

RAISE YOUR GLASS



THE INNOVATION AND TECHNOLOGY SURROUNDING THE USE OF GLASS IN YACHTBUILDING IS A CURRENT HOT TOPIC IN THE MARINE INDUSTRY. WITH DESIGNERS WORLDWIDE CONJURING INCREASINGLY ASTONISHING WAYS OF USING GLASS, **FRANCES** AND **MICHAEL HOWORTH** TAKE A LOOK AT THE CURRENT STYLES, PRACTICAL QUESTIONS AND SAFETY ISSUES, AND WHAT THE FUTURE MAY HOLD.



PIONEERING DESIGN
Left: Neville Crichton's *Como* is an example of Feadship's groundbreaking use of glass, with the proportion of glass in the yacht's silhouette reaching 42 percent.

The recent launch of the 46-metre *Como* for Neville Crichton drew much attention to Feadship's pioneering use of glass. The client requested unprecedentedly large windows in the hull and a wealth of glass in her superstructure, to the point that in the case of this yacht the proportion of glass within the yacht's silhouette reached 42 percent. *Como* is not alone - as well as *Hampshire II* and *Musashi*, builders have turned to glass for the impressive *Venus*, another relatively recent launch from Feadship.

In much the same way that skyscrapers have been transformed by glass, advances in technology in the use of glass have, over the years, radically changed the way yachts look. In recent decades, the use of glass in the construction of large yachts has been constantly on the rise. In 1960 the average proportion of glass within yacht silhouettes was around seven percent, a figure that had doubled by 1990 as windows became larger, were placed closer to each other, and played a far more prominent role in styling. Today that figure is nudging 30 percent.

The current developments in the use of glass on superyachts can be traced to the first Future Feadship Concept design in 2006, called *X-stream*. Dutch builders Feadship received an enthusiastic response to their idea of offering a fully glazed superstructure and a glass observation area in the bow. This led to a research program focused on the use of very large glass panels, the deployment of glass for strength, and the influence that glass has on interior comfort levels.

The first yacht to benefit from this research was the 88-metre *Mushashi* in 2010, where the structural elements around the luxury interior spaces were kept to a minimum and the proportion of glass to metal in her exterior profile was over 20 percent. Then *Aeon*, another in the line of Future Feadship Concept design yachts, featured glass in the hull and showed the world how large windows at the waterline could offer amazing views of the oceanic world. This idea was subsequently brought to reality on the 78.5-metre *Hampshire II* in 2012, which offers an underwater viewing port of over one metre in diameter from the wine cellar on the bottom deck.

BIRTH OF VENUS

The late Steve Jobs, creator of computer giant Apple and owner of the 78.2-metre superyacht *Venus*, was not alone in his love for windows, (not the Microsoft kind!) His head-turning yacht was created in a unique collaboration between Jobs, Philippe Starck and Feadship, which received special attention in many ways, but it was the use of glass that garnered most acclaim. The giant windows on her pavilion deck required close co-operation with the Lloyd's Register of Shipping and glass expert Eckersley O'Callaghan. Normal windows are tested full-scale in a steel construction using water pressure to see whether the construction will hold. *Venus's* pavilion windows measured 10 x 2.4 metres, however, and there is no testing facility for such a size. Moreover, the connection system is very different as there is only a connection on one side with the windows resting on a couple of supports.

Bram Jongepier, manager of knowledge development at Feadship, told *Ocean*, "Once *Venus* was launched we could measure actual hull deflection with the tank loading centred and completely to the ends.

"We were also able to check the accuracy of our FEM calculations - the first time anyone has had access to real-life feedback on the computational models used. Crucially, we were able to replicate the results of the tests to an accuracy of 10-15 percent - an impressive figure for such an extraordinarily complex product."

It seems that everyone queuing up to buy production yachts has the same view as Steve Jobs. Exterior glazing has always



been a fundamental styling element on such craft, even back in the early days when the issues were just the rake and height of a windscreen. Director of design at UK-based Sunseeker, Ewen Foster, told *Ocean*, “As our product has gotten larger, and the glazed areas have increased, the design and proportions of the exterior glazing have become as strong a statement as any other of our exterior styling cues that help define just what makes a Sunseeker yacht look like a Sunseeker.”

INCREASED DEMAND

Over the years boatbuilders have seen a push from the marketplace for larger and larger glazing within the superstructure, and more recently the hull itself. They have certainly embraced this trend and actively work with suppliers and the relevant classification bodies such as RINA and CE with the aim of pushing the boundaries on glazing sizes, yet ensuring that the strength far exceeds any current and foreseeable future rules and regulations.

The Australian market has a love for the outdoors, which demands maximising opening glass sections for ventilation and interaction with the surroundings.

Tom Barry-Cotter is designer of the Elandra 53, the first boat from Elandra Yachts in Arundel, Queensland. This first of its kind caters for these demands with full concertina bi-fold saloon doors, electric saloon window, electric sunroof and opening hull windows – ensuring that every cabin onboard can access fresh air.

The evolving design of blind products providing greater light and thermal properties, in compact easy-to-use systems, definitely enhances flexibility in the use of glass in these areas. Barry-Cotter says, “Boaters no longer want to feel cocooned below deck in dark cabins, it is vital that boat users are able to feel a part of the environment they have come to enjoy. Toughened glass allows large expanses of natural light to illuminate lower cabins through large panoramic hull windows without compromising hull integrity.”

Riviera, internationally renowned for the clever indoor/outdoor characteristics of its pleasure yachts, actively seeks owner feedback via worldwide forums, and is finding increased demand for boats with more glass. Stephen Ford, industrial designer and head of concept design at Riviera, said, “Our new 75 Enclosed Flybridge currently under construction for a Dubai owner will have huge sweeping glass panels down each side of the hull, which incorporate into it large hull windows up to 300 millimetres x 1200 millimetres. All the glass used is tinted, toughened safety glass, bonded to the fibreglass hull. Our new 6000 Sport Yacht – in addition to its expansive sliding glass saloon windows – has a toughened glass rear bulkhead featuring an opening awning window, as well as two electric sliding sunroofs built into the hardtop, plus fixed skylights aft in the saloon. The sense of light

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FUTURISTIC EFFECT

Above: The flybridge on *Como* is also dominated by glass, with glass panels able to rise from the deck in the event of bad weather.

and space in the 6000’s accommodation deck is enhanced even further by the huge windscreen and the stylish and contemporary hull windows, and opening portholes on both sides of the boat.”

Not all boatbuilders are rushing to install extra glass. Greg Haines of Maritimo told *Ocean*, “Glass is really not an issue, our boats are long-distance cruising boats that make offshore passages, and our customers prefer not to have glass below the gunnel line.” The company did concede that where there was demand for more glass, it generally revolved around the desire for increased ventilation.

TESTING STAGE

In 2012 Feadship initiated a study into load-bearing glass that focused on specific locations in the yacht - local, not global loads. As a test, the load of the wheelhouse roof of a 45-metre Feadship was placed on the windows. After calculations it was found that by increasing the thickness of the front windows from 14 to 30 millimetres, they could support the roof.

Five full-scale tests were then carried out that proved that an enormous amount of weight could be placed on top of the windows. For regular windows, a normal load is prescribed at about three tonnes per square metre.

The roof above is also considered a design load, and this was also transferred onto the window (around three tonnes). Lloyds regulations require that windows be able to support four times the normal load without breaking. The tests put four times the normal load on the window and then started adding the deck load (compression load) too. It took more than 15 tonnes of weight before it actually broke.

Feadship are now convinced they are able to load windows with the load from the deck above in a local situation. They know how thick they need to be, they know how to test them, and have already discussed this with the class authorities. Ovens of the size required to bend giant glass panels are now available, and better builders have the design and construction expertise to ensure total safety at sea.

Some consider this trend for larger glazing areas to be a new thing in the marine industry. Others will argue that for hundreds of years, exterior glazing has to some extent mirrored what may be found at home on land, and in some cases vice versa. The Georgian sash windows in Nelson’s quarters aboard HMS *Victory* are, for example, an obvious case of a visual connection with more comforting lodgings at home. Whether this is the underlying root of this trend or not, we are seeing today the results of a desire to bring the outdoors in, and to blur the boundaries between the inside and outside guest areas aboard a yacht. Production builders like Sunseeker and Princess in the UK are seeing an ever-increasing similarity between a client’s interior design taste within their land-based accommodation, and what they desire from the interior of their yacht.

Pelorus, *Darius*, *Topaz* and *Quantum Blue* were all yachts designed by Tim Heywood and all exhibit large windows in both the hull and superstructure to flood the interior with light. The use of deck overhangs to the superstructure and deeply recessed windows in the hull help provide shade to reduce the load on the air conditioning.

Heywood told us, “I have always felt that when you’re inside a yacht you need to see the sea, that is why you’re on a yacht in the first place, so I have always loved large windows. Back in 1981 on the *My Gail III* project we had windows in the superstructure over three metres long, these were the longest one-piece windows possible at the time and I have pushed to create bigger windows whenever I can, since then.

“The larger the glass, the greater the thickness and we have had large windows of 40 millimetre-thick glass on many projects. The thickest glass we have used is on the Lürssen project *Topaz* where the aft swimming pool window is no less than 120 millimetres thick!

“My latest design, *Quantum Blue*, has louvered sky lights on the top deck made of curved edge-lit 30-millimetre-thick tinted glass, a major achievement for the builders, again Lürssen, and a striking feature to both fore and aft roofs. She has just completed her first sea trials and will leave Germany soon.”

As always, the challenge is in the details. With larger and thicker glass panels, the support engineering has to be carefully designed with extremely strong but elegant fittings. The use of gently curving, stainless steel columns to end vast side screens with concealed fixings and clever locking mechanisms, needs careful study and intelligent structures to make it viable, buildable and, above all, safe. Six-square-metre movable panels of 30-millimetre-thick glass, on a yacht, must move smoothly and safely, putting great responsibility on the design team.

Perhaps a large part of this trend can be attributed to the ever-growing charter market and the resultant changes in how and why a yacht is used. Continued advances in technology and materials, in conjunction with continual bench testing witnessed by classification bodies, have allowed builders to fit ever-larger glazing in areas that not long ago were prescribed by the then rules in force. What were once accurately termed as portholes or portlights are now in certain cases, large windows. At the shipyards operated by Sunseeker for example, they utilise monolithic and laminated thermally toughened glazing, and also laminated chemically toughened glazing depending on the application and position on the boat. Some areas are totally flat, some are curved in two directions.

ART OF GLASS

The use of glass on superyachts is not confined to just the superstructure. Many interior designers are using glass as an art form inside the yachts they are creating.

Julia and Colin Webster are British artists who specialise in the use of glass. Their skills of melding different elements inside glass have been the subject of many exhibition pieces around the world. Commissioned to work on the 68-metre Lürssen-built *Kismet* (now *Global*) by interior designers Reymond Langton, Julia was called upon to create two glass panels, one standing majestically behind the enormous round bath in the owner’s suite, the other dividing the cinema from the main saloon. For the bathroom, the owner fell in love with a design incorporating what could be enormous peacock feathers. Each of the very fine and intricately shaped elements is in fact a separate piece of coloured glass that has been blown into individual shapes that are layered between sheets of glass and the entire work of art is then fired inside an enormous kiln. Three rough and sometimes sharp panels emerge from that process and are then polished and smoothed. To add the subtle curvature, each panel has to then be slowly and very carefully reheated to the point where they can be shaped before allowing them to cool equally slowly. At any point in this delicate process it can go horribly wrong, crack and become worthless scrap. For the screen between the saloon and cinema, the brief was to ensure the areas were divided in such a way as they appeared not to be. The design of autumnal leaves was again made up from many thousands of glass chippings that are by heat melted into a single panel. Julia’s husband Colin, meanwhile, began to create multi-coloured jellyfish-like shapes



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in glass. These were affixed to the glass bottom of the spa pool above the beach club in such a way that when the sun shines through the aerated water it casts pretty, changing patterns inside the clubhouse ceiling.

It should not be forgotten that with larger expanses of glazing comes more heat. It is vital to carefully balance the glazing aesthetic effect against any increase in air conditioning and other ventilation requirements.

Ewen Foster of Sunseeker says, “The main deck saloon on our 28-metre yacht is as close as we have got to a 360-degree glazed living space. Whilst spectacular, the engineering behind this look was immense. Our clients see this yacht and demand a similar look on smaller and larger yachts, and our challenge as ever is to incorporate their brief within our styling without spoiling our overall ‘look’, engineer the areas to be structurally sound and efficient to build, and ensure the best balance is achieved between sea-going practicality and a leisure lifestyle.”

THE FUTURE

It is likely that in years to come glass will play an increasingly important role in the exterior styling of superyachts. The Pastrovich Studio, a Monaco-based yacht designer, has unveiled its plans for XR-Evolution, which will hold a number of glass pods that could be deployed should those chartering the yacht want to be alone. Another design proposal, by Lujac Desautel, is simply called ‘Glass’. He used an unexpected source for his inspiration, choosing the concept of the Lego toy bricks to conceive a modular structure with each floor stacked upon the other like building blocks. German shipbuilder Blohm+Voss commissioned Zaha Hadid to come up with a concept designed to get people talking. Her design, enmeshed in a lattice-like exoskeleton of huge shaped glass, give this stunning yacht an almost transparent feel.

Bram Jongepier at Feadship says, “Now we are working with various designers and potential clients on something truly spectacular that will reap the rewards of all this research.”

Clearly the breaking news here is that there is much more glass on the horizon. ○

WINDOW TO THE WORLD

Above: Yacht owners no longer want to be cocooned in darkness on their boat, therefore larger windows such as those seen here on 35-metre sailing yacht *Tenacious* are increasingly in demand.