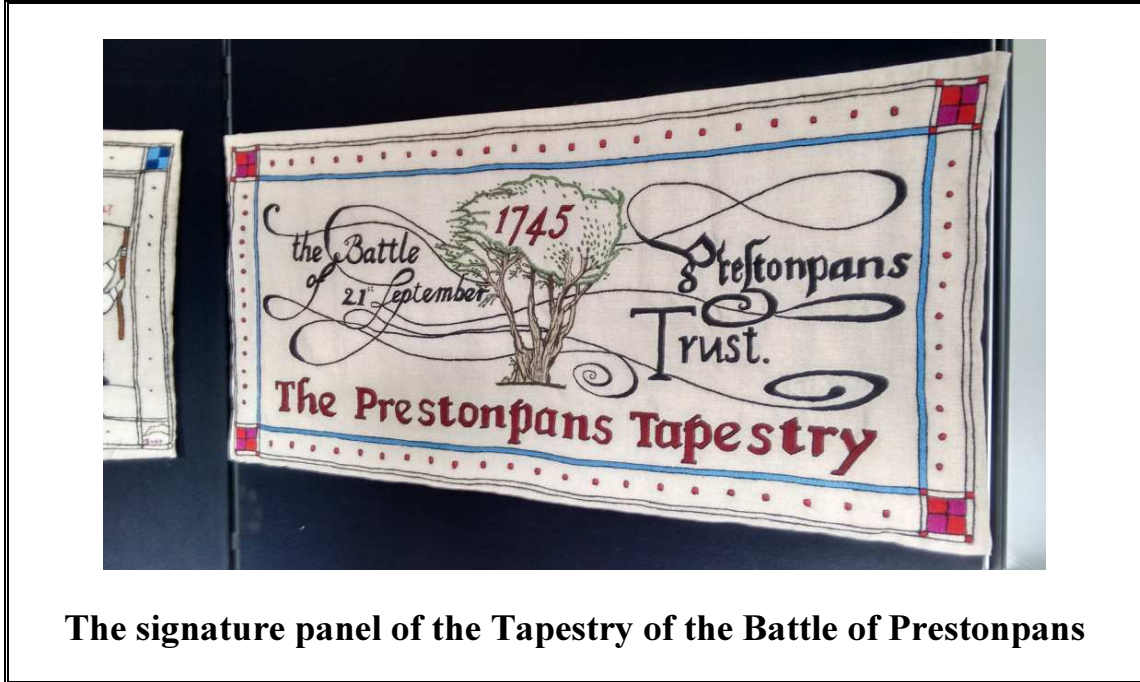


The Scottish CONSERVATION STUDIO

Paper • Textiles • Artefacts • Preventive



The signature panel of the Tapestry of the Battle of Prestonpans

Condition and conservation assessment

Client: **The Battle of Prestonpans (1745) Heritage Trust**
Contact: **Herbert Coutts, Joint Chairman**

1. Background

The world-famous 70 metres long Bayeux tapestry inspired the 105 metres Tapestry of the Battle of Prestonpans (referred to as the Tapestry from here on). The work to create the outstanding Tapestry was completed in summer 2010 (www.en.wikipedia.org/wiki/Prestonpans_Tapestry, accessed 22.9.2018). The Tapestry has since been displayed in a range of community venues and museums in Scotland, England and France. The Tapestry carries on being available for other exhibitions on demand.

The Battle of Prestonpans (1745) Heritage Trust (referred to as the Trust from here on) expects to be able to find a permanent home for the Tapestry within the next five years.

This report refers to the Bayeux Tapestry in France as a point of reference to caring for another very long, vulnerable textile.

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2. Client brief

In September 2018 the Tapestry was on display for three weeks in Cockenzie House in Cockenzie. On 15 September 2018 Herbert Coutts invited Tuula Pardoe, Accredited Conservator of Costume and Textiles from The Scottish Conservation Studio, to visit the Tapestry to assess its condition and long-term conservation needs. In Mr Coutts' words 'suggestions as to how it would be best 'conserved' in what 'environment' in such an eventual permanent home' would be most helpful.

Dorie Wilkie, the Tapestry embroiderers' leader, was available on the day of the visit. Arran Johnston has provided some information about the storage and transport of the Tapestry for the purposes of this report.

3. Brief Tapestry description

The Tapestry is sewn on a medium-weight plain-weave ground cloth in plied dyed woollen threads. Although it is called a tapestry it is in fact an embroidered textile, i.e. it is stitched, not woven like a true tapestry. The Tapestry is lined with medium-weight unbleached plain-weave cotton fabric. There is a layer of nylon net between the linen face layer and the cotton lining.

The top edges and side edges of the 21 lengths are furnished with narrow black hooked Velcro (photo 1). The Velcro is sewn to the lining of the lengths in machine-sewn locking stitch.

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4. Condition of the Tapestry

It is difficult to care for a tapestry that is as extraordinarily long as the Tapestry of the Battle of Prestonpans. Still, based on a brief visual assessment while the Tapestry was on display in Cockenzie House, it appeared to be in a good condition apart from relatively minor, largely inherent problems such as puckering, uneven tension and creases. However, at the moment problems arising from the Tapestry's present display, storage and transport are arguably a greater threat to its long-term preservation than its present condition may let one believe.

4.1. Puckering and bulging

Dorie Wilkie said that she had insisted that every person who embroidered a panel for the Tapestry had to carry out the work by having the linen fabric tensioned on a frame. Some embroiders still stitched their work without a frame, and this led to panels that cannot lie flat because the fabric tension is compromised. Puckering of the ground fabric is a common problem in hand-embroidered textiles. When a puckered textile is rolled for storage, it inevitably creases. Even the Bayeux Tapestry has creases (photos 2 and 3) that have formed as a consequence of the embroidery puckering the ground linen fabric. Creases like these in the Tapestry are inherent faults that could ultimately only be put right by re-stitching the affected panels. There is unlikely any desire or need to do that.

Dorie Wilkie also said that in 16 panels the lining is making the hems of the panels bulge (photo 4). She has adjusted the lining of some of such panels. This has helped to release the tension, and it will help keep the panels free of creases that would form should the bulging not be adjusted.

According to Herbert Coutts a Friends of the Tapestries Workshop is scheduled for 15.11.2018 when the issues of bulging will be addressed.

4.2. Creases

Some of the panels of the Tapestry have slight creases that originate from its handling and storage. Linen is a natural fibre that exhibits the greatest capacity of all fibres to crease if not kept flat. As the Tapestry is often handled, packed and moved from one display venue to another or unpacked for storage it is likely to become more and more creased over time. More on this in '7. Handling' and '8. Storage and transport'.

4.3. Graphite lines

The designs of some of the panels changed as their embroidery was being carried out. As graphite had been used to draw the design of the panel on the linen, this left some graphite lines exposed on some of the panels' linen ground cloth. An example of this can be seen in photo 5. Would it be possible to remove the unnecessary graphite lines that are now seen as visually distracting?

Graphite is a mix of finely ground graphite and clay powders. Fabric has a complex three-dimensional structure, and the graphite is likely to be unevenly distributed across it. To attempt to remove the graphite with an eraser (the way erasing removes graphite from paper) would risk causing wear on the linen fabric, making the area of the lines even more visually distracting and changing the look of the worked-on areas.

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Graphite would not dissolve in organic solvents. To involve water would carry risks and might promote removal of the graphite but it would need to be done under great control and would unlikely be able to remove all – if any at all - of the graphite.

It is strongly recommended that should any attempts to remove the graphite lines be made the techniques be tested on scarp linen first.

Making new panels without the unnecessary visible graphite lines would be one way of solving this problem. On the other hand, with the preservation of Tapestry facing bigger problems than graphite lines it would appear best to leave the lines largely as they are.

5. Mounting

Transportable stand-alone stands are supplied with the Tapestry for the display of the panels. The panels are covered in black looped material that allows the black Velcro on the back of the Tapestry lengths to stick to it. These stands are able to display two lengths of the Tapestry across their height.

The present mounting makes the setting up the Tapestry for an exhibition as easy as it can be for its short-term displays in a variety of locations. When a permanent home for the Tapestry is found and the Tapestry is to be displayed in a protective display case, consult a textile conservator for mounting the Tapestry. A display case designer and a textile conservator should work together to establish the safest method and materials for mounting the Tapestry.

6. Display conditions in Cockenzie House

Due to the length of the Tapestry and complex room structure of the old building of Cockenzie House the lengths of the Tapestry were divided between a range of rooms and corridors for display according to how much space they were able to provide.

The display of the Tapestry in Cockenzie House fell short of best practice display standards in a number of respects. Much of damage on textiles, which ultimately over time becomes irreversible, takes place gradually and, more often than not, unnoticed. As reference, The Bayeux Tapestry (www.historyextra.com/period/norman/bayeux-tapestry-now-future-curator-britain-france, accessed 22.9.2018) is now so weak that the authorities in charge of its preservation have so far been unable to clearly answer the question whether it will be possible to transport it to the United Kingdom for temporary display in about 2020 as recently planned. As the Bayeux Museum is due to undergo refurbishment in the near future, they are now also forced to consider whether it will be possible to carry on displaying the tapestry vertically on a wall or whether the tapestry will only be able to withstand display on a slightly slanted, near vertical support.

It is unusual for any textile to survive as long as the Bayeux Tapestry. Presumably it has partly survived because it is unusually long and hence difficult to ignore. It was also made in an era where the riches of material culture was limited to the well-to-do classes of the medieval society. It has survived because its significance was recognised early enough and it has been given the protection it deserves.

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There is every chance that by carefully protecting the Tapestry of the Battle of Prestonpans, the result of hundreds of hours of work of a large group of people, will still be in a displayable condition in a thousand years' time.

6.1. Open display

Cockenzie House as an exhibition venue provided temperature and relative humidity levels for the convenience of visitors and staff, not for the benefit of the Tapestry. In addition, in Cockenzie House the Tapestry was on open display that provided no protection either against accumulation of dust, insect pests, people touching it, accidental damage and vandalism.

Deterioration and inevitable aging of natural fibres such as linen and wool occurs by a variety of mechanisms and paths, one or more of which may predominate under specific circumstances. However, by taking positive steps much can be done to eliminate or reduce this. Monitoring and control of the environment, and provision of protection, is able to slow down textile deterioration.

6.2. Relative humidity and temperature

Linen and wool are hygroscopic fibres, and they react to relative humidity of the environment. They absorb moisture from the air and expand when the humidity level goes up. When the level goes down, they contract. Repeated fluctuations stress fibres, which over time leads to physical damage such as loss of strength and splitting. To avoid this it is essential to understand how the display and storage environment behaves and to control it.

High relative humidity levels, above 60 – 65%, give rise to mould growth, increase the risk of insect pest infestation and accelerate chemical degradation reactions in textiles. Low relative humidity levels make textiles excessively dry and brittle. Heat and humidity can also lead to much greater deterioration than light. Ideally the relative humidity levels should be kept between 40% and 65% for 90% of the time, allowing slight seasonal variations, both for the display and storage of textiles. The relative humidity levels would be best controlled with temperature, which should be kept between 13°C and 20°C. Temperatures too high accelerate fibre degradation, promote pest infestations and support mould outbreaks. Temperature levels for the storage of textiles can be lower than on display, without allowing the relative humidity to creep too high, but temperature should never fall below freezing.

With the cost of heating on the increase and the imminent global need to cut down on the use of fossil fuels and emission of greenhouse gases it is important to assess with what means the display and storage environment of the Tapestry can be controlled. This should be easiest to achieve in a building that is as air-tight as possible, avoiding bringing in air from the outside as far as possible.

6.3. Ultraviolet radiation

This diagram, from 'www.nasa.gov/science/toolbox/emspectrum1.html', shows the range of different wavelengths of the electromagnetic spectrum.

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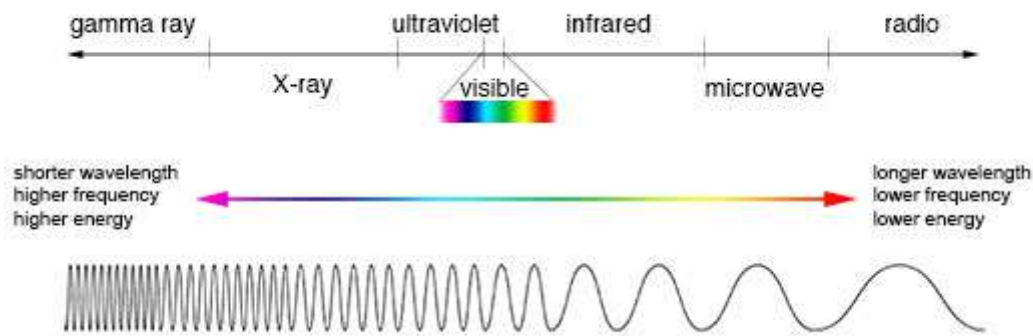
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Ultraviolet radiation is part of the electromagnetic spectrum. The sun emits it, and hence it is present in daylight in huge quantities. It is present in daylight whether the day is sunny or overcast; on a sunny day there is more ultraviolet radiation in the light outside, less on an overcast day. The short wavelength, between 10nm and 400nm, and high energy of ultraviolet radiation make it highly destructive to all organic material, including textiles. Human beings cannot see it, and it contributes nothing towards how we see the world around us. Textiles on display should be subjected to close to no ultraviolet radiation as it quickly fades dyes and breaks up fibres.

In Cockenzie House daylight was flooding in from every window and skylight. Photo 6 shows a view of the first floor room in which 40 metres of the tapestry was on display. Ultraviolet radiation levels at the ends of the panels closest to the two windows were recorded at around 100 microwatts per lumen (as measured with a UV-meter).

In the smaller room where the first panels of the Tapestry were on display (photo 7) the ultraviolet radiation recording on the end of the Tapestry farthest away from the windows, facing the windows, showed 120microwatts per lumen at the top of the display panel and 290microwatts per lumen at the bottom of the panel.

Photo 8 shows a skylight through which ultraviolet radiation from daylight streamed on the two lengths of the Tapestry on the wall of this corridor.

Since daylight contains ultraviolet radiation, closing the shutters in the exhibition rooms would have achieved its total elimination. Ultraviolet radiation can also be cut down to about 10microwatts per lumen with ultraviolet radiation filtering film that can be installed on glass such as windows. Different light-bulbs emit different quantities of ultraviolet radiation; fluorescent tubes are amongst those that emit it and need UV-filters.

6.4. Visible light

The best way to preserve textiles is to keep them away from all visible light, i.e. in total darkness. This, of course, is impractical when a textile needs to be on display.

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Visible light, i.e. the tiny part of the electromagnetic radiation that our eyes can see, is just a small fraction of electromagnetic radiation around us. It has the wavelength band between 400nm and 760nm. Whether it is daylight from the sun or artificial light from light-fittings, it causes significant damage to textiles by causing colour changes, fading and physical break-up of electric forces in the molecular structure of fibres.

Damage and deterioration that visible light causes cannot be reversed: once a dye, for example, has faded, there is no way to reverse it. Once a textile starts splitting, fragmenting and, ultimately, turning into dust, all that textile conservation can do is to provide the textile with physical support.

Damaging effects of visible light are cumulative, i.e. the effects build on previously acquired effects. To keep down the effects of exposing a textile to visible light requires keeping visible light levels as low as possible and keeping the length of exposure minimal. Textiles on permanent display face a particularly serious, on-going risk of damage through their exposure to visible light.

Textiles are amongst the most light-sensitive organic objects in any collection. One only needs 50 lux to be able to see the shape, colour and pattern of a textile. Visible light level of no more than 50 lux is recommended for the display of textiles. However, it is not a level that would prevent damage to textiles owing to their exposure to visible light. It only slows down the damage. Every effort should be made to keep the Tapestry in the dark when no-one is viewing it, when the display is closed to visitors and when the Tapestry is in storage.

In a museum textiles are usually on display for a short length of time, i.e. a matter of months, and they are returned for a rest in a dark storage while other textiles replace them on display. The Tapestry, for being a one-off irreplaceable textile, may be destined to be on permanent display, and in such circumstances both the intensity and length of its exposure to visible light must be carefully controlled.

Museums set annual exposure limits to their objects on display that are calculated by multiplying the amount of visible light, as measured in lux, by the number of hours per a twenty-four-hour period by the number of days a year of that exposure.

There is much information about light on the internet. One that explains the key concepts in simple terms can be found at [‘www.iar.unicamp.br/lab/luz/ld/Arquitetural/Museus/manuais/light%20and%20Ultraviolet%20Radiation.pdf’](http://www.iar.unicamp.br/lab/luz/ld/Arquitetural/Museus/manuais/light%20and%20Ultraviolet%20Radiation.pdf).

In Cockenzie House visible light came from both daylight and artificial light sources. Visible light measurement (as measured with a lux-meter) read as over 1000 lux, i.e. at the top of the scale the monitor was able to register, at the end of the panel that in photo 9 looks the brightest lit. In photo 7, where the high readings of ultraviolet radiation were recorded (see ‘5.1.1. Ultraviolet radiation’), there also the visible light recordings were high at 300 – 350 lux.

The artificial lighting in Cockenzie House was provided for the visitor and staff

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comfort, not to benefit the Tapestry. The range of ceiling pendants and wall-mounted light fittings provided a bright pool of light under and around them. Photo 10 shows a bright pool of light on one of the panels of the tapestry under a ceiling spotlight in a corridor in Cockenzie House. Uneven lighting of a textile causes uneven fading and other light-damage in the long term.

6.5. Infrared radiation

Humans cannot see infrared radiation, with wavelength longer than 760nm, but we can feel it as heat. About half of the sun's energy output is infrared radiation. Old-fashioned tungsten light bulbs emit significant amounts of infrared radiation. (Should they be placed inside a display case, they would heat up, and hence dry, the air in it.) Excessive heat from artificial light sources dries out textiles as well as increases their chemical degradation processes. Infrared radiation can increase the destructive effects of visible light and ultraviolet radiation.

Effects of infrared radiation of the air can be measured using a simple thermometer.

6.6. Mould

Moulds are living organisms, which, once they start germinating and growing on a textile, utilise the textile material for their nutrition. Moulds stain and can ultimately destroy textiles.

Mould spores are present in enormous quantities everywhere in our environment, and yet we cannot see them. They accumulate on unprotected textiles, and once the environmental humidity exceeds 60 – 65%, the spores start germinating.

The best way to prevent mould growth on the Tapestry is to keep it protected against spores of the environment at all times. To display it on the inside of an external wall would risk damp building up behind the Tapestry as would humid environment above 60-65% both on display and in storage.

6.7. Dust

Dust is a cocktail of fibre fragments from clothing and other textiles, mould spores, pollution particles, pollen, grit etc. Over time dust collects on a textile on open unprotected display. It reacts with relative humidity of the environment and promotes degradation of textile fibres. Over extended period of time dust can become embedded in a textile and permanently, beyond all means of remedial conservation, disfigure it (photo 11). Insect pest larvae are able to live on tiniest quantities of dust in textile stores and display – it is essential to keep all such areas free from dust.

One way to keep the Tapestry clean of dust and debris is to always lay it on a clean table for packing and unpacking. If a clean, long enough table is unavailable, a clean sheet on the floor can provide a clean work surface.

One of the ways to keep the effects of dust on the Tapestry at bay is to clean it with controlled vacuum suction through a protective layer of net. How often the Tapestry is cleaned is a matter of judgement. It is probably best never to return it to long-term storage without vacuuming dust off it first.

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6.8. Insect pests

The woollen embroidery threads of the Tapestry risk insect pest damage for being proteinaceous fibres. It is understood that the warehouse where the tapestry is stored has insect pest traps but it is not known what they are and how often they are checked for insect presence. For the avoidance of doubt, insect pest larvae damage textile fibres, not the grown-up insects.

Insect pests are active during the warmer months of the year, from about March to September, although this can depend on the environmental conditions. They prefer dark, warm, dusty and undisturbed areas in stores and display areas.

Vacuum-cleaning the Tapestry gives a good chance to look at the Tapestry at close quarters and check it for signs of insect pest activity.

In the past control of insect pests to guard heritage objects was based on the use of chemicals, many of which were harmful to people and the environment. Now chemicals are the last resort and the control is carried out by practice called integrated pest management. This involves creating an integrated pest management policy and procedures, and dedicating and training people to carry responsibility for it and ensuring they have the necessary funds for it. British Standard 'BS EN 16790:2016 Integrated pest management (IPM) for protection of cultural heritage' offers definite guidelines for pest management practice.

6.8.1. Mothballs

It is understood that the warehouse in which the Tapestry is stored has some mothballs installed there. Mothballs need to be in airtight containers or cupboards for them to deter insect pest larvae. They sublime into the air, and in a leaky container, cupboard or room, they contaminate the air and potentially harm the people who breathe in that air. Mothballs have also been found to cause changes of colour in textiles. They make people feel that they have done something useful for the benefit of their textiles but, in fact, mothballs in most instances do not help keep insect pests away.

6.9. Touching, accidental damage and vandalism

Visitors and staff in Cockenzie House were able to brush right past the range of Tapestry panels on display there. On open, unprotected display the Tapestry is highly vulnerable to damage through staff and visitors touching it as well as accidental damage and vandalism.

Should the Tapestry ever become stained as the result of an accident or vandalism, it should be cleaned as soon as practicable because the longer stains are left on a textile the more difficult it becomes to remove them. In such an instance it would be best to consult a textile conservator before any cleaning attempts are made.

7. Handling

The Tapestry is made out of 21 lengths that each has five one-metre-long wide panels sewn together. For storage the lengths are each rolled on a cardboard tube with interleaving white cotton cloth. The cloth helps support the panels as they are being rolled. It also helps separate the hooked Velcro from the rest of the panels.

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It was impossible to assess what one of the five metre lengths of the Tapestry looked like on a storage tube on the visit to Cockenzie House. Five-metre-long lengths, with Velcro along the top edge, are very long to roll on tubes without creasing the linen. This is because Velcro adds bulk to the top edge of the Tapestry on the roll, and the rest of the Tapestry is left with nothing but the thin cotton sheet to compensate for that thickness. By the time the five-metre length has been rolled on a tube the thickness difference is considerable between the top and bottom edges of the Tapestry. Experience shows that in such a situation it can be impossible to do the rolling so that the Tapestry on the tube does not crease.

The panels had a small number of creases from their handling. They were not a physical threat to the tapestry yet but were visually distracting.

The reasons for why five panels of the Tapestry have been sewn together are not clear. If rolling the five-metre panels on the tubes creases them, to shorten the lengths might alternatively relieve the problem. Alternatively, if each of the one-metre-wide panels were separate it would then be possible to stack them in boxes for storage and transport. To join the separate panels to each other for display could then be achieved by sewing Velcro to the vertical edges of each panel.

Representatives of the Trust unpack and install the Tapestry for exhibitions so that only they themselves handle it. Please note that the panels should always be rolled with their face outwards on the tubes. That way the lining, rather than the face, becomes creased. It is important to insist that the panels be opened on clean surfaces when they are unpacked and packed up in exhibition venues.

8. Storage and transport

A range of practices are involved in packing the Tapestry for storage and transport. According to Arran Johnston, who is responsible for the storage of the Tapestry, it is ‘rolled for transportation, onto 21 lined tubes, with cotton interfacing between surfaces and with particular care taken to avoid the Velcro making contact with the embroidered surface. The rolled sections are then placed upright into seven custom-made boxes, made from heavy-duty cardboard with fitted lids.’

It is not known how the rolled panels are fitted in the boxes, what size the boxes are or what kind of cardboard the boxes are made out of. To avoid creasing the rolled-up panels it would appear sensible to suspend them in the boxes with supportive rods through their centres.

Arran Johnston carries on saying that ‘On return to the industrial unit at which the tapestry is kept, it is then unrolled and hung from panels and batons in the same method as it is displayed. The area where it is stored is covered over with a canopy to limit dust and protect from water should there ever be a leak in the roof. There are moth-balls, insect traps, and electric mouse repellents around this space. For transportation to exhibitions, the tapestry is re-rolled and packed into the boxes as described, which are then transported by van.’

It is not known why the Tapestry panels are hung for storage. It appears unusual

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practice as it opens them up for the storage environment and handling much more than if they were kept in their boxes.

Dorie Wilkie explained that in Cockenzie House the rolled-up panels were going to be packed in large blue Ikea plastic bags for moving and storage. It was understood that the tubes were going to stand upright in the bags.

A problem with flimsy plastic bags is that they provide little physical protection to the rolled-up panels. The panels in such bags are vulnerable to squashing and creasing, spillages, dust, debris etc both in transit and storage. It would be better to pack them in acid-free cardboard boxes tailored to their measurements. In the boxes the rolled-up panels would ideally stay suspended horizontally with a pole through their middle. Tailoring the lids would wedge the tubes with their poles in place.

For transporting a large number of rolled-up panels in cardboard boxes it would appear that the boxes would wear out relatively soon. Would they, in addition to cardboard boxes, benefit from transport crates made for the protection of the panels? Would it be feasible to transport the panels in such crates?

9. Display in other venues but Cockenzie House

It is understood that apart from requesting that 'the atmospheric conditions in the display area should be consistent and without major fluctuation' the Trust does not set conditions for the display of the Tapestry in temporary exhibition venues.

Without monitoring no new exhibition venue is able to provide evidence of the quality of the display conditions that they can provide. It is recommended that when the Trust transports the Tapestry to a new display venue, they travel with dedicated meters for measuring the ultraviolet radiation and visible light levels as the minimum. With the meters it is possible to measure the brightness of light and amount of ultraviolet radiation falling on the Tapestry. By moving the meters to different distances from the light source it is possible to determine a suitable position for the Tapestry in relation to the light. With the meters it would be possible to work out what the levels at the venue are and then seek to adjust the conditions so that they best help keep the Tapestry out of harm's reach as far as exposure to ultraviolet radiation and visible light go.

It is hoped that with the description of risks from the environment in this report the Trust will be able to decide whether they need to ask for further controls of the display environment for the protection of the Tapestry.

10. British Standards

There is a range of Standards from the British Standards Institute that can be consulted with the view of establishing a permanent home for the Tapestry such as:

- BS EN 15757:2010: Specifications for temperature and relative humidity to limit climate-induced mechanical damage in organic hygroscopic materials.
- BS EN 15999-1:2014: Guidelines for the design of showcases for exhibition and preservation of objects. General requirements.

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- BS EN 16790:2016: Integrated pest management (IPM) for protection of cultural heritage.
- PAS 198:2012: Specification for managing environmental condition for cultural collections.
- PD CEN/TS 16163:2014: Guidelines and procedures for choosing appropriate lighting for indoor exhibitions.
- BS EN 16853:2017: Conservation process. Decision making, planning and implementation.
- BS EN 16893:2018: Specifications for location, construction and modification of buildings and rooms intended for the storage or use of heritage collections.

11. Permanent home

The Battle of Prestonpans Preservation Trust expects to be able to find a permanent home for the Tapestry within the next five years. It should be considered whether the complete Tapestry will be displayed or whether lengths of the Tapestry would be rotated on periodic display. Rotation would save some of the stress on the Tapestry and keep it in a good condition for longer than to permanently display all the panels.

To preserve the Tapestry for the next 1000 years it would appear useful to consult the Bayeux Museum about how they have been looking after the Bayeux Tapestry over the recent decades. As stated in the ‘Press kit 2018 The Bayeux Tapestry’ (see ‘Tapestry/http://www.bayeuxmuseum.com/en/2018_presskit_bayeux_tapestry.pdf’): ‘Light, dust, changes in temperature, insects and mould all endanger the preservation of textile material. The tapestry is in a protective glass showcase, on display 360 days a year, under dim lighting to prevent the colours from fading. The temperature is maintained at 18-20°C, with a level of humidity at around 50%, to prevent the fibres in the linen and yarns from deteriorating.’ A photo of the display of the present Bayeux tapestry display can be seen in photo 11.

Correspondence with and a visit to the Bayeux Museum would help the Trust in their decision-making for how to display the Tapestry in its eventual permanent home. Further to this, there is a replica of the Bayeux Tapestry on display in Redding Museum (www.bayeuxtapestry.org.uk/bayeuxinfo.htm). It is mounted as a continuous strip in a specially designed display case, a photo of which can be seen in photo 12.

Contact with these museums, to benefit from their experience in caring for very long, highly light-sensitive, vulnerable textiles, would cut down the risk of potentially costly mistakes in creating a permanent home for the Tapestry.

To achieve effective, high standards for the care of the Tapestry in its permanent home:

- Weigh up how long it will be feasible to carry on exhibiting the Tapestry in temporary venues that offer little protection to it.
- Create a written preservation policy for the long-term care of the Tapestry.
- Consider whether the entire Tapestry or only parts of it will be on permanent

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display. If only parts of it will be displayed, build in a plan for the rotation of the panels.

- Assess the climatic conditions of the building and display case in which the Tapestry will be permanently displayed with appropriate professionals. Set the target temperature and relative humidity ranges for its care in consultation with a professional conservator.
- Establish means for the control of the climate of the display case and environment with appropriate professionals with the view of minimising the cost of heating in the face of the imminent global need to cut down on the use of fossil fuels and emission of greenhouse gases.
- Display the Tapestry in a protective display case in consultation with experienced professional display case and exhibition designers and conservators.
- All the materials inside the display case need to be chemically stable so as they will not contribute to the damage of the Tapestry by contact and emission of harmful fumes.
- Consult a professional textile conservator for mounting the Tapestry in its permanent home.
- Cut down all ultraviolet radiation as close to 0 as possible with filters and choice of light-bulbs that emit little or no ultraviolet radiation for the display of the Tapestry.
- Install the display case with lighting that is as even as possible across the tapestry from top to bottom and from left to right.
- Keep the visible light level to the absolute minimum, keeping in mind that light-damage is cumulative and irreversible. Take all steps to keep the Tapestry in darkness when no-one is paying attention to it.
- Daylight is too damaging and uncontrollable for the display of the Tapestry.
- Set out Integrated Pest Management programme for the protection of the Tapestry.
- Record the current condition of the Tapestry panels in photographs, and drawings where appropriate, for future reference.
- Have a professional textile conservator to assess the condition of the Tapestry periodically.

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 October 2018

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1. Black hooked Velcro on the back of one of the panels.



2. Horizontal creases in the linen fabric especially in the top right-hand corner, Bayeux Tapestry.



3. A close-up of creases in the Bayeux Tapestry (<https://www.bbc.co.uk/news/uk-42713552/>, accessed 22.9.2018.)



4. An example of creasing and bulging of the linen fabric.



5. A graphite line on the linen above the figure's head.



6. Two windows allowing unrestricted access to ultraviolet radiation to the exhibition room. A third window was located at the opposite end of the room.



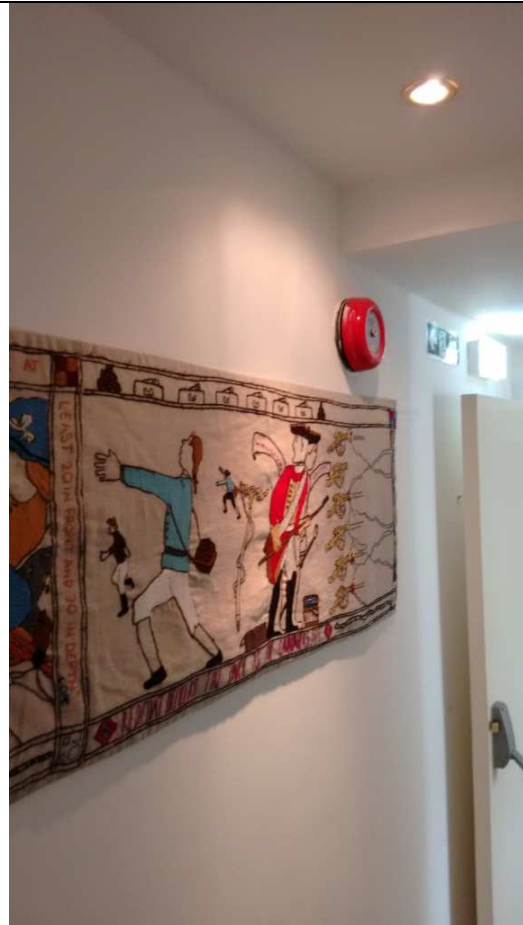
7. The start of the Tapestry exhibition.



8. Skylight allowing ultraviolet radiation from daylight stream on the Tapestry panels.



9. A damaging level of visible light at the brightly lit end of one of the tapestry panels.



10. A ceiling spotlight pooling bright visible light on a tapestry panel in a corridor.



11. Part of the Bayeux tapestry on display in Bayeux Museum. Please note that the dim lighting of the exhibition space allows minimal lighting of the tapestry appear more powerful to the human eye than it is.



12. A copy of the Bayeux Tapestry on display in the Reading Museum.