DIY SMALL BOAT BUILDING
With Clinker Plywood Designs

This manual was written to be an informative, easy to understand introduction to a boat building method well suited to the first time DIY small boat builder using Stitch & Tape construction. It shows how this boat building method is used to produce a boat from scratch using plans for this method or any similar designs, quickly, cheaply and relatively easily.

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By Paul Downey
STANLEY SmallCraft








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Introduction

Clinker Plywood hull construction basically involves cutting out the planks and other component parts of the boat from sheets of plywood. A build frame of moulds, the keel and stem assembly plus the transom is set up over the moulds. Then the planks are attached on position, one pair at a time slightly overlapping the previous plank. They may need to be held in place with wire or cable ties before the epoxy fillet is applied in the overlap to hold everything together. This produces a strong monocoque type hull which is ready to be fitted out.

There are several different materials that are used to build a boat and with those materials there are different ways to use them to produce the finished craft. This might depend on the intended use for the boat, size or the design criteria. Boats could be built in steel, aluminium, fibreglass, timber, plywood and even concrete. With the use of each of those materials there are different methods used in the build. For example, in a traditionally built wooden boat with a rounded hull, the boat could have been built using clinker or carvel planking or it could have been cold moulded plywood.

Wood has been a very popular material with DIY small boat builders for a very long time. It has declined somewhat in recent years with the advent of plywood and various plastics etc. The favourite now is plywood although some do try fibreglass but that can involve building a mould before you start, its messy, temperature critical and the vapours can be harmful so not suitable for working in small, confined places.

However, as we are interested in the DIY builder here, this manual we are going to deal with just one main material - plywood. That presents another problem as there are different grades of plywood that could be used but we will deal with that problem later.

The information in this manual is primarily aimed at the inexperienced amateur builder and is written to reflect this, although anyone of any experience could gain something from this work. I have drawn on my experiences and those of builders' of my designs, so that you can find the answer to almost any problem you may come across during the build. I have tried to be informative yet as brief as possible to avoid becoming boring! However, you may find some things have been repeated in different sections. This is because they are quite important items and I don't want you to miss that particular point.

You can use this manual to help build other Clinker Plywood designs if you wish and there are a great many out there to choose from. Although I have used my designs as examples throughout this manual, the information is the same for other boats designed to be built using this method. It is not a method exclusive to my designs and I have tried to simplify things as much as possible. All my DIY designs are intended to be as simple as possible to build with nc

complicated craftsman joints.

All the pictures used in the manual show the work of builders of those designs who, in the main, had no experience of boat building and had only limited DIY experience. They followed the plans step by step and produced the boats you will see in the pictures. Many of these pictures are included on my website and they are as was and not touched up or staged so any errors they made, large or small, can be seen.

So, why build your own boat? There are many answers to this question but for me it is simple. The satisfaction that comes from seeing a few bits of wood turned into a beautiful little boat is something I never tire of. You can build at your own pace and that of your wallet. You can put your own ideas into it by adding bits of trim and painting or varnishing to your preference. It is a very rewarding hobby and is great for the long winter evenings unless, of course, you prefer watching television.

I have been around small boats virtually all my life and built my first dinghy at the age of 12 – with assistance. I was taught how to build and repair boats the “old fashioned” way. Plank on frame either carvel or clinker from small dinghies to larger craft such as yachts and fishing boats. During this time and later, I learned how to design them and soon built up a large portfolio of my own designs. All of those original designs were for the more traditional wood/plywood plank on frame construction but in 1995 I re-designed some of them for the more modern Stitch & Tape or Clinker Plywood construction methods. Now, after 30 years of experience of boat building, I build mainly in Stitch & Tape as I like it for ease and speed of construction. Personally, I also think it the best method for the novice DIY builder.

These days, as a business, we need to build more in fibreglass than any other medium as that is the most popular with customers. Personally, I don’t like fibreglass boats as I find them heavy. Plywood is lighter but unless looked after, will rot. Fibreglass is prone to rot too, in different ways, but is often considered by many to be maintenance free but it too needs to be maintained.

However, Clinker Plywood boat building is still a great method that produces some great little traditional looking boats. I now have had my designs built all over the world in many different countries with some great examples built by DIY builders. Some were having a go at building a boat for the first time.

Brief Notes on Small Boat Design.

This section is just a few lines on small boat design. It is not a "How to" guide or anything along those lines. It is simply a few notes on how we go through the design process and how certain things can affect the eventual performance the finished boat.

An old boat builder I knew simply said "With little dinghies and even larger boats, if its boat shaped, looks right, is the same on both sides and things are where they should be - then it'll work." He was generally right although it helped to know what was right before you looked. What looked right to me didn't always look right to him. I learned it all eventually along with the "academic" way of designing.

With the kind of boats that we at ***STANLEY SmallCraft*** normally design and build, it is simply a case of drawing what we or our client would like, running through the design process on paper, checking it with the computer (which is taking over a bit now) and building a prototype which is then tested. If it works as well as we wanted we draw up the plans for it some of which are suitable for our DIY plans.

Hundreds of my designs have been built by DIY buildersin many countries around the world and when I design something new, I try to keep in mind any suggestions they may have sent in along with things we find out as we build in our workshop. I encourage feedback from my builders to help me with future designs to make things easier or add new things to existing design. I also work with a charity boat building project for young people, which is a great source of information for me when designing something new.

I always try to keep the boats I design as simple to build as possible with no complicated joints. I am helped with this by the simpler methods of building using plywood and modern epoxy glues. When I started out, we built our boats using a number of sturdy frames with timber planking resulting in heavy boats, even in small dinghies. Now, most of the frames are left out, when using plywood, resulting in far lighter boats. Recently, I designed and built a canoe in 4mm plywood which I could carry easily with one hand.

These days, it is possible to build a small boat without using any screws or nails at all. Epoxy takes care of all the fixing of one piece to another. We build using simple joints with no complicated craftsmen joints to cut. In the main, things are glued where they touch. This is the way some designers work for the DIY builder. Others use various combinations of traditional craftsman methods with modern techniques. Some, including myself, will still design for a traditionally built boat as well.

When a designer is designing a new boat for a client, there are a few basic preliminary factors he will need to know;

How long will the boat be?
What materials will be used for the build?
Is it to row, motor or sail or all three?
Is it a day boat or overnighter?
How many people will it carry?
What weight restriction might there be for trailering etc.?
Where will the boat be used – inland or tidal?

As the design process moves on there will be more. The boat needs to balance properly and the sail rig, if there is to be one, also needs to be positioned correctly. As the designer goes through the process of designing the boat, he will have several mathematical calculations to complete and then several checks to perform that may require changes to the original drawing. But, once all done, the new design should do all it is intended to do.

However, people don't always use boats as they were intended to be used and people also have different preferences as to, for example, where the rowlocks should go, height of the thwarts, or if a little lee or weather helm is required when sailing and maybe more or less people and gear to be carried. All these things would require a change so small boats are designed for the use expected by general majority and the individual can customize if they see fit.

You could take your boat building hobby one step further and perhaps design one for yourself. There are a few books that could help you with this and probably the best to start with is John Teale's "How to Design a Boat".

Types of Wood & Working with it.

The title of this section should really be “Working with Plywood” as the designs and methods this manual is concerned with produce boats built primarily from it. Wood, in the form of timber lengths of various sizes, is used for some items in the build but the bulk of the boat construction is plywood - a very useful material to have available. It can be cut to shapes that are bent in place and joined together to form the actual hull shell to which frames, seats and other items are added. It is used in several construction methods to produce a wide variety of boats in many sizes from the smallest dinghy up to, for example, a 30 foot yacht, and I will be dealing with just Clinker Plywood in this manual. As you get into the larger boats, more framing and bulkheads become necessary to give the strength required.

Plywood is normally available in the UK as standard 8’ x 4’ (2.44m x 1.22m) sheets of varying thicknesses. It comes in three main grades, interior, exterior and marine, of various qualities within each grade. You can also find other types such as veneered plywood and Birch plywood. For the purposes of DIY small boat building, good exterior or, preferably, marine grade is used. 1/8” (4mm) would probably be the thinnest and 3/4” (18mm) the thickest you are likely to use. With the small boats 1/4" (6mm) is the most commonly used thickness. Thicker plywood; 9mm, 12mm or 18mm is used, depending on the size of the boat for frames, transom, rudder, dagger board etc. Plywood is available in larger sheets, 3.1m x 1.5m for example, but you will have to shop around.

I have heard of plywood being sold in 2.4m x 1.2m sizes but the standard size in the UK and many other countries is still 2.44m x 1.22m (8ft x 4ft).

As for the argument between using marine plywood or exterior grade plywood when building small boats, it is normally just a question of price for the DIY builder as marine plywood is more expensive than exterior. You have to weigh up the benefits for you one against the other. Your choice of wood will affect the final result. Poor quality wood left untreated, no matter how well crafted, could and probably will result in a weak boat. For example, plywood is weakened if it has voids in it. If that void runs across the full width of a plank and isn’t filled, it is highly likely that it will fail. Cheaper boards are more likely to have these voids.

Exterior WBP Plywood– is cheaper than marine but you invariably get what you pay for. WBP means it is water resistant and the glue will resist water at up to boiling temperature. Not something you are likely to need unless you spill your fresh coffee on it.

It is better quality now than it used to be and the glue used to stick it all together is normally the same as marine plywood. It is the quality of the veneers that makes marine plywood better than exterior. In the case of 6mm plywood exterior, it is often made up of a thicker wood pulp type core with very thin veneer face either side. This is not as strong as having three or five

laminations of an equal thickness as in marine ply. However, 6mm marine ply may be the same but the core will be wood and the veneers thicker. It means it will be heavier but good quality.

The main problem with exterior grade plywood is strength from the quality of materials used to produce it. There will be some voids in cheaper plywood between the veneers which weakens it and these may not present themselves until you start to build. One way to help spot any voids is to check for any holes on the edges of the sheet before you buy it. If it has a corresponding hole on the other side this could mean the void runs the full width of the sheet. During the build, check the cut edges of each plank or panel. If you find any holes, use a piece of thin wire to find the depth of it and then, for deep holes, take a small piece of waste plywood which you then need to de-laminate. Cut a piece or pieces long enough to fill the hole.

Do not try to jam too much into the hole to fill it as it may start to push the laminations apart. I usually make my filling pieces a bit shorter, coat them in resin mix, inject a thin fillet mix into the hole to fill it and then use a thick fillet mix to plug the hole. With shallower holes, you may only need a little fillet putty to fill the hole. Better quality exterior plywood will often have any voids filled. Check for blisters, scratches or repairs on the face veneer and don't buy anything that isn't as perfect as you can get.

Also, the face veneer on exterior grade plywood may be quite thin and can, after the build, become scratched through the surface paint/varnish with normal use. Deeper scratches will allow water to penetrate through the veneer which will eventually result in de-lamination. If you damage the veneer during the build, repair it.

A lot of designers advise the sheathing of the hull in fibreglass cloth and I would agree. However, if the budget is tight, a coat or two of resin before the paint or varnish is applied will give good protection. If any damage occurs, it should be treated quickly with full repair or something to provide at least a temporary water barrier.

Some well-made boats built in exterior grade plywood and well maintained have lasted for years. Equally, some marine plywood boats left for years with peeling paint etc. have not lasted as long. Boats, like most things, need to be looked after if you want them to last.

Marine Plywood – at least quality marine plywood will have veneers of equal thickness and 5ply is better. It should conform to BS1088 and be stamped as such. My example 6mm plywood is normally made up of three or five equal thickness laminations and each lamination will be complete with no voids, which makes it stronger. It is actually easier to work with and will often give a better finish for varnishing or painting. It is likely to last longer than exterior grade and a well-built marine plywood boat should have a greater value if you come to sell your work. But, be careful when selecting it as there are some inferior boards out there being sold as quality marine plywood. Look for the BS1088 mark; check the laminations and quality of the face veneer. As already mentioned, it is more likely that your 6mm plywood will be a wood core with outer veneers unless you are paying £50 plus per sheet.

As the main consideration for the home boat builder is usually cost, then good quality exterior grade plywood fits the bill perfectly. However, I would always recommend the use of marine plywood but its price can be prohibitive when working on a tight budget so, good quality exterior plywood is a suitable option.

Whichever you choose, exterior or marine, the weakest point of plywood is the edges. If left untreated it will soak up water which will lead to rot or de-lamination. You should therefore seal any exposed edges with epoxy, paint and/or varnish. In every case, never be tempted to use interior grade plywood.

Other Wood - used for the rub rails, inwales, keel etc. can be Douglas fir, spruce or DIY softwood – (sometimes a cheaper spruce but with knots). Oak can be used and is more resistant to rot but is heavier and expensive. Mahogany was an often used choice in larger sailing boats built for racing etc. and as trim in smaller craft. It is an expensive option however, and it is hard to find good mahogany at a price to justify using it on a boat of the size we are concerned with here. Most types of cheaper mahogany don't give the same colour as the good stuff but usually have the same strength and are as resistant to rot. Sitka spruce is the wood of choice because it is strong but lightweight. It is very often the first choice for masts but is expensive and can be hard to find. When buying, be selective and try to find cheap enough lengths with as few knots as possible. Teak, though not cheap and rarely used in dinghies, is excellent because it is very resistant to rot. All wood will rot if left untreated but teak will last longer than most. My main choice for my small boats is Douglas fir for a decent workable wood at a reasonable price.

I would not expect the first-time builder to use the more expensive timber. However, it is an option to use nice hardwoods for trim etc. but these are harder to work so sharp tools are essential. Another option could be mahogany or teak for seat edges and transom trim etc. When selecting timber for the rub rails, inwales, keel and other more structural items, look for lengths with few or no knots. Look out for cracks, splits and warping selecting only the best you can find. If you have a table saw and planer you could buy wider boards (which are often cheaper) and cut your requirements from them.

I have, over the years, used salvaged timber from demolition sites, salvage yards or bankrupt stock auctions. However, before it becomes part of any boat, it is always checked for signs of rot and damage. I built a Stevenson's Projects (USA) Weekender with a friend some time ago and we used old scaffold boards for the keel, exterior plywood from a bankrupt stock supplier for the hull, frames, cabin and deck. The stringers, rub rails etc. were sawn from old floor boards. She lasted 7 years but sadly, was little used in all that time and spent most of her life on a rusting trailer in a storage yard. She was finally damaged beyond repair by another larger boat falling on her in some particularly windy weather while I was re-fitting her for the coming season. A very sad day and I hope to build another one day.

Your choice of materials should reflect the use you intend for the craft you are going to build. If you want a little dinghy to use for pottering about on the canal, small lake or non-tidal river for a few weekends a year, the cheaper materials would be sufficient. If you intend to launch from the beach and sail along the shore line, around the estuary or large lake with rocky shoreline, better quality materials are needed.

If you decide to build your boat from good quality marine plywood, use other quality wood in the rest of the build. Why go to the expense of decent plywood only to fit inferior wood to it that may rot, split or break and ruin all your hard work to produce the finished boat? The opposite should be the case if you decide to use cheaper exterior plywood. If you start with cheaper materials then carry that through to the end with the best quality you can get for the price. If you start with better quality materials, keep it that way. Be more selective. However, if your boat is going to be rubbing against others constantly, the rubbing strips could be made of cheaper wood as they may need replacing every few years.

Please, never be tempted to use interior grade plywood and coat it with epoxy. The glue used in interior plywood is not waterproof and the wood used for the veneers is likely to rot quickly. It won't last and could fail while you are on the water.

Safety in the workshop - remember to use a mask when sawing wood or plywood to avoid breathing in the saw dust. If working in an enclosed workshop, keep the mask on after cutting as the saw dust will hang in the air for some time. Follow all safety advice on all the tools you will be using, powered or not. This also applies when sanding wood and especially epoxy.

Assuming your boat is not intended to be sold, a small boat can be built relatively quickly and quite cheaply. If you were to sell it, you must declare what materials you have built it from to any prospective buyer and that it was amateur built. (Don't forget the RCD rules). The boats build for my family or personal use are built in whatever I have and are rarely sold on. I do build boats to sell or have boats built for me that I sell through my business but they are built of good quality marine plywood etc. I will build cheaper boats from quality exterior grade plywood but normally only to order at the request of the buyer. I had one particular customer who stated exterior plywood with his order as he used his boat for working around his marina and it was likely to get damaged. The difference marine plywood would make for him would be negligible so why pay the extra? Although I would say that marine plywood is more likely to stand up to the damage than the exterior version.

Woodworking Tools & Workshops for Boat Building.

Woodworking tools

Most of the tools used in boat building, at least for a small simple dinghy, are more or less the same as you will probably already have in your household DIY tool kit. Whatever tools you have must always be in good condition and any cutting tools must be sharp. Blunt tools make it more difficult to do a perfect job and can actually make the job harder. Believe it or not, more accidents are had with blunt tools than sharp ones.

I built my very first Clinker Plywood boat with the same basic set of tools I used to build my first Stitch & Tape boat. It comprised of; a metal tape, a hand saw, a sharp 1" chisel, a couple of screwdrivers, a utility knife, a pair of pliers and a borrowed electric jig saw and orbital sheet sander. Power tools can be mains powered or re-chargeable but for jobs such as cutting out the plank panels I find a mains powered tool better for the task. Some other tools can help if you have them such as a laminate trimmer, router, electric planer, belt sander and so on but they are not essential.

Below is a list of the more useful tools that would help with the build. You might have more tools than the list or maybe less but as long as you have enough to mark out your plywood, something to cut it with, a drill and bit (hand or power), a pair of pliers to tighten your stitches, a block plane or a surform (cheap cheese grater type tool) for fairing up and sand paper, you should be able to build your small boat.

Saw Horses x2 – you could build your own but, if you prefer, and plans can be found free on the internet. You can buy the fold-away type workbenches but they must be sturdy. During the build you will need to check the alignment of your boat and, to do that, your saw horses/workbenches must be level themselves and stay level if you need to brace the boat into shape.

Metal tape measure

Pencil - HB

A straight edge - I use a 1.5m spirit level but any straight edge will do. If using a length of wood, ensure it is straight and check it from time to time to make sure it hasn't warped.

Carpenters square or similar – your saw may be able to be used as a square but all you really need is a tape measure and a straight edge.

Adjustable Bevel Gauge – Ideal for taking angles from the boat when measuring up for the quarter knees etc.

Flexible Batten - I use a piece of 9mm square, 2.4m length of strip wood or quadrant from my local DIY store. You could use any length of wood or plastic as long as it bends easily in a nice smooth curve.

Handsaw - A good sharp, fine cutting (more teeth per inch) and one that cuts both ways gives best results.

Electric Jig Saw - With a fine plywood cutting blade. The biggest problem with a jig saw is that you can get a very splintered edge on one side if you use a rough cutting blade. Finer blades reduce this.

Circular Saw - I use a circular saw because, personally, I find it easier to get an accurate cut. However, it may take some practice and is no good for tight curves. It should be ok for the design in this manual. If you can't get round a curve, cut wide and trim to the line later.

Electric Drill - With wood drill bits. A small hole cutter will help when cutting the holes in the frames.

Electric Sander - Or similar. I have a sheet sander for larger areas and a detail sander for the smaller parts.

Electric or Hand Planer – A sharp hand plane is fine but some people prefer power.

Clamps - Buy, beg, borrow or hire as many as you can get your hands on. I now have between 30 and 60 of different types at any given time, mainly the spring clip variety. I could always do with more.

Chisels - I get by with just a 1" one kept very sharp.

Surform - The cheese grater type of planer with square rounded cutting surface. There are others but this is really all you need for most small jobs.

Pliers – The normal type I find more helpful but some builders prefer the long nose type.

Small Wire Cutters

Screwdrivers - Flat head and Phillips.

Hammer - A normal claw hammer would be sufficient.

A Spirit Level - A short one found in the average household toolkit is fine.

A pack of cheap Paint Brushes - Mine came from our local bargain shop. The bristles may come out but they can be picked out or sanded off when epoxy cured. I would pick them out if on the final coat.

A couple of better quality Paint Brushes - For the painting/varnishing.

Sandpaper - A mixed pack from the local DIY store was used in the sample build. There are some good quality sandpapers available these days.

Empty tins, yoghurt pots etc. - Or similar for mixing resin. I found very cheap measuring jugs from my local bargain shop excellent and re-usable. Jam jars, tins, plastic milk bottles cut to size can all be used. Jam jars break if dropped so I use cat food tins.

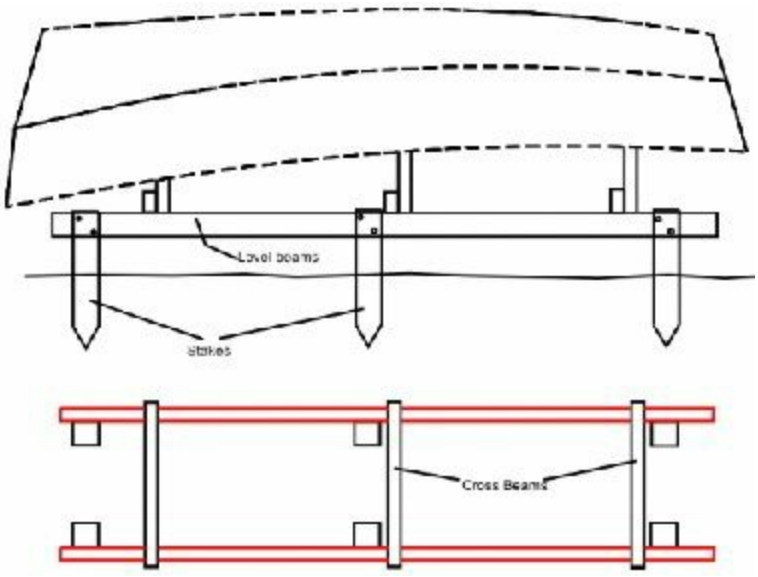
Parcel Tape - The brown type for sealing parcels etc. This is a simple, cheap and effective way of protecting the parts you don't want stuck together. We always mask off all the areas of the boat, inside and out, that are not to be epoxied, with old carrier bags and parcel tape so as to keep epoxy spills from them. We also use 2" masking tape along and just outside of fillet lines, both sides, to keep the epoxy where it should be. It was effective but it could be said that the time he spent masking up was as long as a clean-up job might have been. However, we normally want a clean surface for a varnished finish and his method will achieve just that. Fillet mix will leave dark stains on the plywood which does not help to give the best varnished finish.

Masking Tape – Used to keep epoxy off areas you don't want it on but must be removed before epoxy cures too much or will become part of the boat.

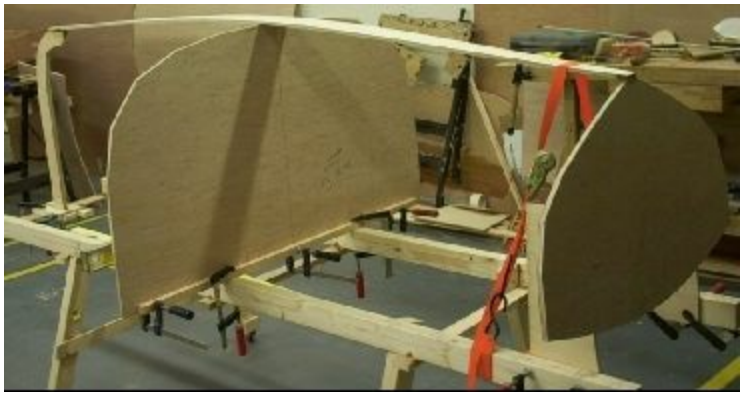
Workspace

You don't need a purpose built workshop, although if you have access to one so much the better. Many boats have been built or repaired out of the workshop. I have often found myself working on a boat on a muddy river bank mooring getting as much done between the tides as daylight allows. A garage if you have one or a similar size shed is ideal and could, in some cases, be considered the luxury end of home boat building. You can build a small boat under a tarpaulin to keep the rain off your work. In the case of a garage, I would say that a 10 footer is the largest boat you can build "comfortably" in the average UK single garage. You need a bit of space to work all around the boat and I would not want to attempt a build while being wedged up against a wall or door or having to crawl under my work. It may also affect the quality of the boat you build. However, you can make the best of the area you have to work in. As an example, you could construct a wheeled building frame that you could wheel in and out of your garage or workshop to give you more room to work if necessary.

In any case, whatever workspace you have, you need a level surface to work from. This is likely to be the case if working in a garage, shed or other building but, if working outside under a tarpaulin for example, it may be difficult to find a flat level surface. A patio could be ideal perhaps depending on the surface. However, you can build a boat on the lawn if you need to. You just need to construct a level workbench to put your work on. Something, for example, like half a dozen stakes in the ground that won't move, and at a workable height above the ground, with two, one or two piece, longitudinal beams parallel to each other and level and braced with some cross members perhaps at the frame positions of the boat. Ensure the beams are exactly parallel, level and at the same height.



Above, an example of a simple working frame staked into the ground.
Below, a build frame set up as per our plans using just one mould.



A small boat could be built in your house if you have a room large enough. It is not as unusual as you might think and I have done it. A friend asked me to build a Barrow Boat kit for him and it was far too cold in the garage to build it. My very understanding and tolerant wife said I could use half our large lounge as long as I protected the furniture around the work area. The main thing to consider if you use this option or any other indoor option is simply, will you be able to get the boat out of the building when completed.

The best temporary arrangement I have seen was a shed constructed from metal fence post holders with wooden posts in them, a low wooden framework supported with wooden stakes in places and attached to the posts and a level 12mm floor screwed on top. It was big enough to allow for the boat, storage and space to work around it. This was then covered with a timber frame and cheap tarpaulin. An expensive option perhaps to build just one boat but it did mean the builder not having to uncover and re-cover everything every time he wanted to work on it.

You can buy ready-made tent like temporary structures made for car storage etc. These are ideal but expensive unless you intend a long term use for it. I know of people who have gone around farms, industrial estates and the like and simply asked if they could rent a small space for building their boat. Some have managed to negotiate a rent paid by simply building another small boat for the owner of that space.

Epoxy - General Usage and Glues.

There are many types of epoxy products but the one we are concerned with here is Marine Epoxy for wood construction - an epoxy resin formulated to bond wood and for use in marine conditions. There are several good manufacturers of epoxy resins that are for the marine environment but then you should ensure you choose from those that are specifically for boat building in wood. There are several brand names that are available all over the world and, in the main for the purposes of this manual, there is little to choose between them. It normally comes down to personal preference and price. We use a solvent free epoxy.

Epoxy is a great material and is now widely used in wooden boat building – not just amateur home boat building. It is basically a two part plastic in liquid form and the two parts on their own stay liquid until mixed when there is a reaction between them and the mixture becomes a solid. It can be used for most boat building applications with the use of various thickening additives, fibreglass tape or cloth that is often supplied by the manufacturer. It is true that you can build a boat without using any mechanical fixings at all – just the epoxy.

The different additives can be used with almost any brand of epoxy but you cannot mix different brands of resin or hardener.

It can get a bit messy when working with epoxy so you need protective clothing or at least clothing you don't mind getting permanently damaged. You must wear a mask (especially when sanding epoxy), goggles and protect your hands with disposable latex gloves.

The biggest drawback to epoxy is cost. It is still quite expensive despite its popularity. It also requires that the mixing is accurate with regard to quantity of resin and hardener. It must be properly mixed and some manufacturers give a mixing time to help try and ensure this. Epoxy is also affected by temperature.

Polyester resins can and are still used but they are not as strong or versatile as epoxy. I have used polyester successfully with boats I have built in the past but not with a pure Stitch & Tape built boat. Polyester has to be carefully and properly applied or it will fail and it doesn't hold as well as epoxy in the long term, so it is probably not the best choice for the first-time builder. If you have some knowledge and experience with polyester then you may feel confident enough to use it. I personally don't recommend it in favour of epoxy.

Working temperatures for epoxies are fairly general across all brands and details will be given with your particular brand. Room temperature is the normal working temperature. Basically, they don't like it too cold or too hot. In colder temperatures, try to get some heat into your working area especially in freezing conditions. Some epoxies won't perform very well at lower temperatures. Some brands allow the use of hardeners that decrease the curing time and work

well in the cold. Alternatively, hardeners that increase the curing time help on very hot summer days. Again, check the manufacturer's instructions. One tip; on cold days keep your resin warm.

Hardener seems to stay fluid in lower temperatures but resin will thicken and become more difficult to dispense. This can damage your pumps if you try to force cold resin through them. Warm it up, by standing it in hot water and it will flow better. However, letting it get too warm will prematurely start the curing process giving you less working time before it starts to solidify.

The epoxy resin when mixed with the hardener generates heat as the two parts react with each other. The hotter it gets, the faster it cures. Bear in mind particularly that, in the confines of your mixing pot, it will get hotter quicker and accelerate the curing process. So, don't mix more than you can feasibly use in the working time – the time between mixing and the curing process starting. Estimating this time can be difficult but experience will eventually show you.

Best advice – mix small quantities at a time and always be ready for applying the epoxy, making sure the area you are going to be working on is fully prepared before starting to measure out your resin.

Generally, when working with plywood, the area you are working on will need to be primed with resin mixed with hardener first and then left for 10 minutes or so before the fillet or the fibreglass tape is applied. Do not add further epoxy to a joint once the curing process is underway until it is fully cured unless your brand allows it.

If you return to your work expecting the epoxy to have cured and you find a waxy film on the surface, this is called "amine blush". Some brands are less prone to it than others but if you find it, it MUST be removed. This can be done with warm soapy water and a spongescourer. Ensure you remove all of it as it can cause problems with paint or varnish not drying – ever – resulting in the need to remove everything from the affected area which is a very messy job. Note: You cannot get rid of amine blush by just adding more epoxy either.

When using epoxy for various parts of the build, preparation is the key. Have everything you will need ready and to hand; pots, mixing sticks, tape, filler additive etc. Make sure you are wearing your gloves, mask and goggles. Prepare the area to be epoxied. It must be clean, free of any grease and dry. Make sure you don't mix up more epoxy than you can use before the curing process starts. You will get to know how much as you go through the build. The manufacturer's instructions will give you the curing times.

Always read and follow the safety advice at all times when using epoxy. Wear latex gloves (or similar – even the yellow ones you wife has under the kitchen sink), goggles to keep splashes out of the eyes, a mask when sanding and clothes and shoes you don't mind ruining. Some people, though only a small percentage, may develop an allergic reaction to epoxy so protect yourself.

You need to be accurate with the amount of resin and hardener you use and mixing them together properly is important. If not mixed properly it will not harden properly which will cause weakened joints etc. Your manufacturer will tell you how much hardener to add to the resin. It is done in quantities or weights, though quantity is more normal nowadays.

Some manufacturers will supply you with measuring cups to measure out the required quantity of resin and hardener. Others will supply you with calibrated pumps to dispense the resin. Some require, for example, two pumps of resin to one of hardener, others are calibrated at one full squeeze of each. I always use the pumps out of preference as pumps are less messy.

If your instructions tell you to mix for a minute or 2 minutes or whatever, do just that. Make sure all the resin and hardener are mixed together taking care as you stir to include any that is stuck to the side of your mixing vessel.

Additives are used to thicken the epoxy for various applications. The type of additive and the amount used will, of course, depend on the job in hand. The additives used for the simple design in this manual are all fillet mix which is a thick mixture. There are various additives on the market and your epoxy supplier will be keen to sell you their own brand but, any brand will normally do. I only use two brands of resin simply as a personal choice. With one the resin and additive mixes up to a dark brown colour and matches most plywood quite nicely. With the other resin and additive has a creamy coloured finish but this can be remedied easily either by using the first company's additive or colouring your mix. You will have to practice, but art acrylics will colour your mix and these have the advantage of allowing you to get a better match. A little goes a long way so you don't need to add much. These acrylics are not too expensive and you should practice with small batches first till you get it right.

I am told that you can use sawdust as an additive for gap filling. One cheap source of supply is the stuff they used to sell in pet shops in as near to powder form as possible. I know of a builder who unravelled a length of fibreglass tape, cut it up into very small pieces, added it to a quantity of fine powder sawdust from the collection bag of his belt sander which had been used to sand floors and built his dinghy from it. All the main joints were taped and the whole thing stayed together for at least the 4 years he used it where I was moored before he moved on. I once heard of bread flour being used as a filler additive. My old rub rails needed changing and the gap would need filling but I only had resin with no additives and it would take 3 days to get some. I remembered what I'd heard and the local shop had some bread flour so I tried it and it worked.

The question of which additive and how much is required – or how thick the mix should be – is dictated by the job you are doing. I will explain the more common additives used in small boat building and follow that with the different mixes. In any case, you should refer to the instructions with your particular brand of epoxy to see what they recommend. As a general rule the following is a good guide:-

Additives

Micro-balloons –
There are two types, glass or phenolic, and they come as a white powder. They are used as a gap filler which sands easily. As they are light in weight they are often used with wood flour for fillets where weight is of concern.

Cab-o-sil (Colloidal Silica) -
Used for structural gluing/bonding, filling and filleting where high strength is required.
Milled Fibres -
These are short strands of fibreglass for use when the epoxy needs to act as a gap filler and provide extremely high strength and resistance to cracking.

Wood Flour -
A cheaper additive used for filleting, bonding and filling. I use this in all the small boats I build.

Also available is chopped cotton fibres that work the same as wood flour.

Mixes

Resin/Hardener mix only - Used for priming areas for filleting, coating wood/plywood to seal it and to saturate (wet out) fibreglass tape or cloth.

Resin/Hardener mix with Wood Flour added to a consistency of thin tomato soup that will flow easily - With tape on one side to stop it flowing out, it is used to fill small narrow gaps. This mix is used in clinker ply boats for filling the gaps in the laps.

Resin/Hardener mix with Cab-o-sil to consistency of mayonnaise - Used primarily as a glue. Use it to glue seat support stringers to frames and when butting two pieces of wood/plywood for scarfing together.

Resin/Hardener mix, Milled Fibres or Wood Flour to consistency of a thick smooth peanut butter – Used for filleting. This is used where strength is required and is often reinforced by applying fibreglass tape over it.

Some suppliers will have their own blend of some of the above that they will recommend as a general fillet mix.

Fibreglass tape is a major part of the construction. It is simply fibreglass strand woven into a cloth tape of various widths. The edge of the tape is selvage to stop it from unravelling and this will need to be sanded down after the joint is fully cured.

If you intend sheathing your boat, this is done with a fibreglass cloth which comes in various types measured in ounces or grams. You can cut your tape requirement at the correct width from cloth to avoid the selvage edge but, as these lengths will probably not be long enough to do the whole chine joint as with tape, you should overlap each length by a few centimetres for strength.

Biaxial cloth or tape provides more strength for the joint but is more expensive. Sheathing is not really necessary for the boat in this manual. When you consider that some early Stitch & Tape boats were built using polyester resins and well-built examples have stood the test of time, maybe the extra strength and cost of biaxial tape is not necessary with epoxy.

IMPORTANT: Some people think they can save money and get a good finish using just epoxy. This is true – partly. But, remember, epoxy is not UV resistant and will need the protection of a coating of varnish or paint.

Glues

Glues are could be considered somewhat redundant now we have epoxy. However, when fitting smaller parts, such as knees or breast hook for example, epoxy can be wasteful. You have to mix up enough to do the job in hand and this very often means mixing up more than you actually need – one pump is not enough but two is too much. Therefore, glues such as **Cascamite** (now **Extramite**) , **Aerolite 306** or polyurethane glues such as **Balcotan** are an excellent alternative.

Cascamite has been around a long time now and comes in powder form that is mixed with water to use. It is a good performing glue with some gap filling ability but not much so your carpentry will have to be more accurate.

Aerolite 306 has also been around a long time. It is a two part glue. One part in powder form that is mixed with water and one part liquid hardener that is applied to the surface to be glued and the two parts are then clamped together till the glue is set.

Balcotan 100 is relatively new to the UK but is a good glue. It is a one part waterproof glue and foams as it sets. I have used it and found it works ok. It can be found in fast or slow setting formulations and is quite cheap. Clamping is important with these glues to get the best result as they expand while setting. Any excess glue can be wiped off or, as a solid foam when set, simply cut or scraped off.

Do not be tempted to use cheap water resistant PVA, or even non-waterproof glues, that are usually a white cream-like glue. They just aren't strong or water resistant enough for the job.

One glue I haven't yet mentioned is a resorcinol/phenol/formaldehyde glue now called **Polyproof**. (Was **Extraphen**). It's a very good, durable glue but there are cheaper, similar performing glues now available. Resorcinol glues were always my first choice for building before I started using epoxy.

Scarf Joints.

In any design over about 7½ feet (2.4m) you will have to make a plank in two or more parts when using standard sheets of plywood. With my designs up to about 12 feet, as with others, it involves butting two pieces of plywood together and fixing them permanently together. This is called scarfing and in this section I am going to explain how it is done. Before I do however, it is possible that it is not just two or more pieces of plywood that will need joining together to make a full length item. It could be the wood rub rails; inwales, bottom runners etc. and they will be dealt with at the end of this section.

There are several different ways to scarf two pieces of plywood but I always favour those that don't show in the finished boat. This is sometimes possible by having the scarf joint under seats or decks but it is not always possible to hide them in this way, so then the choice, for me, comes down to the type of scarf joint that is least visible but strong enough for the job.

As mentioned when dealing with plywood, it is normally available as standard 8' x 4' (2.44m x 1.22m) sheets of varying thicknesses. It is available in larger sheets but most builders buy standard sheets and join them together as whole or part sheets to get the size of the largest plank they need. Alternatively, they mark out all the planks on the separated sheets, cut out all the pieces and then join those pieces to get one complete plank. In this case, accuracy when lining up the two parts of a plank is critical. If they have been cut to size they must be joined exactly or the plank won't fit correctly and will very likely show in the completed hull.

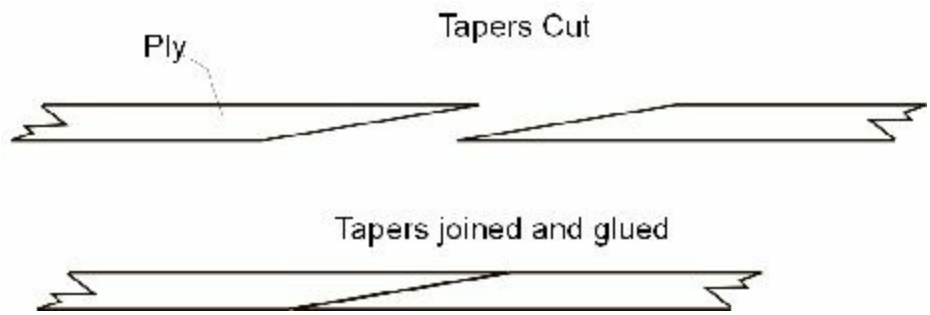
There are a few ways to make the scarf joint. Different designers and builders have their preferences but, for me, it always comes down to two questions – will it be strong enough and how will it look? Personally, I don't like joints that will show too much and my designer explained to me that they don't have to. He said that a properly glued simple butt joint, positioned correctly, will hold well for most boats up to 12 – 15 foot in length. He showed me two options which I have always used and had no problems with dinghies I have built. However, having said that, I am only dealing with small rowing or sailing craft that may have a small outboard motor clamped to them. I am not so sure when it comes to building a small speed boat, for example, as the pressures on them are different.

The main scarf joints used are basically as follows but this is by no means the definitive explanation. There are other ways and variations but those below are suitable for the purposes of this manual.

Traditional Scarf Joint

The diagram below shows what this type of scarf joint will look like. I have only done this type of joint a couple of times with plywood and from these attempts I don't think it very suitable

for the first time builder. In the main I have used it to join lengths of wood in traditional boat building and when fitting planks, inwales and rubbing strips.
The two ends of the plank to be joined are tapered, laid on top of each other and glued. This produces a smooth joint. However, it does need to be designed into the build as the plank will be shortened by as much as the overlap so I would suggest scarfing the necessary ply sheets together and then marking out the planks.
Shorter tapers are easier although longer ones are stronger. The taper is often recommended to be a ratio of 6:1 - 12:1. That is, using 8:1 and 6mm plywood as an example, 8mm long for every 1mm of plywood thickness. The taper is cut with a belt sander, planer or just a piece of coarse sandpaper wrapped round a wooden block. It would be best to position the sheets to be scarfed on top of each other and then cut them all at the same time. At least this way they will all be at the same angle.
More details on this method of scarfing can be found in boat building publications or on the internet but, as I don't think it suitable for the average first timer, I won't describe it further here.



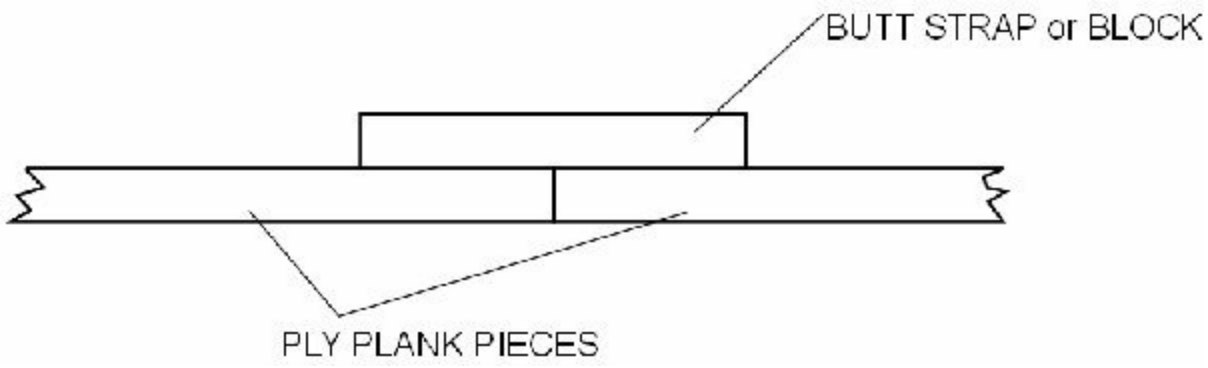
Traditional Scarf Joint Above.

Butt Block or Strap Joint

This type is used more often in amateur builds because it is considered easier than most other ways. Some think it probably the easiest. I have only used this method once. I have to confess that I don't like it personally but it is easy and more forgiving of minor errors, as when the joint is finished any gaps can then be filled.

This joint is best made for each individual plank because you will need to keep the block or strap clear of at least one edge for the chine tape or lap joint however, I don't recommend using this method for clinker ply. That is not to say that it can't be done, I think it ruins the look of the inside of the boat unless the can be hidden.

For this method, you butt the two parts of the plank together, then cut a piece of plywood from the same thickness plywood to fit inwards from the line of any chine joint tape run and a few centimetres wider than the joint each side. For example; a 6mm thick plywood plank would have a butt block or strap 15cm wide glued in position centrally over the butted pieces and temporarily held with screws or staples. See below.



Simple Fibreglass Butt Joints

I use two types of these and they both work well. They have been around a long time and are often known as “Invisible Butt Joints”. These are the preferred joints in my small boats but they do need care when doing especially when turning them over. This is why I recommend scarfing planks as opposed to full plywood sheets.

Simply explained, all you do is make sure your plank has a flat surface to lie on and does not move while curing. Butt the two pieces of plank together, epoxy 75mm tape over the joint, turn over and repeat on the other side. That’s it! Once completed and finished off, the materials holding the joint together are invisible.

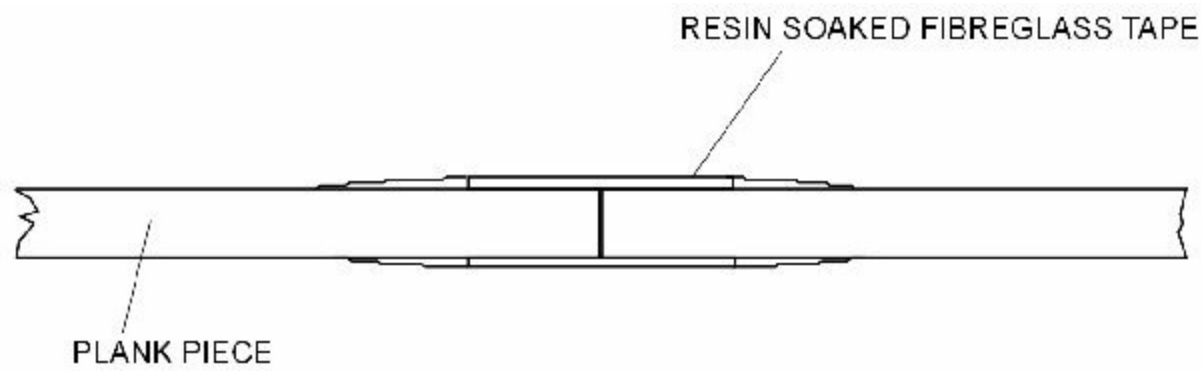
The main drawback with this method is that the joint is fragile when being turned over to do the other side. Also, although it works well with 4mm and 6mm planks as only one layer of tape is required, with thicker plywood two or three layers are needed.

As the plank is so fragile when turning it over, it is possible to do it all in one go. You need a flat, clean workshop floor, some polythene (the type used for temporary greenhouses or as a damp proof membrane normally found in garden or DIY centres on a roll. However, you don’t need much of it – two pieces for each plank, a little more than the width of the plank and about 150mm wide) and some weights.

Cut all your tape ready for the joint or joints you are going to work on. Lay one piece of polythene on the floor in the position where the joint will be on the plank. Apply resin to the polythene in the centre 80mm of it and lay on the tape with more resin as you would if applying it to plywood. Lay each plank section in position butted together without moving the tape soaked resin underneath. A couple of dry runs will help. Fill any voids in the joint with fillet mix and the apply resin and tape to the upper side of the plank and wet out. Make sure it doesn’t move out of position as you do so. Lay another piece of polythene over the joint and roll it out. Finally, put a weight on the joint. It needs to be heavy enough to keep the tape flat on the joint area being careful not to squeeze all the resin out of the joint. I use a piece of scrap plywood, a little smaller than the polythene so it won’t become attached to the plank, and some house bricks, though not too many. Now leave it until fully cured. Give it the time

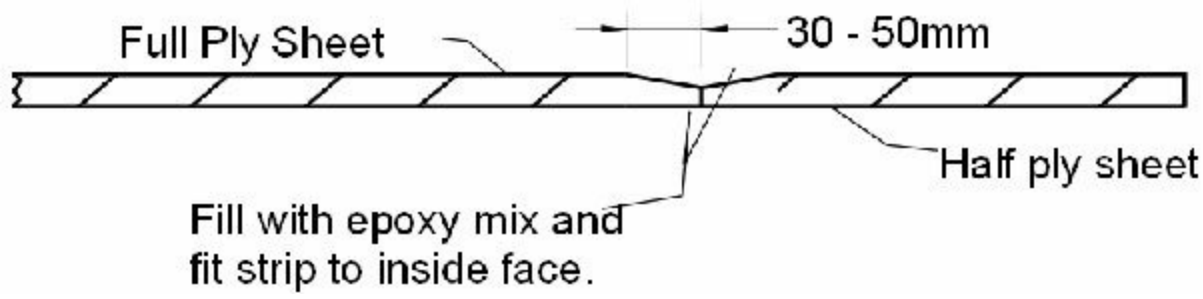
recommended as per the instructions and then add 12 hours to be sure.

When fully cured, carefully remove all the weights and peel off the top piece of polythene. If you notice the joint isn't properly cured, replace it and the weights. If it is fully cured, peel off the other piece and you will have a plank taped both sides and as long as any voids were filled, a strong joint. All that is left to do is clean it up by taking down the selvage tape edges and applying another coat of resin both sides. Some builders sand down the edges and then wait till during the latter stages of the build before they apply any more resin is applied.



Above, a Simple Invisible Butt Joint.

Another version of the above method is to cut a taper about 30-40mm from the joint edge to half the thickness of the ply in each piece. Butt the pieces and seal the edges so the filler won't seep out, fill the recess with fillet mix and tape both sides. As the above method is sufficient, there seems little point in this but it is a method that is used by some builders. The joint can be done as with the simple butt joint above taping both sides at the same time. The difference would be when applying the weight to it, make sure your plywood used to take the weight won't bow into the joint. 12mm should stop this.



Another Simple Scarf Joint above.

Scarfing Lengths of Wood

There are several methods of scarfing with this too from the more complicated interlocking type to the simple butt joint. I have chosen to mention just two simple methods as I don't want to spend much time on this subject. This is because, the boats most first time builders attempt are normally simple designs under about 12 foot and longer lengths of the wood you will need are usually easily available so no scarfing is necessary. This is particularly true of boats similar to the 7' – 6" (2.28m) RYE BAY 8. A 2.4m length is a standard size from most suppliers. Various timber merchants will have various longer lengths they can supply so scarfing wood is not often necessary.

I suggest when using these two methods, that it depends what the wood is being used for as to which method is used. I will give a brief explanation of both and when they are best used.

I suggest, with these two methods, that it depends what the wood is being used for as to which method is used. I will give a brief explanation of both and when they are used.

The first method is the taper joint as with the plywood version previously mentioned. Make the taper 8:1 (8mm long for every 1mm of thickness) glue and clamp in position making sure both mating surfaces are exactly in line.

The second method is as with the simple butt joint above. Using fitting the rub rails as an example, starting at the stem, glue and clamp all the way along until you get to the end. Fit a clamp on the end, glue and butt the next piece to it holding in place with a clamp on the mating end then continue fitting the rest till you get to the transom.

FITTING OUT & FINISHING YOUR BOAT.



Fitting out is considered by some to be the most important part of building a boat as it is a chance to show off your woodwork skills by using better quality wood for the seats, knees and trim etc. and then varnishing the boat with progressive coats to give an almost show room finish. There surely can't be anything more appealing than a well-constructed boat with a beautifully varnished finish. Well, not for me anyway. It will last longer too.

I recently built a dinghy during the winter when I needed a tender to get me out to my mooring. I built her in the normal way but made the knees and breast hook from the same wood as the inwales and blended them nicely together. I used solid wood for the seats and then spent a long time preparing it for the first of twelve coats of yacht varnish, each coat prepared properly for the next. She had a painted interior and exterior hull but the varnished finish to the seats and trim made her look absolutely beautiful. She now graces the mooring while we are out sailing and looks good as we sail back towards her.

Fitting out a rowing dinghy basically means fitting in the seats, trim and rowlocks etc. A sailing dinghy involves adding the rig, dagger board/centre board, rigging, deck fittings and so on. But in most cases it's the same procedure unless you are building a boat with a cabin.

The standard of your craftsmanship will show with the fitting out so take your time and take care. There is no rush at this point if you want a good finish. You can, of course, fill all the gaps with epoxy fillet and cover the whole boat with paint but, a nicely crafted piece of woodwork with a gloss varnish finish is very pleasing to look at.

My plans give details of the fitting out for each design - most plans do. This is the part of the build where you can personalise your boat. Some builders will have the knees or breast hook positioned slightly differently but they all go in the same area on any boat. For example, the

breast hook on my WINCHELSEA 8 is fitted flush with the inwales but it could be fitted either on top or under them.

Basically, you add to your bare hull the seats – full length bench or centre thwart, inwales, rubbing strips, quarter knees, decks, etc. then rowlocks and any other fittings you may want or need such as an engine pad on the transom. You could curve both transom tops and add a thin plywood shaped trim to personalise it.

Your decision of a painted or varnished finish is largely dictated by the finish you have achieved when you get to this stage. Personally, I don't very often find a DIY Stitch & Tape hull that is completed to a high enough standard for an all over varnish finish. I would need the perfect seams at the joints plus a high standard of finish to the seats and other items that the professional builder will produce. That is not to say that it can't be done but many DIY builders find a mixture of paint and varnish gives them the best result. The hull – inside and out – is painted and the seats and trim items are varnished.

Whatever the finish you need a decent surface to start with. Preparation is the key. Clean all surfaces to rid them of any epoxy fillet or glue and sand down smooth with progressively finer grade sandpaper. One word of caution here is make sure you don't rub so hard as to remove the veneer from the plywood. Once the preparation is complete, clean it down and remove any dirt, grease or dust. Now you are ready to apply the first coat of finish.

With a paint finish, if you have given the whole boat a coat or two of epoxy, then two or three coats of undercoat and three or four coats of top coat will suffice. Lightly sand each surface with fine sandpaper and clean off between each coat.

With a varnish finish on new wood, a diluted first coat followed by up to twelve further coats depending on the finish required. The more coats the deeper the shine. Again, lightly sand each layer with fine sandpaper and clean off between each coat.

Above are two DIY examples of the same ROMNEY 2.2 design both finished differently.
The one on the left for sailing and the one on the right for rowing.

MAINTENANCE OF YOUR BOAT.

Looking after your boat is important if you want it to stand the test of time or it could end up like the boat above. When in use your pride and joy will get knocked about a bit and will need a bit of care to keep it in good condition. Even the so called “plastic” boats need maintaining to keep them looking good and to prolong their useful life. It is a myth that they are maintenance free and they will deteriorate if not looked after.

If your boat is to be kept under cover when not in use so much the better and maintenance is often easier. If it is to be kept at a mooring or in a dinghy park etc. where it is constantly exposed to the elements, more care for your boat is needed.

At a mooring, your little boat is not only exposed to the elements but also to constant rubbing against the dock, other boats moving about and people perhaps using her as a bridge to their own boat. A good paint/varnish job is required for such craft. Any damage should be repaired instantly and any scratches that have penetrated the paintwork to the wood below should be treated as quickly as possible to avoid water damage. If possible, get a cover for your boat that will be raised slightly in the middle so water cannot collect. A simple “A” frame over the centre thwart will do the job. When left on a mooring, keep an eye on the condition of your mooring ropes. They are often neglected and when you come to use her, she’s gone, not stolen but broken loose and drifted away. Another reason for putting a name and home on her perhaps.

In a dinghy park or perhaps pulled up on the beach the boat should be stored upside down. Again a good paint/varnish job is required and any damage should be repaired instantly and any scratches that have penetrated the paintwork to the wood below should be treated as quickly as possible to avoid water damage. If the boat cannot be stored upside down then a cover should be provided.

If you will be keeping your boat under cover there are still some things you should do before you put her away. Wash her down, inside and out, clean out all dirt etc. that collects in corners and wipe dry. If you have built in buoyancy in plywood or wooden boats they should have their drain plugs removed and any water drained out. Keep the drain plugs out to allow ventilation which will dry the remaining dampness over time. Remember to replace them when the boat is used again. I always recommend storage upside down simply to keep the dirt and dust out.

Every year, usually in the spring, check to see if a new coat of paint is required. It is good practice to give the varnish another coat or two as it will probably be scratched with use. In either case, lightly rub down beforehand. Check her over for damage and repair as necessary.

The Clinker Ply or Glued Lap Method of Building a Boat.

The above photos are of a first attempt at building WINCHELSEA 8.

Clinker ply may look more complicated than Stitch & Tape and perhaps, in some ways it is but in my opinion, it only takes a little more effort to achieve a far better result. Also, in my opinion, it produces a more traditional, better looking boat. There is a wide range of designs that this method is suited to and usually, the more planks you have, the rounder the hull shape. It is an economical method of building a boat often costing no more than a Stitch & Tape build. Where Clinker Ply mainly differs from most is in initial construction. The boat is built over a mould in a more traditional fashion, the planks are held together with epoxy rather than roves or nails and when the boat is taken off the mould still with no frame, it is far more rigid than a stitch and tape boat at the same point in construction.

I would recommend first building a scale model of the boat you intend to build. As previously mentioned, I normally use a scale of 3" = 1' or slightly larger because I find it fiddly and awkward to work a smaller scale. I use thin card from cereal packs etc. and hold everything together with sticky tape. I have also built these with balsa wood or even bass wood. The model will give you some idea of what to expect when you come to build the actual boat. Set up the frames on a board, add the keel, stem and transom then fit the planks. Add all the frames and the transom etc. to see how they fit following the procedure in the full size plans. It will help show you that it will all go together.

There is another build method which is similar to Stitch & Tape and that is Lap Stitch construction where the planks etc. are cut out and the plank lands have a rabbet cut to take the next plank and locate it in the correct position when stitched. The resulting gap created at the lap of each chine joint is then filled as with the method here.

Another method is to bevel the plank land area and coat it with glue to receive the next plank. This is more like traditional clinker building but epoxy glue is used instead of being clenched with copper rivets. It is a far cleaner looking finish but is not so widely used in DIY boat building.

However, for the purposes of this manual, there is only one method I will spend any time on. There are other methods and I will touch on one later. I use Clinker Plywood for my designs as I find it a good method which suits the DIY builder. It gives you the plank shapes and dimensions to cut them out and assemble over the build frame.

One of the others is more like the traditional clinker building method. It is a more involved procedure and requires a decision to be made as to how many planks are needed and the layout of the planks to be lined off as no plank shapes are given. As I am mainly dealing with the first-time or amateur builder, I feel the method I use is more suitable. I think only a few first time builders would want to attempt to plank their hull this way. I have included it so that, as you gain more experience, you know it is an option.

Clinker Plywood Boat Building.

I chose this method for my designs because it is probably easier for the first-timer than other, in my opinion. It allows for simple building with no complicated joints – things are glued where they touch.

I will use the plans for my WINCHELSEA 8 as an example to help describe this method as it wa re-designed to be built using it. Originally it had been designed to be built using the traditional wood clinker method with nine planks, but only one was ever built that way. The re-design took out several planks to make it easier to build in plywood.

The details apply to other designs meant to be built this way although some may be more complicated and may involve additional parts to the build. These could be more complicated joints etc.

The basic sequence of the build is;

- Check you have all the necessary tools.
- Select and buy the materials.
- Clear an area to build the boat. A garage or patio for example.
- Transfer the dimensions from the plans to the plywood sheets.
- Cut out the hull panels from the plywood sheets.

- Construct the build frame.
- Assemble the hull panels over the build frame.
- Epoxy all joints.
- Remove hull from build frame.
- Ensure boat is square and level.
- Seal the interior chine joints with epoxy.
- Fit seats, rub rails, inwales etc.
- Sand and paint/varnish.
- Launch and enjoy!

Marking Out

Using the WINCHELSEA 8 as the example, I would start with the planks first out of personal preference, then the keel, moulds and transom. I will follow that sequence here.

Select a sheet of plywood and lay it on a flat surface. A clean garage floor, patio etc. I have a back problem so I place the ply on two fold-away type workbenches to bring it up to a workable height. You could use saw horses if you have them, a wallpaper pasting table, with extra support or anything that will bring it up to a workable height and to support it without any movement. To avoid the plywood sagging as you mark out, lay the 12mm sheet on first followed by one of the 6mm sheets but make sure you remove the 12mm sheet before cutting!

Ensure you have everything you need including the printed out dimensions of the panels you want to mark out first.

Select which edge you are going to start your measurements from and mark out the grid. This is basically parallel lines equally spaced 305mm apart along the length of the plywood sheet. Draw them in clearly with a pencil but don't mark the surface of the plywood. I do not advise the use of a very long straight edge unless you can be sure it won't flex and is absolutely straight. I now have a 1m builder's rule and a 1.8m spirit level to draw my straight edges. A shorter or even longer straight edge can be found if you prefer.

REMEMBER: Before you start, accuracy is *very* important. Time spent getting things accurate is time saved by avoiding having to trim to fit later or the expense of having to do it all again.

Plans for Clinker Ply boats normally come with a table of offsets to transfer to the plywood sheets to give you the individual panel shapes. Ours, for WINCHELSEA 8, like some others, give you a drawing of the panel layout with the dimensions on it. For WINCHELSEA 10 I provide a table of offsets that are then plotted on the station lines. This gives all the plank shapes for that sheet.

Once all the dimensions are marked out and double checked, you can join the dots with the help of a flexible batten held against all the marked points with nails or weights. Drive a nail

into each marked position on the grid for the line you are working on and then bend your flexible batten round them on the outside of the line. Hold it in place with some weights or more nails, on the waste side (outside), so that it is held against all the nails and it won't move as you mark the line on the inside, between the nails. Make the line a good clear one as this is the line you are going to cut along.

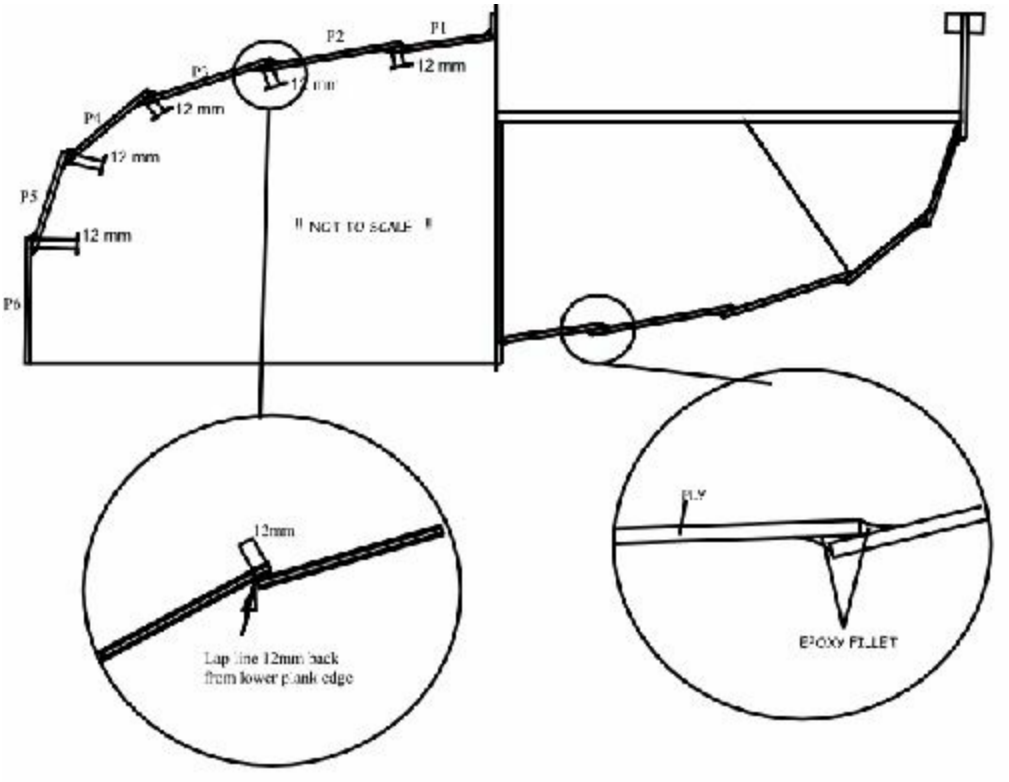
NOTE: When marking your plywood panels, don't press too hard with your pencil when drawing the grid lines or you will end up with an indentation when you come to rub them out. This is not so important with lines you will be cutting to. However, you should use a soft lead pencil.

You will note that the dimensions only give you one of each plank. This is why you need to be accurate with your cutting out as you will be using them as templates for the second other plank on the second sheet of 6mm ply. The two sheets can be clamped together and cut at the same time. If there is any scarfing to be done refer to the method given in the Stitch & Tape section.

Once the marking out is complete the panel is ready to be cut out. Put it to one side and mark out the keel etc. on the 12mm plywood. The same sequence applies with this panel. Draw the grid, plot the dimensions of the keel/stem piece and use a flexible batten to get the curved line. The lower stem can be sketched out free hand as you may not have a batten flexible enough.

Mark out the transom and moulds. Remember, when marking out the transom to make sure the chosen plywood is free of any warping or twisting. It must be flat or any warping will show up by making the boat look out of shape. When the keel is cut out, push a thin bradawl or nail through each station point where the planks are to land. Then join the dots on the other side to give you the plank lands marked on both sides.

In the drawings for my WINCHELSEA designs, you will notice a red line on each plank except plank 1. These are the lap lines, showing where the plank will rest on the previous plank. Each plank, after plank 1, overlaps the previous plank and the resulting gap is filled with epoxy fillet mix which is ultimately what holds the boat together. See example below.



Above is a cross section showing how the planks fit to each other to create the laps.

NOTE: When marking out the planks, your plans may require them to be marked out with a curve shape at the forward end so that they fit the curve of the stem. They may start the plank a little way in on the plywood sheet to allow extra to mark the shape when fitting. The option used with WINCHELSEA 8 here is simple as each has a straight edge and a corresponding mark to fit to o the stem as that is marked out. These are the methods normally used to create a curve at the stem.

Cutting Out

Make sure you follow all safety instructions for the tool you are going to use. Wear a mask and goggles and take care with whatever tool you are using to cut with. Even an ordinary hand saw can be dangerous if not used properly. Check the manufacturer's instructions to make sure you are using the tool properly. If new to it, find some old or spare plywood/wood to practice on first.

As I have said, I prefer to use a circular saw as I have never been able to get a good clean curve using a jig saw. This is not to say that a jig saw won't give you a good cut. It will, if you use a fine enough blade. There are drawbacks to using a circular saw too and it took me a few planks before I sorted them out. The biggest one was, if I had to stop part way along the line and then trying to start up again in full control. The blade would often bounce back into the plank and I would end up with a small hole when I assembled the hull. It was easily solved if it happened but was not neat and often resulted in having to have a painted finish instead of the more appealing varnish which I prefer.

Cut out the hull planks, transom and moulds. Cut along the line. Take your time and be as accurate as possible. Don't cut to the waste side and trim later as I was taught years ago. Instead, cut accurately along the line, which you will have spent some time ensuring is correct, and then you will just have to clean it up with a little with sandpaper before assembly. That's why I suggest you practice first. Before you cut out each piece, mark it for identification purposes later. There are only a few panels but it will help make sure you get things right. Mark the planks to show which is the forward end that will fit to the stem.

Assembly

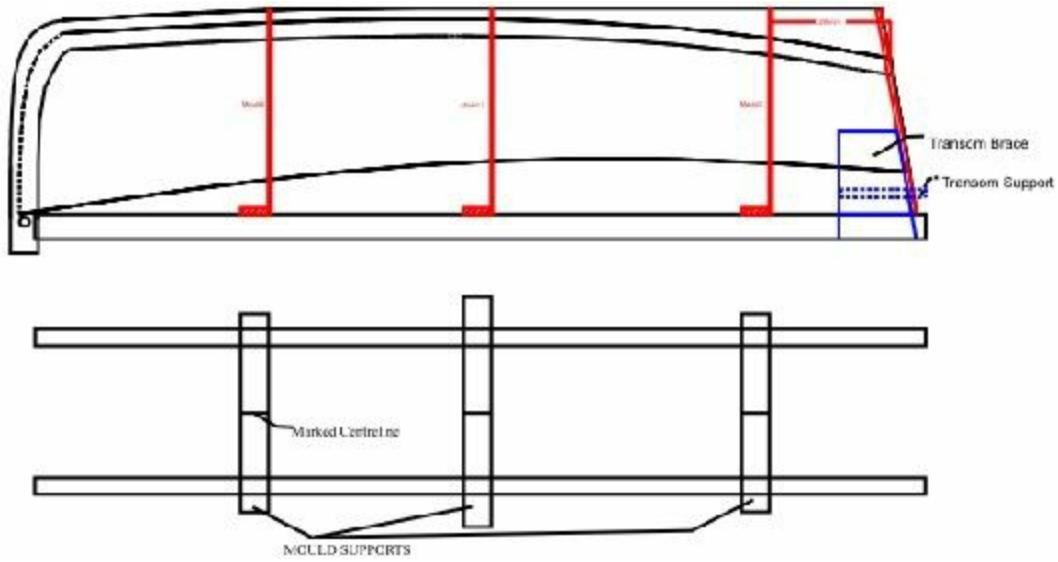
Before you can start to assemble the boat you will need to set up the build frame (as per details below). It is made up from two straight beams of wood. These are laid over two saw horses or fold-away type work benches, parallel to each other, a certain distance apart on their narrow edge and in line. Ensure that your work benches are on a level floor. Check they are level and the surface is smooth at least where the support beams are going to sit as it is important to have everything level.

One test builder had a sheet of 18mm x 2400mm x 600mm plywood. It was completely flat with no warping or twisting so he used it instead of the two longitudinal beams. Everything else was just marked out for position and then screwed into place on it. He is convinced it helped with keeping things level but had to make sure he placed support under it to stop it sagging even slightly between the saw horses. He marked a centre line measuring from one side and used the same side to plot the other dimensions.

Now take the mould supports, mark a centre line on them and secure in place so that the marked centre line is exactly central between the two beams. The following example comes from the WINCHELSEA 8 plans instructions:

"Measure from the end of each Support Beam 600mm along the top edge and mark it to draw a straight line across it. Do the same with the other Beam. Now continue by marking the next Mould point and then the third. Mark the mould supports with a centre line on both sides which will help you line up the mould centrally. On the underside, measure out from the centre line 200mm each side. This will give you your reference points for positioning on the beams. Attach the supports in order 1, 3 and then 2. Fit them accurately with one screw each side and then check its square before securing with the second screw each side. You will now have a basic ladder frame".

Check again that it's all level and fit each mould, ensuring they are flat on the beams and secure with four screws, at least two each side of the centre line and this will give you a rigid structure. Cut and fit 25mm x 25mm screw pads to a size roughly in the centre of each plank land to all the moulds on the forward facing side. They need to be big enough to take one screw and fixed in from the edge so they don't impede the curve of the plank or the next plank. These could be glued on before attaching the moulds to the build frame.



Build Frame used in WINCHELSEA 8.

Now you can start to build the build the boat. . . . .

Attach the keel over the moulds. However, you don't want the keel to be glued to the build jig so, put parcel tape in the mould slot for the keel and then cover all the plank lands and screw pads. The keel will have marks on it for each mould station so you can line them up. Check each mould is square and then secure the stem.

The stem needs to be braced during construction and different designers use different ways to do this. For this design, fit two pieces of 18mm x 75mm pine to extend a little way forward of the stem from each beam with a plywood pad secured across them with a slot cut centrally to take the stem.

While doing this, keep checking positioning of the keel and that the moulds are square and upright, screw small blocks to the mould on one side of the slot to allow another screw to secure the keel in position. These too can be fitted before the moulds are attached to the build frame. When putting in the small screws to hold the keel in place, it is important to remember that when you will need to remove them the boat will have been fully planked and this will make them difficult to get at. For this reason put them in at an angle.

Now attach the transom brace at the position shown on the plans to the outside of each beam. The supports which hold the transom in place are glued on and held with clamps till dry with the transom in place. This is so you can have a square or rounded transom top as you prefer. Also, it can be easier to fit the transom braces with the transom in position to account for any errors at this point. Hold them and the supports with clamps as you check positioning etc. and then screw/glue in place when satisfied. The transom, when finally fitted, is glued with epoxy to the keel.

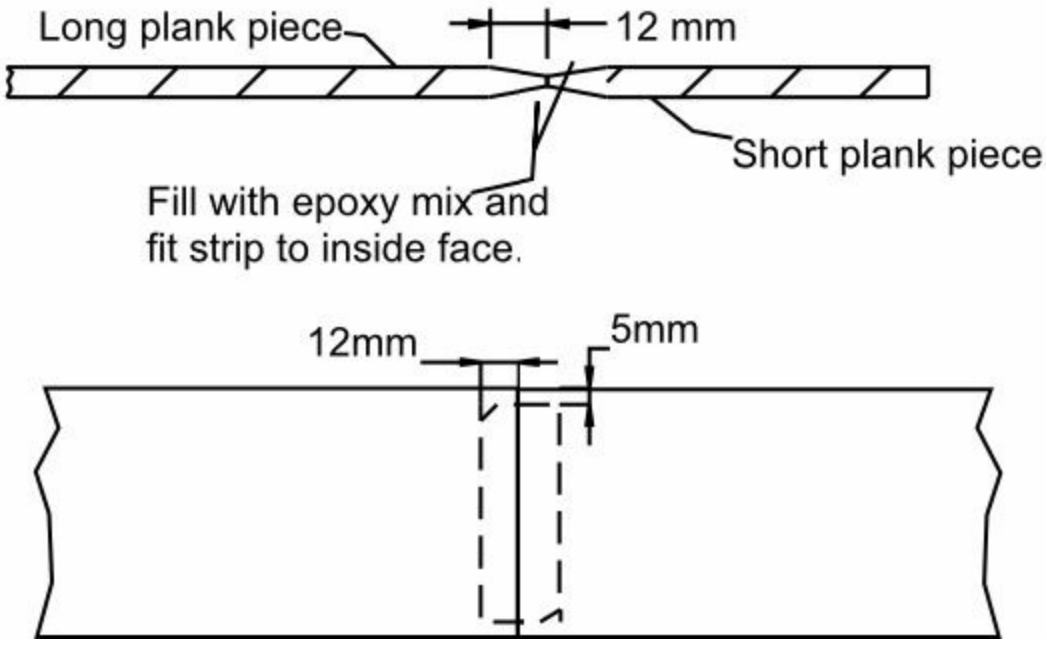
NOTE: the setting up of the build frame and the moulds etc. could be different in some other designs but the details here will give you some idea of what is required.

Check again that everything is correctly positioned and square. This constant checking is necessary as when the hull is completed, there is only limited opportunity to correct its alignment once everything glued in place.

When the build frame is complete, you can now start to planking.

All the planks should have been cut out, cleaned up and the edges made as fair as possible without taking too much off. Except for the first plank, both edges will be on show either inside or outside. With WINCHELSEA 8 the first two planks can be cut a little longer than necessary a the aft end of each plank to allow for any errors. This is trimmed off later. Planks 3, 4, 5 & 6 all have a little extra where the plank is larger than the plywood sheet. These need to be scarfed and this can be done in-situ on the build frame.

The WINCHELSEA example suggested making the scarf joint a little differently. Both joinin edges are sanded to a blunt point and 6mm in from each edge, then filling with epoxy and clamping both sides with parcel tape covered over-size ply pads to hold in place. A piece of 75mm fibreglass tape is applied over the joint. (See below). This has worked well or you could use the simpler invisible butt joint explained previously.



The original scarf joint used in the original WINCHELSEA 8.

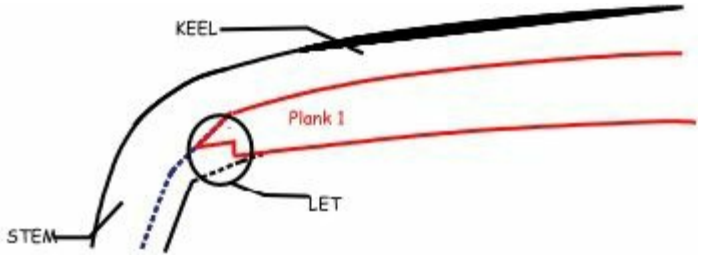
Starting with the first or garboard plank, lay it on the mould and using a clamp and some waste timber at the keel roughly in the middle, hold it in place loosely. Bend it to fit at the stem checking that it lands in the right place and hold in place to pre-drill a hole for the screw to temporarily secure. Now check the transom end. You will have cut all the planks a little longer

at the transom end to allow for fitting. Hold in place with a clamp while you check that the edge of the plank is as close to the keel as possible and the curve of the plank is fair. When satisfied, secure the plank at the transom and ensure it is flat against the moulds – hold with a screw if required but keep it away from the lap joint. Check as you work that the curve of the plank is fair with no flat spots. Then dry fit the other side. This is called dry fitting because no glue is used at this point.

When both sides have been dry fitted, mark at the transom end so any excess can be trimmed off and repeat the process with the next plank – plank 2. Check and re-check for fairness and position, but don't screw it down at the stem yet. Plank 2 overlaps plank 1 and should rest on the lap line (see Drawing 2). Use screws to hold it there if it doesn't but don't use too much force to get it in position. You now need to cut the "let" in plank 1 to allow plank 2 to come flush at the stem. This is basically a slot cut out from plank 1. It will be as deep as the plank lap, 12mm, and as long as required to allow plank 2 to come in nicely and fit flush at the stem. As a guide I found a size of around 50mm was average at each plank but you will need to find it from the boat.

Once the size of the "let" has been found, remove plank 2, unscrew plank 1 and cut the "let". Then glue plank 1 in position with epoxy at the stem and transom holding it in position with the screws used to dry fit. Re-screw at the moulds if needed, always checking for fairness and then epoxy fillet along the keel on the outside. Use masking tape or parcel tape on the inside at any large gaps to stop the epoxy fillet falling through. It is possible to continue with planking now as the previous plank is held by screws but it is probably best to wait for the glue fillet in plank 1 to fully cure before continuing with the planking. Always fit the planks in pairs so that both sides are fitted and secure before the starting next pair and constantly check for fairness.

Planking continues following the same procedure as before. Dry fit plank 2 and secure it temporarily with screws, dry fit plank 3 to find the "let" and then remove both before re-fitting plank 2 with epoxy, all the time checking for fairness with each plank. Now dry fit plank 3, secure it temporarily with screws, dry fit plank 4 to find the "let" and then remove both before re-fitting plank 3 with epoxy, and so on. When you reach plank 6, no "let" need be cut in it as there are no more planks. Also, each plank should fit flush against the previous plank.



When all the planking is fitted, you can now start to fill the joints. You should not have any

gaps at the lap joints but if you have, try to close them with screws being sure to keep a fair line. Use masking tape or parcel tape on the inside of any gaps to hold the epoxy fillet mix in place.

Refer to the manufacturer's instructions on the use of your epoxy. Mix some resin and hardener and prime all the joints with epoxy before mixing up some epoxy as for the fillet mix only a little thicker and fill all the lap joints with it. Wipe away any excess to keep the plank edge clean. This may take two attempts as the fillet can sag into the joint in places. You will also note that a couple of the lap joints are much wider than the others. These could have been changed and made smaller but the aim of this design is to keep things as simple as possible while still producing a good looking boat.
When all the epoxy filleting is cured fully – if your epoxy supplier instructions give a cure time of 24 hours for example, leave it for a further 24 hours. (This is by no means a criticism of the supplier but temperature makes a difference to cure times so better safe than sorry.) Clean off any excess epoxy drips and rub down the whole of the outside of the hull to a nice smooth finish and give it a coat of epoxy to seal the plywood. Again, refer to the manufacturer's instructions, but it is just a resin and hardener mix. One coat is normally enough but if they suggest more then do so.

When cleaning off excess cured epoxy, use a hot air gun or old hair dryer to soften it and remove it with a scraper. Always wear a mask when doing this and when rubbing down.

When this coating is fully cured, remove the hull from the build jig. It should come away as keel, planks and transom. Remember to remove the screws you used to hold the keel in place. When the hull comes off the moulds, it should be quite rigid. However, at this point it is easy to damage it so take care. Although one person can manage it, two would be easier.

The hull should be set up level so that you can easily get to the interior, then braced into shape and alignment checked, as with the Stitch & Tape method, to ensure that it is in its proper shape and alignment. It is normal for there to be a small amount of twist when the hull is removed from the moulds and it should be held in place before continuing. Some designs call for the inner lap joints to be filleted. In any case, stem and the keel seam will be filleted as will the transom and the build would now continue with the fitting out of the hull.

Another Method.

As previously mentioned, I am not going to go through these methods in any great detail. They are more complicated for the novice builder than the above method and, should you want to try it, there are some good publications out there to help.

Firstly, a base frame is constructed and the moulds and any frames (stations) are positioned and fixed to it. Then the keel is fitted along with the transom and stem to give us a secure build frame to work to. Apart from the fact that there is probably more moulds, up to this point it is

the same as the previous method but now things get a little different.

In the first method, we had the shape of the planks given to us and it was just a case of attaching them to the build frame in position noting the lap mark for each one. In this method, we don't have the plank shapes at all. All we may know is the number of planks we will need to attach to each side. Don't be put off by this as it might not be as difficult as it appears.

To proceed from this point we go through a process called "lining off".

There will normally be a line drawing with your plans using these methods, perhaps even giving the mould shapes at given station points and they may well be to scale. This can help with lining off.

The first thing to do is to decide on the number of planks for each side, if it is not given in your plans, and there are a couple of things to consider with this decision. Traditional hulls are made from a number of narrow planks to gain the rounded shape of the hull, but the use of plywood allows for fewer, wider planks. If you want to keep the traditional look of the boat then more planks will achieve this. Too few however, will completely change the hull appearance. Also, as mentioned with WINCHELSEA 8, fewer planks will produce wider or mor open laps.

So, having decided on the number of planks, we have to decide on the width and shape of each plank. Traditionally, the garboard plank and the next one or two are wider than the rest. In some designs, the sheer plank is quite a wide plank in comparison to the rest but, to keep the traditional look, the garboard and next plank should be the widest. It will depend on the style of hull you are building and many plans will suggest how many planks you need. As to the shape of the plank, this again depends on the style of hull. Some taper more at the ends to a narrower finish so that the middle of it is wider. Each plank will be a percentage of the size of the garboard plank once that has been fixed.

Very basically, a graph is used to find the sizes or proportions of the planks. It uses the girth of the hull at the midsection as the main reference and then the girth of each station is marked, followed by the percentage size of each plank which then gives the width of the plank at each station which is marked along with the width of the land or lap.

Once all the station points are marked on the moulds, a stringer, the full length of the hull, is held at each mark for each plank to make sure the line is fair. Then the plank shape and size is found by the use of a spiling batten and transferring that to a plywood sheet which will give you the full shape of the plank which is then cut, often oversize, and trimmed after fitting. The lands are then bevelled and the next plank is fitted till the sheer plank when the planking is complete.

I could go into more detail than this but it is not a method used for my designs and I don't

want to confuse so I have kept it brief. There are some good books on the subject that will take you through the process step by step if you want to look into it further. I have read a couple of them but I think Ian Oughtreds' "Clinker Plywood Boatbuilding Manual" is good book.

The Lapstrake Method

In the main this method is used for a multi-chine canoe construction. It is a cross between Stitch & Tape and Clinker Ply. Once again, only a brief explanation is given here but it may be pretty self-explanatory given what I have said so far. To my knowledge, the method was changed slightly, called Lap Stitch and was patented in the US in 2000. The Lap Stitch idea was a simple change but an effective one.

With the Lapstrake method a build frame with moulds is set up and the strakes, or planks, are held in position over the moulds by bevelling the lands to provide a gluing surface and the accurate drilling of the stitch holes at the edge of the lap line so that, when assembled, the plank was held tight against the stitches in the correct position. The planks are glued at the land, then filleted inside and out with epoxy tape to the inside of the joint.

Lap Stitch does away with the need for a build frame and brings things closer to the Stitch & Tape build method. The dimensions for the plank are given and a rabbet is cut into the plank land. A rabbet is an edge groove or rebate cut into the bottom of the plank for the top of the next plank to fit into. This rebate is then filled with epoxy and results in a tidy clinker style finish which is surprisingly easy to achieve.

Glossary of terms used in this manual.

Amidships, Midships.
This is the location defining the mid-point of the boat. It's normally defined as half the distance between the forward end of the waterline to the aft end of the waterline.
Aft.
The rear part of the boat.
Batten.
A long, square, flexible and knot free piece of wood used to draw the curved lines once the plywood is marked out.
Beam.
This is the widest point of the boat at any location along its length. This would normally be at the sheer but some designs have a tumblehome, where the sheer turns inboard, and so it would be part of the hull below it that would be the widest point.
Bevel
The angle on one piece of wood to make it fit an adjoining piece.
Breast hook
A structural piece of the boat that is located horizontally at the upper bow or stem to hold the sides in and help to prevent twisting of the hull.
Broad strake.
The plank next to the garboard plank.
Butt
The point where two ends of a plank or plywood sheet meet.
BWL, Beam Waterline.
This is the maximum width of the boat measured across a water plane cut of the boat in the water. Depending on the context, this value may or may not refer to the beam at the design waterline. It might be maximum loaded beam, dry weight beam etc.
Centreline (CL).
The line, for example, used as a reference point down the middle of the bottom plank, from which measurements are taken.
Chine, chine line, chine joint.
This is the division line between two planks where they touch.
Clamp
A longitudinal piece that runs at the top of the hull holding the frames in position and giving rigidity to the upper hull. Also, a clamp can be a mechanical device used to hold pieces together.
Cleat
A device for securing rope without knotting it.
Cockpit
The normally open area in which to sit and control the boat.
Deck

An area of the boat that keeps water out, providing a dry area under it.

Displacement

The weight of the boat in terms of how much water it displaces.

Epoxy

A two part resin and hardener mix used as basic mix or in conjunction with additives for various boat building applications.

Epoxy Fillet

A neat line of epoxy mixed with a filleting blend additive and applied to a chine joint to form a structural bond. This is reinforced with fibreglass tape inside and out.

Forward

Toward the front or bow of the boat.

Frame

A structural piece to which the planking or skin of the boat is attached.

Gain.

The cut made to fit a plank flush at the stem.

Garboard.

The plank next to the keel.

Grid.

In the case of my plans, lines marked across the plywood sheets onto which the dimensions of the planks etc. are plotted.

Gunwale.

I have used the term “rub rails”. It is a long piece of wood fitted to the sheer or top of the uppermost plank.

Gusset.

A piece of plywood used to add strength to frames.

Half Breadths.

The dimensions given from a centreline to the required measurement out from it normally at right angles. See the frame drawings.

Hull

The body of the boat.

Inwale

A strip of wood running along the inside, top edge of the planking as with the rub rails.

Keel/Keel Strip

The backbone of the boat that runs along the centreline fore and aft at the bottom of the boat.

Keelson.

As with the keel but inside the boat and may not run the full length in some cases.

Knee/Quarter knee

A piece of wood bracing two planks or panels together. Basically, a bracket. A quarter knee is a knee at the top of the transom and the sheer providing extra strength and preventing twist in the hull

Laminate

A piece formed from several smaller pieces, usually to form an awkward shape. To make a wider board, for example, pieces are edge glued together.

Lap Line
The inner line on a plank, to mark its' position against the next plank.
Lap strake.
The method of building in a more traditional way to give a clinker finish.
Let
A notch cut in a plank at the forward end to allow the following plank to lay flush at the stem.
Lining Off.
The process of working out the number and size of each plank.
Limber Hole
A drain hole in a frame, usually next to the keel, to allow any water that finds its way into the boat to flow and not collect in one area.
Lofting
This is drawing out the lines of the hull full size to give the shapes of moulds and frames etc. (There is no need for lofting with the designs in this manual.
Mast
A normally almost vertical spar that supports the sails.
Mast Step.
A piece of wood, or plywood, with a hole on it to receive the base of the mast.
Offsets
Dimensions given for the lines of the boat.
Outboard
Toward the outside of the boat.
Outwale.
See "Gunwale" or "Rub Rails".
Plan View
View from above drawn on the plans.
Planking
The watertight skin of the boat. This is normally made up of several pieces.
Port
The left side of the boat.
Pot Life
The term used for the time your epoxy will last when mixed before it starts to cure.
Profile
The side view of the hull.
Quarter Knees.
A shaped piece of wood or plywood that is fitted between the sheer and transom.
Rabbet
A groove cut into the keel and stem at the correct angle to accept the planks.
Rowlocks/Oarlocks
A shaped support to hold the oars in place when rowing.
Rub Rails.
A long piece of wood fitted to the sheer or top of the uppermost plank. (Gunwale).
Rudder

Used for steering the boat

Runners

Used on the bottom of the boat to protect the hull. Brass or galvanised metal strips can be screwed to them to protect them.

Rubbing Strakes/Strips.

This is fitted to the outside of the top of the uppermost plank or sheer line.

Scarph, Scarf

A joint made to join two pieces of wood. It can be made in several different ways.

Scupper

A hole in the hull, flush with the decks or seats, to allow the draining of water.

Sheer

The curve of the top of the hull as seen from the side.

Sheerstrake.

The uppermost or top plank.

Skeg

At the after part of the keel it would be a small triangular piece attached to the keel.

Spar(s).

The name given to the mast and boom etc. to which the sails are attached.

Station

A specified point along the keel where a frame is to be fitted.

Station Points (SP)

A measurement used to plot the shape of a hull panel or plank.

Starboard

The right side of the boat.

Stem

The foremost piece of the boat to which the planks are attached.

Stern

The back or aft part of the boat.

Stringer

A strengthening timber on a frame or running fore and aft inside the boat.

Thwart

A seat running across the boat.

Tiller

The handle used to move the rudder to steer the boat.

Transom

The plank, or panel, that forms the back, or after, part of the boat.

Water line.

The line marked on the boat or the plans where the water should come to on the boat when loaded.

!!SAFETY!!

Please ensure you follow all safety precautions, not just when building the boat but when using it as well. You should be sure you get the latest safety advice for use of all the tools you use and use of the finished boat.

If using the boat on inland waters, you must follow the local regulations.

If you intend using the boat at sea or in tidal waters, make sure you know what you're doing and you have all the relevant safety equipment.

Do not put yourself or anyone else at risk.

Boating is enjoyable but has its' dangers like many other things.

Be responsible and be safe.

Always wear a life jacket or buoyancy aid.

Always tell someone where you're going and when you expect to be back.

See the coastguard website http://www.mcga.gov.uk for safety advice and more.

Disclaimer

Every effort has been made to ensure that the information in this manual is as accurate as possible. As you are the builder, the implementation of the methods of building and actual building of the boat as described in this manual are beyond my control. Therefore I cannot be held liable for any incidental or consequential damage resulting from the use of the information and building methods as described in this manual.