

The Importance of Roofing Underlays in reducing the risk of damage caused by wind uplift

- The Association of British Insurers, 2003
- BS5534: 2003
- Wind uplift on roofing underlays – a review of design acceptability around the UK, 2004
- NHBC Standards Extra 2005

Winds of Change

Some 200,000 buildings are damaged by high winds in the UK every year, costing the British economy up to £800+ million.



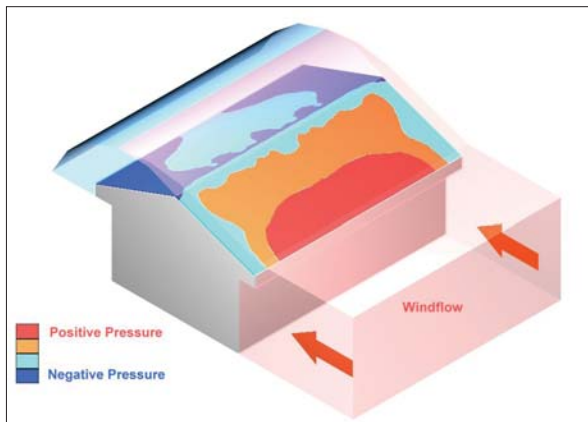
The April 2005 issue of Standards Extra from the NHBC referred to the high winds earlier in the year with gusts in Scotland and Northern Ireland of over 100mph causing severe damage to roofs.

With a predicted increase in the frequency and severity of

storms in the UK and Ireland, and the increase in wind speeds it is now more important than ever to recognise the part that roofing underlays play in preventing tiles or slates being dislodged from roofs.



Wind uplift is one of the main causes of roof covering failure. Wind blowing over the roof causes pressure differentials and where negative pressure or suction occurs, the roof underlay plays a crucial role in acting as a primary line of defence.

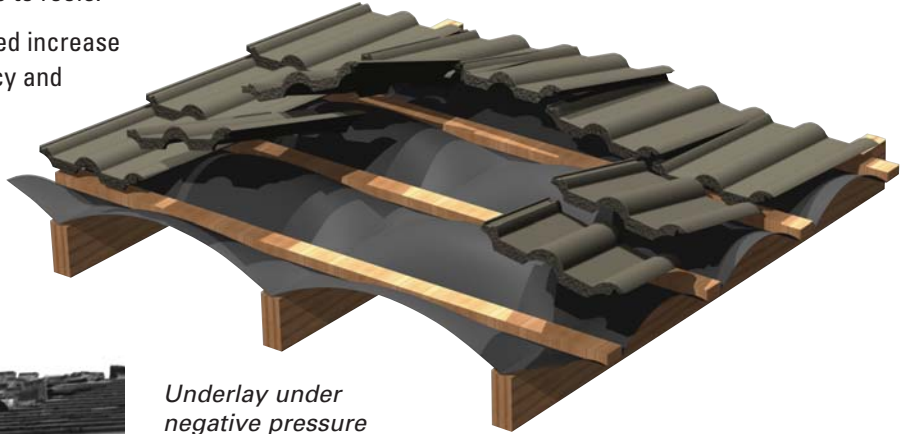


Drawing showing windflow over a roof with the positive and negative pressures created

The Role of Roofing Underlays

In unsupported applications, some two thirds of the total wind load has to be absorbed by the underlay, the remaining one third by the correctly fixed roof covering. (BS 5534: 2003).

BS 747 Type 1F and 5U re-inforced bitumen have been the traditional roofing underlays for this country for decades and have been shown by site experience and by testing to resist the worst wind uplift conditions expected in the UK and Ireland without extending unduly under load.



Underlay under negative pressure

However the disadvantages of the BS 747 underlay types are well documented including weight and useability.

If an underlay has too much inherent elongation or extensibility under load it will deflect upwards to such a degree that it comes into contact with the underside of the roof covering and can dislodge the slates and tiles.

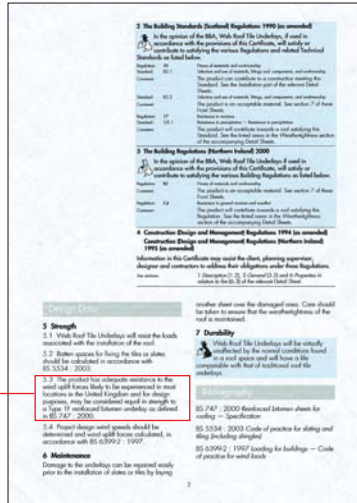
Underlays that are air permeable are by definition unable to resist all of the windload pressure. Whatever windload pressure that escapes through the underlay will be transferred onto the roof covering requiring higher frequency of fixing of the slates or tiles.

With the trend towards vapour permeable (breather or type LR) underlays and the modern lighter weight impermeable, (non-breathable or type HR) alternatives to 1F and 5U, the issue of wind uplift has been largely overlooked.



Independent Certification

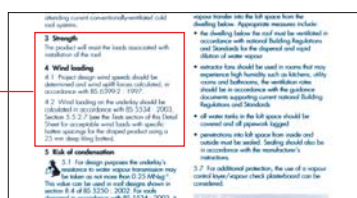
It is not helped by the fact that many of the independent certificates of the modern light weight alternatives make the standard statement under strength;



5.3 The product has adequate resistance to the wind uplift forces likely to be experienced in most locations in the United Kingdom and for design purposes may be, considered equal in strength to a Type 1F reinforced bitumen underlay as defined in BS747:2000.

However, in the performance tables, the same certificates go on to quote actual resistance to wind load figures which show that the products are in fact anything but equal in strength to Type 1F and have severe restrictions on use at maximum batten gauge.

It has now been acknowledged that this statement on strength is potentially misleading in regard to wind load resistance and the wording is being amended to simply read;



3 Strength

The product will resist the loads associated with the installation of the roof.

4 Wind loading

4.1 Project design wind speeds should be determined and wind uplift forces calculated, in accordance with BS 6399-2:1997.

4.2 Wind loading on the underlay should be calculated in accordance with BS 5534:2003, Section 5.5.2.7 (see the tests section of this Detail Sheet for acceptable wind loads with specific batten spacings for the draped product using a 25mm deep tiling batten)

Wind Loading

Under **Wind Loading** they now clearly refer the reader to the Table of Performance where the actual wind uplift figures are quoted.

This new wording will appear on all new certificates and will be changed on all existing certificates as and when they come up for renewal.

Wind Uplift Performance

Products generally have their resistance to wind uplift performance quoted in terms of an acceptable uplift for a specified batten gauge. For typical interlocking concrete tiles, the most commonly used roof tile type in the UK, the maximum batten gauge would be around 343mm.

Table 5 Service performance

Tests (units)	Method ⁽¹⁾	Mean result
Water vapour permeability(gm ⁻² day ⁻¹)	BS 3177	4.43
Water vapour resistance (MNs ^g)	BS 3177	46
Low temperature flexibility (°C)	MOAT 27:5.4.2	
aged		<-25
aged ⁽²⁾		<-25
Resistance to wind loads (kPa)	T1/03 ⁽³⁾	
batten spacing 350mm		0.5 ⁽⁴⁾
batten spacing 330mm		1.0 ⁽⁴⁾
batten spacing 300mm		1.0 ⁽⁴⁾
batten spacing 250mm		2.5 ⁽⁴⁾
Slip resistance (coefficient of friction)	BBA T1/10 ⁽¹³⁾	
dry		0.90
wet		0.73

(1) The test documents are detailed in the Bibliography. Numbers in the table refer to sections/parts of the various documents. (2) Heat aged at 70°C for 56 days. (3) BBA test methods. (4) Maximum pressure achieved.

Of the many modern alternatives to Type 1F and 5U, very few have unrestricted use ie the ability to resist 2.5kPa at maximum batten gauge. Most have wind uplift limitations that restrict the maximum usable batten gauge and preclude the use of typical concrete interlocking tiles in many parts of the country.

There is a danger that specifiers and contractors simply accept that all modern lightweight alternatives to Type 1F and 5U underlays are equal in all respects by virtue of independent certification without reading the conditions of use in the certificate.

New CTMA and CRTC Fixing Guidelines

The Concrete Tile Manufacturers Association and the Clay Roof Tile Council are shortly due to launch a simplified zonal method of ascertaining the frequency of fixings of all its members roof coverings for given locations in the UK. This will provide a 'safe' fixing specification to comply with BS 5534:2003 requirements.

For a more detailed and site specific calculation individual roof covering manufacturers can still provide a bespoke service but, whichever calculation method is used, the assumption has been made that;

a) the roof underlay is air impermeable (if an underlay is air permeable its ability to resist wind pressure will be reduced as a consequence)

b) the underlay will not deflect or balloon under wind loading to make contact with the underside of the roof covering

This further re-inforces the importance of checking the wind uplift performance of the underlay against the predicted design wind load for the roof to ensure that the underlay will be fit for its intended purpose.

Full copies of the Wind Uplift Report can be downloaded from our web site at www.glidevale.com or requested by post from our Marketing Team on 0161 962 7113

Independent Report

Glidevale commissioned an independent report on wind load calculations "Wind Uplift on Roofing Underlays", produced by RWDI Anemos. This shows that for example buildings of two or three storeys require a resistance of at least 2.5kPa at maximum batten gauge to ensure that an underlay can be safely used in more than 98% of the locations in the UK.



Subsequently, Glidevale, commissioned RWDI Anemos, to develop software which enables specifiers and contractors to obtain site specific information regarding the suitability of an underlay in terms of wind uplift for all post code locations in the UK.

Protect Roofing Underlays

Glidevale's Protect A1 and Wunderlay impermeable underlays and Protect VP400 vapour permeable underlay have independent certification for unrestricted use with regard to wind uplift. All have a wind uplift performance of 2.5kPa at 343mm batten spacing enabling unrestricted use in all exposure conditions in the UK and Ireland.

Glidevale have over 20 years experience in roofing products in the UK and Ireland. Our aim is to manufacture and supply only products that are fit for function and to help educate the industry to the issues they should bear in mind when drawing up specifications or purchasing products.

For further advice or detailed information regarding a specific project please contact our Technical Services Team on **0161 962 7113**

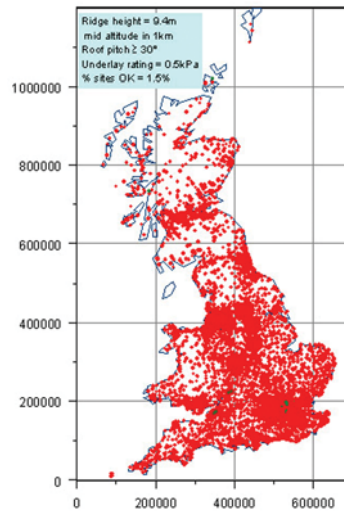
A CPD seminar on Wind Uplift can be provided on request, subject to numbers. Please contact our Marketing Team for further information.

References

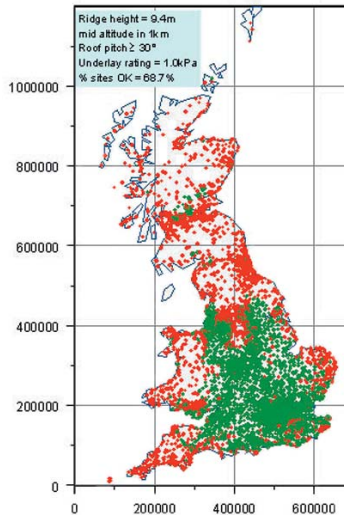
The Vulnerability of UK Property to Windstorm Damage - the Association of British Insurers July 2003
BS5534: 2003

Wind Uplift on Roofing Underlays - a review of design acceptability around the UK.
RWDI Anemos March 2004

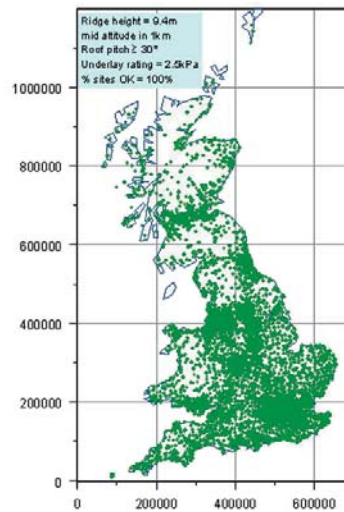
NHBC Standards Extra April 2005



Example 1
Ridge height 9.4m
Mid altitude
Roof pitch 30°
Underlay rating 0.5kPa



Example 2
Ridge height 9.4m
Mid altitude
Roof pitch 30°
Underlay rating 1.0kPa



Example 3
Ridge height 9.4m
Mid altitude
Roof pitch 30°
Underlay rating 2.5kPa

■ restricted use ■ unrestricted use

Maps selected from RWDI Anemos report 'Wind Uplift on Roofing Underlays'. Full copy of report available on request.

protect

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