

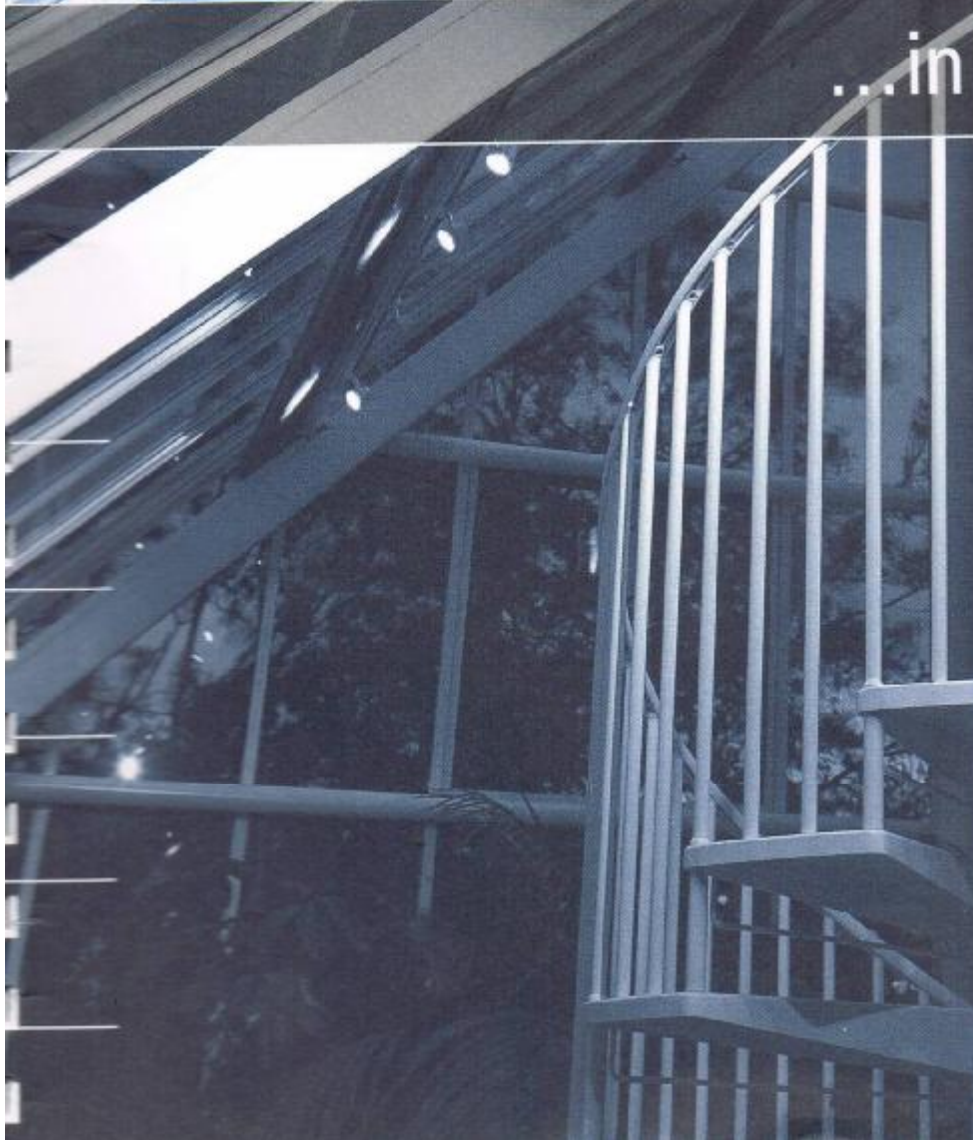
**Test report :**

ACR(M)001:2000 test for  
fragility on Naturalight Systems  
Ltd 1200 mm x 1200 mm  
Standard rooflight

Test report number 209 150d



...in partnership



**Prepared for :**

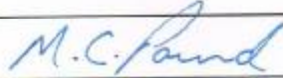
Mr D Derrick

Naturalight Systems Ltd

18 July 2002

## Prepared on behalf of BRE by

Signature



Name

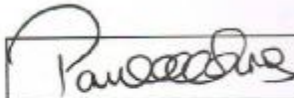
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## 1 Introduction

At the request of Mr W Reay of Naturalight Systems Ltd, Bedlington, Northumberland, BRE tested a 1200 mm x 1200 mm specimen of Standard rooflight on 20 May 2002.

The tests assess the fragility of the specimen rooflight when subjected to impact by a large, soft body as in the standard ACR(M)001:2000.

The tests were carried out under the BRE Standard Terms and Conditions of Business by P Dillon as part of contract number CV 9219, and observed by Mr D Derrick and Mr J Hogg from Naturalight Systems Ltd.

## 2 Details of the tests carried out

The tests were based on ACR (M) 001: 2000 Test for fragility of roofing assemblies<sup>1</sup>. This standard is applicable to any product that will form a roof or part of a roof assembly. The test attempts to simulate accidental impacts that can occur when humans stumble and fall onto the top surface of roof products. It provides information about the degree of resistance to the impacts and classifies the products tested accordingly.

The tests use a 45 kg cylindrical shaped impactor bag filled with compacted sand. The impactor, drop heights, number of drops and time of retention after impact are according to ACR (M) 001: 2000.

The impactor bag described above was dropped vertically onto the outdoor surface of the specimen rooflight. Depending on the results from the first impact a second identical impact may be performed at the same position on the same test specimen. When impacts are completed at one position then the next position is tested usually using new components. The height above the specimen, from which the impactors was released, gave impact energies of 530 J (Joules). The impact energy in Nm (Newton metres) is calculated by multiplying the force of the impactor in Newtons by the drop height in metres. A Newton metre is equivalent to a Joule. For example:  $441.45 \text{ N} \times 1.2 \text{ m} = 529.74 \text{ Nm (J)}$ .

Impacts are usually performed at three positions to match those specified in the ACR standard. They are:

- i. Within 150 mm of the centre of the test sample
- ii. Within 300 mm of a support point, at least 150 mm away from the support
- iii. Within 150 mm of the edge of the sheet, adjacent to the underlap with the other sheet, at a position chosen by the 'competent' person.

The rooflight was impacted at the three positions on the glazing shown in Diagram 1:

1. Central, at the apex of the glazing.
2. At a point along the longer sides, 300 mm up from the edge of the glazing.
3. Near a corner of the glazing, at a point 300 mm from where it meets the upstand.

When impacting curved or sloping glazing the impactor can sometimes bounce off the surface on impact. When this occurred the impactor was placed carefully back onto the surface of the rooflight at the impact point and the time for retention of the impactor was started.

### 3 Performance criteria, classifications and definitions

ACR(M) 001: 2000 Test for fragility of roofing assemblies

1<sup>st</sup> impact at a point. On impact, if the impactor falls through the test assembly and hits the ground, the test assembly is classified as fragile.

If the impactor is retained on the test assembly the assembly must retain the load for at least 5 minutes. This time period may be shortened or extended if justified by the 'competent' person.

If the test assembly retains the load for the 5 minutes after the impact then it will be classified Class C. Non-fragile assembly.

2<sup>nd</sup> impact to same point as 1<sup>st</sup>. The impactor is removed and a second impact similar to the first is made to the same point. If the impactor is retained on the test assembly after the second impact it must be retained for 5 minutes. If the impactor is not retained after the second impact the test assembly will be classified Class C. Non-fragile assembly. If, however, the test assembly retains the impactor after the second impact it will be classified Class B. Non-fragile assembly.

To attain a higher grade than Class B a person competent to do so closely examines the roofing assembly. If this examination shows no sign of damage to sheet or assembly likely to affect the long term strength and weathertightness then the test assembly shall be upgraded to Class A Non-fragile assembly.

Any tearing at fixings, any fracture points, delamination within the product or damage to the surface protection that could accelerate the degradation process should be regarded as sufficient not to give a Class A rating.

ACR (M) 001: 2000 definitions:

Competent person – A person who can demonstrate that he/they has/have: a) sufficient knowledge of the mechanical and physical properties of the material and assembly under test. b) practical experience of installation of the product, usage and behaviour and failure in service

In these tests the competent person was Mr D Derrick of Naturalight Systems Ltd.

## 4 Test specimen

Naturalight Systems Ltd supplied new parts for members of their staff to assemble the rooflight specimen described and tested in this report. The test specimen and components were all stored for at least one hour in the test laboratory conditions before testing. Figure 1 shows the Standard rooflight specimen mounted on the test rig.

**Type:** Square, double polycarbonate skinned domed rooflight, mounted on a galvanised steel upstand. Reference: NaturaLight Systems Ltd Standard rooflight.

**Fixings:** The metal upstand was fixed to the metal purlins at about 600 mm centres using self-drilling/tapping screws. The dome was fixed to the upstand with self-drilling screws with moulded head washers.

**Purlins:** The metal purlins are part of the test rig. They are 3 m long x 0.175 m deep x 0.050 m wide arranged with centres at about 600 mm apart for these tests.

**Dimensions:** The overall internal size of the test rooflight was about 1.20 m long x 1.20 m wide.

## 5 Test set-up

The test rig is that specified in ACR (M) 001: 2000 and consists of a steel frame with steel legs giving a horizontal specimen mounting surface height of about 900 mm. The rig is mounted on a concrete floor. The test specimen is fixed securely to the purlins on this test rig so that it spans across three purlins.

The large, soft body impactor was suspended vertically above the rooflight at an appropriate drop height and released from an electronic release mechanism with a remote trigger. Figure 1 shows the test rig, general test set-up and configuration of the specimen rooflight.

## 6 Results for the 1200mm x 1200 mm Standard rooflight

The weight of the impactor bag was checked prior to the day's testing and found to be within the prescribed limits, at 45 kg. The length of the drop height gauge was also checked and found to be within  $\pm 3\%$  of 1.2 m. Laboratory conditions were within  $20\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ .

The soft body impact test results are given in full below and in the photographs of some tests. Any work or actions carried out on the rooflight between pairs of impacts is recorded below.

The test impacts were performed at three positions on the specimen rooflight shown on diagram 1. The results are given below:

### Position 1. Central, at the apex of the glazing.

**1<sup>st</sup> impact.** The impactor bounced off the rooflight on impact. It was replaced and was then retained at the point of impact for 5 minutes. There was no apparent visible damage to the rooflight.

**2<sup>nd</sup> impact.** The impactor bounced off the rooflight on impact. It was replaced and was then retained at the point of impact for 5 minutes. There was no apparent visible damage to the rooflight.

### Position 2. At a point along the longer sides, 300 mm up from the edge of the glazing.

**1<sup>st</sup> impact.** The impactor bounced off the rooflight on impact. It was replaced and was then retained at the point of impact for 5 minutes. The dome did partially invert on impact but recovered immediately. There was no apparent visible damage to the rooflight.

**2<sup>nd</sup> impact.** The impactor bounced off the rooflight on impact. It was replaced and was then retained at the point of impact for 5 minutes. The dome did partially invert on impact but recovered immediately. There was no apparent visible damage to the rooflight.

### Position 3. Near a corner of the glazing, at a point 300 mm from where it meets the upstand

**1<sup>st</sup> impact.** The impactor bounced off the rooflight on impact. It was replaced and was then retained at the point of impact for 5 minutes. There was no apparent visible damage to the rooflight.

**2<sup>nd</sup> impact.** The impactor bounced off the rooflight on impact. It was replaced and was then retained at the point of impact for 5 minutes. There was no apparent visible damage to the rooflight.

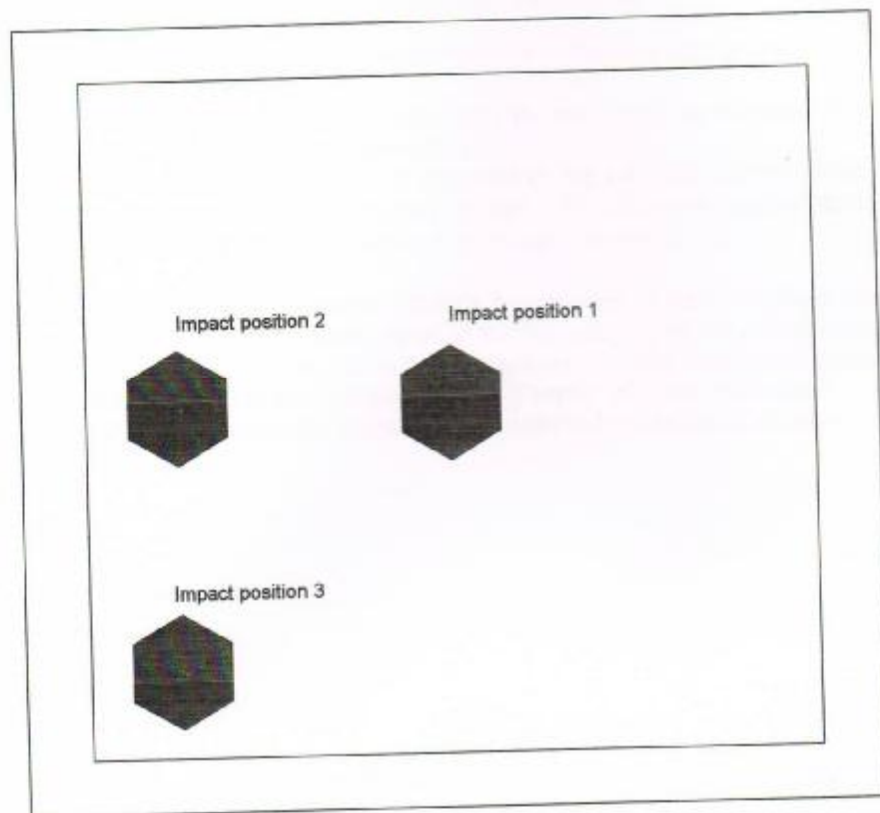


Diagram 1. Impact positions on the Naturalight Systems Ltd 1200mm x 1200mm Standard rooflight specimen

## 7 Conclusions and classifications

The impact tests reported here have assessed the fragility of a specimen of Naturalight Systems Ltd, 1200 mm x 1200 mm Standard rooflight. The tests were performed according to methods in ACR(M) 001:2000 and results interpreted with regard to the classifications in it.

Where possible impacts were made to equivalent positions on the rooflight to the three positions specified in the standard. The results are classified as:

- i. Within 150 mm of the centre of the test sample – Position 1 on the rooflight - Class A non-fragile assembly
- ii. Within 300 mm of a support point, at least 150 mm away from the support – Position 2 on the rooflight - Class A non-fragile assembly
- iii. Within 150 mm of the edge of the sheet, adjacent to the underlap with the other sheet, at a position chosen by the 'competent' person – No equivalent position on the rooflight - Position 3 on the rooflight - Class A non-fragile assembly.

The specimen rooflight sustained the six impacts, two at each of three positions, with no change of components during the tests. After all the impacts a close examination by the competent person and BRE showed no significant damage. Accordingly, the specimen rooflight mounted and fixed in the manner described herein attained the overall classification of Class A non-fragile assembly. The criteria for this result are given in Section 3 of this report.

## 8 References

1. ACR (M) 001:2000. Test for the fragility of roofing assemblies. Advisory committee for roofwork. Materials Standard.



**Figure 1. The 1200mm x 1200mm Naturalight Systems Ltd Standard rooflight mounted on the BRE test rig**