

**Soft and hard body
Impact tests on a
Euroclad Facades
Division's Linear 1
rainscreen facade
system test wall**

Prepared for: Mr. N Jenkins

Euroclad Façade Division

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Test report number 231 322

Tested by

Name Malcolm Pound
Position Laboratory Manager and Senior Consultant
Date 16 August 2006



Signature

Prepared by

Name Malcolm Pound
Position Laboratory Manager and Senior Consultant
Date 26 August 2006



Signature

Approved on behalf of BRE

Name Dr.P.Blackmore
Position Associate Director, Actions, Centre for Materials and Engineering
Date 07 September 2006



Signature

BRE
Garston
WD25 9XX
T + 44 (0) 1923 664000
F + 44 (0) 1923 664010
E enquiries@bre.co.uk
www.bre.co.uk

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1 Introduction

At the request of Mr. N Jenkins, Operations and Technical Manager of Euroclad Facades Division, 84/85 Seawall Road, Cardiff, CF24 5TH, BRE issued proposal 118089 on 19 July 2006. The proposal was accepted on 19 July 2006 and the specimen constructed at BRE on 10/11 July and tested on 16 August 2006.

The tests to methods in BS 8200: 1985¹ measures the resistance of the specimen test wall to soft and hard body impacts. Classification of the results is based on guidance in BS 8200.

The test assembly comprised of a sealed backing support wall with Linear 1 rainscreen installed to the exterior face and is fully described in Section 3 of this report.

The tests were carried out by M. C. Pound, BRE under the BRE Standard Terms and Conditions of Business as part of BRE Job numbers 231 322 in project number CV1220.

2 Details of tests, classification and of test apparatus

The hard and soft body impact tests were performed to methods from *BS 8200: 1985, Code of practice for design of non-load bearing external vertical enclosures to buildings*. Minimum impact energies are specified for opaque wall components that may fall into six categories, A to F, given in the standard. The six categories give the likelihood of exposure to impacts; from Category A with the most exposure to persons exercising little care and hence most likely to be damaged, to category F unlikely to suffer impacts from persons or thrown objects.

For each of the wall categories test impact energies are specified that test for 'retention of performance of the exterior surface' and 'Safety to persons'.

The performance of the test wall shall not be reduced by test impacts designed to measure 'retention of performance of the exterior surface'. BS 8200 also states that when a brittle material is impacted then the results shall be defined as 'Failure' or 'No damage'. For other materials the results can be defined as 'Damage to the surface finish', 'Indentation' or 'No damage'.

If the test wall is indented by the impacts then the depth of the indentation shall be measured; failure criterion in this case may be aesthetic only. When damaged sections of wall surfaces are easily replaced then a lower impact resistance value may be acceptable.

The impact tests specified in CWCT Standard for systemised building envelopes: 2005². Centre for window and cladding technology, are similar to the above.

Soft body impactor and tests

The soft body impactor is a sphero-conical shaped canvas bag filled with 3 mm diameter hardened glass beads to give a diameter of 400 mm and a mass of 50 kg. This impactor is swung against the test specimen from various drop heights to give impact energies in these tests of 350 Nm and 500 Nm.

The drop height, H, above the position of the impactor at rest against the target area on the specimen is calculated from the following:

$H = e / 9.8$ m when 'e' is the required impact energy in Nm and 'm' is the mass of the impactor in Newtons. For example 500 Nm is achieved with a drop height of 1.02 m and 120 Nm with 0.245 m.

The test is performed at the weakest part of the specimen usually found by testing an array of points on the specimen's surface. In this case tests were at points at the middle of rainscreen panels, mid-span between the panel fixing brackets, points immediately over the fixing points and points near the edge of panels.

Hard body impactors and tests

The two hard body impactors used are both steel balls; one has a diameter of 62.5 mm with a mass of 1 kg and the other is 50 mm diameter with a mass of 0.5 kg. The drop height, H, above the position of the impactor at rest against the target area on the specimen, is calculated using the same formula as with the soft body impact.

The impactor is released from a mechanism that allows it to fall vertically down a tube of the correct length to attain the impact energy required. In these tests impact energies of 3, 6 and 10 Nm were used.

The test is performed at the weakest part of the specimen usually found by testing an array of points on the specimen's surface. In this case tests were at points at the middle of the rainscreen panels, mid-span between the panel's fixing points, points immediately over the fixing points and points near the edge of panels.

3 Test specimen

The general details about the specimen wall supplied and constructed by Euroclad Facades Division for these tests are given below:

Type: A test wall clad on the exterior face with Euroclad Linear 1 pressure equalising rainscreen façade system. As specified in the Parts List and drawings and shown in photographs in the annex to this report, the cross section of the test wall comprises;

1. Eight Linear 1 rainscreen panels at 4mm thick; various panel sizes with 'joints' on the exterior face of 18 to 20 mm width.
2. One Window pod (blanked off for tests with a panel)
3. One window sill detail of galvanised steel
4. The panels above are hung on aluminium horizontal rails and vertical tracks. These are fixed to aluminium adjustable cleats that in turn fix back to the backing wall.
5. The backing wall is a metal Metsec frame, 150 mm deep, with large (bottom) and small (top) parts divided horizontally by a steel 'I' section beam fixed to the test rig at either end.
6. A 12 mm thick Pyroc cementitious board is fixed to the face of the Metsec frame nearest outdoors.
7. On the outdoor face of the Pyroc board is a breather membrane. This is Monoflex plastic sheet with 150 mm overlaps where necessary fixed under the cleats described above.
8. 50 mm thick Phenolic rigid insulation boards are fitted onto the outdoor face of the breather membrane.
9. Between the outside face of the insulation and the indoor face of the rainscreen panels there is a gap of 87 mm.

Dimensions: Exterior surface of the Linear 1 rainscreen; 3960 mm high x 4000 mm wide (overall).
Area of outdoor face: approximately 15.84 m² (not allowing for joints)

4 Test rig and preparatory procedures

The specimen wall was constructed in BRE test rig 'B' and conditioned in the test laboratory for at least 4 hours within the temperature and humidity ranges of 10°C to 30°C and 25% to 75% RH respectively before testing commenced. For the impact tests the specimen holder with test wall was secured to a rigid steel frame and the impactors suspended in front of the surface to be impacted.

5 Summary of test results

The test results are summarised in Table 1 below. Figures show detail of the specimen wall and detailed results are given in Annex 1.

BS 8200 requirements	Soft body impacts	Hard body impacts
Retention of performance	120 Nm. No damage. Pass	3, 6 and 10 Nm. Light indentation. Pass
Safety to persons	350 Nm and 500 Nm. No damage. Pass	10 Nm. Light indentation. Pass

Table 1. Summary of impact test results

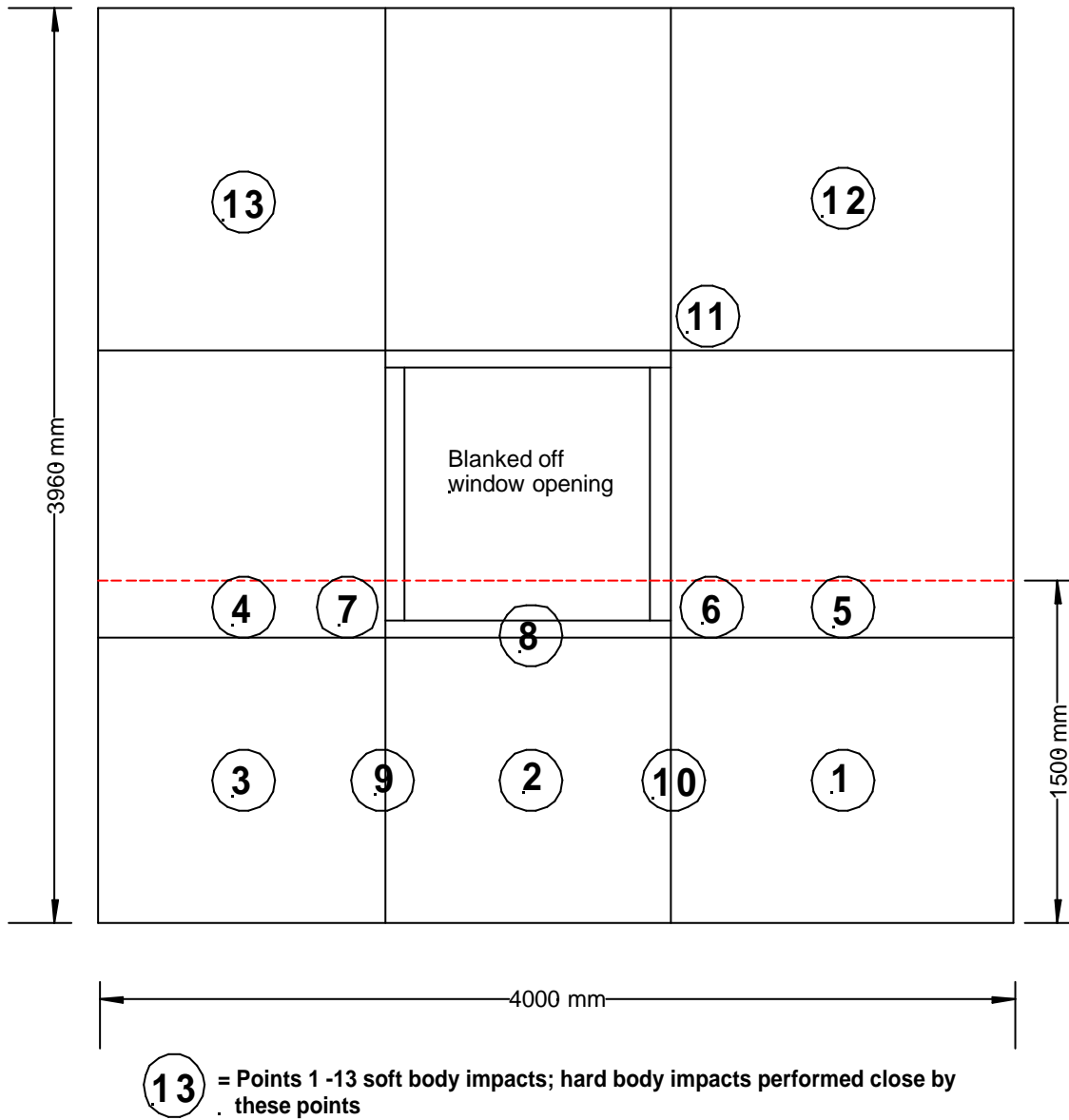
6 Conclusions

When the specimen Euroclad Façade Division test assembly incorporating Linear 1 pressure equalising rainscreen façade system was tested to the standards described herein it was found to be:

- Sufficiently resistant to soft body impacts to satisfy the criteria in BS8200 for retention of performance and safety to persons.
- Sufficiently resistant to hard body impacts to satisfy the criteria in BS8200 for retention of performance and safety to persons. As a result of hard body impacts some light indentation did occur on the outer face of the rainscreen panels but this was deemed not to affect the performance of the rainscreen.

7 References

1. BS 8200: 1985, Code of practice for design of non-load bearing external vertical enclosures to buildings. British Standards Institution, London.
2. CWCT Standard for systemised building envelopes: 2005. Centre for window and cladding technology



Not to scale

Figure 1. Outline sketch of the outside face of the specimen wall showing positions where impact testing was carried out

ANNEX 1. Impact test results

BS 8200 requirements	Position	Soft body impacts	Position	Hard body impacts	
Retention of performance	1	120 Nm No damage	1	6 and 10 Nm – light indentation	
	2	120 Nm No damage	2	6 and 10 Nm – light indentation	
	3	120 Nm No damage	3	6 and 10 Nm – light indentation	
	4	120 Nm No damage	4	6 and 10 Nm – light indentation	
	5	120 Nm No damage	5	6 and 10 Nm – light indentation	
	6	120 Nm No damage	6	6 and 10 Nm – light indentation	
	7	120 Nm No damage	7	6 and 10 Nm – light indentation	
	8	120 Nm No damage	8	6 and 10 Nm – light indentation	
	9	120 Nm No damage	9	6 and 10 Nm – light indentation	
	10	120 Nm No damage	10	6 and 10 Nm – light indentation	
				11	3 and 6 Nm – light indentation
				12	3 and 6 Nm – light indentation
				13	3 and 6 Nm – light indentation
Safety to persons	1	500 Nm No damage	1	10 Nm – light indentation	
	2	500 Nm No damage	2	10 Nm – light indentation	
	3	500 Nm No damage	3	10 Nm – light indentation	
	4	500 Nm No damage	4	10 Nm – light indentation	
	5	500 Nm No damage	5	10 Nm – light indentation	
	6	500 Nm No damage	6	10 Nm – light indentation	
	7	500 Nm No damage	7	10 Nm – light indentation	
	8	500 Nm No damage	8	10 Nm – light indentation	
	9	500 Nm No damage	9	10 Nm – light indentation	
	10	500 Nm No damage	10	10 Nm – light indentation	
	11	350 Nm No damage	11	10 Nm – light indentation	
	12	350 Nm No damage	12	10 Nm – light indentation	
	13	350 Nm No damage	13	10 Nm – light indentation	

Table A1. Soft and hard body impact test results

Soft and hard body impact tests on a Euroclad Façade Division Linear 1 rainscreen façade system test wall



Figure A1. The indoor face of the test specimen wall showing the soft body impactor

Soft and hard body impact tests on a Euroclad Façade Division Linear 1 rainscreen façade system test wall



Figure A2. The indoor face of the test specimen wall showing a hard body impactor

Soft and hard body impact tests on a Euroclad Façade Division Linear 1 rainscreen façade system test wall



Figure A3 and A4. Showing a hard body impactor and the light indentations caused by the impacts

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