SOLUTIONS

HOW WE CRACKED IT

The challenge
Ventilating ceiling voids in line with the roof of an existing structure without remedial works to the roof

The solution
Combined roof and cladding ventilation. Airflow behind gable-end rainscreen cladding was allowed to circulate into the roof void

Architect
David Nossiter Architects

Contractor
John R Luck

Site
Pye Barn, Moulsford, Oxfordshire

The concept
An 18th century timber-framed aisled barn had been converted into a dwelling 50 years ago and was in need of modernisation. We were asked to produce a spacious family home. Construction began in spring 2007, and the project was completed early this year. We wanted to celebrate the proportions of the barn and the strength of the oak structure by creating open-plan spaces with ceilings following the line of the roof.

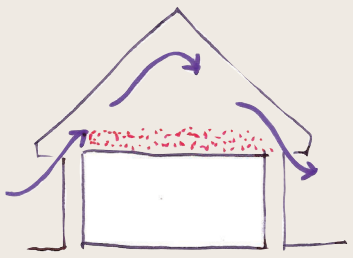
David Nossiter is a principal at David Nossiter Architects.

1 An existing roof

Having brought the existing roof up to modern standards of thermal performance, we then had to provide ventilation within the roof void so as to dry out any condensation that might occur.

The problem was made more difficult because we wanted the ceiling line to follow the profile of the roof. The existing roof was laid on timber battens fixed to softwood sarking boards. On inspection, it was clear that we could not provide sufficient ventilation without removing and relaying the entire roof. However, budgetary constraints meant this was not a viable option.

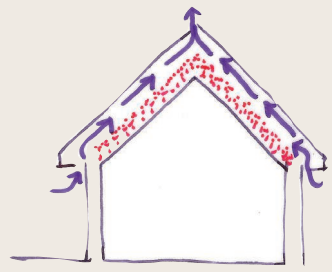
2 Technical background



Loft insulated above the ceiling line.

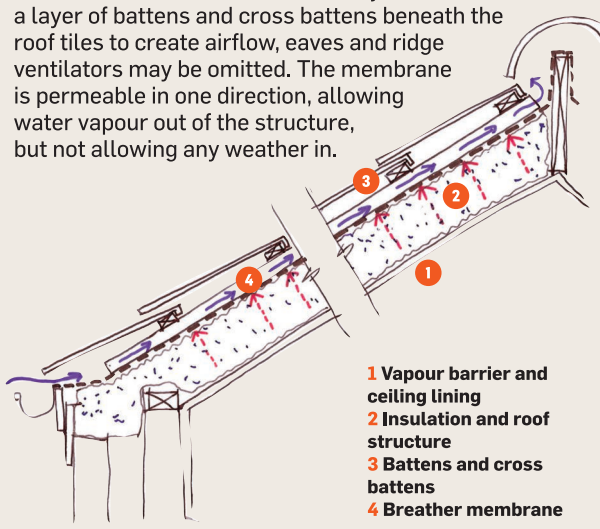
Ventilation in roofs
In a traditional loft where insulation is situated above the ceiling line, roofs are ventilated at the eaves either with proprietary eaves ventilators or within the eaves soffit board.

When the ceilings and roof insulation are in line with the roof space, ventilation is usually achieved at the eaves and at the ridge. A minimum continuous ventilation gap of 50mm needs to be maintained above the insulation.



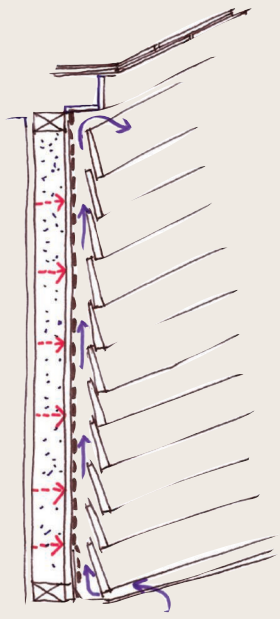
Loft insulated in line with roof space.

Breathable membranes
A more recent development is the use of breathable roof membranes. When used in conjunction with a layer of battens and cross battens beneath the roof tiles to create airflow, eaves and ridge ventilators may be omitted. The membrane is permeable in one direction, allowing water vapour out of the structure, but not allowing any weather in.



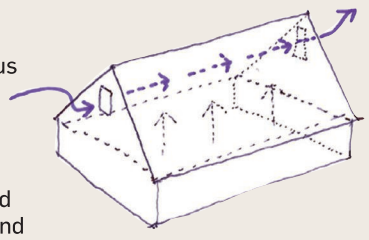
1 Vapour barrier and ceiling lining
2 Insulation and roof structure
3 Battens and cross battens
4 Breather membrane

Ventilation in cladding
Rainscreen cladding functions in a similar way. For example, in the case of timber-framed construction, a breather membrane is applied onto timber sheathing which faces the insulated timber structure. There is then a continuous air gap, between vertical timber battens, onto which rainscreen cladding is fixed. 15mm ventilation gaps are required at the top and lower edges of the cladding.

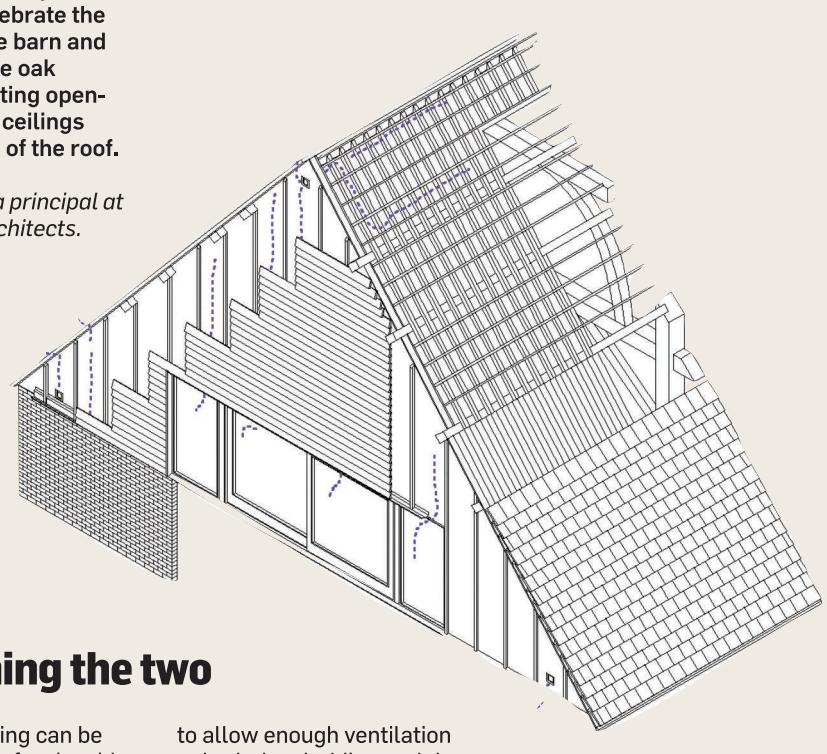


3 Typology of barns

Feathered-edged timber weatherboarding is indigenous to the location of the site, and the gable ends of the barn were wrapped in a rainscreen cladding of this material. The barn is an aisled structure typical of those found in the Midlands and the North, where pastoral farming was dominant. Traditional haylofts had a high level non-glazed



window opening at each gable end, allowing air to pass inside and underneath the ridge of the roof, thus drying the hay.



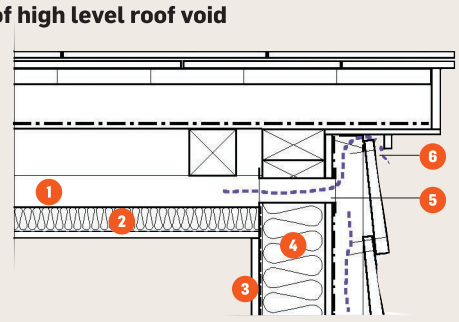
4 Combining the two

Rainscreen cladding can be thought of as a roof on its side. If we could also use the 50mm air space situated behind the rainscreen to ventilate the roof void, we could avoid relaying the roof. Air gaps at the edges of the cladding were increased to allow enough ventilation to both the cladding and the roof. At each eaves position and at high level, 165 x 165mm ventilation ducts were placed behind the rainscreen, through the building fabric and into the roof void.

5 The effect

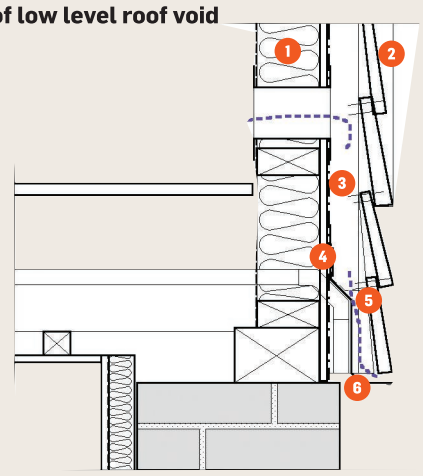
At the centre of the barn is an 8m-high galleried hallway leading to a lofty master bedroom and bathroom suite. Sliding glazed doors and a glass balustrade are located within the timber-clad gable end. On summer evenings, the family can slide open the full-height windows under the large expanse of roof and enjoy views of the garden below and village green beyond.

Ventilation of high level roof void



1 Cross timber battens
2 Plasterboard
3 Vapour barrier
4 Existing timber studs
5 Vent
6 Insect mesh and vent gap

Ventilation of low level roof void



1 Insulation
2 Aluminium flashing
3 Treated timber battens
4 Breather membrane
5 Weather-boarding with min 25mm gap
6 Ventilation gap and insect mesh

The completed barn.