ROOFING

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MARLON CS

PRODUCT GUIDE

MARLON CS LONGLIFE
PROFILED
POLYCARBONATE SHEET

SPECIFICATION
& PERFORMANCE

DESIGN FACTORS

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BRETT
MARTIN

BRETT MARTIN

Brett Martin is a multi-site international organisation producing multi-wall, profiled and solid Polycarbonate sheet in addition to comprehensive GRP and PVC rooflight ranges, semi-finished plastic products and plastic above and below ground drainage systems.

The Company's reputation for excellence in product quality and technial service is built on almost 50 years manufacturing experience.

BRETT MARTIN
ROOFING PRODUCT
MANUALS

marlon cs®
LONGLIFE

PRODUCT GUIDE

Brett Martin is one of the world's leading manufacturers of polycarbonate sheet, supplying material around the globe for a huge variety of applications.

No other manufacturer in Europe can provide the roofing industry with such a unique product range, or such comprehensive experience and expertise

Marlon CS Longlife complements Brett Martin's other leading brand rooflight materials, Trilite translucent GRP and Marvec transparent PVC, all of which are manufactured to standards of excellence which have earned Brett Martin BSI Registered status under BS EN ISO 9001.

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BRETT MARTIN

Brett Martin is one of the largest manufacturers of profiled translucent and transparent plastic rooflights in Europe, directly distributing all rooflight products throughout the UK, and has a national distributor throughout the world.

Brett Martin is listed on the BSI Register of Firms of Assessed Capability under BS EN ISO 9001.

Brett Martin is the only manufacturer of rooflights in GRP, extruded PVC and extruded polycarbonate in Europe, and producer of rooflights in single skin and double skin site assembled forms as well as Factory Assembled Insulating Rooflights - FAIR.

From this unique position, Brett Martin alone can inform the designer, architect and specifier as to the relative merits and appropriate uses of each material and rooflight type.

Finished rooflights are delivered directly to site from Brett Martin factories.

Consequently our client gains the best possible service in the most convenient way - a single point of contact, offering a unique choice of materials and rooflight types, and a single responsibility from drawing board and specification to arrival of rooflights on site.

Trilite translucent GRP rooflight sheeting has been manufactured for almost 50 years, and Marvec transparent PVC sheeting for almost 30 years, during which time there have been many changes in the roofing industry and in roof construction materials, systems and methods.

Many years of involvement with all professions and disciplines involved in roofing, in rooflight manufacture and technical service, have enabled Brett Martin to give a constructive and speedy response to roofing developments and to provide practical and cost effective rooflight products.

Brett Martin's unique single company involvement with the rooflight requirements of any project from conception to completion is invaluable, as each building has an individual rooflight requirement. Technical and design assistance can be provided at the outset; profile tooling and fabrication requirements are most easily accommodated within one organisation.

POLYCARBONATE

Polycarbonate as a rooflight material has a number of distinct advantages:

- **Toughness** - makes polycarbonate less susceptible to transport, handling and installation damage than other thermoplastics , particularly in cold weather.
- **Impact resistance** - polycarbonate's exceptionally high resistance to impact damage means it is usable in, for example, areas prone to vandal damage.
- **Retention of properties over a wide temperature range** - polycarbonate retains its properties better than other thermoplastics in temperatures ranging from -40 to +130°C, so is ideal for use in cold and hot climates.
- **Light transmission** - visible light transmission values are superior to any other plastic rooflighting material.
- **UV and infra red light opacity** - polycarbonate transmits only a minimal amount of UV light, and little infrared light. This means that on the one hand it effectively screens out UV light while providing natural illumination, and on the other hand it helps raise and maintain interior temperatures, which is important, for example, in horticulture.

MARLON CS LONGLIFE

Marlon CS Longlife profiled polycarbonate sheeting is a high performance polycarbonate rooflight sheet, which admits natural light into domestic, commercial, industrial and other buildings.

Marlon CS Longlife can be used to form complete roof coverings or can be incorporated into profiled metal roofing and cladding systems, ranging from simple single skin to advanced composite panel.

In addition to transparent colourless sheets, tinted sheets are available to provide differing levels of solar control.

Marlon CS Longlife is a very durable material, many times tougher than glass, with excellent light transmission, fire performance and stability in temperature extremes.

A protective co-extruded layer on the outer surface of the sheet forms a barrier which is resistant to the detrimental effects of UV light, minimising long term yellowing and maintaining mechanical properties.

Marlon CS Longlife carries a 10 year warranty in respect of light transmission and a 3 year warranty in respect of weather breakage, as defined in the Marlon CS Longlife profiled polycarbonate sheet Warranty leaflet, available separately.

PRODUCT GUIDE

The Marlon CS Longlife Product Guide contains information on the product specifications and performance, design criteria for the use of Marlon CS Longlife and installation instructions.

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SPECIFICATION & PERFORMANCE

SPECIFICATION & PERFORMANCE

MATERIAL PROPERTIES

Polycarbonate resin has a good combination of physical, thermal and optical properties which make it a very suitable rooflight material. Marlon CS Longlife is produced from a polycarbonate resin, of which the following are typical properties.

PHYSICAL CHARACTERISTICS

	Test Method	Results
Specific gravity	DIN53479	1.2
Water absorption (24hrs @ 23°C)	DIN53495	0.36%
Water permeability (1mm thick)	DIN53122	2.28g/m²
Oxygen index		25%

MECHANICAL PROPERTIES

	Test Method	Results
Tensile strength at yield	DIN53455	>60N/mm²
Elongation at yield	DIN53455	6 - 8%
Tensile strength at break	DIN53455	>70N/mm²
Elongation at break	DIN53455	>100%
Elastic modulus	DIN53457	>2300N/mm²
Impact strength (Izod notched 23°C)	ASTM D256	600 - 800J/m

THERMAL PROPERTIES

	Test Method	Results
Heat resistance temperature (Vicat VST B)	DIN53460	145 - 150°C
Deflection temperature under load	ASTM D648	135 - 140°C
Coefficient of linear thermal expansion	DIN53752	0.067mm/m/°C
Thermal conductivity (K)	DIN52612	0.21W/m°K
Service temperature range (no loading)		
long term		-40 to +100°C
short term		-40 to +130°C

OPTICAL PROPERTIES

	Test Method	Results
Refractive index	DIN53491	1.58

LIGHT TRANSMISSION

Colour	LT (%)	ST (%)	DT (%)	SC
Clear	89	86	84	0.98
Bronze 'B'	48	71	65	0.82
Opal 'Q'	64	78	73	0.90
Grey 'H'	27	43	30	0.49

LT = Light Transmission, ST = Solar Transmission, DT = Direct Transmission, SC = Shading Coefficient

MANUFACTURE

Marlon CS Longlife is manufactured by extruding the sheet from a die and profiling it in a single continuous operation. This preferred method of production is least stressful to the material in terms of the heat applied for processing.

When thermoplastic products are produced by reheating and thermoforming flat sheet stock, the temperatures involved in thermoforming can degrade the sheet and affect its long term durability.

Manufacturing by extrusion means controlled processing conditions which optimise heating and minimise residual mechanical stresses. Residual stresses can cause excessive warping, bowing, and waisting of sheets, which can in turn give rise to difficulties achieving weather tight fitting of roofs.

SHEET LENGTHS & TOLERANCES

Sheets are available in lengths up to 13m. Note that these should be regarded as stock lengths for cutting; it is often impractical to use sheets exceeding about 4m in length due to the allowances that have to be made for thermal expansion.

Tolerances: Lengths up to 5m; -0, +l0mm
Lengths over 5m; -0, +25mm
Width +/- 5mm

PROFILE & ROOFLIGHT TYPES

In addition to greca and sinusoidal profiles for domestic applications, Marlon CS Longlife can be extruded in profiles which match commonly available metal roofing and cladding profiles.

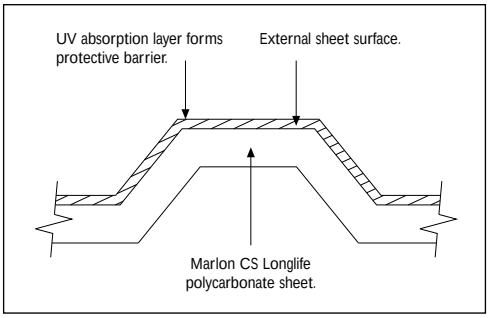
Marlon CS Longlife sheets can be used for rooflights in single skin uninsulated roofs. They can also be used in insulated and composite panel roofs in the form of double skin site assembled rooflights and factory assembled insulating rooflights.

Product information sheets specify each profile, its installation, and limitations on spanning capabilities for given sheet thicknesses and applied loads. Marlon CS Longlife profiles are suitable for use in new buildings, as well as replacing glass and other rooflighting materials when renovating existing buildings.

SURFACE PROTECTION

UV light degrades thermoplastics, including polycarbonates: decline of mechanical properties, for example, impact resistance, is indicated by yellowing of the sheet.

To prevent deterioration Marlon CS Longlife has a UV protective layer co-extruded on to the outer surface, forming a barrier against UV light entering the body of the sheet, minimising long term yellowing and ensuring durability and toughness.



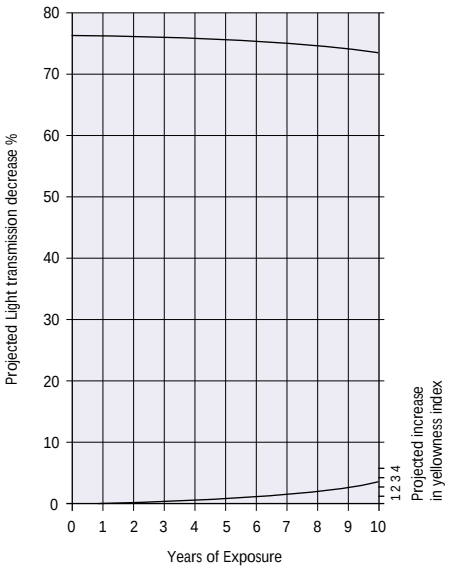
WEATHERABILITY, IMPACT RESISTANCE GUARANTEE

WEATHERABILITY

Accelerated weathering tests in a weatherometer produce little change in light transmission or yellowness index.

Significantly, accelerated and natural weathering have negligible influence on the physical properties of Marlon CS Longlife, eg tensile strength, impact resistance.

During the life of the sheet natural weathering will leave its thermal or mechanical properties essentially unaltered.



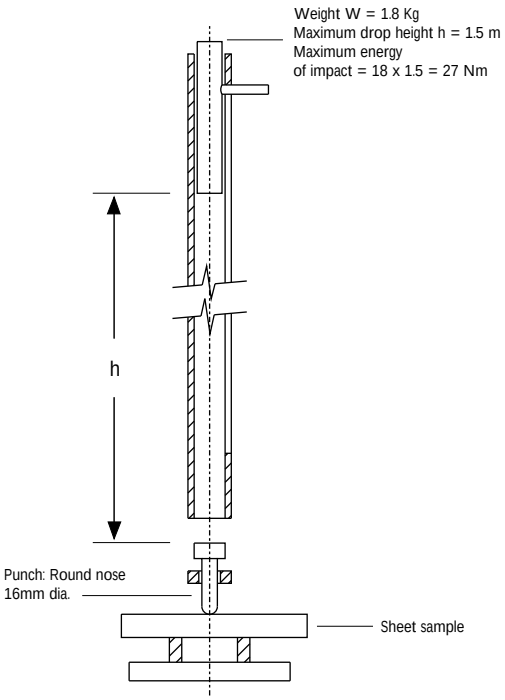
The protected surface is always clearly identified. The sheet must always be fitted with the UV protected side out, otherwise it will deteriorate, as will be shown by yellowing and decline of physical properties, e.g. the sheet will become brittle and lose impact resistance.

IMPACT RESISTANCE.

Of all glazing materials polycarbonate exhibits greatest resistance to impact over a temperature range of -40 to +130°C. It is approximately 200 times more resistant to impact than glass; PVC has limited impact resistance at low temperatures; GRP sheet is resistant to impact but will show impact abrasions much more easily than polycarbonate.

High impact resistance means that Marlon CS Longlife is suitable for use in areas where hail storms would cause excessive damage to other glazing materials.

FALLING DART IMPACT TEST



The impact test illustrated demonstrates the impact resistance of Marlon CS Longlife. A striker of diameter 16mm contacts a sample of sheet placed on a support ring with inner diameter 38mm. A weight of 1.8kg is dropped on to the striker from a height of 1.5m. The resulting impact energy of 27Nm only dents the sample: it does not crack or penetrate.

GUARANTEE

Marlon CS impact resistance is subject to guarantee, the conditions of which are shown on the Marlon CS Longlife Warranty leaflet.

SERVICE TEMPERATURE RANGE

While ambient temperatures seldom exceed 25°C, surface temperatures on roofs and within double skin rooflights can exceed 80°C in Northern European summer conditions, and are much higher in many areas of Africa, Asia, Australia, Middle East, USA. Temperatures below -20°C on external surfaces in winter are not uncommon.

Marlon CS Longlife will retain its physical properties over the range of temperatures found in these locations.

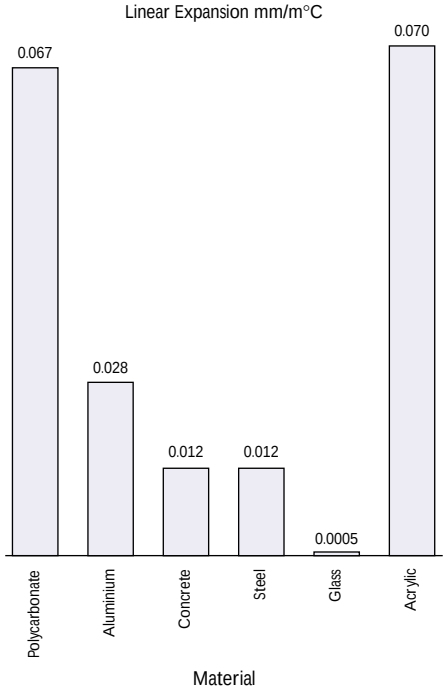
In comparison, PVC sheet is quite brittle at -20°C, and is unsuitable for use in conditions where surface temperatures exceed 60°C. GRP sheet will perform very well mechanically in this temperature range but prolonged exposure to the higher temperature will cause relatively rapid discolouration.

THERMAL EXPANSION

Polycarbonate has a high coefficient of thermal expansion; the table below and graph opposite illustrate the relative expansions of polycarbonate and other common building materials.

Material	Linear expansion mm/m°C
Polycarbonate	0.067
Aluminium	0.0238
Concrete	0.012
Steel	0.012
Glass	0.0005
Acrylic (PMMA)	0.070

It is evident from these figures that Marlon CS Longlife expands approximately 3 times as much as aluminium under the same temperature rise. The high expansion coefficient means clearance must be allowed in the holes drilled for fixings and sheet lengths have to be limited so that there is not excessive differential movement at end laps.



LIGHT TRANSMISSION

The wavelengths of natural daylight which strike the earth's surface, and are transmitted through Marlon CS Longlife are illustrated in the graph. Visible light and light in the near infra red sections of the spectrum are transmitted best.

UV LIGHT.
It is evident that very little UV light is transmitted; therefore, while Marlon CS Longlife has a high visible light transmission, it forms a very good shield against UV light.

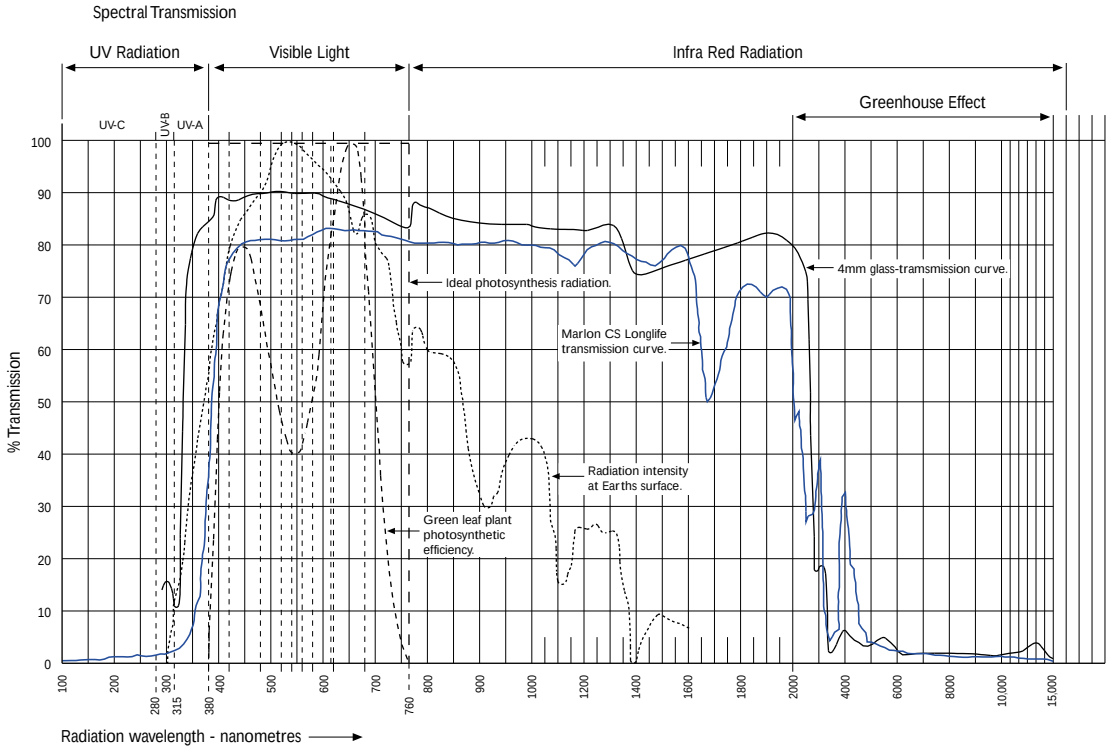
As a result the interiors of buildings can have very good levels of natural daylighting while the contents are little affected by the UV light.

A low level of UV light transmission is also an important condition for the growth of many plants.

High opacity to UV light also means that Marlon CS Longlife is a good material to protect people against the harmful effects of UV light yet allows enjoyment of natural light.

INFRA RED LIGHT.
Marlon CS Longlife is quite opaque to infra red light wavelengths above 2100 nanometres approximately. When daylight enters a building it is absorbed by interior surfaces and contents raising their temperature. The heat is reradiated as infra red radiation, little of which can pass out through the Marlon CS Longlife. Consequently much of the heat generated cannot escape and the temperature inside the building increases - this is known as the greenhouse effect.

Buildings with Marlon CS Longlife rooflights or glazing retain heat at night as reflected infra red radiation is trapped. This is advantageous in horticultural buildings which are constructed with large areas of Marlon CS Longlife.

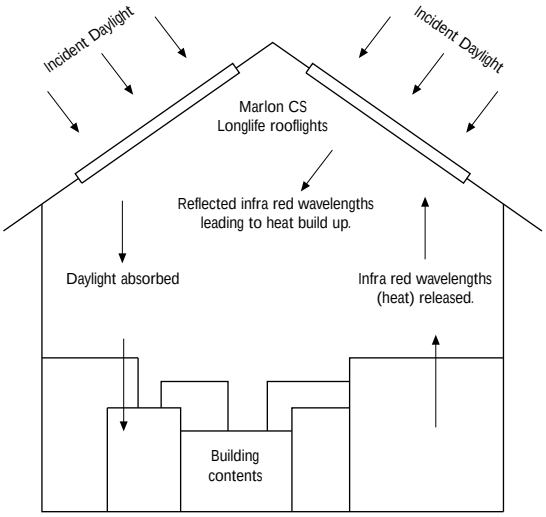


SOLAR HEAT GAIN

The greenhouse effect - solar heat gain - described on page 12, is an important phenomenon in any building which incorporates Marlon CS Longlife or any other glazing material.

Measures must be taken to avoid internal temperature increases due to solar heat gain becoming excessive, to the detriment of building occupants or contents.

When designing any building incorporating rooflight or glazing materials, consideration must be given to controlling the solar input by using tinted material, and/or providing screening or ventilation systems.



Values for the light transmissions and shading coefficients of the clear and tinted forms of Marlon CS are given below.

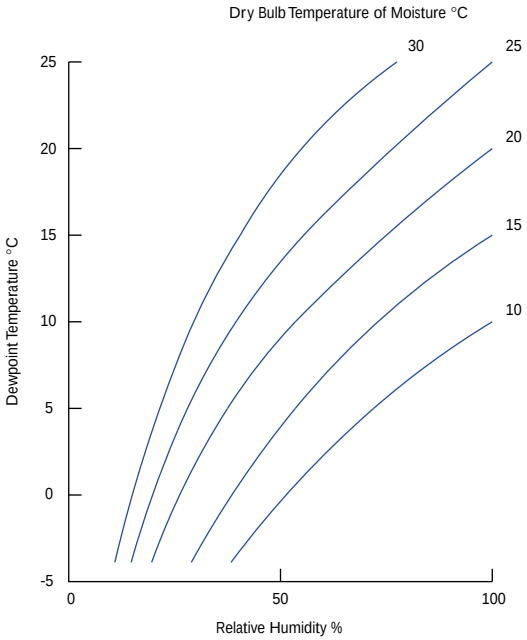
Colour	Light Transmission	Shading Coefficient
Clear	89	0.98
Bronze 'B'	48	0.82
Bronze 'R'	55	0.86
Opal 'L'	77	0.97
Opal 'Q'	64	0.90
Grey 'H'	27	0.49
Grey 'T'	53	0.84

CONDENSATION & INSULATION

The moisture content of the air in a building and the temperature of the inside surface of the rooflight determine the occurrence of condensation.

Occupancy and activities within a building determine the air moisture content - relative humidity. When the inner surface reaches the dewpoint temperature moisture starts to condense from the air.

The graph shows the relationship between dewpoint temperature, air temperature and relative humidity.



Thin single skin sheets of any roofing material, either metal or rooflight, have high thermal transmittance and therefore provide little insulation and produce a relatively high incidence of condensation. However, two thin skins of rooflight material with a still air space of 20 to100mm between them, forming a double skin rooflight, will achieve higher thermal efficiency and reduce condensation risk.

The thermal transmittance of a double skin rooflight is 2.8W/m^2 °C while for a single skin rooflight it is 5.7W/m^2 °C. A triple skin rooflight has a thermal transmittance of 2.0W/m^2 °C.

Double skin site assembled rooflights or factory assembled insulating rooflights can be made from Marlon CS Longlife as necessary to suit many types of roof system and construction. In addition to providing natural daylighting, double skin and triple skin rooflights, in particular factory assembled insulating rooflights, provide high levels of energy conservation with consequent fuel economies.

FIRE PERFORMANCE

Marlon CS Longlife exhibits good fire performance properties. Test results are tabulated below.

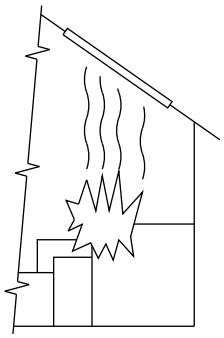
Country	Test Method	Classification
France	NFP 92-507	M2
Germany	DIN 4102	B1
UK	BS 476 Part 7	Class 1Y

Australia	AS 1530.3 1989	
	Mean	Std Error
Ignition	N/A min.	N/A
Flame propagation	N/A s	N/A
Heat release integral	N/A kJ/m^2	N/A
Smoke release, log D	-2.214	0.114
Optical density, D	0.0071 /m	

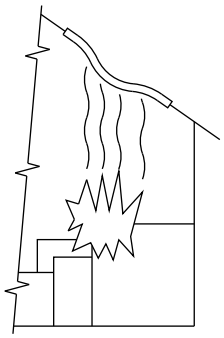
Regulatory indicees	Units	Range
Ignitability	0	0-20
Spread of flame	0	0-20
Heat evolved	0	0-20
Smoke developed	0-1	0-20

VENTING

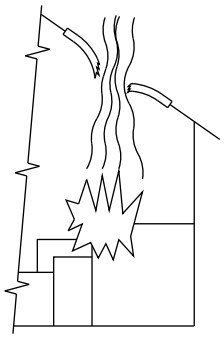
An important feature of Marlon CS Longlife is that its softening point is below 200°C. When a fire in a building is underneath a Marlon CS Longlife sheet it will soften and open, allowing smoke, heat and gases produced by the fire to escape. This 'venting' property means that damage within buildings can be limited.



Fire underneath Marlon CS rooflight.



Hot gases rising to ceiling level soften rooflight



Rooflight opens venting hot gases to atmosphere.

CHEMICAL & ENVIRONMENTAL ATTACK

As with other thermoplastics, contact with aggressive or concentrated chemicals, undried wood preservatives and most solvents must be avoided. However, Marlon CS Longlife has good resistance to acids, aliphatic hydrocarbons and alcohols; common environmental pollutants and marine environments do not have detrimental effects.

A list of various chemicals detailing performance when in contact with Marlon CS Longlife is appended, see page 28.

ATTACK FROM PVC COATINGS

Marlon CS Longlife rooflights are often used in roofs where the corrugated steel sheet has a PVC plastisol coating. The plasticisers used in the formulation of plastisol coatings can migrate into the polycarbonate sheet. This causes the physical properties of the sheet to deteriorate; most critically tensile strength and impact resistance will be reduced, and sheet failure can occur.

It is essential to avoid contact between Marlon CS Longlife and materials using such plasticisers. This can be done in two ways.

1. White or light coloured tape can be applied to the side and end laps so that the Marlon CS Longlife sheet rests on this tape and not directly on the plastisol coated steel.

2. Paint can be applied to the roof sheet areas which will be under the Marlon CS Longlife rooflight. When this has dried and forms a barrier the rooflight sheet can be fitted in position. Epoxy or polyurethane based paints are generally suitable, but the compatibility of each paint with polycarbonate sheet must first be checked.

Application of these barrier materials is shown on the side and end lap details, page 24.

ADHESIVES AND SEALANTS

The compatibility of individual adhesives, sealants, and sealing tapes must be assessed, as plasticisers or other constituents used in their manufacture can migrate into the polycarbonate material and critically reduce its strength. Some suitable materials are listed below.

BOSTIK

Adhesives:	Bostik 1782 clear	
	Bostik 1755	
	Bostik 7431	
Sealants:	Medium modulus	Bostik 1581

EXPANDITE

Sealant:	Sillicone	Sillicone Sealant 33

SELLOTAPE / CELLUX GMBH

Sealing & bonding tapes:	IDL 0303
	IDL 0310
	IDL 0320

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DESIGN FACTORS

DESIGN FACTORS

ROOFLIGHTS

Rooflights are too often regarded as just a roof accessory: but a rooflight is not an optional or unessential extra. Consider the functions which it must perform, for example, provide natural daylighting to the building interior, provide thermal insulation, fire performance, weathertightness, and durability.

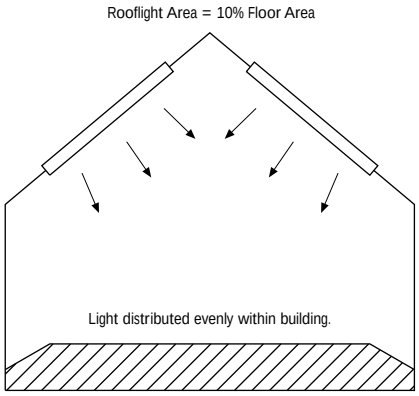
Consequently the rooflight must be afforded more than passing consideration. Rooflights often form at least 10% of the total area of many roofs, therefore they must be treated as an essential integral part of the roof.

DAYLIGHTING BUILDINGS

Marlon CS Longlife can be used in a wide variety of buildings - industrial, commercial, recreational, agricultural and domestic.

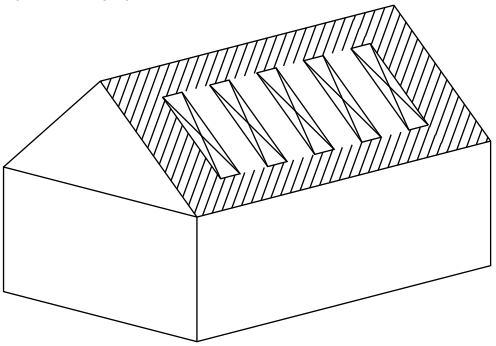
Building function determines the required internal lighting level. Roof and rooflight design and construction must optimise light and thermal insulation levels while minimising condensation and solar gain.

In practice a suitably lit building interior is often achieved with a total rooflight area equivalent to 10% of the building floor area.



Rooflight areas one sheet wide with a metal sheet spanning one or two purlin centres above and below on the slope are a good layout arrangement in terms of the above functions, giving good light distribution and relative ease in installation while avoiding high wind uplift areas near to roof eaves and ridge.

Optimum rooflight pattern.



Rooflights with metal sheets either side and situated to avoid high wind uplift areas.

High wind uplift area.

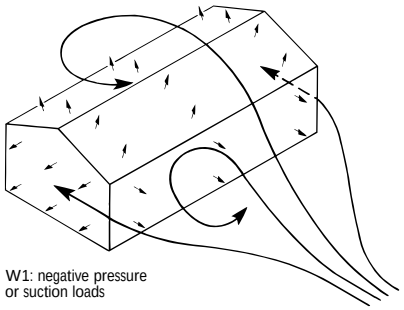
WIND & SNOW LOADINGS

Of primary importance for a building is a knowledge of the likely loads to which it will be subjected by the environment. In particular, wind and snow loads on the roof and wind loads on the walls, and therefore by definition on rooflight and glazing panels, must be determined.

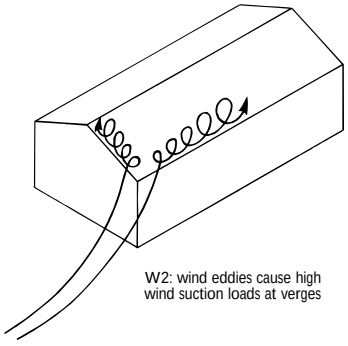
Each building and structure is situated in a unique wind environment, with many factors influencing the force which the wind exerts on each part of its surface.

In addition to its geographical location, local topography and orientation relative to surrounding buildings and the prevailing wind, the wind pressure is influenced by, for example, building shape, height and roof pitch.

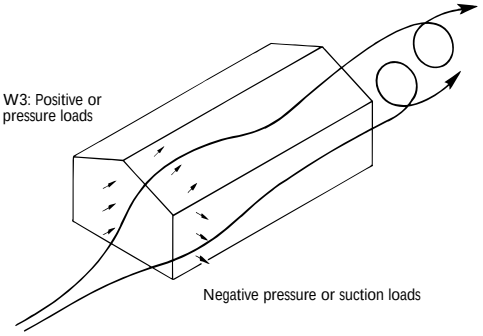
On the windward side of a building, wall and roof panels experience a positive pressure, while on the leeward side there is a negative pressure or suction load.



W1: negative pressure
or suction loads



W2: wind eddies cause high
wind suction loads at verges



As the wind blows over and around the building, at the corners of the walls and at the ridge, eaves and verges, eddy currents are formed which exert varying negative pressures in those areas.

For each building it is necessary to estimate the forces that are likely to be experienced by Marlon CS Longlife sheets when fitted in areas of the building which have different wind load conditions.

Snow loading is also influenced by a similar range of environmental and building features. Snow loadings can be greater than would normally be anticipated, for example, behind parapet walls, in roof valleys and where snow can slip from a higher to a lower roof.

The following national standards give means of calculating wind and snow loads:

Austria	B4013
Denmark	DS410.2
France	DTU-NV65
Germany	DIN 1055
Holland	NEN 3850

By referencing the calculated loads to the Marlon CS Longlife information sheets it is then possible to ensure that a given profile of Marlon CS Longlife is used within permitted parameters.

ROOFLIGHT PRACTICE

Marlon CS Longlife sheets are resilient and highly resistant to impact damage. However, as with all other glazing materials care must be taken to handle, store and install properly to ensure the best performance from the sheet.

It is almost inevitably found that poor standards of handling storage and installation lead to the majority of problems encountered with rooflights in general.

STORAGE

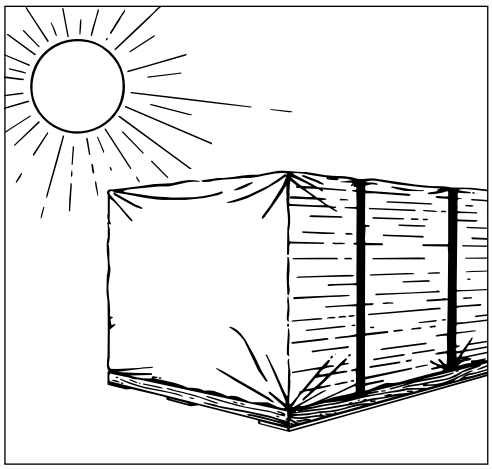
All Marlon CS Longlife sheets should be stacked horizontally, preferably on a continuous, non - abrasive, flat, dry surface: on suitably constructed pallets: or on timber bearers at least 100mm wide spaced at intervals not exceeding 1m.

Stack height should not exceed 1m.

Sheets of differing lengths should not be placed on the same stack.

Always store indoors where possible.

If storage outdoors cannot be avoided then, particularly in the case of on-site storage while building construction progresses, a secure storage site should be provided, well away from foot and vehicle traffic and ongoing construction work.



All sheets stored outdoors must be covered with a reflective, opaque, waterproof cover, supported away from the sheet surface.

Sunlight is magnified while passing through an uncovered stack of sheets, each sheet contributing a little. The temperature build up after sunlight passes through a relatively small number of sheets can be considerable: distortion and damage can occur. Water between sheets exacerbates the effect.

Secure all covers to prevent ingress of sunlight, wind and rain; ventilate covered stacks providing air circulation and preventing heat build up.

No covers, other materials or objects should be placed on, or come into contact with the top surface of the sheet to avoid spoiling its appearance.

HANDLING

Take great care when handling sheets in windy conditions.

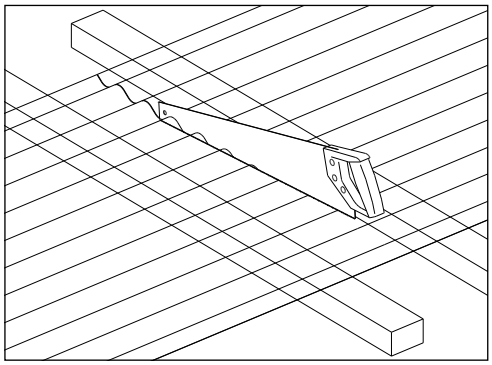
Lift sheets cleanly off the stack: pick up each sheet by the edges, roll into a tube shape and secure for ease of carrying. Sheets in excess of 3m long should be carried by more than one person.

CUTTING

Marlon CS Longlife can be cut satisfactorily with a variety of tools:

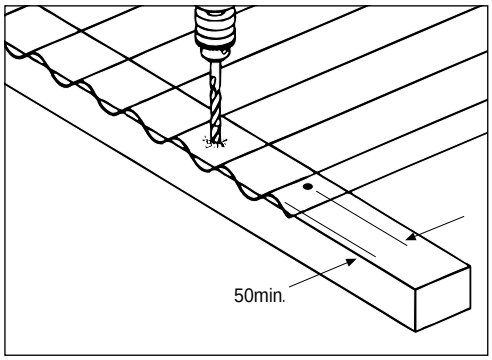
- A fine tooth hand saw; hold the saw at a shallow angle and cut with slow steady strokes.
- A jig saw fitted with a metal cutting blade.
- A band saw fitted with a high speed metal cutting blade.
- A circular saw fitted with a diamond grit blade.

Support the sheet to avoid stress and vibration when cutting.



DRILLING

Metal drill bits are suitable for drilling Marlon CS Longlife. Hand or power drills can be used. Support the sheet under the area where it is being drilled to avoid stress and vibration.



FIXING

It is vital when fitting Marlon CS Longlife to make sufficient allowance for thermal movement.

Note that sheet lengths have to be limited so that excessive thermal movement does not make end laps unweatherable, or hole diameter requirements so large that the sheet is not secure under the washer.

Sheet side laps should always be laid away from the prevailing wind.

As Marlon CS Longlife is a relatively flexible material, it is always necessary to check that sheet covering width is accurately maintained as the sheets are being laid.

Holes for primary fixings should be drilled oversize, 6mm larger than the fixing shank diameter for sheet lengths up to 2m, and an additional 3mm per metre length thereafter.

Primary fixings should normally have a minimum 29mm diameter washer: the fixing shank must be perpendicular to the sheet surface: tighten correctly for effective sealing: avoid over tightening which will prevent thermal movement: use caps on fixings to prevent possible leakage down shank. A bead of transparent neutral curing silicone applied under the washer before fixing aids sealing.

Primary fixings should normally be located in profile valleys: however where profile geometry is restrictive or roof pitches shallow - less than 10° - and exposed, crown fixing can at times be considered but firm support of the profile under the fixing is necessary. Wide valley profiles require two fixings per valley located close to the corrugations.

Never locate a primary fixing closer than 50mm to the end of a sheet.

Secondary fixings secure and seal side laps of Marlon CS Longlife sheets to each other or secure and seal the Marlon CS Longlife sheet where it laps with a metal sheet.

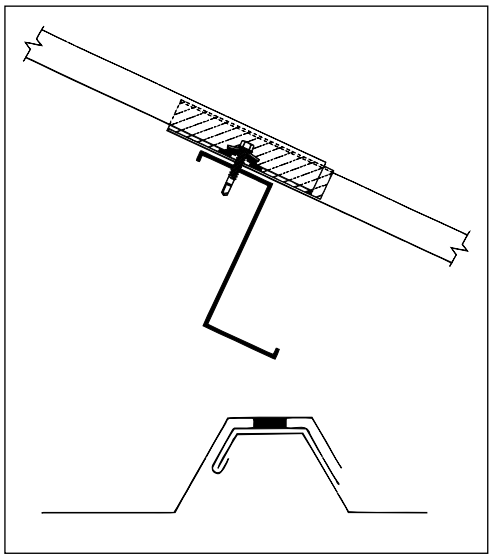
Laps between Marlon CS Longlife sheets and where Marlon CS Longlife underlaps metal should be stitched with fixings of the expanding rubber grommet type. A stitching screw to metal can be used where the Marlon CS Longlife overlaps a metal sheet. Holes for these fixings must accommodate thermal movement.

Secondary fixings should be placed at 380mm maximum centres - or as close as 300mm where roofs are exposed or roof pitches shallow.

Note that all rubber fixings and washers must be assessed for compatibility with polycarbonate sheet. EPDM is generally suitable.

For effective weather-tightness, side and end laps must always be sealed. Typical lap details and sealant positioning are shown in diagrams

Lap sealants must be compatible with polycarbonate e.g. Cellux/Sellotape IDL 0310 tape.

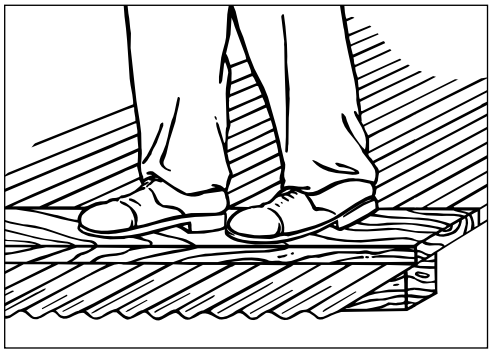


Roof slopes should be a minimum of 5° to ensure rainwater runoff.

SAFETY

Marlon CS Longlife is a glazing material, and therefore must be treated with appropriate care at all times.

Never walk on Marlon CS Longlife sheets. Where access across a Marlon CS Longlife covered roof is necessary, use walking boards placed across at least three purlins to spread the load.



CLEANING

To maintain the light transmission of any glazing material, periodic cleaning is necessary.
Marlon CS Longlife must be cleaned with some care, as it is not resistant to all cleaners and the surface can be marked easily.

The recommended cleaning procedure is as follows:

- use lukewarm water to rinse sheet and soften dried dirt
- make up a solution of lukewarm water and ordinary household cleaner or a mild soap and use this to wash sheet
- use a sponge or soft cloth to gently remove dirt and grime
- rinse with clean lukewarm water and repeat washing if necessary
- after final rinse dry off with a soft cloth

NOTE:

1. Never scrub Marlon CS Longlife with brushes, abrasive materials or sharp tools.
2. Never use strong alkali or abrasive cleaners.
3. Never steam clean: use low pressures if pressure washing.
4. Never use acetone, petrol, benzene, or solvents containing Butyl Cellosolve or Isopropanol.

It is advisable to test the suitability of any cleaner on a sample piece of Marlon CS Longlife first. After installation, labels, glazing compounds etc can be removed using petroleum spirit, after which wash the sheet as described in the above procedure.

APPENDIX

CHEMICAL RESISTANCE

While Marlon CS Longlife is made from a polycarbonate resin which is resistant to most chemicals, it is impossible to simulate the diversity of materials and conditions to which the finished sheet could be subject in application.

The chemical resistance of Marlon CS Longlife depends not only on the specific compound, but also on its concentration, temperature, duration of contact, pressure and the level of stress within the material.

Tabulated below are the chemical resistances of Marlon CS Longlife to a range of chemicals at 23°C: these are typical for unstressed and unloaded samples immersed in a solution of the chemical for six months.

KEY
+ good resistance
○ limited resistance
- no resistance

- acetaldehyde
+ acetic acid, to 10% solution
- acetone
+ acetylene
- acrylonitrile
○ allyl alcohol
+ alum
+ aluminium chloride, saturated solution in water
+ aluminium oxalate
+ aluminium sulphate, saturated solution in water
- ammonia
+ ammonium chloride, saturated solution in water
- ammonium flouride, saturated solution in water
- ammonium hydroxide solution
+ ammonium nitrate, saturated solution in water
+ ammonium sulphate, saturated solution in water
- amyl acetate
- aniline
+ antimony chloride, saturated solution in water
+ arsenic acid, 20%
+ battery acid
- benzaldehyde
- benzene
- benzoic acid
- benzyl alcohol
+ borax, saturated solution in water
+ boric acid
+ brake fluid
- bromine
- bromobenzene
+ butane
- butyl acetate
+ butyl alcohol
+ butylene glycol
- butyric acid
- calcium chloride, saturated solution in water
+ calcium hypochlorite
+ calcium nitrate, saturated solution in water
+ carbon dioxide
- carbon disulphite
+ carbon monoxide
- caustic potash
- caustic potash solution
- caustic soda
- caustic soda solution
- camphor oil
- carbolic acid
+ castor oil
+ cement
+ chlorinated lime
+ chlorinated lime solution, 2% in water
○ chlorine gas, dry
- chlorine gas, moist
+ chloroamine
- chlorobenzene
- chloroform
+ chrome alum, saturated solution in water
+ chromic acid, 20% in water
+ citric acid, 10%
+ coal gas
+ copper sulphate, saturated solution in water
- cresol
+ cupric chloride, saturated solution in water
+ cuprous chloride, saturated solution in water
○ cyclohexanol
- cyclohexanone
- DDT
- diamyl phthalate
- dibutyl phthalate (plasticiser)
○ diesel oil
- diethyl ether
+ diethylene glycol

+ diglycolic acid, saturated in water
- dimethylformamide
○ dinonyl phthalate (plasticiser)
○ dioctyl phthalate (plasticiser)
- dioxane
○ diphyl 5,3
- drilling oil
+ ethanol
- ether
+ ethyl alcohol, 96% pure
- ethyl amine
- ethyl bromide
- ethylene chloride
- ethylene chlorohydrin
+ ethylene glycol
+ ferric chloride, saturated solution in water
+ ferrous sulphate
+ fish liver oil
+ fish oil
+ foodstuffs
+ formalin, 10%
○ formic acid, 30%
+ fruit juices
○ fuel oil
○ general purpose adhesives
+ glazier's putty
○ glycerol
+ gylcol
+ gypsum
+ heptane
+ hexane
+ hydraulic fluid
- hydrochloric acid, concentrated
+ hydrochloric acid, 20%
- hydroflouric acid, concentrated
+ hydroflouric acid, 5%
+ hydrogen peroxide, 30%
+ hydrogen sulphide
+ insulating tape
- iodine
○ iodine, tincture
○ isoamyl alcohol
○ isopropyl alcohol
○ jet fuel JP4
- kerosene
+ lactic acid, 10% solution in water
+ lanolin
+ laundry soap
+ ligroin (hydrocarbon mixture)
+ magnesium chloride, saturated solution in water
+ manganese sulphate, saturated solution in water
+ mercuric chloride, saturated
+ mercury
+ methane
+ methanol
- methyl amine
- methylene chloride
- methyl ethyl ketone
- methylmethacrylate
○ milk of lime, 30% suspension in water
- nail varnish
- nail varnish remover
+ napthetic lubricating oil
+ nitric acid, 10%
- nitric acid, 10-20%
- nitric acid, 20%
- nitrobenzene
- nitrous fumes, dry
+ oleic acid, concentrated
+ oxalic acid, 10% in water
+ oxygen
+ ozone
+ paraffin base lubricating oil
+ paraffin oil
+ pentane
○ perchloric acid, concentrated
+ perchloric acid, 10% in water
- perchloroethylene
+ perhydrol 30%
○ petroleum
○ petroleum ether (hydrocarbon mixture)
+ petroleum spirit (for dry cleaning, free of aromatics)
- phenol
- phenylethyl alcohol
+ phosphorus oxychloride
- phosphorus trichloride
+ polyamide
+ polyethylene
○ polymeric plasticisers
+ polyvinyl chloride
○ polyvinyl chloride containing plasticiser
+ potassium aluminium sulphate, saturated solution in water
+ potassium bromide, saturated solution in water

+ potassium carbonate, saturated solution in water
+ potassium chloride, saturated solution in water
- potassium cyanide
+ potassium dichromate, saturated solution in water
+ potassium metabisulphite, 4% in water
+ potassium nitrate, saturated solution in water
+ potassium perchlorate, 10% in water
+ potassium permanganate, 10% in water
+ potassium rhodanide, saturated solution in water
+ potassium sulphate, saturated solution in water
+ propane gas
+ propargyl alcohol
+ propionic acid, 20%
- propionic acid, concentrated
+ propyl alcohol
- pyridine
+ rapeseed oil
+ resorcinol solution, 1%
+ rubber (free from plasticiser)
+ rubber (natural)
+ sea water
+ silicoflouric acid, 30%
+ silicone oil emulsion
+ soda
+ sodium bicarbonate, saturated solution in water
+ sodium bisulphate, saturated
+ sodium bisulphite, saturated solution in water
+ sodium carbonate, saturated solution in water
+ sodium chlorate, saturated solution in water
+ sodium chloride, saturated solution in water
+ sodium fat soap
+ sodium hypochlorite, 5% solution in water
+ sodium sulphate, saturated solution in water
○ sodium sulphide, saturated solution in water
+ soft soap
+ silicone fluids
- spices
+ starch
- styrene
+ sublimate, saturated solution in water
+ sulphur
○ sulphur dioxide
- sulphuric acid, concentrated
+ sulphuric acid, 50%
○ sulphuric acid, 70%
- sulphurous acid, 10%
- sulphuryl chloride
- tannic acid
+ tartatic acid
- tetrachloroethane
○ tetraethyl lead, 10% in petroleum spirit
- tetrahydrofuran
- Tetralin
- thiophene
- toluene
○ trichloroacetic acid, 10%
- trichloroethyl amine
- trichloroethylene
- trichloroethyl phosphate (plasticiser)
- tricresyl phosphate (plasticiser)
○ turpentine oil
+ turpentine substitute
+ urea, saturated solution in water
○ varnish
+ vaseline
+ water
- white spirit
- xylene
+ zinc chloride, saturated solution in water
+ zinc oxide
+ zinc sulphate, saturated solution in water

REFERENCES & FURTHER READING

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