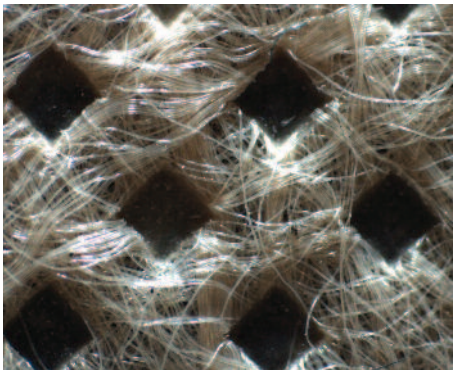
Lofty ambitions: Protecting ba

Stacey Waring has spent years counting loops and inspecting underlays that we use in our lofts with great intensity. Stacey has done this because she's recognised roofing membranes can entangle and kill bats roosting in our loft spaces. Ahead of her research being published, she's given us this insight into her work and findings.

In 2009 a collaborative research project was set up by the University of Reading and Bat Conservation Trust (BCT), with the aim to investigate claims that bats were dying after becoming trapped in modern roofing underlays. Prior to this there had been very little information regarding the change in building practices that saw breathable roofing membranes (BRMs) replacing the traditional bitumen felt underlays when buildings were renovated.

Bats tangled in felt

The first signs of problems came to light following a visit to a Dorset property in 2004, by Colin Morris. The roof had previously been fitted with a BRM and during this visit it was noticed two serotines had become entangled in fluff on the BRMs surface and died in-situ, which was reported to Bat Conservation Trust. At this point BRMs were very new and rarely fitted in properties likely to be used by bats; however, by 2007 there were three more reports of bats dying and so the task of attempting to understand the problems began.



Plastic filaments under the microscope

Why are BRMs used?

The first job was to understand the structure of BRMs and how they differed from the traditional felt underlay that had been used for the past century. This was produced using bitumen reinforced with a loosely woven hessian grid. BRMS are manufactured by extruding extremely fine plastic filaments onto a conveyor belt, which are then compressed into a sheet of material. These sheets are then laminated to form multi-layer BRMs. This form of manufacture is cheap and incorporates some advantages over bitumen felt that have made BRMs extremely popular: They are lightweight, easy to use and breathable – they aid the transport of water vapour out of the roof space.

These benefits have resulted in BRMs becoming the primary underlay of choice in the past decade. Breathability is especially important in the UK where pitched roofs, changeable weather conditions and the use of central heating make the roof space particularly vulnerable to moisture build-up, and therefore an increased risk of condensation. As prolonged exposure to condensation can result in the deterioration of roofing elements, BRMs are particularly appealing for use during renovation of older properties, especially heritage buildings where the risk of condensation could pose a threat to original materials.

Older buildings used by bats

These older buildings can also provide a wide spectrum of roosting opportunities for bats. For some species, including pipistrelle, serotines, long-eared bats and horseshoe bats, buildings have become an essential source of roost sites, either through loss of natural roosting opportunities or because man-made sites offer preferable conditions. The roof alone offers many areas both external and internal, for a number of different bat species. Externally, principal sites are under tiles, within the eaves or squeezed between the tiles/slates and the underlay.

Serotines tangled in BRM

In fact, it is where BRMs have been placed in buildings being used as bat roosts that issues have been raised on numerous occasions. I now have evidence that at least 156 bats have died through entanglement, the majority of which have been pipistrelles and serotines. This number is likely to be much higher as many BRMs fitted in roosts will not be checked for many years and this number only includes bat deaths where we have seen physical evidence and not anecdotal reports.
Due to the apparent scale of the problem, it was important that this research project determined what the issues were when BRMs were fitted into bat roosts and whether there were any products on the market that were safe for use where bats were present. A decision was also made to research the effects bats had on BRMs, to ensure that only products that could stand up to use by bats were considered safe. So after preliminary investigations into some of the concerns of bat workers and BRMs manufacturers, three key areas of research were decided upon:

1. The risk of entanglement of bats in filaments pulled loose from the BRM surface
2. The effect of roosting bats upon BRM functionality

ts from man-made filaments

3. How use of bitumen and BRMs can alter roof void microclimates.

On the surface this appeared a simple enough task. However, the lack of research in this area meant that all my tests had to be designed (and often re-designed) in order to obtain suitable results.

Experiments were developed to recreate the effects of bats crawling across a BRM surface in order to determine the risk of entanglement. Bat excrement was applied to the surface of membranes to consider the effect they may have on the BRMs' ability to function: the results from this experiment were then placed into modelling software to consider the effect this may have on the risk of condensation within a roof space. In order to test the effect of different underlay types on roof microclimate, dataloggers were placed in a custom-built test rig (aka the super shed!), which was designed with separate roof sections that were fitted with a range of BRMs and bitumen felt. All experiments carried out in the lab were then compared to results obtained from real-world scenarios in order to validate the methods used.

All BRMS on the market are bad news for bats

The outcomes from all the above-mentioned methods are currently being written up as a doctoral thesis; however, so far they have produced some strong evidence that informs us of the suitability of BRMs for use in bats roosts. The results show that all BRMs currently on the market are unsuitable for use within a bat roost. This is due to the polypropylene filaments used in the manufacture of these products. It is important to note that these filaments are also used in products that are not classed as breathable membranes and so care must be taken to avoid non-woven products when specifying for bat roosts.

It is not only the bats who can be negatively impacted when BRMs are fitted in bat roosts. Experimental results have shown that the breathability and watertightness of membranes can be severely compromised when exposed to bats. This is through contamination with excrement and abrasion from bat claws. Consequently, placing a BRM into a bat roost is bad for both parties and may lead to the death of a protected species and the early failure of the product installed.

Armed with this information it is important to ensure that when a roof void containing a bat roost is being renovated, the only option that can currently be considered safe is traditional Type 1F bitumen felt. It is important to stress that it should be Type 1F bitumen, due to new concerns over bitumen felt that is reinforced with polypropylene filaments (referred to as Type 5U). Whilst no testing has been done on this yet, there have already been reports of bats dying following entanglement in exposed filaments.

Case study – Sylvia Bevis, Devon Bat Group

Sylvia Bevis contacted Stacey in 2011 with regards to a BRM that had been fitted in a bat roost. This is what she has to say:

'Greenway is a National Trust bath house situated on the River Dart. Its loft space acts as a maternity roost for lesser horseshoe and brown long-eared bats, around 12 adults of each species. These bats also hibernate in the loft during the milder temperatures of winter along with a single greater horseshoe bat. In 2000 the roof and hanging shingles were replaced and a breathable membrane used. Where the brown long-eared bats have been roosting the fibres in the membrane have pulled loose. I had been aware of a small amount of "fluffing" before I found a juvenile long-eared dead after its thumb had become caught in the resulting fluff.

After several unsuccessful attempts to rectify the situation including placing bitumen felt over areas, using greenhouse shading and other types of roofing membrane etc, I consulted with Stacey, the National Trust and Richard Green Ecology Ltd and it was arranged to have the BRM removed from the ridge beam to the first purlin. Bitumen felt was then fitted between the rafters and is held in place by wooden battens. I am still taking great care to check the remaining BRM regularly as the bats appear to like to use it for roosting. If any more fluffing occurs then the remaining BRM may also have to be removed. One thing I have observed is that when the BRM starts to deteriorate it progresses extremely quickly."

© Richard Green Ecology Ltd - who were contracted to advise on BRM removal at Greenway

It is important to note that the bath house at Greenway did not require a BRM and so the option of removing it was acceptable for this property. This will not always be the situation and so shouldn't be attempted without consultation.