of no more than ±10% RH per 24 hours within this range.

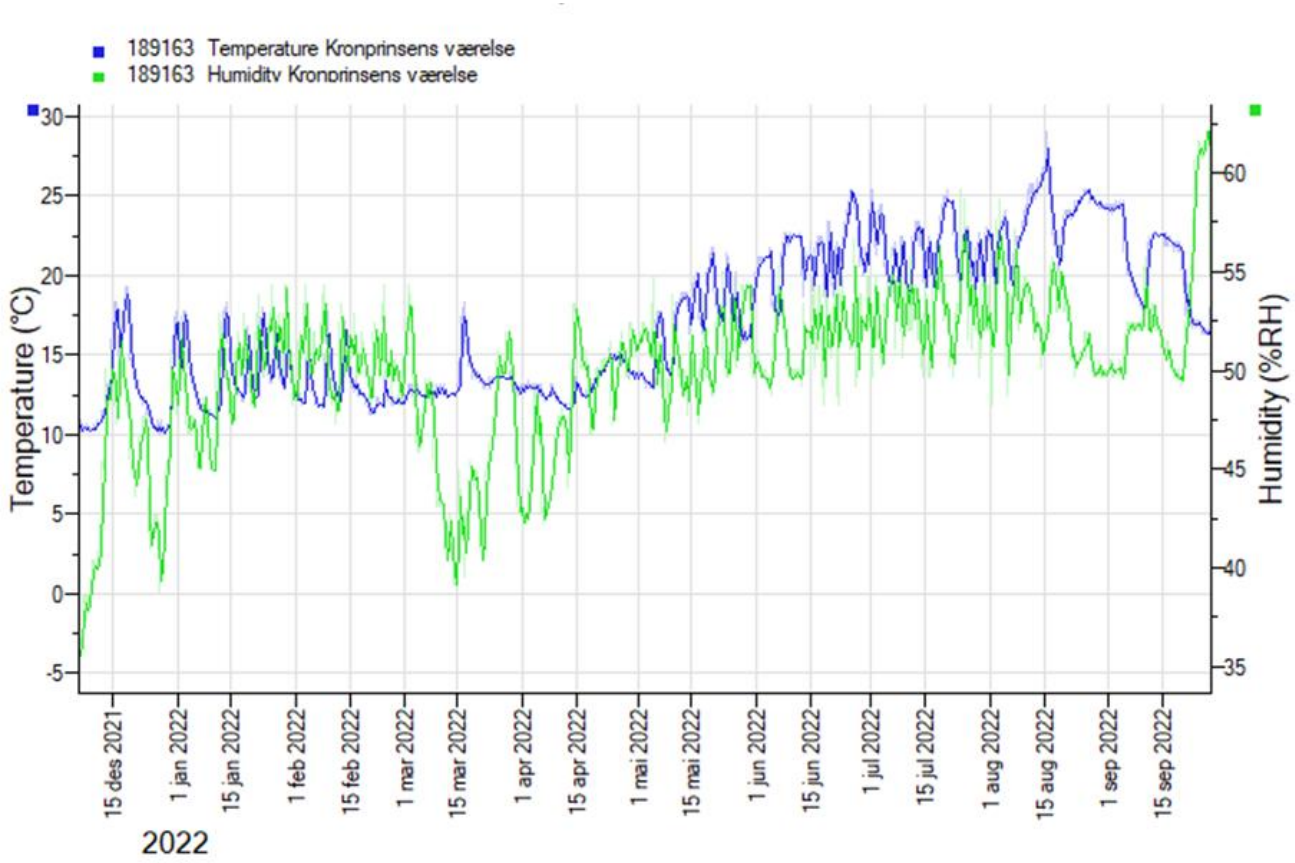
More sensitive objects will require specific and tighter RH control, depending on the materials, condition, and history of the work of art. A conservator's evaluation is essential in establishing the appropriate environmental conditions for works of art requested for loan.

AIC Interim Guidelines endorsed by the Association of Art Museum Directors:

For the majority of cultural materials, a set point in the range of 45-55% relative humidity with an allowable drift of +/-5%, yielding a total annual range of 40% minimum to 60% maximum and a temperature range of 59-77ºF (15-25ºC), is acceptable.

- Fluctuations must be minimized.
- Some cultural materials require different environmental conditions for their preservation.
- Loan requirements for all objects should be determined in consultation with conservation professionals.

Grafer og data



Med gjenstanden som rettesnor

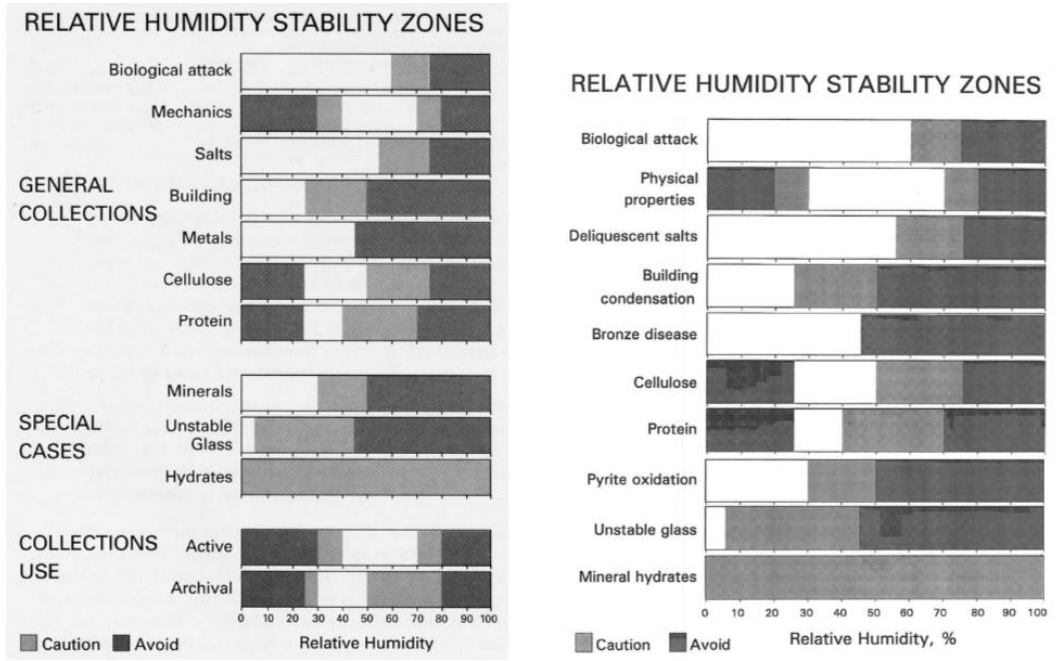


FIGURE 6. Relative humidity stability zones from (left) Erhardt and Mecklenburg (1994:37) and (right) Erhardt et al. (1995:20). The ranges of relative humidity are suggested for various materials and situations. According to Erhardt and Mecklenburg (1994), "no one RH is ideal, and any value chosen must be a compromise."

Effects	Low sensitivity	Medium sensitivity	High sensitivity	Very high sensitivity
±40% RH	None-small damage	Small-severe damage	Severe damage	Severe damage
±20% RH	None-tiny damage	None-small damage	Small-severe damage	Severe damage
±10% RH	No damage	None-tiny damage	None-small damage	Small-severe damage
±5% RH	No damage	No damage	None-tiny damage	None-small damage
Flat sheets of paper, film, tape, with an image or data layer may delaminate, fracture, or distort permanently.	**Support layer with finely dispersed image/data layers.** E.g., most single sheets of paper with print, halftones, line drawings, inks, washes. **Laminates with low differences in expansion.** E.g. most case-bound books. Most CDs. Commercial signs painted on metal.	**Layered structures with moderate strength, moderate differences in expansion.** E.g., most photographs, negatives and film. Most magnetic records. Thin, well adhered inks on parchment, such as deeds. Gouache on paper. Book bindings of vellum and or wood.	**Layered structures with poor strength, moderate to high differences in expansion.** E.g., Thick images on parchment. Globes. Thick oil-resin images on paper or cloth. Objects listed as medium vulnerability that have weakened substantially due to UV exposure, or aging already causing flaking.	**Large reactive (to fluctuations) sheets that are restrained at the periphery.** E.g., large paper sheets adhered to stretchers, 19th Century photo-portraits on fabric and stretchers. Large prints adhered at all four corners (usually tear near the point of restraint.)
Wood or wood assemblies may crack, split, delaminate, or distort permanently	**Single wood components, or assemblies designed to eliminate stresses, or.** E.g., floating panels in furniture or room paneling; tongue and groove planking nailed or bolted on edge only such as wainscotting, wood boxes on farm machinery (unless jammed due to painting, warping), hollowed out totem poles, wooden tool handles. **Assemblies with prior damage that allows stress release.** E.g. most old tables where all screws and joints are loose, any panels already split.	**Wood assemblies with uniformly distributed stresses during fluctuations.** E.g., most plain wood furniture with tight joints, no prior splits, most veneers and marquetry that cover a continuous piece below, such as most 18th Century - 19th Century chests of drawers, fine tables. Furniture made with plywoods, such as many Victorian catalog pieces. Note that fluctuation to higher RH may not always cause visible damage, since many joints, panels are invisibly crushed, but this makes them more likely to split during lower RH.	**Wood assemblies with concentration of stresses during fluctuations.** E.g., Veneer over corner joints, such as many wardrobe doors, Victorian secretaries, Art Deco furniture. Fretwork, applied wooden ornaments. Assemblies with bolts, nails, screws that hold both sides of a single plank. Many musical instruments.	**Wood assemblies with attached or inlaid metal, horn, shell, etc. that spans more than 1cm across the wood grain. Attachment or inlays may delaminate or buckle.** E.g. West coast masks with abalone, 18th Century-19th Century fine furniture, clocks, with inlays.
Paintings or paint layers may crack, delaminate, flake	**Acrylic paintings on canvas**. E.g., many paintings since 1960 . These may move to medium sensitivity if a heavy glue size was used, or if adhesion between layers is poor.	**Rigid paint layers on canvas, in moderate to good condition.** E.g. most oil paintings on canvas. These may move to high sensitivity if	**Oil paint, gilding, on wide spans of wood, or paint on other organic rigid supports with weak adhesion.** E.g., most panel paintings, wide gilded	**Paint layers bridging seams or flaws that concentrate stress.** E.g. polychromes, painted furniture, painted architectural

Forventninger

Museum Study of the Climate4Wood Research Project

Stina Ekelund,[1,2] Paul van Duin,[3] Bart Ankersmit,[4] and André Jorissen[5]*

ABSTRACT. A very important task for conservators and other museum professionals is minimizing the risk of damage to objects in their care. Changes in the physical state of the object are to be avoided, but under which conditions these changes occur is difficult to predict; for example, fluctuations in museum climate are a high risk to objects. The focus so far has been to monitor the indoor climate instead of monitoring changes induced in the objects. This is logical because reading a climate graph is more straightforward than monitoring an object. By studying many objects in detail and collecting empirical data over a large collection of objects, our knowledge about expected damage and its relation to material and constructive parameters will increase. Understanding the mechanisms leading to damage caused by climate fluctuations will help us to predict when and where such damage might occur. The Climate4Wood research project was initiated with the aim to identify the effects of indoor climate fluctuations on the damage resistance of decorated wooden panels in museum collections. By means of a combined museum, modeling, and experimental study, climate-related changes of decorated oak wooden panels in furniture and paintings were addressed from a multidisciplinary conservation and engineering approach. The methodology and the outcome of the museum study are illustrated by examples from two studies in the Rijksmuseum collection: (1) a study of 134 doors of 49 Dutch cabinets and (2) a study of 249 Dutch seventeenth century panel paintings. The outcome of these studies is discussed, as well as how object-based information serves for the modeling and experimental studies. Examples are given of how this information can be relevant for preservation strategies and conservation practice.

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[2] Now at Building Preservation Section, Ryfylkemuseet, Nordenden 14, 4230 Sand, Norway.
[3] Rijksmuseum, Museumstraat 1, Postbus 74888, 1070 DN Amsterdam, Netherlands.
[4] Cultural Heritage Agency of the Netherlands, Smallepad 5, 3811 MG Amersfoort, Netherlands.
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Manuscript received 2 June 2018; accepted 7 May 2019.

INTRODUCTION

In museums and historical collections the aim is to minimize the risk of irreversible change or damage to the artifacts in our care. The main risk for wooden objects is related to the swelling and shrinkage behavior of the material. Swelling and shrinkage may cause cracks, open joints, induce delamination, cause deformation, and lead to loss of material. For hygroscopic materials the shrinkage and swelling behavior is usually considered to be related to fluctuations in the surrounding microclimate, and these conditions are therefore often strictly controlled.

The focus of scientific research since the 1990s on indoor climate–related changes to museum objects has been on materials in paintings on canvas and panel. Mechanical and dimensional properties of individual materials or combinations of materials have been investigated in a variety of climate conditions (Mecklenburg and Tumosa, 1991; Mecklenburg et al. 1998; Bratasz, 2010). However, there is a gap between the results gained from laboratory-based research and that gained from

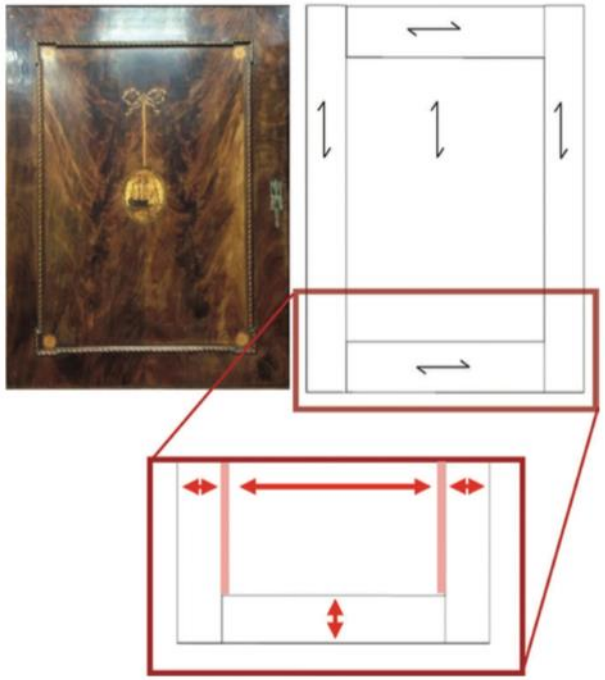

FIGURE 3. Shrinkage of an unrestrained panel in frame construction. The grain direction is indicated by the black arrows. The largest movements due to shrinkage and swelling occur perpendicular to the grain, indicated by red arrows. The shrinkage behavior of unrestrained panels can be observed as lines along the edge of the frame, here marked in pink. Rijksmuseum BK-15320, 1,120 × 834 × 27 mm, 1775–1800. Photo and diagram by Stina Ekelund.

FIGURE 4. Four-board panel with original cross battens and characteristic glue joint failure, later rejoined. Hendrik Noorderwiel, Rijksmuseum SK-C-1550, 1,177 × 1,770 × 10 mm, 1647. Top photo courtesy of Rijksmuseum; bottom photo by Stina Ekelund.

Kan gjenstandens klima-historie sees?

Godt nok inneklima?

Available online at www.sciencedirect.com
ScienceDirect
Energy Procedia 78 (2015) 1317 – 1322
Energy Procedia
6th International Building Physics Conference, IBPC 2015

Energy impact of ASHRAE's museum climate classes: a simulation study on four museums with different quality of envelopes

Rick Kramer[a]*, Henk Schellen[a], Jos van Schijndel[a]

[a] University of Technology Eindhoven, 5600 MB Eindhoven, The Netherlands

Abstract

ASHRAE's indoor climate design classes for general museums, galleries, archives and libraries are well known: AA (most strict), A, B, C and D (least strict). Museum staff often select class AA, presuming to gain the best overall preservation result that is possible. However, the exact consequences on the energy demand are unknown and therefore barely taken into account when selecting a class. This study quantifies the energy demand of four museum zones with different quality of envelopes (ranging from historical to state-of-the-art museum envelopes), conditioned according to ASHRAE's climate classes. The lower and upper limits of indoor temperature and relative humidity, and the resulting energy demand are determined using building simulations. The conclusions: (i) conditioning according to class B significantly saves energy compared to class A, while class B is still considered as precision control and protects most artefacts; (ii) moving down one class, e.g. from class AA to A, saves relatively more energy for a state-of-the-art building than for a historical building; (iii) Subclasses A_d (larger daily fluctuations) and A_s (seasonal adjustments, but smaller daily fluctuations) pose the same risk on the collection, but subclass A_d requires less humidification and dehumidification than A_s, so larger daily fluctuations may be preferred above seasonal adjustments.

Keywords: ASHRAE; museum ; energy; building simulation.

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1876-6102
doi:10.1016/j.egypro.2015.11.147

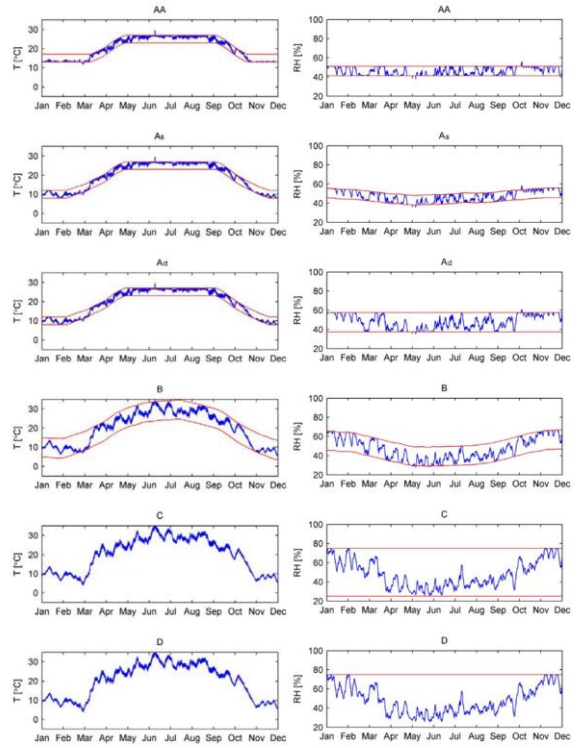

Fig. 3. Resulting indoor T (left) and RH (right) for QoE 3, conditioned according to ASHRAE's museum indoor climate classes.

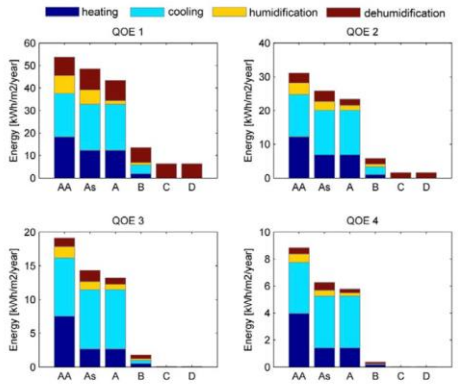

Fig. 2. Specification of energy demand per QoE.

4. Conclusions

- Class B significantly saves energy compared to class A, while class B is still considered as precision control and, probably, adequately protects most artefacts (highly vulnerable artefacts may be placed into display cases).
- Moving down one class, e.g. from AA to A, saves relatively more energy in QoE 4 (modern) than in QoE 1 (historical). So, also in modern buildings it is highly relevant to study collection needs and not to condition unnecessarily strict.
- Subclasses A_d and A_s pose the same risk on the collection, but subclass A_d requires less humidification and dehumidification than A_s, so larger daily fluctuations are preferred above seasonal adjustments.
- Thermal comfort was not included, so the results' trends are valid, but absolute energy demands will differ. The effect of comfort requirements needs further research.

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Kan man senke varmen?

ANNO
Museene i Hedmark

NY RESEPSJON: Gunn Knappe og Jan Ove Fuglebrenden legger siste hånd på verket før de kan ønske publikum velkommen tilbake etter strømstenging - til et nyoppusset resepsjonsområde på Anno Norsk skogmuseum. Foto: Stine S. Skjæret

PRESSEMELDING - 16. MARS 2023 19:21

Strømstengte museer åpner igjen

Dagbladet Bergen LOGG INN

Kan stenges på ubestemt tid

Flere av Bergens største attraksjoner kan måtte stenge som følge av de høye strømprisene. - Vi kan ikke bare skru av strømmen, sier museumsdirektør.

DYRT: Flere av Bergens museer opplever en mangedobling i strømutgiftene. Nå vurderes drastiske tiltak. Håkonshallen og Rosenkrantztårnet kan stenges på ubestemt tid. Foto: Bymuseet i Bergen

Jyllands-Posten KØB MENU

11/11/2022 KL. 17:30 | FOR ABONNENTER

Museer lukker for at spare på energien – men mug, skimmelsvamp og møl kan flytte ind

Energikrisen har ramt museerne, hvor flere og flere vinterlukker afdelinger. Det haster med en økonomisk hjælpepakke, lyder det.

TILFØJ TIL LÆSELISTE

Kan man varme opp på en annen måte?

RIKSANTIKVAREN

Meny

No

NYHETER

Råd nr 1: Vurdér varme-pumpe først

– Vårt råd er å velge varmepumpe først. Det skal være enkelt å gjøre gode valg som tjener både gamle hus, klimaet og eiernes lommebok, sier riksantikvar Hanna Geiran.

Publisert: 12. desember 2022

Riksantikvaren · Följer
12 dec 2022

Vinteren kommer 🌧️ Da kan den ferske veilederen vår være god å ha!

– Denne høsten har vi jobbet frem en ny veileder om at det enkleste, mest effektive og billigste tiltaket som også gir minst inngrep i gamle bygg er å installere varmepumpe, sier Geiran. – Skal folk velge et tiltak for å spare energi i sitt gamle hus, så bør de tenke varmepumpe først.

Les mer om varmepumper her 👇
https://www.riksantikvaren.no/varmepumpe-er-rad-nr-1/

Les mer om energieffektivisering her 👇
https://www.riksantikvaren.no/energieffektivisering/

Illustrasjon: Romfarer Arkitekter AS/Stein Høglund

Erfaring fra interiørprosjektet

Bygninger med begrenset eller ingen oppvarming

- Begrense vegetasjon og vann rundt (og i) bygningene
- Korrosjon av metall. Få nye «klimarelaterte» skader
- Gode rutiner
- Sirkulasjon
- Mugg
- Kondens

Takk!

Stina Ekelund Erlandsen

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