Breathable Roofing Membranes and Bats: retrospective and proactive measures to prevent death and injury

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Note from the Authors

This manuscript is being circulated following recent concerns between the interactions of breathable roofing membranes and bats, in efforts to generate discussion and drive forward solutions where breathable roofing membranes have already been installed in buildings and short-term solutions are required. The authors do not advocate the continued installation of breathable roofing membranes.

Summary

The interaction between bats and Breathable Roofing Membranes (BRM) is becoming increasingly brought to the forefront of bat conservation; particularly as sustainable solutions to building maintenance and functionality are being sought and applied. A number of recent publications have highlighted cases of entanglement of bats in BRMs. Until further research is undertaken an interim solution to deal with the use of BRMs retrospectively is required. Three examples of a solution using Netlon® mesh to reduce the risk of exposed BRM to bats are discussed.

Background

The interaction between bats and Breathable Roofing Membranes (BRM) is becoming increasingly brought to the forefront of bat conservation; particularly as sustainable solutions to building maintenance and functionality are being sought and applied. Traditionally, bitumen felt with hessian fibres (type 1F) was used. More recently, BRMs made from non-woven spun-bonded polymer fibres are being installed during roof repairs and building restoration works.

An article published by the BCT (2014) highlighted fatal cases of bats becoming entangled in BRM. In most documented cases, serotine *Eptesicus serotinus* and pipistrelle *Pipistrellus spp* species have been affected. Research into the entanglement of bats in BRMs is ongoing (Waring et al. 2012; Waring et al. 2013; Waring 2015). In the mean time, ecological consultancies are beginning to integrate recommendations within bat survey and mitigation reports for clients to avoid the use of BRM's. In February 2015, Natural England announced proposals including the use of BRM within a known bat roost are likely to result in a Further Information Request, including the use of bitumen felt type 1F only with license annexes (Natural England, 2015). The reason behind this decision appears to be led by a cautious approach given the evidence brought forward so far and the lack of research evidence available against its use in known bat roosts.

Until further research is undertaken an interim solution to deal with the use of BRMs retrospectively is required. We aim to outline a solution developed by Colin Morris (Vincent Wildlife Trust) which has been applied to three sites where BRM was either identified post

installation or was in the process of being installed and where roosting bats were either confirmed or likely to be present. An historical building was re-roofed in 2007 (Site 1) and two historical buildings were subject to roof repairs (Site 2 & 3); the details of which are summarised (Table 1).

Table 1. Summary of the outline details of each site.

Site	Type of Building	Bat roost details	Scheduled works
Site 1 – Chiltern Hills, South Oxfordshire	Mansion house with part slate and part clay roof tiles	Brown long-eared *Plecotus auritus* bat maternity roost	Re-roofed in 2007. No further works scheduled
Site 2 – Aylesbury Vale, Buckinghamshire	Disused timber framed barn with asbestos (formerly thatched) roofed	None present, however, the barn is within close proximity of other buildings with confirmed roosts used by occasional individual roosting bats of brown long-eared, pipistrelle *Pipistrellus spp.* and barbastelle *Barbastellus barbastella*	Conversion to office units including full re-roofing works, including use of clay and slate tiles
Site 3 – Wycombe, Buckinghamshire	Mansion house with part slate and part clay roof tiles	Brown long-eared satellite roost	Partial re-roofing and installation of protective fire doors

Action

Two varieties of fine meshed plastic material available from TDP LTD were considered (Table 2).

Table 2. A summary of the features of each Netlon® mesh considered.

Product code	Mesh Size	Roll size	Weight (g/m^2)	Cost (£)per roll*
XN1455-8002	2mm (diamond)	1m x 50m	230	159.04
XN1081-8000	2mm x 1mm	450mm x 15m	246	70.28

* Correct at the time of publication, ex VAT and delivery.

Site 1 – Chiltern Hills, Oxfordshire

The presence of exposed BRM on the inside of the roof void was identified by the licensed ecological consultant in March 2014. In one roof void area (approximately 10%) of the

complex roof structure loose fluffed fibres with staining was noted creating an entanglement hazard for the maternity colony of brown long-eared bats (Fig 1).

The risk of the BRM to bats was discussed with the owner. Due to the time of the year, a quick response solution was required prior to the return of the maternity colony. Netlon® mesh type XN1455-8002 was used to cover all exposed areas of BRM from inside the one roof void. The mesh was fastened using staples to wooden roof timbers, taking approximately one week to complete. Staples were placed close to each other to prevent bats from becoming trapped between the BRM and the mesh. A recommendation to carry out a more long-term fixing of the mesh post-maternity season was recommended using battening. A follow up visit on the 30 June 2014 indentified the continued use of the roost by brown long-eared bats, with approximately ten individuals recorded (Fig 2).

Site 2 – Aylesbury Vale, Buckinghamshire

The use of BRM on the roof of the barn during the conversion process was interrupted in April 2014 by an ecological consultant when BRM had been battened to the roof and approximately 20% of the re-tiling had been completed. The roof construction included the use of chipboard, insulation, battening, BRM, cross battening and roof tiles. Therefore, the removal of the existing membrane would have caused significant increases in project costs and delays to the completion deadline. In this case, the identified risk was the future potential for individual/small numbers of bats roosting under roof tiles to become entangled within the BRM in the future. Netlon® mesh type XN1081-8000 was used to cover the remainder of the BRM over the cross battening during the installation process and prior to the fixing of the remainder of the roof tiles (Fig 3 and 4).

Site 3 – Wycombe, Buckinghamshire

Only a partial area of the total roof space was subject to works. The roof void required the installation of fire doors together with minor ridgeline re-tiling. An inspection survey of the roof void undertaken 4 July 2014 revealed four brown long-eared bats including a juvenile. Additionally, the presence of BRM was identified within the roof void. The BRM was covered by sarking boarding exposing <10mm of the BRM underneath or was covered in traditional bitumen felt in most areas, with the exception of one small roof pitch where the BRM was fully exposed.

Netlon® mesh type XN1455-8002 was used to cover over the internally exposed BRM, fixed with battening (Fig 5).

Consequences

No bats at any of the three sites have been recorded entangled in the BRM, prior to or post the Netlon® installation. Site 1 showed evidence of wear on the BRM by bats through the presence of fluffed fibres and staining indicating bat roosting in these locations.

The brown long-eared maternity colony at Site 1 was recorded to continue to use the roof space following the installation of Netlon® mesh. Whilst this method of intervention demonstrates a valid response to protect a bat roost from incidental death and injury, a number of potential concerns have been raised. Firstly, it is of paramount importance that the mesh is preferably fixed with battens. Where staples are used as a quick fix they must be positioned close together to prevent bats from crawling between the mesh and BRM which

may lead to the bats becoming trapped. Stapling mesh to BRM is also likely to reduce its function. Secondly, only about 10% of the whole roof void has been treated in this manner, the remaining 90% remains a risk to bats in the future although there was no evidence that bats were using this area for roosting during the initial inspection. Thirdly, in this case the BRM was exposed from not only the internal areas of the roof void but also from the external areas, i.e. through gaps between roof tiles. This solution only resolved one area of risk; to address the external area would require a full tile strip and the removal of BRM material. In these circumstances the application of Netlon® over the full extent of the roof and BRM would be the least preferred option. This work would inevitably carry a significant cost, particularly where the property is of historical significance which may generate further complications such as Listed Building consent requirements and possible disturbance of the bat roost.

The solution delivered on Site 2 is expected to have a mitigating effect in protecting any future use of the building by bats, particularly potential roost spaces under roof tiles.

Site 3 provides an example of proactive temporary solution to the use of BRM in a roof void where future risk is identified. The application of the Netlon® together with the battens provides a neat finish which doesn't present any potential gaps which could allow bats to crawl through to the BRM.

It is anticipated that all sites will continue to be monitored in future years for both the presence of bats and effectiveness of the solution provided. In the case of solutions being used under tiles this may be more problematic to provide specific evidence for or against without full or partial tile removal.

The cutting out of the BRM when exposed on the inside of the roof is another alternative to deal with the presence of the material in buildings where bats are present. This may be suitable in some circumstances and buildings and has been implemented successfully (e.g. BCT, 2014). The need for BRM within a building is ultimately for the client and their building/roofing specialist to determine based on the current requirements for building standards and the requirements under the building/roofing specialists professional insurances, however these decisions must take account of the potential for bats to be present in the future.

Currently, BRM is widely used for both new housing and refurbishment/repair of existing buildings across the UK, often cited as an important component of sustainability measures, particularly in new builds. As the use of BRM continues to increase, so does the future risk to roosting bats, essentially creating a ticking time bomb that could create a significant constraint on population recovery jeopardising the future favourable conservation status of many species of bats. Furthermore, the incidental but arguably reckless death and injury of bats is likely to go undetected and pose difficulties in the application of wildlife legislation in years to come. This is particularly a concern if it is a species that prefers to roost on the upper side of the membrane; where entanglement/deaths are unlikely to be recorded until the roof covering is removed.

The use of Netlon® mesh can assist with the temporary prevention of future entanglement of bats in buildings where BRMs are historically present and retiling is not an option due to expense or other issues. The three site examples illustrate that proactive measures can be considered to provide the best short to long-term solution depending on the circumstances

however these solutions should not be used to justify the use of BRM in the future and may well negatively impact on the intended benefits of using the material in the first place.

The need to fully engage with the building industry, architects, suppliers and contractors, together with government departments for sustainability and the natural environment is urgently required. Further discussions are currently taking place between a BRM working group (comprised of Stacey Waring and representative from the Bat Conservation Trust, Natural England, National Trust and others), from which further guidance to the ecological and building industry is anticipated, including the use of fine meshes.

References

BCT (2014) Lofty ambitions: Protecting bats from man-made filaments. *Bat News*. **103**: 6-7pp.

Natural England (2015) *Update: Breathable roof membranes (BRM), bats and licensing.* EPS Mitigation Licensing: Latest Developments – February 2015

Waring, S., Essah, E.A., Gunnell, K., Bonser, R. (2012) Breathable Roofing Membranes and Bats: Interactions, Outcomes and Predictions, in: Amoeda, R., Mateus, R., Braganca, L., Pinheiro, C. (Eds.), BSA 2012 – Proceedings of the 1st International Conference on Building Sustainability Assessment. Presented at the BSA 2012, Green Lines Institute, Porto, Portugal, pp. 175–184.

Waring, S. D., Essah, E. A., Gunnell, K. & Bonser, R. H. C. (2013) Double Jeopardy: The potential for problems when bats interact with breathable roofing membranes in the UK. *Architecture & Environment.* **1** (1): 1-13pp.

Waring, S. (2015) Bats and Roofing Membranes. PhD thesis. Reading University.

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Fig 1 Fluffing and staining of BRM at Site 1.

Fig 2 Brown long-eared colony roosting on Netlon® mesh (without battens) over BRM at Site 1.

Fig 3. Overlaying the Netlon® onto the BRM at Site 2 as part of the re-roofing works.

Fig 4. Overlaying battens and tiles over the Netlon® as part of the re-roofing works at Site 2.

Fig 5. Overlain Netlon® with battens onto the BRM at Site 3.