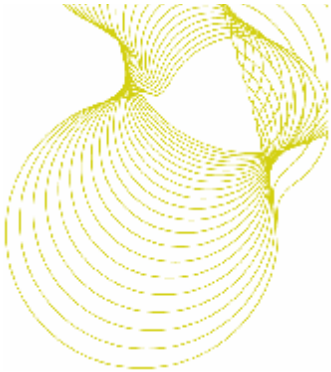
High speed wind tests on the Manthorpe GDV Dry Verge System

Prepared for: Ranulph Pack
Manthorpe Building Products

15 July 2005

Test report number 224-493



Prepared by

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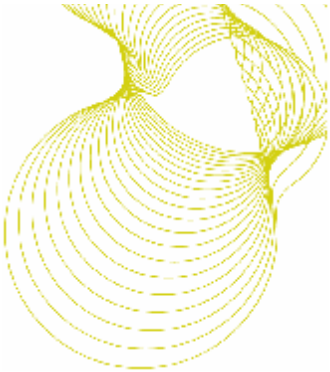
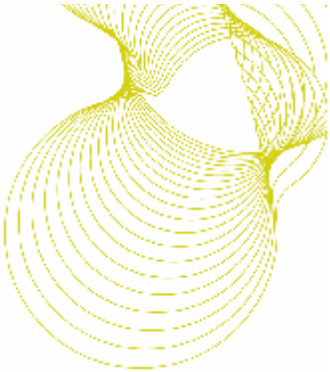


Contents

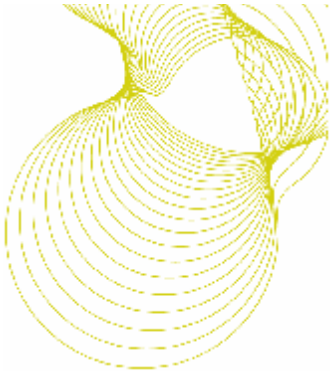


1 Introduction

This report details testing undertaken on 6th July 2005 to check that the Manthorpe GDV Dry Verge System can withstand high windspeeds without damage. The testing was carried out at BRE, Bucknalls Lane, Watford, WD25 9XX, UK. The client for these tests was Manthorpe Building Products Ltd, Manthorpe House, Brittain Drive, Codnor Gate Business Park, Ripley, Derbyshire, DE5 3ND.

This testing is based on BRE Proposal No. 115341 dated 6th June 2005, which was accepted by Mr Pack of Manthorpe Building Products on 16th June 2005.

The testing was carried out at BRE as project CV0576 under the BRE Terms and Conditions for Testing. This report describes the work carried and the results obtained.



2 Details of tests carried out

The objective of the testing was to assess the performance of the Manthorpe GDV Dry Verge System under high wind speed conditions. The Dry Verge System was installed on a 2m x 2m (plan dimensions) 22.5° pitch test roof which was mounted at the end of the BRE wind tunnel. The verges were installed as they would be in practice, as detailed in the product information sheets and fixing instructions in Annex A. Two types of roof tile were used with the Dry Verge System; a flat interlocking concrete tile and a profiled interlocking concrete tile.

There is no defined procedure for testing verge systems such as these under wind loading. The advice given in BS5534:2003 is for users to pay particular attention to the resistance to wind load of dry roofing products (Note 2 Clause 4.16.7) but no guidance is given on how to do this. Consequently it was decided that the most appropriate approach would be to subject the verges to high windspeeds to observe how they respond. This was done by mounting the test roof at the end of the BRE high speed wind tunnel. The roof was placed on a turntable so that it could be rotated to subject it to winds from all directions. For each wind direction tested, the wind speed was increased in steps of 10m/s until the maximum speed of the wind tunnel was reached. The wind speed was held at a constant value for a period of approximately 5 minutes at each step increment. A video of the testing was also produced.

Figure 1 to 3 show the verges installed on the test roof.

Figure 1 Manthorpe GDV left right verge with flat tiles

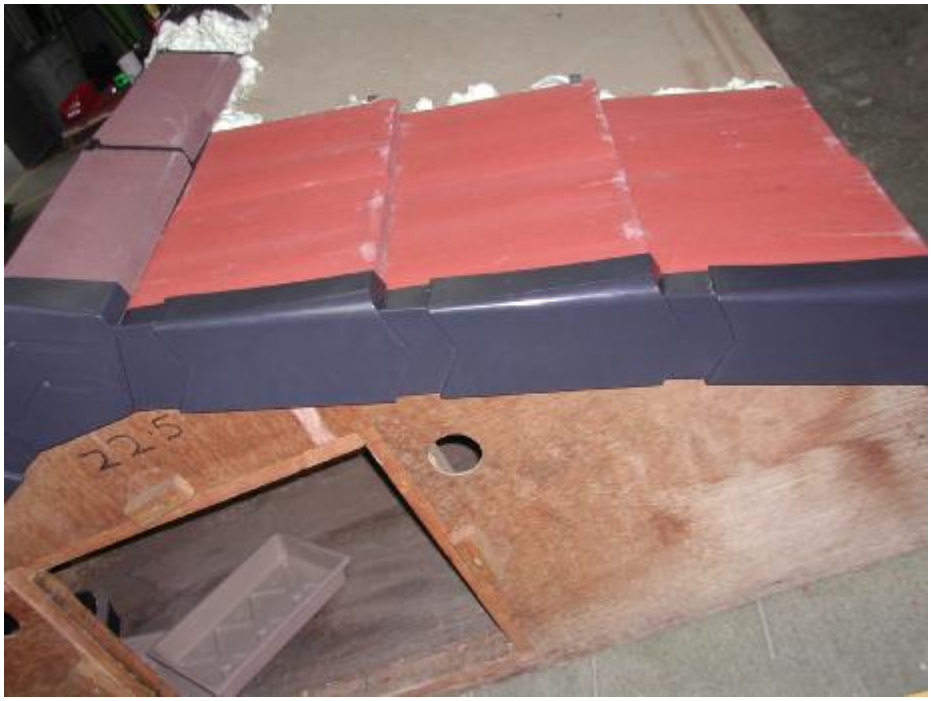
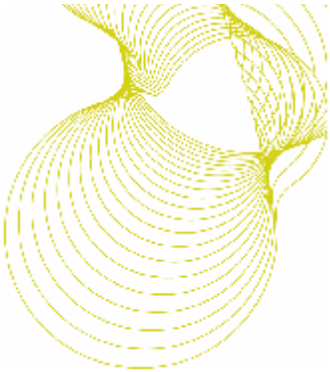


Figure 2 Manthorpe GDV left hand verge with flat tiles

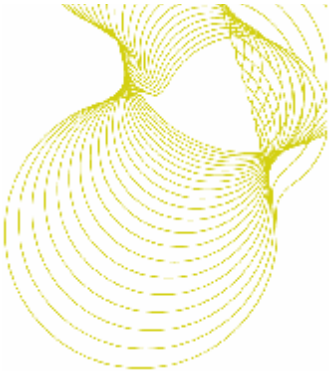
Figure 3 Manthorpe GDV right hand verge with profiled tiles



3 Test results

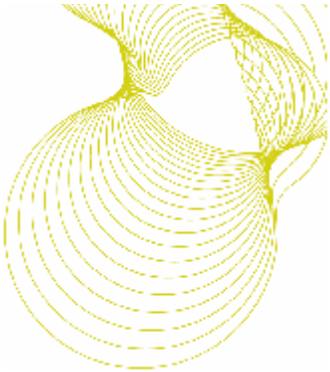
The verges were tested with wind approaching from a range of wind direction. A total of 10 tests were carried out as shown in Annex B. Log sheets of the tests are given in Annex C. In all of the tests the Manthorpe GDV verges resisted the wind tunnel's maximum wind speed of 48m/s (108mph) without showing any signs of distress or damage. At the higher windspeeds the verges vibrated under winds from certain directions but none of the fixings worked loose.

To put a wind speed of 48m/s into context, from BS6399: Part 2 (the British Standard for wind loading on buildings) the design wind speed to be expected on a two-storey house in the London area in a fifty year design life would be of the order of 25m/s to 35m/s (depending on factors such as the roof height, distance to sea and distance from the edge of the town and the heights and spacing of surrounding buildings). For a similar house in a town in Scotland the design wind speed would vary from about 35m/s to 45m/s. These examples exclude the effects of topography and ground altitude. If the building is on the top of a steep hill then the wind speeds can be increased by up to 36%, wind speeds also increase by about 10% for every 100m increase in ground level. To determine the actual design wind speed at any particular site it is necessary to follow the procedures given in BS6399-2.



4 Summary

The results from these tests on the Manthorpe GDV Dry Verge System show that the verges when fixed according to the manufacturers instructions will resist wind speeds of at least 48m/s without failing or demonstrating any other visible signs of distress.



Annex A - Details of the Manthorpe Dry Verge System

Manthorpe Building Products

Product Information Sheet

Dry Verge System – Overview

CODE **GDV**

Description:

The Manthorpe Interlocking Dry Verge System is a fast and effective method for finishing the verge of a concrete tiled roof.

The Dry Verge System is compatible with almost every make and profile of concrete interlocking tiles and is completely maintenance free. The system can be mechanically fixed in all weather conditions without the need for mortar.

The Angled or Round Ridge End Cap can be used to protect the end of the ridge while the Eaves Closure seals the base of the verge preventing access for birds and large insects.

The sleek appearance of the product maintains the stepped appearance of the verge while remaining unobtrusive to the original roof design.

Features:

Easy to fix and maintenance free.

Suits most makes and profiles of concrete interlocking tiles that have a batten gauge between 280mm and 345mm.

Secures tiles to the roof, preventing wind uplift problems.

Mortar-free solution allows fixing in all weather conditions.

Long term UV resistance prevents discolouring from exposure to sunlight.

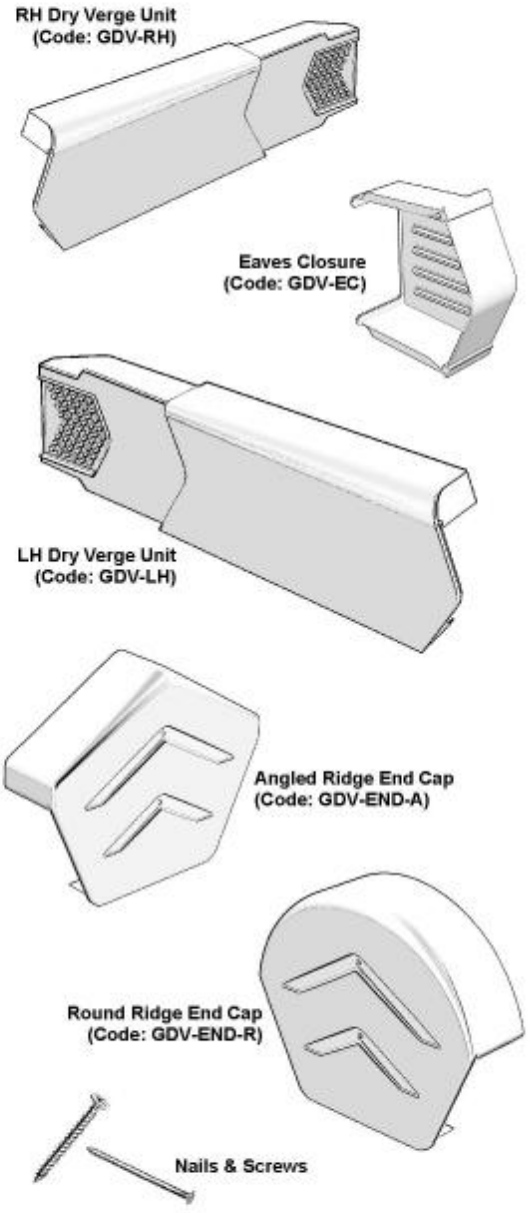
Prevents entry of birds and large insects.

Suitable for new build or refurbishment situations on roofs of 15° to 55° pitch.

Complies with BS 5534 requirements for mechanical fixing.

References:

BSI: British Standard 5534:2003
BSI: British Standard 6399-2:1997
NHBC Standards Chapter 7.2



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DRN R.P | Date 14.2.05

The company maintains a policy of continuous development of its product range and reserves the right to amend the specification without notice.

DRG No **MBP 8225**

Issue **A**

Manthorpe Building Products

Product Information Sheet

Dry Verge System – Eaves Closure

CODE **GDV**

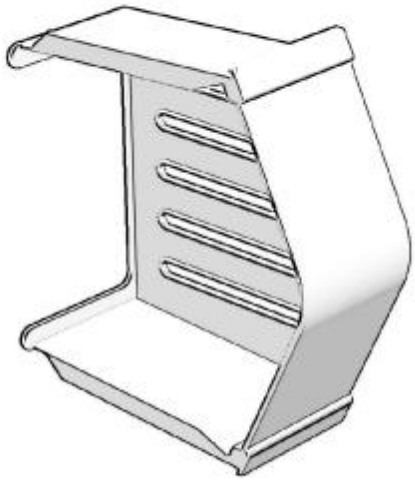
Product Codes:	
Eaves Closure Unit	**GDV-EC**

Description:

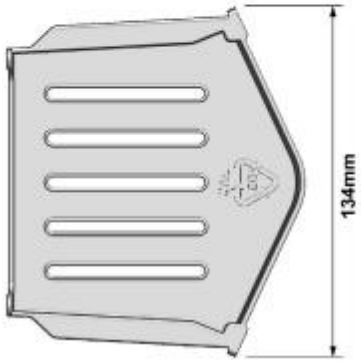
The Manthorpe Eaves Closure Unit prevents the entry of birds and large insects into the building structure through the base of the roof verge.

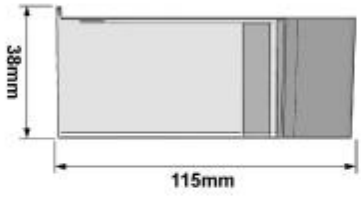
The GDV-EC Eaves Closure can be nailed into the end of the fascia board. The first Dry Verge Unit is then clipped securely over the Eaves Closure providing a strong foundation for the remainder of the system.

The design is ambidextrous in nature and can be used on both verges of the roof.



PACKING DETAILS	Eaves Closure Pack contains 2 Eaves Closure Units, 2 Nails and Fixing Instructions. 20 Packs per Box.
WEIGHT	3kg per Box
MATERIAL	Unplasticized Polyvinyl Chloride (uPVC)
MANUFACTURING PROCESS	Injection Moulded
COLOUR VARIATIONS	Terracotta (TR) Dark Brown (BR) Slate Grey (GR) White (WH)





References:

BSI: British Standard 5534:2003
BSI: British Standard 6399-2:1997
NHBC Standards Chapter 7.2 Pitched Roofs

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Issue **A**

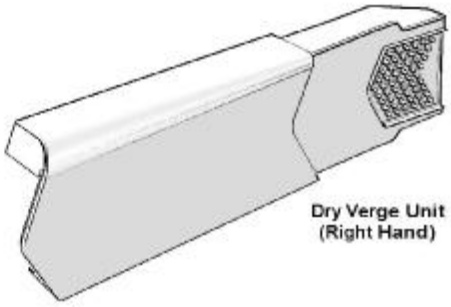
Manthorpe Building Products

Product Information Sheet

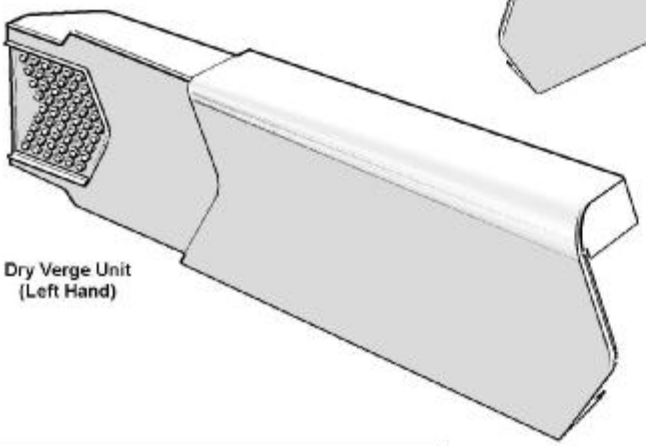
Dry Verge System – Verge Units

CODE **GDV**

Product Codes:	
Dry Verge Unit (Right Hand)	GDV-RH
Dry Verge Unit (Left Hand)	GDV-LH



Dry Verge Unit (Right Hand)



Dry Verge Unit (Left Hand)

Description:

The Manthorpe Dry Verge System provides a secure mechanical fixing solution for most makes and profiles of Concrete Interlocking Tiles laid between **280mm** and **345mm** batten gauge.

The Verge Units can be easily fitted to each tile in succession, locking the tile in place to prevent wind uplift problems. The system is mortar-free and can be fixed in all weather conditions. Once fitted they are completely weatherproof and maintenance free.

Each Verge Unit is manufactured from a high grade of uPVC, providing long-term resistance against plastic degradation and 'colour bleaching'.

The Manthorpe Dry Verge is available in Terracotta, Dark Brown, Slate Grey and White to compliment any variation of roof design. The Dry Verge system preserves the 'stepped' appearance of the roof tiles while maintaining the continuous line on the underside of the verge.

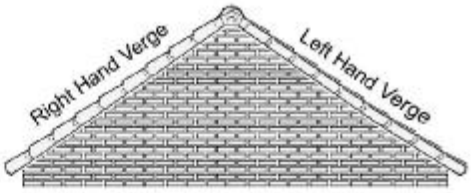


Illustration shows left and right hand verge units as viewed from outside the building. Note careful attention should be taken when specifying 'left' and 'right.'

References:

BSI: British Standard 5534:2003
BSI: British Standard 6399-2:1997
NHBC Standards Chapter 7.2 Pitched Roofs

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DRG No **MBP 8226** (PAGE 1 OF 2)

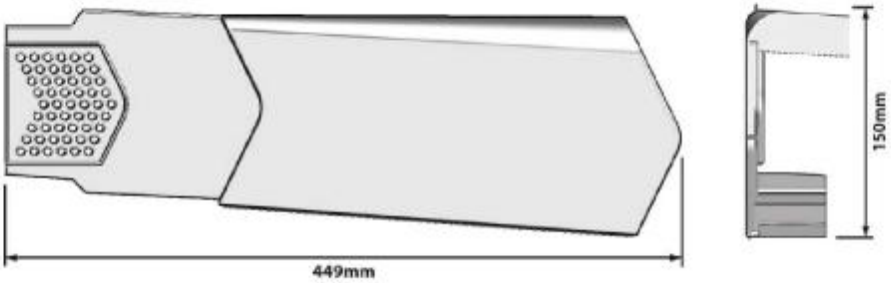
Issue **A**

Manthorpe Building Products

Product Information Sheet

Dry Verge System – Verge Units

CODE **GDV**



Guidance:

Each Dry Verge Unit should be fixed using aluminum or stainless steel, 3.35mm shank diameter spiral roll or annular shank nails, 38mm in length (these are not provided).

The Manthorpe Dry Verge Units can be fixed directly to the end of the tiling battens or used in conjunction with an additional refurbishment batten to avoid the need for raking a mortar bedded verge. (See Fitting Instructions).

At the eaves, each run of Dry Verge units should be closed off at the bottom using the Manthorpe Eaves Closure Pack (Product Code: **GDV-EC**) to prevent the ingress of birds and large insects.

At the ridge, the Manthorpe Angled or Round Ridge End Cap (Product Code: **GDV-AR** or **GDV-RR**) should be used to prevent the ingress of birds and large insects.

At a top edge abutment or similar, a lead flashing should be dressed over the tail of the top verge unit. The length of flashing will be dependent on the rafter pitch.

Note: Suitable for 25mm thick battens only.

BATTEN GAUGE COMPATABILITY	280mm to 345mm
ROOF PITCH COMPATABILITY	15° to 55°
PACKING DETAILS	Dry Verge Pack contains 10 Left **or** Right Dry Verge Units plus Fixing Instructions. 5 Packs per Box.
WEIGHT	14.5kg per Box
MATERIAL	Unplasticized Polyvinyl Chloride (uPVC)
MANUFACTURING PROCESS	Injection Moulded
COLOUR VARIATIONS	Terracotta (TR) Dark Brown (BR) Slate Grey (GR) White (WH)

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DRG No **MBP 8226** (PAGE 2 OF 2)

Issue **A**

Manthorpe Building Products

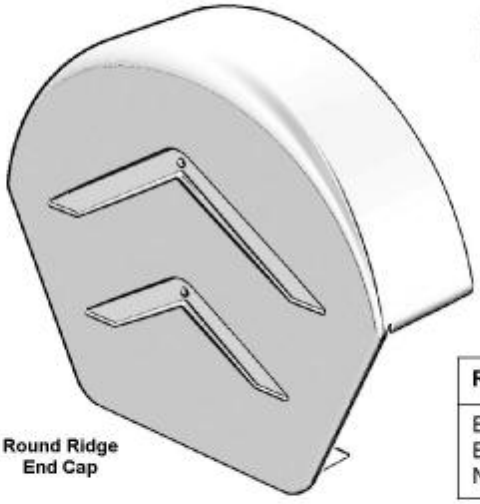
Product Information Sheet

Dry Verge System – Ridge End Caps

CODE **GDV**

Product Codes:	
Round Ridge End Cap	GDV-END-R
Angled Ridge End Cap	GDV-END-A

Angled Ridge End Cap



Round Ridge End Cap

References:

BSI: British Standard 5534:2003
BSI: British Standard 6399-2:1997
NHBC Standards Chapter 7.2 Pitched Roofs

Description:

The Manthorpe Ridge End Caps work in conjunction with the Manthorpe Dry Verge System to provide a neat and attractive finish for most makes of Round and Angled Concrete Ridge Tiles.

The Ridge End Caps provide durable protection at each end of the ridge, eliminating problems caused by water penetration and wind uplift whilst preventing the entry of birds and large insects into the roof cavity.

Each Ridge End Cap is supplied with fixings and fitting instructions and can be quickly and easily fixed directly to the Ridge Batten(s) in all weather conditions.

The Ridge End Caps are manufactured from a high grade of uPVC, providing long-term resistance against plastic degradation and 'colour bleaching'.

Features:

Easy to fix and maintenance free.

Mortar-free solution allows fixing in all weather conditions.

Long term UV resistance prevents discolouring from exposure to sunlight.

Suitable for new build or refurbishment situations on roofs of 15° to 55° pitch.

Prevents entry of birds and large insects into the roof cavity.

Suitable for most makes of half round and universal angle concrete ridge tiles.

Complies with BS 5534 requirements for mechanical fixing.

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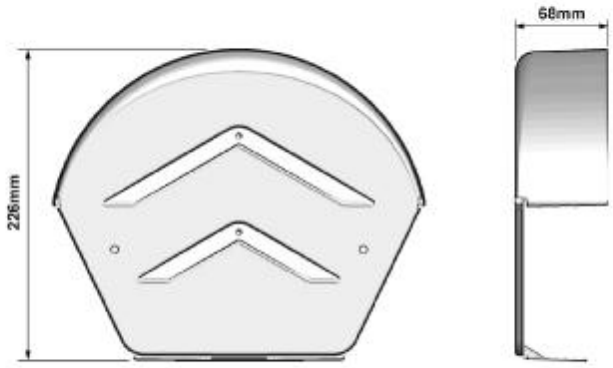
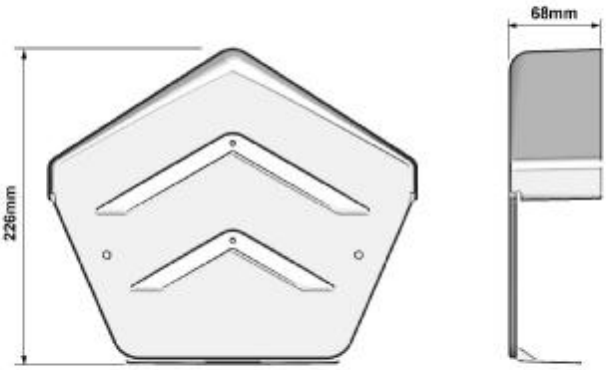
DRG No **MBP 8227** (PAGE 1 OF 2)

Issue A

Manthorpe Building Products	Product Information Sheet
Dry Verge System – Ridge End Caps	CODE **GDV**



Half Round Ridge End Cap GDV-END-R



Universal Angle Ridge End Cap GDV-END-A

PACKING DETAILS	Ridge End Pack contains 2 Round **or** Angled Ridge End Caps, 4 screws and Fixing Instructions 10 Packs per Box.
WEIGHT	4.5kg per Box
MATERIAL	Unplasticized Polyvinyl Chloride (uPVC)
MANUFACTURING PROCESS	Injection Moulded

COLOUR VARIATIONS	Terracotta (TR) Dark Brown (BR) Slate Grey (GR) White (WH)

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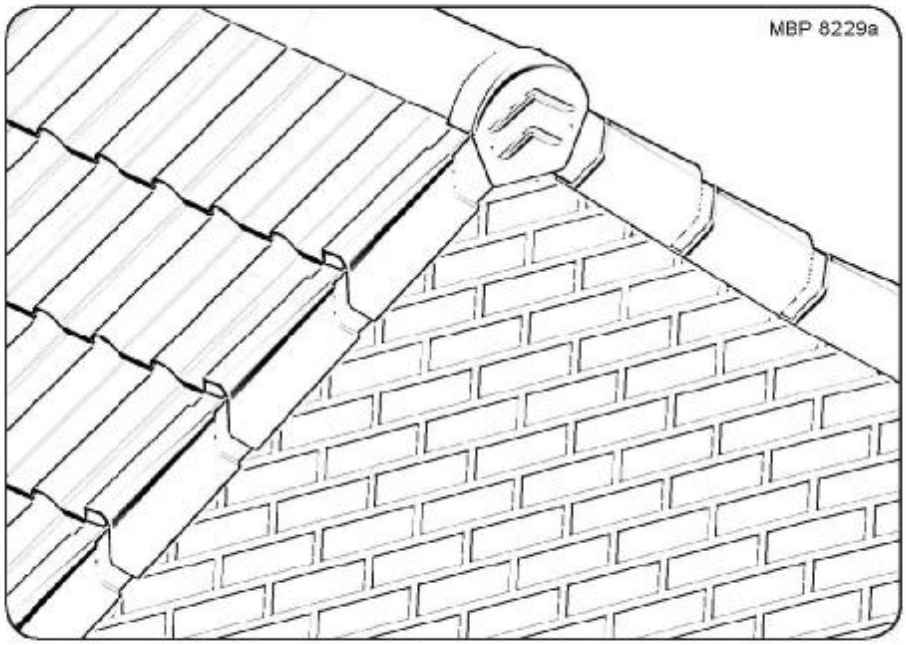
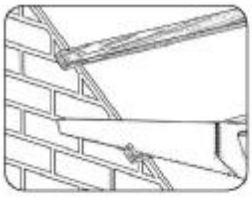
MANTHORPE
BUILDING PRODUCTS

SmartVerge™
Dry Verge System

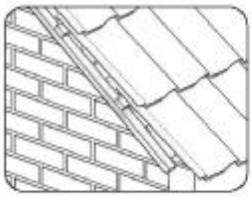
Fixing Instructions



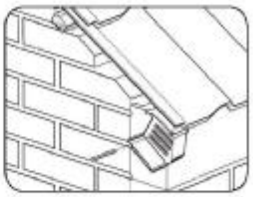
Installation



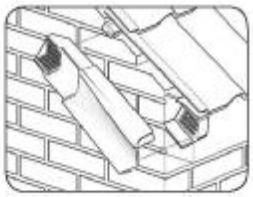
1. Saw the tiling battens off square so that they overhang the gable wall or bargeboard by **30mm**. The top course tiling battens should be distanced no further than **85mm** from the apex. (Note: Roof underlay intended for use on verges should lap the outer skin of the brickwork by 25mm to 50mm or, in the case of an overhanging verge, onto a flying rafter).



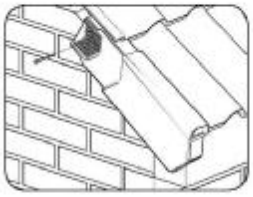
2. For **refurbishment** situations where the ends of the tiling battens are bedded in mortar or showing signs of degredation, securely fix a length of 25mm x 38mm batten strip along the entire length of the verge as shown above. This can be used for nailing each Dry Verge Units to the verge of the roof in place of the batten ends.



3. Clip an **Eaves Closure Unit** into the front nose of the Dry Verge Unit and place this over the first eaves tile. Mark out the position of the Eaves Closure Unit, then carefully remove the Dry Verge Unit. With the fixings provided, nail through one of the slots in the Eaves Closure unit and into the end of the fascia board as shown above.

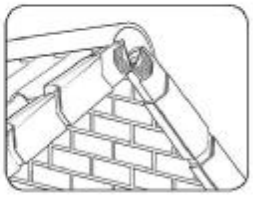


4. 'Flex' open the first **Left Hand Dry Verge Unit** and position over the Eaves Closure Unit. Push the Verge Unit onto the Eaves Closure until both sides of the clip engage with the outer fins of the Eaves Closure Unit.



5. Slide the Dry Verge Unit with the Eaves Closure up along the tile towards the apex until the Verge Unit butts against the end of the tile. Nail the tail end of the Verge Unit through an appropriate hole so that the nail penetrates the centre of the tiling batten end and firmly holds the Dry Verge in place. (Note: Use 3.35mm shank diameter spiral roll or annular shank nails, 38mm in length).

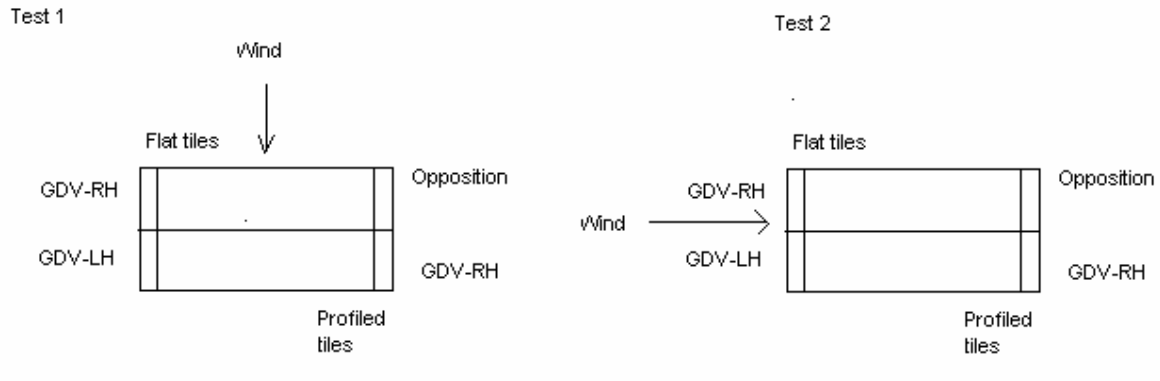
6. 'Flex' open a second Dry Verge Unit and push on to the tail of the first until both sides of the clip engage with the tail fins of the first. Once again ensure the Verge Unit butts against the end of the tile, then nail the tail end of the Verge Unit through an appropriate hole so that the nail penetrates the centre of the tiling batten.

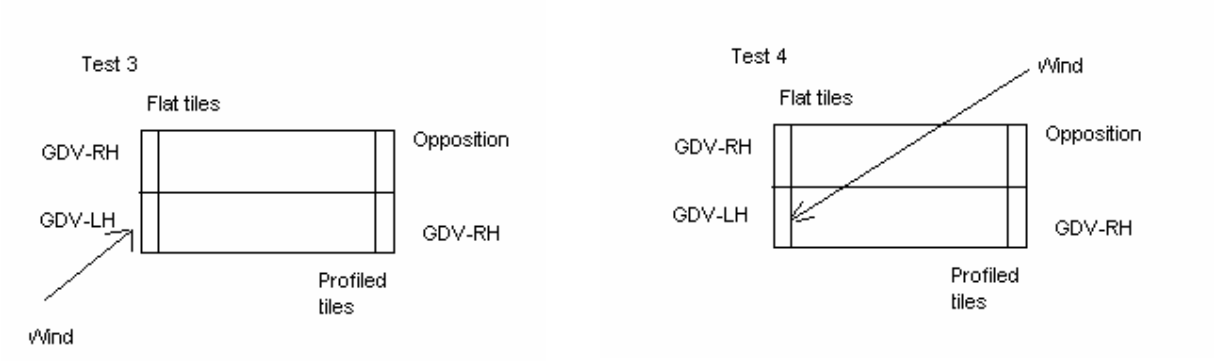


7. Repeat this process up the verge until all tiles have been covered. Once the Left Hand Verge is completed repeat steps 1 to 7 on the opposite verge, this time using the **Right Hand** Verge Units.

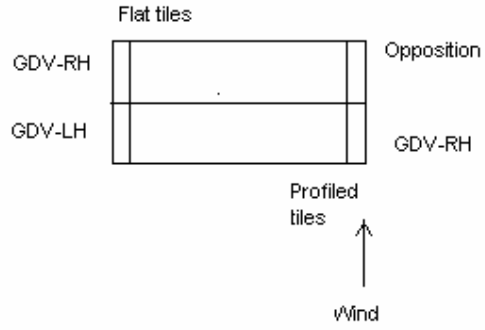
8. To finish the roof at the apex , place the Ridge End Cap over the end of the ridge tile so that it hooks over both Dry Verge Units. Using the screws provided, screw into the Ridge End Cap through the desired blind nail hole and into the end of the ridge batten, or, if this is not available into the top tiling battens.

Annex B - Wind directions used in each test

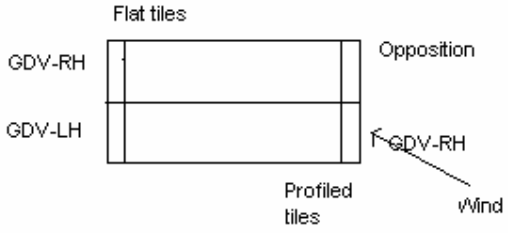




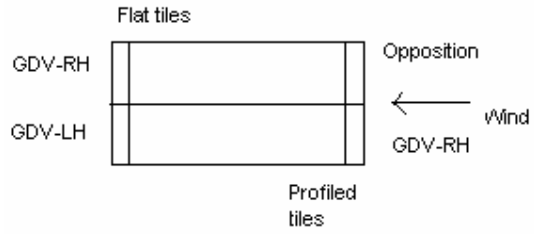
Test 5



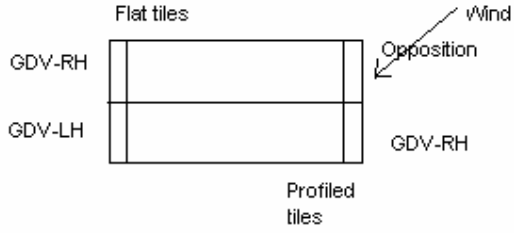
Test 6



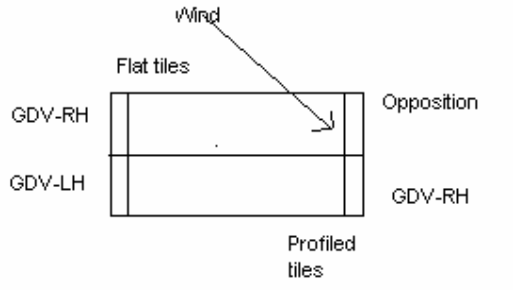
Test 7



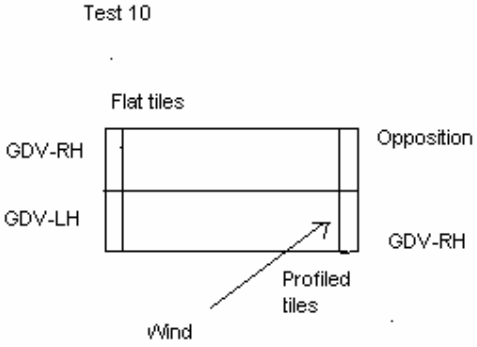
Test 8



Test 9



Test 10



Annex C - Test log sheets

Test 1.
Flat tiles GDV-RH sideways to wind

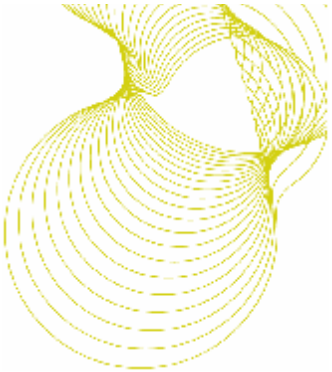
Wind speed (m/s)	Observations
10	No movement.
20	No movement.
25	No movement.
30	No movement.
35	Slight vibration at sides of dry verge.
40	Slight vibration at sides of dry verge.
45	Slight vibration at sides of dry verge.
48	Slight vibration at sides of dry verge.

Test 2.
Flat tiles GDV-RH and GDV-LH gable end to wind.

Wind speed (m/s)	Observations
20	No movement.
25	No movement.
30	No movement.
35	No movement.
40	No movement.
45	Tile below ridge and next to verge chattering a little
48	Second tile below ridge and next to verger chattering a little

Test 3.
Flat tiles GDV-LH 45^{O} to wind, gable end.

Wind speed (m/s)	Observations
20	No movement.
25	No movement.
30	No movement.
35	No movement.
40	No movement.
45	No movement.
48	No movement.



Test 4.
Flat tiles GDV-LH 45^{O} wind blowing across length of roof.

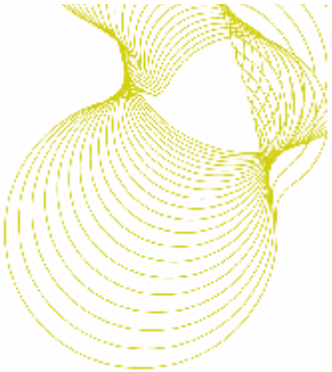
Wind speed (m/s)	Observations
20	No movement.
25	No movement.
30	No movement.
35	No movement.
40	No movement.
45	No movement.
48	No movement.

Test 5.
Profiled tiles GDV-RH sideways to wind.

Wind speed (m/s)	Observations
20	No movement
25	No movement
30	No movement
35	Second tile up and next to verge chattering a little.
40	Second tile up and next to verge chattering a little more.
45	Second tile chattering very little, permanently lifted.
48	Verge vibrating sideways amplitude of 5 to 10mm.

Test 6.
Profiled tiles GDV-RH 45^{O} to wind, gable end

Wind speed (m/s)	Observations
20	No movement
25	No movement
30	No movement
35	Top of verge vibrating slightly.
40	Top of verge vibrating slightly.
45	Top of verge vibrating slightly, Middle tile next to verge chattering slightly.
48	Similar.



Test 7.
Profiled tiles GDV-RH gable end to wind.

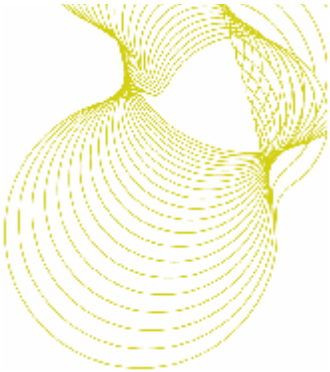
Wind speed (m/s)	Observations
20	No movement.
25	No movement.
30	No movement.
35	No movement.
40	No movement.
45	Slight vibration in sides of verges.
48	Slight vibration in sides of verges.

Test 8.
Profiled tiles Competitor left verge 45^{O} to wind, gable end.

Wind speed (m/s)	Observations
20	No movement.
25	No movement.
30	No movement.
35	No movement.
40	No movement.
45	Middle tile next to verge chattering a little.
48	Middle tile chattering less, permanently lifted. Slight vibration of verge.

Test 9.
Profiled tiles competitor left verge 45^{O} wind blowing across length of roof.

Wind speed (m/s)	Observations
20	No movement.
25	No movement.
30	No movement.
35	No movement.
40	Middle tile next to verge lifting slightly.
45	Middle tile chattering a little.
48	Middle tile chattering less, permanently lifted.



Test 10.
Profiled tiles GDV-RH 45^{O} wind blowing across length of roof.

Wind speed (m/s)	Observations
20	No movement.
25	No movement.
30	No movement.
35	No movement.
40	No movement.
45	No movement.
48	No movement.

==========REPORT ENDS==========