Environmental Standard Readings for Sustainable Museum Artifacts in Display Case: Case Study of Malaysian Museums

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ABSTRACT

Artifacts in a museum's display case will usually undergo a process of deterioration. These artifacts are typically categorized into 'sensitive artifacts' and 'non-sensitive artifacts'. Due to the organic contents in sensitive artifacts i.e. textile and manuscript, extra supervision are required. This trait is differs to the non-sensitive artifacts, for instant, the coins, ceramic, pottery and weaponry which consist of non-organic materials. Organic materials akin papers, cotton and thread are easily react to the heat, humidity and Lux compared to the non-organic materials such as iron, gold, bronze, alloy, glass and ceramic. Therefore, temperature, humidity and LUX reading is very important to protect the artifacts in the display case from deteriorate. Standard guidelines for temperature, humidity and Lux reading was introduced by an international agency, ICOM (International Council of Museum) to ensure the preservation of both categories of artifacts. This paperwork intended to discuss the implementation of the guidelines to 3 Malaysian museums. The museums are National Museum in Kuala Lumpur, Terengganu State Museum and Islamic Art Museum Malaysia. The finding reveals that 98% of sensitive artifacts and 23% of non-sensitive artifacts in Malaysian museum are contravened with the guideline. Thus, it proves that Malaysian museums do not comply with the proposed reading guideline.

Keywords: *Museums, sustainable, museum display, display cases, environmental standard reading*

INTRODUCTION

Artifact collection must be cared for in a manner so as to preserve them for the foreseeable future. The curator's duty is to control the display environment with continuous checking of showcase's reading. One goal of every museum is to make objects accessible to the public to researchers and to other institutions. A second goal is to ensure the long-term safety and preservation of the collections, Thomson (1986:i-iii). To provide adequate care for objects while on display, 6 environmental factors must be controlled as precisely as possibly. The main factors to consider are temperature; relative humidity; particulate matter and pollutant; biological organisms; reactivity of material and natural/artificial lighting, Dean (1994 : 67). According to David Dean, the museum display mission are exposing artifact collections to museum visitors, providing enlightening and educational experience and proving the museum's visitors trust, Dean (1994 : 2).

LITERATURE REVIEW

ICOM background

The International Council of Museums (ICOM) is the only international organisation representing museums and museum professionals. Since 1946, ICOM has assisted members of the museum community in their mission to preserve, conserve and share cultural heritage. ICOM also takes advice from

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institutional partners to achieve its objectives. ICOM is governed in an inclusive and hierarchical manner, on an international level. The organisation gathers almost 30,000 members and is made up of National Committees, which represent 137 countries and territories, and International Committees, which gather experts in museum specialties worldwide. The International Council of Museums works for society and its development. It is committed to ensuring the conservation and protection of cultural goods. ICOM sets standards for museums in design, management and collections organisation. The *ICOM Code of Ethics for Museums* is a reference in the global museum community. It establishes minimum standards for professional practices and achievements for museums and their employees. ICOM carries out its international missions thanks to international mandates in association with partners such as UNESCO, INTERPOL and the World Customs Organisation (WCO). ICOM's missions include, fighting the illicit traffic of cultural goods, risk management, culture and knowledge promotion and protection of tangible and intangible heritage.

Background of Museums in Malaysia

ICOM Definition of a Museum in 2001 as "A museum is a non-profit making, permanent institution, in the services of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits for the purposes of study, education and enjoyment, material evidence of man and his environment". Much of Malaysia's history and heritage are being preserved in the many museums around the country. The first museum in the country was built in Taiping, Perak in 1883. When later it was acknowledged there was a need for a more comprehensive and organized collection to house the artifacts and treasures, Kuala Lumpur was chosen as the location of a new and larger museum. The Selangor Museum was built in 1888, then integrated with the Taiping Perak museum to become the Federated Malay States (FMS) Museum. Since Malaya, (which was then under the British colonial administration), the FMS Museum came under the administration of the Federated Malay States Museums Department. In 1945, as a result of bombing incidents, a considerable amount of artifacts were destroyed. Those that were salvaged were temporarily housed at the Taiping Museum. Currently there are about 101 museums in Peninsular Malaysia (2007).

The plate 1.01 below shows the display showcases design schemes at National Museum in 2005 (before renovation). A combination of glass and wood based materials were generally employed for the showcases. The plate 1.02 below shows the view of textile wall mounted display showcase at the Malaysian Culture Gallery, National Museum in 2005 (before renovation).

Plate 1.01 ; The plate shows the display showcases design scheme at National Museum during 2005 before renovation.
Source: Norashikin Abdul Karim, 2005

Plate 1.02 ; The plate shows the textile wall mounted display showcase at National Museum before renovation
Source: Norashikin Abdul Karim, 2005

The plate 1.03 below shows the view of display showcases scheme at galleries A and B and plate 1.04 below shows the view at galleries C and D in National Museum after renovation work (2008).

Plate 1.03 ; The plate shows the view of display showcases scheme at galleries A and B in National Museum after renovation work (2008).
Source: Norashikin Abdul Karim, 2007

Plate 1.04 ; The plate shows the view at new scheme galleries C and D in National Museum after renovation work (2008).
Source: Norashikin Abdul Karim, 2007

Artifacts Deterioration: Preservation of Artifacts in Showcases

Plate 1.05 ; The plate shows the traditional Malay Head gear accessories for courtly ladies at National Museum Kuala Lumpur.
Source : Norashikin Abd.Karim, 2007

Plate 1.06: The plate shows that the curator is measuring the reading of light intensity (Lux) in the ceramic display showcase at National Museum Kuala Lumpur.
Source: Norashikin Abdul Karim, 2008

The serious problem was the deterioration of artifact in display showcases, found at the National Museum Kuala Lumpur prior to renovation in 2007. Plate 1.05 shows the artifact deterioration sample at the National Museum. Artifacts deterioration occurs due to the neglect of the 6 environmental factors during the process of display in showcases. For example, the traditional Malay head gear accessories above suffer deterioration such as oxidation, dullness and dusty surfaces. This problem was also identified by Geoff Pickup in his report. Artifact collection must be cared for in a manner so as to preserve them for the foreseeable future. The curator's duty is to control the display environment with continuous checking of showcase's reading (See plate 1.06 above).
David Dean stipulates 3 environmental factors or 3 agents of deterioration of display artifacts (D. Dean, 1994, pp. 67-81):

Temperature

A major part of display designing involves modifying and enclosing spaces. It should know the capabilities of the museum heating, ventilation, and air conditioning system (HVAC). Climate control is more difficult. A refrigerated air conditioner can help maintain proper temperature levels in both display and storage areas. Achieving temperature control means that relative humidity is more easily controllable. Temperature can be maintained and collections will remain more stable.

Relative Humidity (RH)

Relative humidity is a amount of water vapour and will hold at saturation at certain temperature. For the display case it has the higher temperature inside the case, the lower the relative humidity (RH).

Natural and Artificial Lighting

Light is a visible and invisible, energy and ingredient for all chemical and mechanical process of heat form of energy. Natural sunlight contains all frequencies of electromagnetic energy or radiation, the invisible that damages objects most. UV light and the visible light most harmful type of light for collections to energize and damage the molecules and chemical change causes skin cancer. The materials of sensitive to UV are hair, feathers, leather, silk, ivories, and dyes**.** Artificial light sources available for general illumination, fluorescent lighting produce the most ultraviolet rays can reduce damage with using the UV filter.

Controlling Relative Humidity in Display Showcases

Relative humidity (RH) is the ratio of water vapour in the air to the amount that it could hold if fully saturated, it is expressed as a percentage. Low levels of relative humidity imply dry conditions since the air is then capable of taking up moisture. High values are recorded when the air is already humid and unable to take up much more moisture, for example in humid or wet weather. RH is measured with a 'hygrometer'(Paine, 2006, p. 172). According to Paine (2006) again, organic materials are also susceptible to attack from mould/fungi if conditions are humid, over 65 per cent RH. Metallic objects can also be adversely affected by high levels of RH, which encourage corrosion. RH needs to be as low as possible for all metallic objects. Paine (2006) advises that museums should aim to have a constant RH all year round in display showcase. Ideally, it should not rise above 60 percent or fall below 40 per cent, and should be stabilized at 50-5 per cent for a mixed collection. In older buildings, where condensation can occur at this level, 45-50 per cent RH is an effective compromise. According to Tim Padfield, the relative humidity (RH) in museums holding a variety of materials is usually set at 50 0r 55 percent (%). The reason for this standard is difficult to find because the values have been redefined so many times in the literature (Padfield, 1994, pp. 6-8).

Controlling Temperature in Display Showcases

Temperature is measured with a 'thermometer'. Temperature is an important factor in RH because the ability of air to hold water vapour increase with higher temperature and decrease with lower temperatures. Change in temperature in a display showcase area can therefore affect levels of RH. Changing temperature can also speed up the rate of biological/chemical deterioration (Paine, 2006, p. 173). According to Paine (2006), museum collections do not require high temperatures. A temperature of 18◦C (+/-2◦C) is an acceptable temperature for the display of a mixed collection. Beware of localized high temperatures created by heaters or spotlights. According to ICOM (2004), for several decades, the standard in humidity and temperature advice was simple, and rigid: aim to achieve 21◦C with 50% RH, and very little fluctuation permitted. This standard grew out of a concern for paintings and furniture in Europe, and was indeed beneficial to those collections. Unfortunately, it was not at all beneficial to modern archival and

paper materials, which needed cool and dry conditions for long life. (Michalski,2000) It was not beneficial to corroded metals, which needed dry conditions. It was unnecessarily stringent for many collections, such as paintings, wooden artifacts, parchment, which were at serious risk only from damp. Finally, as noted under sustainability, it was an expensive standard to implement at a building level (Stefan Michalski, ICOM, 2004a).

Controlling Light in Display Showcases

Light is another critical environmental factor. Natural sunlight is the most harmful form of energy for museum collections. It contains all frequencies of electromagnetic energy including heat and ultraviolet light. If sunlight is not necessary, it is best to keep it out of the galleries altogether. If it is required, collection objects such as textiles, paintings, drawings, woods, and such materials should not be placed in direct sunlight. Metal and some ceramics are not greatly impacted by sunlight, but it is best not to expose anything to direct sunshine (G. E. D. Dean, 1996, p. 119). Light can cause serious damage to museum collections and is one of the greatest threats to the long-term care of collections. Light is a form or energy and can cause colour fading as well as deterioration in the materials from which museum objects are made. All museum objects are to a greater or lesser extent affected by light, although metals and ceramics are not affected to the same extent as other materials. Some materials are extremely sensitive to light and every care needs to be taken to reduce their exposure levels. Special care should be taken to protect museum items made of more than one type of material. The intensity of light is measured by 'light meter' using units of measurements known as 'lux unit'. Recommended maximum levels of illumination range from 50-200 lux.

The following levels should not be exceeded for the categories of material shown (Paine, 2006, pp. 169-170):

a) 200 lux – oil/tempera paintings, undyed leather, lacquer, wood, horn, bone and ivory, stone.
b) 50 lux – costume, textiles, watercolour painting, tapestries, furniture, prints and drawings, postage stamps, manuscripts, ephemera, miniatures, wallpaper, dyed leather and most natural history and ethnographic items.

The lighting standard is, this is usually based on Garry Thomson's recommendation (in The Museum Environment), itself in agreement with earlier authorities, of 50 – 200 lux, according to material. This standard has prompted many an angry memorandum from conservators complaining about 70 lux in the costume collection. If this 70 lux comes from a tungsten lamp it does less damage than 10 lux from a blue sky. Here again the problem lies in the conservator's or architect's acceptance of the standard as a mere number, without understanding the underlying photochemistry (Padfield, 1994, pp. 7-8).
For many decades, the lighting standard in museums stated that textiles and works on paper should be illuminated at only 50 lux and paintings and other painted surfaces 150 lux. (Lux is the SI international unit of light intensity). For comparison, full sunlight can be up to 100,000 lux, indirect daylight 10,000 lux, bright spotlamps are 2000 lux, office lighting typically aims to provide 750 lux on the desk, and a candle held an arm's length away shines 1 lux on you (Stefan Michalski, ICOM, 2004a, p. 78).
ICOM (2004) stated that several complications arose. Older viewers cannot see details at 50 lux – the usually recommended lighting level for light-sensitive textiles, watercolours and manuscripts, while even young viewers cannot see complex or dark for no good reason. On the other hand, many others are so sensitive to light that continual illumination even as low as 50 lux will cause fading after many years of permanent display. The author has reviewed all the literature on visibility, as well as all the useful data on textile fading, and developed a general lighting guideline.

METHODOLOGY

Case Study Method

Empirically, design research is generally based on case studies. A case study is an-depth study of the cases under consideration, and this depth has become another feature of the case study approach. French sociology clearly describes it as a monographic approach. Case studies employ various methods. These can include interviews, participant observation, and field studies, Jacques Hamel (1993:1). There are currently about 126 museums in the Peninsular and East Malaysia. This study specifically observes the museums in Peninsular Malaysian only (see plate 1.35 above). The following museums had been taken as case studies:

1. National Museum, Kuala Lumpur (Malaysia National Museum) -1963
2. Terengganu State Museum (The Largest Museum in Malaysia) -1977
3. Islamic Art Museum Malaysia (The Modern Museum in Malaysia) -1998

Methods of Measurement (Primary Data)

One method of measurement was involved in this particular research, it was on-site measurements of display case environmental performance of Light intensity (*Lux*), Relative Humidity (RH) and Temperature (◦C). Therefore, the 35 display showcases in Inventory 3 were finally selected by the researcher to be in last stage and be measured in detailed. These are:

1. 12 showcases in the Islamic Art Museum
2. 10 showcases in the National Museum
3. 13 showcases in the Terengganu State Museum

Upon analysis, it is discovered that the following categories of artifacts are popularly displayed in the 3 chosen museums:

1. Sensitive artifact : Textile and manuscript
2. Non-Sensitive artifact : Coin, ceramic/pottery and weaponry

Once the choice of the 5 artifacts was established the researcher will include the following scope of study which is the study on the 2 types of showcase design, namely ‘Free Standing Showcase’ and ‘Wall Mounted Showcase’.

RESULTS AND DISCUSSIONS

The following Table 1.01 below show the readings taken for temperature, relative humidity (RH) and Lux for the measured sensitive and non-sensitive artifacts that are textile, manuscript, coins, ceramic/pottery and weaponry display showcases at National Museum, KL, Terengganu State Museum and Islamic Art Museum.

Textile Display Showcase	Light Intensity (Lux)	ICOM (Lux)	Temperature (◦C)	ICOM (◦C)	Relative Humidity (RH)	ICOM (RH)
MN/T/FS1	a. 60* b. 26	< 50Lux	*28 ◦C	24 ◦C	57.3 %	< 70%
MN/T/WM2	a. 755* b. 211*		*25.6 ◦C		66.1 %	
MN/T/WM3	a. 733* b. 702* c. 386*		*25.4 ◦C		66.8 %	
MN/T/FS4	a. 70* b. 160* c. 130*		*26.6 ◦C		63.8 %	
MT/T/WM1	a. 20 b. 120* c. 80* d. 100*	< 50Lux	*26.0 ◦C	24 ◦C	61.6 %	< 70%
MT/T/WM2	a. 1100* b.400* c. 200* d. 100*		*24.7 ◦C		58.0 %	
MT/T/WM3	a. 580* b. 100* c. 220 d. 60		*25.5 ◦C		53.4 %	
MT/T/FS4	a. 140* b.280* c. 40		24.0 ◦C		61.6 %	
IAMM/T/WM1	44		24.0 ◦C		65.0 %	
IAMM/T/WM2	44		24.0 ◦C		68.0 %	
IAMM/T/FS3	66*		24.0 ◦C		66.0 %	
Manuscript Display Showcase	**Light Intensity (Lux)**	**ICOM (Lux)**	**Temperature (◦C)**	**ICOM (◦C)**	**Relative Humidity (RH)**	**ICOM (RH)**
MN/M/FS5	a. 975* b. 28 c. 595*	< 50Lux	*25.6 ◦C	24 ◦C	66.1 %	< 70%
MN/M/WM6	a. 577* c. 633* b. 335*		*25.4 ◦C		66.8 %	
MT/M/WM3	a. 20 b. 40		*26.6 ◦C		67.0 %	
MT/M/FS4	a. 400* b. 210* b. 100* d. 60*		*27.4 ◦C		63.0%	
IAMM/M/WM1	54*		24.0 ◦C		66.0 %	
IAMM/M/WM2	44		24.0 ◦C		52.0 %	
IAMM/M/WM3	73*		24.0 ◦C		66.0 %	
Coins Display Showcase	**Light Intensity (Lux)**	**ICOM (Lux)**	**Temperature (◦C)**	**ICOM (◦C)**	**Relative Humidity (RH)**	**ICOM (RH)**
MN/C/WM7	a. 60 b. 50 c. 50	Maxs. 150 Lux	*28.5 ◦C	21 ◦C	57.4 %	45% - 65%
MT/C/FS7	a. 60 b. 300* c. 180*		*25.7 ◦C		59.3 %	
MT/C/FS8	a. 60* b. 80* c. 40		*27.6 ◦C		64.8 %	
IAMM/C/FS7	a. 176* b. 285*		*24.0 ◦C		65.0 %	
Ceramic/Pottery Display Showcase	**Light Intensity (Lux)**	**ICOM (Lux)**	**Temperature (◦C)**	**ICOM (◦C)**	**Relative Humidity (RH)**	**ICOM (RH)**
MN/CP/FS8	a. 220* b. 220* c. 120*	Maxs. 150 Lux	*25.5 ◦C	21 ◦C	65.3 %	45% - 65%
MT/CP/WM9	a.280* b. 480* c. 80		*27.5 ◦C		*66.3 %	
MT/CP/WM10	a. 3000* b. 660* c. 380*		*27.6 ◦C		57.3 %	

IAMM/CP/FS8	**58**		***24.0 ◦C**		**64.0 %**	
IAMM/CP/FS9	**44**		***24.0 ◦C**		**65.0 %**	
IAMM/CP/WM10	**66**		***24.0 ◦C**		**64.0 %**	
Weaponry Display Showcase	**Light Intensity (Lux)**	**ICOM (Lux)**	**Temperature (◦C)**	**ICOM (◦C)**	**Relative Humidity (RH)**	**ICOM (RH)**
MN/W/WM9	**a. 480*** **b. 110***	**Maxs. 150 Lux**	***25.7 ◦C**	**21 ◦C**	***67.8 %**	**45% - 65%**
MN/W/FS10	**a.170*** **b. 40**		***26.4 ◦C**		***62.3 %**	
MT/W/FS11	**a. 60 b. 50 c. 30**	**Maxs. 150 Lux**	***25.1 ◦C**	**21 ◦C**	**56.4 %**	**45% - 65%**
MT/W/WM12	**a. 100 b. 60 c. 30**		***25.1 ◦C**		**56.5 %**	
MT/W/WM13	**a. 100 b. 70 c. 340* d. 80**		***26.0 ◦C**		**56.0 %**	
IAMM/W/WM11	**45**		***24.0 ◦C**		***67.0 %**	
IAMM/W/FS12	**46**		***24.0 ◦C**		**65.0 %**	

Table 1.01: The table shows the the readings taken for temperature, relative humidity (RH) and Lux for the measured sensitive and non-sensitive artifacts display showcases at 3 Museums. (MN-Muzium Negara, MT-Muzium Terengganu, IAMM-Islamic Art Museum, T-Textile, M-Manuscript, C-Coins, CP-Ceramic/Pottery, W-Weaponry, FS-Free Standing, WM-Wall Mounted, (*) – not comply.

CONCLUSIONS

As a conclusion of this paper on environmental standard reading for museum artifacts in display cases, it can be concluded here that the Lux, temperature and relative humidity readings of display cases for 5 local artifacts at National Museum, Terengganu State Museum and Islamic Art Museum were not seriously follow the ICOM readings guidelines. The finding reveals that 98% of sensitive artifacts and 23% of non-sensitive artifacts in Malaysian museum are contravened with the guideline. Thus, it proves that Malaysian museums do not comply with the proposed reading guideline. To ensure that artifacts are properly conserved begins from the interior spaces of the museum itself whereby temperature, humidity and total light intensity (lux) should be controlled to adhere to ICOM's standard. This is so that the display showcases are in good condition. Consequently, the control of the interior environment (macro-environment) to the standard of ICOM will effect to the control of the showcase interior (micro-environment).Therefore, the design of display showcases must take into consideration the character/type of the artifact to be displayed. The showcase display and preservation aspects like measuring the right temperature, relative humidity (RH) and light intensity (lux) according to the ICOM standard must be seriously adhered to.

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