

THE ROYAL AIR FORCE MUSEUM'S POLICY FOR MONITORING LIGHT LEVELS

INTRODUCTION

1. This policy addresses the monitoring of light levels in storage and public display areas of the Museum's sites at London, Cosford and Stafford.
2. Ultraviolet radiation (UV) and visible light will be monitored as exposure to either can cause harm to museum objects.
3. By monitoring light levels, and therefore the resulting impact on objects, the Museum will be able to take steps to limit and prevent damage to the collections.
4. Although damage to light-sensitive material cannot be completely avoided, it can be reduced by taking certain measures. The most important are eliminating UV as far as possible, limiting light intensity (illuminance) and reducing the length of exposure.
5. The table at Annex A lists object materials represented in the RAFM collections, their sensitivity to light, and the maximum recommended light levels to ensure their preservation.

DEFINITIONS

6. 'Light source' will refer to both artificial lights and windows. Artificial lights are those positioned on ceilings, floors and in showcases.
7. 'Light-sensitive' will refer to material of moderate or high sensitivity to light (see Annex A).
8. 'Filter' will refer to both UV and visible light filters unless specified.

DAMAGING FACTORS

9. The most damaging part of light from any given source, whether natural or artificial, is its UV content. UV will be eliminated as much as possible by the use of UV filters on windows and artificial lights.
10. The deterioration caused by visible light is cumulative and irreversible. It is a function of both the intensity of light (illuminance), and the length of exposure to it. These factors will be mitigated by the selection of appropriate artificial lights and visible light filters, and by reducing the total length of exposure of light-sensitive material.
11. As artificial lights deteriorate over time this causes light levels to change, and filters also lose their effectiveness with age. To ensure their continued effectiveness artificial lights and UV filters will be replaced when necessary.

OBJECTIVES OF MONITORING PROGRAMME

12. To identify light sources that require filters.
13. To identify artificial lights that are unsuitable for the objects they illuminate. In order to do this the maximum recommended exposure for light-sensitive material will be calculated (see Annex A).
14. To facilitate a programme of replacing artificial lights and filters.
15. To initiate measures to reduce the level of exposure of light-sensitive material by various means, including the selection of appropriate artificial lights and filters, rotating exhibits, limiting display illumination and the use of replicas.

MONITORING ACTIVITIES

16. Monitoring activities will vary depending on whether spaces are for storage or display, whether natural light enters these areas, and the light-sensitivity of the material housed there.
17. All monitoring of light levels will be done by taking spot readings¹.
18. The findings of the monitoring activities detailed below will be recorded and used to inform programmes to replace artificial lights and filters, and to initiate measures to reduce the level of exposure of light-sensitive material.
19. The Museum Registrar will collate and present the findings of all monitoring activity to Curatorial Heads of Departments, Director Collections Division, and the Buildings Services Manager, comparing performance with the target conditions given at Annex A, and suggesting actions for improvement.

Monitoring UV

20. Spot readings will be taken from each light source **in all display and storage areas** to determine whether UV filters are needed. These readings will be carried out according to a 12 month timetable and will be repeated annually – see Environmental Monitoring Procedure – Light, Annex C1 (RAFM/DCM/2/6/25/5).

Monitoring visible light

21. Spot readings will be taken from light sources that illuminate light-sensitive objects **in display and storage areas**. These readings will be carried out according to a 12 month timetable and will be repeated annually – see Environmental Monitoring Procedure – Light, Annex C2 (RAFM/DCM/2/6/25/5).

22. A natural lighting survey will be carried out in each **display area** exposed to natural light so that the total exposure of light-sensitive objects to visible light can be calculated. Spot readings will be taken at regular intervals over a 12 month period – see Environmental Monitoring Procedure – Light, Annex C3 (RAFM/DCM/2/6/25/5).

¹ A single measurement of UV or visible light.

23. Natural lighting surveys will not be carried out in storage areas as material should be positioned away from direct sunlight and/or housed in protective enclosures.

OTHER ACTIVITIES

24. Light monitoring may be carried out by curatorial staff in areas and at times other than those described above to record light levels in areas of local concern.

25. Lights will be switched off in display and storage areas when not in use.

26. Light-sensitive material will be positioned away from direct sunlight.

27. Light levels will be checked before the installation of new exhibits to ensure they fall within the maximum recommended levels for the material to be displayed (see Annex A).

28. Light monitors will be sent for calibration testing every two years, in accordance with the manufacturer's recommendation.

29. Appropriate professional advice will be sought regarding the light-sensitivity of display items and the selection of appropriate artificial lights and filters. A list of suitable contacts is given at Annex A of the Environmental Monitoring Procedure – Light (RAFM/DCM/2/6/25/5).

HEALTH AND SAFETY CONSIDERATIONS

30. Where it is necessary for staff to enter showcases to take light readings this will be done in accordance with the relevant showcase Risk Assessment as held by the Building Services Department. Staff will also receive training in manual handling and lifting techniques as appropriate.

FUTURE ACTIVITIES

31. Detailed plans will be produced to facilitate a programme to replace filters and artificial lights. The plans will show:

- a) the locations of all artificial lights with the maximum recommended light levels for the material they illuminate
- b) the last recorded spot readings
- c) the specifications of artificial lights and filters
- d) the date that any artificial light or filter should be replaced.

32. Measures to reduce display lighting levels will be investigated, according to the findings of monitoring activity, for example the installation of fabric coverings or automated lighting.

SOURCES

33. Wilson, Jackie, ed; "Lighting for Museums and Art Galleries" Lighting Guide LG8: 1994; The Chartered Institution of Building Services Engineers; London; 1994.
34. Thomson, Garry; "The Museum Environment" (2nd ed.) Butterworth-Heinemann Series in Conservation and Museology; Butterworth-Heinemann; Oxford; 1998.
35. "Benchmarks in Collections Care"; Resource; 2002.

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Version 1: Approved by the Trustees 25 February 2008

Annex A

Light levels should not exceed those indicated below:

Sensitivity <i>Materials</i>	Visible light²	UV³
None <i>metal;</i> <i>stone;</i> <i>glass;</i> <i>ceramics;</i> <i>enamel</i>	Illuminance: N/A Exposure ⁴ : N/A	N/A
Moderate <i>oil and tempera paintings;</i> <i>undyed leather;</i> <i>wood;</i> <i>plastics;</i> <i>painted metal surfaces;</i> <i>painted enamel</i>	Illuminance: 200 Lux Exposure: 600,000 lux/hours per year	75 µW/Lumen
High <i>textiles;</i> <i>costume;</i> <i>dyed leather;</i> <i>fabric aircraft surfaces;</i> <i>organic pigments/dyes;</i> <i>archival material;</i> <i>manuscripts;</i> <i>newspaper;</i> <i>photographs;</i> <i>watercolours;</i> <i>gouache;</i> <i>prints;</i> <i>drawings;</i> <i>natural history exhibits;</i> <i>fur</i>	Illuminance: 50 Lux Exposure: 150,000 lux/hours per year	75 µW/Lumen

² Visible light is measured in terms of its intensity (illuminance), and is expressed in **Lux**, which is one light unit (**Lumen**) per square metre

³ Ultraviolet radiation is expressed as a proportion of visible light and is measured in microwatts per Lumen (**µW/Lumen**) of visible light

⁴ The total length of exposure to visible light is measured in **lux/hours**
(lux/hours) = time (hours) x illuminance (lux)