ENGLISH HERITAGE TRUST LOAN ENVIRONMENTAL CONDITIONS APPENDIX

1. INTRODUCTION

There are three key reasons for English Heritage Trust (EHT) loan conditions, which are underpinned by recorded display conditions over decades.
The EHT approach to managing the risk from relative humidity and temperature follows BS EN 15757:2010 a British and European standard - *Conservation of cultural property. Specifications for temperature and relative humidity to limit climate-induced mechanical damage in organic hygroscopic materials.*

A : Evidence of previous behaviour/response of objects to existing room conditions in 105 EHT properties.

- Evidence from two randomised national condition surveys, assessing 52,000 objects, where the cause of damage was recorded. (Xavier-Rowe & Fry, 2011)
- Evidence from 100% condition surveys including 1,300 easel paintings, archaeological iron and copper alloys (8,000 objects). (Thickett, 2022)
- Evidence from acoustic emission of 80 objects, mostly wood. (Thickett, et al, 2012)
- Evidence from investigations into the cause of over 400 instances of observed damage.

B: Conditions the spaces/rooms have maintained following long-term monitoring, or can be achieved with reasonable mitigations (e.g. humidistatic heating or adaptive ventilation).

C: If environments are proven unsafe, and for specific materials, microclimates are used for close control (showcases; print and painting glazed frames; historic enclosures used for reliquaries, miniatures, daguerreotypes) or objects are removed from display.
Microclimate performance is guaranteed through specification and quality control, including testing, of showcases to achieve specific air exchange rates.

As part of the review into the EHT loan environmental conditions, global guidance was recorded, building on the helpful AICCM table (https://aiccm.org.au/conservation/environmental-guidelines).
The English Hertiage Trust loan environmental conditions are based on the EHT collection and delivery of preventive conservation over the past 25 years.

Contents

References

Xavier-Rowe, A. & Fry, C. (2011) Heritage Collections at Risk - English Heritage Collections Risk and Condition Audit. ICOM Committee for Conservation 16th Triennial Meeting Lisbon Portugal 19-23 September 2011, Critério Artes Gráficas, Lda.; ICOM Committee for Conservation
https://www.english-heritage.org.uk/siteassets/home/learn/conservation/collections-advice--guidance/heritage_collections_at_risk.pdf
Xavier-Rowe, A., Lankester, P. and Thickett, D. (2021) Principles for developing low-cost, sustainable stores. Transcending Boundaries: Integrated Approaches to Conservation. ICOM-CC 19th Triennial Conference Preprints, Beijing, 17–21 May 2021, ICOM-CC
https://www.english-heritage.org.uk/siteassets/home/learn/conservation/collections-advice--guidance/principles-for-developing-low-cost-sustainable-stores_2021_icom_cc_beijing.pdf
Thickett, D. (2022) Using Epidemiology to Validate Scientific Results for Complex Situations. In Metal 2022: Proceedings of the Interim Meeting of the ICOM-CC Metals Working Group, Helsinki, 5-9 September 2022, eds. P. Mardikian, L. Näsänen, and A. Arponen, ICOM-CC and The National Museum of Finland, 253–260.
https://www.english-heritage.org.uk/siteassets/home/learn/conservation/collections-advice--guidance/using-epidemiology-to-validate-scientific-results-for.pdf
Thickett, D. , Luxford, N. and Lankester, P. (2012) Environmental Management Challenges and Strategies in Historic Houses. In Proceedings of the The Artifact, its Context and their Narrative, Getty Conservation Institute, Los Angeles, CA, USA, 6–9 November 2012.
https://www.english-heritage.org.uk/siteassets/home/learn/conservation/collections-advice--guidance/environmental-management-strategies-and-challenges-in-historic-houses.pdf

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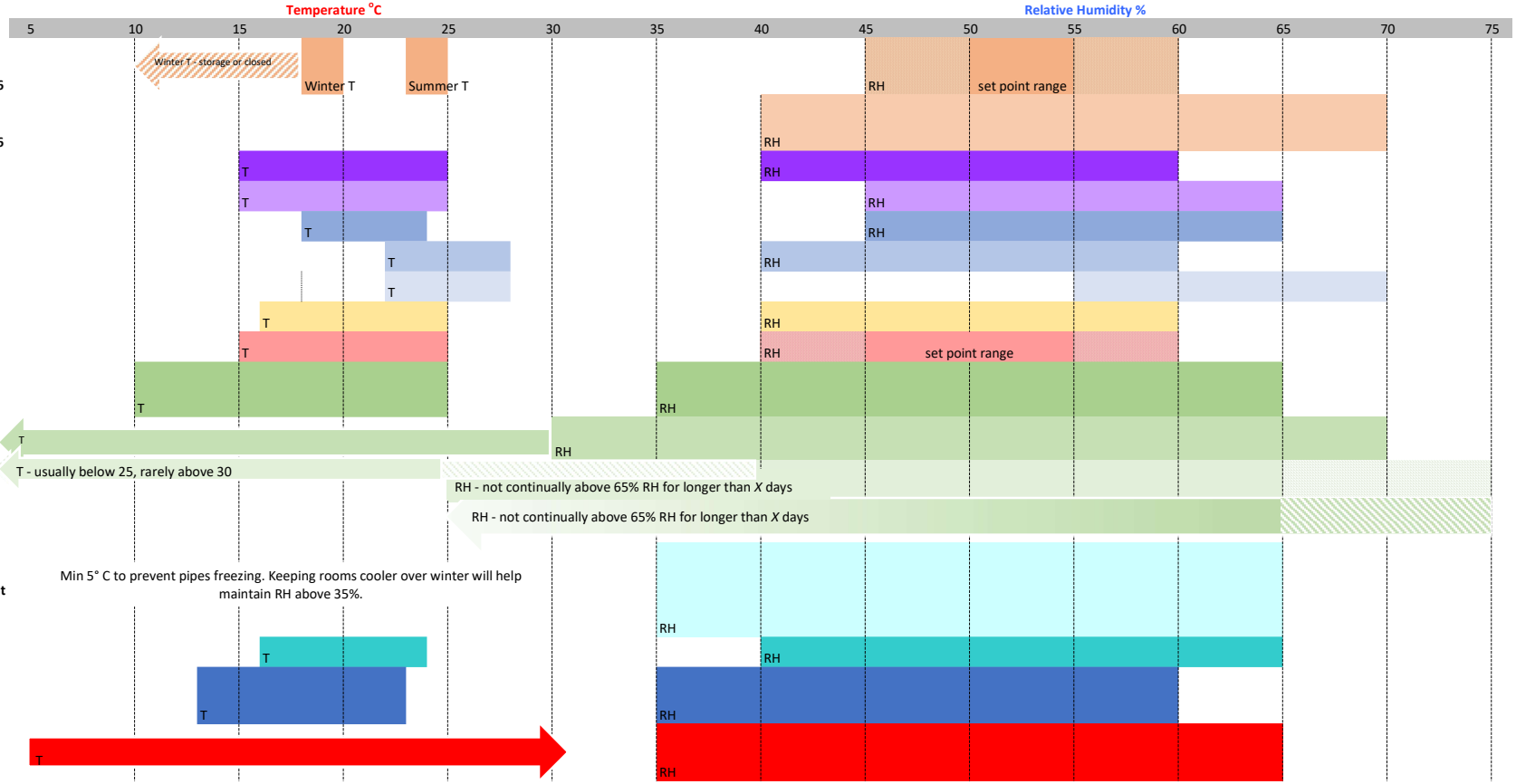
2. Comparison of environmental temperature and relative humidity guidelines (must be read in conjunction with fluctuations and seasonal variations page 3)

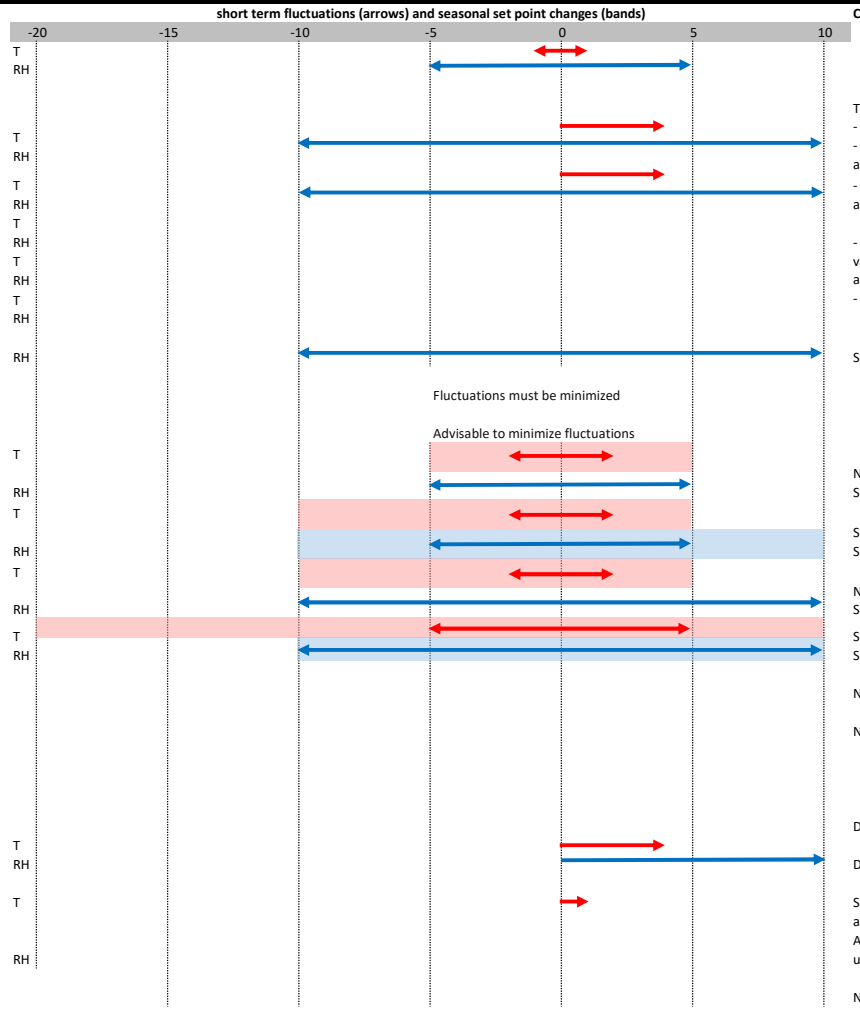
NOTE: This work is an updated version of the table created by AICCM (https://aiccm.org.au/conservation/environmental-guidelines)

English Heritage



* **ASHRAE AA/A1/A2** difference is in the level of seasonal change and fluctuations**, see page 3**

3. Comparison of environment temperature and relative humidity guidelines - Fluctuations and Seasonal variations



			Comments
	Class 1	T	
1	**Museum Environment, 1986**	RH	
	Class 2		
2	**Museum Environment, 1986**		Temperature kept reasonably constant to stabilise RH - Stable diurnal drift in temperature and relative humidity within the deadbands is the optimal outcome.
		T	- Multiple short-term fluctuations of 5 to 10% relative humidity that are longer in duration than 2 hours should be investigated and addressed.
3	**AICCM Temperate**	RH	
		T	- Unstable temperature, such as rapid increases or multiple short-term fluctuations of more than 4°C, should be investigated and addressed
4	**AICCM Humid**	RH	
		T	
5	**HCC Temperate**	RH	- Diurnal variations in temperature are small in hot humid climates and large in hot dry and temperate climates. Large diurnal variations in temperature and relative humidity are more likely to damage objects composed of restrained layers through the action of expansion and contraction.
		T	
6	**HCC Hot Dry**	RH	
		T	- Few materials respond to rapid, wide fluctuations of relative humidity that are less than 1 hour in duration.
7	**HCC Hot Humid**	RH	
8	**Bizot Green Protocol**	RH	Stable temperature
9a	**AIC**		
9b	**AAMD**		
10a	**ASHRAE category AA***	T	
	(precision control		No seasonal change to RH set points
	no seasonal RH change)	RH	Seasonal temperature set point change of up 5°C and down 5°C
10b	**ASHRAE category A1***	T	
	(precision control		Seasonal RH set point change of up 10% and down 10%
	seasonal T & RH change)	RH	Seasonal temperature set point change of up 5°C and down 10°C
10c	**ASHRAE category A2***	T	
	(precision control		No seasonal change to RH set points
	seasonal T change)	RH	Seasonal temperature set point change of up 5°C and down 10°C
11	**ASHRAE category B***	T	Seasonal RH set point change of up 10% and down 10% RH
	(limited control)	RH	Seasonal temperature set point change of up 10°C and down 20°C
12	**ASHRAE category C**		
	(prevent extremes)		No requirement
13	**ASHRAE category D**		
	(prevent damp)		No requirement
14	**Guidance note on environmental management for collections and climate sustainability**		Drift within these parameters (35-65% RH) is OK. Large variations are not.
		T	
15	**GIS** (withdrawn end 2024)	RH	Difference between the highest and lowest reading in any 24-hr period
		T	
16	**BS 4971:2017 5.1.2 environmental stability**		Seasonal temperature changes should adjust as slowly as possible, within the selected parameters, in order to stabilise RH. Seek to achieve temperature changes no more than 1 °C in any 24 hr period without the use of air conditioning. All stored material should be packaged to reduce the rate of any RH change caused by temperature fluctuation or other unexpected moisture sources.
		RH	
17	**English Heritage (general objects incl. paintings)**		No requirement for <10% variance over a 24hr period

* 1 Rate of seasonal adjustments in relative humidity set point should not exceed the short-term fluctuation limit each 30 days, and the rate for temperature adjustment should not exceed the short-term fluctuation limit each 7 days (e.g., for A1, a seasonal adjustment can be no faster than 5% rh change per 30 days and 2°C change per 30 days.
2 Short-term fluctuation means any fluctuation shorter than the times specified in footnote 1 for rate of seasonal adjustment (i.e., 30 days for relative humidity fluctuations, 7 days for temperature fluctuations). Space gradient refers to the differential in relative humidity or temperature between any two locations where objects are permitted to be placed in the controlled space (designers can specify out-of-limit locations, such as a specific distance to exterior walls and supply vents

4. Glossary, notes and weblinks

		abbreviation	meaning	description	links
	Class 1			Appropriate for major national museums, old or new, and also for all important new museum buildings	
1	**Museum Environment, 1986**		The Museum Environment, 2nd Edition, Garry Thomson		https://www.routledge.com/Museum-Environment/ThomsonCbe/p/book/9780750620413
	Class 2			Avoid the major dangers while keeping cost and alteration to a minimum. For example important historic houses and churches. Ducted air conditioning not assumed.	
2	**Museum Environment, 1986**				
3	**AICCM Temperate***	AICCM	Australian Institute for the Conservation of Cultural Material		https://aiccm.org.au/conservation/environmental-guidelines
4	**AICCM Humid**				
5	**HCC Temperate**	HCC	Heritage Collections Council		https://aiccm.org.au/conservation/environmental-guidelines
6	**HCC Hot Dry**				
7	**HCC Hot Humid**				
8	**Bizot Green Protocol***	Bizot NMDC	The Bizot Group is an international network of art museum directors from major institutions around the world including several NMDC members. National Museum Directors' Council (UK)		https://www.nationalmuseums.org.uk/what-we-do/climate-crisis/bizot-green-protocol/
9	**AIC / AAMD***	AIC AAMD	American Institute for Conservation of Historic & Artistic Works Association of Art Museum Directors (USA)		https://www.conservation-wiki.com/wiki/Environmental_Guidelines
			American Society of Heating, Refrigerating, and Air-Conditioning Engineers	Museums, Galleries, Archives and Libraries in modern purpose-built buildings or purpose-built rooms	
10	**ASHRAE category AA/A1/A2*** (precision control)	ASHRAE	2019 ASHRAE handbook : HVAC applications [SI edition] : chapter 24 : museums, galleries, archives, and libraries	Temperature at or near human comfort	https://store.accuristech.com/standards/a24-museums-galleries-archives-and-libraries-si?product_id=2573501
11	**ASHRAE category B** (limited control)			Museums, Galleries, Archives and Libraries needing to reduce stress on their building (e.g. historic house museums), depending on climate zone *X* days refers to Fig. 3 within chapter 24 for mould germination	
12	**ASHRAE category C** (prevent extremes)				
13	**ASHRAE category D** (prevent damp)			Collections in open structured buildings, historic houses *X* days refers to Fig. 3 within chapter 24 for mould germination	
14	**Guidance note on environmental management for collections and climate sustainability**			This short guidance note was prepared by a group of committed Icon accredited conservators and conservation scientists in response for the need for cultural heritage institutions to operate in a more sustainable manner in response to the global climate crisis, rising energy costs and local and national carbon reduction policies.	https://www.icon.org.uk/resource/guidance-note-on-environmental-management-for-collections-and-climate-sustainability.html
15	**GIS**	GIS	Government Indemnity Scheme (UK)	The ranges shown were in place until the end of 2024, current application forms refer to the Bizot Green Protocol	https://www.artscouncil.org.uk/sites/default/files/2025-01/GIS%20Application%20Form%2012.2024%201.docx
16	**BS 4971:2017**	BS	British Standards	BS 4971:2017 Conservation and care of archive and library collections	https://knowledge.bsigroup.com/products/conservation-and-care-of-archive-and-library-collections
	BS EN 15757:2010			BS EN 15757:2010 Specifications for temperature and relative humidity to limit climate-induced mechanical damage in organic hygroscopic materials	https://knowledge.bsigroup.com/products/conservation-of-cultural-property-specifications-for-temperature-and-relative-humidity-to-limit-climate-induced-mechanical-damage-in-organic-hygroscopic-materials
17	**English Heritage (general objects incl. paintings)**				
18	**ICOM-CC and IIC declaration (2014)**	ICOM-CC	International Council of Museums - Committee for Conservation	The ICOM-CC and IIC declaration (2014) references three interim guidelines, which are no longer interim. The three guidelines referenced are denoted by * next to their name.	https://www.icom-cc.org/en/environmental-guidelines-icom-cc-and-iic-declaration
		IIC	International Institute for Conservation of Historic and Artistic Works		
19	**CCI**	CCI	Canadian Conservation Institute	Refers to ASHRAE classes in chpt 24 (2015 edition)	https://www.canada.ca/en/conservation-institute/services/preventive-conservation/environmental-guidelines-museums/classes-control.html