

Marine  
Windows

Seaglaze - The Safe Choice

Buyers Guide

**Seaglaze**  
CRAFTING EXCELLENCE

Commercial / Leisure / Retail



# Window Fundamentals

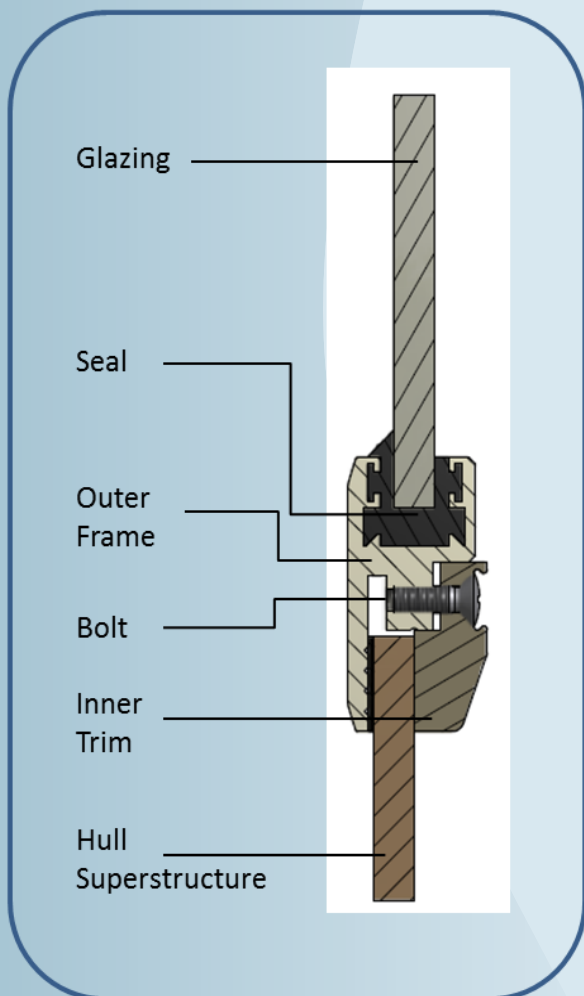
Marine windows provide a vessel with light and exterior vision, can allow ventilation and will keep the boat interior dry. Well designed windows can also strongly compliment the boat appearance for their lifetime.

This guide is designed to help you make the best choice in relation to your windows.

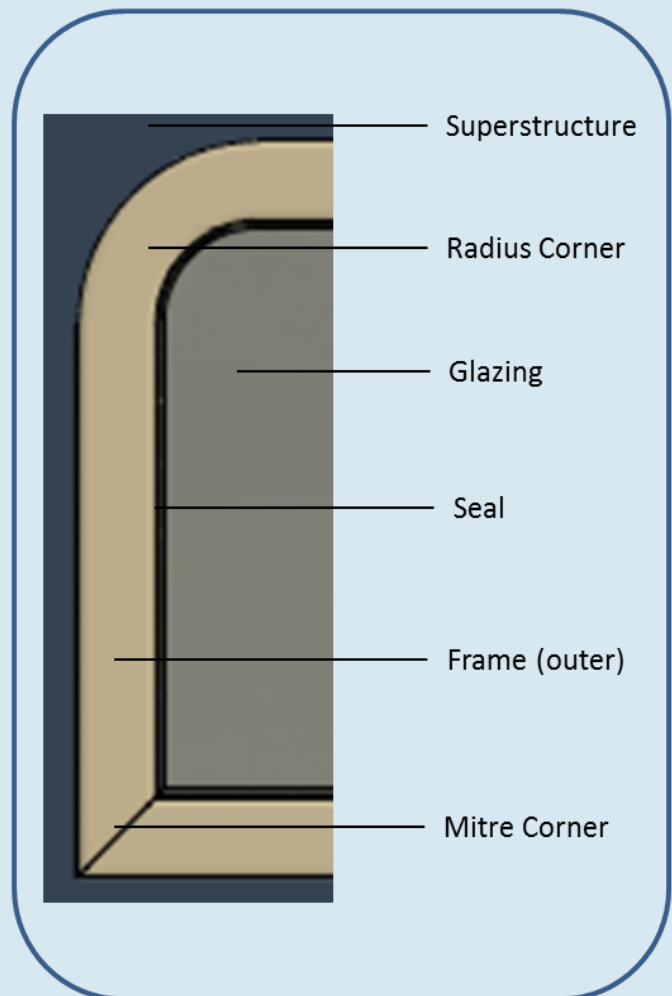
Seaglaze windows are constructed using aluminium frames and are glazed with either glass or plastic—however, there are various options available that will be explained under the **Glazing** section. Our aluminium is normally treated (by anodising and then powder coating) to prevent corrosion and the glazing is then encased with the necessary seal to ensure water tightness.

Our prime concern is that you choose windows - regardless of whether you buy them from us or someone else - you are aware of all the details necessary and can make a well-informed decision on your choice.

## Anatomy of a Marine Window



Cross Section



Viewed From Outside

# Overview

## Weight of Frame

### Ten things Seaglaze **needs** to know about your frames:

1. The weight (and therefore strength) of the frame to be used.
2. If the superstructure is flat or curved.
3. The method used to fix the frame to the boat.
4. The choice of glazing material.
5. The thickness of glazing material (or we will calculate for you)
6. The choice of tint (if any)
7. The choice of frame corner types.
8. The frame finish.
9. If an internal trim is required.
10. The type and style of the window.



The weight and strength of the frame depends on the type of boat, how and where the boat is used and the location of the windows on the boat.

Craft which only operate on inland waterways will need a much lighter section than full ocean faring craft. Forward facing windows and those near the waterline generally need to be more robust.

Seaglaze has a wide selection of frames and will help guide you to the best choice.

## Fixing Method

Four primary methods exist for fixing windows to a hull:

### Through Fix Frames:

The window frame is bolted or screwed to the superstructure requiring holes to be drilled for the fastenings. Whilst simple and reliable, this will involve a degree of preparation and an increased risk of leaks due to the numerous holes.

The fixings themselves can be concealed in a channel which is then hidden with a screw cover, a small strip fitted after the windows have been fixed in place.

### Clamp In Frames

The clamp in section is made up of two parts; an outer frame and an inner trim. The frames are bolted to each other without screw holes being necessary and the parts "grip" the hull section, being fast and easy to fit.

Providing the correct bedding seal is used between the frame and the hull, the windows can be subsequently removed if necessary.

### Direct Bond

Direct bond windows are toughened glass or plastic units that are bonded directly to the vessels superstructure with no frames. The glazing is bonded to the vessel with an appropriate adhesive which is covered by a digitally printed border (Glass only). This method allows for a flush glazed look although does not offer any options for trimming on the inside.

### Hidden Frame

Taking the advantages of the Clamp In frame and the aesthetic benefits of direct bond, Hidden Frame has the flush glass exterior look with the interior benefits of the internal frame and trim for ease of fit and removal if necessary.



## Glazing Choice

An ideal glazing material would be lightweight, strong, be resistant to abrasion, UV light and be low cost. Unfortunately, neither of the alternatives (glass or plastic) have these characteristics.

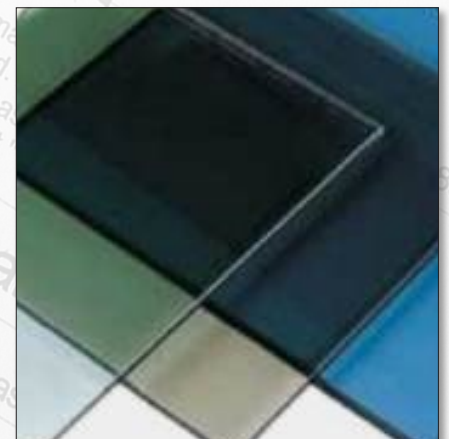
### Glass:

Glass is UV stable and highly scratch resistant. It is strong and cheap but has drawbacks. It can be relatively easy to shatter, is very difficult to bend and is **heavy**.

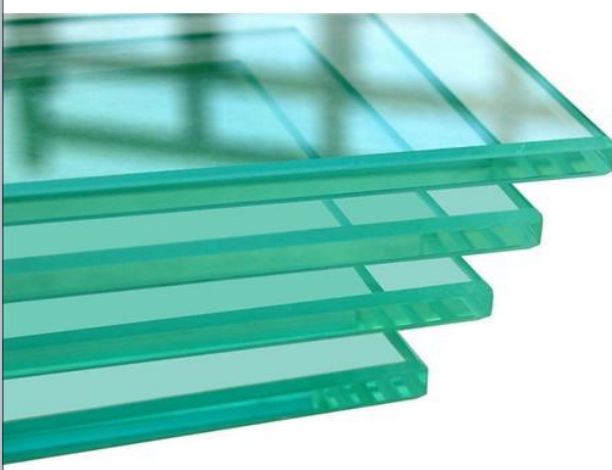
**Example:** glass weight is measured as 2.5kg per mm of thickness per m<sup>2</sup>. So a window 2m x 0.5m glazed with 6mm glass will weigh 15kg.

### Plastic - i.e Acrylic or Polycarbonate:

Acrylics can withstand great pressures before breaking and are approximately half the weight of glass. However, due to strong UV they do tend to degrade over time and are prone to surface abrasion. Moreover, with temperature changes, plastics expand and contract more than glass, placing great strain on the sealing material.



# Glazing



## Glazing Thickness

ISO 12216 is the International Standard which specifies technical requirements for windows on small craft of up to 24m, taking account the type of craft, its design category, and the location of the window.

Seaglaze automatically calculates the glazing thickness depending on the above, so you don't have to do the work—we do it for you.

All you need to answer are the questions that relate to the above and we will choose the correct thickness of glass; a certificate confirming that the ISO standard has been adhered to can be provided.

## Plain or Tinted

Although more expensive, tinted glass can not only improve the visual appeal of a boat, it can add to the comfort of those inside by restricting the amount of direct sunlight into the interior.

Choices vary, but tend to centre on light or dark grey. Other tints such as bronze, blue or green are available but costs can vary according to choice.

**\*Note\* Given the above, there are restrictions on using tinted glass in a wheelhouse where no other method of navigation is possible, tinted glass is not recommended for the wheelhouses on craft which operate in darkness.**

## Glass

All glass starts life as simple float glass and, at this stage it is known as 'single ply annealed glass' and is primarily used for domestic glazing.

Standard glass should never be used in marine applications because of its brittle nature and tendency to form large, dangerous shards when broken.

Fortunately it is possible to 'treat' glass after production to alter its properties.

## Toughened Safety Glass

For marine use, the main method of modification is heat toughening to produce Toughened Safety Glass, also known as Tempered Glass. In this process glass is brought almost to its melting point before being rapidly chilled by blowing cold air over the surface.

The glass reacts, forming a 'skin' which wants to be smaller than the glass it contains; the result being a glass that is capable of withstanding considerable pressure and will flex and tolerate a degree of twist (especially the thinner pieces).

If the glass surface is broken however, the glass disintegrates into tiny pieces. Therefore, toughened glass requiring cutting or drill holes will need to have this completed prior to the treatment process, therefore accurate measurements are essential. Fortunately, the result of breaking into tiny pieces makes toughened glass more suited to marine applications. Additionally, the glass retains nearly all its abrasion resistance and is normally less expensive than plastic.

## Laminated glass

The main alternative to toughened is laminated glass, which consists of two sheets of ordinary annealed glass bonded under pressure either side of a particularly strong plastic film. Whilst either sheet may break as easily as normal glass, the whole piece stays together, held in place by the plastic interlayer. Due to the glass still being only annealed, it is very prone to cracking and so it is only used by exception in the marine industry.

## Toughened Laminated glass

Toughened glass can be incorporated into a laminated unit to create Toughened Laminate which offers the best of both worlds – though at a cost and weight penalty.

As part of the laminating process, ultra thin or fine wires can be embedded in the interlayer to provide a heating capability to de-mist or even de-ice the glass. This however, is a much more expensive option.

# Acrylics

## Acrylic

Acrylic is used widely in the boating industry because it is easy to work, widely available, light in weight and reliable. It can be drilled and even fixed directly to the boat. It can be cold bent to a greater degree than glass, or quite dramatically with the application of heat.

Acrylic can withstand reasonable pressure, though it will crack and collapse, especially in cold weather if too much force is encountered.

The downsides are the tendency to scratch and, not being UV stable means internal stress cracks or crazing will appear over time due to the effect of the sun's rays.

Due to a variety of factors, acrylic, especially rare tints and thicknesses can cost substantially more than regular toughened glass.

## Polycarbonate

Polycarbonate has an excellent resistance to breakage and is light weight. Immensely strong, it is used for riot shields, bullet proof glass and by the RNLI. Whilst generally more stable than acrylic, it can degrade over time and its surface is relatively soft, making it prone to abrasion unless treated.

Seaglaze will always supply a hard polymer finish to improve the scratch resistance but it still falls short of glass, meaning it is not recommended for use with windscreen wipers.

Though multiple tints are available, we can only provide hard polycarbonate in a clear tint. Polycarbonate is also available in fewer thicknesses than either acrylic or glass and is routinely the most expensive of the 3 to use.



# Window Types

## Type Explained

### Fixed Windows

Fixed windows are, as a rule, the only certain design for keeping water out and have the advantage of being the cheapest.

However, ventilation is important so opening windows are often a requirement and provide an alternative means of escape.

### Opening Windows

Opening windows that can be sealed shut are the next best thing to a fixed window.

These windows employ some form of system that ensures the window frame is pulled tight against a seal to ensure its integrity.

Common options here are top hinged windows or drop back hopper types.

### Sliding Windows

Standard sliding windows are the least watertight given their nature – they are required to slide along a brush seal which, when faced with what the elements can throw at it, are simply not able to cope.

However, they are fitted with drain slots so that most water that gets past the glass and seals is ducted straight back out again.

Common options here are sliding or half drop windows.

### Double Glazed Windows

Double glazed windows are a common requirement because of their ability to retain warmth, but are considerably more expensive and there are limitations on their use and capability (e.g. - they cannot accept most opening types.)

## Corner Types



### Mitre Corners

The metal is cut to form sharp corners although the joints are a natural weak area for water to ingress. Also, the extra work required to build the window can follow through to the costs.

*If the window needs to be pulled to fit a curved hull, this can stress and pull apart the joints.*

Some of the heavier frame sections can be welded at the joints although this adds to the cost considerably because of the extra manufacture time involved.



### Radius Corners

Radius corners tend to be more widely used because of the reduced frame breaks (usually being constructed in two halves).

The limitation is the degree to which the frame can be bent and the heavier the frame section, the less degree of bend it will tolerate.

## Sealant

Sealants are twofold; one that is within the window frame, the other being used between the frame and the boat hull.

For the hull sealant, we recommend using a non-setting mastic so the window can be removed at a later date. This is down to customer and/or boat builder choice.

The glass to frame seal is our responsibility and there are two main alternatives; gaskets or hand applied mastic or silicone.

For Direct Bond glazing we advise you to speak to an adhesives supplier for the best product to use.

### Gasket

The gasket method uses a U-shaped rubber gasket that is custom made for the glass and the frame. Although they make frames very quick to glaze, gaskets lack long-term resilience in marine application and we therefore rarely use them.

Quite apart from the reliability of the gasket itself there is also the problem that tracing any leak can be very difficult as the exit point of the water may not be anywhere near the source of the leak.

### Silicone / Mastic

The alternative, which works well when applied by a skilled operator in a factory, is to bond the glass to the frame with a silicon compound. The silicone is injected into the frame with a compressed air gun. The glass is then bedded to the sealant and, for added durability, a silicone 'overhead' is applied to the outside face for extra protection.

# Window Styles

## Frame Finish

Although Seaglaze uses marine grade aluminium, the metal is reasonably re-active in its raw, or mill, state and generally not suitable for marine use as the surface will tend to oxidise. However, with suitable treatment an extremely stable state can be achieved.

## Anodising

Anodising is an electrolyte process that seals the surface of the aluminium. The depth of finish is measured in microns and 10 to 15 is the minimum which should be considered for a marine environment; we specify an average of 20 microns. Satin silver is the most common finish although there are other, less commonly used colour available. We no longer offer them as they have not proved satisfactorily durable over time in the marine environment. Additionally, the anodising process can produce a 'graining' which means it is not always possible to get an exact match between two parts of a window frame which have to be bent and cut prior to the anodising process. For both these reasons we recommend an anodised and powder coat overspray finish whereby we paint over the anodising.



## Powder Coat

The frames are first sprayed with an electrostatically charged paint powder which finds its way into all the nooks and crannies. The frames are then baked in a high temperature oven where the paint powder melts and provides a thick lustrous surface, free from runs. When not pierced, the resulting finish is very durable and, whereas anodising tends to highlight welded joints, powder coating will flow over and reduce their appearance. The finish though is susceptible to blistering & further corrosion if not properly cared for.

Although the standard colours are black or white, there is an enormous range of RAL colours including some very stylish muted shades – powder coat has a shelf life, so paint being brought in specially may carry a higher price than standard colours.



## Fastenings / Trims

The final area to consider is how the frame is to be attached to the boat and how the inside edge of the aperture is to be finished. The options on the fastenings fall into four groups: screws, rivets, bolts and nuts.

To neatly finish off the interior it is common to fit an internal trim ring (a metal ring that goes around the inside of the window and will hide any raw edges where the aperture has been cut into the hull). They also help by trapping and trimming off any interior fabric linings. Finally, they assist in spreading the load of the fastenings on the boat.

By their nature, clamp in windows have an inner trim ring as standard but with visible or through fix frames there is a choice.



## Conclusion

Whilst what you have read is a guide; Seaglaze is here to help.

To find the answers you need, just call and our expert staff will simply take you through the process to find the windows you need.

We are proud of our ability to provide top quality products to all our customers.

## Seaglaze Marine Windows Limited

Seaglaze was founded in 1970 and now occupies a modern, custom-built 15,000 sq ft. factory on the outskirts of Norwich, in the heart of the Norfolk Broads.

With around 40 full time staff dedicated to the manufacture of high quality yet affordable products, Seaglaze has built up a regular client list of prestige boat builders throughout the UK and overseas.

### Introducing Specialist Toughened Glass Ltd

Seaglaze identified an industry need for superior, reliable and complex quality glazing both in the leisure and commercial market.

**Specialist Toughened Glass Ltd**, our new in-house glass toughening plant, provides customers with high quality and complex glazing products to tight deadlines and demand.

By bringing the toughening process in-house we can now offer a quicker turnaround and a superior quality product at a reduced cost.

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