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BRE Test Report

High Speed wind tests on the Manthorpe SmartVerge Interlocking Plain Tile Verge System

Prepared for: **Ben Hales**

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1 Introduction

At the request of Ben Hales, Manthorpe Building Products Ltd, BRE issued proposal P123548 on 15th June 2022. The proposal was accepted by Ben Hales on 16th June 2022.

This report details testing undertaken on 27th July 2022 to assess the performance of the Manthorpe SmartVerge Interlocking Plain Tile Verge System under high wind speed conditions. The testing was carried out at BRE, Bucknalls Lane, Watford, WD25 9XX under the BRE Standard Terms and Conditions of Business for testing as BRE Project number P123548 -1000.

The testing was witnessed by Ben Hales and Dan Walker of Manthorpe Building Products.

2 Test Specimens

A small duo pitch “dog kennel” roof rig was commissioned and built by BRE. This had a roof length of 1100mm and roof width of 2000mm. Rafters were included at 500mm centres. This had a constant roof pitch of 22.5°. Four types of interlocking plain tiles were installed on the rig at a head lap of 95mm. The free tile edge in the middle of the test roof was sealed to prevent wind getting beneath the tiles. Ridge tiles used were installed using the manufacturers fixings and fitting instructions.

The Manthorpe SmartVerge Interlocking Plain Tile Verge system (product code GPPV-IPT) was installed at both verges of the test rig as per the manufactures installation instructions. At the eaves, the SmartVerge Interlocking Plain Tile Eaves Closure was installed (product code GPPV-IPEC). The specimen was installed by Ben Hales and Dan Walker of Manthorpe Building Products.

Figure 1 shows the test rig prior to test. Additional photos are included in Appendix A.

Figure 1. Manthorpe SmartVerge Interlocking Plain Tile Verge system installed with interlocking plain tiles.

The layout of the test specimen is shown in Figure 2 and described in Table 1.

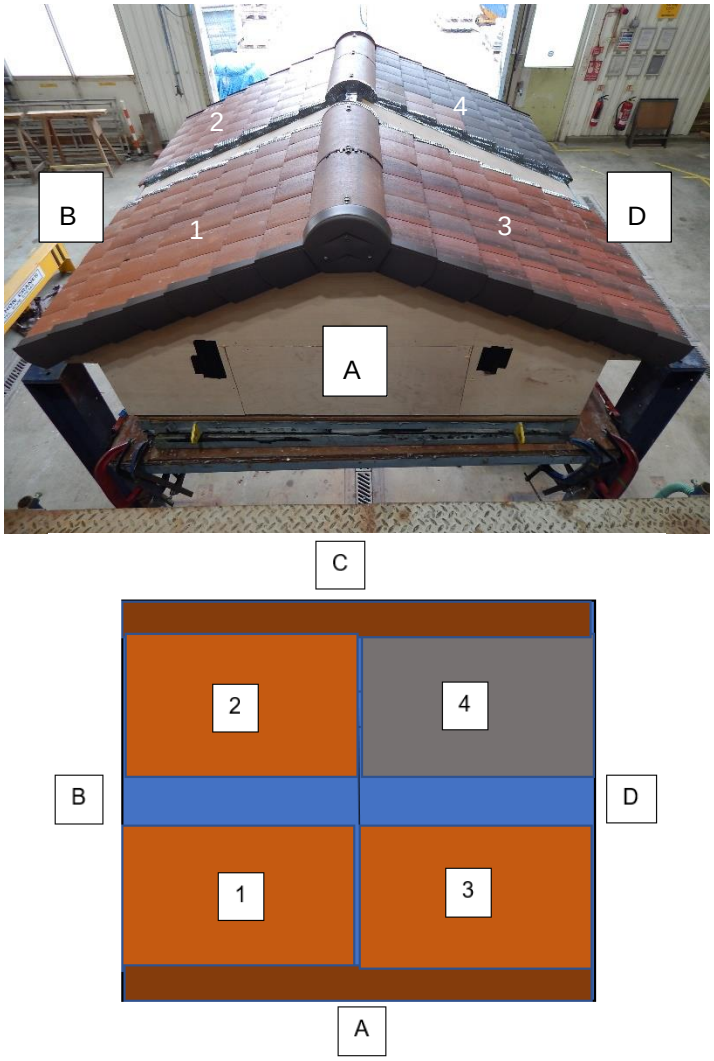


Figure 2. Plan view of test specimen.

Section	Description
1	Gemini Fortcrete, 173mm gauge
2	Marley Ashmore, interlocks laid at a slight taper, more gap at top
3	Redland Duoplain, side interlocks removed
4	Marley Ashmore, correctly laid

Table 1. Description of test specimen.

3 Test Programme

The objective of the testing was to assess the performance of the Manthorpe SmartVerge Interlocking Plain Tile Verge system with SmartVerge Interlocking Plain Tile Eaves Closure system under high wind speed conditions. There is currently no defined procedure for testing verge systems such as these under wind loading[1]. The advice given in BS5534:2015 Clause 4.15.8 is as follows '*Users should pay particular attention to the resistance to wind loads…*' but no guidance is given on how to do this.

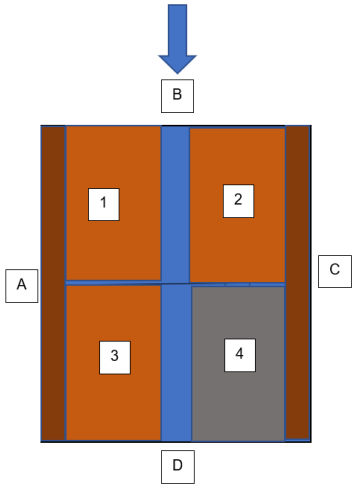
In order to simulate the wind effects acting on the verge units as realistically as possible, the verge units were installed on a duo pitch roof at a roof pitch of 22.5°. The test rig was then installed at the outlet of the BRE Number 3 wind tunnel and subjected to high windspeeds to observe how they respond. The roof, as described previously, 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 increments until the maximum speed of the wind tunnel was reached. The wind speed was held at a constant value for a period of time at each step increment. Any visible damage was noted and recorded.

[1] There is a British Standard (BS8612) for dry fix roofing products which gives simplified loading tests for verge units, but these do not completely replicate wind action on the verges

4 Results and Discussion

A total of 8 tests were carried out on the Manthorpe SmartVerge Interlocking Plain Tile Verge system with SmartVerge Interlocking Plain Tile Eaves Closure.

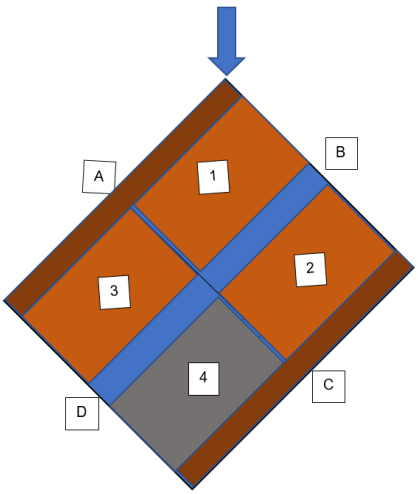
4.1 Test 1 – Face B



Tunnel Speed (m/s)	Time (mins)	Details
25	2	No Movement
30	2	No Movement
35	2	No Movement
40	2	No Movement
48	2	2nd course of tiles in section 1 chattering
48.75	5	As above

No visible damage occurred during the test.

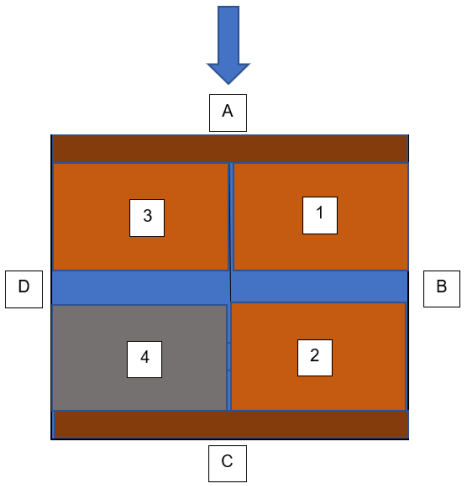
4.2 Test 2 – Junction of Face A and Face B



Tunnel Speed (m/s)	Time (mins)	Details
25	2	No Movement
30	2	No Movement
35	2	No Movement
40	2	No Movement
48	2	4th course of tiles under verge unit in section 3 chattering Ridge cap between sections 1 and 3 vibrating
48.75	5	As above

No visible damage occurred during the test.

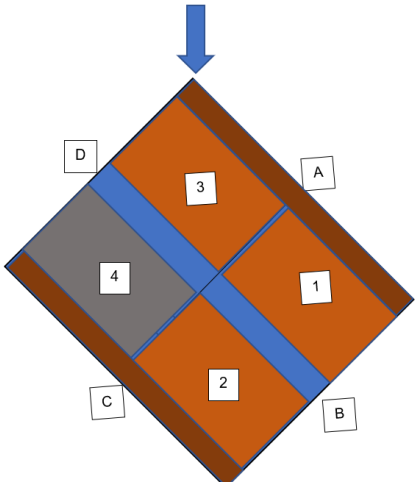
4.3 Test 3 – Face A



Tunnel Speed (m/s)	Time (mins)	Details
25	2	No Movement
30	2	No Movement
35	2	3rd course of tiles in section 3 chattering
39	2	2nd course of tiles in middle of section 3
48	2	3rd & 4th course of tiles section 3 pushing up on verge unit
48.75	5	As above

No visible damage occurred during the test.

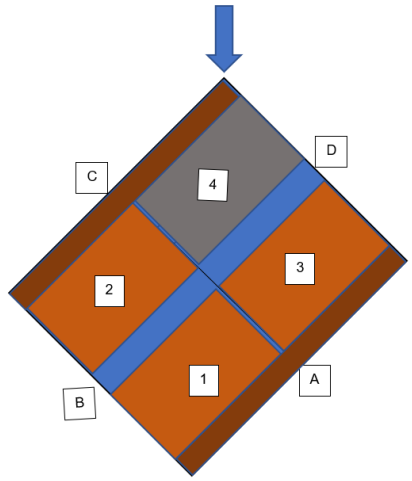
4.4 Test 4 – Junction of Face A and Face D



Tunnel Speed (m/s)	Time (mins)	Details
25	2	No Movement
30	2	No Movement
35	2	No Movement
40	2	No Movement
48	2	5th course of tiles in section 3 pushing up on verge unit & chattering Top course of tiles in section 1 pushing up on verge unit & chattering
48.75	5	As above

No visible damage occurred during the test.

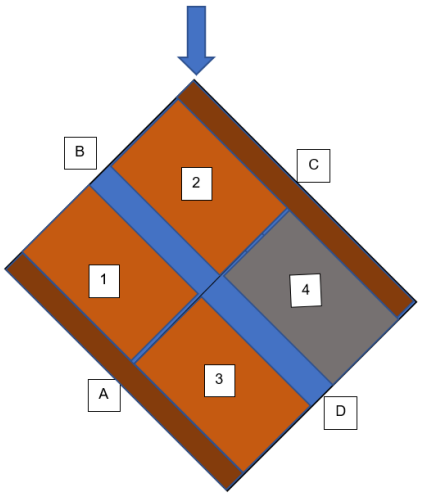
4.5 Test 5 – Junction of Face D and Face C



Tunnel Speed (m/s)	Time (mins)	Details
25	2	No Movement
30	2	No Movement
35	2	No Movement
40	2	No Movement
48	2	No Movement
48.75	5	No Movement

No visible damage occurred during the test.

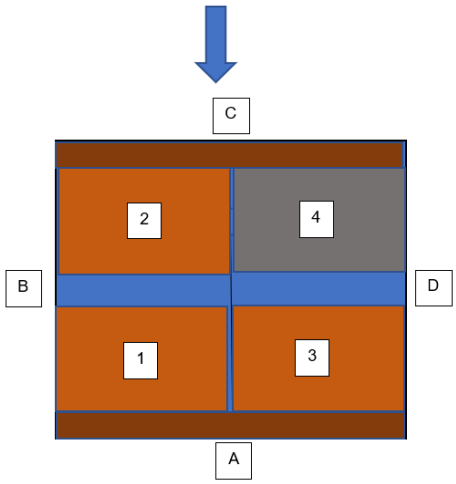
4.6 Test 6 – Junction of Face B and Face C



Tunnel Speed (m/s)	Time (mins)	Details
25	2	No Movement
30	2	No Movement
35	2	No Movement
40	2	No Movement
48	2	No Movement
48.75	5	No Movement

No visible damage occurred during the test.

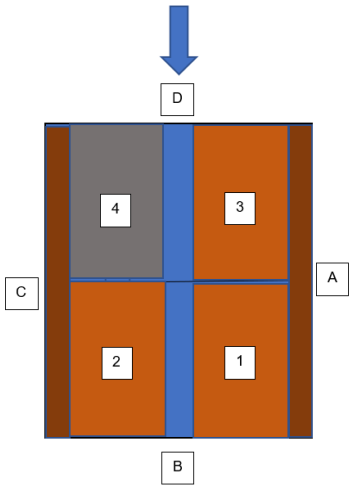
4.7 Test 7 - Face C



Tunnel Speed (m/s)	Time (mins)	Details
25	2	No Movement
30	2	No Movement
35	2	No Movement
40	2	No Movement
48	2	3rd, 4th, 5th course of tiles in section 2 pushing up on verge unit & chattering Middle of 2nd, 3rd, 4th course of tiles in section 2 chattering 2nd, 3rd, 4th, 5th, 6th course of tiles in section 4 chattering
48.75	5	As above

No visible damage occurred during the test.

4.8 Test 8 – Face D



Tunnel Speed (m/s)	Time (mins)	Details
25	2	No Movement
30	2	No Movement
35	2	No Movement
40	2	No Movement
48	2	Tiles in middle and end courses being held down by verge units chattering 3rd course of tiles in section 3 under verge chattering
48.75	5	As above

No visible damage occurred during the test.

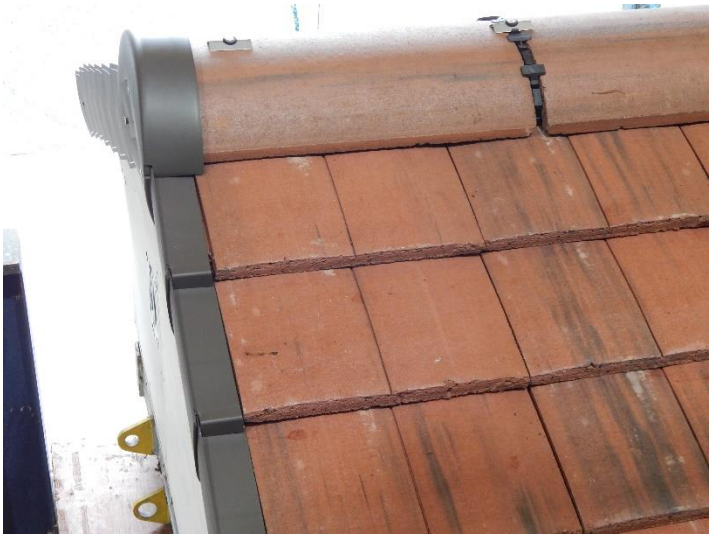
4.9 Context of Test

To put the testing into context. From BS EN 1991-1-4 (the European Standard for actions on structures) the design wind speed to be expected on an isolated two-storey house in the London area for a fifty-year design life would be of the order of 32m/s. For a similar house in Aberdeen the design wind speed would be approximately 43m/s. The actual design wind speed would depend 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. Both these examples assume an isolated house, if there was shelter from surrounding buildings then the design wind speeds would be significantly lower. 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 BS EN 1991-1-4 and the UK National Annex.

5 Summary

In all of the tests completed, the Manthorpe SmartVerge Interlocking Plain Tile Verge system when fixed according to the manufacturer's instructions resisted the wind tunnel's maximum wind speed of 48.75m/s (109.1mph) without showing any signs of distress or damage. At the higher wind speeds the verges showed no signs of movement, although some tiles vibrated slightly under winds from certain directions. However, none of the fixings worked loose. It is very likely that these verge systems will be able to withstand higher wind speeds than the maximum applied during the testing, although this was not demonstrated in the testing because the maximum speed of the wind tunnel was reached. At the completion of the testing the verges and their fixings were visually inspected and all components and fixings were found to be in good order and completely undamaged.

Appendix A – Additional Photographs of Manthorpe SmartVerge Interlocking Plain Tile Verge system During High-Speed Wind Tunnel Testing



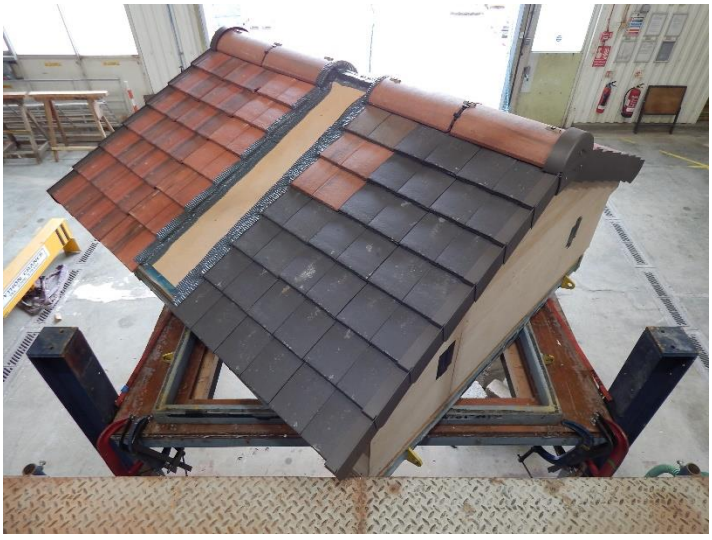
Close up of Manthorpe SmartVerge Interlocking Plain Tile Verge system and SmartVerge Interlocking Plain Tile Eaves Closure.

Test 1.

Test 2.

Test 3.

Test 4.



Test 5.

Test 6.

Test 7.

Test 8.

Report Ends