

The Simple Logic

by Derek Kelsall, 2004

Quantifying the effort involved in the various tasks, from the designers first sketches to the sailing trials, it is very clear that the major effort in all boat projects is that of the boat builder. It is also evident that what the boat builder does and how he does it is, to a very great extent, in the hands of the designer. Unless the designer has been involved in some special study, he will have little or no hands on experience and will follow the current fashion.

Kelsall Design, KSS and resin infusion is "Elegant but so simple. Simple but so logical". We design boats, we build our boats and our clients build our boats. The way we both design and build is unique to ourselves, the simple logic of what we do is evident to every open minded, unbiased, enquiry.

My design career began with the reasoned, but to some extent lucky, choice of foam sandwich as a material and build method. Throughout the 40 years since those pioneering days, seeking the simpler and better way to handle the material, to make the boat builders job more efficient has been my enduring objective. Lacking specific training, there being no expertise in this field at that time, simple logic and an open mind, has been my guide throughout.

To illustrate - the traditional approach, still the most common for custom boat building today, has not changed in centuries. That approach was devised to produce boats made from planks, frames and stringers, with the multiple frames producing the shape. Today, perhaps 80% of all custom build projects use a sandwich structure. That actual structure does not require frames or stringers for strength but does still rely on frames for the shape. Our unique approach comes from knowing the properties of the materials and the structure we wish to create. Quantifying the effort involved in the various tasks, from the designer's first sketches to the sailing trials, it is clear that the major effort in all boat projects is that of the boat builder. It is also evident that what the boat builder does and how he does it is, to a great extent, in the hands of the designer. Without hands on experience, the designer will follow the current fashion.

Strip cedar from the timber merchants, strip foam from the foam suppliers, or a variety of panel methods from the panel producers, are all widely promoted and the typical designer will offer the builder these options. We want to see the boat go afloat as quickly as reasonably possible and with the least effort. We know from first hand, what is involved at every stage. We know which tasks take the most time and which are the most efficient ways. This automatically means that there can only be one method that we can promote – KSS – Kelsall Swiftbuild Sandwich.

On the basis of efficient use of the boat builder's time, there is no competition. Our clients range from the professional to the first time home builder. He has a decision to make. He will get one message from me and a very different message from all other designers he might consult. Which makes most sense to him, is the decision he has to make. The following should assist in making that decision.

The Simple Logic of Foam Sandwich

I chose PVC foam core, with composite skins in 1965. I found it worked and I have stayed with it, with no alternative ever challenging for efficiency and effectiveness. Almost all boat structures and other structures which consist of fairly large areas of panel, are most efficiently made, for strength and stiffness for least weight, of some form of sandwich structure. Foam in boats gives the ideal core properties when used with fibreglass skins. It adds buoyancy and insulation. It gives a clean interior. KSS makes full use of the unique feature of foam construction which allows one skin and foam to be bent and have the second skin added to fix the shape. In addition, foam does not take up water and does not rot. It is just a wonderful material, which is a joy to work with. It cuts and sands and bends with ease. For all of these reasons I have seen foam construction progress from being virtually unique to myself, to being endorsed by virtually all designers. The simple logic takes us one stage further: We never mix foam sandwich composites with other materials and we exclude all materials from our structures which could take up water or deteriorate with time. Our sixties boats pass survey today and I expect them to still be sailing in another 30 years time.

The Simple Logic of the Table

I argued the logic 30 years ago. We made the table, it improved everything we did and we never looked back. With composites, to do as much as possible on a table could not be more logical. The glass lays flat, the foam lays flat where it is positioned and the resin does not flow away as it does on angled surfaces. Move any job onto the boat and add two, three or more times the working hours. Reaching from scaffolding, to position fibreglass or to laminate is not only inefficient it does nothing for the quality. There are other gains. For example, the table can make use of all but the smallest offcuts of both foam and glass. Less wastage and less cost in disposing of the waste.

The Simple Logic of KSS

Progressing to KSS was steady, step by step, by making ever more use of the table, which we did by planning in the design office. To start with a flat panel and then to use all or part of that panel as a developed panel is the logical approach. There is almost no limitation on the shapes that can be achieved, providing part of that panel can remain as developed panel. In effect, we hang the shaped part onto an edge of a developed panel and in doing so we have immediately removed 85% of the fairing problem. I.e. The panel takes a fair line and the shaped part follows and it is all put into position in one move. No part of a catamaran is compromised by the use of KSS, even where every part starts as a flat panel.

The Simple Logic of Resin Infusion

Fibreglass gets its strength from the very strong fibres being fully encased in a strong resin matrix. Laminating is the process of getting the resin into the spaces between the fibres to replace the air that is there before laminating. Take the air out before starting is the logical starting point. RI also takes the resin into any other voids. Doing so on the table makes KSS and RI the perfect partnership. There is another major factor for the boat builder. It exchanges the handling of sticky, messy, smelly resin with bucket and roller, for clean laminating under a vacuum bag, requiring no effort other than mixing and then monitoring the resin flow. The ability to post cure on the table is a great asset. It is done as a matter of course by the professional kit producers. Post curing is particularly appropriate for the high performance laminates for some projects.

The Simple Logic of KSS Design

We design, with the way it will be built in mind at all times. Every part of the KSS structure is drawn accurately as a separate panel. These can be premade as a kit by the boat builder, but also now available for all our projects, professionally made to a very high standard and can be delivered anywhere in the world.

The Simple Logic of Designing to Suit

Part of 'designing to suit' is to find the style that suits the way in which the craft is going to be built most efficiently. For example, we have found that the table and RI methods allow a full sandwich panel to be produced in a time efficient, one shot infusion. I.e. adding the second skin only requires the glass to be put into place and does not otherwise add to the job. The more full sandwich panels the boat builder has to work with the quicker the boat will be built. If we design to use the panel without adding further laminate we have slashed away a lot more time and we have saved weight and materials. Our latest designs make good use of this feature.

The Simple Logic of Full Size

Full size panels ensure fair lines. The panels act like the designers or the boat builders fairing batten. However, that is not the only factor. Joining say 8x4 sheets will add at least 15% to the weight and cost in joining material. Then those joins need to be smoothed and finished which is yet another task. An interesting fact of custom boat building is that the time involved is almost directly aligned with the number of panels rather than to the size of the panels. If the designer can draw one panel to do the job of two he will have saved boat building time.

The Simple Logic of the Mould Table Finish

Making a table as the first step in a project, might be seen as effort that could be going into the boat. The smooth finish from the table however, is THE big time saver. That area of finish, one time, the typical way, will take longer than making the table. The table uses its smooth finish, over and over again and consider this is just one of the advantages, the table is the best investment the boat builder can ever make. The common alternative is called torture boarding - for both the effort and the dust and the itch that goes with it. Again, the alternative longboarded finish will more often than not add more of the filler material to the outside surface than volume of material in the outside skin. This is costly and unwanted extra weight that no cat needs. An even greater amount will have been removed in the form of dust, at great cost. Conventional finishing applies to about 20% of the area of KSS projects.

The Simple Logic of KSS Assembly

A catamaran has two hulls which need to be parallel with each other, without twist and the bulkheads need to be square to the hulls etc. KSS uses the panels, information set out on them and the eye to control the accuracy of this task.

The Simple Logic of KSS Shaping for Hulls

The KSS hull is made from two panels. The panels and the information on those panels determine the shape, with minor control from a simple frame of straight timbers. Typically we make a 10m hull panel in a day. We take half a day to prepare the two panels and another half day to set the panels in place and to shape. The final shaping takes an hour, with perhaps another half day to refine the detail. No other system comes close. Typically, narrow strip will be used to produce the compound curvature. The length of strip can often be measured in miles. KSS produces the same compound shape using a few short dart cuts, at about 350mm intervals.

The Simple Logic of the KSS Deck Edge Radius Batten

The DER is applied to all Kelsall designs and, is one of the most effective features of KSS. A radius batten is produced from a plastic tube, for the full hull length. The sheer line for each of the four hull panels is set out on the table and the DER batten set to it. The perfect sheer line is the result from a minor effort in making the batten and setting out on the table. The deck panel tucks under the radius with bond on the radius and not on the flat.

The Simple Logic of Starting from Large Flat Panels

The majority of today's custom build projects start with either small panels, or strips, or a combination of both. The table and RI allow us to make a panel, from the basic materials, in the time that it takes to assemble the typical 8x4 panels together into one large panel. The difference is that we have a smooth finish on that panel. Add also, that the smooth finish and join areas etc., will need further treatment and this can all be done while the panel is still flat.

The Simple Logic of Vacuum Pressure

Our foam sandwich panel making, over 30 years, has made use of vacuum. Initially, to ensure the important bond between the skin on the table and the foam, where relatively low pressure is sufficient. The power of vacuum pressure is enormous, but needs only a plastic sheet, sealing tape and a pump to use that power on the table. For RI the pressure needed is close to 100% vacuum, which removes the air before the infusion begins and the resin runs in to replace the void. In doing so, the quality of laminate is second to none. The pumps we use are often from small refrigeration or air conditioning units.

The Simple Logic of Kelsall Style

We have talked a lot about flat panels. Though much of the boat shape is of developed panels, a boxy look is not a criticism that ever comes from any of our clients. Quite the opposite. We do not however, offer the all very rounded look which is common for many 'modern' cat designs. We know the time and cost and weight that it adds to the project. It is not a fashion that we have any interest in following and we are happy to put any one of our designs along side for comparison.

The Simple Logic of Kelsall Design

We work with simple shapes, but accept no compromise of utility. We support the KISS principle at every stage. 20+ years in the competitive world of custom boat building concentrates the mind. I have also spent the time on the water, crossed the oceans and won major races. I know what is needed to do the job. I have, for example, capsized a cat (11m) just to see what happens. I have (inadvertently and alone) spent time on a capsized multihull offshore. There is no substitute for this type of experience when making decisions that will affect the performance and the safety of the serious offshore cruising craft. We have designed and built world winners. We have moved the barriers, with such as largest of type on a number of occasions, and the rest of the world has followed - and is still following.

SUMMARY

At the end of the day, what we have achieved is a standard of efficiency and of build which owes everything to the best application of simple, logical technology rather than relying on devoting hours of practiced skills. Kelsall and KSS and RI will boost your project, whatever the type or style or size of catamaran.

"What I have seen makes me realise that I have spent far too many years doing it the wrong way, the hard way".

A common comment from experienced boat builders

The Simple Logic Detail

Those are the basics for the structure, but not the sum total. Simple logic applies to our deck fittings, steering, rubbing strakes, rigs, spar making and to our latest innovations, the unique catamaran trailer sailer, cross beam systems, and unique trailer sailer rig.

The Simple Logic Fit Out

All of the above refers to the structure. The fit out is just as important. The clean interior with built in insulation is a boon when it comes to fit out time. Our recommendations continue in the same way, with the same materials and the same benefits. The fit out is often used to add stiffness where needed and is most effective when using the same materials. Finally you may ask; why is Kelsall the one offering something that is different? Where we are today is the result of four decades of dedication to the subject and a steady progression, as we tried and tested the ideas as they came along. I am indebted to many of my clients for having the faith in my ideas to put them to the test and also for many of the actual ideas which they have put forward and we have adopted. No other comparable build method has been subject to such intensity of development, either in time or investment or by such open and active minds. Anyone studying the development of boat build materials and methods over the last few decades would find it entirely logical that it is the Kelsall name on this one. I made the investment and continue to do so. It is a subject that I find both rewarding and fascinating.