


**Test Report 8421003.**  
Smart Systems Limited  
incorporating Smart Extrusions

## Introduction.

This report has been prepared by A Pearce and relates to the activity detailed below:

Job/Registration Details	Client Details
<b>Job number:</b> <b>8421003</b> Job type: Testing Samples Submitted Start Date: 01/10/2015 Test type: Type Sample ID: 10158567 <b>Registration:</b> <b>KM 81580</b> Scheme: BS 4873 / PAS24 Protocol: PP 519 Scheme Mgr: Lorraine Balch Quality system: ISO 9001:2008	Smart Systems Limited incorporating Smart Extrusions Arnolds Way Yatton BS49 4QN United Kingdom

The report has been approved for issue by Mark Manito – Team Manager

Approved For Issue	
	Issue Date: 16 December 2015

## Objectives.

Type test for product certification

## Product Scope.

Smart Systems Eco Futural Aluminium alloy windows

## Report Summary.

The samples were received on 10 December 2015 and the testing was started on 15 December 2015.

The samples submitted complied with the requirements of the test work conducted.

## Test Samples.

Sample Id	ER Number	Description
1	10158567	Aluminium alloy windows

## Description of Test Samples.

Sample Description
1 off projecting side hung next to projecting side hung window
1 off Projecting top hung window
1 off fixed window (external)
1 off fixed window (internal)

## Test Requirements.

PAS24 Type window testing

Clause	Requirements
<b>As required</b>	<b>Test and Assessment</b> Please see results table for testing and assessment of samples as detailed. <i>See Table A - PAS24 Type window</i>

## Summary of Test Comments.

Clause	Comments
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## Glossary of Terms.

PASS: Complies. Tested by BSI engineers at BSI laboratories.

PASS1: Complies. Witnessed by BSI engineers in manufacturers laboratory.

PASS2: Complies. Tests carried out by third party lab; results accepted by BSI.

PASS\*: Report resulted in uncertainty and states that Compliance is more probable than non-compliance.

FAIL: Non compliance – Product does not meet the requirements of this clause.

FAIL\*: Report resulted in uncertainty and states that Non-compliance is more probable than compliance.

N/A: Not applicable to design under consideration.

N/T: Not tested due to similarity to previously tested item; reference earlier test report.

## Conditions of Issue.

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Unless otherwise stated, any results not obtained from testing in a BSI laboratory are outside the scope of our UKAS accreditation.

# Table A - PAS24 Type windows

## Product Description.

### TEST SAMPLE

1 off projecting side hung next to projecting side hung (sample 1)

1 of projecting top hung (sample 2)

1 off fixed light (external) (sample 3)

1 of fixed light (internal) (sample 4)

(Sample ID No 10158567)

Date sample received: 12 December 2015

## Test Results.

1.	Manipulation	Test samples 1 and 2 met the requirements of the Specification in respect of Clause 4.3
2.	Glazing removal	Test samples, 1, 2, 3, and 4 met the requirements of the Specification in respect of Clause 4.4
3.	Mechanical loading	Test samples 1 and 2 met the requirements of the Specification in respect of Clause 4.5.
4.	Manual check test	Test samples 1 and 2 met the requirements of the Specification in respect of Clause 4.6

### CLAUSE 2 SAMPLE SELECTION

The sample submitted for tests was selected by the Client on behalf of BSI.

## Assessment.

The assessment of the test sample followed the sequence detailed in Scheme document PCP519.

### CLAUSE 3 TEST APPARATUS AND SAMPLE MOUNTING

The test apparatus used for the manual and mechanical tests is shown in figure 2 of this Report. This apparatus meets the requirements of the Specification.

The test sample was submitted for test mounted in a 50 x 100mm timber subframe in accordance with the manufacturer's installation requirements.

## Description of Sample. (sample 1)

<b>Sample type -</b>	Projecting side hung next to projecting side hung
<b>Material -</b>	Aluminium alloy
<b>Construction -</b>	Cleated
<b>Fittings (each sash) -</b>	Hinge: 16" Securistyle side hung stays Locking: A six point locking (six mushroom bolts) ERA espagnolette system operated by a (W KB) key locking handle 5 of run up blocks 2 of pairs of Vector hinge protectors
<b>Glass -</b>	Double glazed, 6-18-6mm toughened glass sealed units
<b>Glazing system -</b>	Internal beads and gaskets
<b>Sample dimensions -</b>	For information only (nominal sizes)  Overall size Length: 1730mm      Height: 1440mm  Sash size Length: 840mm      Height: 1410mm

# Test Results.

Sample type – Projecting side hung next to projecting side hung

Date of test – 15 December 2015

Laboratory temperature – 19.4 °C

## PERFORMANCE REQUIREMENTS

## ASSESSMENT

### Clause 4.3 Manipulation test

The sample was mounted vertically in the test rig as described in Clause 3.  
The test was carried out in accordance with the given objective of this Clause using the tools specified in A.2.1.

The key for the lockable hardware was fully removable.  
No entry could be effected within the time allowed.

Pass

### Clause 4.4 Infill medium removal test

#### Clause 4.4.2 Manual test

The sample was mounted vertically in the test rig as described in Clause 3.  
The sample was assessed using the tools specified in A.2.1 Group A and A.2.2 Group B

Holes were made to outside with 6mm chisel, but could not remove unit.  
No entry gained in 3 minutes

Pass

#### Clause 4.4.3 Mechanical test

The sample was mounted vertically in the test rig as described in Clause 3.  
A perpendicular to plane load of 2.0kN was applied to each corner of the glazing in turn as specified in Clause 4.4.3.

No evidence of bead failure  
No entry could be effected

Pass

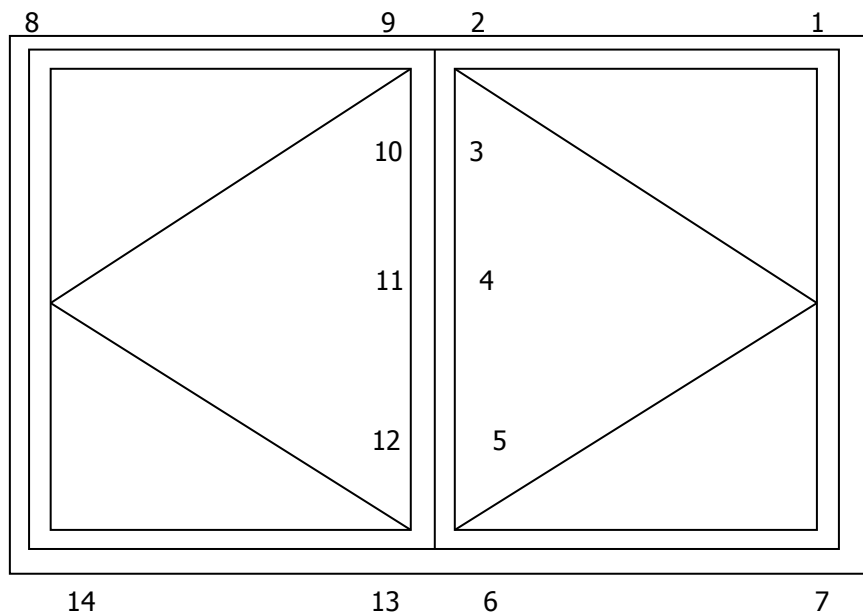
# Test Results (Continued).

## Clause 4.5 Mechanical loading test

The sample was mounted vertically in the test rig as described in Clause 3.

The test was carried out in accordance with the procedures detailed in Clause 4.5.2 using the test apparatus detailed in Clause 3.

Diagram of points of application of loads



### B.4.5.2 Loading procedure

### ASSESSMENT

Point of application of load (right hand light)

#### First sequence

1 - Hinge protector/Hinge (right head)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN towards opposite stay

Load applied perpendicular to plane: 3.0kN applied for 10 seconds



# Test Results (Continued).

## B.4.5.2 Loading procedure (continued)

## ASSESSMENT

Point of application of load

### 2 - Corner (mullion head)

Standard loading case used: 3

Load applied in plane: 1.0kN in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

### 3 - Mushroom bolt/Mushroom bolt (upper mullion)

Standard loading case used: 3/4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

### 4 - Mushroom bolt/Mushroom bolt (centre mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

### 5 - Mushroom bolt/Mushroom bolt (lower mullion)

Standard loading case used: 3/4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

## Test Results (Continued).

### B.4.5.2 Loading procedure (continued)

### ASSESSMENT

Point of application of load

#### 6 - Corner (mullion sill)

Standard loading case used: 3

Load applied in plane: 1.0kN in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

#### 7 - Hinge protector/Hinge (right sill)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Right hand light

No entry effected

Pass

### First sequence

Point of application of load (left hand light)

#### 8 - Hinge protector/Hinge (left head)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

#### 9 - Corner (mullion head)

Standard loading case used: 3

Load applied in plane: 1.0kN in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

## Test Results (Continued).

### B.4.5.2 Loading procedure (continued)

### ASSESSMENT

Point of application of load

#### 10 - Mushroom bolt/Mushroom bolt (upper mullion)

Standard loading case used: 3/4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

#### 11 - Mushroom bolt/Mushroom bolt (centre mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

#### 12 - Mushroom bolt/Mushroom bolt (lower mullion)

Standard loading case used: 3/4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

## Test Results (Continued).

### B.4.5.2 Loading procedure (continued)

### ASSESSMENT

Point of application of load

13 - Corner (mullion sill)

Standard loading case used: 3

Load applied in plane: 1.0kN in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

14 - Hinge protector/Hinge (left sill)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Left hand light

No entry effected

Pass

### Clause 4.6 Manual Check Test

The sample was mounted vertically in the test rig as described in Clause 3.

The test was carried out using the tools described in B.4.6.2 in accordance with the procedures detailed in C.4.6.2.

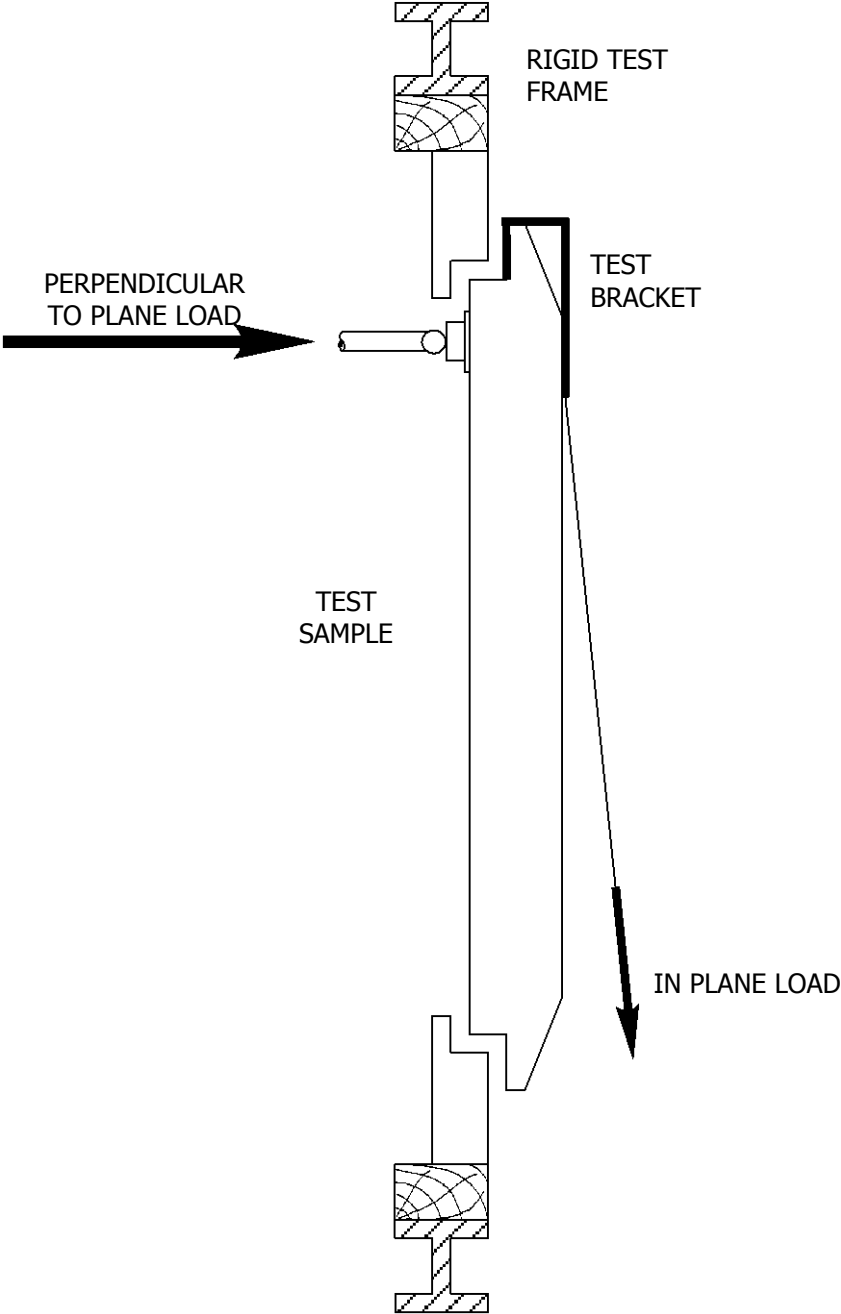
No alternative method of entry could be effected

Pass

### Clause 4.7 Additional mechanical loading test

Not applicable as an alternative method of entry was not identified under Clause 4.7.

**FIGURE 2**



## Photograph of Sample.



## Description of Sample. (sample 2)

<b>Sample type -</b>	Projecting top hung window
<b>Material -</b>	Aluminium alloy
<b>Construction -</b>	Cleated
<b>Fittings -</b>	Hinge: 21" Securistyle top hung stays Locking: A six point locking (six mushroom bolts) ERA espagnolette system operated by a (W KB) key locking handle 6 of run up blocks 2 of pairs of Vector hinge protectors
<b>Glass -</b>	Double glazed, 6-18-6mm toughened glass sealed unit
<b>Glazing system -</b>	Internal beads and gaskets
<b>Sample dimensions -</b>	For information only (nominal sizes)  Overall size Length: 1480mm      Height: 2530mm  Sash size Length: 1440mm      Height: 1410mm

# Test Results.

Sample type – Projecting top hung

Date of test – 15 December 2015

Laboratory temperature – 19.4 °C

## PERFORMANCE REQUIREMENTS

## ASSESSMENT

### Clause 4.3 Manipulation test

The sample was mounted vertically in the test rig as described in Clause 3.  
The test was carried out in accordance with the given objective of this Clause using the tools specified in A.2.1.

The key for the lockable hardware was fully removable.  
No entry could be effected within the time allowed.

Pass

### Clause 4.4 Infill medium removal test

#### Clause 4.4.2 Manual test

The sample was mounted vertically in the test rig as described in Clause 3.  
The sample was assessed using the tools specified in A.2.1 Group A and A.2.2 Group B

Holes were made to outside with 6mm chisel, but could not remove unit.  
No entry gained in 3 minutes

Pass

#### Clause 4.4.3 Mechanical test

The sample was mounted vertically in the test rig as described in Clause 3.  
A perpendicular to plane load of 2.0kN was applied to each corner of the glazing in turn as specified in Clause 4.4.3.

No evidence of bead failure  
No entry could be effected

Pass



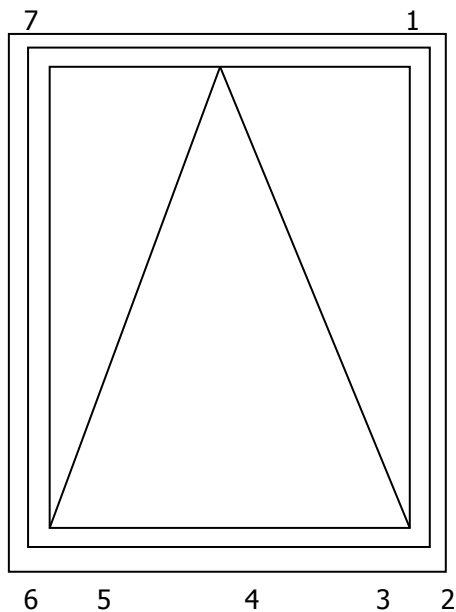
## Test Results (Continued).

### Clause 4.5 Mechanical loading test

The sample was mounted vertically in the test rig as described in Clause 3.

The test was carried out in accordance with the procedures detailed in Clause 4.5.2 using the test apparatus detailed in Clause 3.

Diagram of points of application of loads



#### B.4.5.2 Loading procedure

#### ASSESSMENT

Point of application of load

##### First sequence

1 - Hinge protector/Hinge (right head)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN towards opposite stay

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

# Test Results (Continued).

## B.4.5.2 Loading procedure (continued)

## ASSESSMENT

Point of application of load

### 2 - Corner (right sill)

Standard loading case used: 3

Load applied in plane: 1.0kN in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

### 3 - Mushroom bolt/Mushroom bolt (right sill)

Standard loading case used: 3/4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

### 4 - Mushroom bolt/Mushroom bolt (centre sill)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

### 5 - Mushroom bolt/Mushroom bolt (left sill)

Standard loading case used: 3/4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

## Test Results (Continued).

### B.4.5.2 Loading procedure (continued)

### ASSESSMENT

Point of application of load

6 - Corner (left sill)

Standard loading case used: 3

Load applied in plane: 1.0kN in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

7 - Hinge protector/Hinge (left head)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

No entry effected

Pass

### Clause 4.6 Manual Check Test

The sample was mounted vertically in the test rig as described in Clause 3.

The test was carried out using the tools described in B.4.6.2 in accordance with the procedures detailed in C.4.6.2.

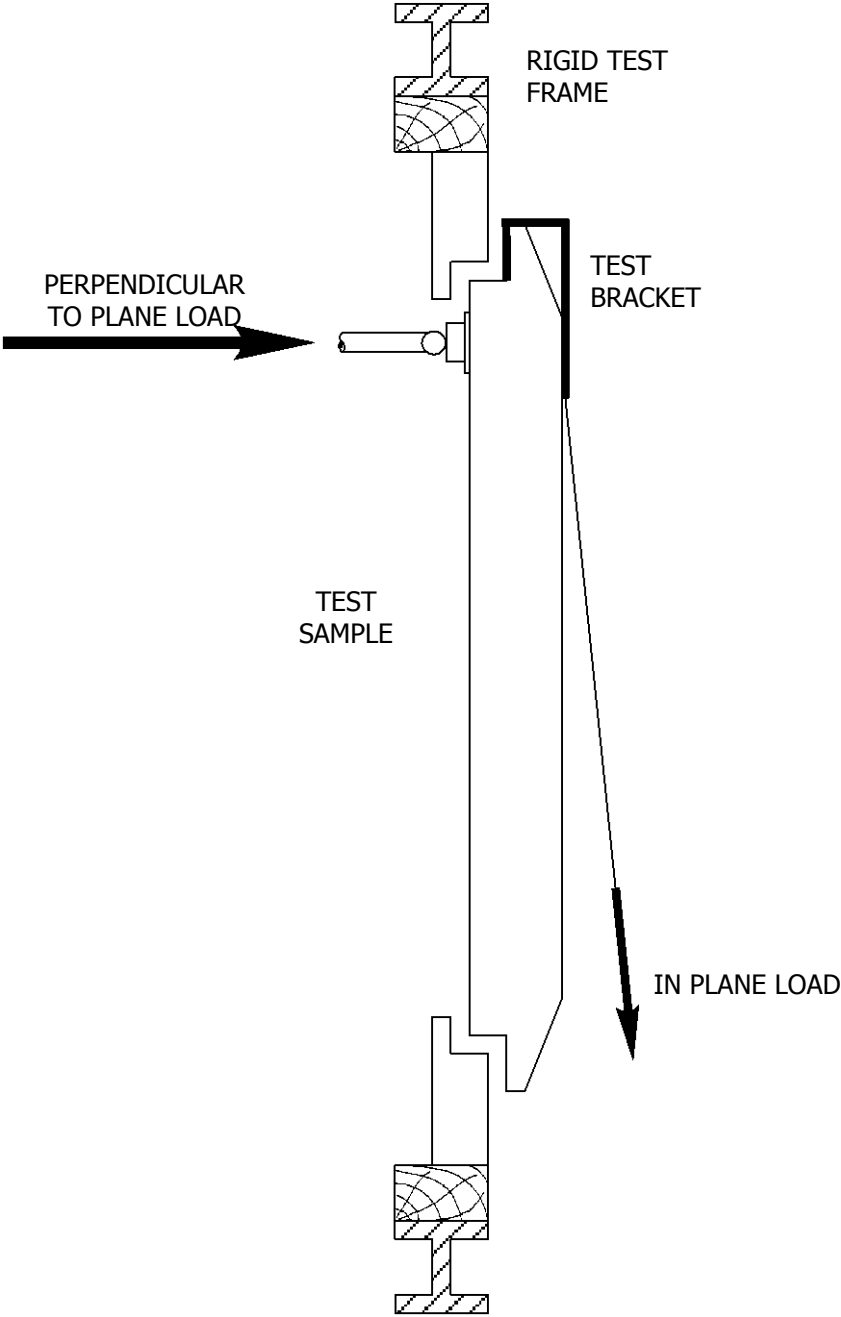
No alternative method of entry could be effected

Pass

### Clause 4.7 Additional mechanical loading test

Not applicable as an alternative method of entry was not identified under Clause 4.7.

**FIGURE 2**



Photograph of Sample.



## Description of Sample. (sample 3)

<b>Sample type -</b>	Fixed
<b>Material -</b>	Aluminium alloy
<b>Construction -</b>	Cleated
<b>Glass -</b>	Double glazed, 6-18-6mm toughened glass sealed unit
<b>Glazing system -</b>	External beads, gaskets and GT security glazing clips
<b>Sample dimensions -</b>	For information only (nominal sizes) Overall size Length: 1500mm      Height: 1500mm

# Test Results.

Sample type – fixed

Date of test – 16 December 2015

Laboratory temperature – 19.5 °C

## PERFORMANCE REQUIREMENTS

## ASSESSMENT

### Clause 4.4 Infill medium removal test

#### Clause 4.4.2 Manual test

The sample was mounted vertically in the test rig as described in Clause 3.  
The sample was assessed using the tools specified in A.2.1 Group A and A.2.2 Group B

Holes were made to outside with 6mm chisel, but could not remove unit.  
No entry gained in 3 minutes

Pass

#### Clause 4.4.3 Mechanical test

The sample was mounted vertically in the test rig as described in Clause 3.  
A perpendicular to plane load of 2.0kN was applied to each corner of the glazing  
in turn as specified in Clause 4.4.3.

No evidence of bead failure  
No entry could be effected

Pass

## Photograph of Sample.





## Description of Sample. (sample 4)

<b>Sample type -</b>	Fixed
<b>Material -</b>	Aluminium alloy
<b>Construction -</b>	Cleated
<b>Glass -</b>	Double glazed, 6-18-6mm toughened glass sealed unit
<b>Glazing system -</b>	Internal beads and gaskets
<b>Sample dimensions -</b>	For information only (nominal sizes) Overall size Length: 1500mm      Height: 1500mm

# Test Results.

Sample type – fixed

Date of test – 16 December 2015

Laboratory temperature – 19.5 °C

## **PERFORMANCE REQUIREMENTS**

## **ASSESSMENT**

### **Clause 4.4 Infill medium removal test**

#### **Clause 4.4.2 Manual test**

The sample was mounted vertically in the test rig as described in Clause 3.  
The sample was assessed using the tools specified in A.2.1 Group A and A.2.2 Group B

Holes were made to outside with 6mm chisel, but could not remove unit.  
No entry gained in 3 minutes

Pass

#### **Clause 4.4.3 Mechanical test**

The sample was mounted vertically in the test rig as described in Clause 3.  
A perpendicular to plane load of 2.0kN was applied to each corner of the glazing  
in turn as specified in Clause 4.4.3.

No evidence of bead failure  
No entry could be effected

Pass

## Photograph of Sample.



\*\*\* End of Report \*\*\*