

## LIGHTENING THE LEVELS - CONTROLLING DAYLIGHT IN CHALLENGING SPACES

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### ABSTRACT

The National Trust for Scotland (NTS) cares for over fifty properties with historic material culture collections on open display. These properties range from Scottish baronial castles to thatched cottages; each houses collections that are susceptible to light damage. For the past forty years, the NTS has been investing in light protection measures, including ultraviolet (UV) absorbing window film and roller blinds. This work has been undertaken on an ad-hoc basis, leaving some properties with little or no protection. To address this problem the NTS has funded 'Lightening the Levels': an accelerated project to achieve in two years what would take twenty at the current rate.

This paper explains the various ways the NTS is managing light across its portfolio, showing the scale and scope of the project. It will focus on the challenges that the more unique properties create, such as geographic location, access, the Scottish weather, and the limitations of working in historic interiors. It will also examine the installation and decision-making behind UV film and blinds in these interesting spaces. It will look at the installation of LED lighting in display areas and the collaborative approach the Collection Conservation Services (CCS) team has taken with other departments. A key driver of the project is how we plan to engage staff and volunteers with the practical aspects of light management. An important part of this has been the introduction of property specific light plans, which empower staff and volunteers to control light effectively.

Finding the right combination of protection measures for each property has been very important and there is no 'one size fits all' solution. The project is learning as it goes along; increasingly the importance of getting staff and volunteers engaged has been shown to be vital to the success of the project.

### KEYWORDS

National Trust for Scotland; Daylight; Control; Historic houses; Ultraviolet

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## Introduction

Light as an agent of deterioration can be difficult to manage; we require light to view the historic interiors and enjoy visiting historic properties. Often daylight is the most appropriate lighting for these spaces but it also causes objects to deteriorate, colours to fade or darken, and structures to weaken (FIG. 1 and 2).



FIG. 1 - Light damage to chair leg. © National Trust for Scotland.

FIG. 2 - Light damage to textile. © National Trust for Scotland.

The National Trust for Scotland (NTS) cares for over fifty historic properties with in-situ collections that are susceptible to light damage. For the past forty years, the NTS has been investing in light protection measures such as roller blinds and ultraviolet (UV) absorbing window film. This work has been conducted on an ad-hoc basis, leaving some properties with little or no protection. To address this problem the NTS has funded 'Lightening the Levels': an accelerated project to achieve in two years what could take upwards of twenty years with the existing ad-hoc approach.

## Lightening the levels

Lightening the Levels is an accelerated two-year project to improve daylight management across the NTS portfolio. To improve how

daylight is managed sounds a broad, unspecific aim, but the project has definite objectives and outcomes. The first of these objectives involves ensuring that each property has the physical measures in place to manage daylight effectively. The second objective focuses on ensuring that staff and volunteers are aware of light damage and have enough training and knowledge to use these physical measures effectively. Additionally, other smaller work-streams exist for the project, such as gathering information on light-emitting diodes (LEDs) and low-energy lighting; updating information on light and light management at properties; and future-planning for the replacement of UV film. The intended outcomes of the project are summarised as follows:

- To provide adequate UV film and blinds to relevant NTS properties within two years, where no provision currently exists.
- To replace and repair, within two years, all ageing or damaged daylight protection measures that would need replacing in the next five to ten years.
- To provide all relevant properties with light management protocols to ensure effective use of blinds.
- Produce a long-term plan for cyclical maintenance to allow future-planning of replacement UV film.
- Investigate low-energy, low-UV solutions to the re-lamping of historic light fittings.

### **Background to the project**

Planning and information gathering for ‘Lightening the Levels’ started much earlier than the commencement of the project in February 2015.

In 2011/12, light and light management was the work placement focus of a year-long Institute of Conservation (Icon) internship funded by the Bute Memorial Fund at the NTS. One of the aims of the internship was to raise the profile of light as an agent of deterioration within the NTS and to begin gathering information on what light protection measures were in place at each of the fifty properties. A basic light audit exercise was undertaken for each historic house to record information about current measures in each room with collections. Spot readings for lux levels were taken and UV film was inspected to ensure it was functional at under seventy-five  $\mu\text{W}/\text{lm}$  (PAS:198, 2012, p.23). This information was then presented in a short report providing clear recommendations for improvements. From the light reports, each property was given a traffic light colour-code to classify the adequacy of existing light protection measures.

- **Grade 1-** Property has good control measures in place, such as blinds, shutters, and UV film. They are used in an effective and systematic manner.
- **Grade 2-** Property has some control measures and they are occasional used, but generally on an ad-hoc basis, with little or no system in place.
- **Grade 3-** Property has little or no control measures in place and has no system or plan relating to their use.

In February 2015, seven properties were rated Grade 3, which have little or no control measures in place and require the installation of new protection measures. Twenty-seven properties were rated Grade 2 and required some work to bring the protection measures up to standard. Nearly all properties require a light management plan; light plans are clear, simple procedures for staff and volunteers to follow to ensure light levels are acceptable through judicious use of blinds,

shutters and curtains. An effective light plan should take into account property staffing, opening hours, orientation of rooms and material collections. To address the lack of light protection highlighted by the light audits, the 'Lightening the Levels' project was proposed as a one-off initiative to look at light protection as a whole within the NTS and was supported by the Senior Management Team. The project is led by a Project Conservator and funded from a discrete conservation deficit fund.

### **Project planning**

From the information in the light audits and light reports, twenty properties were highlighted as not having adequate protection measures and would require work to bring the current protection measures up to standard. For the project, adequate protection measures are defined as follows:

- All standard windows in collections areas have functioning UV film that is in a good condition, i.e. not peeling or bubbling and not over fifteen years old.
- The property has clean working blinds in appropriate collections areas and these are in keeping with the historic environment.

The timescale for the project is two years and has been split into two phases, each phase lasting a year and with ten properties requiring installations in each phase. This has allowed the project to combine the larger and smaller properties, as well as group the work in terms of geographical location, organising the work into one or two-week slots. Most installations, particularly those requiring new UV film, are organised between April and October, as the installations are less likely to be hampered by poor weather. The project will focus on light

plans in the winter months of December to February, preparing them for the start of the new season in late March.

### Scope and scale

Managing daylight in historic houses using UV film and blinds is nothing new: these are standard protection measures found in many properties. What is notable about this project is the scale and scope: the improvement of light management across fifty properties, spanning the length and breadth of Scotland in only two years (FIG. 3). Each property is very different in size, scale and type of collection, and each therefore has different requirements for light protection. Some properties require completely new UV film and blinds throughout, whereas others require maintenance or repair (i.e. fixing damaged blinds, or replacing failed or missing UV film). Some properties already have the relevant protection measures in place, though need to improve on how they use the existing blinds. Each property needs to be assessed individually and decisions made on what is the most appropriate and useful measure for that particular property.

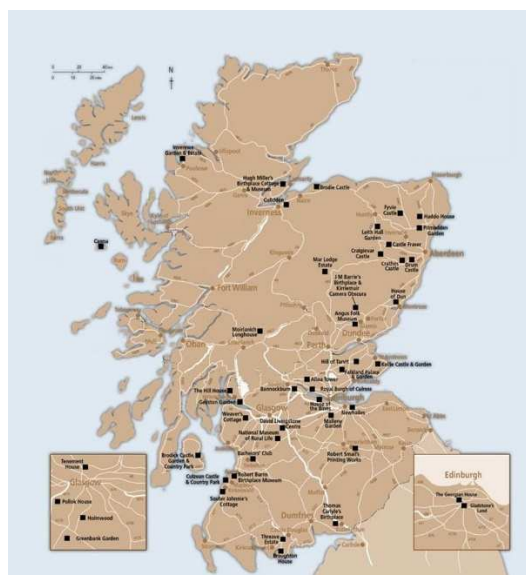


FIG. 3 - Map showing properties covered by the project. © National Trust for Scotland.

## **Tendering for contractors**

From the initial light audit data, it was clear that at least twenty properties required some level of installation or repair of UV film and blinds. Because of the cost threshold, it was necessary to tender for an experienced contractor. The tender stipulated a contractor with experience of working in historic houses, who could remove and apply UV from/to old or historic glass, and also install traditional sun blinds. There are few companies who offer the installation of both UV film and blinds, and who also have the relevant experience. A total of three suitable contractors from across the United Kingdom were identified as meeting the tender criteria. As part of the tender process all three contractors were subsequently invited to visit a property, submit an example quote, and provide documentation specifying how they met the criteria of the tender. Each contractor's quote and documentation was marked according to a NTS-agreed matrix, with four criteria, including experience of working in a historic house, cost, and quality of documents submitted. Once rated, and after agreement from the CCS team and Procurement team, the contractor with the highest score, that met all requirements, was awarded the contract.

Lessons were learnt during this process. At the start of the project it was anticipated that the tender process would only take three months, but from start to finish the process took around five months to complete. The tender process was much longer and more involved than first expected and this had an impact on the project's schedule and meant installation work at properties did not begin until late summer. The importance of getting the right contractor with the correct skills and experience cannot be underestimated and is vital to the success of the project.

## **Installation and challenges**

Each property has its own challenges for getting light protection measures installed, such as access, geographic location, the Scottish weather, or just the historic environment itself. Many of the properties in the north region can be difficult to access when the weather is poor and their closed season often reflects this. Some properties are located on islands, making access difficult and reliant on weather. Other properties are busy with functions and events and do not have a long closed period when work can be undertaken, requiring that the work takes place when the property is open to the public. Most often the historic houses themselves bring challenges, including the environmental conditions, as properties can be cold and damp places to work in the winter months; from antidote evidence at other NTS properties this is not an ideal environment for applying UV film. Not all properties have electric lighting, meaning that any work must be done in daylight hours. Often large items need to be moved to allow access to windows, and smaller items carefully packaged and stored away from the area of work. Some properties require scaffolding to reach high-level windows. Many properties have very few non-collection areas or storage space, making it difficult to set up or store equipment in a safe spot. Other properties are so small that moving ladders and any large equipment can be difficult.

Arranging the installations can also have challenges. Some properties are so small that the work may only take a few hours and need to be grouped with others to make the best use of the contractors' time, using economy of scale. Others properties are large enough that work may take over two weeks to complete and need to be carefully scheduled to suit the operation of the property. All of the twenty



properties planned for installations will have one or more of these challenges to overcome for a successful installation (FIG. 4).



FIG. 4 - Removing UV film for an installation.  
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### **‘Light Plans’ – how we can use our blinds more effectively**

As well as installing new blinds at properties, it is also important to engage staff and volunteers in using the blinds systematically and effectively. A blind left up all day is no better than no blind at all. Currently the NTS has no standard documentation or protocols for light plans; a small number of properties do have them, though this is as a result of staff at individual properties being particularly industrious and these pockets of good practice will often change when staff move on or other priorities take over.

In Phase One, it was necessary to pilot a light plan at a property to allow the project to start putting together protocols for using blinds. The light plan needed to be simple to understand and adaptable for other properties, as well as it being effective. The Georgian House was used as a pilot: this is a medium-sized property in the centre of

Edinburgh and four principle rooms were chosen to pilot the light plan. Two visits were made to the property to take spot readings; this, combined with Hanwell lux data and the Sunseeker mobile application, gave a good indication of light levels room by room at various times of the day during the open season. Visiting the property also allowed time to speak to staff and volunteers about light in the rooms and how the property was staffed. This was invaluable for getting a realistic working light plan. From this pilot exercise a draft template was produced, as well as a methodology on how to put a light plan together (FIG. 5 e 6).

Room: Dining Room		Blind positions for Georgian House		
<b>Light Sensitive Contents:</b> <ul style="list-style-type: none"> <li>• Textile screen</li> <li>• Leather chairs</li> <li>• Oil paintings</li> </ul> <b>Collections to watch</b> The textile screen near the fireplace and leather chairs need protection from direct daylight.		Bright sunny day	Cloudy day	Dull dark day
	10:00-14:00			
<b>Notes:</b> <ul style="list-style-type: none"> <li>• Two south facing windows.</li> <li>• Windows are set in alcoves.</li> <li>• Working Scottish Holland blinds, requires two hands to operate.</li> </ul>	14:00-18:00			
	<ul style="list-style-type: none"> <li>• South facing windows cause daylight peaks around 12-2pm</li> <li>• Try to avoid direct sunlight on collections</li> </ul>			
<b>Light Protection Measures:</b> <ul style="list-style-type: none"> <li>• Ultraviolet film</li> <li>• Scottish Holland blinds</li> <li>• Shutters</li> <li>• All lamps are LEDs.</li> </ul>		If you don't feel comfortable using the blinds please ask for help		
For more information please contact Anna Starkey, Project Conservator.				

FIG. 5 - Light Plan front for the Georgian House. © National Trust for Scotland.

## The Georgian House Blind Drill

**For use by Room Guides to help protect our collections from light damage.**



Light damage on red leather armchair



Faded and weakened curtain linings



the National Trust for Scotland  
a place for everyone

FIG. 6 - Light Plan back for the Georgian House. © National Trust for Scotland.

Putting together the documentation for the light plan is only half of the task. For a light plan to be effective it must be used by property staff and volunteers as part of the day-to-day operation of a property. This can be difficult to achieve; some properties have very limited staff and volunteers and will not always have someone in the rooms to look after the blinds. For some properties, this will be a culture change, getting staff and volunteers to think differently about how they use the blinds. Below are a few examples of ways the project is trying to encourage the use of light plans at properties.

- Extra time will be spent visiting the properties when they are open to provide an informal opportunity to speak to seasonal staff and volunteers.
- It was found that although housekeepers often open up the rooms for the day, volunteer guides were the people most likely to be using the light plan during opening hours. Knowing who to target with the light plan at each property is important.
- Key members of staff will be involved in the production of the light plan, which should be seen as a collaborative effort and not something thrust on the property staff without their input.
- Getting the property manager to 'buy in' to the advantages of using the light plan is extremely important, and they will be involved in the process wherever possible.
- Pre-season meetings will be attended by the project to introduce the light plans to staff and volunteers.
- Light plans will follow the installation of new blinds and UV film wherever possible, ensuring that the new protection measures are used effectively.

Getting the light plans accepted as part of the everyday care of the property is one of the biggest challenges the project faces and requires

a variety of methods and strategies to achieve this. Getting light plans accepted at properties will not happen overnight and will require operational changes at many properties.

### **Low energy lighting**

As well as managing daylight, the NTS is interested in finding low-energy, low-UV lamps for its historic display rooms. This has the two-fold benefit of lowering energy costs and reducing the damaging UV radiation which some lamps can emit. Choosing a lamp for a historic property is not straightforward: the look of the lamp, its colour temperature, colour rendering index (CRI), weight, and the amount of UV it emits, all have to be taken into account. The low-energy lamp market is constantly changing and expanding, and the project is looking at various different options, but there is no 'perfect' lamp that meets all requirements. Other departments within the NTS are also interested in looking at low-cost lighting and we are working together to share knowledge and experience to establish a robust plan for re-lamping historic properties.

### **Public engagement and social media**

From the outset of the project, communication and public engagement have been seen as important. This has been both internally within the NTS – ensuring property staff and senior management are aware of the project – and externally to visitors at properties. The project has its own blog, which is updated regularly to keep track of the installations and other work at properties. The NTS Twitter feed and Facebook accounts have also been utilised to increase views of the blog, and widen the audience. The project has an

internal intranet page and has been represented at a number of NTS events, such as conservation days and the Annual General Meeting. Also, where work has been carried out when a property has been open to the public, there has been an effort to engage the visitors and explain about how we protect collections from light damage.

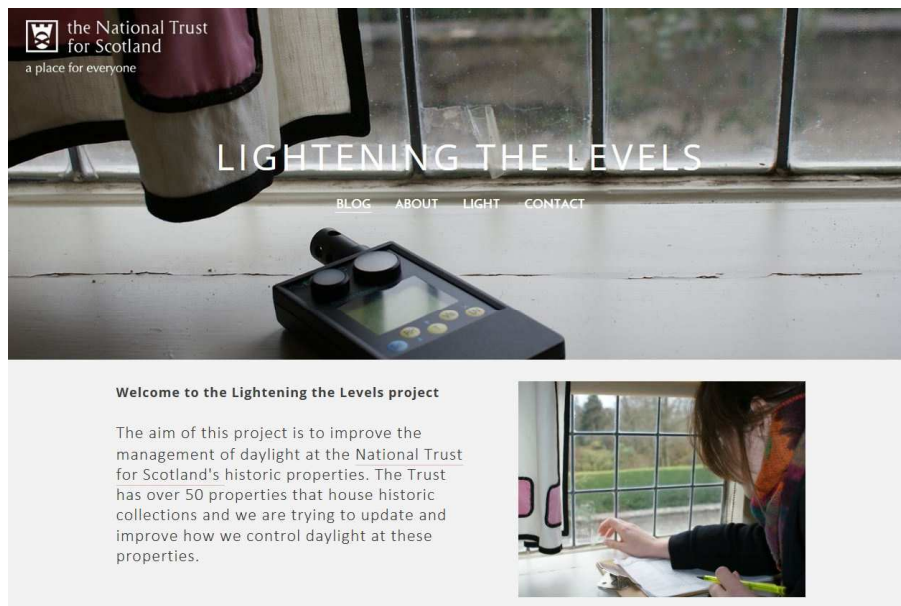


FIG. 7 - Project blog. © National Trust for Scotland.

## Conclusion

The installation of daylight protection measures in historic properties presents many challenges: access, geographic location, weather, cost, size, or the historic environment itself. With collections that require moving or protecting, longer opening hours, visitors and functions all must be taken into account when improving the management of daylight in these spaces. The scope and timescale of the project means that these are done on a property-by-property basis. The installation of protection measures is a large part of collections care, but is only effective when the protection measures are maintained and used as part of the normal operation of the properties. Ensuring that properties have light plans, and that staff and volunteers understand

the type of damage light can cause, is key to limiting light damage. Engaging staff and volunteers with light management is the most challenging aspect of the project, as well as the most important, and requires different strategies to implement at different properties. Changing the working habits at properties does not happen overnight, but requires time and repeated effort. The success of the project rests on getting staff and volunteers engaged with light management at properties, using blinds to limit light damage.

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