



## Wright Window Systems Ltd

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**Agrément  
Certificate  
No 02/3907**

Designated by Government  
to issue  
European Technical  
Approvals

## THE DURAFLEX PVC-U WINDOW SYSTEM

Fenêtre  
Fenster

## Product



• THIS CERTIFICATE RELATES TO THE DURAFLEX PVC-U WINDOW SYSTEM COMPRISING THE WINDOW TYPES AND SIZES REFERRED TO IN THE ACCOMPANYING DETAIL SHEETS.


• The windows referred to in the Detail Sheets are fabricated and marketed by Wright Window Systems Ltd at the above address.

• The windows in the Duraflex range are for use in the exposure situations described in the relevant Detail Sheets.


• It is essential that the windows are installed and used in accordance with the conditions set out in the Design Data and Installation parts of the Detail Sheets.

## Regulations


### 1 The Building Regulations (England and Wales)

 The Secretary of State has agreed with the British Board of Agrément the requirements of the Building Regulations to which windows can contribute in achieving compliance. In the opinion of the BBA, the position of the Duraflex PVC-U Window System under the Regulations, if used in accordance with the provisions of this Certificate, is as stated in Detail Sheet 1.

### 2 The Building Standards (Scotland) Regulations

 In the opinion of the BBA, the position of the Duraflex PVC-U Window System under these Regulations, if used in accordance with the provisions of this Certificate, is as stated in Detail Sheet 1.

### 3 The Building Regulations (Northern Ireland)

 In the opinion of the BBA, the position of the Duraflex PVC-U Window System under these Regulations, if used in accordance with the provisions of this Certificate, is as stated in Detail Sheet 1.

### 4 Construction (Design and Management) Regulations

In the opinion of the BBA, the position of the Duraflex PVC-U Window System under these Regulations, if used in accordance with the provisions of this Certificate, is as stated in Detail Sheet 1.

## Conditions of Certification

### 5 Conditions

5.1 This Certificate:

- (a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (d) is copyright of the BBA.

5.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, shall be construed as references to such publication in the form in which it was current at the date of this Certificate.

5.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabricating process(es) thereof:

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked by the BBA or its agents; and

(c) are reviewed by the BBA as and when it considers appropriate.

5.4 In granting this Certificate, the BBA makes no representation as to:

- (a) the presence or absence of any patent or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the nature of individual installations of the product, including methods and workmanship.

5.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.



In the opinion of the British Board of Agrément, the Duraflex PVC-U Window System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 02/3907 is accordingly awarded to Wright Window Systems Ltd.

On behalf of the British Board of Agrément

Chief Executive

Date of issue: 22nd March 2002

## Associated Detail Sheets

The following Detail Sheets are part of this Certificate:

Detail sheet	Edition	Date of issue	No of pages	Imprint ref	Title	System status
1	9	27th July 2001	4	09BRW1	PVC-U Window System Building Regulations	Current
4	4	27th February 2002	8	04DFW4	The Duraflex Diamond Suite Tilt and Turn PVC-U Window System	Current
5	4	27th February 2002	8	04DFW5	The Duraflex Diamond Suite Outward Opening PVC-U Window System	Current





## PVC-U WINDOW SYSTEM

### DETAIL SHEET 1

Edition 9

No of pages 4

## Regulations

### 1 The Building Regulations 2000 (England and Wales)



The Secretary of State has agreed with the British Board of Agrément the requirements of the Building Regulations to which windows can contribute in achieving compliance. In the opinion of the BBA, the PVC-U Window System specified on the Front Sheet, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: **B1**

Means of escape

Comment:

Where a window is required, in a dwelling, to provide a means of escape from an inner room or a loft space converted into a habitable room, the window can meet this Requirement when it incorporates an opening light providing a clear opening area of at least 0.33 m<sup>2</sup> and not less than 450 mm high by 450 mm wide and is positioned as set out in Approved Document B1. The obstruction caused by opening lights hung on projecting friction stays must be taken into account when the clear opening is determined. However, the route through the window can be at an angle rather than straight through.

Requirement: **F1**

Means of ventilation

Comment:

In calculating the contribution of the product to natural ventilation, the area of opening should be calculated in accordance with section 6.1 in the relevant Detail Sheets and related to floor area and position in the wall as set out in Approved Document F1. Background ventilation can be provided by the methods described in section 6.2 of the relevant Detail Sheets.

Requirement: **K4**

Protection from collision with open windows etc

Comment:

In buildings other than dwellings, this Requirement can be met by installing windows so that projecting parts are kept away from people moving in and around the building; or by installing features which guide people away from any open window. Approved Document K4 sets out some ways of complying with this Requirement.

Requirement: **L1**

Conservation of fuel and power

Comment:

In calculating the heat loss through windows the U values given in sections 7.1 to 7.3 of the relevant Detail Sheets should be used. In new work, the guidance given in the Approved Document to Part L regarding positioning a window in the reveal must be taken into account.

Requirements: **N1 and N2**

Protection against impact and Manifestation of glazing

Comment:

Glazing less than 800 mm above floor or ground level should meet the requirements of N1. Except where windows incorporate only small panes, glass and plastics sheet materials which satisfy the test requirements of BS 6206 : 1981 should be used to meet the requirements of N1. See section 9.3 of the relevant Detail Sheets. To meet the requirements of N2, it may be necessary to incorporate features into glazing in non-domestic buildings to make its existence apparent to people using them.

Requirement: **N3**

Safe opening and closing of windows etc

Comment:

In buildings other than dwellings, windows which can be opened by people in or about the building should be constructed or equipped so that they can be opened, closed or adjusted safely. See sections 9.1 and 9.2 of the relevant Detail Sheets.

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Requirement:	<b>N4</b>	Safe access for cleaning windows etc
Comment:		In buildings other than dwellings, this Requirement can be met where provision is made for safe means of access for cleaning both sides of glazed surfaces where there is danger of falling more than two metres. Approved Document N4 sets out some ways of complying with this Requirement.
Requirement:	<b>Regulation 7</b>	Materials and workmanship
Comment:		The product is acceptable. See sections 13.1 to 13.3 of the relevant accompanying Detail Sheets.

## 2 The Building Standards (Scotland) Regulations 1990 (as amended)



In the opinion of the BBA, the PVC-U Window System specified on the Front Sheet, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards as listed below.

Regulation:	<b>10</b>	Fitness of materials
Standard:	B2.1	Selection and use of materials and components
Comment:		The PVC-U window system complies with the requirements of this Standard. See sections 13.1 to 13.3 of the relevant accompanying Detail Sheets.
Regulation:	<b>13</b>	Means of escape from fire, facilities for fire-fighting and means of warning of fire in dwellings and enclosed shopping centres
Standard:	E8.3	Emergency escape windows
Standard:	E9.21	Emergency access windows
Comment:		Windows providing a clear opening area of at least 0.33 m <sup>2</sup> and at least 450 mm high and 450 mm wide (escape window) and not less than 850 mm high by 500 mm wide (access windows) are deemed to satisfy these Standards as emergency windows, when suitably located. The obstruction caused by opening lights hung on projecting friction stays must be taken into account when the clear opening is determined. However, the route through the window may be at an angle rather than straight through.
Regulation:	<b>17</b>	Resistance to moisture
Regulation:	<b>18</b>	Resistance to condensation
Standard:	G3.1	Resistance to precipitation
Comment:		Walls incorporating the product, installed and used in accordance with the provisions of this Certificate, can meet this Standard. See Table 3 of the relevant Detail Sheets.
Regulation:	<b>22</b>	Conservation of fuel and power
Standard:	Relevant technical standards within Part J2	Conservation of fuel and power: the building fabric
Comment:		In calculating the heat loss from a building in connection with the relevant sub-paragraphs of this Standard, the U values given in sections 7.1 to 7.3 of the relevant Detail Sheets should be used.
Regulation:	<b>23</b>	Ventilation of buildings
Standard:	Relevant technical standards within Part K2	Ventilation of buildings other than garages
Standard:	Relevant technical standards within Part K4	General ventilation requirements
Comment:		In calculating the contribution of the product to natural ventilation in connection with the relevant sub-paragraphs of these Standards, the area of opening should be calculated in accordance with section 6.1 in the relevant Detail Sheets. Trickle ventilation can be provided by the methods described in section 6.2 of the relevant Detail Sheets.
Regulation:	<b>27</b>	Miscellaneous hazards
Standard:	P2.2	Collision with glazing
Comment:		Glazing must comply with the details in BS 6262 : 1982 where accidental collision with it is likely. See section 9.3 of the relevant Detail Sheets.
Standard:	P2.3	Cleaning of windows and rooflights
Comment:		Windows installed in buildings in purpose group 1 situated more than 4 m above the adjacent ground must comply with Standard P2.3 regarding access.

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## 3 The Building Regulations (Northern Ireland) 2000



In the opinion of the BBA, the PVC-U Window System specified on the Front Sheet, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the various Regulations as listed below.

Regulation:	<b>B2</b>	Fitness of materials and workmanship
Comment:		The windows are acceptable. See sections 13.1 to 13.3 of the relevant accompanying Detail Sheet.
Regulation:	<b>C4</b>	Resistance to ground moisture and weather
Comment:		The windows are weathertight (see Table 3 of the relevant Detail Sheets) and can thus contribute to the ability of the wall to meet this Regulation.
Regulation:	<b>E2</b>	Means of escape
Regulation:	<b>E7</b>	Deemed-to-satisfy provisions for means of escape
Comment:		A window in a dwelling can contribute to meeting the requirements when it incorporates an opening light providing a clear opening not less than 850 mm by 500 mm and is positioned not more than 1.1 m above the floor. The obstruction caused by opening lights hung on projecting friction stays must be taken into account when the clear opening is determined.
Regulation:	<b>F2</b>	Conservation of fuel and power — the Building Fabric
Regulation:	<b>F5</b>	Deemed-to-satisfy provision for conservation of fuel and power
Comment:		In calculating the heat loss through windows, the U value given in sections 7.1 to 7.3 of the relevant Detail Sheets should be used except where a deemed-to-satisfy solution is being adopted.
Regulation:	<b>H7</b>	Protection from collision with open windows, skylights or ventilators
Regulation:	<b>H8</b>	Deemed-to-satisfy provision for H7
Comment:		Reasonable provision shall be made to minimise the risk of people colliding with an open window when moving in or about a building. In so far as they relate to a dwelling, the requirements of H7 shall only apply to a window which opens over a public route of travel. The requirements of this Regulation shall be deemed to be satisfied if the window installation complies with Technical Booklet H, Section 7, December 2000.
Regulation:	<b>K2</b>	Means of ventilation
Comment:		When calculating the area of window openings for ventilation purposes, see section 6.1 of the relevant Detail Sheets. Trickle ventilation can be provided by the methods described in section 6.2 of the relevant Detail Sheets.
Regulation:	<b>V2</b>	Impact with glazing
Regulation:	<b>V6</b>	Deemed-to-satisfy provision for V2
Comment:		Where people are likely to come into contact with glazing in a building the requirements of this Regulation shall be deemed to be satisfied if the glazing complies with Technical Booklet V, Section 2, December 2000. See section 9.3 of the relevant Detail Sheets.
Regulation:	<b>V3</b>	Transparent glazing
Regulation:	<b>V6</b>	Deemed-to-satisfy provision for V3
Comment:		In a building, other than in a dwelling, transparent glazing, of which people may be unaware and with which they are likely to collide, shall incorporate features which make it apparent. The requirements of this Regulation shall be deemed to be satisfied if the glazing complies with Technical Booklet V, Section 3, December 2000.
Regulation:	<b>V4</b>	Safe opening and closing of windows, skylights and ventilators
Regulation:	<b>V6</b>	Deemed-to-satisfy provision for V4
Comment:		Any window which can be opened by a person shall be so constructed or equipped that it may be opened, closed and adjusted safely. The requirements of this Regulation shall be deemed to be satisfied if the window complies with Technical Booklet V, Section 4, December 2000. See sections 9.1 and 9.2 of the relevant Detail Sheets.
Regulation:	<b>V5</b>	Safe means of access for cleaning glazing
Regulation:	<b>V6</b>	Deemed-to-satisfy provision for V5
Comment:		Reasonable provision shall be made for safe means of access to clean glazing. The requirements of this Regulation shall be deemed to be satisfied if the means of access complies with Technical Booklet V, Section 5, December 2000.

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4 Construction (Design and Management) Regulations 1994 (as amended)

Construction (Design and Management) Regulations (Northern Ireland)  
1995 (as amended)

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See section:

2 Delivery and site handling of the relevant Detail Sheets.

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On behalf of the British Board of Agrément

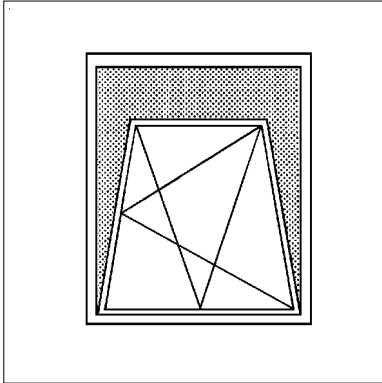
Date of Ninth issue: 27th July 2001

Chief Executive



## THE DURAFLEX DIAMOND SUITE TILT AND TURN PVC-U WINDOW SYSTEM

### Product



**CAUTION:** This Detail Sheet is not valid in isolation and must be read in conjunction with the Front Sheet and Detail Sheet 1, which give the Certificate holder's name, *Conditions of Certification*, and the product's position regarding the Building Regulations, respectively.

- THIS DETAIL SHEET RELATES TO THE DURAFLEX DIAMOND SUITE TILT AND TURN PVC-U WINDOW SYSTEM.
- The system comprises single and multilight tilt and turn windows framed in white or woodgrain finish PVC-U and glazed internally with sealed double-glazed units.
- The product is for use where the test pressure classes defined in BS 6375-1 : 1989 and indicated in Table 3 are applicable.
- It is essential that the windows are installed and maintained in accordance with the conditions set out in the Design Data and Installation parts of this Detail Sheet.

### Technical Specification

#### 1 Description

1.1 The Diamond Suite tilt and turn windows (see Figure 1) are fabricated from white or woodgrain finish unplasticized polyvinyl chloride (PVC-U) profiles, produced by conventional extrusion techniques from material complying with Case B (PVC-U with additional polymers), as defined in BBA MOAT No 17 : 1990. Woodgrain profiles are surface covered with PVC which incorporates a clear acrylic protective lacquer. Profiles are available with the foil applied to both visible faces of a brown PVC-U substrate or to the exterior face only of a white PVC-U substrate. The profiles covered by this Certificate are those listed in Table 1 and shown in Figure 2.

1.2 The methods of selection, machining and assembly of frame components are detailed in the *Diamond Suite Window Fabrication Manual*.

1.3 Multilight windows incorporate mullions and transoms connected to the outer frame and, where relevant, to each other by means of welded or mechanical joints.

Figure 1 Corner detail

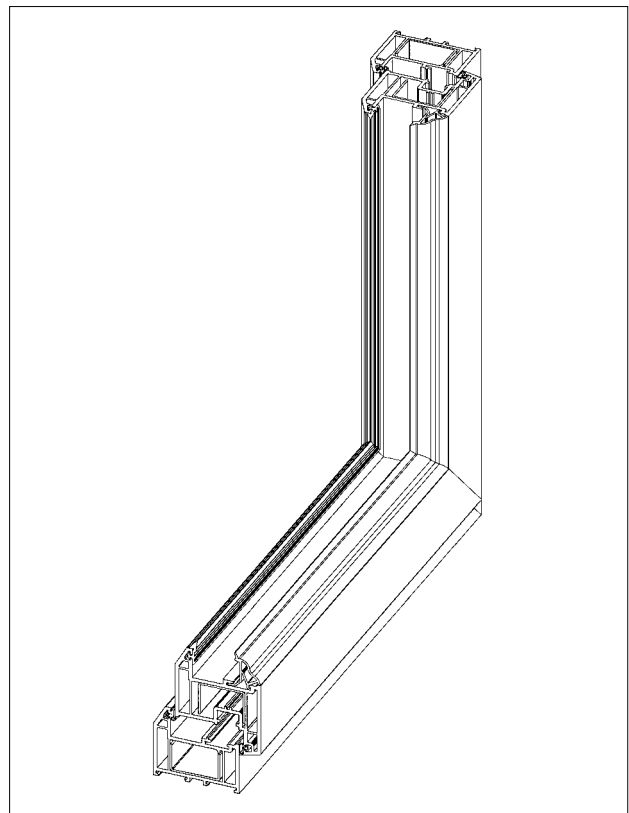


Table 1 Profiles

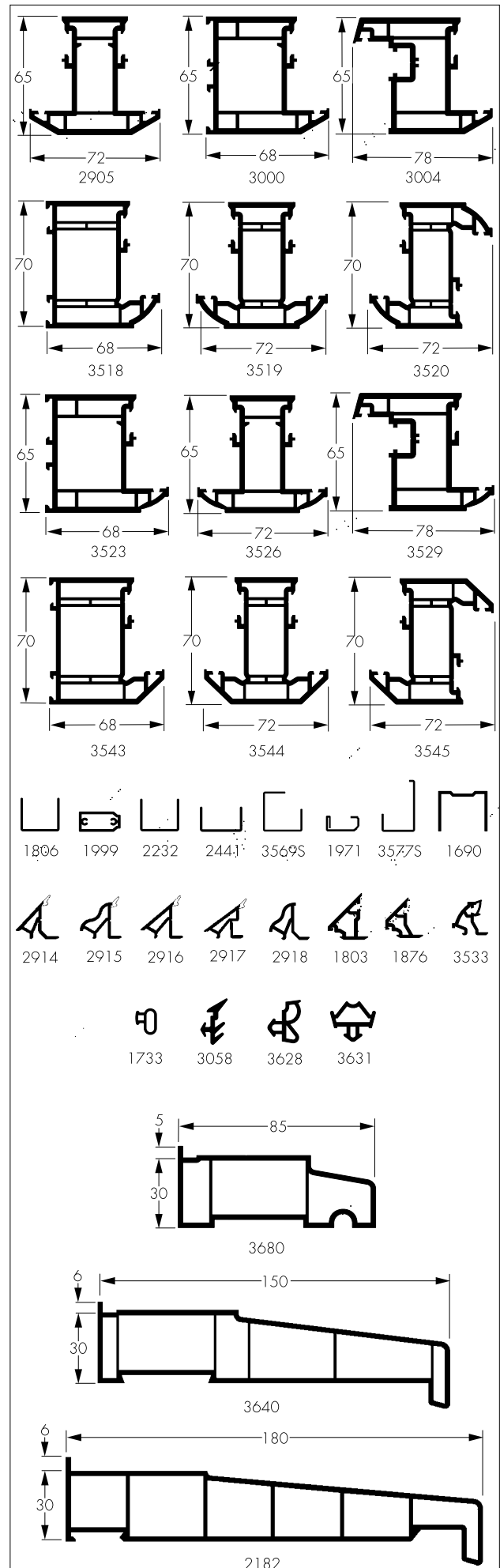
Manufacturer's designation	Profile type	Application
3000	L-section	outer frame (standard)
3523	L-section	outer frame (featured)
3518	L-section	large outer frame (70 mm, featured)
3543	L-section	large outer frame (70 mm, standard)
2905	T-section	mullion/transom (standard)
3526	T-section	mullion/transom (featured)
3544	T-section	'heavy' transom/mullion (70 mm, standard)
3519	T-section	mullion/transom (70 mm, featured)
3004	Z-section	opening light frame (standard)
3529	Z-section	opening light frame (featured)
3545	Z-section	'heavy' transom/mullion (70 mm, standard)
3520	Z-section	mullion/transom (70 mm, featured)
3680	—	stub sill (85 mm)
3640	—	sill (150 mm)
2182	—	sill (180 mm)
1803	—	post-calibrated glazing bead (24 mm)
1876	—	post-calibrated glazing bead (28 mm)
2914	—	co-extruded glazing bead (20 mm, chamfered)
2915	—	co-extruded glazing bead (24 mm, chamfered)
2916	—	co-extruded glazing bead (24 mm, scotia)
2917	—	co-extruded glazing bead (28 mm, chamfered)
2918	—	co-extruded glazing bead (28 mm, scotia)
3533	—	co-extruded glazing bead (28 mm, featured)
1733	—	weatherseal (standard)
3631	—	weatherseal (featured)
3058	—	'E' gasket (standard)
3628	—	low line gasket (featured)
3569S	—	galvanized steel reinforcement (3000, 3523)
3577S	—	galvanized steel reinforcement (3004, 3529)
1971	—	galvanized steel reinforcement (2905, 3519, 3520, 3526, 3544, 3545)
1806	—	aluminium reinforcement (3000, 3523)
2441	—	aluminium reinforcement (3004, 3529)
2232	—	aluminium reinforcement (3004, 3529)
1999	—	ported aluminium reinforcement (2905, 3526)
1690	—	aluminium reinforcement for use with structural support bar

1.4 The PVC-U extrusions are cut to length, and all holes routed or drilled. Where required, galvanized steel or aluminium reinforcement sections are inserted in the PVC-U sections before they are welded together. The welded connections are then cleaned up by polishing, knifing or using a purpose-made machine which also forms a groove or raised pyramid at the weld. Where mullions and transoms are mechanically jointed the outer frame is screwed through to ported aluminium reinforcement inserted in the mullion or transom in accordance with the instructions in the *Diamond Suite Window Fabrication Manual*. The window is completed by locating the weatherstripping in grooves and securing the fittings in position with screws.

1.5 Drainage is provided by a series of slots 5 mm by 25 mm, positioned in accordance with the *Diamond Suite Window Fabrication Manual*. In general, on multilight units each element is treated as a separate window and drainage slots cut accordingly, to retain symmetry where possible. Woodgrain finished sills are vented, as described in the *Diamond Suite Window Fabrication Manual*, to prevent pressure changes causing distortion.

1.6 For white windows outer frames are reinforced with galvanized mild steel or aluminium where their length exceeds 1000 mm, in accordance with the *Diamond Suite Window Fabrication Manual*. Windows with a woodgrain finish have reinforced outer frame and sill if their length exceeds 600 mm.

Figure 2 Profiles





1.7 For white windows opening light frame members are reinforced with galvanized mild steel or aluminium where a member length exceeds 800 mm and woodgrain finish opening light frame members where a member length exceeds 600 mm, in accordance with the *Diamond Suite Window Fabrication Manual*.

1.8 Welded mullions and transoms are reinforced with galvanized mild steel where their length exceeds 800 mm. Woodgrain finish mullions and transoms are reinforced with galvanized mild steel or aluminium where their length exceeds 600 mm. Mechanically jointed mullions and transoms are reinforced with aluminium in accordance with the *Diamond Suite Window Fabrication Manual*.

1.9 Galvanized steel reinforcement is roll-formed from material with a G Z 275N coating complying with BS EN 10142 : 2000. Aluminium reinforcement is extruded from alloy type 6063-T6 to BS 1474 : 1987.

## Size range

1.10 This Detail Sheet covers Diamond Suite tilt and turn single and multilight windows within the limitations shown in Table 2.

<i>Table 2 Size restriction</i>	
	Dimension (mm)
<i>All windows</i>	
Maximum overall width or height of any outer frame	2400
Maximum length of mullion or transoms: (reinforcements 1971, 1690) <sup>(1)</sup>	2100
Maximum length of mullion or transoms: (reinforcement 1971) <sup>(1)</sup>	1400
Maximum size of tilt and turn opening light (separately or in a multilight)	1350 wide x 1800 high

(1) Span refers to the glass edge supporting edge.

## Fittings

1.11 The windows are fitted with specific types of tilt and turn mechanism, approved for the purpose by the BBA, comprising an espagnolette type locking system, hinges and a tilt stay, all formed from zinc-plated steel. The mechanism incorporates locking rollers and, as an option, shootbolt locks which engage with keeps fixed to the outer frame, and is operated with a handle manufactured from zinc alloy with various finishes.

1.12 The tilt and turn mechanism locates in a purpose-made groove in the opening light profile. All furniture is screwed to the PVC-U frame profiles using non-corrodible self-tapping screws which penetrate the equivalent of two thicknesses of PVC-U profile or the reinforcement.

1.13 Details of currently approved types of mechanisms can be obtained from the BBA. Additional components are available from the range of fittings to restrict the opening of the window to a maximum distance of 100 mm.

## Glazing

1.14 Windows are supplied factory glazed or ready for glazing using double-glazed units with glass thicknesses in accordance with BS 6262 : 1982. All glass is positioned by plastic setting blocks and packing pieces.

## Weatherstripping and gaskets

1.15 Weatherstripping, extruded from a PVC nitrile material, is located in grooves around the periphery of the opening light and the fixed frame.

1.16 'E' gaskets, formed from similar material to the weatherstripping are fitted between the frame and the double-glazed unit. The unit is secured by post-calibrated beads forcing the glass against the externally fitted 'E' gasket.

## Quality control

1.17 Quality control includes checks on all materials and components, in particular:

*PVC-U compound*

bulk density

pourability

*Extruded profiles*

dimensions

colour

heat reversion

resistance to cold impact

*Fabrication procedures*

extrusions and fittings (visual inspection)

overall dimensions

operation and opening of locking mechanisms

strength of welded corners.

## 2 Delivery and site handling

2.1 The windows are delivered to site glazed or ready for glazing. For transportation they are suitably protected to avoid damage. Particular care is needed to avoid damaging woodgrain finishes, as it may be impossible to restore the appearance.

2.2 Each window has a label bearing the company's mark and the BBA identification mark incorporating the number of this Certificate.

2.3 The windows should be stored under cover in a clean area, on edge and suitably supported to avoid distortion or damage.

2.4 The weight of glazing can be calculated, where required for manual handling operations, by reference to the information contained in BS 952-1 : 1995. The weight of the unglazed frame, and its ease of handling, particularly by one person, must also be taken into account when planning site operations.

2.5 When selecting means of access, for example, use of scaffolding, the safety of the operatives, the occupants, and the passers-by, during the period of installation, should be considered.

### 3 General

3.1 Selected samples from the Diamond Suite Tilt and Turn PVC-U Window System were tested in accordance with BBA MOAT No 1 : 1974. Assessment of the results shows that the products, within the range described in section 1.10, are suitable for use where the test pressure classes defined in BS 6375-1 : 1989 and indicated in Table 3 are applicable. The gradings are based on the assumption that the outer frame is supported on all four sides in accordance with the manufacturer's instructions.

3.2 For unusual building layouts, building shapes or ground topography, the designer will need to give particular consideration to the prevailing exposure conditions.

Table 3 Test pressure class

	BS 6375-1 : 1989 Test pressure class (Pa)	MOAT No 1 Grading
<i>Strength and stability</i>		
Multilights with mullions or transoms as follows: up to maximum 1400 mm with steel reinforcement (1971) <sup>(1)</sup>	2700	V <sub>3</sub>
up to maximum 2100 mm transom with steel reinforcement and an additional steel section screwed to the face of the mullion or transom (1971, 1690) <sup>(2)</sup>	2700	V <sub>3</sub>
<i>Watertightness</i>		
Multilights up to maximum size	300	E <sub>3</sub>
Individual lights	300	E <sub>3</sub>
Fixed lights	300	E <sub>3</sub>
<i>Air permeability</i>		
All windows	600	A <sub>3</sub>

V<sub>3</sub> indicates that windows meet deformation requirements at 1750 Pa, a cycling test at 1250 Pa and a safety test at 3000 Pa.

E<sub>3</sub> indicates water leakage occurring between 300 Pa and 499 Pa.

A<sub>3</sub> indicates an airflow rate below the line passing the point for a rate of flow of 2 m<sup>3</sup>h<sup>-1</sup>m<sup>-1</sup> at 100 Pa pressure, when tested up to a pressure of 600 Pa [see Figure 3].

(1) Refers to a window with two full-height mullions of 1400 mm and a width of 1000 mm.

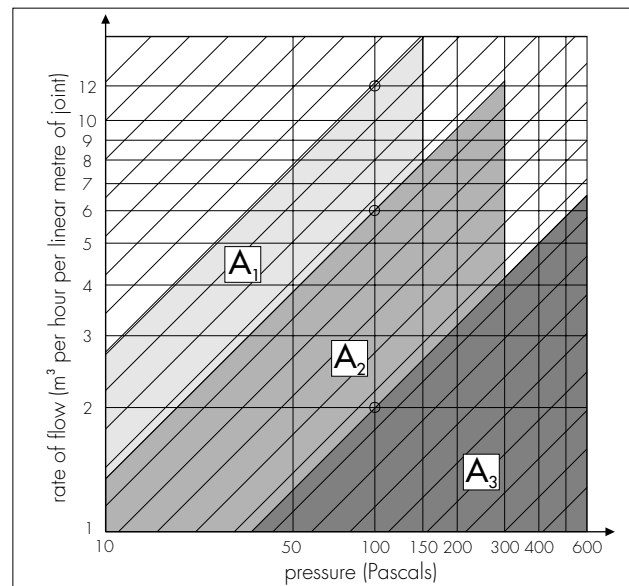
(2) Refers to a window with a full-width transom of 2100 mm and a height of 1200 mm.

### 4 Practicability of installation

4.1 Installation does not present undue difficulty when fitting the windows in openings in new or existing walls provided the installation instructions are followed.

4.2 In common with other types of window fitted to prepared openings, Diamond Suite windows must be correctly positioned in relation to vertical damp-proof courses to prevent water penetration to the internal reveal.

Figure 3 Air permeability grade



### 5 Glass area

The approximate unobstructed glass area of the windows is determined by deducting from the overall width and height the appropriate profile dimensions. For each applicable feature, for example, a fixed light would require twice the outer frame dimension to be deducted from the overall width and overall height. Typical dimensions are given in Table 4.

Table 4 Typical dimensions for determining unobstructed glass area

Window feature	Dimensions (mm)
Outer frame (3000, 3523)	68
Mullion or transom between fixed lights (2905, 3526)	72
Mullion or transom between opening lights (2905, 3004, 3526, 3529)	176
Mullion or transom between one opening and one fixed light (2905, 3004, 3526, 3529)	124
Outer frame and opening light (3000, 3004, 3523, 3529)	120

### 6 Ventilation

6.1 The opening area for natural ventilation may be calculated by multiplying together the overall width and height dimensions of opening lights reduced by the amounts given in Table 5. For opening lights abutting a mullion or transom, the overall width or height of that element will be given as the dimension from the edge of the outer frame to the centre line of the mullion or transom or, where relevant, between centres of the mullion or transom.

6.2 The background ventilation requirements of the various building regulations can be met by the incorporation in the window of a suitably-sized trickle ventilator. The ventilator may be glazed in, fitted in a supplementary head member or fitted by another method approved by the BBA for use with

the Diamond Suite system. Details of any such approved fitting methods can be obtained from the BBA. Details of ventilators covered by this Agrément Certificate can be found on the BBA website.

Table 5 Natural ventilation dimension reductions

Frame member	Deduction from width or height (mm)
Outer frame:	68
Mullion or transom:	36

## 7 Thermal insulation



7.1 The thermal transmittance value (U value) of a fully-reinforced Duraflex tilt and turn window of similar design 1211 mm wide by 1211 mm high incorporating a 1000 mm by 1000 mm standard Kitemarked 4/12/4 mm sealed, double-glazed unit of known thermal performance, when measured by the Guarded Hot Box Method according to BS 874-3.1 : 1987, is  $2.55 \pm 0.26 \text{ Wm}^{-2}\text{K}^{-1}$ .

7.2 For design purposes, a representative value for the linear thermal transmittance of the PVC-U frame may be taken as  $0.19 \text{ Wm}^{-1}\text{K}^{-1}$ . The heat loss through the PVC-U frame is the product of the linear thermal transmittance value, the frame length and the difference in environmental temperatures either side of the frame, ie the heat loss (in watts) through the PVC-U frame = 0.19 by total length of frame by the difference in environmental temperature either side of the frame.

7.3 The overall thermal insulation of the window will be dependent on the performance of the double-glazed units. It is recommended that a unit is specified that carries the BSI Kitemark to BS 5713 : 1979.

## 8 Condensation risk

8.1 For condensation to occur on any surface the temperature of that surface must fall below the dew-point of the air adjacent to it. Where a temperature differential exists between the interior and exterior surfaces of a Diamond Suite tilt and turn window the frame members do not constitute a 'cold bridge' and condensation will occur on the glass before it appears on the frame.

8.2 Measurements show that for a fully-reinforced window, subject to internal conditions of 20°C and 65% RH, the external temperature must fall below -2.5°C before condensation occurs at any point on the visible interior surface of the PVC-U frame, or below -19.2°C before condensation occurs on the majority of the frame surface.

## 9 Safety



9.1 When fitted with a restrictor, movement of the opening light can be effectively limited to give an opening of not more than 100 mm, as recommended for child safety in BS 8213-1 : 1991.

9.2 The windows can comply with the recommendations of BS 8213-1 : 1991 with regard to the positioning of hand-operated controls.



9.3 Account must be taken of the recommendations given in BS 6262-4 : 1994<sup>(1)</sup>, which include the use of safety glass, complying with BS 6206 : 1981, under certain circumstances.

(1) Dealing with the safety of people upon impact with the glazing.

## 10 Security against intrusion

10.1 Diamond Suite opening lights are fitted with a lock mechanism as described in section 1.12. When fastened in the closed position the opening light cannot be opened by manipulation from the outside, for example, by the insertion of a thin blade. Key operated locks are required for certain windows to meet the security requirements of NHBC Standards Chapter 6.7 *Doors, windows and glazing* and the Zurich Building Guarantees Technical Standards, Sections 6.12 and 12.16. It is vital that glass packing is carried out to the manufacturer's recommendations to prevent forced entry by flexing of the frame members allowing disengagement of the lock mechanism.

10.2 The design of the glazing is such that the removal of the glazing from outside is extremely difficult, as all beads are fitted internally.

## 11 Ease of operation

The window can be operated without difficulty when correctly installed.

## 12 Maintenance

12.1 The window can be re-glazed and the gaskets and weatherstripping replaced, but these operations should be carried out by specialist operatives using the materials recommended by the Certificate holder specified on the Front Sheet and approved by the BBA.

12.2 If damage occurs, the furniture and fittings can be replaced.

12.3 The PVC-U frame members can be cleaned using water containing household detergent. If dirt is allowed to build up on the members over long periods it may become more difficult to restore the surface appearance. Abrasive cleaners should not be used, particularly on woodgrain finishes as the loss of the acrylic lacquer will have a serious effect on durability.

12.4 Care should be taken when using proprietary materials for cleaning the glass, to ensure that deposits are not allowed to remain on the PVC-U where they may cause discolouration and damage to the surface. In addition, care must be taken to avoid damage to, or discolouration of, the members when stripping paint from adjacent

timber, for example, by means of a blowlamp or paint stripper.

12.5 Paints can adversely affect the impact strength of the PVC-U frame members and the application of dark colours to white profiles could lead to a risk of thermal distortion. Therefore painting is not recommended.

12.6 The tilt and turn locking mechanism should be cleaned and lubricated periodically to minimise wear and to ensure smooth operation.

## 13 Durability

13.1 Evidence is available on the performance in the UK and other Northern European countries of PVC-U similar to that used for the system over a period of 15 years for woodgrain windows and in excess of 20 years for white windows. Such evidence, when compared with the results of tests on the Diamond Suite PVC-U, indicates that the windows will have a life of at least 25 years. Any slight colour change or surface dulling that might occur will be uniform over the visible surfaces of the windows for both white and woodgrain finishes, assuming in the latter case that the acrylic lacquer is undamaged.

13.2 Fittings, including the hinges, locking mechanism and operating handles, as described in this Detail Sheet, will have similar durability except where windows are to be installed in areas subject to particularly aggressive conditions. These conditions can prevail in coastal locations or near sources of industrial pollutants and replacement of fittings may be necessary within the life of the window.

13.3 The gaskets, weatherstripping and the mastic seal to the building structure may need to be replaced within the life of the window.

## Installation

### 14 General

14.1 The window must be fixed into the opening, in accordance with the recommendations in the BPF Code of Practice for the installation of PVC-U windows and doorsets (Ref : 348/2 March 1996), using proprietary expanding anchors through the frame or galvanized steel fixing lugs. Replacement windows should be fitted in accordance with BS 8213-4 : 1990 in particular with reference to clause 9.3.1.

14.2 Openings in new walls should be formed using a suitable template 10 mm wider and higher than the window to be installed. The window should not be built in at the construction stage.

Notwithstanding the information referred to in section 14.1, a typical installation involves the following steps:

- after checking the dimensions of the window, the frame is de-glazed if necessary and positioned in the opening. Holes are drilled through the outer frame and into the masonry to take fixing anchors. Alternatively, lugs are positioned on the frame and attached to the masonry by means of screws and plugs. In either case fixings must be positioned not less than 150 mm from corners and at centres not exceeding 600 mm
- all glazing or re-glazing of the window is undertaken as required, using the technique fully described in the *Diamond Suite Window Fabrication Manual*
- the installation is completed by application of a silicone or similar durable sealant to the perimeter and the fitting of trims and window board to the interior.

## Technical Investigations

The following is a summary of the technical investigations carried out on the Diamond Suite Tilt and Turn PVC-U Window System.

### 16 Tests

16.1 Tests were carried out in accordance with the methods defined in MOAT No 1 : 1974 to determine:

air permeability  
 watertightness  
 effect of wind loads  
 effect of thermal differential  
 efficiency of window fittings  
 resistance to impact, racking and bending loads  
 ease of operation.

16.2 Tests in accordance with MOAT No 8 : 1973 and MOAT No 17 : 1990 gave the results for the PVC-U extrusions as detailed in Table 6.

Table 6 PVC-U extrusion test results

Test	Result	
	White	Brown
ash content (%)	6.36	4.47
Vicat softening temperature (°C)	92	89
tensile strength (MPa)	44.47	46.73
modulus of elasticity (MPa)	2471	2885
tensile impact (kJm <sup>-2</sup> ):		
new material at 23°C	709	639
UV aged material	622	579
heat aged material	669	600
induction time of dehydrochlorination (min):		
new material	76.6	65.7
UV aged material	49.7	58.2
heat aged material	68.6	53.1
impact test at -10°C		pass
shrinkage on heating at 100°C for 1 hour		<2%
verification of gelation		pass

16.3 Additional test work in accordance with MOAT No 57 : 1995 and BS 7722 : 1994 was carried out on woodgrain finish windows and profiles to determine:

*Windows*  
effect of solar heat gain

*Profiles*  
colourfastness of surface foil  
adhesion to substrate profile  
abrasion and scratch resistance  
retention of impact strength  
corner finishing.

## 17 Other investigations

17.1 The profile manufacturing process and the window fabrication procedure including, in each case, the methods adopted for quality control, have been examined and found satisfactory by the BBA.

17.2 An assessment was made of the results of a Guarded Hot Box test carried out on a Duraflex tilt and turn window of similar design to the Diamond Suite System.

## Bibliography

BS 874-3.1 : 1987 *Methods for determining thermal insulating properties — Tests for thermal transmittance and conductance — Guarded hot-box method*

BS 952-1 : 1995 *Glass for glazing — Classification*

BS 1474 : 1987 *Specification for wrought aluminium and aluminium alloys for general engineering purposes: bars, extruded round tubes and sections*

BS 5713 : 1979 *Specification for hermetically sealed flat double glazing units*

BS 6206 : 1981 *Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings*

BS 6262 : 1982 *Code of practice for glazing for buildings*

BS 6262-4 : 1994 *Glazing of Buildings — Code of practice for safety — Human impact*

BS 6375-1 : 1989 *Performance of windows — Classification for weather-tightness (including guidance on selection and specification)*

BS 7722 : 1994 *Specification for surface covered PVC-U extruded hollow profiles with heat welded joints for plastics windows*

BS 8213-1 : 1991 *Windows, doors and rooflights — Code of practice for safety in use and during cleaning of windows and doors (including guidance on cleaning materials and methods)*

BS 8213-4 : 1990 *Windows, doors and rooflights — Code of practice for the installation of replacement windows and doorsets in dwellings*

BS EN 10142 : 2000 *Continuously hot-dip zinc coated low carbon steels strip and sheet for cold forming — Technical delivery conditions*

MOAT No 1 : 1974 *Directive for the Assessment of Windows*

MOAT No 8 : 1973 *Directive for Rigid PVC Products Used Externally in Building*

MOAT No 17 : 1990 *UEAtc Technical Guide for the Agrément of Windows in PVC-U*

MOAT No 57 : 1995 *UEAtc Technical Report for the Assessment of Windows in Coloured PVC-U*



On behalf of the British Board of Agrément

Date of issue: 27th February 2002

  
Chief Executive

# Electronic Copy

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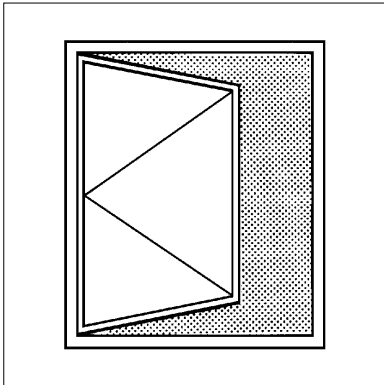
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## Product



**CAUTION:** This Detail Sheet is not valid in isolation and must be read in conjunction with the Front Sheet and Detail Sheet 1, which give the Certificate holder's name, *Conditions of Certification*, and the product's position regarding the Building Regulations, respectively.

- THIS DETAIL SHEET RELATES TO THE DURAFLEX DIAMOND SUITE OUTWARD OPENING PVC-U WINDOW SYSTEM.
- The system comprises single top-hung windows, single side-hung windows and multilight windows comprising opening lights and fixed lights, all framed in white or woodgrain finish PVC-U and glazed internally or externally with sealed double-glazed units.
- The product is for use where the test pressure classes defined in BS 6375-1 : 1989 and indicated in Table 3 are applicable.
- It is essential that the windows are installed and maintained in accordance with the conditions set out in the Design Data and Installation parts of this Detail Sheet.

## Technical Specification

### 1 Description

1.1 The Diamond Suite outward opening windows (see Figure 1) are fabricated from white or woodgrain finish unplasticized polyvinyl chloride (PVC-U) profiles, produced by conventional extrusion techniques from material complying with Case B (PVC-U with additional polymers), as defined in BBA MOAT No 17 : 1990. Woodgrain profiles are surface covered with PVC which incorporates a clear acrylic protective lacquer. Profiles are available with the foil applied to both visible faces of a brown PVC-U substrate or to the exterior face only of a white PVC-U substrate. The profiles covered by this Certificate are those listed in Table 1 and shown in Figure 2.

1.2 The methods of selection, machining and assembly of frame components are detailed in the *Diamond Suite Window Fabrication Manual*.

1.3 Multilight windows incorporate mullions and transoms connected to the outer frame and, where relevant, to each other by means of welded or mechanical joints.

1.4 The PVC-U extrusions are cut to length, and all holes routed or drilled. Where required, galvanized steel or aluminium reinforcement sections are inserted in the PVC-U sections before they are welded up by polishing, knifing or using a purpose-made machine which also forms a groove or raised pyramid at the weld. Where mullions and transoms are mechanically jointed the outer frame is screwed together. The welded connections are then cleaned through to ported aluminium reinforcement inserted in the mullion or transom in accordance with the instructions in the

*Diamond Suite Window Fabrication Manual*. The window is completed by locating the weatherstripping in grooves and securing the fittings in position with screws.

Figure 1 Corner detail

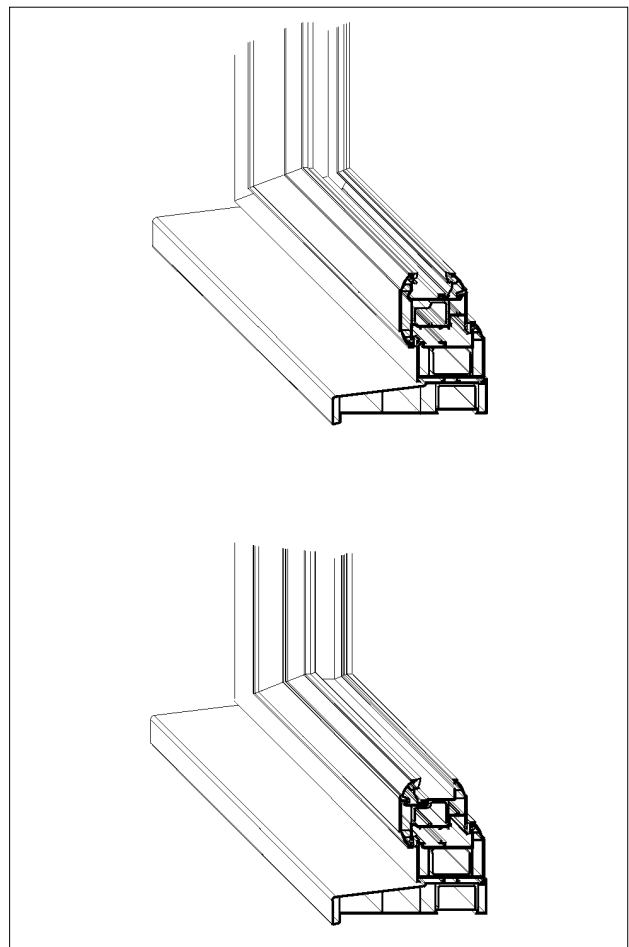


Table 1 Profiles

Manufacturer's Profile designation	Profile type	Application
2900	L-section	outer frame (standard)
3522	L-section	intermediate outer frame (featured)
3000	L-section	outer frame (standard)
3523	L-section	outer frame (featured)
3005	L-section	outer frame (standard)
3521	L-section	outer frame (featured)
3542	L-section	intermediate outer frame (70 mm, standard)
3517	L-section	intermediate outer frame (70 mm, featured)
3543	L-section	large outer frame (70 mm, standard)
3518	L-section	large outer frame (70 mm, featured)
2902	T-section	opening light frame (internally beaded, standard)
3528	T-section	opening light frame (internally beaded, featured)
3008	T-section	opening light frame (internally beaded)
3540	T-section	opening light frame (internally beaded)
3544	T-section	'heavy' transom/mullion (70 mm, standard)
2901	T-section	mullion/transom (standard)
3524	T-section	mullion/transom (featured)
2905	T-section	mullion/transom (standard)
3526	T-section	mullion/transom (featured)
3519	T-section	mullion/transom (70 mm, featured)
2903	Z-section	opening light frame (externally beaded, standard)
3527	Z-section	opening light frame (externally beaded, featured)
3009	Z-section	opening light frame (externally beaded)
3541	Z-section	opening light frame (externally beaded)
3545	Z-section	'heavy' transom/mullion (70 mm, standard)
2904	Z-section	mullion/transom (standard)
3525	Z-section	mullion/transom (featured)
3520	Z-section	mullion/transom (70 mm, featured)
3680	—	stub sill (85 mm)
3640	—	sill (150 mm)
2182	—	sill (180 mm)
1803	—	post-calibrated glazing bead (24 mm)
1876	—	post-calibrated glazing bead (28 mm)
2430	—	post-calibrated glazing bead (24 mm)
2914	—	co-extruded glazing bead (20 mm, chamfered)
2915	—	co-extruded glazing bead (24 mm, chamfered)
2916	—	co-extruded glazing bead (24 mm, scotia)
2917	—	co-extruded glazing bead (28 mm, chamfered)
2918	—	co-extruded glazing bead (28 mm, scotia)
3533	—	co-extruded glazing bead (28 mm, featured)
1733	—	weatherseal (standard)
3631	—	weatherseal (featured)
3058	—	'E' wedge gasket (standard)
3628	—	low line gasket
GO201	—	wedge gasket (1.5 mm blue tear-off)
GO202	—	wedge gasket (2-3 mm green tear-off)
GO203	—	wedge gasket (3-4 mm orange tear-off)
GO204	—	wedge gasket (4-5 mm red tear-off)
GO205	—	wedge gasket (5-6 mm white tear-off)
GO206	—	wedge gasket (6-7 mm yellow tear-off)
3570S	—	galvanized steel reinforcement (2900, 3522)
2202	—	galvanized steel reinforcement (2901, 2904, 3524, 3525) (Reverse butt weld)
3575S	—	galvanized steel reinforcement (2901, 2904, 3524, 3525) (Standard weld)
3571S	—	galvanized steel reinforcement (2905, 3526, 3544, 3545)
3573S	—	galvanized steel reinforcement (2902, 2903, 3528, 3527)
2201	—	aluminium reinforcement (2901, 2904, 3524, 3525)
2510	—	aluminium reinforcement (2900, 3522)
2441	—	aluminium reinforcement (2900, 3522)
2921	—	aluminium reinforcement (2902, 2903, 3528, 3527)
2309	—	ported aluminium reinforcement (2901, 2904, 3524, 3525)
1999	—	ported aluminium reinforcement (2905, 3526)
1690	—	aluminium reinforcement for use with structural support bar
—	—	double-sided glazing tape 12 mm x 5 mm

1.5 Drainage is provided by a series of slots 5 mm by 25 mm, positioned in accordance with the *Diamond Suite Window Fabrication Manual*. In general, on multilight units, each element is treated as a separate window and drainage slots cut accordingly, to retain symmetry where possible. Woodgrain finished sills are vented, as described in the *Diamond Suite Window Fabrication Manual*, to prevent pressure changes causing distortion.

## Reinforcement

1.6 For white windows, if the outer frame is fixed at specific centres, ie greater than 150 mm and less than 250 mm from each corner, greater than 150 mm from each mullion/transom and not more than 600 mm centres, then generally no outer frame reinforcement is needed. However, if fixing conditions cannot be determined, it is advisable that all outer frames over 1000 mm be reinforced. Windows with a woodgrain finish have reinforced outer frames and sill if their length exceeds 600 mm.

1.7 For white windows, opening light frame members are reinforced with galvanized mild steel or aluminium where their length exceeds 800 mm or their height exceeds 600 mm, for top-hung lights, and their length exceeds 600 mm or their height exceeds 800 mm, for side-hung lights. Woodgrain finish opening light frame members are reinforced where their length exceeds 600 mm as detailed in the *Diamond Suite Window Fabrication Manual*.

1.8 Mullions and transoms are reinforced with galvanized mild steel or aluminium where their length exceeds 800 mm, in accordance with the rules given in the *Diamond Suite Window Fabrication Manual* (see also Table 3 Test pressure class). Woodgrain finish mullions and transoms are reinforced with galvanized mild steel or aluminium where their length exceeds 600 mm. Mechanically jointed mullions and transoms are reinforced with aluminium in accordance with the *Diamond Suite Window Fabrication Manual*.

1.9 Galvanized steel reinforcement is roll-formed from material with a G Z 275N coating complying with BS EN 10142 : 2000. Aluminium reinforcement is extruded from alloy type 6063-T6 to BS 1474 : 1987.

## Size range

1.10 This Detail Sheet covers Diamond Suite outward opening top-hung, side-hung and fixed-light windows and combinations of these within the limitations shown in Table 2.

## Fittings

1.11 Top-hung and side-hung windows covered by this Detail Sheet are fitted with friction hinges constructed from stainless steel type 1.4016 to BS EN 10088-1 : 1995. The hinges incorporate a plastic slider which can be adjusted by means of a brass screw or a die-cast, slot-headed cam to provide the necessary braking action. The hinges are fixed to the frames with screws.



Figure 2 Profiles

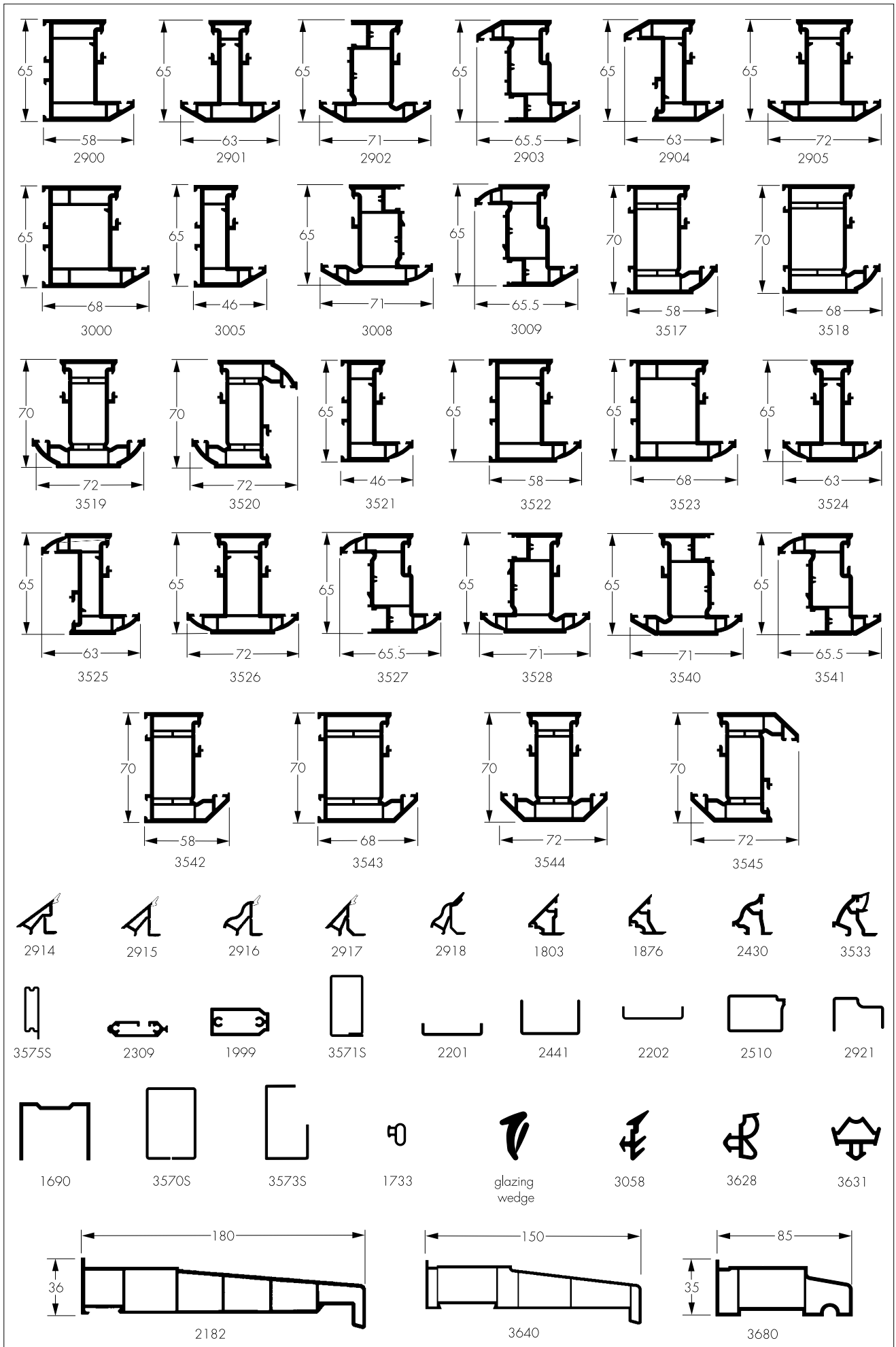


Table 2 Size restriction

	Dimension (mm)
<i>All windows</i>	
Maximum overall width or height of any outer frame	2400
Maximum length of mullions or transoms	2400
<i>Top-hung opening lights</i>	
Maximum size of top-hung opening light <sup>(1)</sup> (separately or in a multilight)	1200 wide x 900 high
<i>Side-hung opening lights</i>	
Maximum size of side-hung opening light <sup>(1)</sup> (separately or in a multilight)	700 wide x 1500 high

(1) Opening light sizes refer to outer frame to outer frame, or outer frame to mullion/transom centre line dimension, and must not exceed limitations on weight or size imposed by the friction hinge manufacturer.

1.12 Opening windows are fastened by means of cockspur type handles manufactured from zinc or aluminium alloy and available with various finishes or, alternatively, by concealed espagnolette or shootbolt locking systems constructed from chromated zinc-plated mild steel, operated by a handle. Cockspur, shootbolt and espagnolette handles are available, as an option, with a key locking facility. The keeps are made from zinc-based alloy or other materials approved by the BBA. The espagnolette and the keeps are fixed by means of self-tapping screws which penetrate a thickened area of the profile wall and/or into reinforcement. The espagnolette handle is formed from zinc-based alloy with various finishes.

1.13 Details of currently approved types of hinges and locking mechanisms can be obtained from the BBA. Additional components are available from the range of fittings to restrict the opening of the window to a maximum distance of 100 mm.

## Glazing

1.14 Windows are supplied factory glazed or ready for glazing using double-glazed units with glass thicknesses in accordance with BS 6262 : 1982. All glass is positioned by plastic setting blocks and packing pieces.

## Weatherstripping and gaskets

1.15 Weatherstripping, extruded from a PVC nitrile material is located in grooves around the periphery of the opening light and the fixed frame.

1.16 Gaskets are formed from a similar material to the weatherstripping. On internally beaded windows, 'E' gaskets are fitted between the frame and the double-glazed unit. The unit is secured by post-calibrated beads forcing the glass against the externally fitted 'E' gasket. On externally beaded windows, 'E' gaskets or wedge gaskets, colour-coded to suit various gap sizes (see Table 1) and including a tear-off portion, or glazing tape are fitted between the frame and the double-glazed unit. The unit is secured by co-extruded bead.

## Quality control

1.17 Quality control includes checks on all materials and components, in particular:

*PVC-U compound*  
bulk density  
pourability

*Extruded profiles*

dimensions

colour

heat reversion

resistance to cold impact

*Fabrication procedures*

extrusions and fittings (visual inspection)

overall dimensions

operation and opening of locking mechanisms

strength of welded corners.

## 2 Delivery and site handling

2.1 The windows are delivered to site glazed or ready for glazing. For transportation they are suitably protected to avoid damage. Particular care is needed to avoid damaging woodgrain finishes, as it may be impossible to restore the appearance.

2.2 Each window has a label bearing the company's mark and the BBA identification mark incorporating the number of this Certificate.

2.3 The windows should be stored under cover in a clean area, on edge and suitably supported to avoid distortion or damage.

2.4 The weight of glazing can be calculated, where required for manual handling operations, by reference to the information contained in BS 952-1 : 1995. The weight of the unglazed frame, and its ease of handling, particularly by one person, must also be taken into account when planning site operations.

2.5 When selecting means of access, for example use of scaffolding, the safety of the operatives, the occupants, and the passers-by, during the period of installation, should be considered.

## Design Data

### 3 General

3.1 Selected samples from the Diamond Suite Outward Opening PVC-U Window System were tested in accordance with BBA MOAT No 1 : 1974. Assessment of the results shows that the products, within the range described in section 1.10, are suitable for use where the test pressure classes defined in BS 6375-1 : 1989 and indicated in Table 3 are applicable. The gradings are based on the assumption that the outer frame is supported on all four sides in accordance with the manufacturer's instructions.

3.2 For unusual building layouts, building shapes or ground topography, the designer will need to give particular consideration to the prevailing exposure conditions.

### 4 Practicability of installation

4.1 Installation does not present undue difficulty when fitting the windows in openings in new or existing walls provided the installation instructions are followed.

4.2 In common with other types of window fitted to prepared openings, Diamond Suite windows must be correctly positioned in relation to vertical damp-proof courses to prevent water penetration to the internal reveal.

Table 3 Test pressure class

	BS 6375-1 : 1989 Test pressure class (Pa)	MOAT No 1 Grading
<i>Strength and stability</i>		
Multilights with mullions or transoms as follows:		
up to maximum 1230 mm with aluminium reinforcement (2201)	1200	V <sub>2</sub>
up to maximum 1230 mm with steel reinforcement (3575S)	1600	V <sub>2</sub>
up to maximum 1400 mm with steel reinforcement (3571S) <sup>(1)</sup>	1750	V <sub>3</sub>
up to maximum 2400 mm transom with steel reinforcement and an additional steel section screwed to the face of the mullion or transom (3571S, 1690) <sup>(2)</sup>	1850	V <sub>3</sub>
up to maximum 2100 mm mullion with reinforcement as above <sup>(3)</sup>	1800	V <sub>3</sub>
Individual opening lights	2700	V <sub>3</sub>
<i>Watertightness</i>		
Fixed lights	300	E <sub>4</sub>
Opening lights	300	E <sub>4</sub>
<i>Air permeability</i>		
Fixed or opening lights	600	A <sub>3</sub>

(1) Refers to a window with two full-height mullions of 1400 mm and a width of 1500 mm.

(2) Refers to a window with a full-width transom of 2400 mm and a height of 1250 mm.

(3) Refers to a window with two full-height mullions of 2100 mm and a width of 1800 mm.

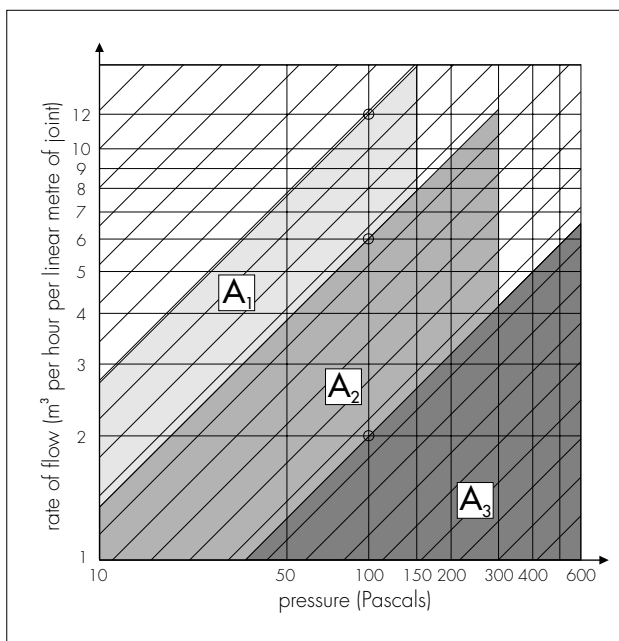
V<sub>2</sub> indicates that windows meet deformation requirements at 1000 Pa, a cycling test at 750 Pa and a safety test at 2000 Pa.

V<sub>3</sub> indicates that windows meet deformation requirements at 1750 Pa, a cycling test at 1250 Pa and a safety test at 3000 Pa.

E<sub>4</sub> indicates no water leakage occurring at a differential pressure of 500 Pa.

A<sub>3</sub> indicates an airflow rate below the line passing the point for a rate of flow of 2 m<sup>3</sup>h<sup>-1</sup>m<sup>-1</sup> at 100 Pa pressure, when tested up to a pressure of 600 Pa (see Figure 3). Temperature differentials applied to the window to simulate winter and summer conditions did not affect operation or alter the air permeability characteristics.

Figure 3 Air permeability grade



## 5 Glass area

The approximate unobstructed glass area of the windows is determined by deducting from the overall width and height the appropriate profile dimensions. For each applicable feature, for example, a fixed light would require twice the outer frame dimension to

be deducted from the overall width and overall height. Typical dimensions are given in Table 4.

Table 4 Typical dimensions for determining unobstructed glass area

Window feature	Dimensions (mm)
Outer frame (2900, 3522)	58
Mullion or transom between fixed lights (2901, 3524)	63
Mullion or transom between opening lights (2901, 2903, 3524, 3527)	143
Mullion or transom between one opening and one fixed light (2901, 2903, 3524, 3527)	103
Outer frame and opening light (2900, 2903, 3522, 3527)	98

## 6 Ventilation

6.1 The opening area for natural ventilation may be calculated by multiplying together the overall width and height dimensions of opening lights reduced by the amounts given in Table 5. For opening lights abutting a mullion or transom, the overall width or height of that element will be given as the dimension from the edge of the outer frame to the centre line of the mullion or transom or, where relevant, between centres of the mullion or transom.

6.2 The background ventilation requirements of the various building regulations can be met by the incorporation in the window of a suitably sized trickle ventilator. The ventilator may be glazed in, fitted in a supplementary head member or fitted by another method approved by the BBA for use with the Diamond Suite system. Details of ventilators covered by this Agrément Certificate can be found on the BBA website.

Table 5 Natural ventilation dimension reductions

Frame member	Deduction from width or height (mm)
Outer frame 2900	58
Mullion or transom 2901 2905	32 36

## 7 Thermal insulation

7.1 The thermal transmittance value (U value) of a fully-reinforced Duraflex outward opening window with 1000 mm by 1000 mm, Kitemarked, sealed, double-glazed units, when measured by the Guarded Hot Box Method according to BS 874-3.1 : 1987, is given in Table 6.

7.2 For design purposes, the heat loss through a PVC-U frame is the product of the linear transmittance value, the frame length and the difference in environmental temperatures either side of the frame. The linear transmittance value of the measured frames (referred to in Table 6) may be taken as the values given in Table 7.

## 10 Security against intrusion

**Table 6** Thermal transmittance value (*U* value) ( $Wm^{-2}K^{-1}$ )

Kitemarked sealed double-glazed unit (mm)	Size of window width x height mm and depth of outer frame (mm)		
	1138 x 1138 65	1166 x 1165 65 <sup>(1)</sup>	1169 x 1166 70 <sup>(2)</sup>
4/12/4	2.63±0.26	—	—
4/20/4	—	2.37±0.24	—
4/20/4 <sup>(3)</sup>	—	1.76±0.18	—
4/20/4	—	—	2.31±0.23
4/20/4 <sup>(3)</sup>	—	—	1.71±0.17

(1) Using frame profile 3522.

(2) Using frame profile 3518.

(3) Lowe 'k' glass.

**Table 7** Linear thermal transmittance

Depth of outer frame (mm)	Linear thermal transmittance ( $Wm^{-1}K^{-1}$ )
65	0.13
65 <sup>(1)</sup>	0.19
70 <sup>(2)</sup>	0.18

(1) Using frame profile 3522.

(2) Using frame profile 3518.

7.3 The overall thermal insulation of the window will be dependent on the performance of the double-glazed units. It is recommended that a unit is specified that carries the BSI Kitemark to BS 5713 : 1979.

## 8 Condensation risk

8.1 For condensation to occur on any surface the temperature of that surface must fall below the dew-point of the air adjacent to it. Where a temperature differential exists between the interior and exterior surfaces of a Diamond Suite outward opening window the frame members do not constitute a 'cold bridge' and condensation will occur on the glass before it appears on the frame.

8.2 Measurements for example, on the 4/12/4 glazed unit mentioned in Table 6, show that for a fully-reinforced window, subject to internal conditions of 20°C and 65% RH, the external temperature must fall below -3.9°C before condensation occurs at any point on the visible interior surface of the PVC-U frame, or below -12.9°C before condensation occurs on the majority of the frame surface.

## 9 Safety



9.1 When fitted with a restrictor, movement of the opening light can be effectively limited to give an opening of not more than 100 mm, as recommended for child safety in BS 8213-1 : 1991.

9.2 The windows can comply with the recommendations of BS 8213-1 : 1991 with regard to the positioning of hand-operated controls.



9.3 Account must be taken of the recommendations given in BS 6262-4 : 1994<sup>(1)</sup>, which include the use of safety glass, complying with BS 6206 : 1981, under certain circumstances.

(1) Dealing with the safety of people upon impact with the glazing.

10.1 Diamond Suite opening lights are fitted with a lock mechanism as described in section 1.12. When fastened in the closed position the opening light cannot be opened by manipulation from the outside, for example, by the insertion of a thin blade. Key operated locks are required for certain windows to meet the security requirements of NHBC Standards Chapter 6.7 *Doors, windows and glazing* and the Zurich Building Guarantees Technical Standards, Sections 6.12 and 12.16. It is vital that glass packing is carried out to the manufacturer's recommendations to prevent forced entry by flexing of the frame members allowing disengagement of the lock mechanism.

10.2 Externally fitted glazing beads can be removed but subsequent removal of the glass without breakage and noise is difficult due to the glazing being additionally secured by glazing clips or double-sided glazing tape or silicone sealant. Removal of internally fitted glazing beads from the outside is virtually impossible.

## 11 Ease of operation

The window can be operated without difficulty when correctly installed.

## 12 Maintenance

12.1 The window can be re-glazed and the gaskets and weatherstripping replaced, but these operations should be carried out by specialist operatives using the materials recommended by the Certificate holder specified on the Front Sheet and approved by the BBA.

12.2 If damage occurs, the furniture and fittings can be replaced.

12.3 The PVC-U frame members can be cleaned using water containing household detergent. If dirt is allowed to build up on the members over long periods it may become more difficult to restore the surface appearance. Abrasive cleaners should not be used, particularly on woodgrain finishes as the loss of the acrylic lacquer will have a serious effect on durability.

12.4 Care should be taken when using proprietary materials for cleaning the glass, to ensure that deposits are not allowed to remain on the PVC-U where they may cause discolouration and damage to the surface. In addition, care must be taken to avoid damage to, or discolouration of, the members when stripping paint from adjacent timber, for example, by means of a blowlamp or paint stripper.

12.5 Paints can adversely affect the impact strength of the PVC-U frame members and the application of dark colours to white profiles could lead to a risk of thermal distortion. Therefore painting is not recommended.

12.6 The friction hinges and locking mechanism should be cleaned and lubricated periodically to minimise wear and to ensure smooth operation. Care should be taken to avoid applying lubricant to the sliders as this will impair their braking action. The resistance of the sliders can be adjusted, if necessary, with the brass screw or die-cast, slot-headed cam provided in each slider.

## 13 Durability



13.1 Evidence is available on the performance in the UK and other Northern European countries of PVC-U similar to that used for the system over a period of 15 years for woodgrain windows and in excess of 20 years for white windows. Such evidence, when compared with the results of tests on the Diamond Suite PVC-U, indicates that the windows will have a life of at least 25 years. Any slight colour change or surface dulling that might occur will be uniform over the visible surfaces of the windows for both white and woodgrain finishes, assuming in the latter case that the acrylic lacquer is undamaged.

13.2 Fittings, including the hinges, locking mechanism and operating handles, as described in this Detail Sheet, will have similar durability except where windows are to be installed in areas subject to particularly aggressive conditions. These conditions can prevail in coastal locations or near sources of industrial pollutants and replacement of fittings may be necessary within the life of the window.

13.3 The gaskets, weatherstripping and the mastic seal to the building structure may need to be replaced within the life of the window.

## Installation

### 14 General

14.1 The window must be fixed into the opening, in accordance with the recommendations in the BPF Code of Practice for the installation of PVC-U windows and doorsets (Ref 348/2 March 1996), using proprietary expanding anchors through the frame or galvanized steel fixing lugs. Replacement windows should be fitted in accordance with BS 8213-4 : 1990 in particular with reference to clause 9.3.1.

14.2 Openings in new walls should be formed using a suitable template 10 mm wider and higher than the window to be installed. The window should not be built in at the construction stage.

### 15 Procedure

Notwithstanding the information referred to in section 14.1, a typical installation involves the following steps:

- after checking the dimensions of the window, the frame is de-glazed if necessary and positioned in the opening. Holes are drilled through the outer frame and into the masonry to take fixing anchors. Alternatively, lugs are positioned on the frame and attached to the masonry by means of screws and plugs or other suitable mechanical fixing. In either case fixings must be positioned not less than 150 mm from corners and at centres not exceeding 600 mm
- all glazing or re-glazing of the window is undertaken as required, using the technique fully described in the *Diamond Suite Window Fabrication Manual*
- the installation is completed by application of a silicone or similar durable sealant to the perimeter, as required, and the fitting of trims and window board to the interior.

## Technical Investigations

The following is a summary of the technical investigations carried out on the Diamond Suite Outward Opening PVC-U Window System.

### 16 Tests

16.1 Tests were carried out in accordance with the methods defined in MOAT No 1 : 1974 to determine:

air permeability  
watertightness  
effect of wind loads  
effect of thermal differential  
efficiency of window fittings  
resistance to impact, racking and bending loads  
ease of operation.

16.2 Tests in accordance with MOAT No 8 : 1973 and MOAT No 17 : 1990 gave the results for the PVC-U extrusions as detailed in Table 8.

Table 8 PVC-U extrusion test results

Test	Result	
	White	Brown
ash content (%)	6.36	4.47
Vicat softening temperature (°C)	92	89
tensile strength (MPa)	44.47	46.73
modulus of elasticity (MPa)	2471	2885
tensile impact (kJm <sup>-2</sup> ):		
new material at 23°C	709	639
UV aged material	622	579
heat aged material	669	600
induction time of dehydrochlorination (min):		
new material	76.6	65.7
UV aged material	49.7	58.2
heat aged material	68.6	53.1
impact test at -10°C		pass
shrinkage on heating at 100°C for 1 hour		<2%
verification of gelation		pass

16.3 Additional test work in accordance with MOAT No 57 : 1995 and BS 7722 : 1994 was carried out on woodgrain finish windows and profiles to determine:

*Windows*  
effect of solar heat gain

*Profiles*  
colourfastness of surface foil  
adhesion to substrate profile  
abrasion and scratch resistance  
retention of impact strength  
corner finishing.

### 17 Other investigations

17.1 The profile manufacturing process and the window fabrication procedure including, in each case, the methods adopted for quality control, have been examined and found satisfactory by the BBA.

17.2 An assessment was made of the results of a Guarded Hot Box test carried out on a Duraflex outward opening window of similar design to the Diamond Suite System.

## Bibliography

BS 874-3.1 : 1987 *Methods for determining thermal insulating properties — Tests for thermal transmittance and conductance — Guarded hot-box method*

BS 952-1 : 1995 *Glass for glazing — Classification*

BS 1474 : 1987 *Specification for wrought aluminium and aluminium alloys for general engineering purposes: bars, extruded round tubes and sections*

BS 5713 : 1979 *Specification for hermetically sealed flat double glazing units*

BS 6206 : 1981 *Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings*

BS 6262 : 1982 *Code of practice for glazing for buildings*

BS 6262-4 : 1994 *Glazing of buildings — Code of practice for safety — Human impact*

BS 6375-1 : 1989 *Performance of windows — Classification for weathertightness (including guidance on selection and specification)*

BS 7722 : 1994 *Specification for surface covered PVC-U extruded hollow profiles with heat welded corner joints for plastics windows*

BS 8213-1 : 1991 *Windows, doors and rooflights — Code of practice for safety in use and during cleaning of windows and doors (including guidance on cleaning materials and methods)*

BS 8213-4 : 1990 *Windows, doors and rooflights — Code of practice for the installation of replacement windows and doorsets in dwellings*

BS EN 10088-1 : 1995 *Stainless steels — List of stainless steels*

BS EN 10142 : 2000 *Continuously hot-dip zinc coated low carbon steels strip and sheet for cold forming. Technical delivery conditions*

MOAT No 1 : 1974 *Directive for the Assessment of Windows*

MOAT No 8 : 1973 *Directive for Rigid PVC Products Used Externally in Building*

MOAT No 17 : 1990 *UEAtc Technical Guide for the Agrément of Windows in PVC-U*

MOAT No 57 : 1995 *UEAtc Technical Report for the Assessment of Windows in Coloured PVC-U*



On behalf of the British Board of Agrément

Date of issue: 27th February 2002

A handwritten signature in black ink, appearing to read 'P. C. Newson'.

Chief Executive