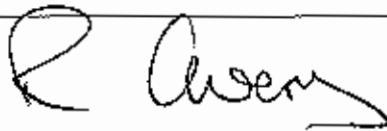
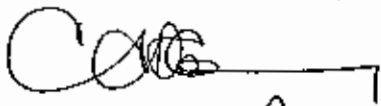


# Test Report



Product Services

Report No	261/4653372/1 of 6	This Report consists of 19 pages
Client	George Barnsdale & Sons Limited High Street Donington Spalding Lincolnshire PE11 4TA	
Authority & date	Request by Client dated 20 December 2004	
Items tested	1 off timber window, George Barnsdale & Sons Limited C2 Flush Casement Internally/Externally Glazed Window System	
Specification	BS 644:2003 Timber Windows - Factory assembled windows of various types - Specification BWF Timber Window Accreditation Scheme Criteria and Requirements Document BS 6375-1:2004 Performance of windows and doors Part 1: Classification for Weathertightness and guidance on selection and specification type testing for product certification	
Results	See Summary of Results on Page 3	
Prepared by	R Avery 	(Engineer I)
Authorized by	A D Coley 	(Laboratory Manager)
Issue Date	4 August 2005	
Conditions of issue	This Test Report is issued subject to the conditions stated in current issue of PS082 'General conditions relating to acceptance of testing'. The results contained herein apply only to the particular sample/s tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, BSI Product Services, who reserves the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.	

**TEST, EXAMINATION AND ASSESSMENT OF ONE TIMBER WINDOW, GEORGE BARNSDALE & SONS LIMITED C2 FLUSH CASEMENT INTERNALLY/EXTERNALLY GLAZED WINDOW SYSTEM**

**INTRODUCTION**

At the request of George Barnsdale & Sons Limited the timber window, detailed below, described on page 4, was tested and assessed to the requirements of BS 644:2003, the BWF Timber Window Accreditation Scheme Criteria and Requirements Document and BS 6375-1:2004, as indicated on the following pages of this Report. This request was made in a Purchase Order from the Client dated 20 December 2004 and referenced 9514. It is emphasized that assessments have not been made against the other Clauses of the Specification.

**TEST SAMPLE**

1 off timber window - A multilight window consisting of a projecting top hung light over a fixed light both next to a projecting side hung light

A type test window as detailed in Annex A5 of the BWF Timber Window Accreditation Scheme Criteria and Requirements Document

Date sample received: 18 February 2005

**PERFORMANCE REQUIREMENTS REQUESTED BY CLIENT**

Positive pressure sequence only required

Air permeability - 600Pa (Class 4)

Watertightness - 300Pa (Class 7A)

Wind resistance - 2000Pa (Class 5)

## **SUMMARY OF RESULTS**

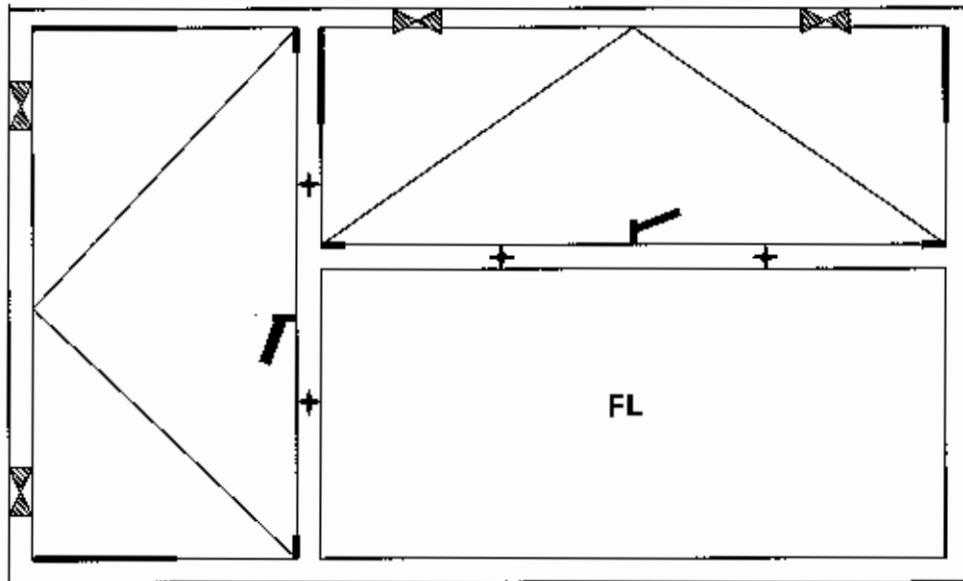
1. **Construction**                      The test sample met the requirements of BS 644:2003 in respect of Clause 8, and its parts thereof, against which assessments have been made
2. **Security and safety**              The test sample met the requirements of BS 644:2003 in respect of Clause 10, and its parts thereof, against which assessments have been made
3. **Air permeability**                  The test sample met the requirements of the BWF Timber Window Accreditation Scheme Criteria and Requirements Document for Exposure Category 600Pa (Class 4)
4. **Watertightness**                    The test sample met the requirements of the BWF Timber Window Accreditation Scheme Criteria and Requirements Document for Exposure Category 300Pa (Class 7A)
5. **Wind resistance**                  The test sample met the requirements of the BWF Timber Window Accreditation Scheme Criteria and Requirements Document for Exposure Category 2000Pa (Class 5)
6. **Operation and Strength**              The test sample met the requirements of BS 6375-2:1987






The test sample met the requirements of Exposure Category 2000 given in BS 6375-1:2004 in respect of its air permeability, watertightness and wind resistance characteristics.

**DESCRIPTION OF SAMPLE**

<b>Sample Type -</b>	A multilight window consisting of a projecting top hung light over a fixed light both next to a projecting side hung light	
<b>Material -</b>	Redwood	
<b>Construction -</b>	Finger joints	
<b>Finish -</b>	Sikkens microporous	
<b>Profile reference -</b>	George Barnsdale C2 Flush Casement Window Drawing No BSI-02 dated 11-10-04	
<b>Fittings</b>		
<b>Projecting top hung light -</b>	A four point locking (two shootbolts and two mushroom bolts) Winkhaus Cobra espagnolette system operated by a key locking Titon handle, 2 off Securistyle Defender top hung friction stays 2 off pairs of Securistyle Vector Excluder hinge protectors	
<b>Projecting side hung light -</b>	A four point locking (two shootbolts and two mushroom bolts) Winkhaus Cobra espagnolette system operated by a key locking Titon handle, 2 off Securistyle Defender side hung friction stays 2 off pairs of Securistyle Vector Excluder hinge protectors	
<b>Weathersealing -</b>	Double sealed with plastics weatherstrip, reference Schlegel Aquamac 109 and Schlegel Zero-Gap	
<b>Glass -</b>	Double glazed, 4-16-4mm sealed units	
<b>Glazing system Opening lights-</b>	Internal beads, reference George Barnsdale C2 Flush Casement Window Drawing No BSI-02 dated 11-10-04 Gaskets, reference Hodgson Flexibond security glazing tape	
<b>Fixed light -</b>	External beads, reference George Barnsdale C2 Flush Casement Window Drawing No BSI-02 dated 11-10-04 Gaskets, reference Hodgson Flexibond security glazing tape	
<b>Sample dimensions -</b>	Length: 1800mm	Height 1350mm
<b>Date of Test:</b>	21 February 2005	
<b>Laboratory Temperature:</b>	19.3°C	
<b>Relative Humidity -</b>	28.3%RH	
<b>Atmospheric Pressure -</b>	99.7kPa	

**ELEVATION DRAWING INDICATING POSITION OF HARDWARE**



-  - friction stay
-  - shootbolt
-  - mushroom bolt
-  - hinge protector
-  - handle
- FL** - direct glazed fixed light

## **PREPARATION AND METHOD OF TEST**

The sample was prepared as required by BS EN 1026:2000 Windows and doors - Air permeability, BS EN 1027:2000 Windows and doors - Watertightness and BS EN 12211:2000 Windows and doors - Resistance to wind load in respect of BS 6375 -1:2004.

The sample was mounted into a plywood surround for installation in the test apparatus. The joint between the sample and the plywood surround was sealed.

### **1. Air permeability**

The air permeability of the sample was determined by the method given in BS EN 1026:2000.

### **2. Watertightness**

The watertightness of the sample was determined by the method given in BS EN 1027:2000.

### **3. Resistance to wind load (P1 and P2)**

The resistance to wind load of the sample was determined by the method given in BS EN 12211:2000.

### **4. Repeat test**

After testing for resistance to wind load test 1 (air permeability) was repeated

### **5. Resistance to wind load (P3)**

The resistance to wind load of the sample was determined by the method given in BS EN 12211:2000.

### **6. Operation and strength**

The operation and strength characteristics were determined by the methods given in BS 6375-2:1987

**EXAMINATION AND TEST - BS 644:2003**

<b>Clause</b>	<b>Description</b>	<b>Result</b>
<b>9.</b>	<b>Construction</b>	
9.1	Timber members	Pass
9.2	Joints	Pass
9.3	Nails, star dowels and other fixings	Pass
9.4	Open joints	Pass
9.5	Horns	Not applicable
9.6	Laminated timber	Not applicable
9.7	Drips and sill members	Pass
9.8	Bead glazing	Pass
9.9	Primer or stain	Pass
9.10	Composite windows	Not applicable
<b>11</b>	<b>Security and safety</b>	
<b>11.1</b>	<b>Security</b>	
	Fasteners	Pass
	Opening lights	Pass
<b>11.2</b>	<b>Safety</b>	
	Limit catches	Not applicable

**AIR PERMEABILITY TEST RESULTS - BS EN 1026:2000 / BS EN 12207:2000****Before resistance to wind load tests**

Three positive pressure pulses of 770Pa were applied prior to testing

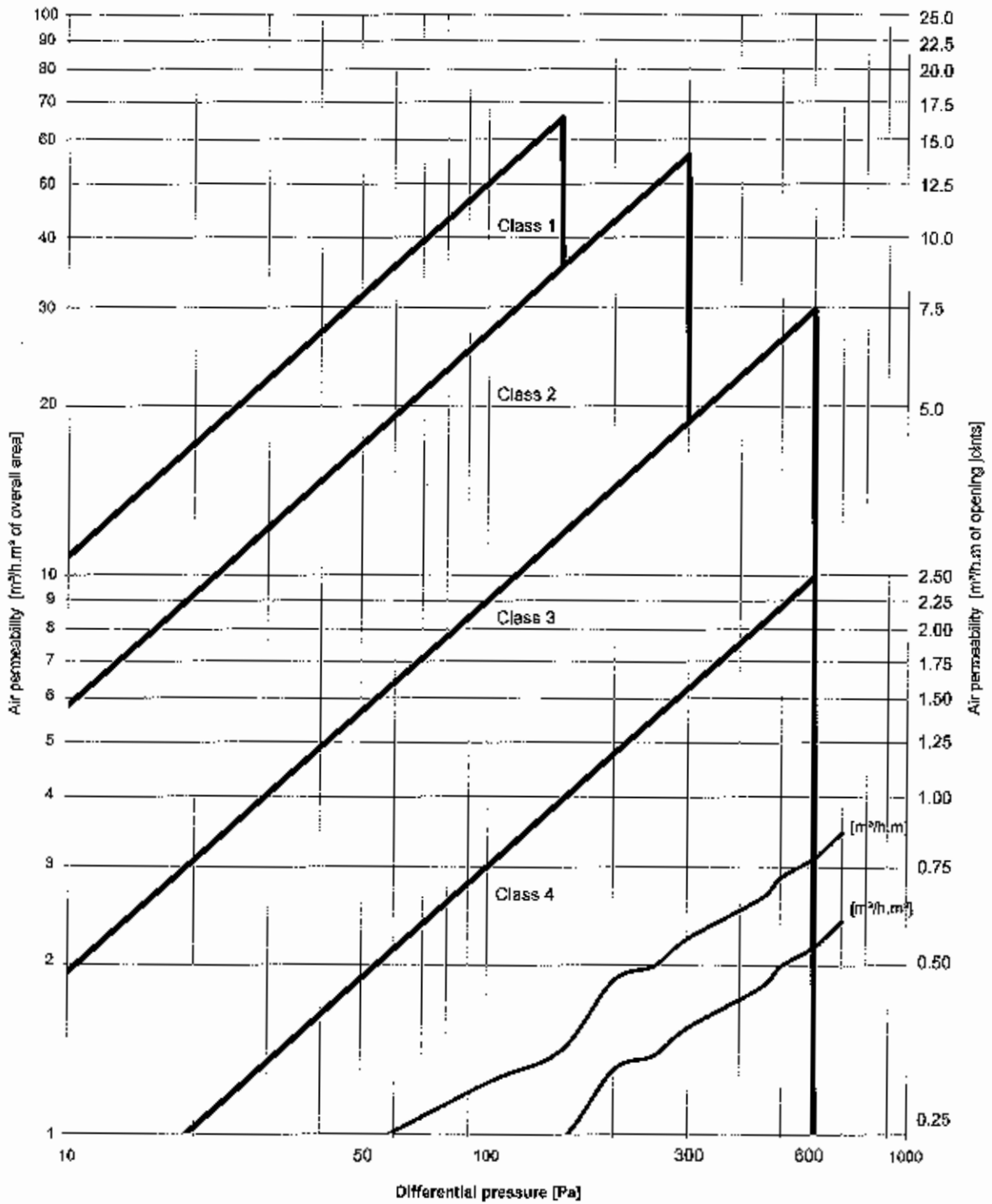
**Table 1**

Air Pressure (Pa)	Blank reading (m <sup>3</sup> /h)	Maximum total air flow (m <sup>3</sup> /h)	Actual rate of air leakage (m <sup>3</sup> /h)	Maximum rate air leakage per meter length of opening joint [m <sup>3</sup> /h.m]	Maximum rate air leakage relative to area of sample [m <sup>3</sup> /h.m <sup>2</sup> ]
50	1.6	3.2	1.6	0.23	0.65
100	3.3	5.4	2.1	0.31	0.85
150	5.0	7.4	2.4	0.35	0.97
200	6.1	9.3	3.2	0.47	1.30
250	7.4	10.8	3.4	0.50	1.38
300	8.3	12.1	3.7	0.56	1.54
450	11.3	15.8	4.4	0.66	1.83
500	12.3	17.2	4.8	0.72	1.99
600	13.9	19.2	5.2	0.78	2.15
700	15.5	21.4	5.8	0.86	2.40

Total opening perimeter [m]: 6.73

Overall area [m<sup>2</sup>]: 2.43

GRAPH OF AIR PERMEABILITY BEFORE GUSTING



**WATERTIGHTNESS TEST RESULTS - BS EN 1027:2000/BS EN 12208:2000****Before resistance to wind load tests****TABLE 2 - Spraying method 1A**

Air pressure (Pa)	Point at which water leakage occurred
750	No leakage recorded

**WIND LOAD RESISTANCE TEST RESULTS - BS EN 12211:2000/BS EN 12210:2000****P1 DEFLECTION TEST**

Three positive pressure pulses at 2200Pa were applied

No visible failures or functional defects to the test sample were observed after wind loads applied at a positive air pressure of 2000Pa.

Actual deflection - 1.74mm (maximum allowed 8.16mm)

Deflection/span ratio 1/704 (maximum allowable 1/150)

Three negative pressure pulses at 2200Pa were applied

No visible failures or functional defects to the test sample were observed after wind loads applied at a negative air pressure of 2000Pa.

Actual deflection - 2.18mm (maximum deflection allowed 8.16mm)

Deflection/span ratio 1/562 (maximum ratio allowed 1/150)

**P2 REPEATED PRESSURE TEST**

No visible failures or functional defects to the test sample were observed after 50 cycles of repeated wind loads applied at a positive air pressure of 1000Pa.

No visible failures or functional defects to the test sample were observed after 50 cycles of repeated wind loads applied at a negative air pressure of 1000Pa.

The air permeability has not increased by more than 20% from the initial air permeability test as required by Clause 6.1 of BS EN 12210:2000 (see Table 3).

**AIR PERMEABILITY TEST RESULTS - BS EN 1026:2000 / BS EN 12207:2000****After resistance to wind load tests**

Three positive pressure pulses of 770Pa were applied prior to testing

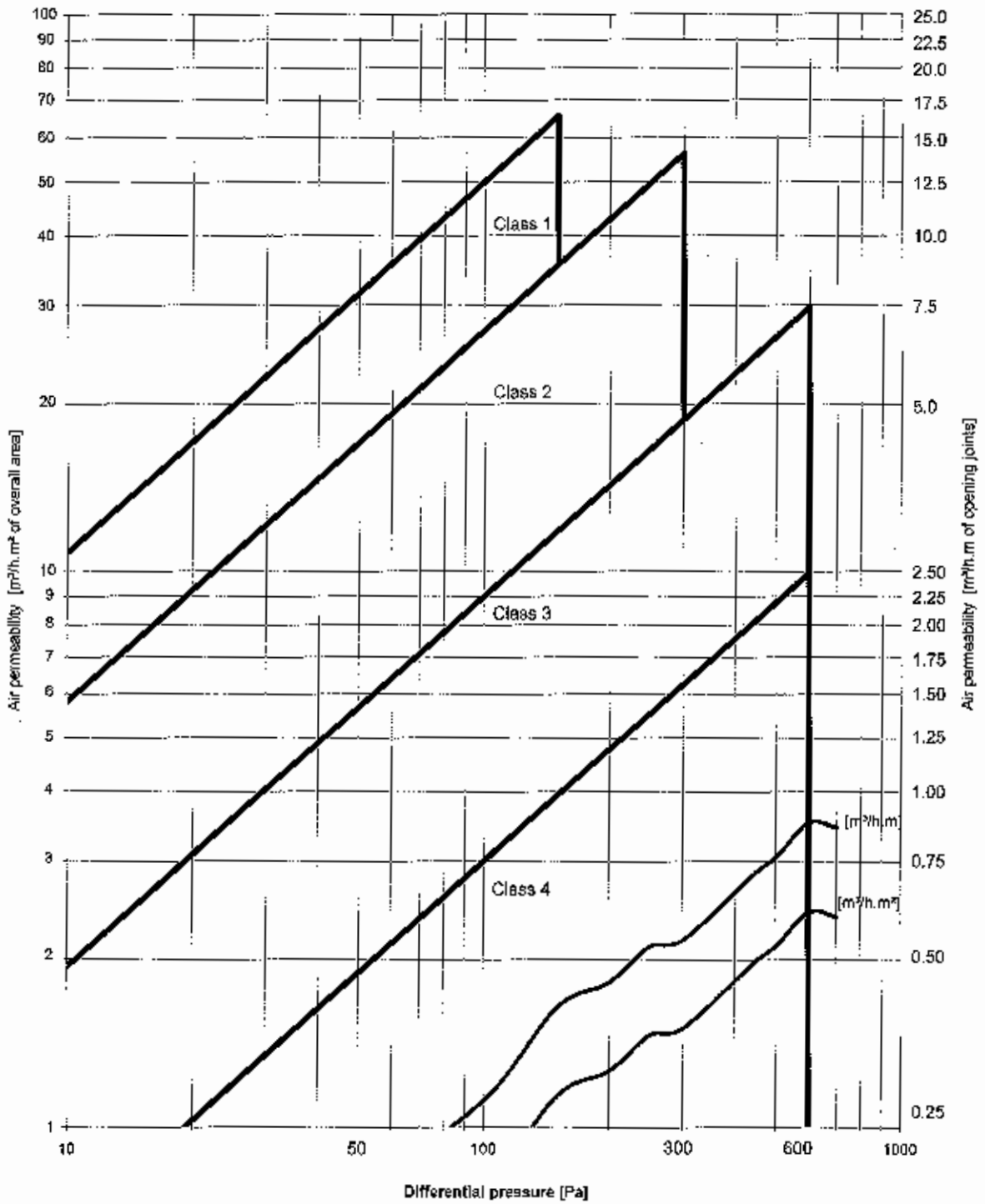
**Table 3**

Air Pressure (Pa)	Blank reading (m <sup>3</sup> /h)	Maximum total air flow (m <sup>3</sup> /h)	Actual rate of air leakage (m <sup>3</sup> /h)	Maximum rate air leakage per meter length of opening joint [m <sup>3</sup> /h.m]	Maximum rate air leakage relative to area of sample [m <sup>3</sup> /h.m <sup>2</sup> ]
50	1.2	2.5	1.3	0.19	0.53
100	2.9	4.8	1.9	0.28	0.77
150	4.1	6.9	2.8	0.41	1.14
200	5.2	8.3	3.1	0.45	1.26
250	6.2	9.8	3.6	0.53	1.48
300	7.4	11.1	3.7	0.54	1.50
450	9.6	14.5	4.8	0.72	1.99
500	10.4	15.6	5.1	0.76	2.11
600	11.6	17.6	5.9	0.88	2.44
700	13.4	19.3	5.8	0.86	2.40

Total opening perimeter [m]: 6.73

Overall area [m<sup>2</sup>]: 2.43

GRAPH OF AIR PERMEABILITY AFTER GUSTING



**WIND LOAD RESISTANCE TEST RESULTS - BS EN 12211:2000/BS EN 12210:2000**

**P3 SAFETY TEST**

No parts of the test sample became detached and the test sample remained closed after a wind load safety test applied at a positive air pressure of 3000Pa.

No parts of the test sample became detached and the test sample remained closed after a wind load safety test applied at a negative air pressure of 3000Pa.

**BS 644:2003 - Clause 13 Operation and strength****(BS 6375-2:1987)****Projecting top hung light****APPENDIX A Test methods**

Variable geometry hinges 410mm long, having one bar fixed to the frame, one bar fixed to the sash and four link bars.

	<b>Result</b>
<b>A2 Test 1 : Ease of fastener operation</b>	
Opening force - 1.3Nm (maximum 10Nm)	Pass
Closing force - 2.0Nm (maximum 10Nm)	Pass
<b>A3 Test 2 : Ease of movement of sash</b>	
Opening forces	
Initial force - 14N (maximum 80N)	Pass
Sustained force – 17N (maximum 65N)	Pass
Closing forces	
Initial force - 26N (maximum 80N)	Pass
Sustained force - 33N (maximum 65N)	Pass
<b>A5 Test 4 : Release of jammed sash</b>	
Force applied - 300N for 5s	
Ease of fastener operation after removal of force (Test 1)	
Opening force - 2.2Nm (maximum 10Nm)	Pass
Closing force - 1.4Nm (maximum 10Nm)	Pass
No visible damage to the window was observed	Pass

**BS 644:2003 - Clause 13 Operation and strength (continued)****(BS 6375-2:1987)****Projecting top hung light****APPENDIX A Test methods****Result****A6 Test 5 : Release of jammed hinge**

Force applied - 300N for 5s (Class A)

Ease of fastener operation after removal of force (Test 1)

Opening force - 2.4Nm (maximum 10Nm)

Pass

Closing force - 3.6Nm (maximum 10Nm)

Pass

Ease of movement of sash after removal of force (Test 2)

Opening forces

Initial force - 44N (maximum 80N)

Pass

Sustained force - 47N (maximum 65N)

Pass

Closing forces

Initial force - 39N (maximum 80N)

Pass

Sustained force - 62N (maximum 65N)

Pass

No visible damage to the window was observed

Pass

Note

The acceptance level, Class A, is that described in  
Amendment No1 to BS 6375-2:1987**A7 Test 6 : Strength of restricted opening and location  
devices and maximum opening stops**

Force applied - 200N for 5s (maximum opening stops)

Window remained operable after force removed

Pass

**BS 644:2003 - Clause 13 Operation and strength****(BS 6375-2:1987)****Projecting side hung light****APPENDIX A Test methods**

Variable geometry hinges 410mm long, having one bar fixed to the frame, one bar fixed to the sash and five link bars.

	<b>Result</b>
<b>A2 Test 1 : Ease of fastener operation</b>	
Opening force - 3.2Nm (maximum 10Nm)	Pass
Closing force - 3.7Nm (maximum 10Nm)	Pass
<b>A3 Test 2 : Ease of movement of sash</b>	
Opening forces	
Initial force - 37N (maximum 80N)	Pass
Sustained force- 40N (maximum 65N)	Pass
Closing forces	
Initial force - 32N (maximum 80N)	Pass
Sustained force - 63N (maximum 65N)	Pass
<b>A5 Test 4 : Release of jammed sash</b>	
Force applied - 300N for 5s	
Ease of fastener operation after removal of force (Test 1)	
Opening force – 2.6Nm (maximum 10Nm)	Pass
Closing force – 3.4Nm (maximum 10Nm)	Pass
No visible damage to the window was observed	Pass

**BS 644:2003 - Clause 13 Operation and strength (continued)****(BS 6375-2:1987)****Projecting side hung light****APPENDIX A Test methods****A6 Test 5 : Release of jammed hinge****Result**

Force applied - 300N for 5s (Class A)

Ease of fastener operation after removal of force (Test 1)

Opening force - 1.3Nm (maximum 10Nm)

Pass

Closing force - 1.7Nm (maximum 10Nm)

Pass

Ease of movement of sash after removal of force (Test 2)

Opening forces

Initial force - 14N (maximum 80N)

Pass

Sustained force - 20N (maximum 65N)

Pass

Closing forces

Initial force - 30N (maximum 80N)

Pass

Sustained force - 41N (maximum 65N)

Pass

No visible damage to the window was observed

Pass

**Note**The acceptance level, Class A, is that described in  
Amendment No1 to BS 6375-2:1987**A7 Test 6 : Strength of restricted opening and location  
devices and maximum opening stops**

Force applied - 200N for 5s (maximum opening stops)

Window remained operable after force removed

Pass

**BS 644:2003 - Clause 13 Operation and strength (continued)****(BS 6375-2:1987)****Projecting side hung light****APPENDIX A Test methods****Result****A8 Test 7 : Resistance to accidental loading**

Force applied - 500N for 5s

Ease of fastener operation after removal of force (Test 1)

Opening force - 2.4Nm (maximum 10Nm)

Pass

Closing force - 3.6Nm (maximum 10Nm)

Pass

No visible damage to the window was observed

Pass

Force applied - 1000N for 1 min

There was no glass breakage and the hardware remained attached to the sash and frame of the window

Pass

**APPENDIX A**

<b>Window types:</b>	<ul style="list-style-type: none"> <li>a) projecting top hung</li> <li>b) projecting side hung</li> <li>c) fixed</li> <li>d) multilight window consisting of projecting top hung light(s) and/or projecting side hung light(s) with or without fixed light(s)</li> </ul>			
<b>Manufacturer's designation:</b>	George Barnsdale & Sons Limited C2 Flush Casement Internally/Externally Glazed Timber Window System			
<b>General description:</b>	The range of windows is double glazed only, is internally glazed (opening lights) and externally glazed (fixed lights), has multipoint locking only and is produced in accordance with George Barnsdale & Sons Limited C2 Flush Casement Window Drawing No BSI-02 dated 11-10-04.			
<b>Size limitations:</b>	<b>Length up to a maximum of</b>	<b>Height up to a maximum of</b>	<b>Perimeter up to a maximum of</b>	<b>Transom/mullion length (including frame) up to a maximum of</b>
Type a)	1200mm	600mm	-	-
Type b)	600mm	1350mm	-	-
Type c)	1200mm	750mm	-	-
Type d)	1800mm	1350mm	6300mm	1350mm
<b>Performance characteristics:</b>	<p>All types</p> <p>Exposure Category 2000 given in BS 6375-1:2004 in respect of its air permeability, watertightness and wind resistance requirements</p>			