Now includes 'A' rated window

0 A
-10 B

SHIELD

SPECIFICATION GUIDE

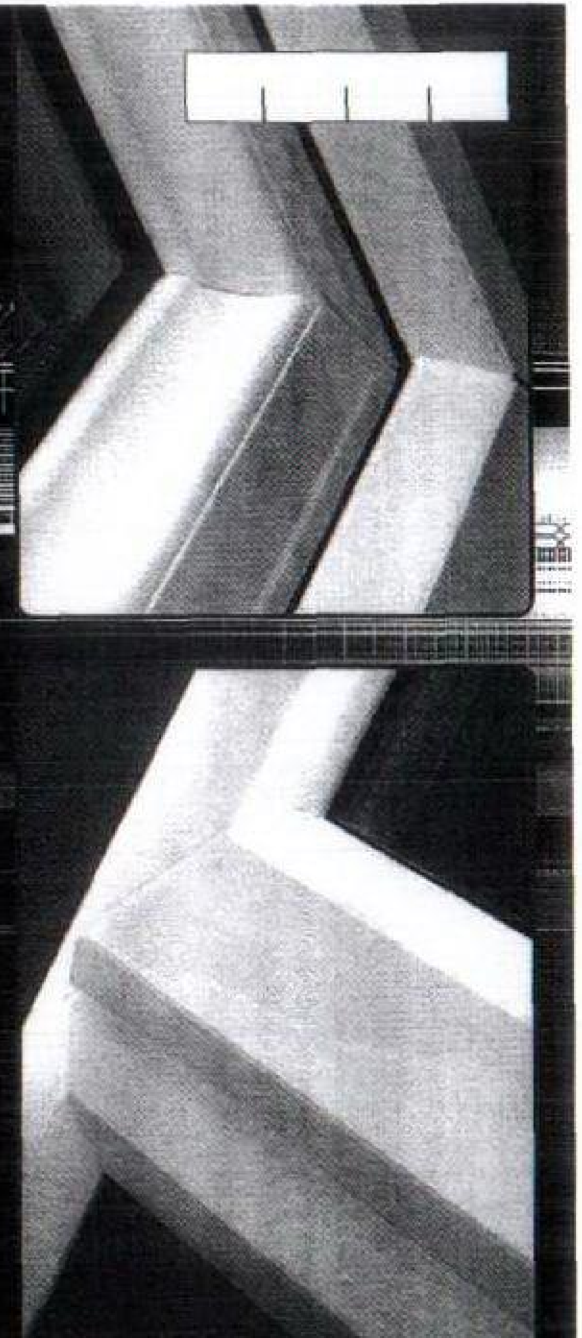
Effective from February 2008

TECHNICAL DATA

ACCREDITATIONS

SCHEMATICS

FAQs



About Synseal

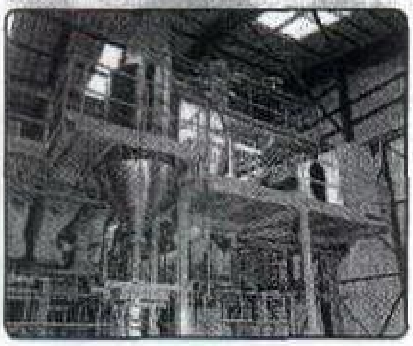
Synseal is a systems company with a difference. It has been involved at all levels in the PVC-U window industry. It started in 1980 and within 18 months of opening the first shop Synseal had opened 13 showrooms across the East Midlands. Later Synseal added a fabrication facility and by 1987 1,000 frames were being fabricated a week with a nationwide customer base. In 1991 Synseal started extruding profile.

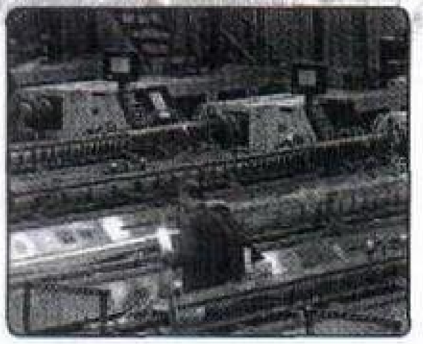
The success of the fabrication business meant Synseal was in direct competition with some customers. That's why it pulled out of the domestic market in 1991. And why it pulled out of fabricating in 1995. At that time Synseal was fabricating 2,200 frames a week. This business was sold to JBS Industries – and is still a strong business today.

Today Synseal is number one in windows and conservatories, an achievement no other company has attained. More fabricators choose Synseal than any other company. So it's hardly surprising that one-in-ten windows and one-in-four conservatory roofs are made with Synseal products.

The Shield window and door system was launched in 1999. This guide contains details of the accreditations, frequently asked questions, schematics and technical data.

In addition to the window system, Shield offers a conservatory roof system.





All information in this manual is provided for guidance only. Synseal Extrusions Ltd cannot be held responsible for the way in which the information in this manual is interpreted.

We reserve the right to alter specifications and descriptions without prior notice as part of our policy of constant development. All dimensions are in millimetres. Do not scale drawings.

SHIELD

Contents

Accreditations

FAQs

Frequently Asked Questions relating to technical matters, quality assurance and window/door/patio installation

Schematics

Cross section drawings of Shield windows and doors

Technical Data

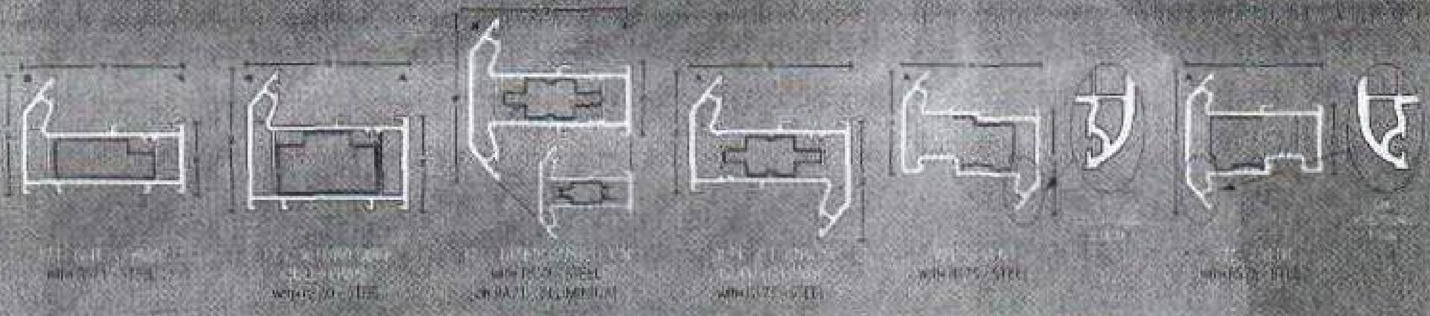
Technical data relating to various aspects of Shield windows and doors

SHIELD

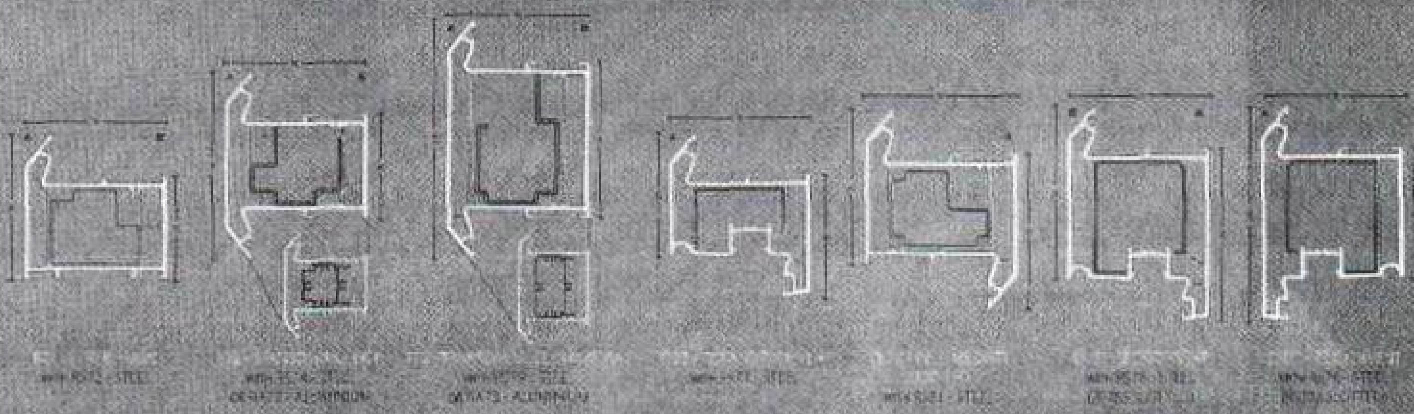
SCHEMATICS

KEY: = PLASTIC = ALUMINIUM = RUBBER = STEEL = FOAM = GLASS = SEALANT = VARIOUS/OTHER

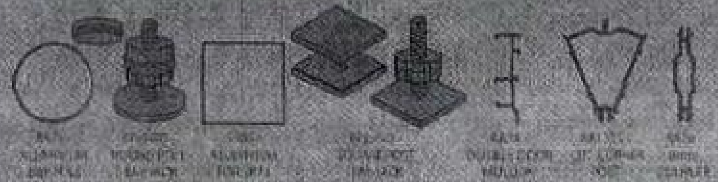
CASEMENT SUITE COMPONENTS & REINFORCEMENTS



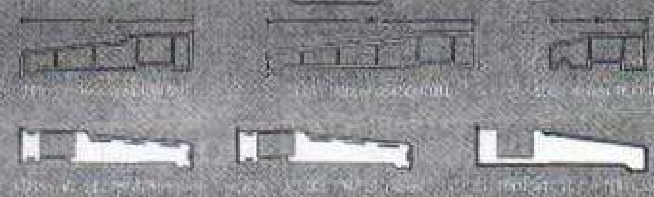
DOOR/TILT & TURN SUITE COMPONENTS & REINFORCEMENTS



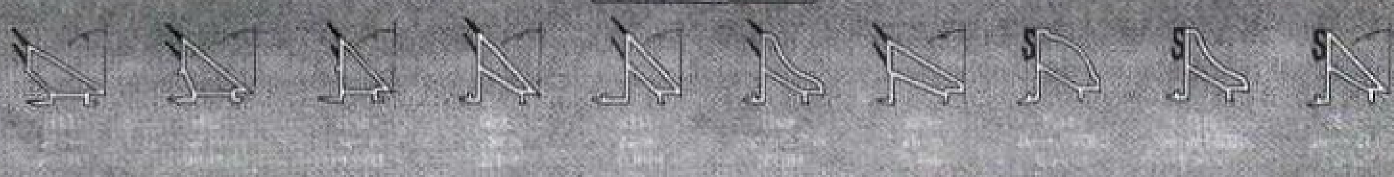
ALUMINIUM REINFORCEMENTS & BAY JACKS



SILLS



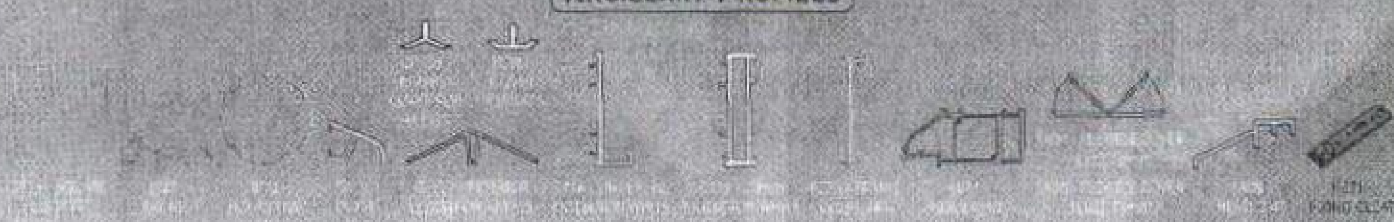
GLAZING BEADS



GASKETS

MOULDINGS & HARDWARE

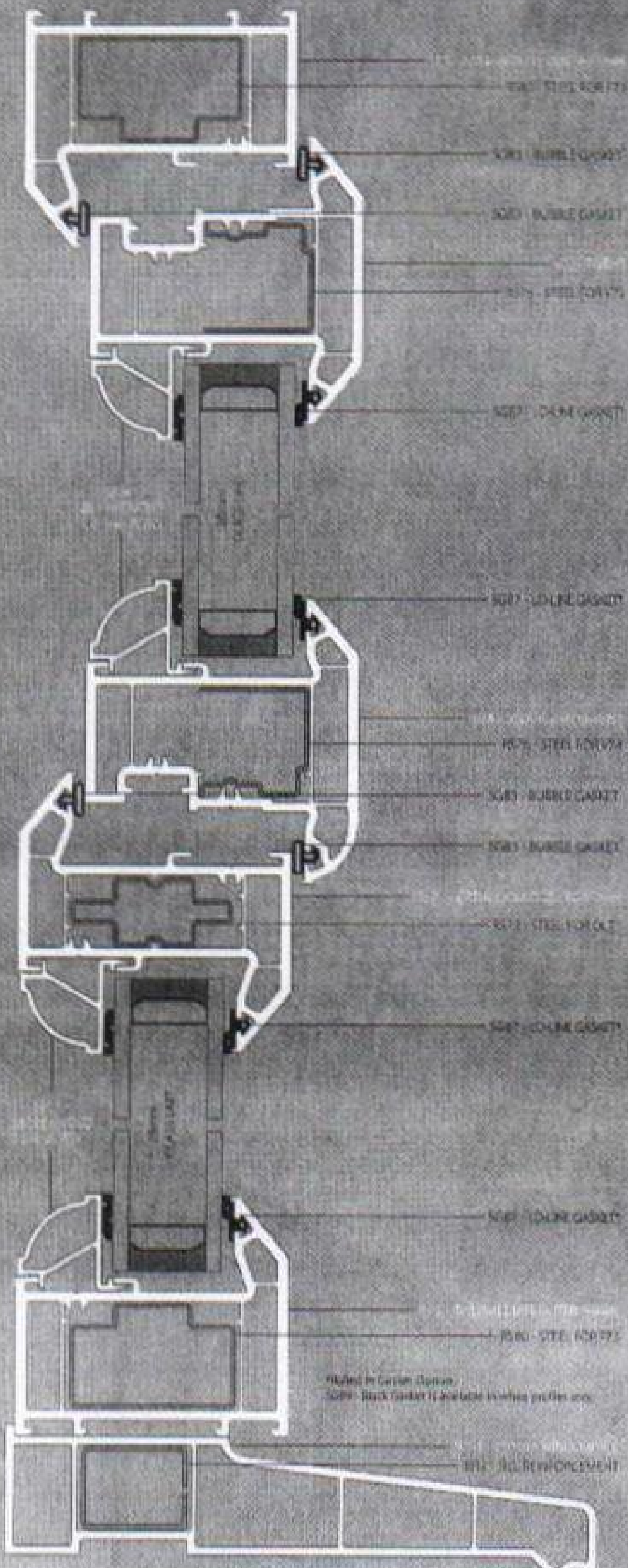
ANCILLARY PROFILES



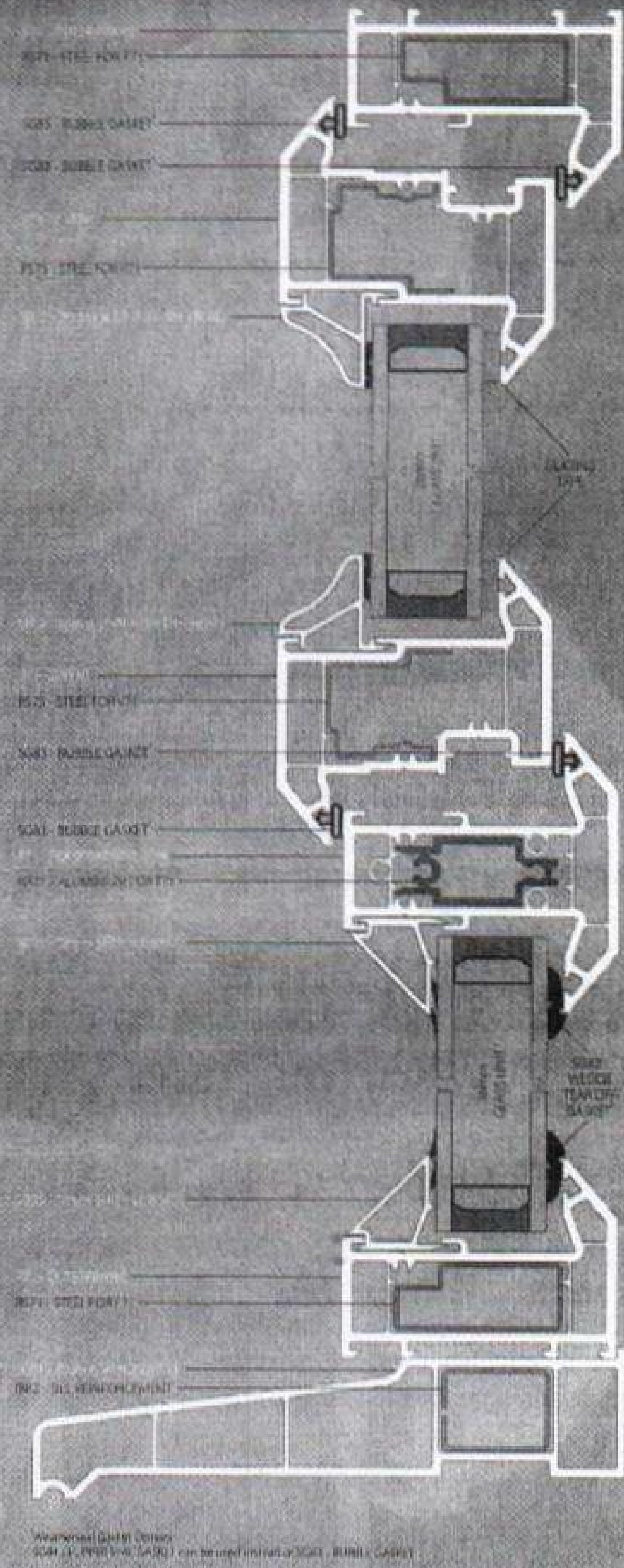
SCHEMATICS

KEY: = PLASTIC = ALUMINIUM = RUBBER = STEEL = FOAM = GLASS = SEALANT = VARIOUS/OTHER

INTERNALLY BEADED CASEMENT WINDOW



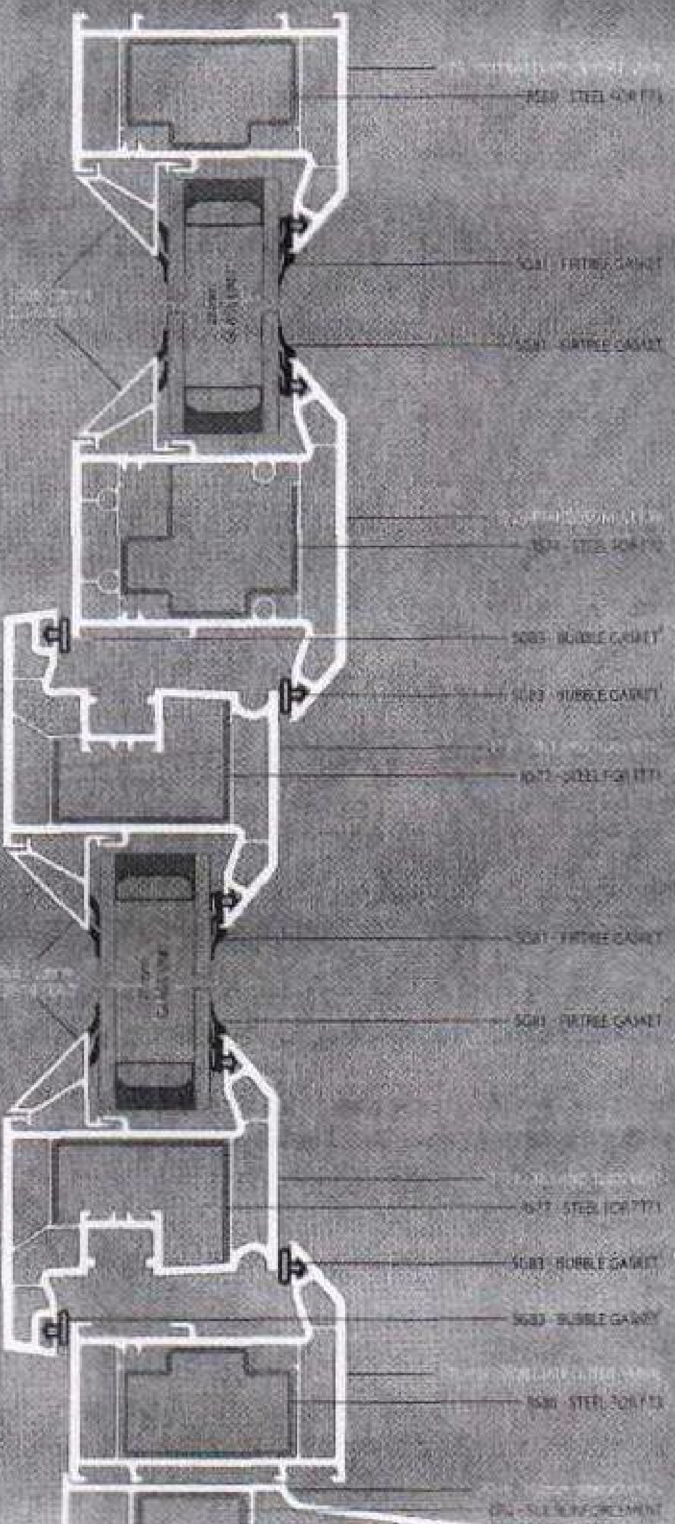
EXTERNALLY BEADED CASEMENT WINDOW



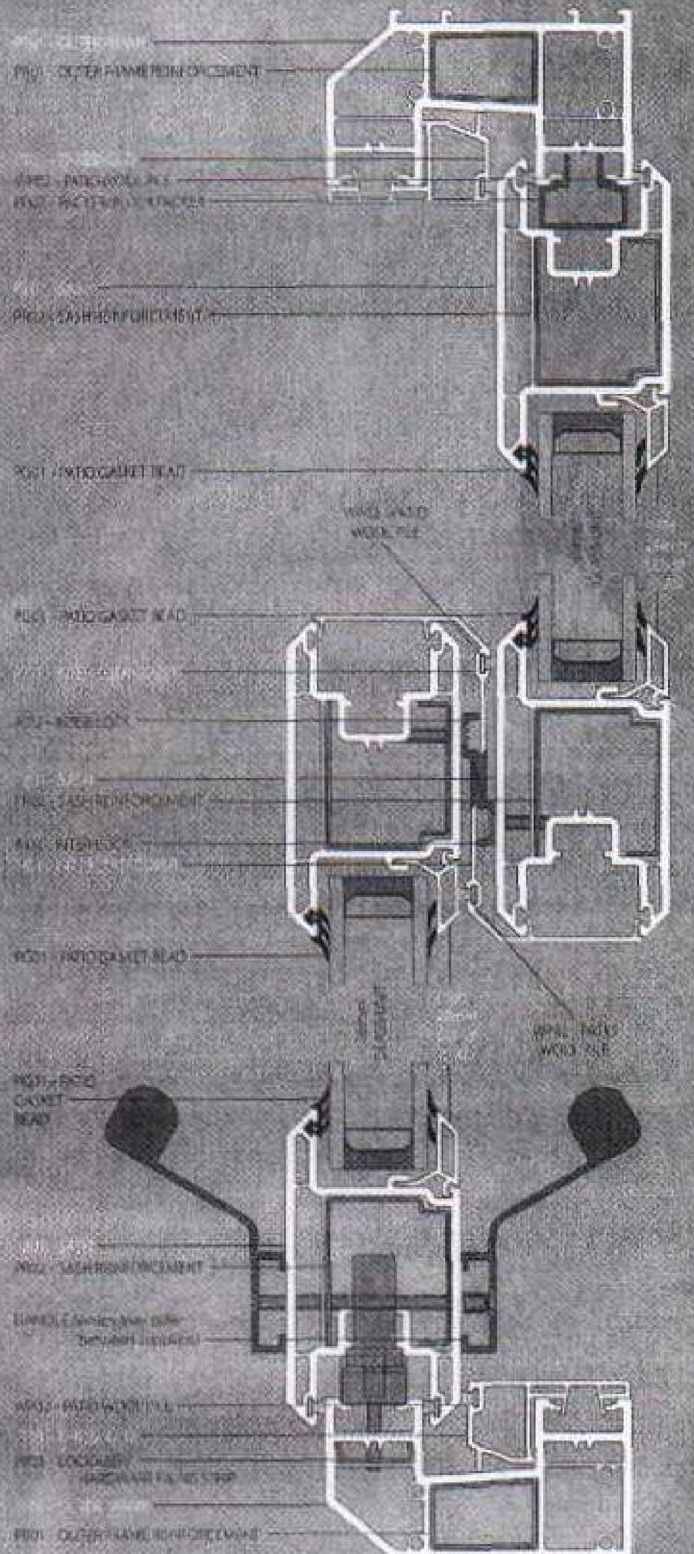
SCHEMATICS

KEY: = PLASTIC = ALUMINIUM = RUBBER = STEEL = FOAM = GLASS = SEALANT = VARIOUS/OTHER

TILT & TURN WINDOW



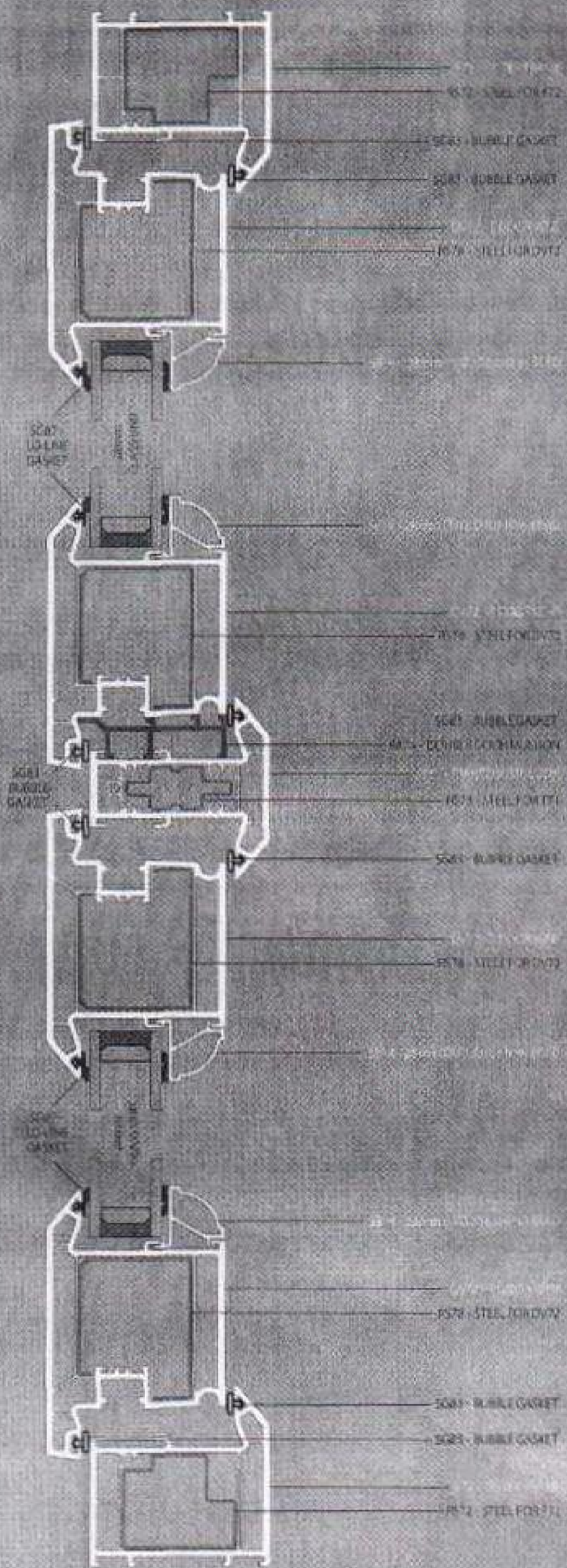
PATIO HORIZONTAL CROSS SECTION



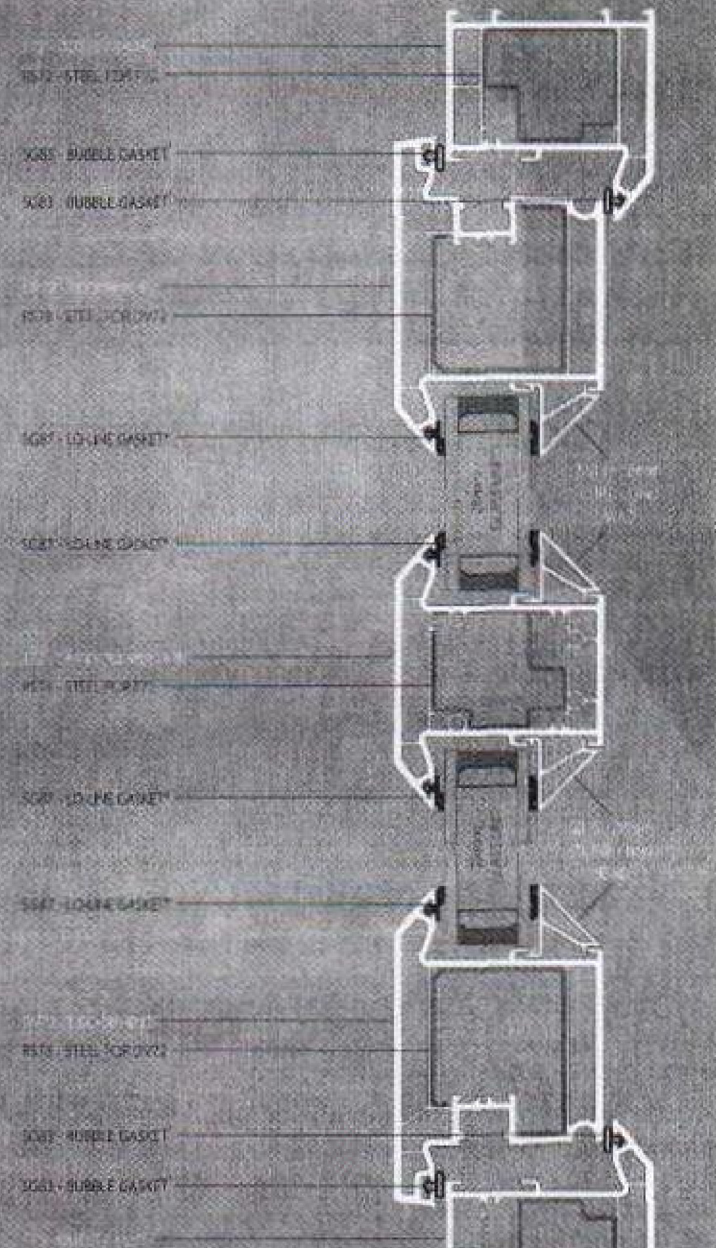
Schematics

Key: = Plastic = Aluminium = Rubber = Steel = Foam = Glass = Sealant = Various/Other

Double Door



Residential Door



MAIN TECHNICAL DETAILS

Name:	Shield 5mm System for windows and doors
Grade Reference:	SYN10 White 01
Material:	Acrylic modified high quality impact resistant, white unplasticised Polyvinyl Chloride extrusion to produce a rigid multi-chambered extrusion.
Physical Properties:	Comply with BS EN 12608 2003
Colours:	Mahogany, White, Cherrywood, Golden Oak, Anthracite Grey, Black Brown, Dark Red (Burgundy), Steel Blue (Oxford) and Dark Green (Brookland)
Appearance:	Smooth, gloss, [illegible] gloss surface [illegible]
Surface Finish:	Stabilised against UV light to prevent excessive colour drift. Meets requirements of BS EN 12608 when used in the EU Moderate climate.
Weldability:	For the determination of the weldability of profiles, welded corners are tested in accordance with DIN 16830. The calculated mean stress at maximum of each corner shall not be <35 N/mm² for the tensile bending test or 35 N/mm² for the compression bending test. Each individual value shall not be <20 N/mm² for the tensile bending test and not be <30 N/mm² for the compression bending strength.
Glass & Glazing:	Subject to manufacture in accordance with the Synseal Technical Manual recommendations, the shield window system will conform to the requirements of the standard.

Physical Properties of PVC-U Type A Material
Grade Ref. SYN10 White 01

Sound Insulation:	30dB minimum
Thermal Conductivity at 20°C:	Typical test value 0.15 W/M deg C. PVC-U has a low thermal conductivity and virtually constant over a wide temperature range.
Heat Reversion:	To BS EN 12608 Clause 5.5 (test method 1hr at 100°C). When tested in accordance with Appendix E, the mean maximum reversion value for individual samples shall not be greater than 2% for profiles and glazing beads. The variation between individual face sides of the same sample shall not be greater than 0.4% for profiles and [illegible] for glazing beads.
Heat Ageing:	To BS EN 12608 Clause 5.7 (test method 30 mins at 150°C). When tested in accordance with Appendix F, the profile shall show no bubbles, cracks or de-lamination.
Resistance of impact at low temperature:	To BS EN 12608 Clause 5.6 Class 2 (1kg method, 1kg from 1.5 metres at -10°C). When main frame, sash-il casement and sash profiles are tested in accordance with EN 477, no more than one sample shall exhibit cracking through the entire wall thickness of the profiles on either face.
Heat Resistance/ Softening Point:	To BS EN 12608. When tested to ISO 306 method B. Minimum Vicat 5kg softening point 75°C. Typical result 82°C. This is well above the requirements of the UK and German specifications.
Apparent Modulus of Elasticity:	To BS EN 12608 minimum requirement 2200 mpa value, when tested to ISO 178. Typical result 2350 mpa.

Retention of Impact Strength after Artificial Ageing:	To BS EN 12608 2003. Minimum 60% of original value specified when tested to EN 513
Colour Fastness:	After exposure in accordance with EN 513 moderate EU climate zone, the change in colour between the unexposed test specimens expressed in ΔE* shall not be >4 & Δb* not >3. The determination of the change in colour is in accordance with EN 513.
Bulk Density of Powder Blend:	Typical test value 0.61 - 0.66. Minimum requirements: None specified.
Specific Gravity of Profile:	Typical test 1.472 [illegible]. Minimum requirement: None specified.

PROFILE STORAGE

Prefabricated Storage:

The profiles should be stored in a suitable area preferably under cover NOT in [illegible] conditions or direct sunlight. If the profile is stored on racking it must be supported at least 1 metre intervals of the entire profile length. If stored on the floor the floor must be level and the profile placed on a protective board base.

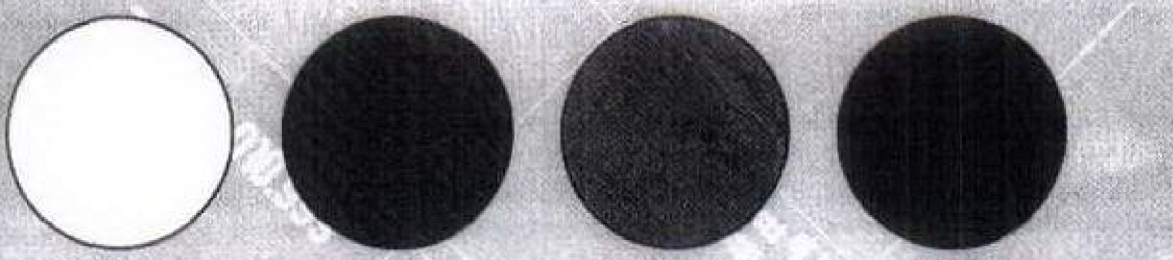
The ideal factory storage temperature should be maintained between 17°C and 20°C as working with profiles in colder conditions can lead to undue complications.

If the profile has been stored in a separate storage area with lower temperatures, at least one hour per °C should be allowed for the profile to reach workshop temperature.

Profile cut ready for welding shall be stored in a dry area with the same ambient temperature of 17°C - 20°C. Care shall be taken if profiles are stored vertically so as not to damage the point of the mitres (check contamination of the weld faces prior to welding).

All cut profiles must be welded within 48 hours as this will avoid contamination of the cut ends and avoid any absorption of moisture which could have an effect on the weld strength.

AVAILABLE PROFILE COLOURS*



White
C121

Mahogany
(Also available for roofs)
2097013

Golden Oak
(Also available for roofs)
80001

Cherrywood
(Also available for roofs)
8015/36/17

Dark Green (Brookland)
6125

Anthracite Grey
7016

Black Brown
8518

Dark Red (Burgundy)
3081

Steel Blue (Oxford)
5150

*Please note: the swatches on this page should be used as a guide only and are [illegible]

THERMAL EXPANSION OF PVC-U

The linear thermal expansion of a material is a measure of how much that material will expand for each 1 degree change in temperature.

Typical values:

PVC-U: 0.00008/°C

Mild Steel (0.06 carbon): 0.0000126/°C

Aluminium (99 % pure): 0.0000240/°C

The values of the coefficient of thermal expansion can be regarded as constant over the temperature range normally experienced in the UK.

A temperature difference between the inside and outside surfaces can lead to differential thermal expansion, which may in some circumstances lead to buckling or distortion.

The bulk temperature of the material is usually used to calculate the expansion. This is not always the same as the surface temperature.

For white profile the temperatures are approximately the same but for dark (woodgrain) profiles the bulk temperatures may be higher than the air temperature due to the higher solar heat gain of dark profiles. Expansion gaps should always be larger for woodgrain profiles than for white profiles to allow for this.

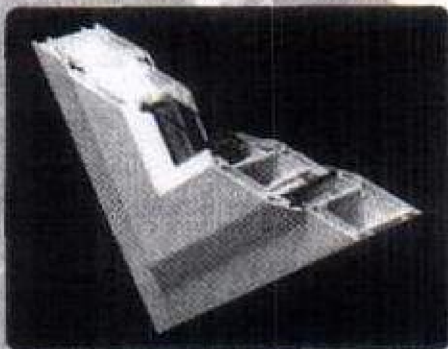
Calculation example:

If a 1000 mm length of PVC-U profile is heated up from 20°C to 40°C, then the expansion is given by:

Original length X change in temperature X coefficient of thermal expansion, ie:

1000 x 20 x 0.00006 = 1.2 mm

Therefore the final length of the PVC-U profile is 1001.2 mm.



EXPOSURE CATEGORIES

Exposure category (design wind pressure) Pa	Air Permeability Pa	Water tightness Pa	Wind Resistance Pa
800	up to 200	200	800
1200	up to 300	300	1200
1600	up to 300	300	1600
2000	up to 300	300	2000
over 2000 (state design wind pressure)	up to 300	300	equal to design wind pressure

Conversion Table - Wind Pressure and Speed

Pressure		Speed		
Pa	lbf/ft²	m/s	km/h	mph
800	16.4	35.6	128	80
1200	24.75	43.6	157.5	98.1
1600	33.75	50.4	181	113
2000	41.9	56.3	202.5	126.1

Note:

The above conversions are based on the aerodynamic relationship:

Pressure = (velocity)² x (a constant)

For design wind pressures these values must be multiplied by a shape factor.

'U'-VALUES AND ENERGY RATINGS

'A' rated Shield Window

PVC-U narrow frame F71 with minimum steel reinforcement to BFRC requirements with 4-16-4 Low-E 0.04 uncorrected emissivity (Saint Gobain Planitherm Total) 90% Argon / 10% Air filled, low-iron (Saint Gobain Diamant) glazing unit with Superspacer warm edge spacer bar with 5mm hot melt butyl secondary seal.

Energy Index (kWh/m²/year) (Energy index certified by BFRC and based on UK standard window. The actual energy consumption for a specific application will depend on the building, the local climate and the indoor temperature)	+0
The climate zone is	UK
Thermal Transmittance (U_{window})	1.40 W/m²K
Solar Factor (g_{window})	0.44 W/m²K
Effective Air Leakage (L_{factor})	0 W/m²K

Shield Window, OptiWhite, Argon, K-glass & Edgetech Super Spacer

Part (see Fig 1)	b_f m	A m²	U_1 W/m²K	U_2 W/m²K	U_d W/m²K	U_f W/m²K	Ψ W/m·K	Φ_f W/K
1	1.3661	0.0898	1.1340	1.6152	1.0309	1.4792	0.0291	0.1391
2	0.4947	0.0315	1.1340	1.6152	1.0309	1.4792	0.0291	0.0610
3	0.4945	0.0315	1.1340	1.6152	1.0309	1.4792	0.0291	0.0610
4	1.2785	0.1389	1.2408	[illegible]	1.0309	1.6367	0.0279	0.2601
5	0.4505	0.0337	1.1963	[illegible]	1.0309	1.3083	0.0286	0.0984
6	0.4505	0.0337	1.1963	[illegible]	1.0309	1.3083	0.0286	0.0984
Fleft / Fright	1.3660 / 1.2785	0.1798	1.2039	1.6896	1.0309 / 1.0309	1.7198	0.0274	0.2681
Σ Frame	1.1800					Ψwin	0.0287	

Glass	D mm	A m²			U_g W/m²K			Φ_g W/K
Left	28	0.5757			1.5284			1.0128
Right	28	0.5760			1.5284			0.8805

Window 'U'-Value = 1.8635 W/m²K

Domestic Window Energy Rating (D W E R)

Pane	$g_\perp$	% glass	f_{ss}	g_w	L factor W/m²K	DWER kWh/m²/yr
Left	0.78	38.40	0.9	0.xxxx [illegible]	0.00	-4.85 [illegible]
Right	0.78	32.83				

Shield Window, Argon, K-glass & Edgetech Super Spacer

Part (see Fig 1)	b_f m	A m²	U_1 W/m²K	U_2 W/m²K	U_d W/m²K	U_f W/m²K	Ψ W/m·K	Φ_f W/K
1	1.3661	0.0898	1.1340	1.6663	1.0309	1.4792	0.0290	0.1391
2	0.4945	0.0315	1.1340	1.6663	1.0309	1.4792	0.0290	0.0609
3	0.4945	0.0315	1.1340	1.6663	1.0309	1.4792	0.0290	0.0609
4	1.2785	0.1389	1.2408	[illegible]	1.0309	1.6367	[illegible]	0.2628
5	0.4505	0.0337	1.1963	[illegible]	1.0309	1.3083	0.0286	0.0983
6	0.4505	0.0337	1.1963	[illegible]	1.0309	1.3083	0.0286	0.0983
Fleft / Fright	1.3660 / 1.2785	0.1788	1.2039	1.7098	1.0309 / 1.0309	1.7198	0.0271	0.2826
Σ Frame	1.1800					Ψwin	0.0285	

Glass	D mm	A m²			U_g W/m²K			Φ_g W/K
Left	28	0.5757			1.5565			1.0018
Right	28	0.5760			1.5565			0.8993

Window 'U'-Value = 1.8822 W/m²K

Domestic Window Energy Rating (D W E R)

Pane	$g_\perp$	% glass	f_{ss}	g_w	L factor W/m²K	DWER kWh/m²/yr
Left	0.72	38.40	0.9	0.4618	0.00	-14.82
Right	0.72	32.83				

Shield Window, Air, K-glass & Edgetech Super Spacer

Part (see Fig 1)	b_f m	A m²	U_1 W/m²K	U_2 W/m²K	U_d W/m²K	U_f W/m²K	Ψ W/m·K	Φ_f W/K
1	1.3661	0.0898	1.1340	1.6093	1.0309	1.4792	0.0280	0.1377
2	0.4945	0.0315	1.1340	1.6093	1.0309	1.4792	0.0280	0.0604
3	0.4945	0.0315	1.1340	1.6093	1.0309	1.4792	0.0280	0.0604
4	1.2785	0.1389	1.2408	1.6088	1.0309	1.6367	0.0263	0.2511
5	0.4505	0.0337	1.1963	1.7571	1.0309	1.3083	0.0274	0.0931
6	0.4505	0.0337	1.1963	1.7571	1.0309	1.3083	0.0274	0.0931
Fleft / Fright	1.3660 / 1.2785	0.1788	1.2039	1.6167	1.0309 / 1.0309	1.7198	0.0249	0.3797
Σ Frame	1.1866					Ψwin	0.0275	

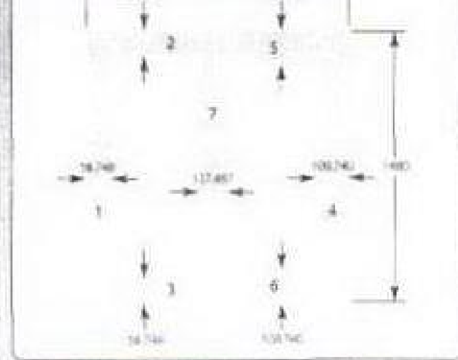
Glass	D mm	A m²			U_g W/m²K			Φ_g W/K
Left	28	0.5757			1.7605			1.1387
Right	28	0.5760			1.7605			1.0140

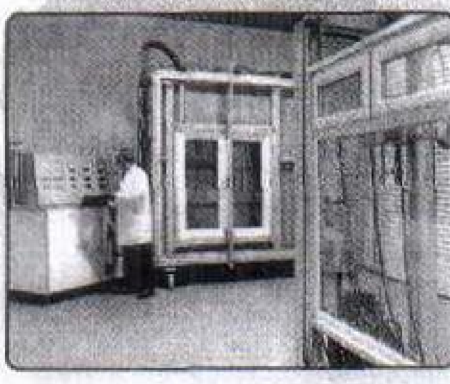
Window 'U'-value = 1.8182 W/m²K

Domestic Window Energy Rating (D W E R)

Pane	$g_\perp$	% glass	f_{ss}	g_w	L factor W/m²K	DWER kWh/m²/yr
Left	0.72	38.40	0.9	[illegible]	0.00	-23.94
Right	0.72	32.43				

Figure 1.





Safe Working Capacities of Reinforcements

KEY: = ALUMINIUM

Bay-pole Load-bearing Capacity

The load-bearing capacity of a bay pole depends upon two factors:

1. the Least Radius of Gyration
2. the Effective Length of the pole

The Least Radius of Gyration is given by:

r = square root (I/A)
where I is the moment of inertia (least axis) and A is the cross-sectional area of the pole.

The Effective Length of a pole is determined by the fixings at its ends. If the pole is held in position at both ends but not restrained in direction then the Effective Length is the actual length of the pole (usually the case for most poles).

If the pole is effectively held in position and restrained at both ends, then the Effective Length is only 70% of the actual length (this condition will only apply if the pole is fixed to the structure so that it will not move until the column starts to buckle).

The Slenderness Ratio of the bay pole can then be calculated by dividing the Effective Length by the Least Radius of Gyration. The maximum permissible stress for that length of bay pole can then be obtained from the graph below. The actual load that can be applied is then given by multiplying the allowable stress by the cross-sectional area.

We have done this for the most commonly used Synseal bay poles and posts; see tables and graphs in this section.

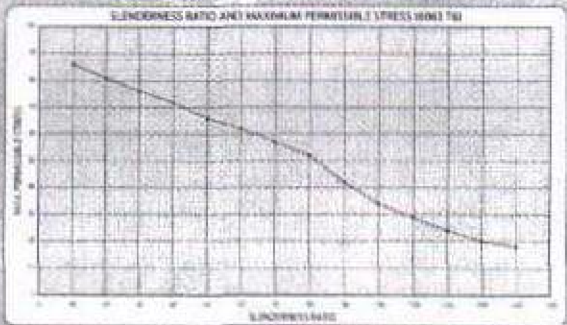
52.5mm dia BAY POLE - RA75

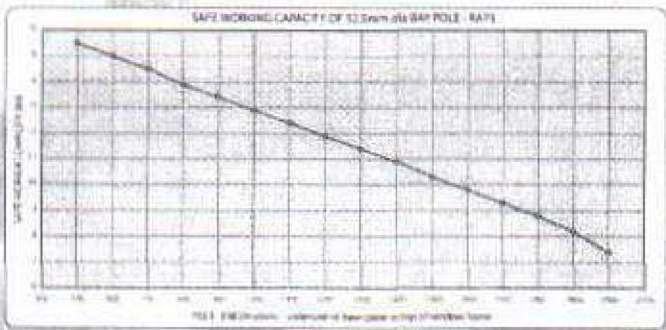
Data supplied by [illegible] - Consulting Civil & Structural Engineers - Nottingham

HEIGHT (mm)	SLENDERNESS RATIO	PERMISSIBLE STRESS (N/mm²)	CAPACITY (kN)
500	27.9	54.1	15.3
600	33.4	52.1	14.8
700	39.0	50.8	14.5
800	44.6	48.7	13.9
900	50.2	46.1	13.4
1000	55.7	45.2	12.9
1100	61.3	43.1	12.4
1200	66.9	41.2	11.8
1300	72.5	39.8	11.4
1400	78.0	38.5	10.9
1500	83.6	35.9	10.2
1600	89.2	34.7	9.8
1700	94.8	32.4	9.3
1800	100.4	31.1	8.8
1900	105.9	28.2	8.2
2000	111.5	25.9	7.4

SLENDERNESS RATIO AND MAXIMUM PERMISSIBLE STRESS (ALUMINIUM GRADE 6063 T6)

(From BPF Code of Practice for the Survey of PVC-U Windows and Doorsets)

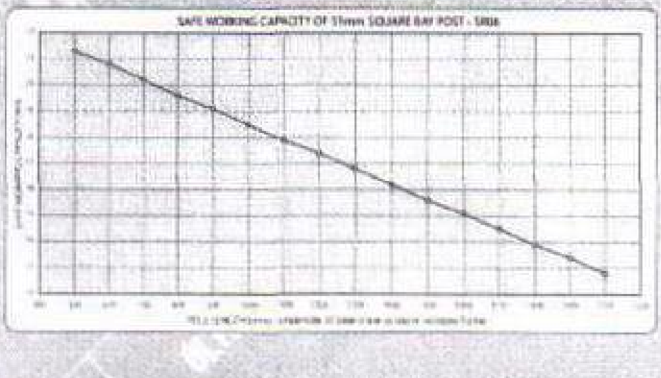




55mm SQUARE BAY POST - SR06

Data supplied by [illegible] - Consulting Civil & Structural Engineers - Nottingham

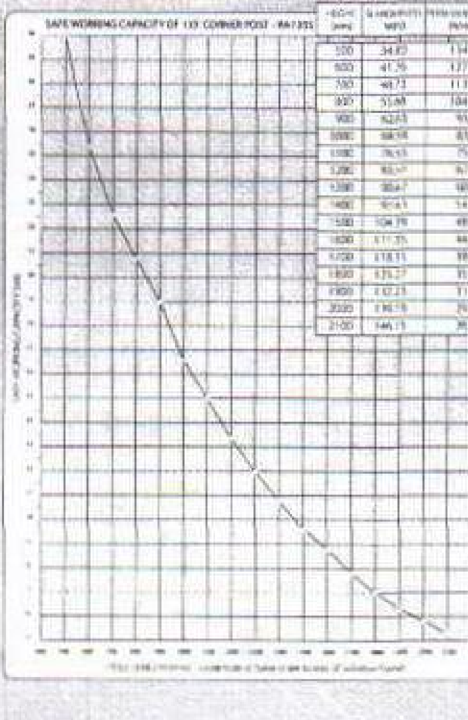
HEIGHT (mm)	SLENDERNESS RATIO	PERMISSIBLE STRESS (N/mm²)	CAPACITY (kN)
500	23.5	54.4	21.3
600	28.2	53.1	20.8
700	32.9	52.8	20.2
800	37.6	52.1	19.8
900	42.3	50.8	19.3
1000	46.9	49.1	18.5
1100	51.6	47.8	17.8
1200	56.3	46.1	17.4
1300	61.0	44.3	16.6
1400	65.7	43.2	16.2
1500	70.4	41.2	15.6
1600	75.1	40.2	15.1
1700	79.8	38.7	14.5
1800	84.5	37.2	13.8
1900	89.2	35.7	13.2
2000	93.9	34.2	12.8



135° CORNER POST - RA1355

Data supplied by [illegible] Associates Ltd - Structural Engineers - [illegible]

[illegible]



HEIGHT (mm)	SLENDERNESS RATIO	PERMISSIBLE STRESS (N/mm²)	UNFACTORED CAPACITY (kN)	FOS	FACTORED CAPACITY (kN)
500	34.83	114	41.49	1.55	26.76
600	41.79	107	39.32	1.55	25.37
700	48.75	113	34.98	1.55	22.57
800	55.68	104	32.20	1.55	20.77
900	62.63	95	29.41	1.55	18.97
1000	69.59	83	25.70	1.55	16.58
1100	76.55	75	23.22	1.55	14.98
1200	83.51	67	20.74	1.55	13.38
1300	90.47	60	18.58	1.55	11.98
1400	97.43	54	16.72	1.55	10.79
1500	104.39	48	14.86	1.55	9.58
1600	111.35	44	13.62	1.55	8.79
1700	118.31	39	12.07	1.55	7.79
1800	125.27	35	10.84	1.55	6.99
1900	132.23	31.68	9.81	1.55	6.33
2000	139.19	29.12	9.03	1.55	5.82
2100	146.15	26.56	8.32	1.55	5.37

Safe Working Capacities of Reinforcements

[illegible]

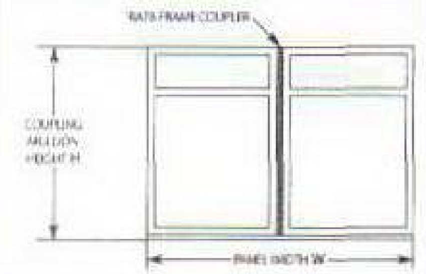
ALUMINIUM COUPLER - RA76

Data supplied by [illegible] - Structural Engineers - [illegible]

KEY: = ALUMINIUM

Graph colour key: ● = 1.2kN ● = 1.5kN ○ = 2.0kN ◎ = 2.4kN

MAX PANEL WIDTH (mm) at	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.2kN ●	5865	4673	2952	2080	1481	1065
1.5kN ●	4398	3055	2244	1560	1096	799
2.0kN ○	3519	2444	1795	1248	877	639
2.4kN ◎	2932	2036	1496			

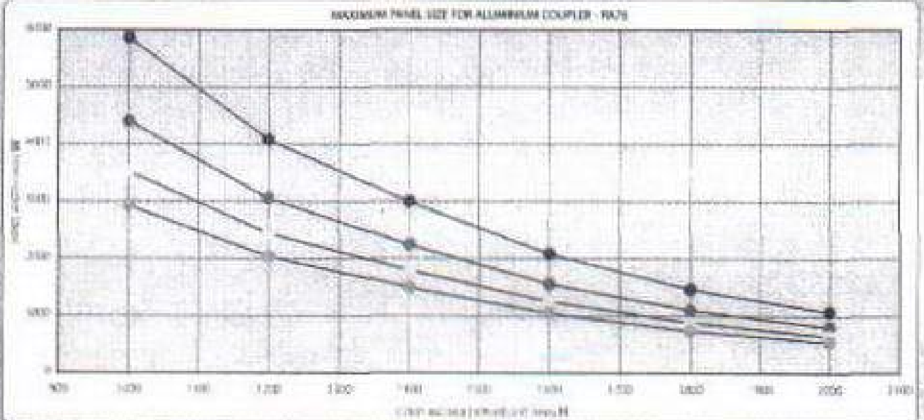


NB maximum panel width is equal to the combination of both frames and the 4mm RA76 Coupling Profile.

Information is not applicable to conservatories. Coupled frame must be fixed to brickwork at either side using standard regulated window industry fixing practices.

The wind loading only sections are considered to be laterally restrained by glazing panels and/or transoms.

None of the calculated maximum panel values include the strength of the two outer frames which will make a contribution to the combined strength.



PVC-U Windows in Fires

Information from [illegible]

Introduction:

[illegible]

Building Regulations:

[illegible]

Ignition and burning response:

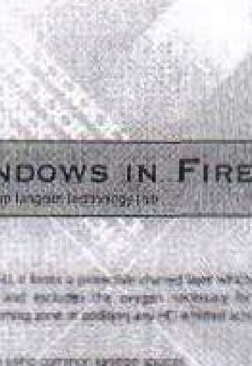
[illegible]

The conclusions are clear:

[illegible]

Smoke and fumes:

[illegible]



[illegible]

Fire resistance:

[illegible]

Large scale fire tests:

[illegible]

The conclusions of the report were:

[illegible]

Summary:

[illegible]

Sound Transmission Through Windows

(NRC Canadian Building Digest, article by J.D. Quirt)

Introduction:

In addition to their primary function as visual openings, windows also transmit sound. This is of concern not only for the exterior surfaces of a building but also for interior applications ranging from office doors to control booths in recording studios. Sound transmitted through windows often limits the overall acoustical insulation.

Sound transmission through windows is governed by the same physical principles that affect walls, but practical noise control measures are influenced by the properties of glass and the characteristics of the window assemblies. Increasing the glass thickness, for example, gives greater noise reduction at most frequencies, but the stiffness of glass limits the improvement. Using multiple layers (double or triple glazing) increases noise reduction at most frequencies, but this is dependent on the separation of the layers.

As with other building assemblies, transmission of sound through cracks may drastically reduce the effective noise reduction. This is of particular concern for operable windows; even windows with good weather-stripping have reduced noise reduction because of air leakage. Most of the data presented in this report are for sealed windows.

The acoustic terms used in this report are as follows:

decibels (abbreviated to dB)

Sound Transmission Loss (TL) which is a standardised measure of the noise reduction in decibels for specific frequency ranges.

Sound Transmission Class (STC) is a single figure rating of sound transmission, calculated by fitting a standard contour to the TL data. It is most commonly used in North America.

Sealed single glazing:

The TL for a large thin pane would theoretically increase by 6 dB for each doubling of the sound frequency or the mass if the effect of stiffness was ignored. Although single glazing does approach this "mass law" behaviour at some frequencies, the stiffness of the glass and the limited size of typical windows cause significant deviations from this prediction (see fig. 1 on page 23).

The sharp decrease in TL at specific frequencies is called the "coincidence dip" and is caused by bending waves in the glass panel. Above the coincidence frequency, laminated glass can provide much higher TL than solid glass. This is apparently due to damping (dissipation of vibrational energy) by the plastic interlayer.

Sealed double glazing:

The TL of double glazing is strongly dependent on the features of the cavity between the two layers of glass. The STC rating increases as the air space increases (see fig. 2 on page 23). For each doubling of the air space, the STC increases by approximately 3. The STC also increases with increasing glass thickness.

If the separation between the panes is small, the STC rating is only slightly higher than that for a single pane of the same glass. This occurs because the air in the space between the two panes acts like a spring, transferring vibrational energy from one pane to the other. This resonance falls within the range of 200 to 400 Hz for a unit with a small air gap (see fig. 3 on page 23). Most of the energy from aircraft or heavy traffic falls within this frequency range, but by increasing the air space and using heavier glass, the resonant frequency can be lowered to improve the insulation against such noise sources.

Sealed triple glazing:

Despite the widespread belief that adding another layer of glass must be beneficial, triple glazing provides essentially the same noise reduction as double glazing unless the air gap is very large. **Figure 4 (on page 23)** compares TL data for a double glazed window with that for a triple glazed window of similar total thickness.

Designing for noise control:

In most cases where substantial noise control is required, double glazing is the most sensible choice. The airspace should be sufficiently large to provide the desired TL.

Using differing thicknesses of glass for double glazing gives greater noise reduction. The highest STC values shown in figure 2 are for double 6mm glass windows with 3mm substituted for one of the 6mm panes would have equal or higher STC ratings.

The use of laminated glass has also been shown to reduce sound transmission.

Figure 1.
Sound transmission loss (TL) for sealed single glazing

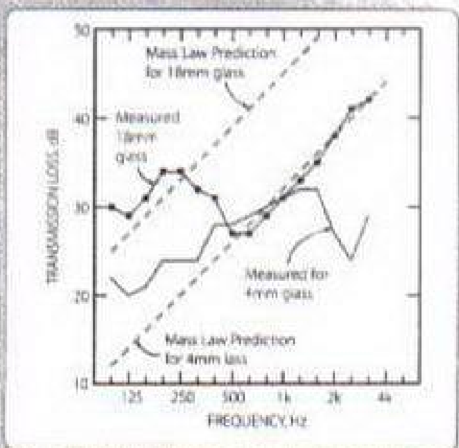


Figure 2.
Sound transmission class (STC) versus interpane spacing for double glazing

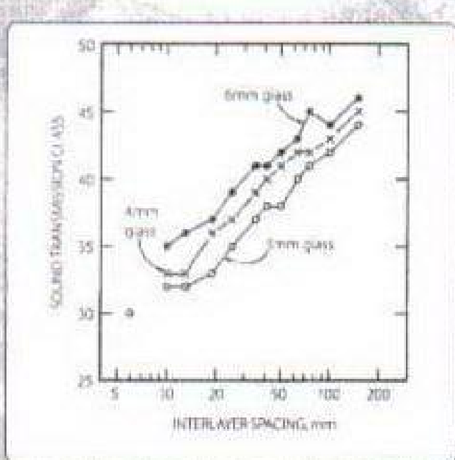


Figure 3.
The effect of a small airspace on TL of double glazing

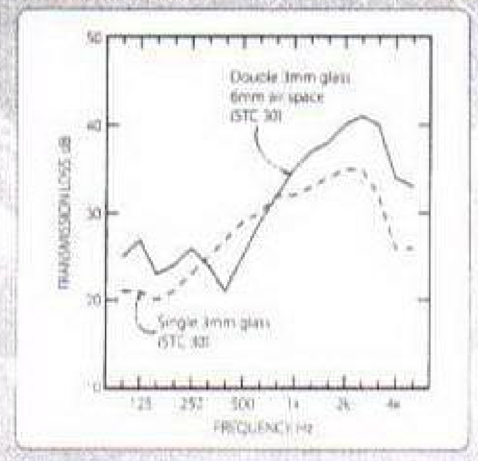


Figure 4.
TL of double and triple glazed windows