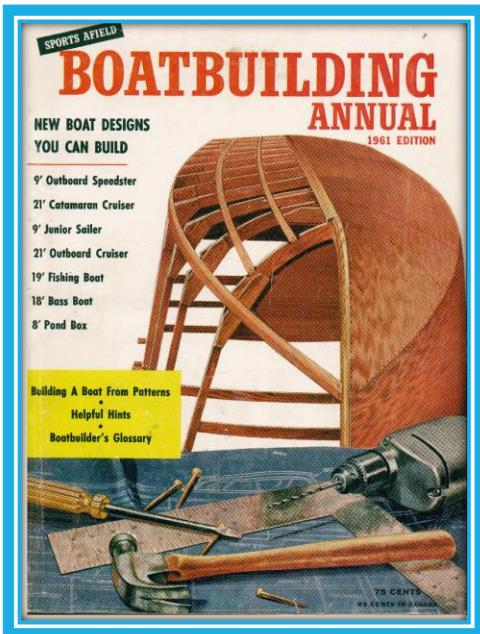


BUILDING A BOAT FROM OLD PLANS



The information below is supplied by MGYD (Mertens-Goossens Yacht Design Inc.), a company with 25 years' experience in boat design for amateurs.

WHERE DO THE FREE BOAT PLANS COME FROM?

There are many old boat plans in the public domain available on the Internet. For many of those plans, the copyright has expired, and they are available for free if you know where to look. Some old plans have been maintained, the copyrights are still in effect, and those plans are legitimately sold, the Atkins designs are a good example. Free copies of public domain old plans can be downloaded from web sites like Svenson or better, BoatPlans-Online.com.

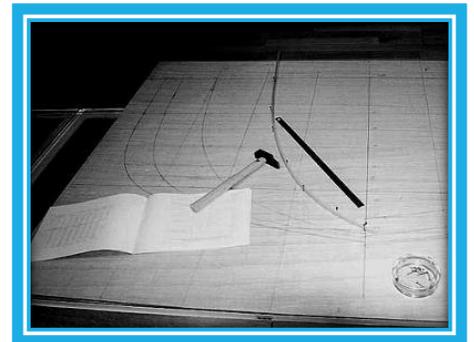
Some copies of the same old plans are sold at various web sites and on eBay, sometimes at an exorbitant price. They talk about a "master boat builder" and his secrets but those are the same plans as the ones above, assembled on a CD. Despite their advertisement, you will not receive nice boxed software or a booklet but just a plain CD in an envelope, with the same copies of plans as the ones listed for free at BoatPlans-Online.com.

There are other legitimate sources of free or almost free plans. Many designers offer one or two free plans as a sample of their work. Then there is DNGoodchild, a company that reprints some of those old plans in high quality format for a small fee. There may be others but, in most cases, your free boat plans will come from one of the web sites above and be copies of old plans published in magazines.

FIRST LOOK AT THE PLANS.

Most of the free plans are more than 50 years old and they are very different from today's plans. The plans were drafted on paper, almost all require lofting and specify materials that may not be available anymore. Those are the points we are going to look at, one item at a time. You can build from those plans, but the plans are more difficult to use than modern ones. To help you, this file will show how to use today's materials as substitutes and explain how to read the old plans.

We will not be able to cover every detail and possible solution. More information is available at technical support websites like our forum for the plans and BoatBuilderCentral.com for materials.



HOW TO OPEN THE PLANS AND PRINT THEM.

Most of the free plans will be in PDF format. To view and print the plans, you need Acrobat® on your computer. Most computers have Acrobat installed but if not, you can download it for free. Once the plans show up on your screen, you can print them on regular paper, but you can also zoom in, enlarge details and print them at a larger scale.

UNDERSTANDING DIMENSIONS.

Older plans were drafted on paper. Despite the skills of the designer, they cannot approach the accuracy of computer-generated plans. Also, the calculations were not as elaborate. To build from those old plans, you must transfer the dimensions to wood or plywood, very often by lofting, and correct some imprecision resulting from the scaling. Many of the free plans show only dimensions for the molds or frames. You must set up molds and build the hull around it. The dimensions are always given about a baseline. Most of those dimensions are given inside the wooden planking but in some places like the stern and the keel, they may be given on the outside: pay attention. Boatbuildercentral.com has some good tutorials showing how to transfer lines from plans to plywood: see a file titled "How to draw and cut a frame". Another one is How to draw a fair curve through points. That is for the plans showing those dimensions on the drawing.

Some of the older plans use a table of offsets.

		— OFFSETS —											READ '2-7.5' AS 2'-7 1/2"		
STA.	0	1	2	3	4	5	6	7	8	9	10	11	T		
SHEER	3-4.6	3-2.1	2-11.5	2-9.2	2-7-0	2-5.1	2-3.9	2-2.1	2-1-2	2-0.5	2-0.5	2-0.7	2-1-4		
CHINE	1-1.6	0-9.3	0-5.6	0-2.6	0-0.3	-0-1.2	-0-2.2	-0-3-0	-0-3.5	-0-4-0	-0-4-2	-0-4-3			
B-1	1-9.4	0-0-4	0-5-6	0-8-0	0-9-0	0-9-1	0-8-7	0-8-4	0-7-7	0-7-3	0-6-7	0-6-4			
B-2		1-8-0	0-2-4	0-2-6	0-4-7	0-5-7	0-6-2	0-6-3	0-6-2	0-5-7	0-5-6	0-5-5			
C.L.	0-0-7	0-8-4	0-10-4	0-11-3	0-11-6	0-11-9	0-10-7	0-10-1	0-9-3	0-8-3	0-7-7	0-7-3			
SHEER	0-0-3	1-6-7	2-5-7	3-0-2	3-4-1	3-6-3	3-7-2	3-7-1	3-6-3	3-5-0	3-3-0	3-0-0	2-8-5		
CHINE	0-8-3	1-7-3	2-3-5	2-9-3	3-0-7	3-2-5	3-3-1	3-2-7	3-1-2	3-1-1	3-0-1	2-11-3			
W.L. 1	0-0-7	0-11-3	1-8-7	2-5-1	2-11-7	3-2-7	3-3-3	3-3-2	3-2-5	3-1-3	3-0-6	2-11-2			
W.L. 2	0-6-0	1-7-0	2-5-0	2-11-0	3-2-5	3-4-2	3-4-5	3-4-2	3-3-4	3-2-0	3-0-5	2-10-7			
W.L. 3	0-10-3	1-11-1	2-8-0	3-1-1	3-4-2	3-5-6	3-6-0	3-5-4	3-4-3	3-2-5	3-0-4	2-9-7			
W.L. 4	1-2-3	2-2-5	2-10-5	3-3-2	3-5-7										

A table of offsets is a table with rows and columns that shows the locations of points through which you will draw lines representing the hull of the boat.

You must mark points, draw lines full size on the floor or on a plywood sheet and correct some inaccuracies resulting from the scaling: paper plans were drafted at a small scale and the thickness of the pencil line can become up to 1" wide when scaled! From those lofted lines, you will take dimensions to fabricate the parts of your boat.

BUILDING A BOAT FROM OLD PLANS

MATERIALS AND SUBSTITUTIONS OF HULL PLANKING MATERIALS:

CARVEL

Carvel planking is the method in which the hull is planked with long planks over a frame. There are different variations on the method. It is very difficult to adapt that construction method to modern materials. You must either source some difficult to find wood or use plywood and epoxy to plank the boat. You cannot simply replace the hull material without redesigning the complete boat. If, for example, you decide to replace the hull planking with foam sandwich, your new material will be much lighter, and you will have to replace that weight with some ballast. This will change the behavior of the boat, don't try. There is one modern material that comes close in weight and strength: *cold molded plywood over strip planking*. This means that you first plank the hull with long thin strips of wood (cedar?) and cover the strips with at least 2 layers of thin plywood strips along the diagonal. The first layer at 45 degrees of the strips, the second at 90 degrees of the previous layer. A final layer of fiberglass is applied over the plywood.



All glue and laminating resin must be epoxy. No fasteners are required: the strips and plywood are installed with staples, often plastic staples like the ones from Raptor. Many builders have used that method to build large replica runabouts. The boats are stronger, stiffer than the originals. They look just as good and require less maintenance. The method is described in detail in the Gougeon book.

STRIP PLANK



Rarely, the free plans will show a strip planked hull. This is a method in which the framing is covered with thin strips of wood, usually cedar. Many builders substitute plywood strips. In all cases, use epoxy as the glue and if possible, cover at least the bottom with a thin layer of fiberglass in epoxy.

CLINKER

Also named lapstrake or lapped seams. This is an old method (drakkars!) but very common method that can easily be adapted to plywood. In clinker boats, the hull is made with narrow planks that overlap each other. In traditional lapstrake boats, each seam is shaped to receive the next one. At the ends, planks are tapered to a feather edge. It is a labor-intensive job that requires good skills and nice woodworking tools. Today, thanks to epoxy, no beveling is required, epoxy will fill the gap and the planking will be stronger than with old boat building glues. Also, many builders use strakes cut from long plywood panels.



BUILDING A BOAT FROM OLD PLANS

PLYWOOD PLANKING:

Many of the designs for amateurs from the 1950's are built from plywood. Those are the easiest ones to adapt. It is a good idea to use thinner plywood than what is specified on the old free plans. Use thinner plywood covered inside and outside with one or several layers of fiberglass. The final panel will be stronger than plain plywood, it will be easier to bend and cut, the boat will be all fiberglass outside and the total cost will be the same than thick plywood covered with one layer of fiberglass outside. Plywood types and sizes changed, we will discuss that below.

PLYWOOD TYPE:

50 years ago, decent marine fir plywood was available at a reasonable price. Cheap plywood or exterior plywood as it is made today is not a good boat building material. That plywood has too many voids and is often made from rot susceptible wood species. However, if you find a good batch of quality exterior plywood with no voids, you can use it if you entirely coat that plywood with epoxy resin. Today, the best deal on marine plywood is Meranti BS6566. Fir is still available but looks rough and should be reserved for interior parts like the framing, soles and inside layers of the transom. Our recommendation: get Meranti or Okoume for the hull shell and Meranti or Fir marine for the framing. To learn more about plywood selection, visit our website, Boatbuildercentral.com or our forum.

LONG PLYWOOD PANELS:



Many of the free plans specify the use of long plywood panels: 10', 15' long or more. Those plywood panels are not available anymore and even if they were, it would be extremely costly to ship them.

There are several ways to fabricate your own long panels.

They can be made by **scarfing** two shorter panels together.

Scarfing requires a special jig and some skills. Properly done, it is a strong joint, but it is easy to make a bad scarf that will break or be a weak point. We do not recommend a scarf unless you are familiar with the technique.

At Boatbuildercentral.com, to produce long panels, we use other techniques proven on thousands of boats. The easiest technique is the **butt block**: two panels are joined at their edges and a strip of plywood (between 6 and 10" wide) is epoxy glued over the seam.

This butt block joint is very strong, stronger than the plywood itself. However, it creates a flat spot when bending the plywood and we recommend it only in areas of minimum curvature. Also, the butt block may interfere with the interior framing but that is easily taken care of with the proper plywood planking sequence.

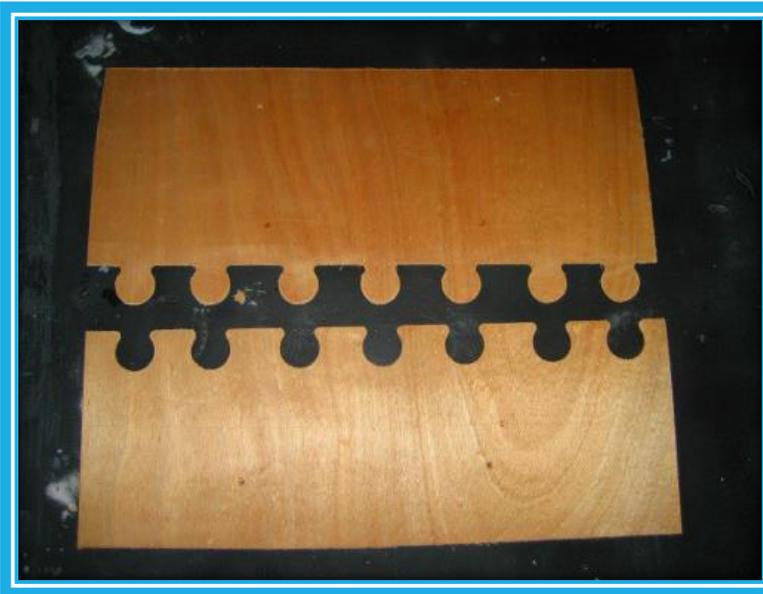


A better method is the **fiberglass splice**. It is somewhat like the butt block: two panels are joined at their edges and covered on each face with fiberglass tape in epoxy.

The number of layers of glass varies in function of the plywood thickness.



BUILDING A BOAT FROM OLD PLANS



The best method is the use of a **puzzle joint**.

Two sheets of plywood are cut like a puzzle along their edges, assembled with epoxy and sometimes covered by one layer of fiberglass tape in epoxy. This is very strong and does not produce a "bump" over the plywood surface. The plywood store at BoatBuilderCentral.com sells marine plywood sheets with a puzzle joint along one or two edges. The plywood is shipped as standard sheet sizes but once assembled, there is no limit to the length of a panel.

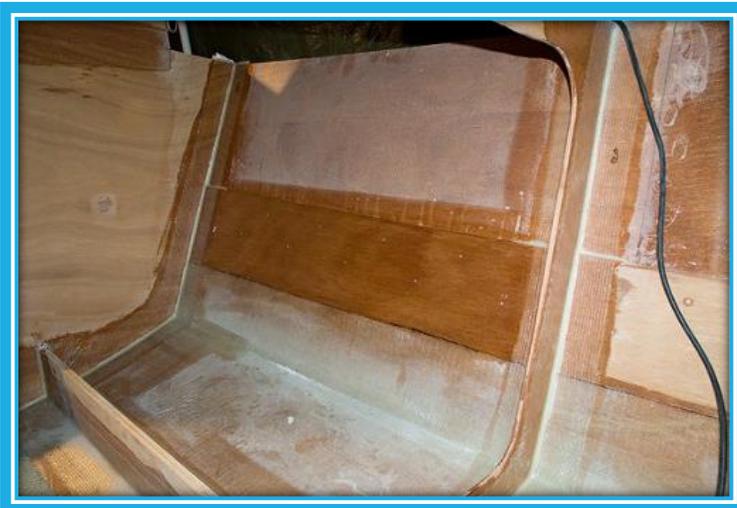
All those techniques are documented at Our forum and BoatBuilderCentral.com in the Help sections.

The three techniques above allow you to build a boat from plans that specify panels 10 or 16' long.

TIMBER, FRAMING WOOD:

All the free plans use hardwood or plywood framing. Often, the framing uses expensive and difficult to find woods like oak, cypress or mahogany. The parts must be beveled at the correct angles. This requires special woodworking tools and skills. In today's designs, instead of wood framing, we prefer to use plywood and fiberglass framing. In many cases, you can replace some of the wood framing shown in the free plans with plywood parts. At a minimum, plywood frames, chines, stems, keels etc. can be made from laminated plywood. Laminated plywood means several layers of epoxy glued plywood. That laminated can be fabricated to the exact size of that structural member or oversize and trimmed just as if it was hardwood. Laminated plywood is dimensionally more stable than hardwood.

Going one step further, the plywood frames can be fiber glassed to the hull planking. If you have the skills, tools and the wood to make your framing as in the plans, feel free to build that way but otherwise, consider our method.



The picture here shows a plywood and fiberglass frame along the side and a plywood stringer along the bottom: strong, no beveling, no expensive wood, easy to build.

MARINE FASTENERS AND MARINE GLUES:

The free plans specify tight wood assemblies, screws or boat nails and marine wood glue. We prefer to use epoxy. Epoxy can be used wherever the plans specify glue and fasteners. Epoxy glue is gap filling and does not require precision wood work, it is forgiving to the first-time boat builder and also much stronger than wood glues. The 2:1 epoxy sold at BoatBuilderCentral.com is used by thousands of builders for 20 years. Epoxy assemblies do not require fasteners: an epoxy assembly is stronger than anything assembled with screws. You may use cheap drywall screws to hold parts together during the gluing but remove them after the epoxy cure. Try to break something assembled with epoxy and it is the wood that will split but not the epoxy glue.

One very common use of epoxy and fiberglass is to replace the chine log with a fiberglass lamination. Instead of using a wooden chine log (laminated plywood or solid wood board), the builder builds a fiberglass seam from several layers of fiberglass tape in epoxy. This can be done for other parts of the boat like the stem. The technique is like stitch and glue. Stitch and glue and related fiberglass building techniques are documented in detail at our website.

Many have built hybrid boats combining the different materials and methods listed above.

BUILDING A BOAT FROM OLD PLANS

WOOD WORKING SKILLS AND TOOLS:

Unless you adapt them to the techniques listed above, the free plans show wood assemblies that must be beveled and joints with tight tolerances. For the hull planking, some boats are caulked with putty, butyl tape or even cotton. You can build a better and stronger boat without bevels, expensive tools and difficult to find materials by replacing all the above with epoxy seams.

BUILD A BETTER BOAT FROM THE FREE PLANS:

By combining some of the methods listed above and substituting materials, you will build a better boat from the old plans.

PLYWOODEN BOATS?

In the fall of 2014, a group of amateur boat builders met in Port Aransas Texas to show their boats and exchange ideas. The meeting was called a PlyWooden boat show. Over 100 boats of all sizes were present, all of them built from plywood and epoxy, many designs were based on the free plans that we discuss here. Some used traditional hardwood framing, most used plywood for the framing. Almost all used plywood for the planking. Many of those boats used fiberglass not only to protect the hull but as an integral part of the structure and to reinforce the planking. Many used plywood stiffeners (stringers) epoxy glued and taped to the hull. Here are some rules of thumb if you want to substitute materials.

PLYWOOD PLANKING THICKNESS RULES OF THUMB:

The substitution rules below are very approximate, use them as a starting point.

- ☞ If the plans specify 1/4" plywood, use 1/4" epoxy coated on all faces with epoxy resin only.
- ☞ For 3/8" ply, replace with 1/4" with either one layer of glass outside or one layer outside and one inside.
- ☞ For 1/2" ply, use 1/4" with one-layer biaxial glass 12 oz. each side.
- ☞ For 3/4", replace with 3/8" with 2 layers of biaxial glass one each side.
- ☞ All fiberglass in marine epoxy resin.

Don't take those figures as absolute, we cannot guarantee them. This is just a guide line. Scantlings will vary depending on the type of framing, boat type, frame spacing etc.

Plywood framing:

The pictures below show a typical plywood frames and stringer structure, egg crate type.

FRAMING RULES OF THUMB:

In all cases, frames should be spaced at least one every 36" and stringers every 24" for a panel span 24 by 36". For small boats up to 16', displacement type, use 3/8" plywood frames on epoxy putty fillets. For planing hulls up to 20': 3/8" with at least one-layer glass tape each side. 20 to 25': 1/2" with 2 layers biaxial each side. Double the plywood and glass for the stringers. This is just a rule of thumb. Boat type, weight, speed and panel sizes may require different scantlings. You should either calculate the framing yourself or consult a designer.



FIBERGLASS YOUR HULL.

Protect your hull, extend its life and add strength to the planking. If you followed our advice to use thinner plywood coated with fiberglass in and out, this is already done but if you build from the thick plywood specified on the free plans, you should at least add one layer of fiberglass in epoxy resin.



BUILDING A BOAT FROM OLD PLANS

MAKE CHANGES TO A DESIGN.

This is probably the most frequent question on boat builders message boards. Visit our forum and you will see it on almost every page. It is understandable: if you wanted a cookie cutter boat, you would not be building her yourself. If you use the plywood framing method, you will be free to modify the superstructure at will. Otherwise, base your changes on the framing shown on the free plans. Keep in mind that your boat must float in its lines. Do not move its center of gravity by adding to or removing the superstructure. If you add a weight forward, move another weight backwards to compensate. Free basic yacht design software will help you define the center of gravity. Freeship is freeware and accurate.

ENLARGE OR REDUCE BOAT SIZE.

You can resize a boat in two different ways. You can either multiply all hull dimensions by the same factor or change the spacing of the frames. In each case, try to limit your changes to + or - 10%. Some say that 20% is fine but keep in mind that if you increase all dimensions by 20%, your volume (boat displacement) will increase at the power of 3 while the surface increases only at the power of 2 and fixed weights do not change. This means about 70% greater volume for a simple 20% increase! That boat will float too high and the structure maybe weak. Stay within 10% if you scale all dimensions. You can go up to 20% by changing the frames spacing.

SAFETY:

Today, all production boats are designed to comply with safety and industry standards (ABYC, USCG, ISO etc.). Some of the best plans for amateurs (Boatbuildercentral.com) are also designed in compliance with those standards. This is not the case of the free plans. While it is perfectly legal to build those boats as an amateur, you must take some points in account: Most of those boats are not self-bailing or unsinkable. Their cockpits drain in the bilges. This can be corrected by redesigning the cockpit and raise the sole above the waterline. You can also make the boat unsinkable using USCG approved buoyancy foam. In the case of outboard powered boats, the transoms are designed for smaller HP engines than what is common today: check your engine for size, bolting pattern and clamp width. Plan for enough room for all cables, steering and tilting the motor. The old transoms do not have motorwells. This is considered unsafe by the USCG, but you can add a motorwell bulkhead. Here is a link from our forum showing how to build a safe and strong transom. The transom clamping boards on most free plans for outboard boats, are specified as being made from mahogany or oak. Nice wood was affordable 50 years ago but cost a fortune today. We recommend building those transoms the same way than in many production boats: from several layers of plywood glued together. The inboard gas engines shown on those plans are not available anymore. In many cases, you can replace them with small but costly diesel engines. Here is a tutorial showing how to install an inboard engine.

There are more differences but those are the main ones you must consider when building from the free plans.

LEGAL MATTERS:

Are those boats legal to build? In the US, as an amateur boat builder in 2015, the answers is yes. The boat will not comply with the ABYC and USCG safety standards but those apply only to production boats. Go to the US Coastguard web site and look for Safety Standards. We don't post the link because it keeps changing.

HOW DO YOU REGISTER A BOAT BUILT FROM THE FREE PLANS?

In the US, things may vary slightly by state, but the general procedure is the same. You should keep your invoices for materials. Once the boat is complete or close to completion, go to the local DMV (Department of Motor Vehicles) with your invoices and request a title. After checking your invoices and filling a form with the main characteristics of the boat, you will be given a title. Use the title to pay the local registration taxes. This will give you a registration number and you are ready to go. In some states, there will be an inspection to make certain that you do not try to register a stolen boat. We know that the same rules apply tin Australia and New Zealand. In Europe (EEU), production boats must conform to ISO standards and be certified. Certification is not required for amateur built boats. A boat built by an amateur cannot be sold for the next 5 years.

WHAT IS THE DIFFERENCE BETWEEN THE FREE PLANS AND STOCK PLANS FOR AMATEURS?

Before you commit to your boat building project, consider the scope of it and compare it to building from better plans. If you love classic boats, the free public domain plans may be ideal but if your goal is to successfully complete a boat in a reasonable time, you may want to consider more recent plans purchased from a well-established designer, usually online.

BUILDING A BOAT FROM OLD PLANS

DESIGN AND PLANS QUALITY:

Today, most boats are designed on the computer. This is much more accurate than old plans drafted on paper in 2 dimensions. The best new designs are all modeled in 3D with extreme precision. Modern plans do not require lofting or scaling since they are designed at full scale on the computer. Another advantage of computer designed boat plans is that the software will calculate the exact shape of every part including the plywood panels that form the hull. Those dimensions are never available in older plans and the boat builder must use patterns to take hull panel dimensions from an assembled jig from a floor loft. See our web site or our forum to understand the techniques used to build a modern plywood boat. Some of that information is applicable to the free plans discussed here. To start a comparison, "[Hull Assembly Methods](#)" is a recommended tutorial, it is available online at boatbuildercentral.com. Download a **free plan from Boatbuildercentral.com** like the NC14 canoe plan to see the difference. At Boatbuildercentral.com, you will find some stock plans based on or very similar to some of the free plans. One of the most popular free plans is named Victory: a small runabout in 12, 14 and 16' long versions. That plan was completely redesigned by our design office, a 3D model was generated from the free plans, lines faired and recalculated. It is now available at Boatbuildercentral.com as the RB12, RB14 and RB16. Some houseboats and the Sailfish type boat listed in free plans collections are also available in a updated version at Boatbuildercentral.com. A 12' kayak listed as the Plyak is available at Boatbuildercentral.com under the name PY12 and there is more. All those boats have hull shapes similar to what the free plans show but are redesigned for modern materials. The new plans are more accurate, much easier to use and pay for themselves in materials savings.