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Architectural Specification Manual

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1.1 Introduction

lumaglass

1.0 Background

U Profile Glass has been produced for over 40 years and is accepted as a standard building component for small and large scale construction projects. The glass channel is a cast glass formed through computer-controlled furnaces, consistently producing glass of the highest quality and to accurate dimensions.

The U-Shape confirguration of the glass produces a high structural strength within the channel, allowing it to be installed at high level or in large units without the need for additional horizontal or vertical supports. The system offers outstanding performance giving high levels of light permeability, exceptional sound and heat insulation.

Architects, interior designers and building specifiers the world over have advised us of their challenges to create innovative, visually arresting, functional and uninterrupted walls of light for all interior and exterior building applications. We have responded and introduced the all new Lumaglass™ system, a design solution that delivers visual impact and provides the necessary energy efficiencies, light continuity and sculptured shape no other provider can technically fulfill.

Lumaglass™ is a simple yet effective concept of self-supporting U-shaped glass channels and electroluminescent or LED lighting with various colour options, adhered to the inside flange of the channel. This is fitted into an extruded aluminium perimeter frame that enables the creation of many innovative and exciting architectural designs.

Similar to U-profile glass, electroluminescent lighting has been around for many years, in fact, it's low energy consumption was used on Nasa's Lunar Lander modules in the late 1960's, and is a well proven lighting technology.

Combining two proven materials offers a fundamental simplicity and versatility permitting the designer exciting architectural effects that make imaginative use of internal illuminated partitions, creating a feeling of space, and, defining stunning external facades.

Lumaglass™ / Westcrowns Contracting Services Ltd

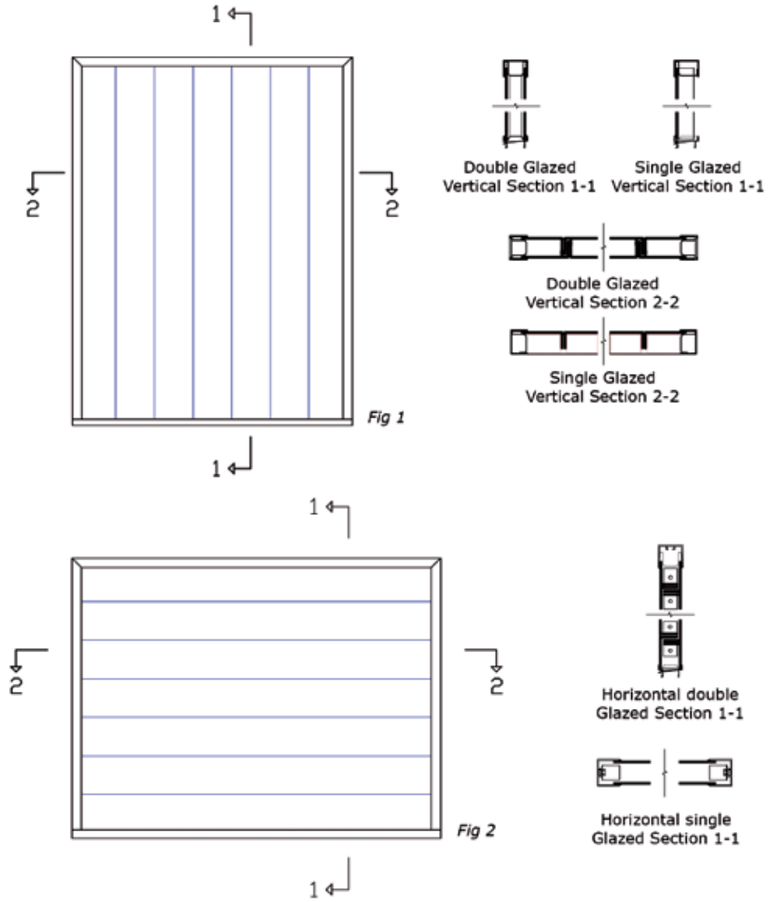
Lumaglass™ Architectural Glazing was formed in 2006 as a division of Westcrowns Contracting Services Limited.

As an innovative product, Lumaglass™ is a natural evolution for the company's established U-shaped profile glazing system. Working closely with architects and designers, we have learned to keep an open mind with our technical expertise in the field based on 140 years of glazing experience within The Westcrowns Group. Aiming not to pay lip-service to a design brief but rather to rise to the technical and creative challenge of delivering practical, but no less impressive, illuminated solutions.

With many years of experience in the design and development of U-shaped glazing systems, combined with a unique electroluminescent or LED lighting technology, the Lumaglass™ team is acknowledged as the experts in their field of illuminated profiled glass. With qualified engineers, CAD facilities, on-site and off-site testing experience, Lumaglass™ offer your project team real expertise and advice on a vast array of possible illuminated glazing systems.

1.1 Glossary of Terms

Plank / Panel –	A length of Profiled Glass.
Vertical Assembly –	A glazing system where the individual planks are installed at 90˚ to the horizontal. *(See Fig 1 below)*
Horizontal Assembly –	A profiled glass glazing system where the individual planks are Installed horizontally. *(See Fig 2 below)*
Vertical Glazing –	Glazing installed at true vertical or 10˚ degrees either side of true vertical.
Sloping Glazing –	Glazing installed between horizontal and 75˚ from horizontal.
EL Lamp –	Electroluminescent light.
Candela M^2 -	The measure of luminance
Inverter -	Technology used to convert DC power to AC.



2. Product Description

2.0 Components - The Lumaglass™ System

The simple concept of self-supporting glass channels and electroluminescent or LED lighting, within an extruded aluminium perimeter frame enables the creation of many innovative and exciting architectural designs. With few components and a practical design process, the Lumaglass™ system combines versatility with exceptional performance to produce an outstanding illuminated glazing product.

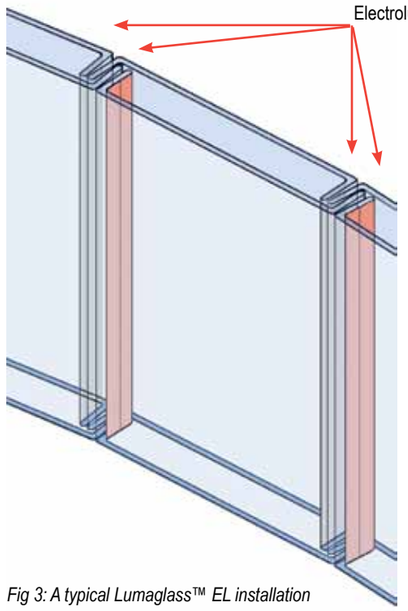


Fig 3: A typical Lumaglass™ EL installation

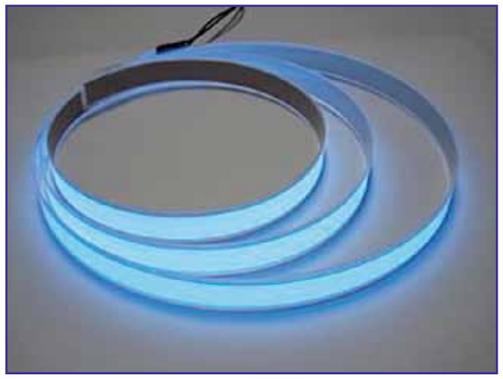


Fig 4: An Electroluminescent Lamp

2.1 Lighting Options

Electroluminescent Lighting

Electroluminescent (EL) technology centres around organic phosphor crystals laid down on a thin aluminium substrate and sandwiched between a clear top electrode. The lamps are manufactured in widths of 76cm and length of 365m creating the world's longest lamp. The master roll is split to the desired width and cut to the desired glass channel length and encapsulated in a protective laminate that creates a flexible 0.7mm thick lamp.

Electroluminescent lights must be illuminated with alternated current using the Lumaglass™ Power Supplies. These have been specifically developed to power our EL lights at the most efficient ratings, and MUST be used for proper operation of the product.

At the nominal recommended operating parameters for high brightness applications, the light is driven by 280 VAC at 650 Hz. The maximum current draw at this brightness is 3.75 Amps. For lower brightness applications, the voltage and frequency may be reduced, to the point where 120 VAC at 60 Hz is all that is necessary to light the product for night light installations.

Electroluminescent light is not directional and therefore hard to compare with (thermal) light sources measured in lux. EL film produces single-frequency (monochromatic) light that has a very narrow bandwidth, is absolutely uniform and visable from a great distance.

The output of the EL lights is measured at the surface of the light in units known as Candelas M^2. At full brightness, our unfiltered green-blue EL lights have an average luminance of 120 candelas M^2. The unfiltered white EL light has an average luminance of 102 candelas M^2.

It is important to note that electroluminescent light is a source intended to be seen, not to see by, so is best suited for lower ambient light conditions.

Basic Colours

As mentioned above Lumaglass™ lighting is produced in two stock colours: green/blue and white. The “White” light has a pink hue when not illuminated and the green/blue light is an off-white when not illuminated.

- The “Green/Blue” utilizes a mix of natural Blue and Green phosphor crystals which, combined, give the best brightness and life available.
- “White” is achieved by adding a dye to the phosphor mix during manufacturing.

When energized, the Blue/Green colour is shifted by the dye, to appear as a pure White colour of 5400 degrees Kelvin.

Colour Filters

By using filters a variety of coloured lights can be achieved by adhereing a coloured gel to standard green/blue or white electroluminescent lights. Ten basic SKU (stock kept units) colour overlays are below. Other gels are available on request and can be matched to any Pantone™ code.

Fig 5: Gel colour chart

Light Emitting Diodes - LEDs

Where electroluminescent lamps are essentially phospher crystals, light-emitting diodes (LEDs) are a semiconductor light source and are available across the visible, ultraviolet and infrared wavelengths, with very high brightness.

LEDs come in different formats from the single LED you would find on electronic equipment indicating on/off. to a flexible surface mounted device (SMD) or “flexstrip” containing 60 LEDs per metre.

An LED Flexstrip

Section 2 - Product Description

The flexstrip of LEDs we use are either 3528 (3.5mm x 2.8mm) or 5050 (5mm x 5mm) LED chips. The flexible SMD 3528 LED strips consist of one LED light emitting chip per lighting source, where as the more powerful flexstrip features 3 chips (RGB) in one housing. The number of LED chips per metre we can use range from 60 to 90 to 120m.

3528 Chip

5050 Chip

Colour And Colour Temperature

Single colour LED flexstrips are available in white, red, green, blue and amber. The 5050 RGB flexstrip provides for full colour changing options, either to select a specific colour , or for programmed colour changing modes.

White LED flexstrip are available in a variety of colour temperatures and it is often asked, “which white LED is right?”

It is suggested that most people tend to prefer “warm white” light as we have been conditioned to find warm appearing lamps “normal” at low lighting levels since it mimics the colour of fire which we have used for thousands of years.

A standard incandescent lamp has a slightly yellowish “warm” white light while halogen lamps are “whiter”. Although different lamp manufacturers describe the light colour in different ways, the “colour temperature” is the best guide to white light.

Why is “Colour Temperature” Important?

Colour temperature of light sources is measured in degrees Kelvin (symbol: K). Different colour temperatures are useful for different lighting purposes. It is just a case of understanding the different colour temperatures available and matching the right LED and u-profile glass finishes to the right application.

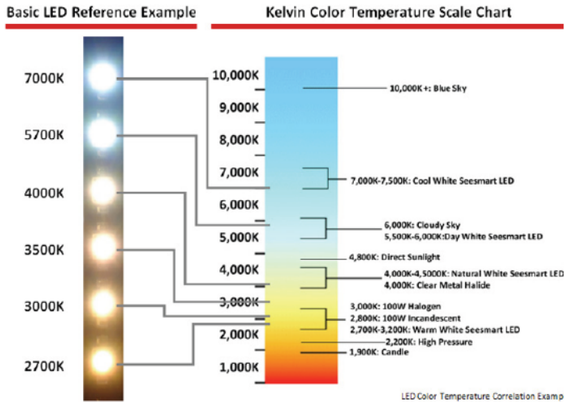
White LED options:

Warm White: 2,700K - 3,000K. This white gives off yellowish light and helps enrich warm colours.

Neutral White: 4,000K - 5,000K. Neutral white looks crisper under higher colour temperatures and appears more “normal” in high lighting situations.

Pure White: 5,500K - 6,500K. Pure white gives off a bluer white that improves our ability to see contrasts.

Cool White: 7,000K + - Cool white (“daylight”) appears to be cooler or bluer and might be used where high quality colour rendition is required.



2.2 Glass


Cast Unwired Sandblasted


Cast Unwired Sandblasted Low Iron


Cast Wired Sandblasted Low Iron


Clear Unwired Sandblasted


Macro Sandblasted


Slimline Sandblasted


Wave Unwired Sandblasted


Cast Wired


Cast Unwired


Cast 16 Wires

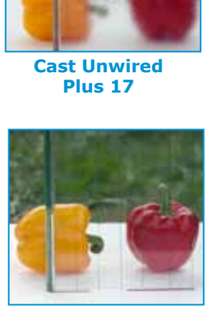

Cast Unwired Plus 17

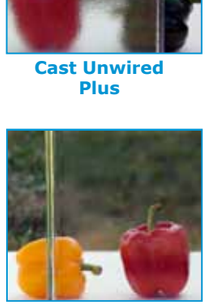

Cast Unwired Plus

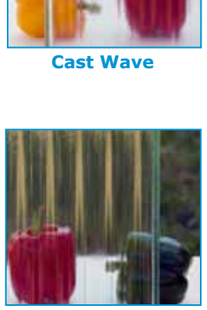

Cast Wave


Cast Unwired Low Iron


Wave Unwired Low Iron


Clear Wired


Clear Unwired


Clear Wave Wired


Slimline


Macro

Glass

Two main ranges of the glass are available - the Normal Profile (NP) system for standard glazing applications and the Special Profile (SP) system where the installation must withstand high lateral loads. By varying the profile in width, flange depth and thickness, the correct profile can be found for most installation.

All glass types are available with or without stainless steel, longitudinal wires, providing a level of safety and security properties appropriate for the application.

Our glass is available in an almost infinite combination of finishes, above are some examples. For more information or to receive sample glass panels, please contact our technical department on 0141 613 6060.

Note: To provide an even wash of light, the internal face of the channel is sandblasted or translucent glass fibre insulation introduced, to diffuse the light.

2.3 Aluminium

The aluminium perimeter framework consists of a simple periphery channel system incorporating locating plastic inserts for the glass. The complete aluminium profile range is extruded from high-grade aluminium, which allows for easy curving of the system. The frames can be anodised or powder coated in a full range of architectural colours.

The aluminium profiles are available in two main ranges to fit both the NP and SP glass types, with a variety of extrusions to suit any installation condition. Profiles that incorporate a thermal break to prevent cold bridging through the glazing system are also available. The impact and weather resistant plastic retaining insert locates the glass within the aluminium frame, preventing glass to metal contact. The simplicity of the aluminium framework, with the small number of components, allows for a quick and easy installation process.

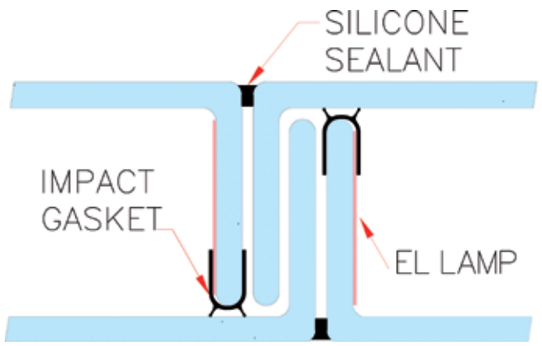
2.4 Silicone

The sealant used is a high quality translucent silicone, which picks up the natural tint of glass. The sealant is applied to all joints, i.e. glass to glass, aluminium to glass and aluminium to building structure, providing a completely weather tight seal to the system. The silicone recommended is a one-part moisture curing sealant. The sealant has outstanding durability, resisting chemical and atmospheric deterioration.

2.5 Impact Gasket

The impact gasket is used to enhance the acoustic and safety properties of the glass in the system. To improve the acoustical properties to a maximum, gaskets #165 and #166 should be used.

Fig 6: Shows basic assembly



2.6 Glass Types and Sizes

To identify the most suitable glass type for a particular application, the following criteria must be taken into account: -

- Performance requirements
- Aesthetic considerations

Structural and Wind Loading Requirements

Two main ranges of Lumaglass™ glass are available - Normal Profile (NP) for standard glazing applications and Special Profile (SP) where the system must either withstand high lateral loads or be installed in large spans. Please refer to the Installation Design Options section for the wind load and admissible span tables, on page 35.

Performance Requirements

The Requirements of Part L (England and Wales) and Section 6 (Scotland) of the Building Regulations can be complied with by using U-profiled glass that uses a hard, low-e pyrolytic surface coating applied to the internal surface of the glass channel. This provides improved thermal insulation properties giving a U-value of 1.8W/m^{2}K that will meet the 2.2W/M^{2}K requirement of the Building Regulations.

For improved thermal insulation properties of 1.4W/m^{2}K, the option on a bespoke white woven glass fibre insulation material can be inserted in the dual glazed cavity. This permits for a similar even wash of light across the glass with additional benefits of improved solar heat reduction, good “day lighting” and added sound reduction.

The Requirements of Building Regulations relating to human impact safety; Part N (England and Wales) and Section 4 (Scotland) can be met by using U-profiled glass that incorporates longitudinal and stainless steel wires within the body of the glass channels. By using the wire-line product together with the impact gaskets ensures that the risk of injury is reduced.

Aesthetic Considerations

Sandblasting - To provide a more translucent finish to all non-coated standard glass types, all standard glass types are available with a sandblasted finish to the internal surface of the glass channel. This will give a more opaque finish and we recommend using the sandblasted finish to achieve an even wash of light.

Solar Heat Gain & Daylighting - Specific metal oxide coatings may be applied to the internal surface of the glass channels to provide decorative or coloured finishes i.e. Amethyst. Alternatively, a woven glass fibre insulation material placed within the double glazing system provides an improved solar heat reduction and good “day lighting”.

Painting - For a more bespoke range of colours, it is possible to apply a ‘wash coat’ of translucent enamel paint to the sandblasted surface. This procedure creates a coloured tint to the glass but still allows for light transmission through the glass channels. We have previously used this technique to create coloured walls of glass and specific logos and designs. Alternatively, it is also possible to apply an acrylic resin coat to the surface of the glass, offering a wide range of colours which can be colour matched using a creative resin software, and effects including metallic, transparent and marble.

Filming - Adhesive backed polymeric films can be applied to the inner surface of the channel glass. The films can offer solar control performance, improved u-value, as well as safety and security.

STANDARD GLASS TYPES	Normal Profile		Special Profile		
	NP26	NP3*	SP2	SP26	SP3*
Width (w) mm	262	331	232	262	331
Flange height (h) mm	41	41	60	60	60
Glass thickness (t) mm	6	6	7	7	7
Weight kg/m^2.	19	18.2	25.5	24.5	22.5
Number of longitudinal wires at 25mm centres	8	10	7	8	10
Number of longitudinal wires at 15mm centres	16			16	
Maximum Lengths in metres	7.5	7.5	7.5	7.5	7.5

- Please contact our technical department regarding the feasibility of using these glasses on particular projects via info@lumaglass.co.uk

Section 2 - Product Description

Tolerances

w	+/- 2.0mm
h	+/- 1.0mm
t	+/- 0.2mm

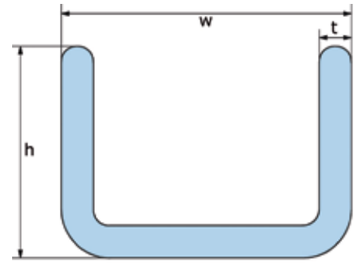


Fig 7: shows basic profiled glass

The glass is available in a variety of different stock lengths - from 2 metres to 7.0 metres, in 0.5 metre increments. The height of the glazing is dependent upon the type of installation, i.e. whether horizontal or vertical, internal or external, and the anticipated wind loading. A guide to the admissable heights is contained within the Installation Design Options section.

Available Lumaglass™ Glass Types

KEY Y Standard Production
S Special Production
N Currently Unavailable

	NP26	NP3	SP2	SP26	SP3
Standard Wired	Y	Y	Y	Y	Y
Standard Non-wired	Y	Y	Y	Y	Y
Amethyst (blue) Wired	Y	N	N	Y	N
Amethyst (blue) Non-wired	Y	S	N	Y	N
Clear (no surface ornamentation) Wired	S	N	N	S	N
Clear (no surface ornamentation) Non-wired	S	N	N	S	N
Clear Amethyst (no surface ornamentation) Wired	S	N	N	S	N
Clear Amethyst (no surface ornamentation) Non-wired	S	N	N	S	N
Sandblasted Standard Wired	Y	Y	Y	Y	Y
Sandblasted Standard Non-wired	Y	Y	Y	Y	Y
Sandblasted Clear (no surface ornamentation) Wired	S	N	N	S	N
Sandblasted Clear (no surface ornamentation) Non-wired	S	N	N	S	N
Toughened Sandblasted Clear (no surface ornamentation)	Y	Y	Y	Y	Y
Toughened Clear (no surface ornamentation)	Y	Y	Y	Y	Y
Sandblasted Wave	Y	N	N	Y	N
Sandblasted Macro	Y	N	S	Y	N
Sandblasted Low Iron	S	S	S	S	S
Sandblasted Slimline	Y	N	S	Y	N

Physical Properties

Optical

As natural light is an essential factor in the internal environment of a building, the incorporation of the U-profiled glass system is therefore ideal to transmit the maximum amount of daylight, without compromising the thermal or weathering performance of the external skin. The light transmission levels of uncoated glass are between 86% and 75% depending on whether the system is single or double glazed. The use of coated versions such as sandblasting or insulation would reduce the light transmission.

The absence of any intermediate horizontal and vertical framing sections ensures that our U-profiled glazing system will always provide the maximum light transmitting surface area for any glazed opening, with the cast surface of the glass allowing the light through to the designated area.

For increased vision through the system, glass type Clear can be incorporated. This specially produced, smooth surfaced glass can provide a higher level of vision, whilst not quite producing the same level of transparency as float glass.

Acoustic
Noise is recognised as a serious health hazard within the working environment. Our U-profiled glazing system using SP double glazing with gaskets #165 and #166 can provide a sound insulation level of up to 41 dB, which compares favourably with any high specification glazing system.

Thermal Insulation
With over 95% of the system consisting of glass, the issue of excessive heat loss through glazed areas must be addressed. Therefore, two thermal insulation options have been developed by the manufacturers to provide a high level of thermal insulation. The normal profile (NP), when double glazed, will provide a U-value of 2.8 W / m^2K with the special profile (SP) providing a U-value of 2.7 W / m^2K. By introducing one layer of the specially coated glass type Plus into the double glazing and using thermally broken aluminium framing, the U-value can be substantially reduced, as shown below in the table. Alternatively, by introducing a translucent glass fibre insulation material between the double glazed system, the U-value can be significantly reduced, as shown in the table below.

Note:
- Plus glass incorporates a hard pyrolytic surface coating - (low emissivity) , which reduces heat loss through the glass and can provide in double glazing an optimal thermal insulation value of 1.8 W / m^2K. The introduction of this coating with the thermally broken frame can also significantly reduce the incedence of water vapour forming.

The translucent glass fibre insulation material is UV stable temperature resistant (up to 120^0C) and insensitive against humidity. The material scatters incoming light and fills the space between the double glazed system, thus reducing heat loss and improving sound insulation.

Safety
At Lumaglass™ we ensure that every installation is assessed to identify any risk of breakage and personal injury and that the design complies with all applicable building regulations and standards. In conjunction with our parent company, Westcrowns Contracting Services Ltd, we continually undertake extensive testing of the product range to ensure that it meets the current safety standards and legislation.

The Lumaglass™ system, when installed in the appropriate formats, has been tested in accordance with BS 6206: 1981 and can give performance equivalent to Class B or Class C. Please refer to the Product Testing Section for further information on the test reports. If a performance quivalent to Class A is required please contact our Technical Department for details on thermally toughened glass.

Performance Tables	U-value in W / (m^2k)	g-value	Light Transmission
Double glazed without coating	2.8	0.68	0.75
Double glazed standard glass with Plus 1,7	1.8	0.63	0.70
Double glazed standard Antisol	2.8	0.49	0.43
Double glazed standard Antisol with Plus 1,7	1.8	0.45	0.41
Double glazed Amethyst	2.8	0.46	0.40
Double glazed Amethyst with Plus 1,7	1.8	0.49	0.51
Double glazed with Glass Fibre Insulation	1.4	0.43	0.36

Ug Heat Transmission coefficient according to EN673

	Single Glazed		Double Glazed	
	NP	SP	NP	SP
Sound Insulation RW Value (dB) (vertical)	22	25	38(1)	41(1)
U-Value (W/m^{2K}) Standard Glass	5.6	5.52	2.8	2.7
U-Value (W/m^{2K}) Standard Plus Glass (2)			1.8(3)	1.8(3)
Light Transmission (Ave %) Standard Glass	86%	86%	75%	75%
Heat Transmission Standard Glass	78%	78%	68%	68%

(1) These sound insulation figures are using PVC isolating gaskets. Without the gaskets the dB values are 36 and 41 respectively.

(2) Double glazed U-profiled glass is compliant with Documents L and J (Section 6) if Plus glass is incorporated.

(3) The double glazed configuration consists of one plank of glass and one plank of Plus coated glass.

2.7 Testing

The U-profile glazing system has been installed throughout the world for 40 years and has been tested in the United States, Great Britain and Germany.

The main areas of testing have been: air permeability, water tightness and structural performance, sound reduction, thermal performance and impact resistance.

Double Glazed
Product testing was undertaken at the UKAS accredited testing laboratory - Taywood Engineering Ltd. The system was tested in accordance with the Centre for Window and Cladding Technology (CWCT) Standard Test Methods for Curtain Walling.

The system specimen satisfied the following test requirements of the CWCT

Standard:-

Air, Water and Structural Performance Air Permeability - 600 Pascals
Watertightness using static pressure - 600 Pascals
Watertightness using dynamic pressure - 600 Pascals
Wind Resistance - Serviceability and Safety - 1300 Pascals

The system was also tested to the requirements of the new European Dynamic Watertighness Test - DD ENV 13050:2001 - and satisfied the requirements for a design wind pressure of 1300 Pascals.

Single Glazed
The test was carried out at UKAS accredited testing laboratory - Wintech Engineering Ltd. Full CWCT test conducted on a sample panel and all requirements were met. A copy of the report is available on request.

Impact Testing
The Lumaglass™ glazing system has been tested by the glass manufacturer and Westcrowns using the test methodology as set out in BS 6206: 1981.

The tests subjected the glazing system to the pendulum impact test and then appraised the post impact performance, i.e. safe breakage, using the 76mm diameter sphere and the force gauge.

The following glass profiles installed in a double-glazed format satisfies the requirement of Part N (England and Wales) and Section 4 (Scotland) i.e. reducing the risk of cutting and piercing injuries, by either breaking safely during the test or not breaking at all.

Section 2 - Product Description

Impacted at a drop height of 305mm - (Equivalent to BS 6206 Class C)
NP26 Double-Glazed 8 wired - Fitted with impact Gasket SP2 Double-Glazed 7 wires - Fitted with Impact Gasket SP26 Double-Glazed 8 wires - Fitted with Impact Gasket.

Impacted at drop heights of 305 and 475mm - (Equivalent to BS6206 Class B)
NP26 Double-Glazed 16 wires - Fitted with Impact Gasket.

3. Power Supply

3.0 Electroluminescent Power Supplies

The Lumaglass™ EL light system has been designed to operate exclusively with our proprietary power inverters. These units are sized by light area. The largest power supply available can light 80600 cm^2 of Lumaglass™ EL Light. This does not limit the size of applications just the size of the individual electrical circuits. Additional areas can be lit with additional power supplies. By planning your wiring, multiple lights and colours can be supplied by a single power supply, creating aesthetic lighting effects.

3.1 EL Compensating Power Supplies

Standard line voltage does not provide sufficient frequency or voltage to adequately light the Lumaglass™ EL lamps. Therefore, a Lumaglass™ power supply is needed to convert standard line voltage to a higher voltage and frequency. The inverters are wired into a standard 240V spur, and in turn are connected to the light. This can be carried out in a variety of ways depending on the end effect desired.

While a Lumaglass™ EL light will never 'burn out', it will over a number of years gradually become dimmer as it is used. The Lumaglass™ inverters compensate for this dimming by automatically increasing the voltage from its initial setting as the light is used. This patented design extends the useful brightness life of Lumaglass™ lights. As some applications will not require high brightness, the voltage may be set anywhere from 150Vac during the installation. This will lessen the brightness, however, it will extend the useful life of the light.

The Lumaglass™ Compensating Power Supplies Information:

- Will accept Input (Mains) voltage of anywhere from 100 to 250 Volts AC, at either 50 or 60 Hz.
- Can produce output voltage (adjustable) of anywhere from 50 to 330 Volts AC, at 650 Hz.
- Have been tested by both the UL (Underwriters Laboratories) Listed to UL48 standard and found to conformity with the directives required to bear the CE mark.
- Have Fused input voltage protection Electronic Open Circuit and Short Circuit and Ground Fault Interruption Protection.
- Accept external Dimming and Flashing control models through 6-Pin connector.

Model	Dimensions Width x Length x Height	Weight	Max Power	Light Area up to	Linear Length X 45 mm	Linear Length X 31 mm
600N	9.2cm x 21cm x 7.9 cm	1.1 kg	30 watts	645-3900 cm^2	Up to 8.7 m	Up to 12.5m
2200N-A	9.5cm x 26.7cm x 8.3cm	1.7 kg	90 watts	3900-11600 cm^2	Up to 25.8m	Up to 37.4m
2200N-B		1.7 kg	100 watts	11600-16800 cm^2	Up to 37.3m	Up to 54m
12KN-A	23.4cm x 34cm x 10.2cm	3.3 kg	155 watts	16800-22600 cm^2	Up to 50.2m	Up to 72.9m
12KN-B		4.4 kg	240 watts	22600-34200 cm^2	Up to 76m	Up to 110.3m
12KN-C		5.6 kg	390 watts	34200-51600 cm^2	Up to 114.7m	Up to 166.4m
12KN-D		6.7 kg	625 watts	50300-80600 cm^2	Up to 179m	Up to 260m

Section 3 - Power Supply

3.2 LED Power Supplies

The LED flexstrip in Lumaglass are 12V DC, therefore, 12V DC power supplies are employed to driver the flexstrip. These drivers are sized and selected as part of our design process to optimise the configuration depending on the requirements for on / off operation, dimming or colour changing.

The drivers can be located up to 15M away from the screen, can be rated as IP20, IP66 or IP67 dimmable, and are easliy integrated to DMX and DALI lighting controls.

3.3 Lumaglass™ Life Span

Electroluminescent

An EL lamp will gradually fade over time but will never fail to light. There is no end of life because the lamps will never "burn out" completely.

The oldest light known at the time of publishing has run continuously for over 50 years (131,036+ hours). The brightness of the light decays gradually but only for every moment that it is actually turned on. The act of turning EL on and off does not negatively impact on its life as is the case with most other incandescent light sources.

Based on a 40 hour per week duty cycle, with a 170 Volt output setting. We estimate a 9 year useful life is possible. Therefore, at Lumaglass™ we recommend that for the very best appearance the lights should be changed every 18,000 - 20,000 hours. This is not to say that the original lights will not continue to work however their performance will not appear at their very best.

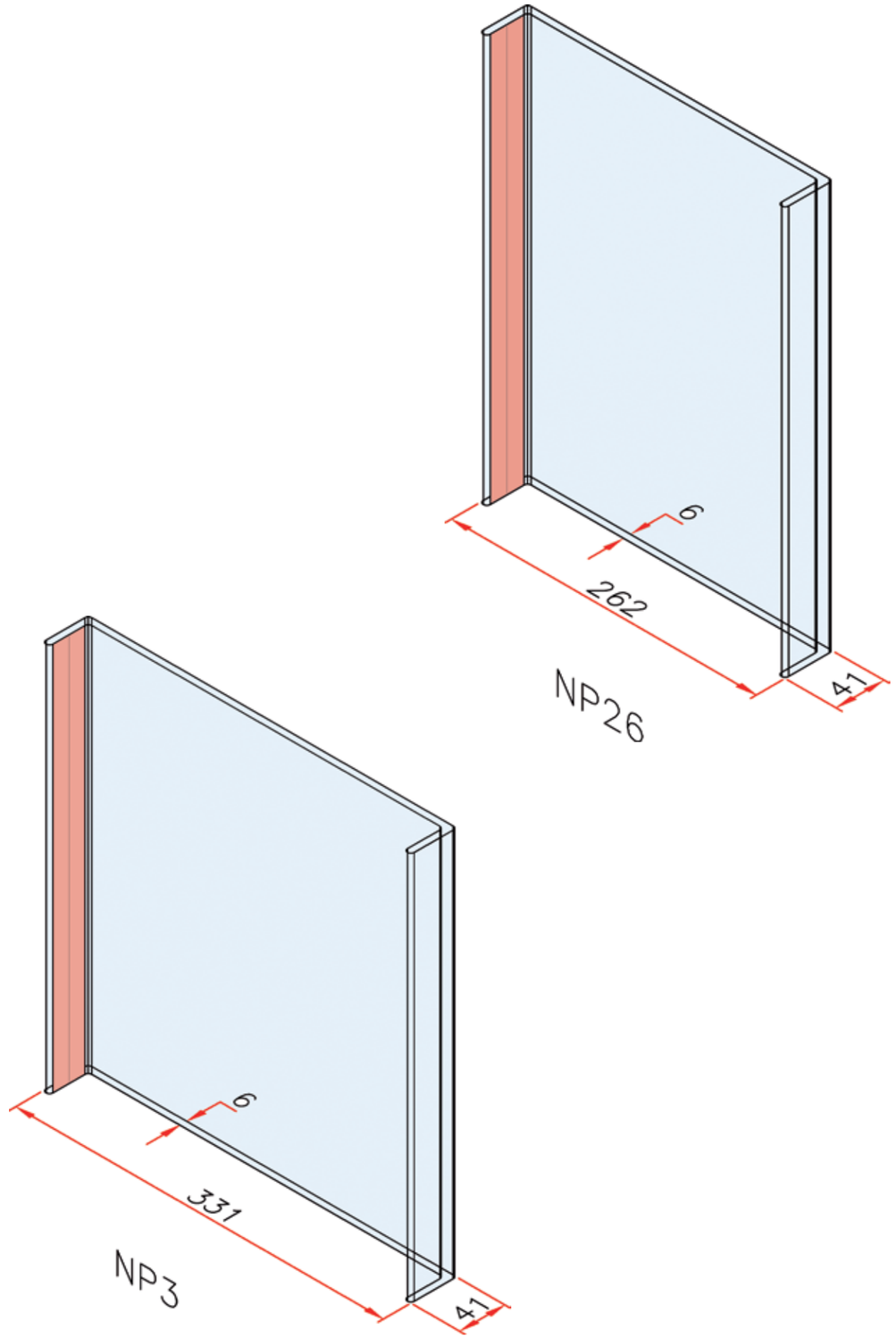
The user and the application determine 'end' brightness of light. What is acceptable brightness in some situations will be too dim for others. Typically aisle lighting and night applications require less brightness than back lighting, for example. An application that can be set initially to lower than normal brightness should be in the interest of light life. For brighter conditions the Lumaglass™ LED option should be considered.

LED

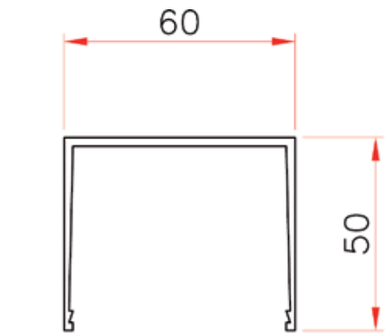
Various LED manufacturers quote between 50,000 to 100,000 operating hours for their LEDs. Based on the same 40 hour per week duty cycle, we expect the Lumaglass™ LED system will still be useful after 18 years.

4.Schedule of Components

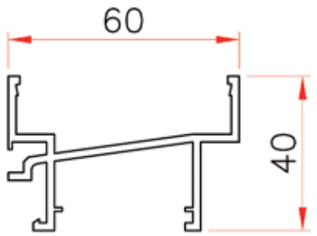
4.0 Normal Profile (NP) - Glass Profiles showing the EL lamp in place.



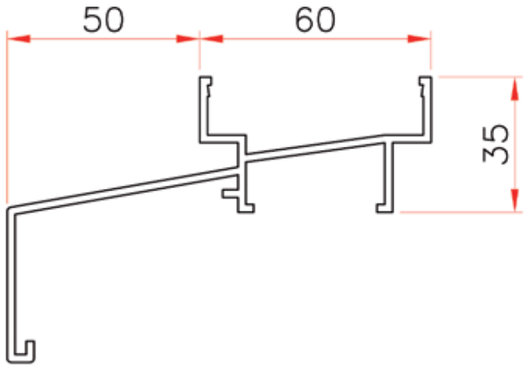
4.1 Normal Profile (NP) - Aluminium Frames



950S FRAME
HEAD, JAMB OR
CILL SECTION

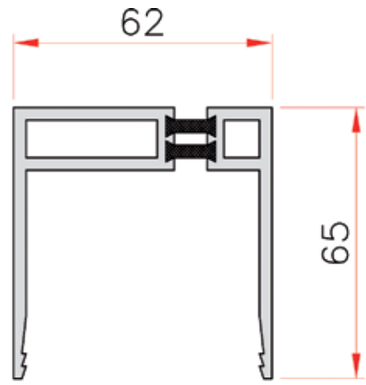


961 FRAME
CILL SECTION

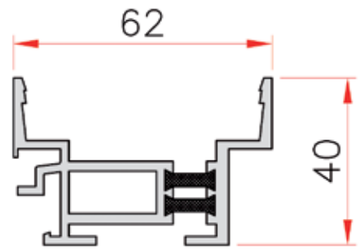


961/50 FRAME
CILL SECTION
ALSO AVAILABLE AS
961/80, 961/100,
961/120, 961/150
& 961/180.

4.2 Normal Profile (NP) - Thermal Break Aluminium Frames

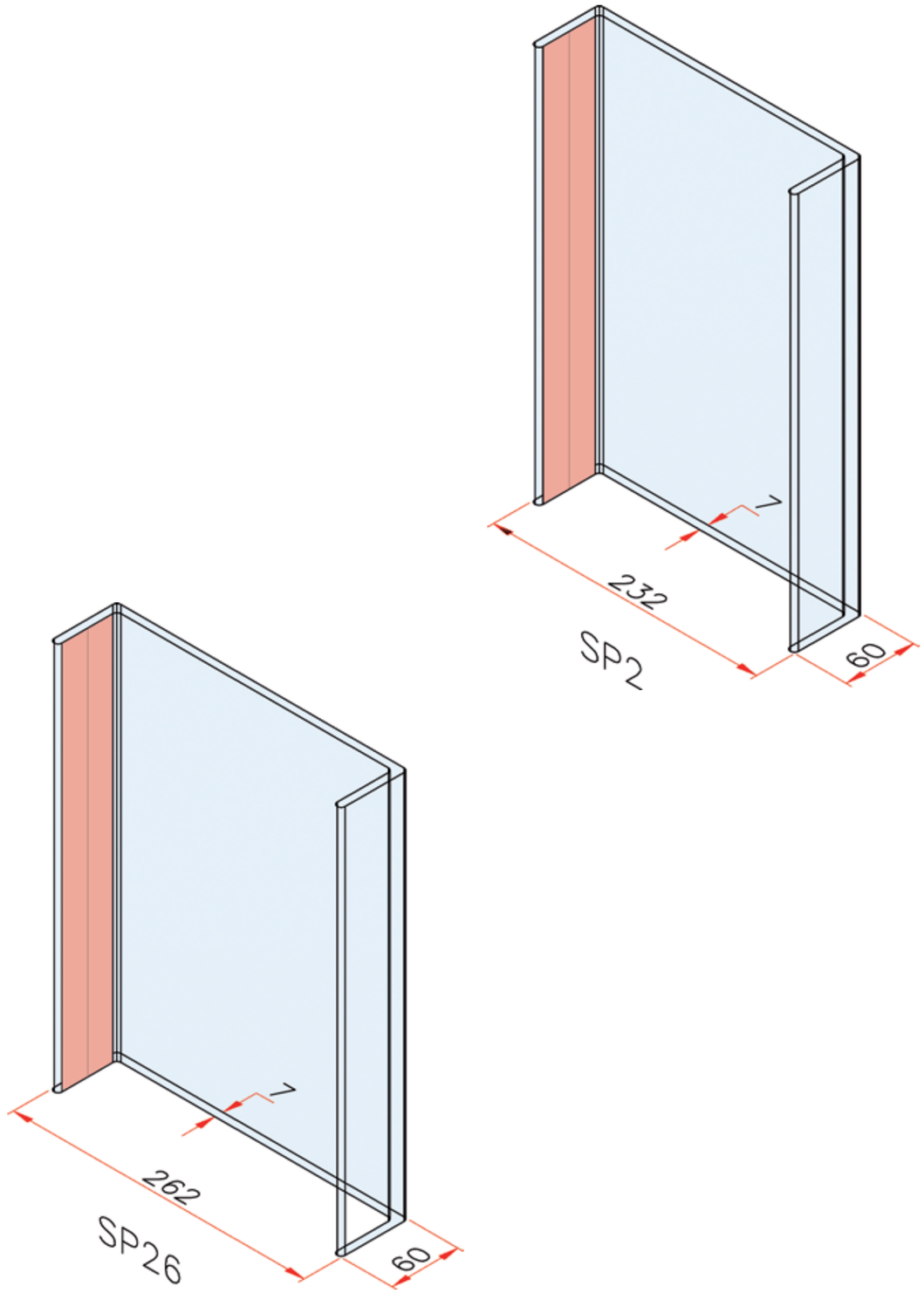


950TB FRAME
HEAD & JAMB SECTION
FOR VERTICAL GLAZING

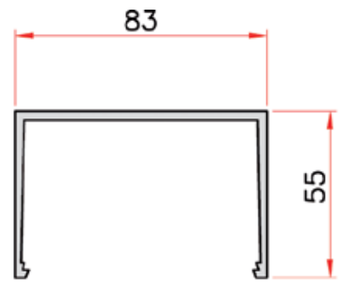


961TB FRAME
CILL SECTION
FOR VERTICAL GLAZING

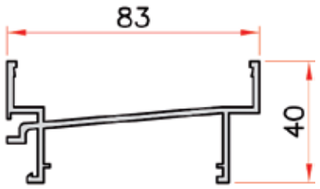
4.3 Special Profile (SP) - Glass Profiles showing the EL lamp in place.



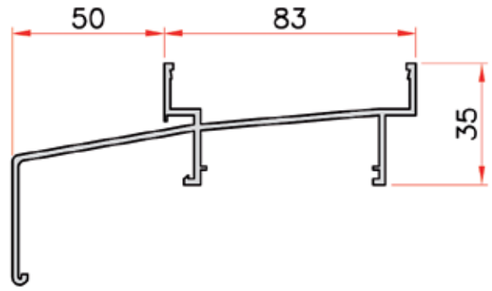
4.4 Special Profile (SP) - Aluminium Frames



980 FRAME
HEAD, JAMB OR
CILL SECTION

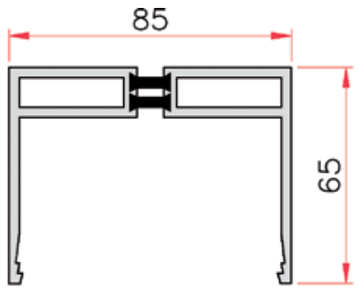


981 FRAME
CILL SECTION

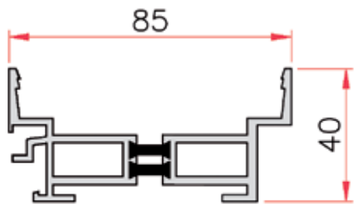


981/50 FRAME
CILL SECTION
ALSO AVAILABLE AS
961/100.

4.5 Special Profile (SP) - Thermal Break Aluminium Frames

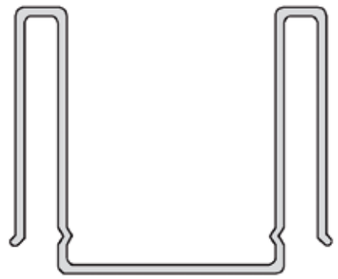


980TB FRAME
HEAD & JAMB FOR VERTICAL GLAZING
USED ON CURVED SCREENS

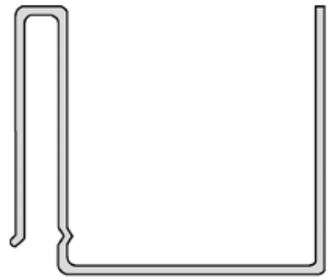


981TB FRAME
CILL FOR VERTICAL GLAZING
USED ON CURVED SCREENS

4.6 Special Profile (SP) - Plastic Inserts



Type 962/2

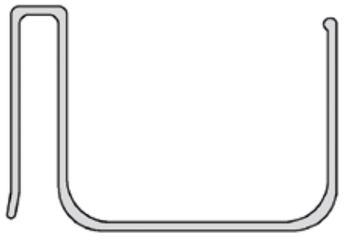


Type 962/1

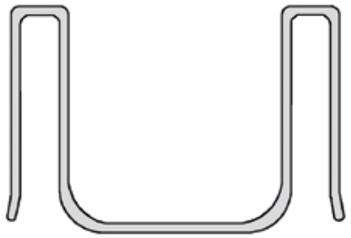
Type 961/2

Type 961/1

4.7 Normal Profile (NP) - Plastic Inserts



Type 980/1



Type 980/2

Type 981/1

Type 981/2

5. Installation Design Options

5.0 Connection Overview

As part of our design services, we optimise the EL or LED flexstrip to be employed, in terms of lamp length, number of lamp assemblies, harness configuration and power unit requirements.

All lamps and harnesses have quick release connectors for an efficient installation process and ease of future maintenance requirements.

5.1 Power Supply Location

Both EL and LED power supplies require 240 Volt spurs to connect to. Although it is preferable to install the EL inverter next to the screen it is possible to locate them up to 90m away in a convenient utility or service room. LED drivers do require to be closer but can be located up to 15m away.

5.2 Installation Options

The installation of the Lumaglass™ system is a quick and simple process, with all components capable of being cut to size on site, efficiently reducing the site measurement time. Lumaglass™ can be installed in double or single glazed format in both vertical and horizontal assemblies. (*Please note this is not the case with toughened Lumaglass™ as the glass can not be cut once toughened*)

Vertical Assembly – Double Glazing

When using this popular method, the main properties of the Lumaglass™ System can be realised, with large installation lengths, optimal U-values and maximum sound insulation levels being achievable.

With double-glazing, the inner and outer shells should be of the same profile. However by using different combinations of colours, pattern and sandblasting attractive architectural effects can be achieved.

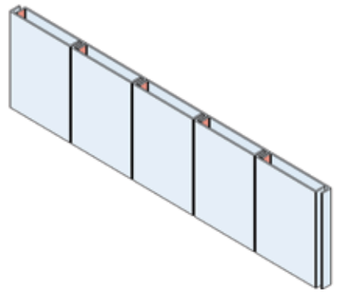


Fig 13 : A double glazed vertical screen

Vertical Assembly – Single Glazing

This method of glazing is the most economical, allowing the maximum transmission of light into a building whilst giving the same outward appearance. When using single glazing with the Lumaglass™ lamps they should be adhered the both flanges to achieve the same effect. However it is restricted in installation height and does not have the efficient U-value properties or good acoustic values of double glazed units. It is primarily used as high-level clerestory glazing, with the flanges installed to the inside.

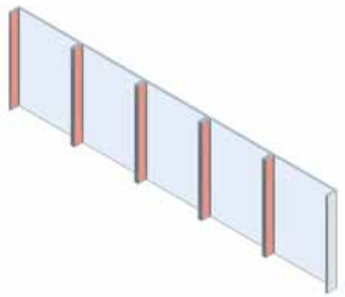


Fig 14 : A single glazed vertical screen

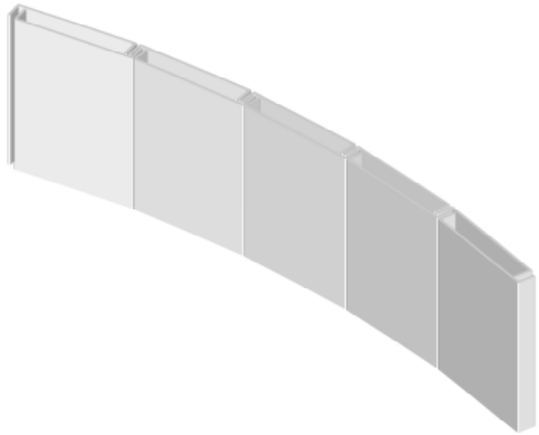
Curved Glazing

In both single and double glazed units the Lumaglass™ system can effectively create curved walls of glass with light of any colour. These channels are simply faceted into a curved aluminium framing.

The narrower the glass panel used in the system, the more effective the appearance. Radii to a minimum of 2 metres can be achieved for internal applications. The use of a specially adapted framework can allow radii of 1 .4m to be achieved for external applications.

If you require more details, please contact the Lumaglass™ technical department regarding the feasibility of any particular project at info@lumaglass.co.uk.

Fig 15 : A curved Lumaglass™ Screen



Horizontal Assembly - Glazing

The horizontal assembly glazing method is an alternative but attractive installation technique where continuous vertical planks can be achieved e.g. staircase cladding.

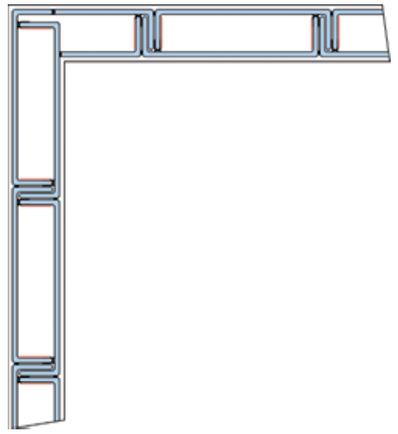
The glass channels are installed horizontally constructing vertical strips of glazing without divisions; the glazing can be single or double glazed, with each channel supported separately within the periphery frame using an aluminium bracketed system.

In this installation format the dead load of the system is transferred to the structure via the vertical framework. For more information please see the Installation Details section.

Glass Corners

With the double-glazed and single-glazed options, it is possible to construct all-glass corners. The glass corners are decorative, inexpensive and present no sealing problems, however, it must be borne in mind that corner and edge zones are subject to higher wind loads and appropriate design measures should therefore be taken into account.

Fig 16 : A corner detail on a Lumaglass™ Screen



Wind Anchors

If the installation heights required are higher than the admissible installation height, a wind rail system may be fitted behind the glazed screen.

Supporting steelwork has to be fitted behind the glazing system to absorb the horizontal wind forces. A specially designed wind anchor is then used to anchor the Lumaglass™ glass planks to the wind rail.

This in no way effects the EL lamps as they are encased within the glass planks system.

This arrangement requires structural calculations and has to be approved by the Lumaglass™ Technical Department.

5.3 Admissible Span Design Charts

Wind pressure N/m²	Maximum span for double glazing in metres				
	NP26	NP3	SP2	SP26	SP3
500	4.49	4.04	7.36	7.1	6.38
750	3.67	3.3	6.01	5.8	5.21
1000	3.18	2.85	5.21	5.02	4.51
1250	2.84	2.55	4.66	4.49	4.04
1500	2.59	2.33	4.25	4.1	3.69
1750	2.4	2.16	3.93	3.8	3.41
2000	2.25	2.02	3.68	3.55	3.19
2250	2.12	1.9	3.47	3.35	3.01
2500	2.01	1.81	3.29	3.18	2.86
3000	1.83	1.65	3.01	2.9	2.61

Wind pressure N/m²	Maximum span for single glazing in metres				
	NP26	NP3	SP2	SP26	SP3
500	3.18	2.85	5.31	5.02	4.5
750	2.59	2.33	4.33	4.1	3.69
1000	2.25	2.02	3.75	3.55	3.19
1250	2.01	1.81	3.36	3.18	2.86
1500	1.83	1.64	3.06	2.9	2.61
1750	1.7	1.53	2.84	2.68	2.41
2000	1.59	1.43	2.65	2.51	2.26
2250	1.5	1.35	2.5	2.37	2.13
2500	1.42	1.28	2.37	2.25	2.02
3000	1.3	1.17	2.17	2.05	1.84

These tables give the maximum installation lengths in metres for vertically installed Lumaglass™ within closed buildings. If greater lengths are required wind anchors are available.

Horizontal double glazed wired

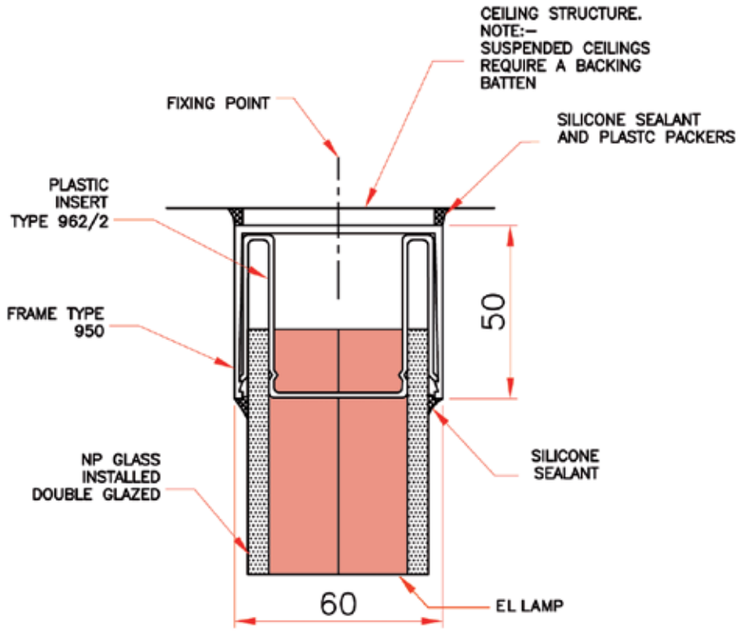
Wind Pressure	NP26	SP2	SP26
600	3.5	4.5	4.5
1000	3.5	4.5	4.5
2000	2.5	4	3.75

The table above gives the maximum installation lengths in metres for all horizontally installed Lumaglass™ using profiled wired glass within a closed building. These figures should be used as a guide only; all design details should be confirmed by the Lumaglass™ Technical Department.

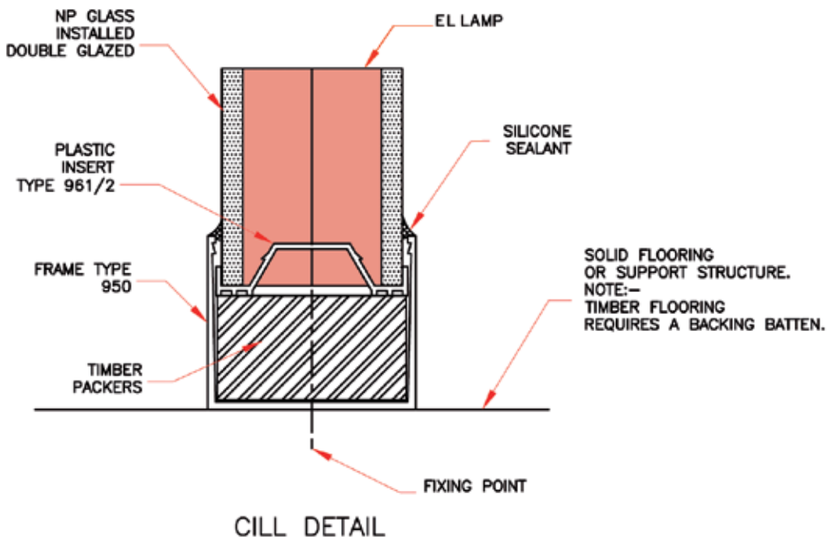
Please Note: These installation lengths may be subject to change. We would recommend contacting our Technical Department via info@lumaglass.co.uk to confirm installation lengths for individual projects.

6.1 Installation Details

6.0 Normal Profile (NP) Head and Base Details – For Internal Glazing

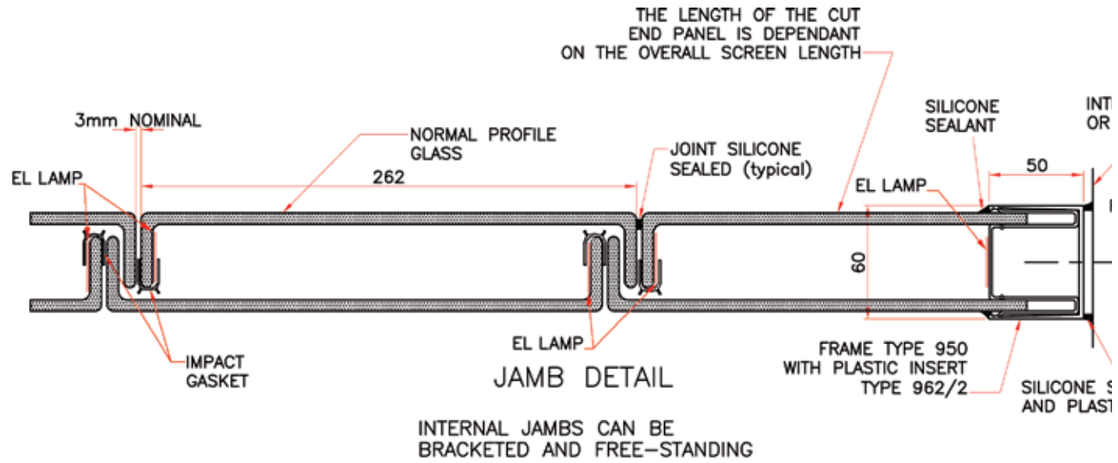


HEAD DETAIL



CILL DETAIL

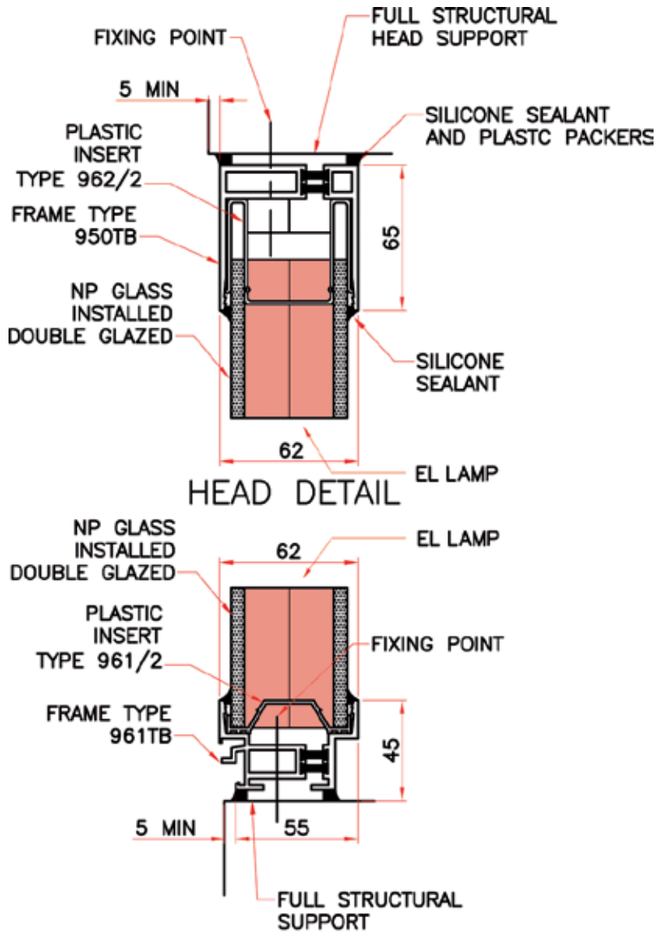
6.1 Normal Profile (NP) Jamb Detail – For Internal Glazing



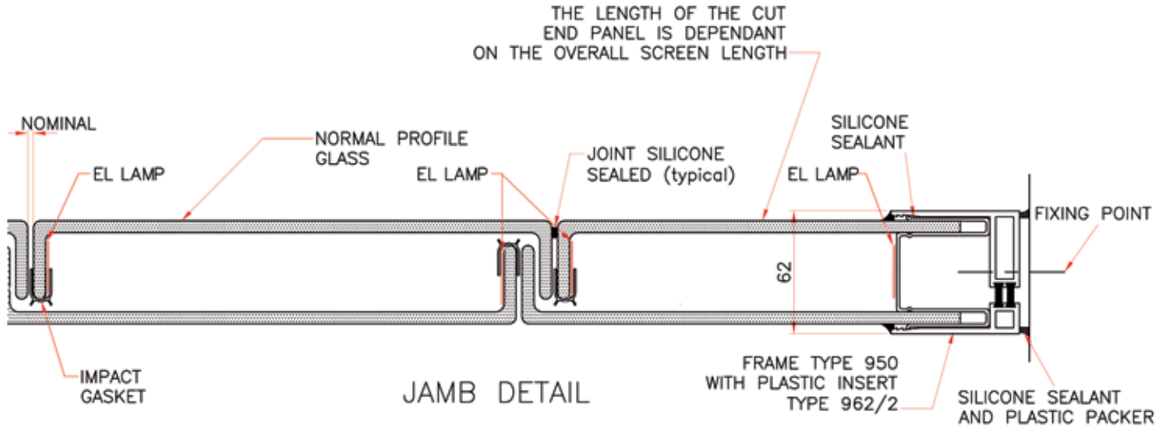
JAMB DETAIL

INTERNAL JAMBS CAN BE
BRACKETED AND FREE–STANDING

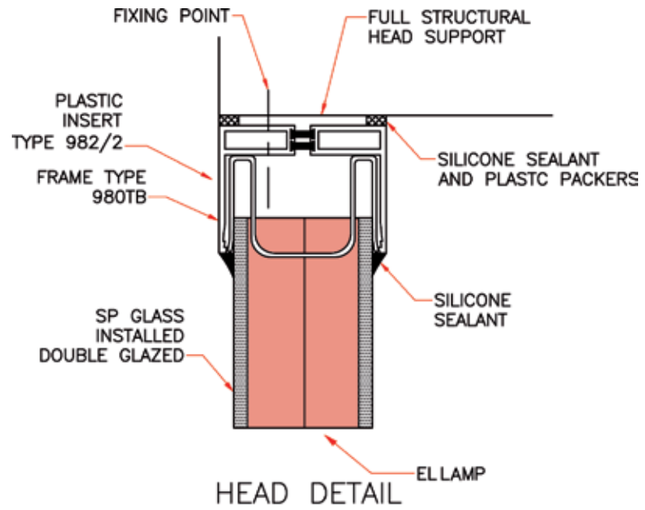
6.2 Normal Profile (NP) Head and Base Details – Thermally Broken For External Glazing



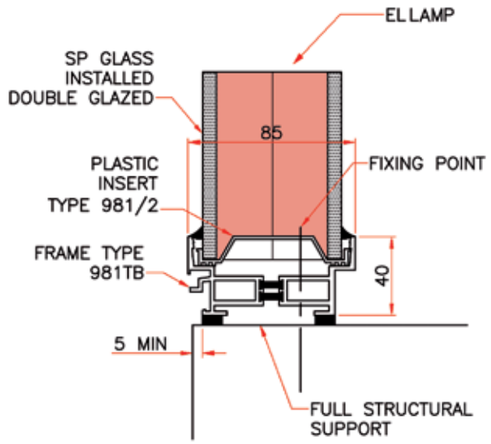
6.3 Normal Profile (NP) Jamb Detail – Thermally Broken For External Glazing



6.4 Special Profile (SP) Head and Base Details – Thermally Broken For External Glazing

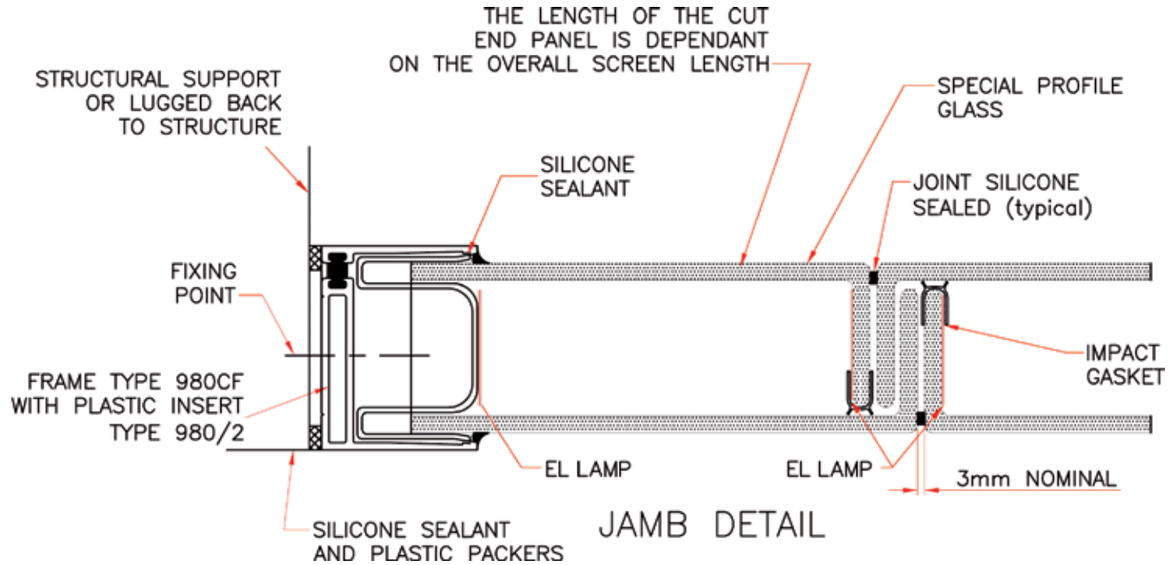


HEAD DETAIL



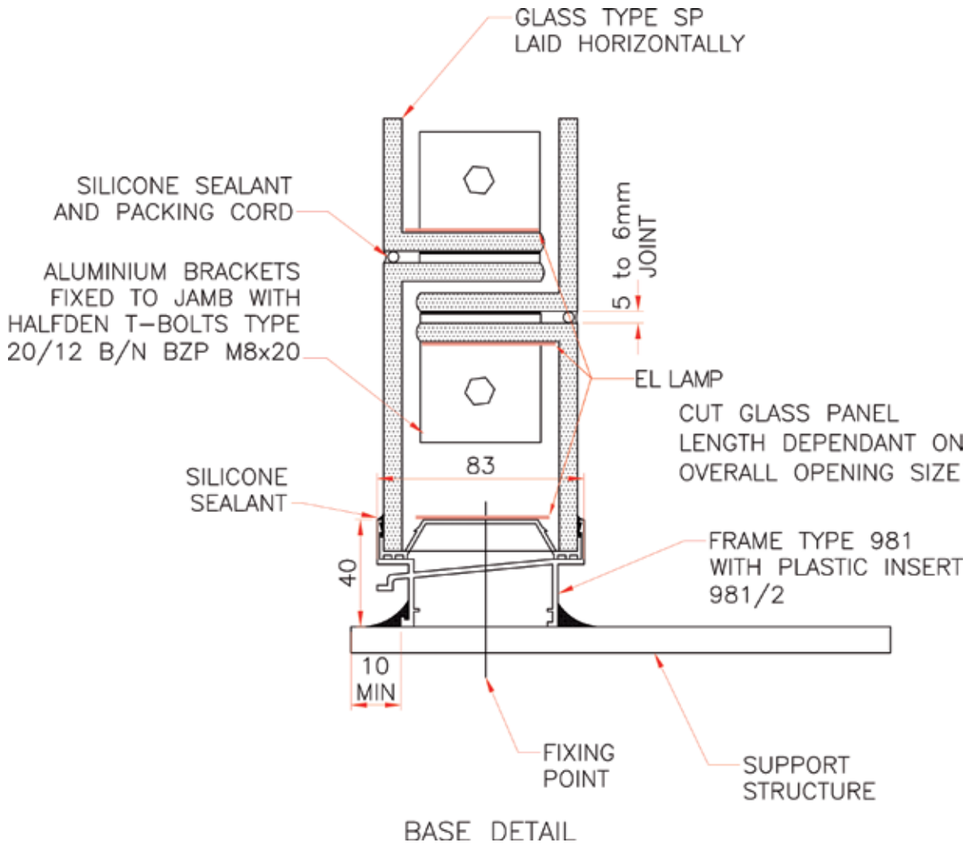
CILL DETAIL

6.5 Special Profile (SP) Jamb Detail – For External Glazing



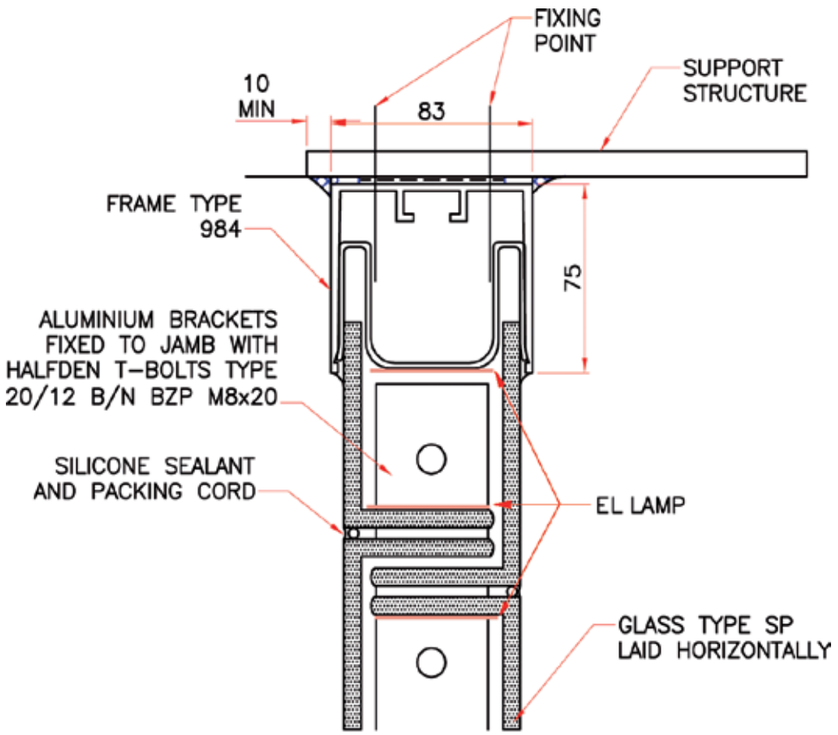
JAMB DETAIL

6.6 Special Profile (SP) Horizontal Base Detail – For External Glazing



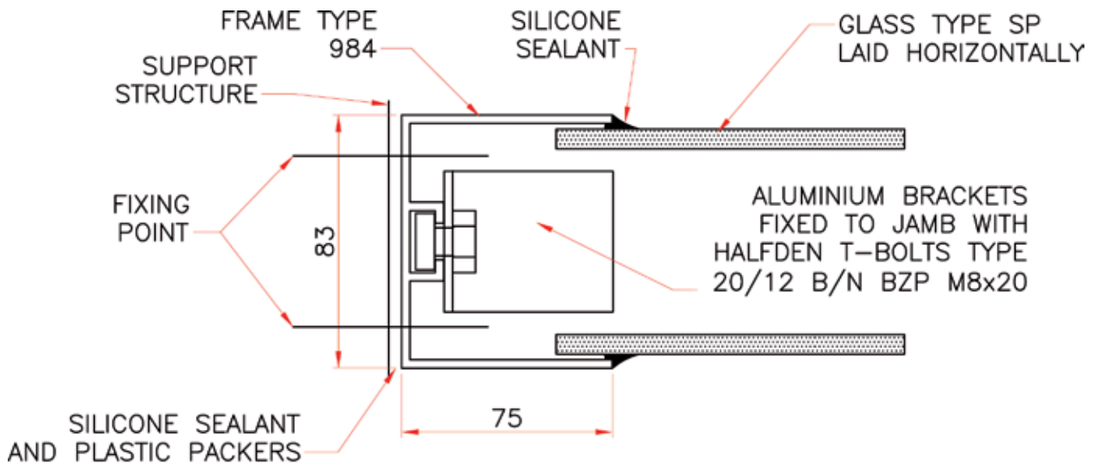
BASE DETAIL

6.7 Special Profile (SP) Horizontal Head Detail – For External Glazing



HEAD DETAIL

6.8 Special Profile (SP) Horizontal Jamb Detail – For External Glazing



JAMB DETAIL

7. Specifications

7.0 For Use in Internal Partitions

H13 STRUCTURAL GLASS ASSEMBLIES

To be read with Preliminaries / General Conditions

For Use in Internal Partitions with LEDs

Type(s) of Glass Assembly:	Lumaglass™ Glazing System
Drawing references:	Architects drawings.
Supporting structure:	As shown on Engineers drawings.
System type:	Glass type – NP26 wired < glass colour and finish >, with < number > number stainless steel wires, installed double-glazed with impact gasket 166. Glass manufactured in accordance with EN 572-7.
Glass channel size:	262 x 41 x 6mm thick.
Lamp type:	LED single colour (White[1], Blue, Green, Red, Amber) or RGB LED
Power module type:	LED 240W driver,
Aluminium frame type:	950 to head, base and jamb.
Plastic insert types:	961/2 to base 962/2 to head and jamb.
Manufacturer:	Pilkington Bauglasindustrie.
Supplied By:	Lumaglass ™, Ashbury House 6 Ashton Road Glasgow G73 1UB Telephone – 0141 613 6060 Fax – 0141 613 6061 E- Mail- info@Lumaglass.co.uk
Impact resistance:	Installed system must meet the requirements for critical glazing locations as stipulated within Approved Document N of the England & Wales Building Regulations.
Fire resistance:	No rating required.
Method of assembly:	Lumaglass ™ glass channels fitted vertically with impact gasket type 166, double-glazed into proprietary aluminium perimeter framing system. Aluminium frame to be fixed to support structure, around extent of structural opening. All materials cut to size on site. All glass to glass and glass to aluminium joints to be sealed with silicone sealant. The Glazing system is to be installed in conjunction with the manufacturer's recommendations.
Weight:	45 kg/m²

[1] White LED colour Temperatures: Warm 2,700-3,000K, Neutral 4,000-5,000K, Pure 5,500-6,500K, Cool 7,000K+.

7.1 For Use in External Screens

H13 STRUCTURAL GLASS ASSEMBLIES

To be read with Preliminaries / General Conditions

For Use in External Vertical Screens with Electroluminescent Lamps

Type(s) of Glass Assembly:	Lumaglass ™ Glazing System
Drawing references:	Architects drawings.
Supporting structure:	As shown on Engineers drawings.
System type:	Glass type – SP26 wired, < glass colour and finish >, with < number > number stainless steel wires, installed double-glazed with impact gasket type 166. Glass manufactured in accordance with EN 572-7. (Should a U value of 1.8 W/m²K be required Plus coating must be specified to the internal pane, or select Timax GL for 1.4 W/m²K)
Glass channel size:	262 x 60 x 7mm thick.
Aluminium frame type:	980TB to head and jamb. 981TB to base
Lamp type:	DFL-150 White or Aqua[1]
Inverter type:	12KN
Plastic insert types:	981/2 to base. 980/2 to head and jamb.
Manufacturer:	Pilkington Bauglasindustrie.
Supplied and Installed By:	Lumaglass ™ Ashbury House 6 Ashton Road Glasgow G73 1UB Telephone – 0141 613 6060 Fax – 0141 613 6061 E- Mail - info@Lumaglass.co.uk
Impact resistance:	Installed system must meet the requirements for critical glazing areas as stipulated within Approved Document N of the England & Wales Building Regulations.
Fire resistance:	No rating required.
Method of assembly:	Lumaglass™ glass channels fitted vertically with impact gasket type 166, double-glazed into proprietary aluminium perimeter framing system. Aluminium frame to be fixed to support structure, around full extent of structural opening. All materials to be site cut. All glass to glass and glass to aluminium joints to be sealed with silicone sealant. The glazing system is to be installed in conjunction with the manufacturer's recommendations.
Weight:	60 kg/m²
Weather Resistance:	External glazing, including jointing and fixing, must be wind and watertight under all conditions with full allowance made for permissible deflections.
Integrity:	Calculate glass sizes, thickness, spans, frame types and location of fixings in accordance with manufacturer's recommendation and BS6399: Part 2 :1997 Standard Method (making due allowance for any internal pressure)to ensure that the glazing will resist all dead loads and design live loads, and accommodate all deflections and thermal movements without damage.

[1] For different colours, please refer to our manual for range of gel filters

7.2 Electroluminescent Technical Specifications For Use In Internal Or External Partitions

To be read with Preliminaries / General Conditions

Type(s) of Glass Assembly:	Lumaglass™ Glazing System
Drawing references:	Architect's drawings.
Supporting structure:	As shown on Engineers drawings.
Distributed By:	Lumaglass™
El Material:	Multi-laminate construction
Sizes & Shapes:	DFL-150 45 mm X >10 m, DFL-0100 25 mm X >10 m
Viewing Angle:	>160 Degrees
Input (Mains) voltage:	of anywhere from 100 to 250 Volts AC, at either 50 or 60 Hz.
Output voltage:	adjustable from 50 to 330 Volts AC, at 650 Hz
Indoor / Outdoor:	Can operate in both environments
Operating Temperature:	–20 ºC +50 ºC (Nor.) / 80 ºC (Max)
Storage Temperature:	–40 ºC to + 85 ºC
Operating Humidity:	0% ~ 99%
Operating Current:	(100 vrms / 400 Hz) 1.5~2.5 mA /sq.in
Operating Power:	Dependant on Lumaglass™ wall parameters
Power Resources:	DC 110 VAC to 240 VAC
Power Inverter:	Different power configurations to optimize Lumaglass™ wall parameters
Capacitance:	2 - 5 nF / sq.in
Brightness:	Dependant on lamp type
Thickness:	0.5 mm +-0.3mm
Weight:	DFL-0175 24g, DFL-0100 14g, per liner metre excluding glass
Safety:	No Ultraviolet Radiation emitted
Bend Radius:	Minimum 25 mm
Normal Edge Seal:	5 mm +- 1 mm
Lead Pulling:	0.5kg 10sec.
Lead Bending:	90 degrees 250gr bending 2 times
Longevity:	30,000 - 40,000 Hours depending on the lamps environment condition and duty cycle
Warranty:	6 month Factory Warranty for EL Inverters and 1 year Factory Warranty for EL Panels.
Testing:	Environmental, Storage & temperature Shock Tests
Certifications:	CE & UL Certifications on Lamps & Inverters available upon request

Section 7 - Specifications

7.3 Testing

The Lumaglass™ Glazing System has been installed throughout the world for 40 years and has been tested in the United States, Great Britain and Germany.
The main areas of testing have been: Air Permeability, Water Tightness And Structural Performance, Sound Reduction, Thermal Performance And Impact Resistance.

Double-Glazed

Product testing was undertaken at a UKAS accredited testing laboratory - Taywood Engineering Ltd during August 2000. The system was tested in accordance with the, Centre for Window and Cladding Technology (CWCT). The Standard Test Method for Curtain Walling.

The system specimen satisfied the following test requirements of the CWCT Standard:-

Air, water and Structural Performance
Air Permeability - 600 Pascals
Watertightness using static pressure - 600 Pascals
Watertightness using dynamic pressure - 600 Pascals
Wind resistance - serviceability and safety - 1300 Pascals

The system was also tested to the requirements of the new European Dynamic Watertightness Test – DD ENV 13050: 2001. The system specimen satisfied the requirements for a design wind pressure of 1300 Pascals.

Single-Glazed
The test was carried out at a UKAS accredited testing laboratory, - Wintech Engineering Ltd. On a sample size of 2000mm x 2000mm. A full CWCT test conducted on a sample panel and all requirements were met. A copy of the report is available on request.

7.4 Impact Testing

Impact on Standard Glass
The Lumaglass™ glazing system was tested using the test methodology as set out in BS 6206: 1981. This tests subjected the Lumaglass™ glazing system to the pendulum impact test and then appraised the post impact performance, i.e. safe breakage, using the 76mm diameter sphere and the force gauge.
The following glass profiles installed in a double-glazed format satisfies the requirement of Part N (England and Wales) and Part P (Scotland) i.e. reducing the risk of cutting and piercing injuries, by either breaking safely during the test or not breaking at all.

Impacted at a drop height of 305mm – (Equivalent to BS 6206 Class C)
NP26 Double-Glazed 8 wires - Fitted with Impact Gasket
SP2 Double-Glazed 7 wires - Fitted with Impact Gasket
SP26 Double-Glazed 8 wires - Fitted with Impact Gasket

Impacted at drop heights of 305 and 457mm – (Equivalent to BS6206 Class B)
NP26 Double-Glazed 16 wires - Fitted with Impact Gasket

Impact Testing on Thermally Toughened Glass

At an independent test house, specimen screens of Lumaglass™ Thermally Toughened Channel Shaped Glass were subjected to pendulum impact testing, using the EN 12600 (1) twin tyre impactor.

Both Toughened SP26 and NP26 glass screens were subjected to the following test programme:
POINT OF IMPACT
1. The joint between 2 planks of double-glazed Toughened Glass
2. The middle of a double-glazed Toughened Glass plank
DROP HEIGHT
1. Impact from a 190mm drop height to the point of impact
2. Impact from a 450mm drop height to the point of impact
3. Impact from a 1200mm drop height to the point of impact

After each impact the screens were examined for breakage. If no breakage occurred, the screens were tested at the next drop height.

Lumaglass™ offer a “Thermally toughened soda lime silicate channel shaped safety glass” that can be claimed to be equivalent to a Class A - BS 6206 safety glass. The performance being determined using the criteria set down in BS6262-4: 2005, clause 11, i.e. if a flat material processed in the same manner can be classified then the shaped material can be similar classified.

Double glazed screens manufactured from thermally toughened U profiled channel shaped glass in either NP26 or SP26 profile can be expected to have an equivalent performance to a flat piece of thermally toughened glass. That is to say a performance equivalent to EN12600 class 1(C).

1) EN 12600; Glass in building - Pendulum test - Impact test method and classification for flat glass

Section 7 - Specifications

7.5 Approvals

UL
UL48 Standards File# E175045 - The Lumaglass™ Electroluminescent Lights - recognized component.
UL48 Listed Systems File# E175045 - Lumaglass™ inverter Models 600 A & B, 2200 A & B and 12K (A-D)

CE
Both Model 600 and 2200 series inverters have been tested by NU Laboratories, Icc. of Annandale, NJ and found to be in conformity with the directives required to bear the CE mark.

Ignition Properties, Smoke Density, Flash point
Lumaglass™ Electroluminescent Lights have been tested to the ASTM D1929-96 and ASTM D2843 The standards for Ignition Properties and Smoke Density, in addition to the Cleveland Open Cup and Pensky Martens Closed Cup Flash point analysis.

Toxicity
The Lumaglass™ Electroluminescent Lights have been analysed for the complete Toxicity Characteristic Leachate Procedure (volatiles and semivolatiles), ensuring their safety for land fill disposal.

TRI-RATED SWITCH GEAR/CONTROL WIRES

PVC insulated switch gear/control wires which are manufactured to BS6231 Type CK and certified to the following standards:
Underwriters Laboratories (UL)
Styles 1015, 1028, 1283 or 1284 depending on size.
Canadian Standards Association (CSA)
Type TEW 105°C

Applications include the wiring of switch, control, metering, relay and instrument panels of power switch gear as well as internal connections in rectifier equipment and in motor starters and controllers. The UL and CSA certifications of these wires enable their use in equipment destined for the North American and the European markets. This gives the benefit of simpler design and manufacturing and less stock holding, compared to the alternative of using wires manufactured to separate standards.

All wires are embossed or printed along their length with the following information:
Manufacturer identification
UL Logo, AWM Style No, 105°C 600V VW-1, AWG size, CSA TEW 105°C FTI, BS6231, mm^2 size

All wires are available in the following colours:
Black, Blue, Brown, Green, Grey, Orange, Pink, Violet, White, Yellow and Green/Yellow

Technical Information

Wires:	Plain annealed copper
Insulation:	Heat resisting PVC
Voltage Rating:	600V between conductor and earth, 1000V between conductors.
Maximum conductor Temperature:	105°C in air, 60°C in oil.

8.Environmental Impact

8.0 Environmental Policy

At Lumaglass™ we recognise that our day to day activities and operations could have an adverse impact on the environment. We acknowledge our responsibilities and commit ourselves to reducing our impact where ever possible. We plan to achieve this by working with both our clients and external agencies as appropriate to promote positive environmental activities. Lumaglass™ aim to ensure that as much of our product comes form a recycled source or can be recycled. Where components can not be recycled we aim to ensure they can be disposed of in a responsible manner.

8.1 Lumaglass™ and the Environment

Glass
In the production of all glass, “cullet” is used to help break down the raw ingredients and reduce the melting time. The proportion of cullet is usually between 10 to 30%. Lumaglass™ however aim to use between 30 to 40% of recycled glass. This not only saves valuable natural resources but also saves energy and reduces emissions of carbon dioxide.

Aluminium
With today’s technology, aluminium and its alloys can be melted and re-cast again and again, producing metal with the same qualities as the original aluminium. This is one of the main reasons why the supporting frame of the Lumaglass™ system is made from aluminium

EL Lamps
At Lumaglass™ we ensure that our products are compliant with the most up to date legislation such as the RoHS act of 2006 (Risk of Hazardous Substances) and that they are environmentally friendly from their manufacture through to their disposal.

As mentioned EL lamps are an extremely energy efficient light source, they will compete and in most cases beat traditional light sources on operating costs (*see fig 9*). When combined with the exceptional life span of EL, it can be said that EL Lamps are one of the most environmentally friendly light sources currently available.

Electroluminescent Lamps unlike most incandescent light sources such as spent fluorescent tubes or, sodium lamps, fall under the new environment legislation classing them as hazardous waste. Therefore they have to be disposed of in a controlled manner. The Lumaglass™ EL lamps however have been analysed for the complete Toxicity Characteristic Leachate Procedure (volatiles and semivolatiles), ensuring their safety for landfill disposal.

8.2 Other Environmental Issues.

In today’s architecture light is used as a tool to highlight features in buildings that the architect wants to emphasize. However by doing this “Light pollution” can be created. “Light pollution” is probably best described as being artificial light that is allowed to illuminate, or pollute, areas not intended to be lit.

However as Lumaglass™ is an iridescent light source it generates only the amount of light needed to illuminate the immediate vicinity. Lumaglass™ can be used as an accent light source, highlighting features that gives a distinctive visual emphasis to the building. This is particularly important when it comes to planning as on the 1st of April 2006, the Environmental protection act 1990 was amended to cover excessive light pollution.