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**Agrément Certificate
No 88/2058**

SPECTUS PVC-U WINDOW SYSTEMS

PRODUCT SHEET 1 — ELITE 70 OUTWARD OPENING AND TILT AND TURN PVC-U WINDOW SYSTEMS

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems (white finish) for use in replacement and new-build applications.

AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.



KEY FACTORS ASSESSED

Thermal insulation — the thermal transmittance value (U value) of the outward opening windows was measured by the Hot Box method according to BS EN ISO 12567-1 : 2000. A & B Glass Co Ltd have achieved BFRC ratings (see section 4).

Weathertightness — the systems can be used in the exposure situations described in section 5.

Ventilation — opening lights can provide rapid ventilation, and background ventilation can be provided by the incorporation in the window of a suitably-sized trickle ventilator (see section 6).

Security — windows meet the basic requirements of NHBC and Zurich (see section 7).

Durability — the PVC-U frames will have a life of at least 25 years (see section 14).

The BBA has awarded this Agrément Certificate for Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems to A & B Glass Co Ltd as fit for their intended use provided they are installed, used and maintained as set out in this Agrément Certificate.

On behalf of the British Board of Agrément

Date of First issue: 6 February 2008

Greg Cooper: Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

In the opinion of the BBA, Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:



The Building Regulations 2000 (as amended) (England and Wales)

Requirement:	B1	Means of warning and 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 ² 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 window to natural purge ventilation, the area of opening should be calculated in accordance with section 6.1 of this Certificate and related to floor area as set out in Approved Document F1. Background ventilation can be provided by the methods described in section 6.2 of this Certificate.
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(a)(i)	Conservation of fuel and power
Comment:		In meeting this Requirement, the U values given in sections 4.1 to 4.3 of this Certificate should be used. For glazing other than that described in this Certificate, the indicative U values shown in Table 6e of SAP 2005 <i>The Government's Standard Assessment Procedure for Energy Rating of Dwellings</i> can be used. When available, a certified U value by measurement or calculation, in accordance with the relevant Standards, should be used. In replacement work, an average elemental U value of 2.0 Wm ⁻² K ⁻¹ (dwellings) or 2.2 Wm ⁻² K ⁻¹ (buildings other than dwellings) is required for PVC-U windows. This can be met by the use of 4/16/4 mm double-glazed units with a low-E coating of emissivity 0.15 or better. Alternatively, a window with a window energy rating of Band E for replacement work is acceptable. New windows in extensions require a U value of 1.8 Wm ⁻² K ⁻¹ or a window energy rating of Band D.
Requirement:	N1	Protection against impact
Requirement:	N2	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 12.3 of this Certificate. 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 12.1 and 12.2 of this Certificate.
Requirement:	N4	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:	Regulation 7	Materials and workmanship
Comment:		The windows are acceptable. See sections 14.1 to 14.3 of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8	Fitness and durability of materials and workmanship
Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The windows can contribute to a construction satisfying this Regulation. See sections 14.1 to 14.3 and in addition, the <i>Installation</i> part of this Certificate.
Regulation:	8(2)	Fitness and durability of materials and workmanship
Comment:		The windows can contribute to a construction satisfying this Regulation. See sections 10.1 and 10.2 of this Certificate.
Regulation:	9	Building standards – construction
Standard:	2.9	Escape
Comment:		Windows providing an unobstructed openable area of at least 0.33 m ² and at least 450 mm high and 450 mm wide can satisfy this Standard, with reference to clause 2.9.4 ⁽¹⁾ as escape 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.

Standard:	3.10	Precipitation
Comment:		Walls incorporating the windows, installed and used in accordance with the provisions of this Certificate, can satisfy this Standard, with reference to clause 3.10.1 ⁽¹⁾⁽²⁾ . See Table 3 of this Certificate.
Standard:	3.14	Ventilation
Comment:		In calculating the contribution of the windows to natural ventilation, with reference to clauses 3.14.2 ⁽¹⁾⁽²⁾ and 3.14.3 ⁽¹⁾ to this Standard, the area of opening can be calculated in accordance with section 6.1 of this Certificate. Trickle ventilation, with reference to clauses 3.14.3 ⁽²⁾ and 3.14.5 ⁽¹⁾ , can be provided as described in section 6.2 of this Certificate.
Standard:	3.15	Condensation
Comment:		The windows can contribute to satisfying this Standard, with reference to clauses 3.15.1 ⁽¹⁾ and 3.15.4 ⁽¹⁾ . See section 11 of this Certificate.
Standard:	3.16	Natural lighting
Comment:		In calculating the contribution of the windows to natural lighting, with reference to clauses 3.16.1 ⁽¹⁾ and 3.16.2 ⁽¹⁾ to this Standard, the area of glazing can be calculated in accordance with section 9 of this Certificate.
Standard:	4.8(b)(c)	Danger from accidents
Comment:		Glazing must comply with BS 6262-4 : 2005 where accidental collision with it is likely, in order to satisfy this Standard, with reference to clause 4.8.2 ⁽¹⁾⁽²⁾ . The provisions described in clauses 4.8.3 ⁽¹⁾⁽²⁾ and 4.8.4 ⁽¹⁾⁽²⁾ to this Standard, regarding the safe cleaning of windows, must also be taken into account. See sections 12.1 to 12.3 of this Certificate.
Standard:	6.1(a)(b)	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
Comment:		In satisfying these Standards, with reference to clauses 6.1.3 ⁽¹⁾⁽²⁾ , 6.2.1 ⁽¹⁾⁽²⁾ , 6.2.2 ⁽¹⁾⁽²⁾ , 6.2.3 ⁽¹⁾ , 6.2.4 ⁽²⁾ , 6.2.7 ⁽¹⁾ , 6.2.8 ⁽²⁾ , 6.2.9 ⁽¹⁾ and 6.2.10 ⁽²⁾ , the U values given in sections 4.1 to 4.3 of this Certificate should be used. For glazing other than that described in this Certificate indicative U values shown in Table 6e of SAP 2005 <i>The Government's Standard Assessment Procedure for Energy Rating of Dwellings</i> can be used. However, when available, a certified U value should be used in preference to the tabulated data.
Regulation:	12	Building standards – conversions
Comment:		All comments given for these windows under Regulation 9, also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ . (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The windows are acceptable. See sections 14.1 to 14.3 of this Certificate.
Regulation:	C4	Resistance to ground moisture and weather
Comment:		The windows are weathertight, see Table 3 in this Certificate and can thus contribute to the ability of the wall to meet this Regulation.
Regulation:	E2	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:	F2(a)(i)	Conservation measures
Regulation:	F3	Target carbon dioxide Emissions Rate
Comment:		In satisfying these Regulations, the U values given in sections 4.1 to 4.3 of this Certificate should be used. For glazing other than that described in this Certificate, the indicative U values shown in Table 6e of SAP 2005 <i>The Government's Standard Assessment Procedure for Energy Rating of Dwellings</i> can be used. When available, a certified U value by measurement or calculation, in accordance with the relevant Standards, should be used. In replacement work, an average elemental U value of 2.0 Wm ⁻² K ⁻¹ (dwellings) or 2.2 Wm ⁻² K ⁻¹ (buildings other than dwellings) is required for PVC-U windows. This can be met by the use of 4/16/4 mm double-glazed units with a low-E coating of emissivity 0.15 or better. Alternatively, a window with a window energy rating of Band E for replacement work is acceptable. New windows in extensions require a U value of 1.8 Wm ⁻² K ⁻¹ or a window energy rating of Band D.
Regulation:	H7	Protection from collision with open windows, skylights or ventilators
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:	K2	Means of ventilation
Comment:		When calculating the area of window openings for ventilation purposes, see section 6.1 of this Certificate. Trickle ventilation can be provided by the methods described in section 6.2 of this Certificate.
Regulation:	V2	Impact with glazing
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 12.3 of this Certificate.

Regulation:	V3	Transparent glazing
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:	V4	Safe opening and closing of windows, skylights and ventilators
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 12.1 to 12.3 of this Certificate.
Regulation:	V5	Safe means of access for cleaning glazing
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.

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See section: 2 *Delivery and site handling* (2.4 and 2.5).

Non-regulatory Information

NHBC Standards 2007

NHBC accepts the use of Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 6.7 *Doors, windows and glazing*.

Zurich Building Guarantee Technical Manual 2007

In the opinion of the BBA, Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems, when installed and used in accordance with this Certificate, satisfy the requirements of the *Zurich Building Guarantee Technical Manual*, Section 4 *Superstructure*, Sub-section *External walls — doors, windows and roof lights* (page 172).

General

This Certificate relates to Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems for use as replacement and new-build windows.

The windows are suitable for use in the exposure situations described in section 5.

Technical Specification

1 Description

1.1 Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems comprise single top-hung windows, side-hung and tilt and turn windows and multilight windows, comprising opening lights and fixed lights, all framed in white PVC-U and glazed internally or externally with sealed double-glazed units⁽¹⁾.

(1) Outside the scope of this Certificate.

1.2 The windows are fabricated from white, unplasticized polyvinyl chloride (PVC-U) profiles, produced by conventional extrusion techniques from material complying with BS EN 12608 : 2003. The profiles covered by this Certificate (see Figure 1 and Table 1) incorporate post-calibration, co-extruded gaskets made from TPE material, eliminating the need for separate weatherseals and glazing gaskets.

1.3 The methods of selection, machining and assembly of frame components are detailed in *Elite 70 Casement and Tilt & Turn Manuals*.

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

1.5 The PVC-U extrusions are cut to length, and all holes routed or drilled. Where required, galvanized steel 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 *Elite 70 Casement and Tilt & Turn Manuals*. The window is completed by securing the fittings in position with screws.

1.6 Drainage is provided by a series of slots (5 mm by 30 mm) and holes (5 mm diameter) positioned in accordance with the *Elite 70 Casement and Tilt & Turn Manuals*. In general, on multilight units, each element is treated as a separate window and drainage slots cut accordingly, retaining symmetry where possible.

Figure 1 Profiles (all dimensions in mm)

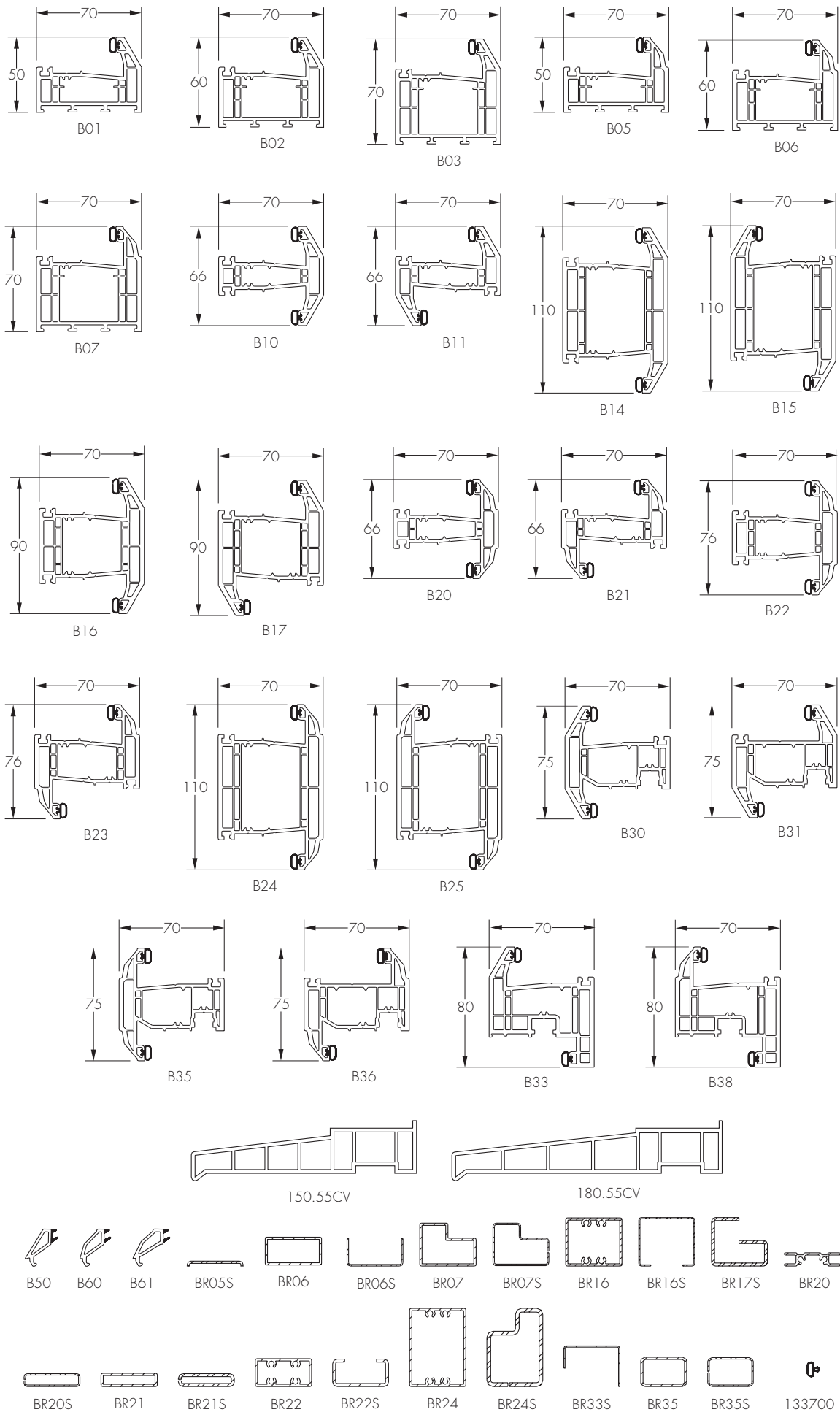


Table 1 Profiles

Manufacturer's designation	Profile type	Application	Outward Opening	Tilt and Turn
B01	L-section	outer frame (50 mm)	√	
B02	L-section	outer frame (60 mm)	√	√
B03	L-section	outer frame (70 mm)	√	√
B05	L-section	outer frame (50 mm)	√	
B06	L-section	outer frame (60 mm)	√	√
B07	L-section	outer frame (70 mm)	√	√
B10	T-section	transom/mullion (66 mm)	√	
B11	Z-section	transom/mullion (66 mm)	√	
B14	T-section	transom/mullion (110 mm)	√	√
B15	Z-section	transom/mullion (110 mm)	√	
B16	T-section	transom/mullion (90 mm)	√	√
B17	Z-section	transom/mullion (90 mm)	√	
B20	T-section	transom/mullion (66 mm)	√	
B21	Z-section	transom/mullion (66 mm)	√	
B22	T-section	transom/mullion (76 mm)	√	√
B23	Z-section	transom/mullion (76 mm)	√	
B24	T-section	transom/mullion (110 mm)		√
B25	Z-section	transom/mullion (110 mm)	√	
B30	T-section	sash	√	
B31	Z-section	sash	√	
B35	T-section	sash	√	
B36	Z-section	sash	√	
B33	Z-section	sash		√
B38	Z-section	sash		√
150.55CV	—	sill (150 mm)	√	√
180.55CV	—	sill (180 mm)	√	√
B50	—	glazing bead (28 mm)	√	√
B60	—	glazing bead (28 mm)	√	√
B61	—	glazing bead (24 mm)	√	√
BR05S	—	galvanized steel reinforcement (B01, B05)	√	
BR06	—	aluminium reinforcement (B02, B06, B22)	√	√
BR06S	—	galvanized steel reinforcement (B02, B06, B10, B11, B20, B21, B22, B23)	√	√
BR07	—	aluminium reinforcement (B03, B07)	√	√
BR07S	—	galvanized steel reinforcement (B03, B07)	√	√
BR16	—	aluminium reinforcement (B16, B17)	√	√
BR16S	—	galvanized steel reinforcement (B16, B17)	√	√
BR17S	—	galvanized steel reinforcement (B16, B17)	√	√
BR20	—	aluminium reinforcement (B10, B11, B20, B21)	√	
BR20S	—	galvanized steel reinforcement (B01, B05, B10, B11, B20, B21)	√	
BR21	—	aluminium reinforcement (B01, B05, B10, B11, B20, B21)	√	
BR21S	—	galvanized steel reinforcement (B01, B05, B10, B11, B20, B21)	√	
BR22	—	aluminium reinforcement (B22, B23)	√	√
BR22S	—	galvanized steel reinforcement (B10, B11, B20, B21, B22, B23)	√	√
BR24	—	aluminium reinforcement (B14, B15, B24, B25)	√	√
BR24S	—	galvanized steel reinforcement (B14, B15, B24, B25)	√	√
BR33S	—	galvanized steel reinforcement (B33, B38)	√	√
BR35	—	aluminium reinforcement (B30, B31, B35, B36)	√	
BR35S	—	galvanized steel reinforcement (B30, B31, B35, B36)	√	
133700	—	replacement weatherseal	√	√

Reinforcement

1.7 Outer frame head members are reinforced with galvanized mild steel where their length exceeds 1350 mm, in accordance with the *Elite 70 Casement and Tilt & Turn Manuals*.

1.8 For side-hung opening lights the horizontal members are always reinforced with aluminium or galvanized steel and the vertical members where their length exceeds 800 mm in accordance with the *Elite 70 Casement Manual*. For top-hung opening lights the horizontal members are reinforced with aluminium or galvanized steel where their length exceeds 800 mm and the vertical members where their length exceeds 600 mm, in accordance with the *Elite 70 Casement Manual*. For tilt and turn opening lights the horizontal members are always reinforced with galvanized steel and the vertical members where their length exceeds 800 mm in accordance with the *Elite 70 Tilt & Turn Manuals*.

1.9 Welded mullions and transoms are reinforced with aluminium or galvanized mild steel where their length exceeds 1000 mm and mechanically-jointed mullions and transoms are always reinforced with aluminium in accordance with the *Elite 70 Casement and Tilt & Turn Manuals*.

1.10 Galvanized steel reinforcement is roll-formed from material with a Z275N coating complying with BS EN 10327 : 2004. Aluminium reinforcement is extruded from alloy type 6063-T6 to BS EN 755-2 : 1997.

Size range

1.11 This Certificate covers Elite 70 outward opening top-hung, side-hung and tilt and turn and fixed-light windows and combinations of these within the limitations shown in Table 2.

Table 2 Size restriction

	Dimension (mm)
Outward opening windows	
Maximum length of mullions or transoms	1800
Maximum overall width or height of any outer frame	2140
<i>Top-hung opening lights</i>	
Maximum size of top-hung opening light reinforced ⁽¹⁾ (separately or in a multilight)	1244 wide x 1244 high
<i>Side-hung opening lights</i>	
Maximum size of side-hung opening light ⁽¹⁾ (separately or in a multilight) reinforced	714 wide x 1464 high 764 wide x 1364 high
Tilt and turn windows	
Maximum length of mullions or transoms	1800
Maximum overall width or height of any outer frame	1800
Maximum size of a single tilt and turn opening light	1584 wide x 1584 high
Fixed lights	
reinforced	3000 wide x 2000 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.

Fittings

1.12 For outward opening windows top-hung and side-hung windows covered by this Certificate are fitted with friction hinges constructed from stainless steel type 1.4016 to BS EN 10088-2 : 2005. 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. Opening windows are fastened by means of concealed shootbolt locking systems constructed from chromated zinc-plated mild steel, operated by a handle. The keeps are made from zinc-based alloy or other materials approved by the BBA.

1.13 Tilt and turn 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. The tilt and turn mechanism locates in a purpose-made groove in the opening light profile.

1.14 Shootbolt and tilt and turn handles are available, as an option, with a key locking facility. The shootbolt, keeps and tilt and turn mechanism are fixed by means of self-tapping screws which penetrate a thickened area of the profile wall or the reinforcing. The shootbolt and tilt and turn handles are formed from zinc-based alloy with various finishes.

1.15 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

1.16 Windows are supplied factory glazed or ready for glazing using double-glazed units with glass thicknesses in accordance with BS 6262-1 : 2005. All glass is positioned by plastic setting blocks and packing pieces.

Weatherstripping and gaskets

1.17 Gaskets and weatherstripping are incorporated onto the profiles by post-calibration, co-extrusion (PCE) (see Figure 1). The double-glazed unit is secured by co-extruded bead.

Quality control

1.18 Quality control checks are carried out on the incoming materials during production and on the finished products.

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.

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

2.3 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.

2.4 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.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems.

Design Considerations

3 Use

Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems are satisfactory for use as windows installed vertically into the external walls of buildings.

4 Thermal insulation



4.1 The thermal transmittance value (U value) of an Elite 70 outward opening window, 1230 mm wide by 1480 mm high, incorporating a side-hung opening light and a fixed-light, glazed with 4/20/4 mm sealed, double-glazed unit with a low-E hard coating of emissivity (ϵ_n) = 0.15 Pilkington K glass when measured by the Guarded Hot Box Method according to BS EN ISO 12567-1 : 2000, is $1.9 \text{ Wm}^{-2}\text{K}^{-1}$.

4.2 The thermal transmittance value (U value) of an Elite 70 outward opening window, 1230 mm wide by 1480 mm high, incorporating a side-hung opening light and a fixed-light, glazed with 4/20/4 mm sealed, double-glazed unit with a Pilkington Optitherm SN low-E coated glass and Pilkington Activ (self cleaning) glass when measured by the Guarded Hot Box Method according to BS EN ISO 12567-1 : 2000, is $1.7 \text{ Wm}^{-2}\text{K}^{-1}$.

4.3 The overall thermal insulation of the window will be dependent on the performance of the double-glazed units. For units other than those described above, the indicative U values shown in Table 6e of SAP 2005 *The Government's Standard Assessment Procedure for Energy Rating of Dwellings* can be used. When available, a certified U value by measurement to BS EN ISO 12567-1 : 2000, or calculation to BS EN ISO 10077-1 : 2000 and BS EN ISO 10077-2 : 2003 should be used in preference to these data given in these tables. Alternatively, window energy ratings may be available for specific frame and glazing combinations. Details can be obtained by visiting the BFRC website (www.bfrc.org).

4.4 It is recommended that glazing units which meet the requirements of BS EN 1279-2 : 2002 and BS EN 1279-3 : 2002 (if relevant) are specified.

5 Weathertightness

5.1 Selected samples from Elite 70 Outward Opening and Tilt and Turn PVC-U Window Systems were tested generally in accordance with BS 7412 : 2002, BS 6375-1 : 1989, BS 6375-1 : 2004, and MOAT No 1 : 1974. Assessment of the results shows that the windows, within the range described in section 1.11, are suitable for use where the test pressure classes defined in BS 6375-1 : 1989 and where the exposure categories and classifications defined in BS 6375-1 : 2004 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.

5.2 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, exposure categories and classification

	BS 6375-1 : 1989 Test pressure class (Pa)	BS 6375-1 : 2004 Classification	MOAT No 1 grading
Strength and stability/Resistance to wind loading			
Multilight units			
width up to a maximum of 2140 mm, height up to a maximum of 2140 mm, perimeter up to a maximum 6560 mm with mullion or transom lengths not exceeding 1140 mm with BR20 aluminium reinforcement	2000	—	V ₃
1140 mm with BR20S steel reinforcement	2700	—	V ₃
width up to a maximum of 1400 mm, height up to a maximum of 1400 mm, perimeter up to a maximum 5400 mm with mullion or transom lengths not exceeding 1300 mm with BR20S steel reinforcement	1200	—	—
width up to a maximum of 1400 mm, height up to a maximum of 1400 mm, perimeter up to a maximum 4800 mm with mullion or transom lengths not exceeding 1400 mm with BR21S steel reinforcement	800	—	—
width up to a maximum of 1500 mm, height up to a maximum of 1500 mm, perimeter up to a maximum 4600 mm with mullion or transom lengths not exceeding 1500 mm with BR21S steel reinforcement	1200	—	—
width up to a maximum of 1300 mm, height up to a maximum of 1300 mm, perimeter up to a maximum 4800 mm with mullion or transom lengths not exceeding 1300 mm with BR20 aluminium reinforcement	800	—	—
width up to a maximum of 1800 mm, height up to a maximum of 1800 mm, perimeter up to a maximum 6000 mm with mullion or transom lengths not exceeding 1800 mm with BR24S steel reinforcement	2400	—	—
width up to a maximum of 1500 mm, height up to a maximum of 1500 mm, perimeter up to a maximum 5200 mm with mullion or transom lengths not exceeding 1500 mm with BR24 aluminium reinforcement	1600	—	—
width up to a maximum of 1200 mm, height up to a maximum of 1200 mm, perimeter up to a maximum 4800 mm with mullion or transom lengths not exceeding 1200 mm with BR22 aluminium reinforcement (mechanical joint)	—	Class 5, 2000 Pa	—
width up to a maximum of 1300 mm, height up to a maximum of 1200 mm, perimeter up to a maximum 5000 mm with mullion or transom lengths not exceeding 1300 mm with BR06 steel reinforcement	—	Class 5, 2000 Pa	—
width up to a maximum of 1150 mm, height up to a maximum of 1200 mm, perimeter up to a maximum 4700 mm with mullion or transom lengths not exceeding 1150 mm with BR06S steel reinforcement	—	Class 5, 2000 Pa	—
width up to a maximum of 1550 mm, height up to a maximum of 1200 mm, perimeter up to a maximum 5500 mm with mullion or transom lengths not exceeding 1550 mm with BR22S steel reinforcement	—	Class 5, 2000 Pa	—
width up to a maximum of 1300 mm, height up to a maximum of 1200 mm, perimeter up to a maximum 5000 mm with mullion or transom lengths not exceeding 1300 mm with BR16 aluminium reinforcement (mechanical joint)	—	Class 5, 2000 Pa	—
width up to a maximum of 1450 mm, height up to a maximum of 1200 mm, perimeter up to a maximum 5300 mm with mullion or transom lengths not exceeding 1450 mm with BR16S steel reinforcement	—	Class 5, 2000 Pa	—
width up to a maximum of 1600 mm, height up to a maximum of 1200 mm, perimeter up to a maximum 5600 mm with mullion or transom lengths not exceeding 1600 mm with BR17S steel reinforcement	—	Class 5, 2000 Pa	—
Individual opening lights			
top-hung	2400	—	—
side-hung			
714 mm wide x 1464 mm high	2400	—	—
764 mm wide x 1364 mm high	2400	—	—
Tilt and turn	—	Class 3, 1200 Pa	—
Fixed lights	2400	—	—
Watertightness			
Multilights			
Outward opening	300	Class 7A, 300 Pa	—
Tilt and turn	—	Class 5A, 200 Pa	—
Fixed lights	300	—	—
Opening lights			
Top-hung	300	—	—
Side-hung	300	—	—
Tilt and turn	—	Class 5A, 200 Pa	—
Air permeability			
Multilights			
Top-hung	600	Class 4, 600 Pa	A ₃
Side-hung	600	—	—
Tilt and turn	—	Class 3, 600 Pa	—
Fixed lights	600	—	—

V₃ indicates that windows meet deformation requirements at 1750 Pa, a cycling test at 1250 Pa and safety test at 3000 Pa.

A₃ indicates an airflow rate below the line passing the point for a rate of flow of 2 m³h⁻¹m⁻¹ at 100 Pa pressure, when tested up to a pressure of 600 Pa.

Temperature differentials applied to the windows tested to MOAT No1 : 1974 to simulate winter and summer conditions did not affect operation or alter the air permeability characteristics.

6 Ventilation



6.1 The opening area for natural ventilation may be calculated by multiplying together the overall width and height dimensions of the frame containing the opening lights reduced by the relevant profile dimensions. 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. Details of any such approved fitting methods can be obtained from the BBA. Details of ventilators covered by an Agrément Certificate can be found on the BBA website.

7 Basic security against intrusion

7.1 Opening lights are fitted with lock mechanisms as described in sections 1.12 and 1.13. 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. For new build work, the security requirements of NHBC Standards 2007, Chapter 6.7 *Doors, windows and glazing* and the *Zurich Building Guarantee Technical Manual 2007, Section 4 Superstructure, Sub-section External walls — doors, windows and roof lights* (page 175) should be referred to. 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.

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

8 Practicability of installation

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

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

9 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.

10 Maintenance



10.1 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 and approved by the BBA. If a co-extruded glazing bead is fitted and the gasket is damaged, for example during re-glazing, it may be necessary to replace the complete bead. Replacements are available from the Certificate holder.

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

10.3 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.

10.4 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 discoloration and damage to the surface. In addition, care must be taken to avoid damage to, or discoloration of, the members when stripping paint from adjacent timber, for example, by means of a blowlamp or paint stripper.

10.5 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.

10.6 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.

11 Condensation risk



Experience of PVC-U window systems similar to this PVC-U window system has shown that, in normal domestic or similar applications, PVC-U windows do not constitute a significant condensation risk when correctly installed. Guidance on some satisfactory design details is given in *Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings*, TSO 2002. Further information is contained in BRE report (BR 262 : 2002) *Thermal insulation: avoiding risks*.

12 Safety



12.1 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 : 2004.

12.2 The windows can comply with the recommendations of BS 8213-1 : 2004 with regard to the positioning of hand-operated controls.

12.3 Account must be taken of the recommendations given in BS 6262-4 : 2005⁽¹⁾, which includes the use of safety glass, complying with BS EN 12600 : 2002 or BS 6206 : 1981, under certain circumstances.

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

13 Ease of operation

The window can be operated without difficulty when correctly installed.

14 Durability



14.1 Evidence is available on the performance in the UK of PVC-U similar to that used for the system over a period of 20 years. Such evidence, when compared with the results of tests on the Elite 70 PVC-U profiles, indicates that the windows will have a life of at least 25 years.

14.2 Fittings, including the hinges, locking mechanism and operating handles, as described in this Certificate, 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.

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

14.4 Any slight colour change or surface dulling that might occur will be uniform over the visible surfaces of the windows.

Installation

15 General

15.1 The window must be fixed into the opening, in accordance with the recommendations in BS 8213-4 : 2007, using proprietary expanding anchors through the frame or galvanized steel fixing lugs.

15.2 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.

15.3 The provision of a cavity closer and/or cavity barrier around the window opening, prior to installation, may be required. Details of products covered by an Agrément Certificate can be found on the BBA website.

Technical Investigations

16 Tests

16.1 Tests were carried out in accordance with the methods defined in BS 6375-1 : 1989, BS 6375-1 : 2004, BS 6375-2 : 1987, BS 7412 : 2002 and 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 were carried out on the PVC-U extrusions in accordance with MOAT No 8 : 1973, MOAT No 17 : 1990 and BS EN 12608 : 2003.

16.3 The thermal transmittance values of two outward opening windows were measured using the Guarded Hot Box Method.

17 Investigations

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.

Bibliography

- BS 952-1 : 1995 *Glass for glazing — Classification*
- BS 6206 : 1981 *Specification for impact performance requirements for flat safety glass and safety plastics for use in buildings*
- BS 6262-1 : 2005 *Glazing for buildings — General methodology for the selection of glazing*
- BS 6262-4 : 2005 *Glazing for buildings — Code of practice for safety related to human impact*
- BS 6375-1 : 1989 *Performance of windows — Classification for weathertightness (including guidance on selection and specification)*
- BS 6375-1 : 2004 *Performance of windows and doors — Classification of weathertightness and guidance on selection and specification*
- BS 6375-2 : 1987 *Performance of windows — Specification for operation and strength characteristics*
- BS 7412 : 2002 *Plastics windows made from unplasticized polyvinyl chloride (PVC-U) extruded hollow profiles — Specification*
- BS 8213-1 : 2004 *Windows, doors and rooflights — Design for safety in use and during cleaning of windows, including door-height windows and roof windows — Code of practice*
- BS 8213-4 : 2007 *Windows, doors and rooflights — Code of practice for the survey and installation of windows and external doorsets*
- BS EN 755-2 : 1997 *Aluminium and aluminium alloys — Extruded rod/bar, tube and profiles — Mechanical properties*
- BS EN 1279-2 : 2002 *Glass in building — Insulating glass units — Long term test method and requirements for moisture penetration*
- BS EN 1279-3 : 2002 *Glass in building — Insulating glass units — Long term test method and requirements for gas leakage rate and for gas concentration tolerances*
- BS EN 10088-1 : 2005 *Stainless steels — List of stainless steels*
- BS EN 10327 : 2004 *Continuously hot-dip coated strip and sheet of low carbon steels for cold forming — Technical delivery conditions*
- BS EN 12600 : 2002 *Glass in building — Pendulum test — Impact test method and classification for flat glass*
- BS EN 12608 : 2003 *Unplasticized polyvinylchloride (PVC-U) profiles for the fabrication of windows and doors — Classification, requirements and test methods*
- BS EN ISO 10077-1 : 2000 *Thermal performance of windows, doors and shutters — Calculation of thermal transmittance — Part 1 — Simplified method*
- BS EN ISO 10077-2 : 2003 *Thermal performance of windows, doors and shutters — Calculation of thermal transmittance — Part 2 — Numerical method for frames*
- BS EN ISO 12567-1 : 2000 *Thermal performance of windows and doors — Determination of thermal transmittance by hot box method — Complete windows and doors*
- 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*

18 Conditions

18.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English law.

18.2 References in this Certificate to any Act of Parliament, Statutory Instrument, Directive or Regulation of the European Union, British, European or International Standard, Code of Practice, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

18.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

18.4 In granting this Certificate, the BBA is not responsible for:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

18.5 Any information relating to the manufacture, supply, installation, use and maintenance of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used and maintained. It does 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; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any 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 manufacture, supply, installation, use and maintenance of this product/system.

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