CHESAPEAKE LIGHT CRAFT

THE BEST BOATS YOU CAN BUILD™

How to Build the Tenderly Dinghy

Tenderly Dinghy

Version 1.1 May 2017

www.clcboats.com

Thanks for your order. This manual will help you assemble the Tenderly Dinghy from a CLC kit or from plans. Read through the entire manual a few times before taking up your tools so that you have a feel for the entire project.

If you encounter any technical problems while building your boat please feel free to call us: 9am to 5pm (Eastern time) Monday through Friday. You can email any time.

Tenderly is ten feet long, 52" wide, and will handle a 425-pound payload. The hull features graceful lapstrake planking and easily-driven lines. Stability is solid and she'll handle two adults and a child. Rigged with a large, efficient balanced-lug sail, she's sporty and responsive on all points. She also rows well with one, two, or three passengers, and moves nicely with a 2hp outboard. Wood-epoxy composite construction ensures rugged durability.

The primary goal for designer John C. Harris was to create a dinghy of classical good looks and traditional layout that was nevertheless quick and easy to build. Laboring over the proportions has resulted in a small boat that does not look remotely like the build-it-yourself project that it is.

"Tenderly is the culmination of 20 years of refinement of our LapStitch™ construction process," Harris says. "Just a few years ago, if you wanted a traditional stem-dinghy that looks like a British day boat from the 1920s, you were stuck building it over a mold using complex techniques."

The combination of nice lines and ample stability results in a terrific little sailing boat. There's plenty of sprawling room for two adults or a bunch of kids. The boat is fast and stiff and in general a joy to sail. Not all builders will sail the boat, as it rows and powers with grace, but the base kits include the daggerboard trunk and mast step to make the conversion easy if desired.

"Spacered inwales," solid timber breasthooks, and quarter knees are standard in Tenderly kits, among other upscale features. Traditional floorboards are an option, doubtless a very popular one.

This manual was written by Dillon Majoros and John C. Harris. Dillon, John, and Jay Hockenberry created the illustrations. The book was edited by Nancy Noyes and Matt Cordrey. The two Tenderly dinghies built for instruction manual photography were assembled by a team that included Dillon Majoros, Travis Guthrie, Andrew Schroerer, and John Staub, among other CLC staff boatbuilders.

Please remember that when buying a boat kit or a set of plans you are *purchasing the right to build one boat.* You must buy additional kits or plans and/or get written permission to build additional boats. CLC and the boat's designer retain all rights, including copyright, to the design.

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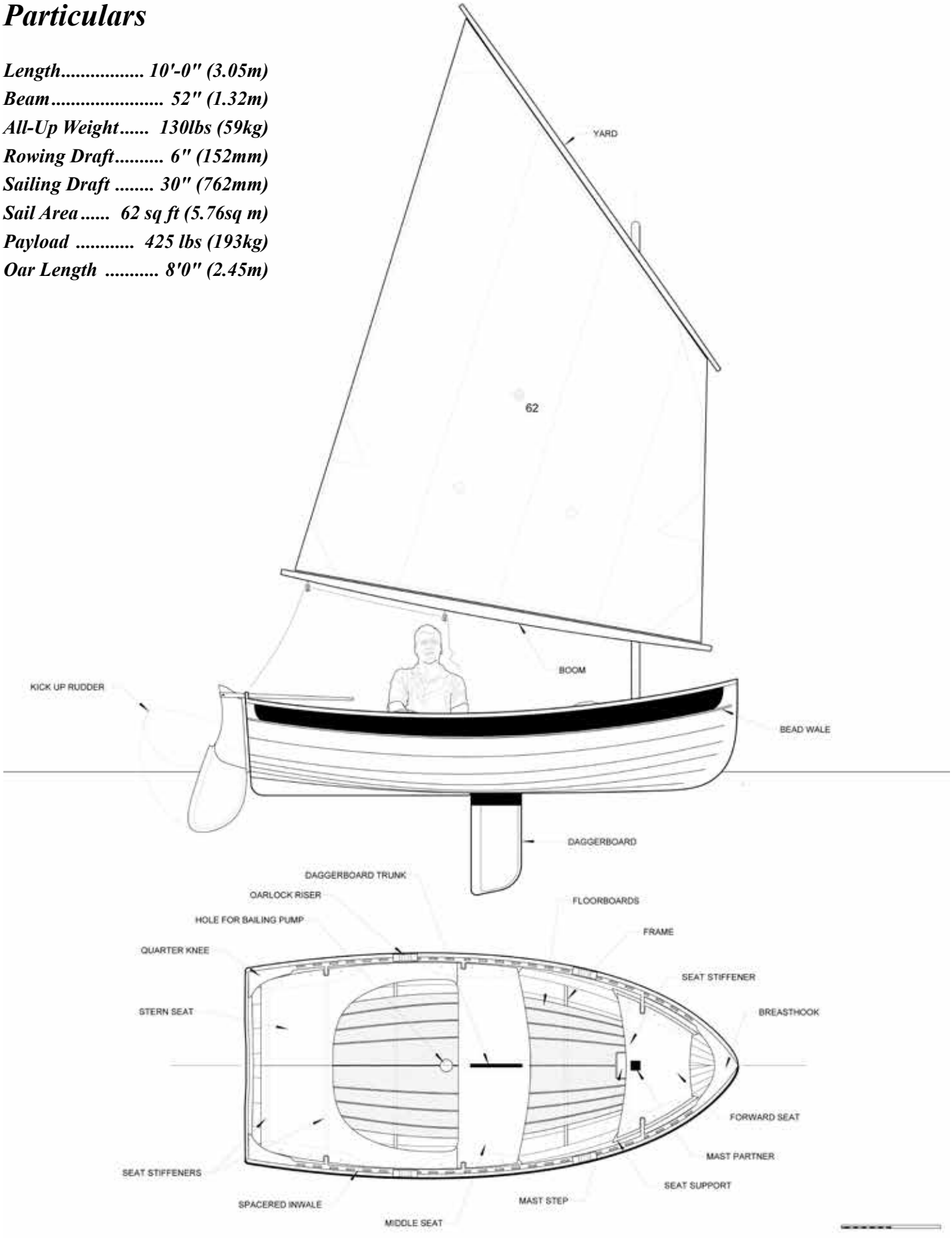
Particulars

Length..... 10'-0" (3.05m)
Beam..... 52" (1.32m)
All-Up Weight..... 130lbs (59kg)
Rowing Draft..... 6" (152mm)
Sailing Draft ..... 30" (762mm)
Sail Area..... 62 sq ft (5.76sq m)
Payload ..... 425 lbs (193kg)
Oar Length ..... 8'0" (2.45m)



Frequently Asked Questions

How big an engine can I use?

This is not a planing hull, so anything more than is required to get you to hull speed (around 5 knots) is unnecessary. A 2hp will do this handily with two adults and a child aboard. 40 pounds of engine weight is the maximum allowed.

Short or long shaft engine?

The transom is designed for a short-shaft (15") engine.

What are the plans and manual like if I want to build from scratch instead of from a kit?

Plans comprise full-sized patterns for every part in the boat, including those parts for the sailing option. This manual includes hundreds of step-by-step photos and diagrams covering the entire build.

Can you send me the plans digitally?

Sorry, until digital rights management technology for architectural work catches up to books and music, we are unable to transmit digital data, only paper plans and manuals.

Can two people row in tandem?

We wouldn't recommend it. The two rowing stations are meant to accommodate multiple seating options. For solo trips, you'll row from the midships station. With passengers sitting aft, row from the forward seat to balance the boat.

How much does the Tenderly weigh?

The stripped hull weighs about 100lbs. All-up it's about 130 pounds.

What sort of trailer do I need for the Tenderly?

The Tenderly is small and light enough for cartopping on most cars. Otherwise, the smallest of boat trailers will do. We tow ours on the Trailex SUT-250-SCLC.

What is the Tenderly's payload?

425lbs (193kg)

Can I build the Tenderly in one of your build-your-own classes?

Absolutely! The classes get you through about 45 hours of construction, which is enough time to complete the major assemblies and have the boat fully sealed with epoxy. You'll take care of the finish sanding, painting, and varnishing at home.

Can I build the rowing version first and add the sail kit later?

Base kits include the daggerboard trunk, mast step, and mast partners, as these are integral structural members of the boat. Converting to sail is simply a matter of adding a rudder and rig.

How skilled do I need to be to build my own Tenderly?

Patient first-time boatbuilders who have some experience with epoxy and fiberglass could manage a Tenderly, especially working from a pre-cut kit. We have gone to tremendous lengths to simplify assembly without compromising the boat's appearance or function.

How long will it take to build the Tenderly?

Budget around 150 - 200 hours of hands-on time for a completely outfitted sailing version.

Are there other sailing rig options?

Not at this time. We think the specified lug rig is a really good match of "engine" to "chassis."

Can the Tenderly be kept in davits?

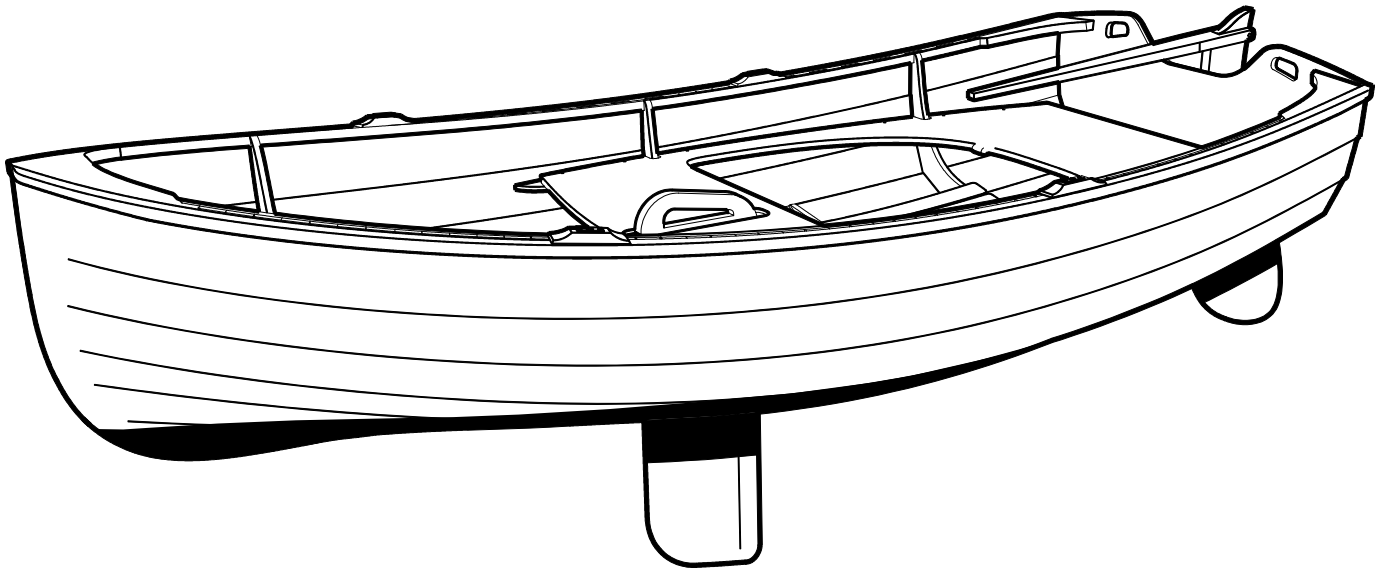
Sure - there are plenty of good mounting points to install eyebolts for a lifting sling. Install a drain plug in the hull bottom and keep it open while the boat is hanging high and dry to prevent the hull from filling with water.

How does the Tenderly tow behind a bigger boat?

With the large, deep skeg and a properly located bowline, the Tenderly exhibits excellent towing behavior.

What's up with that circular cut-out in the floorboards behind the daggerboard trunk?

That's for a handheld bilge pump and sponge. Whether from spray, rain, or wet shoes, you're bound to get a little water in the bilge. But the floorboards keep you and your gear dry. And it's no coincidence that the cut-out makes for a great cupholder...



Your Tenderly Project: An Overview

How Long Will This Take?

Depending on whether you're building a rowing or sailing version, your hands-on time will consume roughly 120-130 hours. A boat with a "workboat finish" and no frills might be less; a concours d'elegance edition quite a lot more. Your boatbuilding skills have less to do with elapsed time than you may think. Our years in the amateur boatbuilding business suggest that less-experienced builders take LESS time, not more, almost universally. They may spend more time scratching their heads, but the experienced builders linger lovingly over the details. Adding a lot of varnished trim, or really just taking their time with the sanding, for example. A lot of careful sanding is the difference between a boat that looks like it was built by children and one that was built by a pro.

There aren't any giant, scary steps in this project. Building the Tenderly is just a long series of small steps. You don't have to do them all in order. If you get bored with epoxy fillets, stop and build the rudder. While the rudder is curing, plane on one of the spars. But you can't SKIP any steps, because there really isn't much extra on this little boat. It's all an integrated system.

Your Boatbuilding Shop

Your comfort is a consideration, since you'll be spending a good bit of time in your shop. But the boat's needs come first. Realistically, you need a space where you can keep the temperature between 60 and 90 degrees F (15 and 32 degrees C). That's simply because none of the epoxy brands perform well outside of those temperature extremes, notwithstanding the claims of their marketing materials. Since Tenderly derives all of its strength from epoxy, you risk ruining your project if you try to work in marginal conditions. In cold temperatures, epoxy simply won't activate completely, so being willing to wait days or weeks for cures isn't a workable strategy. If it's super hot, it will be beyond the skills of even the most seasoned professional to do good work with fiberglass fabric and epoxy. You just can't work fast enough to stay ahead of the epoxy.

In North America, and during the winter boatbuilding season, cool temperatures are more of a challenge than heat. On our website we have an excellent article on safe and inexpensive ways to heat workspaces, small or large. Go to www.clcboats.com/shoptips

Building outside in the open, without a roof, simply isn't practical. Applying epoxy coatings in direct sunlight can be a challenge, and epoxy doesn't have any UV stability so your project could be damaged over the weeks it will spend unprotected by paint or varnish. And you can't pull a tarp over uncured epoxy or a carefully-aligned-but-not-yet-cured assembly. If you're building in your driveway or back yard, acquire a sturdy tent with a roof and walls. As of this writing, a 10' x 20' "car shelter" that you can put up and take down easily doesn't cost more than a few hundred dollars, and would fit a Tenderly with room to spare.

Wooden floors are great, but all you need is a small area that's absolutely solid and level for a pair of sturdy sawhorses.

Power Tools

A determined and resourceful craftsman could scratch-build the Tenderly with a circular saw, saber saw, router, sanders, and a jack plane. But there's plenty of woodworking, especially if you're building from plans. So you should think hard about getting some good equipment. Here are our thoughts on a tools for a home boat shop:

Table Saw: Kit builders can get by without a tablesaw. If you're building from plans, you need one that's capable of cutting 1.5" (36mm) timber without bogging down. Most "hobbyist" tablesaws can't do it. A 10-inch "contractor's saw" is perfect and you'll use it for the rest of your life. Delta makes a good one and they can be had fairly inexpensively. Tablesaws are the most difficult tool in the shop to use, and the most dangerous. Use eye protection always, never push anything up to the blade without a proper "push stick," and keep your body out of the firing line of the blade. Tablesaw work for the Tenderly can be done in brief sessions, so carrying your timber over to a friend's house is a perfect solution if you don't want to buy one. Even better if your friend is an expert on the tablesaw.

Band Saw: Definitely optional for kit builders, not really for plans builders. Get a bandsaw 14" or larger. If you don't have one, after a few sessions you'll wonder how you managed all those years. You'll use it throughout construction. There are innumerable brands. Larger ones with no more than two wheels tend to work better. It's more about getting the blade tension and tracking right than about cost. At CLC we have some big, expensive bandsaws, but an ancient, battered 14" Grizzly that we bought used for $75 still gets used the most. Given a sharp blade, it does first-class work.

Stationary Sander: This is a luxury, but since they aren't expensive, you should indulge. This is a large disc sander that sits on a table. You can perform miracles of woodworking sculpture with one of these. Or, you can just use it to grind a round end into a stick for filleting. Some of them come as a combination disc and sanding belt; these are especially helpful. CLC's is a real piece of junk: it came from a mainland Chinese discount catalog and we expected it to work for a few months while we shopped for a fancy one. That was 20 years ago now and it still gets used every day.

Random-orbital sander: You will need a good 5-inch random orbital sander. We endorse the Porter-Cable, Makita, and DeWalt brands. Here's the essential part: throw away the silly little dust collection bag they come with, and attach the hose of a powerful shop-vac to the dust port. (There are adaptors, but a ball of duct tape works, too.) This will change your entire outlook on the monotonous task of sanding. With a powerful vacuum, VERY little dust will escape into the air. Your sandpaper will also stay sharp longer, as the dust is evacuated from the surface instead of clogging the paper. After years of using dust collection with our sanders, sanding without a vacuum feels like driving without a seatbelt.

Router: A necessity for plans builders, and a very good idea for kit builders, a router is used throughout construction. You'll work a lot harder for lesser results without a router. Get a 1.5 horsepower router and a selection of "roundover" bits with 1/2" roller bearings. You'll want roundover bits in 1/4", 3/8", and 1/2" sizes. Plans builders will need either a rabbeting bit or an end-mill bit to cut the rabbets in the hull planking.

Plywood

Who will be the first to write and ask me if they can use home-center lauan to build Tenderly? If you're on a lauan budget, send us an email and we'll try to suggest some alternate designs. Tenderly was engineered around the specific properties of marine plywood, which has strong, thick veneers and no voids. There are some pretty big spans where there's no framing at all–just a sandwich of marine plywood and fiberglass. That sandwich has enormous strength properties, but you might as well build the boat with wheat thins and polyester resin if you're going to use cheap plywood.

Really, as a percentage of the total cost of the project, the difference between cheap and excellent plywood is very small. The boat will be stronger and more durable, the resale value is enhanced, and you will simply enjoy the time you spend working with high-quality materials.

The non-domestic marine plywoods subscribe to a rating system, known as the "British Standard." BS1088 is what's desired, even better if it has the Lloyd's Register stamp on it. In theory the rating ensures perfect plywood. In practice, these once-hidebound ratings have been watered down a lot in recent years by unscrupulous plywood mills, who stamp their plywood with "BS1088" and "Lloyds" when they have no business doing so. There's little to be done but to examine the panels very closely and stick with major marine ply name-brands of established reputation. (Joubert, a French company, has supplied CLC's plywood for 20 years now.)

Sapele (suh-PEE-lee): This is the premium stuff, and yes, it is expensive. It's also very strong, very durable, and very beautiful. Especially desirable if you plan to varnish large swathes of your boat.

Okoume (oh-KOO-mee): As of 2017, this is the best-known and easiest-to-find of the premium marine grade plywoods. It's lighter and less dense than sapele. It isn't quite as strong and has poor rot resistance; in boatbuilding settings it's always sealed in epoxy, which of course is required on the Tenderly no matter which plywood you choose. Okoume takes about 70 years from planting to harvesting, and all of the leading brands practice sustainable forestry. CLC Tenderly kits are cut from okoume.

Meranti (mer-AHN-tee): This Southeast Asian plywood is dense and strong and quite heavy. The grain tends to tear when cut, which isn't much fun but surmountable. It's fairly inexpensive in a marine grade, and at the moment seems to be widely available.

Fir Marine: This is the only marine plywood made in domestic US mills, and it's milled from completely sustainable sources. We've used fir marine a lot over the years and generally been pleased. It's remarkably durable, but also rough and very heavy and not inexpensive. Unfortunately, it's not available in the 4mm thickness required for Tenderly's hull, but you could use it for seats and frames.

Other plywoods: Let's hope someone comes up with a viable bamboo plywood one of these days. At the moment the bamboo plywoods that are out there are ridiculously expensive, and simply too stiff and hard for boatbuilding. Maybe someday. As for construction grade plywood: sorry. There are workboat-type designs that can be nailed together from AC fir and even, heaven forfend, lauan, but Tenderly is not in that category. It has too much shape in the panels and too many wide spans of plywood to risk anything other than first-rate marine grade plywood.

Timber

Tenderly requires a modest amount of clear, straight-grained timber for structural stringers, spars, hatch details, and the wale beads. A huge variety of timber will work in these applications. On this continent, spruce, pine, and fir are the obvious choices. Our demo model Tenderly spars were made from cypress. The wales are Fijian mahogany or spanish cedar.

The primary requirement is that the timber is dry, free of knots larger than a pencil eraser, and will accept epoxy glue without trouble. Avoid hardwoods or oily woods like oak and teak. Shop around; independent lumberyards that cater to artisans and tradesmen (as compared to the home center types) will tend to have a nice selection of clear timber and can be found anywhere there are artisans and tradesmen. Such yards may even mill your stock for you for a small fee.

Safety

More about that finicky epoxy here. You just can't get the stuff on your skin, or breathe the dust created when you sand epoxy. You may succumb to lazy, macho epoxy practices on a small project–not wearing disposable gloves, snorting clouds of epoxy dust–but on a project of this scale you can really hurt yourself. In fact, you may become so sensitized to epoxy that you have to give up your project before it's finished. Buy disposable gloves by the box, and use them every time you reach for the epoxy. If you get any on your skin, stride at once to the sink and scrub it off with cold water (so it doesn't work into your pores) and an abrasive soap like Lava. Never use solvents to wipe epoxy off of yourself–that just dissolves it into your bloodstream and onwards to your liver.

Particles of epoxy dust and fiberglass set adrift by a sander are terrible for your lungs. You'll get throat-cold symptoms right away–if you're lucky. You might get really sick. The paper masks are adequate protection, but they aren't very comfortable. The rubber cartridge respirators are wonderful. They're comfortable on your face, and the incoming air is cool and refreshing. If you hook a vacuum to your sander to collect the dust at the source, wear ear protection and a nice respirator, and change the sandpaper before it gets dull, you'll find that sanding is a Zen-like pleasure.

Rigging and Sailing

This volume will hold your hand as you build Tenderly, but it does not aspire to teach you to sail, how to tie basic knots, or how to do anything beyond rigging the boat the way we did. Tenderly is not a makeshift or stodgy sailboat. The rig is powerful, the boat is not indestructible, and you can get yourself into trouble. Understand your limits before you leave shore. Take sailing lessons, and latch onto an experienced sailor who not only knows a jib from a jibe, but who knows something about quasi-traditional lug rigs like Tenderly's. If you can't find a proper marlinspike seaman in your town, there are a great many beautiful books about sailing, rigging, and traditional smallcraft. Collect them up on eBay or at your local library.

Unless you're a sailmaker by training, you really have two choices for the sail: Hire a sailmaker to make your sail, or purchase a pre-cut sail kit from an outfit like Sailrite.com. CLC stocks Tenderly sails. Sails are so very much more than just flat sheets with neat hems sewn around the edges! They are sophisticated three-dimensional aerodynamic foils, with much subtlety in shaping and detail. This isn't salesman jive; the difference between a flat blue polytarp sail and a professionally-made sail isn't 10 or 15 percent in performance. It's 70 or 80 percent. You might not be able to sail to windward with bad sails, and at best you'll be disappointed and look like a lubber.

Sails aren't cheap. Our strategy over the years has been to purchase the sail right at the beginning. The cash outlay is a galvanizing force to get the boat finished and on the water, as the sails are absolutely useless until you do so.

Marine Epoxy Basics

Throughout this manual, we refer to waiting until epoxy "cures." In reality it takes weeks for epoxy to cure ("activate" is the precise term, but you know what we mean). Assemblies can be moved safely after the adhesive feels dry to the touch. 24 hours is long enough at 65 degrees F (18C) and above. Whenever an assembly has some critical curing time, we'll be specific.

Epoxy is a two-part adhesive, consisting of a resin and a hardener. You can pick the hardener's speed – fast, medium, or slow – but you can't change the ratio at which you mix the two. A chemical reaction causes the epoxy to activate and "cure." As the mixture begins to cure the chemical reaction generates heat. This can be a problem if you mix too much at a time and take too long to use the epoxy. Plan ahead and even rehearse assembly procedures so you are able to get the epoxy out of the cup in a reasonable time. The reaction always runs faster at higher ambient temperatures and slower in lower ambient temperatures. When in doubt, mix small batches.

The epoxy we use at CLC is mixed at a ratio of two parts resin to one part hardener. Unlike the old-fashioned polyester resin, you cannot speed up or slow down the epoxy cure by altering this ratio. If you change the ratio, the epoxy may never cure.

We use epoxy in several different ways to build our stitch-and-glue boat. We're going to use it as:

- A liquid coating, to seal the wood;
- An adhesive to bond wood parts;
- A structural filler, mixed with wood flour, silica, or Cell-o-fill to make a paste.

Epoxy resin and hardener have some idiosyncrasies that it's good to know about. Resin, especially if it's been allowed to get cold, will sometimes crystallize. You'll find the lower few inches of your resin jug seemingly solidified. The fix is simply to immerse the jug in a pail of hot water. The heat will quickly and completely reconstitute the resin. If you're careful to store it at room temperature, it will stay that way. The hardener tends to darken with age, but this has no chemical effect on the mixture and doesn't affect the appearance, either.

Mixing Epoxy

Our epoxy comes in separate jugs, some with resin and some with hardener. The pumps for resin and hardener are color-coded (blue for resin, red for hardener), and are adjusted so that they dispense the correct ratio. One push on the resin pump and then one on the hardener pump automatically dispenses the proper amount of resin and the proper amount of hardener. Carefully follow the instructions included in the resin and hardener pump package. Be sure to put the hardener pump in the hardener and the resin pump in the resin.

When you're making a big batch of epoxy, pump out the resin and hardener by alternating strokes, first on one pump and then the other; the two parts will have a head start towards being mixed, and you won't lose count. Mix well by hand or with a simple mixer inserted into a slow-speed drill. Most epoxy problems arise from not having mixed the epoxy long enough (or, indeed, at all). Thirty seconds mixing for every pump of resin is ideal, up to a maximum of 4 minutes for larger batches.

Always mix the resin and hardener before adding thickeners.

Clamping Glued Joints

For clamped wood-to-wood joints like **scarfs**, we need the strongest possible mix. To thicken the epoxy for tight wood-to-wood joinery, we mix in Cell-o-fill, a white cellulosic substitute for Cab-o-sil or silica powder. This mixture produces an extremely hard adhesive. It's no fun to sand so clean up carefully. We refer to the ideal thickness of such a mix as a "mustard" consistency. It doesn't drip off a stick, but it spreads easily and smoothly.

Creating Epoxy Fillets and Filling Gaps

For epoxy "fillets" (pronounced "fill-it" in this application), we use wood flour, which is nothing more than very fine sawdust. (So fine that it really needs to come from a factory. The sawdust you create in your shop is ten times too coarse for a good epoxy fillet mix.) You will mix the wood flour with the resin and hardener to create a peanut-butter-like paste, and you'll be using gobs of it for Tenderly. Wood flour and epoxy create a strong "wood putty" which adheres to the wood on either side of a joint, fills gaps well, and can be spread smoothly with simple filleting tools.

One trick for slightly smoother epoxy fillets is to blend in a bit of Cell-o-fill, about 10% by volume.

Whenever you make up thickened epoxy, pump out the resin and hardener, mix the two completely, and then begin adding the thickener a little at a time until you have the consistency you want. Because the Cell-o-fill and wood flour settle a lot when packaged and shipped, we can't issue precise volumetric guidelines for how much to add. Just keep adding fillers until the desired consistency is achieved.

Coating Wood and "Wetting out" Fiberglass Cloth

You will be applying fiberglass cloth to portions of the interior and the exterior of your Tenderly, and any wood surface not sheathed in fiberglass will be sealed with coats of unthickened epoxy.

With the low-viscosity epoxy we supply in our kits, you can roll out fiberglass fabric onto clean, dry surfaces, make sure everything's smooth, then apply epoxy. Take extra care to remove wrinkles in fiberglass fabric BEFORE you mix the epoxy. Saturating the fiberglass, or "wetting out," is done with unthickened epoxy–no fillers. Mix batches of about 10-12 ounces (300-350ml) and use a spreader or a squeegee to spread the poured liquid evenly over the fiberglass cloth. The first coat must be thick enough only to saturate the cloth. As the cloth is saturated it will become transparent and any dry spots will be loudly obvious. When properly done, the cloth will be transparent but the weave will still be very evident. If you apply too much epoxy on the first coat the cloth will float to the surface and you will have a heavier, weaker, and uglier structure.

Subsequent coats fill the weave prior to painting or varnishing. The best tool to use is a disposable yellow foam roller specifically designed for epoxy application. After rolling on the epoxy, "tip" it out with a brush (a foam brush is fine) to pop the tiny air bubbles left by the rollers.

Epoxy cures to a bumpy surface. When you are sanding an epoxy finish in preparation for varnish, you want to remove all of the shiny spots. Sand the really jagged areas with 80-grit paper. 120-grit is good for leveling everything in preparation for paint primer. Areas to be varnished should be rubbed down with 220-grit sandpaper first to remove the swirls left by coarser sandpaper. You can preview a varnished finish with a swipe of denatured alcohol on a clean rag.

Finishing

The care you take in assembling and sanding the boat will determine the quality of your final finish. Don't count on paint or varnish to hide sloppy work. If anything, finish coatings tend magnify blemishes.

Like it or not, you must apply some type of finish coating. Epoxy, like many plastics, deteriorates in sunlight, turning yellow and dull and, after a while, begins to crack. It needs to be protected with either paint or varnish.

Types of Finish:

Varnish

A "bright finish" in the argot of boatbuilding means a clear coating over the wood. (Not to be confused with "staining," a term from furniture building for the process of dying the wood with special pigments.) It's the traditional way to finish small pleasure boats like canoes and rowing skiffs. In modern times it has become a favorite finish for plywood-epoxy smallcraft. A bright finish means you need to take great care with your plywood–no scratches or sanding marks!–and your fillets need to be really neat. The truly brave and dedicated will varnish the whole hull, inside and out. Most builders will varnish at least the rails and spars.

You'll want 3-5 coats of a good name-brand marine varnish on surfaces left "bright." Don't be tempted to use less expensive home center or polyurethane varnishes. Use a disposable foam brush to apply thin coats and sand lightly between coats.

Paint

Modern marine paints have superior gloss compared to house paint types and have gotten fairly easy to apply these days. We strongly recommend a primer on above-the-waterline surfaces. The primer acts as a good link to the epoxy and will greatly improve the smoothness of the painted surface. The number of coats required will depend upon the color you're using; count on at least three.

Two-part paints are very strong and glossy and look like gelcoat. We recommend them only for experienced painters; it takes quite a chemistry set to get the viscosity and drying time right. The same goes for spray-painting rigs. The experts make it look easy, but spraying paint requires a lot of skill. You can make a shocking mess on the boat while experimenting with the infinite combinations of nozzle size, solvents, and shop temperature and humidity.

Oil-based enamel house paint, applied neatly, can look really nice and it's easy to put on and maintain. It just won't be as glossy.

On Tenderly #2, we used Interlux Brightsides polyurethane for the exterior hull sides, and Interlux Schooner Varnish for the interior.

If your Tenderly will live in the water, or spend more than a week or two in the water, you'll need to treat the bottom differently. Use herbicidal bottom paint, but follow the manufacturer's instructions to the letter. Don't use a primer underwater unless it's one recommended by the manufacturer.

Essential Tools and Supplies

It does not take a huge pile of tools to build a stitch-and-glue boat. Here's a list. Many of these items are available from Chesapeake Light Craft. Check out our boatbuilder's store at ***clcboats.com.***

- Tape measure and a yardstick/straightedge
- Combination square (sometimes called a tri-square)
- Bevel gauge
- Pencils
- Small handsaw – Best are the Japanese-style saws that cut on the pull stroke. A small back saw or dovetail saw will also work.
- Block plane – Make sure it is sharp.
- Drill and bits – Along with the usual assortment of drill bits, you will need a #8 (3mm) countersinking bit with a 3/8" (9mm) plug borer. Buy an extra 1/16" (1.5mm) drill bit, the size needed for drilling wire stitch holes.
- Screwdrivers
- Pliers – The best are the "lineman's," specifically for working with wire.
- Wire cutters –These are for cutting stitches; the diagonal cutter type is by far the best.
- A selection of wood rasps
- Razor knife – A regular utility knife with a box of new blades.
- Sawhorses – The straight-top style is best for gluing up your hull.
- Sanding mask or respirator
- Safety glasses – Wear them.
- Clamps – You'll need 50-60 of these. We used inexpensive 3-inch (75mm) spring clamps
- Bar clamps – 3 or 4 of the 12" (300mm) variety
- Electric sander – The 5" (127mm) random orbital sanders are the most versatile and that's what you see in the photos in this manual.
- More clamps
- Electric Router – with 1/4", 3/8", and 1/2" (6, 9, 12mm) round-over bits, and a 1/2" (12mm) flush-trim bit

Tools for builders working from plans; optional for kit builders:

- Tablesaw
- Bandsaw
- Even more clamps
- Rabbeting bit for router

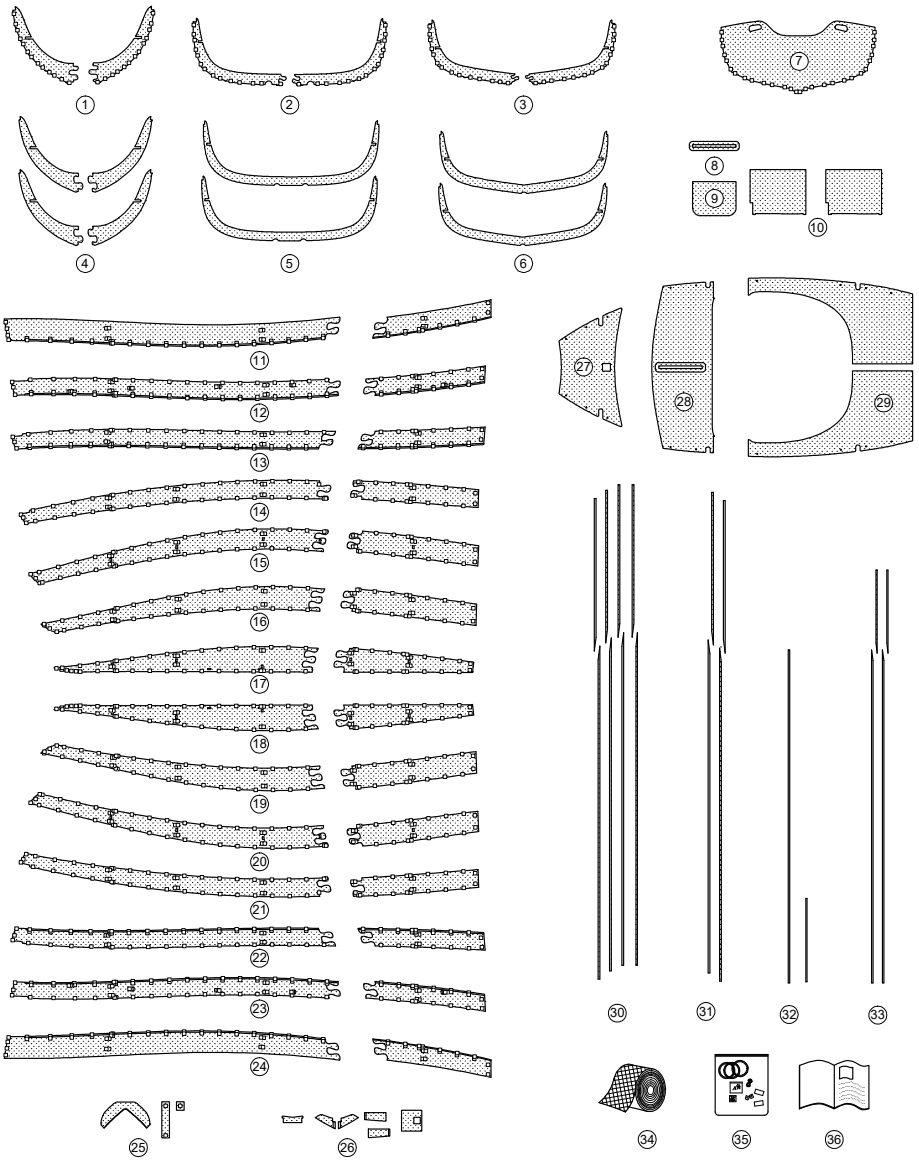
Essential Consumable Supplies:

- Sandpaper – 80-grit, 120-grit, 220-grit
- #6 drywall screws in assorted lengths
- 2" (50mm) masking tape
- Disposable foam brushes – with wooden, not plastic, handles. About 36.
- Disposable bristle brushes – So-called "chip brushes," about 36 for this project.
- Disposable foam rollers – Buy only the solvent-proof short-nap yellow type. About 24.
- Epoxy metering pumps – These pumps are included in our kits.
- Stirring sticks – Popsicle sticks or any similar pieces of wood.
- Disposable gloves – It's economical to buy boxes of 100.
- Respirator or disposable masks
- Polyethylene (plastic) sheeting
- One-gallon freezer bags (for epoxy fillet dispensers)
- Scrap wood – A variety of dimensional lumber scrap for clamping chores and other sundries
- Denatured alcohol (not isopropyl)
- Clean rags

Tenderly Dinghy: Base Kit

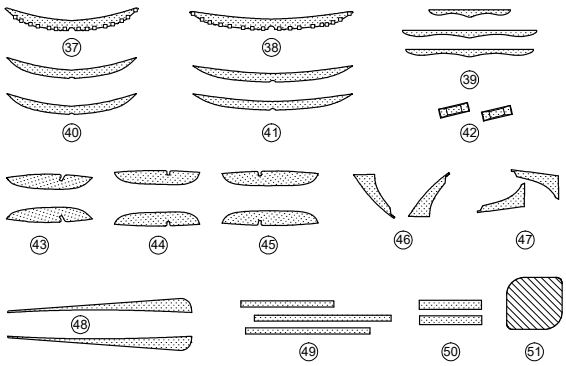
☐BOX 1: 98" x 40" x 2"

1_____Frame 1 (2 parts)
2_____Frame 3 (2 parts)
3_____Frame 5 (2 Parts)
4_____Frame 1 Doublers (4 parts)
5_____Frame 3 Doublers (2 parts)
6_____Frame 5 Doublers (2 parts)
7_____Transom
8_____Trunk Plug - Cap
9_____Trunk Plug
10_____Trunk Sides (2 parts)
11_____Panel 7 - Right (fore and aft)
12_____Panel 6 - Right (fore and aft)
13_____Panel 5 - Right (fore and aft)
14_____Panel 4 - Right (fore and aft)
15_____Panel 3 - Right (fore and aft)
16_____Panel 2 - Right (fore and aft)
17_____Panel 1 - Right (fore and aft)
18_____Panel 1 - Left (fore and aft)
19_____Panel 2 - Left (fore and aft)
20_____Panel 3 - Left (fore and aft)
21_____Panel 4 - Left (fore and aft)
22_____Panel 5 - Left (fore and aft)
23_____Panel 6 - Left (fore and aft)
24_____Panel 7 - Left (fore and aft)
25_____Wale Bead Clamp (3 Parts)
26_____Mast Step (6 parts)
27_____Forward Seat
28_____Middle Seat
29_____Aft Seat (2 parts)
30_____Outwales (8 parts)
31_____Inwales (4 parts)
32_____Inwale Spacer Material (2 parts)
33_____Wale Beads (4 parts)
34_____Fiberglass Tape: 9oz. 25' x 3"
35_____Hardware: Base Kit
36_____Manual



☐BOX 2: 54" x 8" x 6"

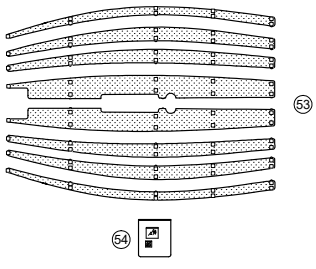
37_____Frame 2
38_____Frame 4
39_____Seat Stiffener Templates (3 Parts)
40_____Frame 2 Doublers (2 parts)
41_____Frame 4 Doublers (2 parts)
42_____Oarlock Risers (1 Pair)
43_____Forward Seat Cleats (2 parts)
44_____Middle Seat Cleats (2 parts)
45_____Aft Seat Cleats (2 parts)
46_____Breasthook (2 parts)
47_____Quarter Knees (2 parts)
48_____Skeg (2 parts)
49_____Seat Stiffeners (3 parts)
50_____Trunk Spacers (2 parts)
51_____Fiberglass Cloth: 6oz. 18yds x 50"



☐BOX 4: 80" x 6" x 10"

(OPTIONAL)

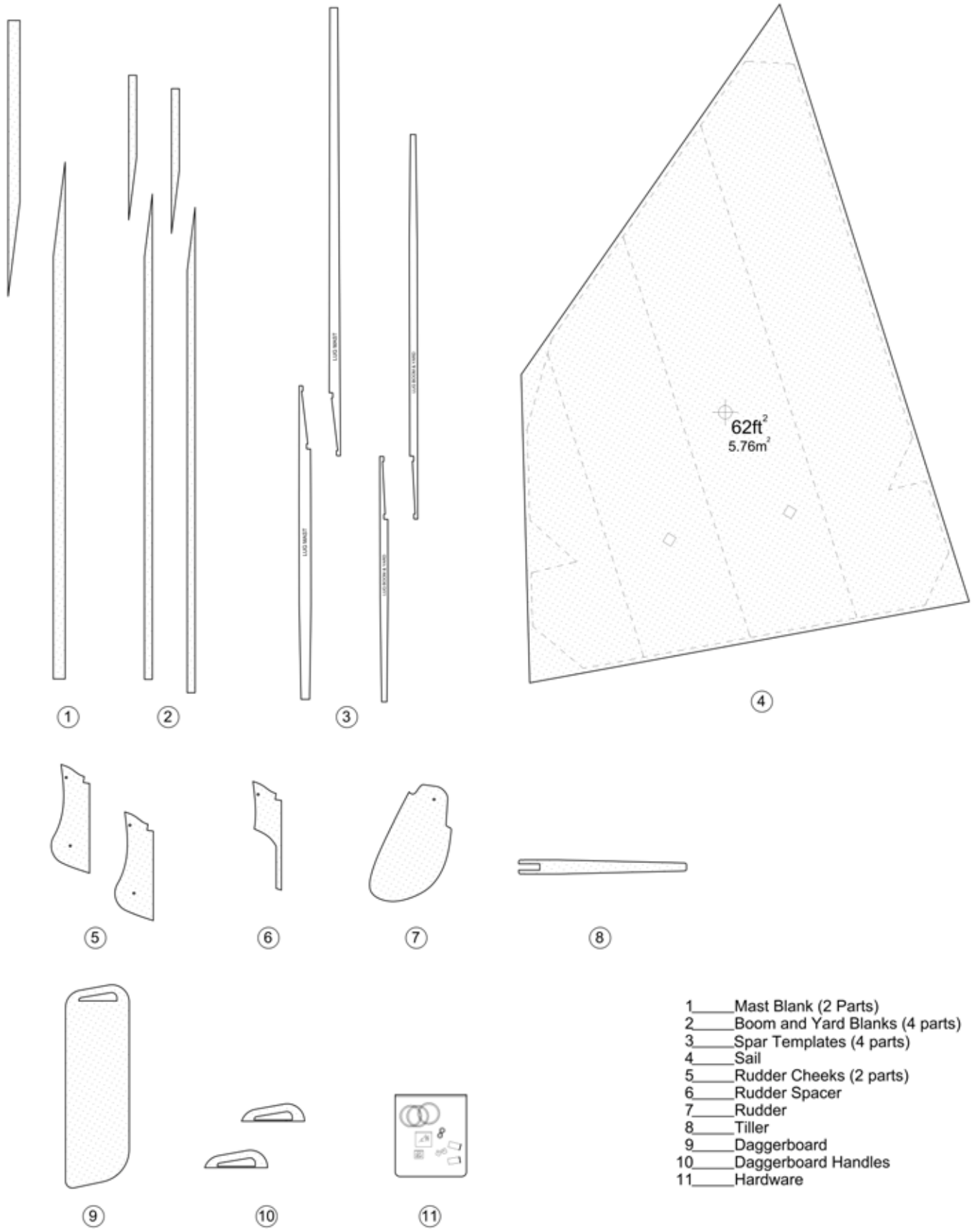
53_____Floorboards (8 parts)
54_____Hardware: Floorboards



☐BOX 3: 12" x 12" x 12"

52_____#3 MAS Economy Kit

Tenderly Dinghy: Sailing Component Kit



1_____Mast Blank (2 Parts)
2_____Boom and Yard Blanks (4 parts)
3_____Spar Templates (4 parts)
4_____Sail
5_____Rudder Cheeks (2 parts)
6_____Rudder Spacer
7_____Rudder
8_____Tiller
9_____Daggerboard
10_____Daggerboard Handles
11_____Hardware

Building Your Tenderly from Plans

Kit builders should skip to page 34.

By its very nature, stitch-and-glue boatbuilding depends upon pre-fabricated components that are assembled into a boat and then fixed in place with epoxy. Plans builders will need to create a "kit" of parts before joining up with the kit builders farther along in the manual.

Choosing Materials

All of the Tenderlys built from CLC kits are made out of okoume plywood. Okoume is easy to work and finishes beautifully. Okoume is also the lightest weight plywood you can find, and is responsible for Tenderly's very modest trailer weight. It's still widely available (including from Chesapeake Light Craft) and it's what we recommend you use to build your Tenderly.

Other materials will work, but the boat will be heavier. We suggest sapele, another marine grade plywood with an exceptionally beautiful grain pattern. Sapele is even stronger than okoume, but a bit heavier and twice as expensive. Meranti will work if you can find it in a marine grade spec (British Standard 6566 or 1088). All plywood used in the Tenderly should be marine grade.

Do not contemplate building the Tenderly out of lauan or construction-grade plywood or anything not sold as marine-grade. Wood-epoxy composite hulls are not suitable for cheap, low-quality materials with voids and weak cores, like lauan or AC-grade plywood.

Likewise, we strenuously recommend sticking with the specified plywood thicknesses for the hull panels: 4mm. This thickness not only yields a desirable combination of strength and weight, it's going to BEND properly. Thicker plywood might not form up properly; thinner plywood might result in outright flimsiness. The urge to substitute some other thickness might come about for many reasons, including availability and economy, but understand that the trade-offs may prove unacceptable.

Material for Tenderly's rails and structural stringers can be just about any straight-grained, knot-free material with good gluing characteristics. The kits are supplied with mahogany rails; spruce, fir, pine, cypress, or cedar would all work too, though they wouldn't be as pretty. Red or white oak is too stiff for the rails and doesn't take epoxy well; Western red cedar is too light and brittle for rails. We use cypress for stiffeners that support the seats; spruce, pine, or fir are all good choices there.

In the US, finding clear, long lengths of lumber is getting hard. There isn't the slightest problem with cutting a couple of scarf joints to join shorter lengths of clear timber into longer lengths. This is, in fact, preferable to long lengths of lumber of questionable quality.

Scarf joints in the rails should have an 8:1 ratio, as shown in the "rail scarf" drawing later in this section. They are easy to cut with a japanese pull-saw, with a bandsaw, or on a tablesaw jig. You can clean them up with a block plane before clamping them together with epoxy. Scarf joints should be glued using Cell-o-fill mixed into the epoxy for maximum shear strength.

Composite wooden boats like Tenderly work only with marine-grade epoxy. Don't consider using polyester resins or other adhesives to substitute for the epoxy, as they simply aren't strong enough for this style of construction. Epoxy should be a low-viscosity blend that doesn't create an amine blush as it cures. We endorse the MAS, WEST System (with 207 hardener), and System 3 Silvertip brands, all of which have these qualities and are available from CLC.

Tenderly Materials List

Description	Metric Equivalent	Specification
Plywood		
4 Sheets 3/16" x 4' x 8'	4mm x 1250mm x 2500mm	Marine Grade Plywood
1 Sheets 1/4" x 4' x 8'	6mm x 1250mm x 2500mm	Marine Grade Plywood
1 Sheets 3/8" x 4' x 8'	9mm x 1250mm x 2500mm	Marine Grade Plywood
1 Sheet 1/2" x 4' x 8'	12mm x 1250mm x 2500mm	Marine Grade Plywood
1 Sheet 3/4" x 4' x 8'	18mm x 1250mm x 2500mm	Marine Grade Plywood
Epoxy and Fiberglass		
3 gallons total activated	11.4 liters	Marine Epoxy
(E.G., 2 gallons resin, 1 gallon hardener)	*Or 7.6 liters resin, 3.8 liters hardener*	
3 pounds Wood Flour	1.36kg	Medium-density filler
1 pound of "Cell-o-Fill"	0.45kg	High-density filler
18 yards 6-ounce x 50" fiberglass fabric	203 grams/sq. metre x 127cm x 16.5 meters	Plainwoven E-glass
25 feet 9-ounce x 3" fiberglass tape	305 grams/sq.metre x 76mm x 7.6 meters	Plainwoven E-glass

Timber

Description	Metric Equivalent	Specification
Base Hull		
Inwales & Outwales		
70 lineal feet of 7/8" x 1/2”	or 22mm x 12mm x 21.3m	Mahogany or similar
Inwale Spacers		
10 lineal feet of 7/8" x 3/8”	or 22mm x 9mm x 3m	Mahogany or similar
Wale Beads		
24 lineal feet of 3/8" x 3/8"	or 9mm x 9mm x 7.3m	Mahogany or similar
Breasthook & Quarter Knees		
1.5 board feet		Mahogany or similar
Or 7” x 3/4” x 40”	or 175mm x 18mm x 1020mm	
Oarlock Risers		
0.4 board feet		Mahogany or similar
Or 1" x 2" x 28”	or 18mm x 50mm x 715mm	
Seat Stiffeners		
1.4 board foot		Mahogany or similar
or 2-1/2" x 3/4" x 110”	or 64mm x 18mm x 2790mm	
Daggerboard Trunk Spacers		
0.3 board foot		Spruce, pine, or fir
or 2-1/8" x 3/4" x 27”	or 54mm x 18mm x 685mm	
Sailing Option		
Main Mast		
6 board feet	0.015 cubic meters	Spruce, pine, or fir
Or 11-1/2 lineal feet of 2-1/2" x 2-1/2”	or 64mm x 64mm x 3.5m	or similar
Boom & Yard		
5 board feet	0.01 cubic meters	Spruce, pine, or fir
Or 19 lineal feet of x 1-3/4" x 1-3/4”	or 45mm x 45mm x 5.8m	or similar
Tiller		
3" x 3/4" x 33”	or 75mm x 18mm x 840mm	Mahogany or similar

Tenderly Hardware List

Base Kit

	QTY	Description	Metric Equivalent	Application
	6	Copper Wire Rolls (200' x 18 gauge)	61m of 1mm copper wire	Hull Stitching
	1	CA Glue		
	1	CA Glue Accelerator		
	1 Pair	Top Mount Oarlocks Sockets		Oarlock Sockets
	1 Pair	Oarlocks		
	8	#10 x 1” Bronze Wood Screw	5mm x 25mm	
	18	1/4-20 x 2” SS Panhead Machine Screw	6mm x 50mm	Seats
	18	1/4” Finish Washer	6mm	
	18	1/4-20 “T” nut	6mm	
	2	#8 x 1-1/4” SS Flathead Wood Screw	4mm x 32mm	
	16	#8 x 1-1/2” SS Flathead Wood Screw	4mm x 38mm	Seat Stiffeners
	16	#8 Finish Washer	4mm	
	2	#8 x 1-1/4” SS Flathead Wood Screw	4mm x 32mm	Skeg
	1	#8 x 3/4” SS Flathead Wood Screw	4mm x 18mm	

Floorboard Kit

	QTY	Description	Metric Equivalent	Application
	80	#8 x 1” SS Ovalhead Wood Screw	4mm x 25mm	Floorboard Mounting
	80	#8 Finish Washer	4mm	

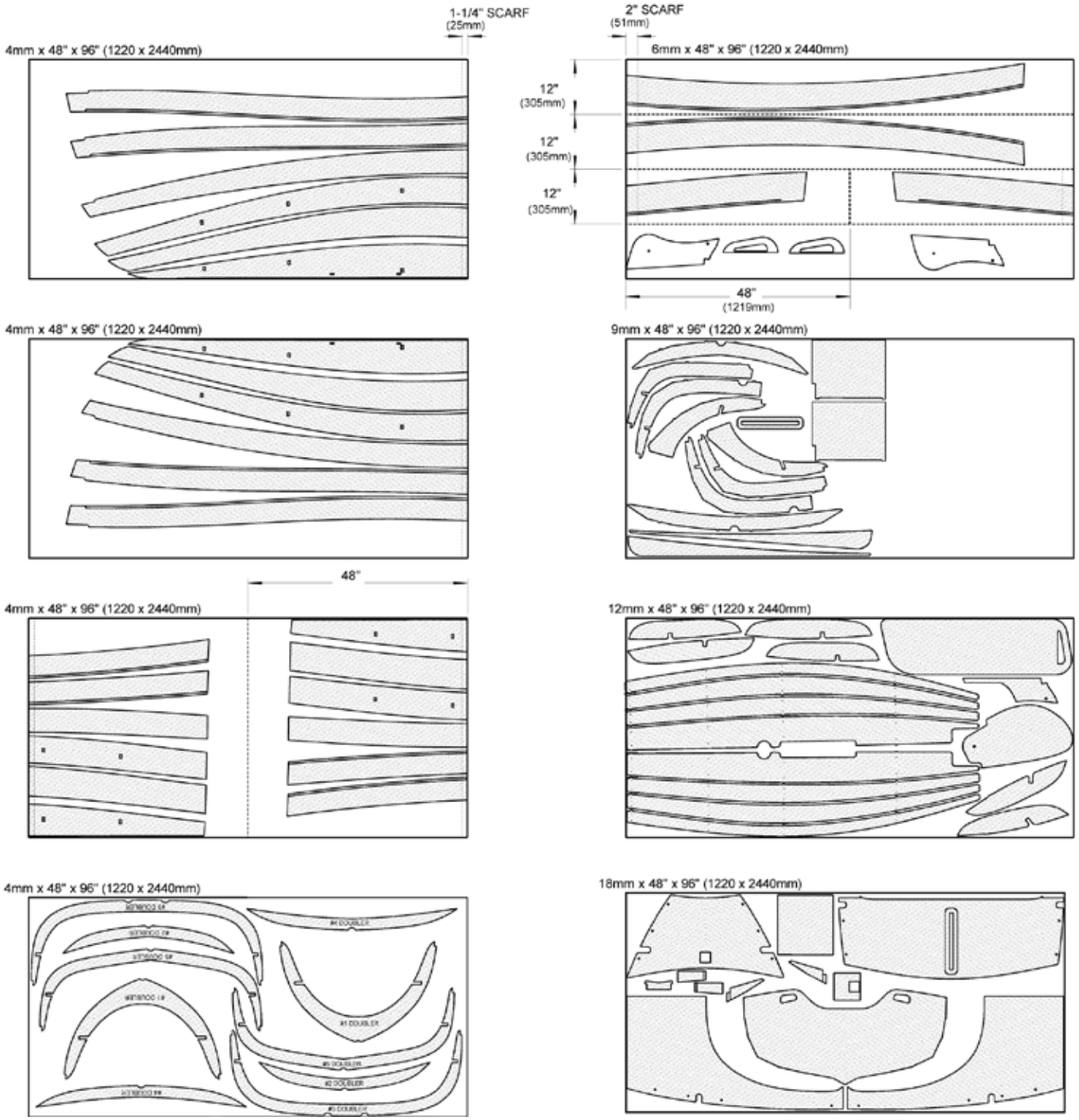
Sailing Component Kit

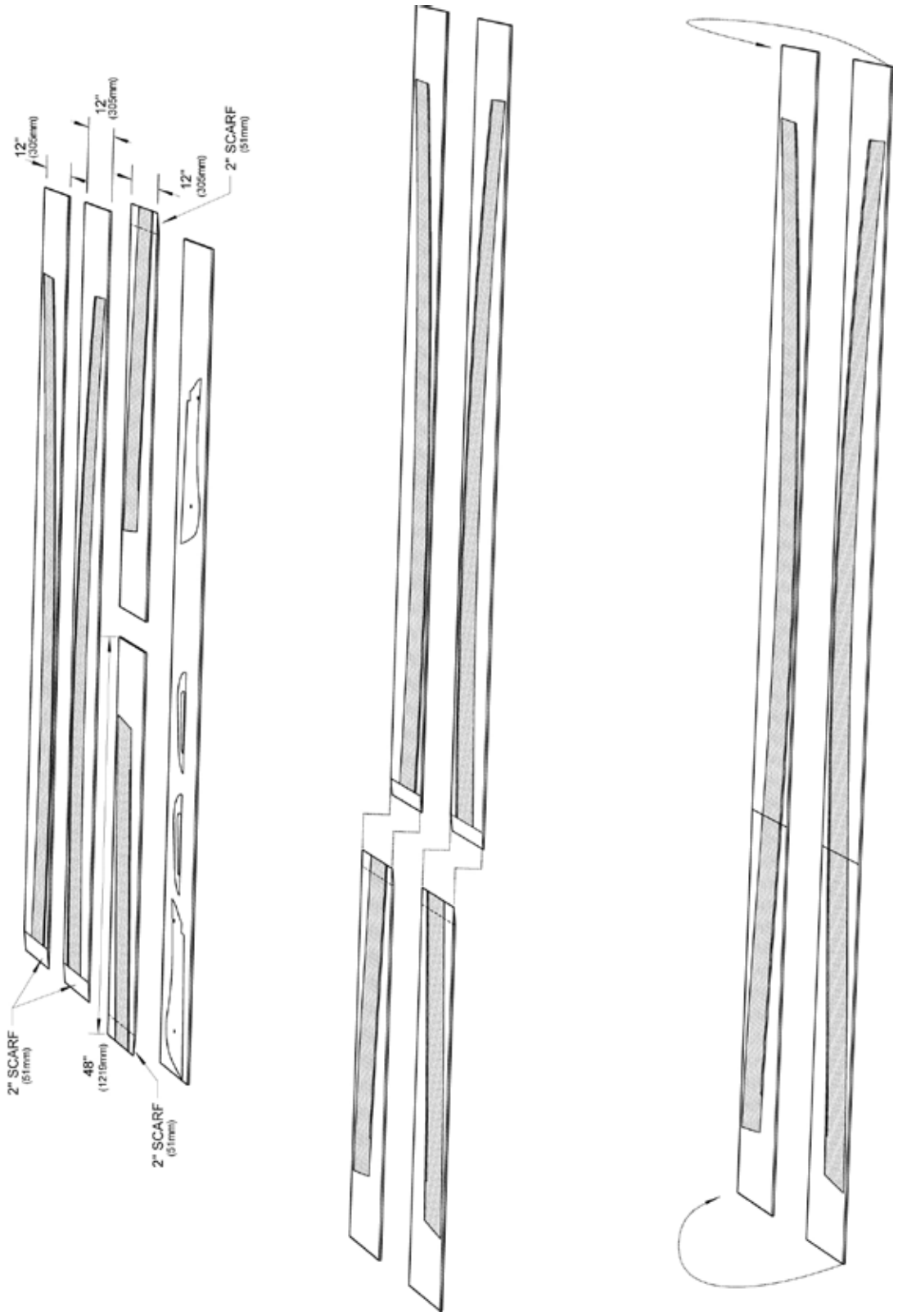
	QTY	Description	Metric Equivalent	Application
	1 Pair	SS Rudder Pintles		*One short and one long pin*
	1 Pair	SS Rudder Gudgeons		Rudder mounting
	1	Stop Tang		Rudder retention
	8	#10 x 1-1/4” SS Panhead Machine Screw	5mm x 32mm	Gudgeon mounting
	8	#10 Flat Washer	5mm	
	8	#10 Nyloc Nut	5mm	
	3	#10 x 1-1/2” SS Panhead Machine Screw	5mm x 38mm	Pintle mounting
	3	#10 Nyloc Nut	5mm	
	2	#8 x 1/4” SS Panhead Wood Screw	4mm x 6mm	
	1	1/4-20 x 3-1/2” SS Panhead Machine Screw	6mm x 90mm	Tiller mounting
	1	1/4-20 Nyloc Nut	6mm	
	4	1/4” Flat Washer	6mm	
	1	5/16-18 x 2” SS Carriage Bolt	8mm x 50mm	Rudder mounting
	1	5/16” Fender Washer	8mm	
	1	5/16-18 Star Knob	8mm	
	1	#6 x 3/4” SS Panhead Wood Screw	3.5mm x 18mm	Stop Tang
	2	4” Plastic Cleat	100mm	Halyard & Downhaul
	4	#8 x 1-1/2” SS Flathead Wood Screw	4mm x 38mm	Cleat mounting
	2	1-1/2” Stainless Steel Block	38mm	Mainsheet

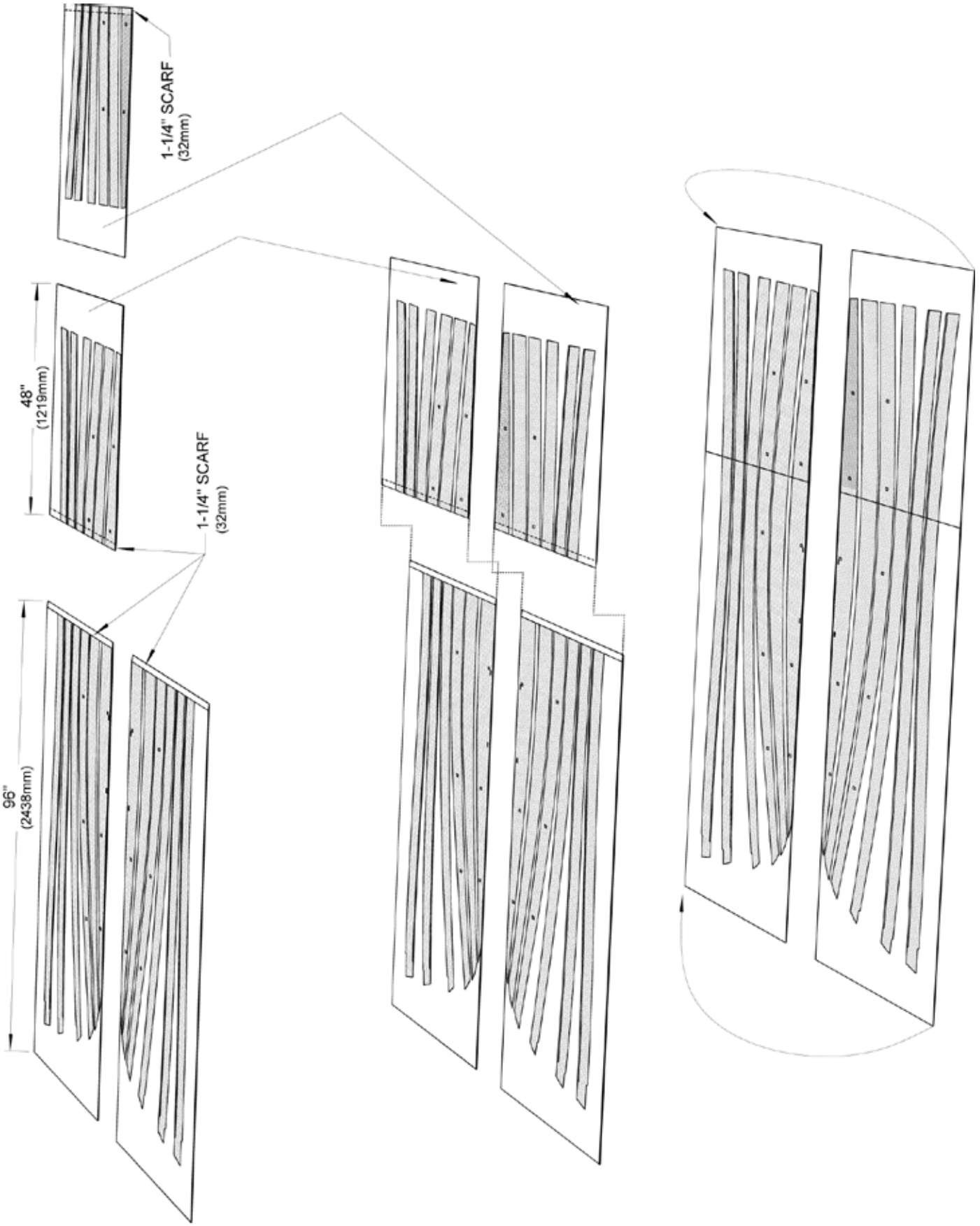
Line & Cordage

	QTY	Description	Metric Equivalent	Application
	30'	1/4” Samson XLS Rope	6mm	Halyard & Downhaul
	25'	3/8” Samson XLS Rope	9mm	Mainsheet
	50'	3/16” Samson XLS Rope	5mm	Sail Lacing & Mainsheet Bridle

Plywood Layout for Plans Builders







Creating "Blanks" *(plans builders only)*

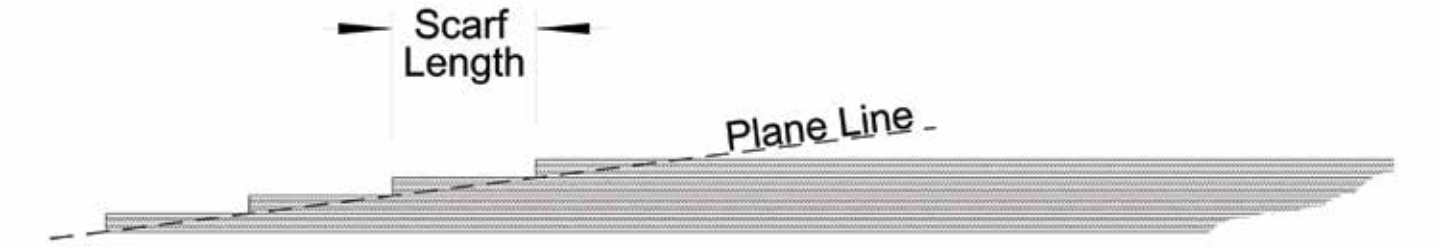
Start by creating rough "blanks," rectangles of plywood long enough for the hull planks. The diagrams on pages 21, 22, and 23 show a suggested layout scheme for your blanks.

"Scarf joints"–simple tapers cut in the plywood blanks–are the logical way to create blanks of sufficient length.

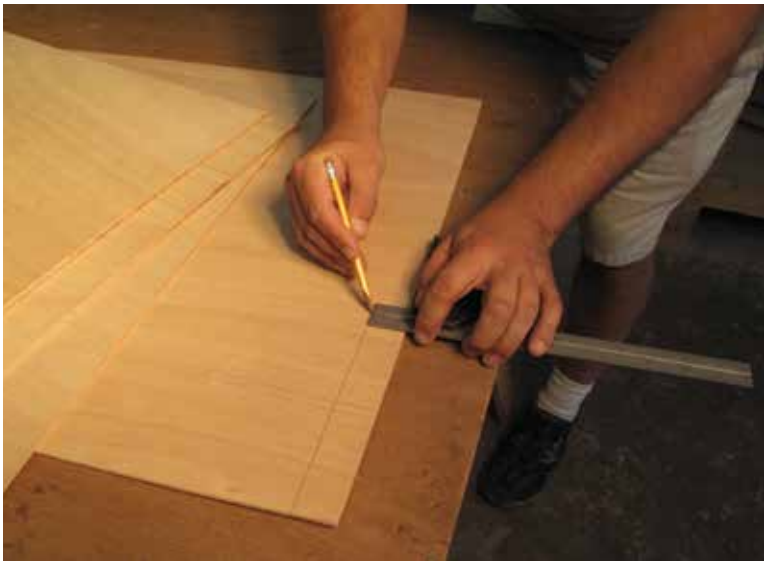
Scarf joints intimidate some builders, but they are not at all difficult once you set plane to wood and just do it. Scarfs should have an 8:1 ratio, or about 1-1/4" (32mm) long in 4mm plywood and 2" (51mm) long in 6mm plywood. We have the best results cutting scarfs with a very sharp block plane. We've also experimented with beltsanders and grinders for cutting scarfs; they never achieve the same precision as a good sharp plane, and aren't any faster. If your plane is dull you might as well chew the scarfs into the panels with your teeth. (Look for plane-sharpening tips on our website.)

A scarf joint, shown here in cross-section, provides a strong and reliable way to join sheets of plywood together.

Stack your matching sheets in a stair-step fashion as shown below, and plane as many scarfs at once as possible. You'll need to scarf the full width of four sheets of plywood for Tenderly, as shown on page 23.



Mark the scarf length on the end of each blank with a straight-edge or tri-square.



Here are four blanks stacked up and aligned, ready for scarf joints. The bottom-most blank is aligned with the end of the workbench for support.

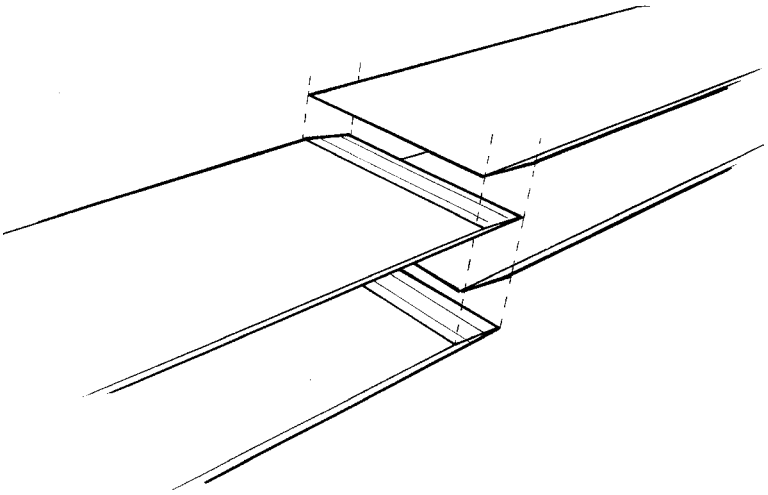
Set to it with your sharp block plane.

You can use the side of your block plane as a handy straight-edge to check the uniformity of the "ramp" you're planing.

Finished scarfs will have neat, parallel plywood glue lines. The glue lines are a big help in cutting uniform scarf joints.

Scarfs will be glued with epoxy. To save setup time, you can glue a couple of blanks at one time, one stacked above the next as shown here.

Just be sure to slip a sheet of thin polyethylene plastic, the kind used as a drop cloth, between each layer. This writer has forgotten this vital step more than once, gluing blanks together irretrievably.



Thicken epoxy with Cell-o-fill to a thin jam consistency and brush both sides of the mating scarf joints.

(CLC Teardrop Camper)

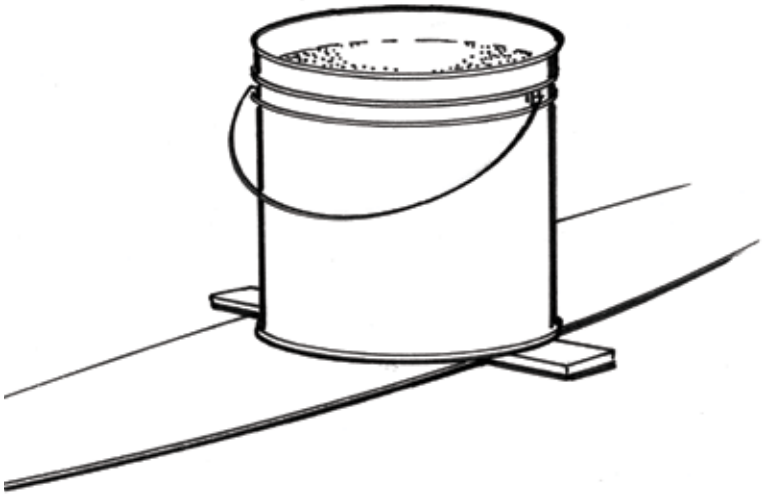
If you're lucky enough to have a big work-table or wooden floor, you can screw a wooden plate down to clamp the scarfs while they cure. Don't forget a strip of plastic to protect the clamping plate.

(CLC Teardrop Camper)

A block of 3/4" (18mm) timber for clamping scarf joints.

(CLC Teardrop Camper)

If you must work on a concrete floor, you can use a heavy weight like a bucket of sand to clamp the scarfs.

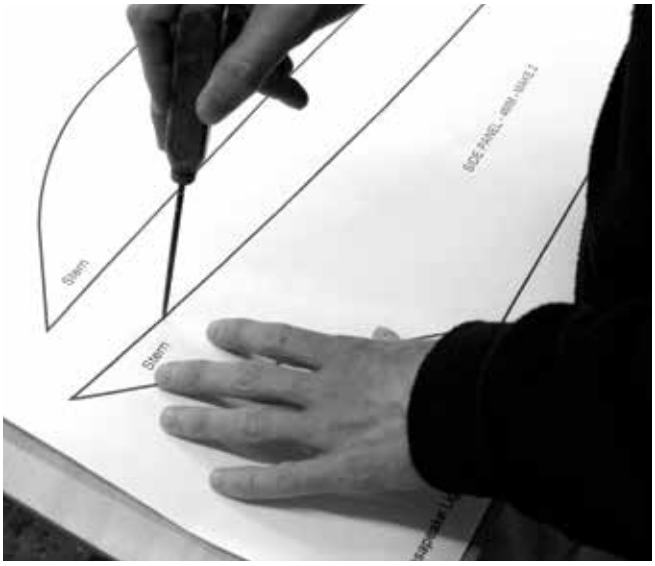


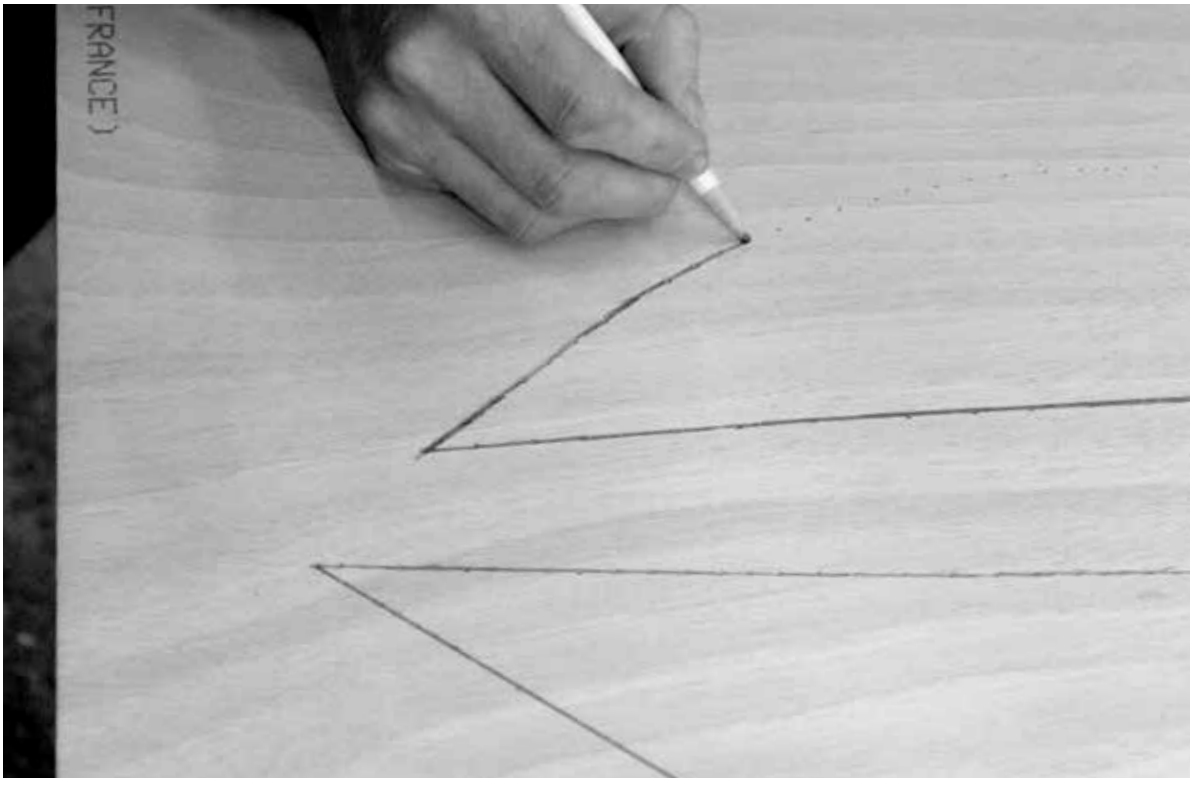
Cutting Out the Parts *(plans builders only)*

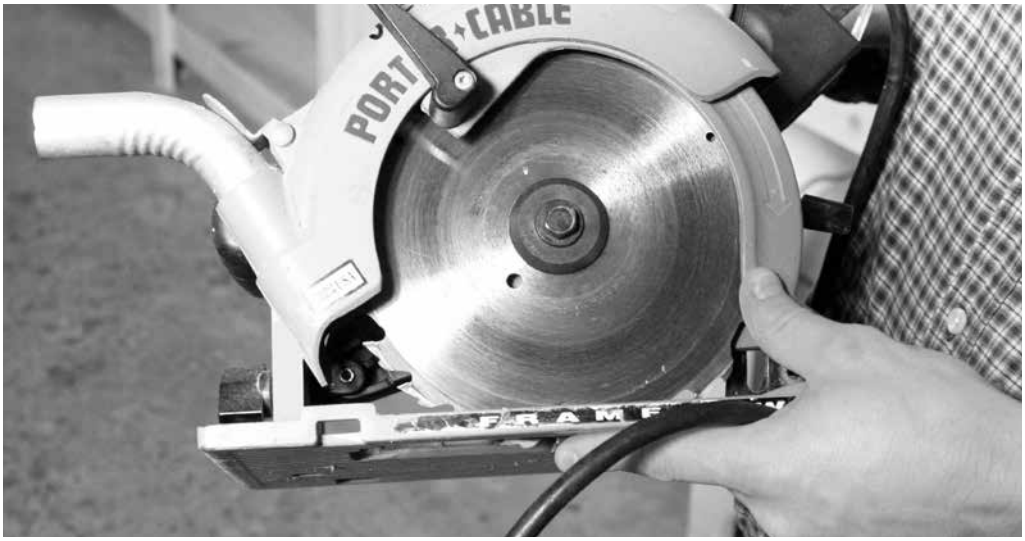
Tenderly's hull panels are shown at full size in the plans. Do NOT cut the plank shapes out of the big sheet of paper. The narrow strips of paper won't hold their shape well enough to be traced accurately. You have a couple of options for transferring the shapes to plywood. The first would be to glue the wide paper patterns to heavy cardboard or masonite, and then cut them out so that you can trace around them.

The second approach, and the one we prefer at CLC, is to place the patterns on the marine plywood and punch through the paper with an awl or icepick. This is fast and accurate (because you aren't gaining width on the shapes by tracing). Connect the punch-marks with a pencil, and you will achieve very accurate transfers.

You only need to trace out half of the side planks. You'll stack the blanks and cut port and starboard planks at the same time, to save time and ensure symmetry.







You're ready to cut out the hull panels. Your options are a saber saw or a small circular saw. Our preference at CLC is the circular saw, because it wanders less than the saber saw, and cuts "plumb."

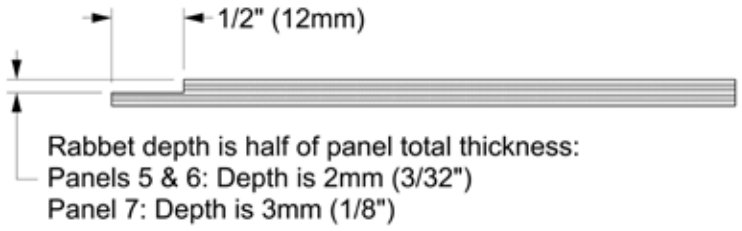
To cut curves in the plywood with a circular saw, set the blade depth just a little deeper than the thickness of the stacked plywood. The plywood sheets rest on sawhorses or scraps of wood.

Unless you have hands like a surgeon, you'll want to cut just outside the pencil lines with the saw, and trim to the pencil line with a sharp block plane. Clamp matching pairs of panels together while planing so that they are identical.

The full-sized patterns also indicate where wire holes should be drilled. Drilling those 1/16th-inch (2mm) holes now will greatly speed along assembly of the boat.

(Peace Canoe)

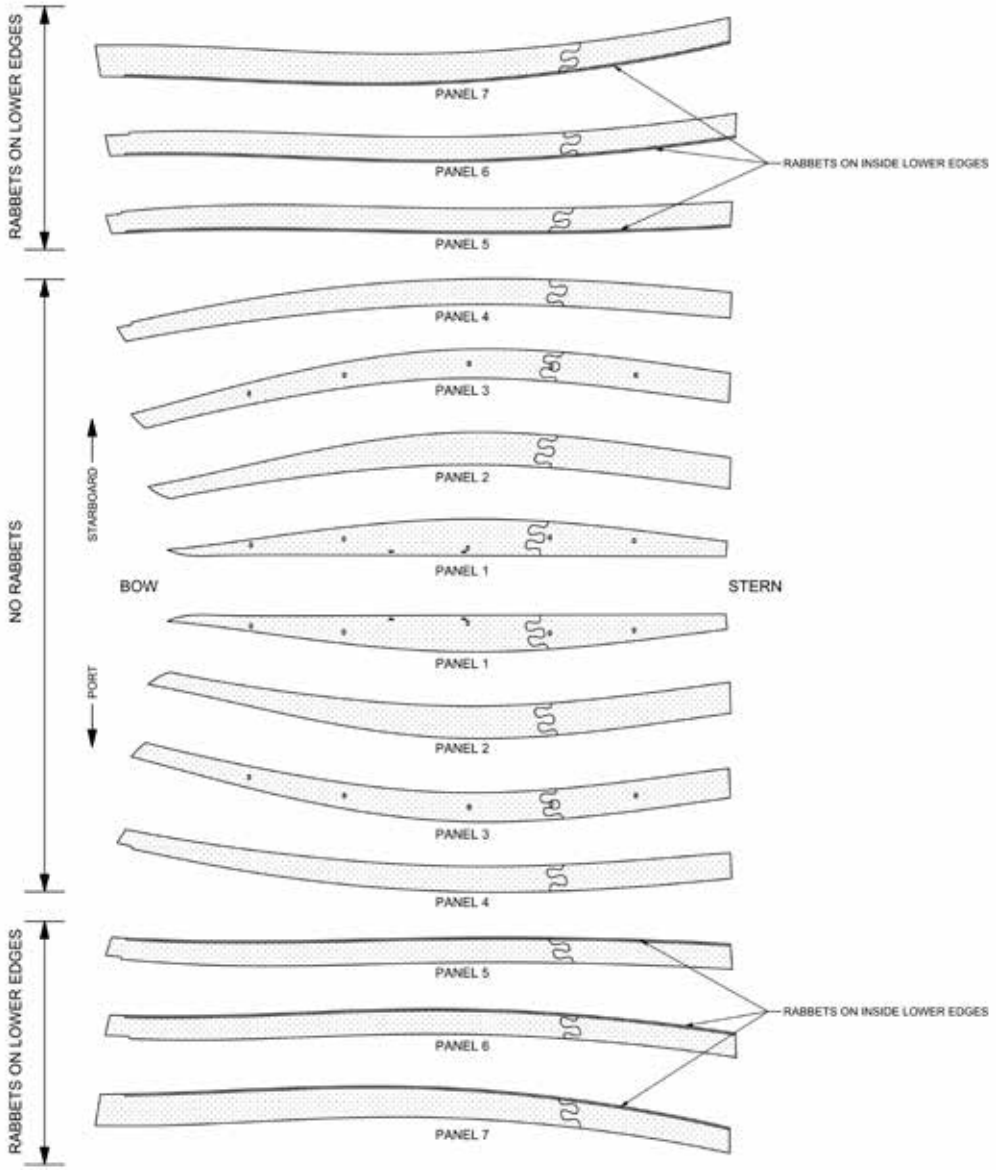
Cutting the Rabbets *(plans builders only)*



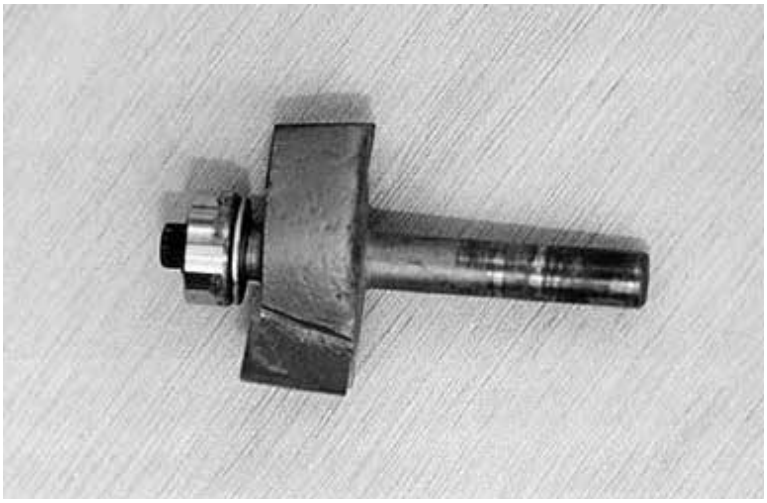
The LapStitch™ joint is central to Tenderly's ease of assembly. This involves machining a rabbet on the lower edges of adjoining hull panels, creating a tight and self-aligning joint. Plans builders will use a router to cut the rabbets, shown in cross-section, *left.* With a pencil, carefully mark the edges of the panels where the rabbet is to be cut. The plans are explicit on the location of the rabbets.

You must create port and starboard pairs of panels and it's quite easy to end up with two starboards and no ports, or the rabbet cut on the top instead of the bottom of the panel. An emphatic pencil mark that says, "RABBET HERE" will spare you that heartache.

Panels 5, 6, and 7 are rabbeted on their lower, inside faces. Again, make sure you create left and right pairs of these panels! Panels 1-4 are not rabbeted.



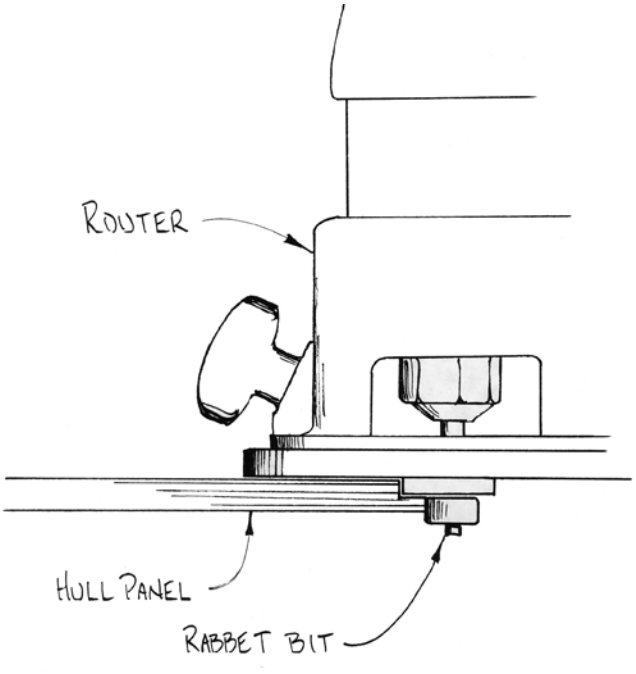
You have a couple of options for rabbet-cutting. The first is a rabbeting bit, like the one shown here. The cutting length needs to be 1/2" (12mm).

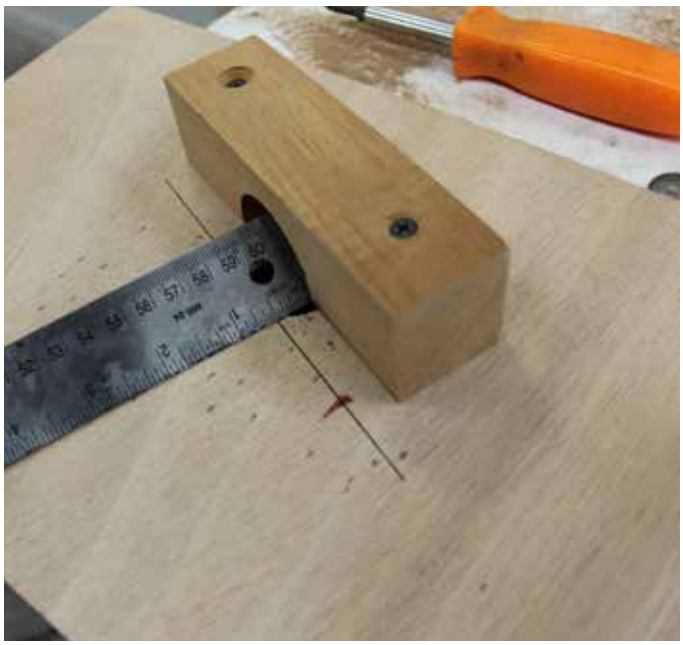


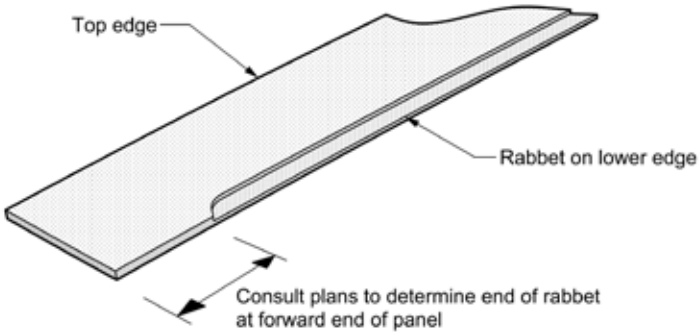
The nice feature of the rabbeting bit is that the roller bearing keeps you from over-cutting. Adjust the bit to cut half the thickness of the plywood and run the router along the lower edges of the panels.

The roller bearing will be riding against a pretty skinny target; you'll need to support the panels carefully along the edge of a work bench, adjusting the panel often so that it's supported and your cut-depth is consistent.

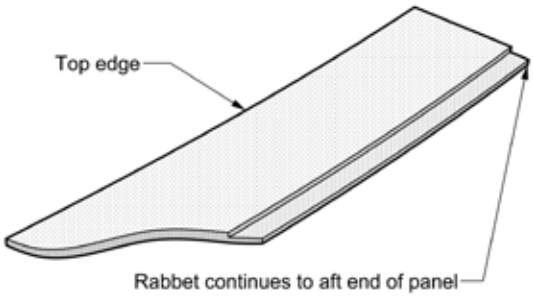
If you can't find a rabbeting bit, an alternative is to use a 1/2" (12mm) end-mill bit *(below)*. Either use a router table, or clamp a bit of scrap wood to your router base as a fence, *below right.* Run the fence along the edge of the panel with the end-mill bit set to the correct depth.





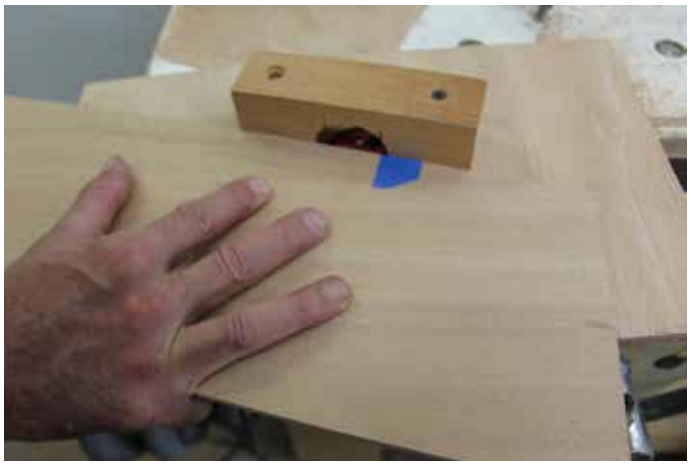


FORWARD END OF PANEL



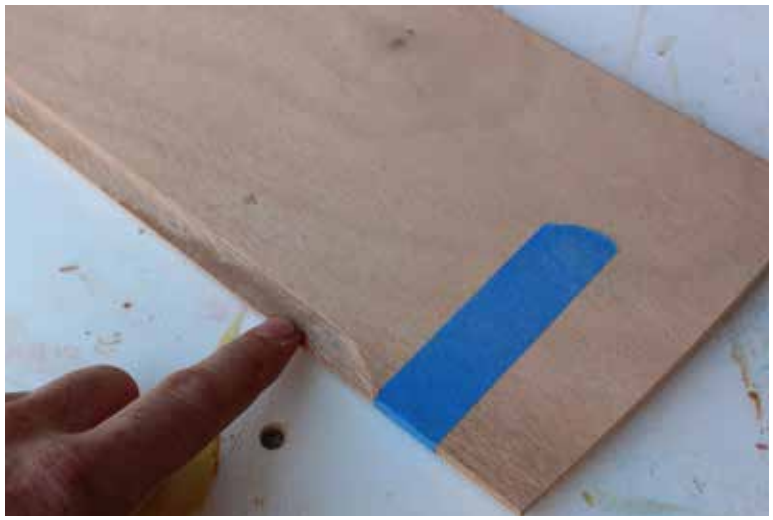
AFT END OF PANEL

The rabbets run from the aft ends of the panels to a few inches shy of the forward ends. This allows the panel overlaps to taper smoothly down to zero at the stem.



Following the dimensions given on the plans, mark off the end of the rabbets with a piece of masking tape. Check the depth and width of your rabbeting jig on a piece of scrap wood before you make the cuts. Remember that the #5 and #6 panels will have rabbet depths set to 2mm (3/32"), whereas the thicker #7 panels will be rabbeted to 3mm (1/8").

Here's the finished rabbet at the forward end of the port-side panel #7.

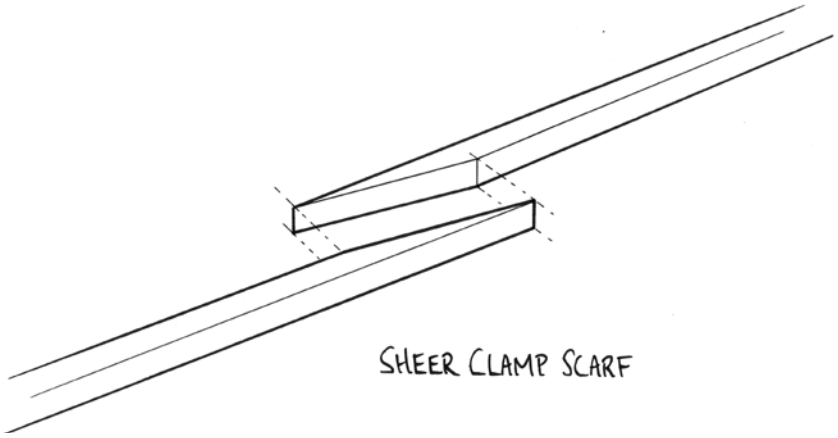


Solid Wood Parts *(plans builders only)*

The Tenderly employs solid timber in a variety of ways. Material used for the inwales and outwales should be a clear-grained and attractive wood; these components are both structural and decorative.

You will need to rip 7/8" x 1/2" (22.2 x 12mm) stock for the inwales and outwales. The inwale spacers are cut from 7/8" x 3/8" (22.2 x 9mm) material. Mahogany looks pretty, if you can find it. We use either Fijian mahogany or Spanish cedar in the kits.

Again, many shorter lengths with scarf joints making up rails is preferred to a single long length of crummy wood.



Timber for daggerboard trunk spacers, seat stiffeners, and sundry parts may be any species that's free of knots larger than a pencil eraser and that takes epoxy well. Spruce, pine, fir, cypress and so on are ideal. Avoid oily woods like oak or teak.

As we get deeper into the instruction manual, details for solid timber parts are discussed.

Having created a "kit" of parts, we'll now join up with kit builders.

Kit Builders: Join Us Here!

Part 1: Building the Hull

Assembling the Planking and Frames

Construction begins by unpacking the kit, taking inventory of the parts, and setting up shop. If you can, stage the hull panels on a folding table or bench supported by sawhorses. If no such surface exists, lay the panels out on the floor. A sheet of plastic drop cloth, as shown here, will protect your work area from epoxy drips.

Each full length hull panel has a forward and aft component. Match up the corresponding parts as you lay them out.

All the hull parts are joined to full length with puzzle joints. Like traditional scarf joints, these provide plenty of bonding surface area for strength with the added bonus of insuring proper alignment when the parts are glued together. The CNC machine may have left a little bit of fuzz behind when it cut the parts; knock these off with a bit of 120-grit sandpaper.

Another product of the CNC machine: small tabs to hold the parts in place during the cutting process. These are approximately 1/8" (3mm) long, and are often slightly slimmer than the part to which they're attached. Trim these off gently with a sharp chisel, plane, or rasp.

Note: Be careful not to confuse the small tabs on the floorboards with these machine tabs! Though similar in size, the floorboard tabs insure proper spacing between boards. These are larger with a more defined, semi-circular shape than the rough machine tabs shown here.

Your first chore: joining the two parts of each hull panel to become one.

Don your gloves and mix up about 4oz (120ml) of epoxy. Stir the resin and hardener thoroughly for a few minutes, and then add Cell-o-fill until you reach a gravy consistency. Use a disposable brush to apply the epoxy to the puzzle joint mating surfaces...

...and press the joints together.

Make sure the two parts are perfectly flush when you join them. A light tap with a wooden mallet can help stubborn joints slip into place.

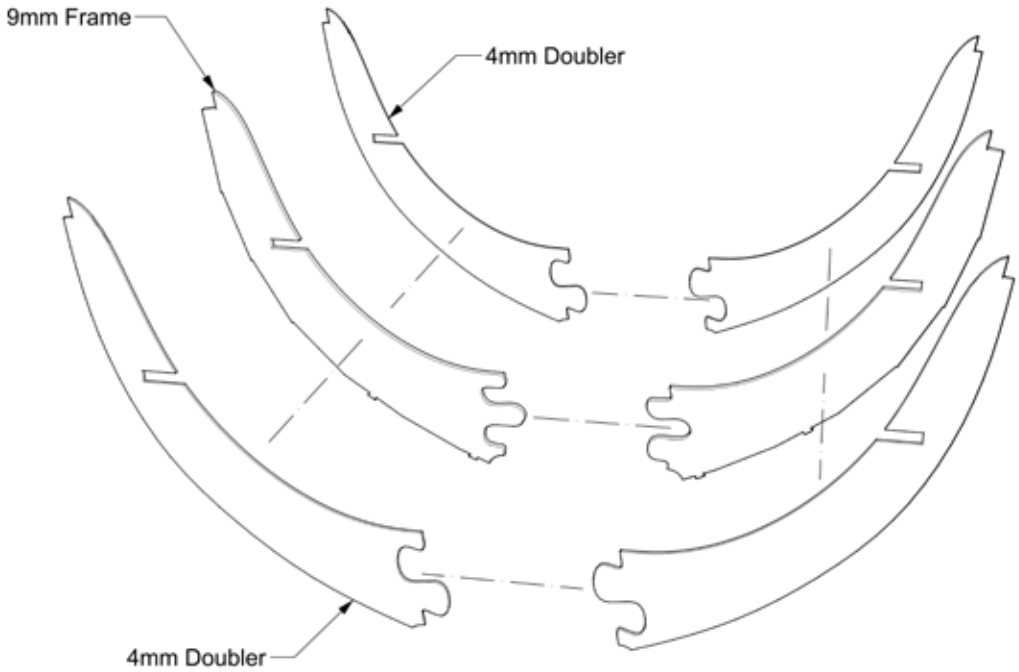
Use a plastic spreader or metal scraper to clean up any excess epoxy drips and blobs. You'll thank yourself later when it's time for sanding!

To conserve shop space, you can stack panels atop one another. Use scrap sheets of plastic to protect the joints and prevent the stacked panels from sticking together, and top off the stack with weights to keep the parts from shifting.

Allow the epoxy to cure for 24 hours at room temperature.

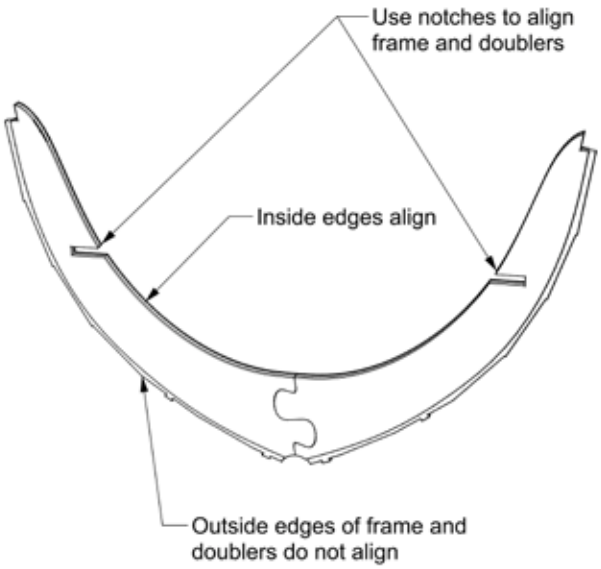
While you're waiting for the puzzle joints to cure you can get started on the frame assemblies.

Each frame is glued up in three layers: a 9mm (3/8") center section and two 4mm (3/16") doublers, as shown in the schematic below. *(Frame 1 shown.)*



You'll use the inside, or top edge, to align the frame parts when you assemble them. For frames 1, 3, and 5 you can use the seat stiffener notches (as shown in this drawing) to align the parts as well.

Note that the outside edges of the 4mm frame parts are inset from the 9mm part. This feature creates a small rabbet in the finished part to maximize surface area where the frames are bonded to the hull.



Organize the frame and doubler components on your work bench, and mix up a batch of epoxy thickened to gravy consistency with Cell-o-fill (just as you did for the puzzle joints).

Use a disposable chip brush to coat the mating face of one doubler...

... then place the 9mm (3/8") frame components.

Frames 1, 3, and 5 use puzzle joints on the center frame sections. Coat the mating surfaces with thickened epoxy...

...and pop the second center section into place.

Now apply a coat of epoxy to the center section and position the second doubler atop the stack.

Check the parts for proper alignment and place a few weights on the assembly to prevent the parts from shifting.

Repeat until you have all five frame assemblies glued. Let them cure for 24 hours at room temperature.

While you wait for the epoxy on the frames to cure, you can apply fiberglass to the inside faces of the daggerboard trunk. The inside of the trunk will be dark and wet its whole life and benefits from a durable 'glass sheathing.

The two rectangular parts on the right side of this image are the trunk sides, the other three parts belong to the rudder "cassette." If you're building the sailing option, you can fiberglass the inside faces of the cassette halves, too.

First, cut rectangles of fiberglass cloth slightly larger than the trunk sides.

Smooth the dry fiberglass fabric with your hands, eliminating wrinkles. Mix a few ounces of resin and hardener–no thickeners needed, here–and pour the epoxy onto the fiberglass in the center of the parts.

Use a clean, flexible plastic spreader to saturate the fiberglass with epoxy, and to pull any excess off the cloth. You've used the right amount of epoxy when the fiberglass becomes translucent but the texture of the weave remains.

Once the epoxy has gelled (dry to the touch), you can trim the excess fiberglass away with a sharp razor blade.

Back to the hull panels: Once the epoxy on the puzzle joints has fully cured, remove the plastic and sand any excess epoxy from the joints. Large drips can be removed with a heat gun and a scraper, and a quick pass with 120-grit sandpaper on the random orbital will smooth the joints nicely.

Don't oversand and cut into the plywood! This can weaken the joint.

Use the sander to remove excess epoxy from the frame assemblies...

...and excavate the difficult-to-reach areas with a rasp. Here, we're cleaning out the "limber holes." Limber holes are small cut-outs in the frames that allow bilge water to move between compartments.

You'll want to round over the inside edges of the frames, and it's infinitely easier to do so on the workbench, before they become integral parts of the boat. Round the inside edges with a 3/8" (9mm) round-over bit in your router, or sand the edges by hand.

You can round the limber holes as well, but don't round the outside edges of the frames that will be in contact with the hull.

Here are the frames, clean and sanded smooth.

We elected to pre-finish the frames before installing them. A bit more work at the beginning, but it saves the hassle of having to epoxy-coat and sand the frames smooth once they're a part of the boat. With a few spring clamps we staged the frames upright on our work bench...

...And coated them with unthickened epoxy. A 2" disposable chip brush is the right tool for the job.

If you have any leftover unthickened epoxy from the frame-coating exercise, you can apply it to those previously-fiberglassed daggerboard trunk faces. The goal here is to add just enough epoxy to eliminate the texture of the fiberglass weave.

Once the epoxy on the frames has cured, you can sand the flat surfaces smooth with 120-grit sandpaper and a random orbital sander.

Sand the frame edges by hand; the power sander will inevitably cut too much. Touch up any spots where you've exposed bare wood with unthickened epoxy.

As with the frames, dress the top edge of the transom and the handle cut-outs with the 3/8" (9mm) router bit. But before you do...

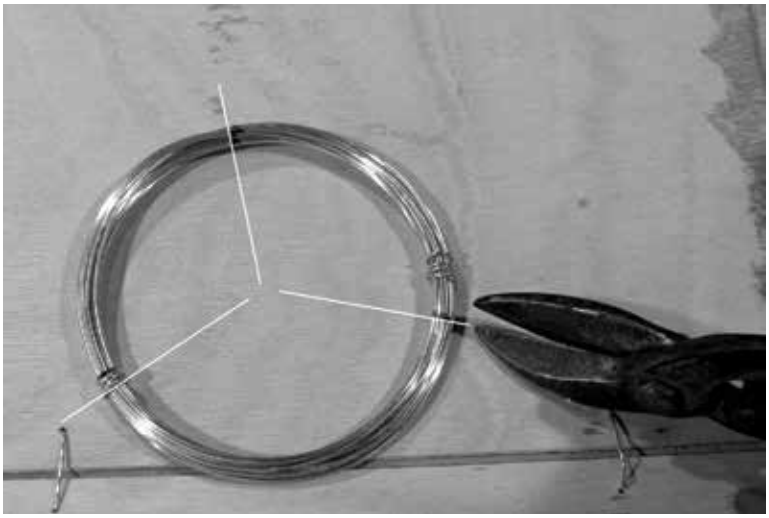
...mark a stopping point approximately 3" (75mm) in from the edges of the transom.

You'll leave this outer edge sharp for now, as the quarter knee (shown here) comes right up to the upper edge of the transom, and a round-over there would form an unsightly gap with the quarter knees installed.

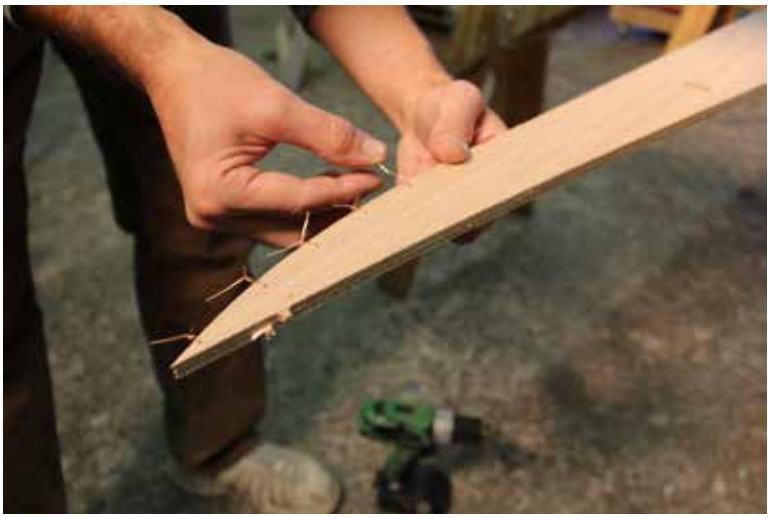
Stitching the Hull

Before you begin stitching, take a few minutes to re-drill any of the stitch holes that may have been filled with epoxy when you assembled the puzzle joints. Use a 1/16" (1.5mm) drill bit.

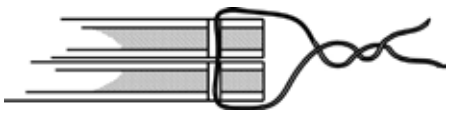
You'll be using 18-gauge (1mm) copper wire to stitch the hull panels together. The kit includes 25' (7.6m) spools of wire. Snip these coils into thirds to create a supply of 4" (100mm) stitches.



Begin the hull assembly by laying one #1 panel atop the other, and wire them together along the keel edge. Start at the bow and work your way back, tightening the wires by hand as you go. No need to break out the pliers yet–finger tight is all you need at this stage.



Here's a cross-sectional view of what you're doing in this step:

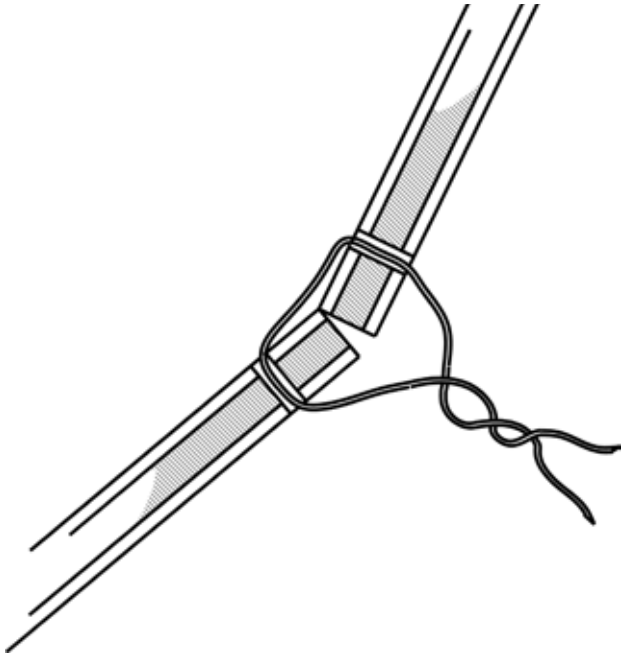


With the panels stitched together along centerline, unfold them onto your sawhorses, like opening a book...

... and start stitching the #2 panels to the #1's.

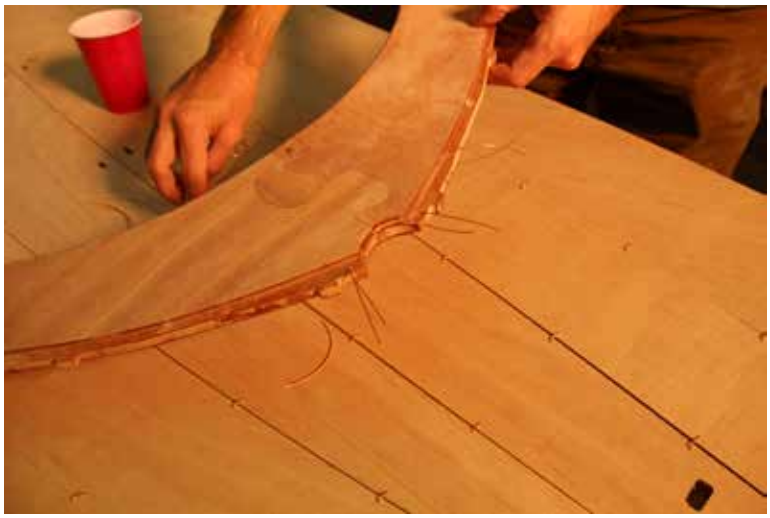
Here we are adding the starboard (right side) # 2 panel:

Until you reach the panels with the machined rabbets, alignment for the first four panels is "inside corner to inside corner", as shown here:



Here we're wiring the #3 panels into place. Note the large gaps between the panels: don't worry too much about an airtight fit at this point!

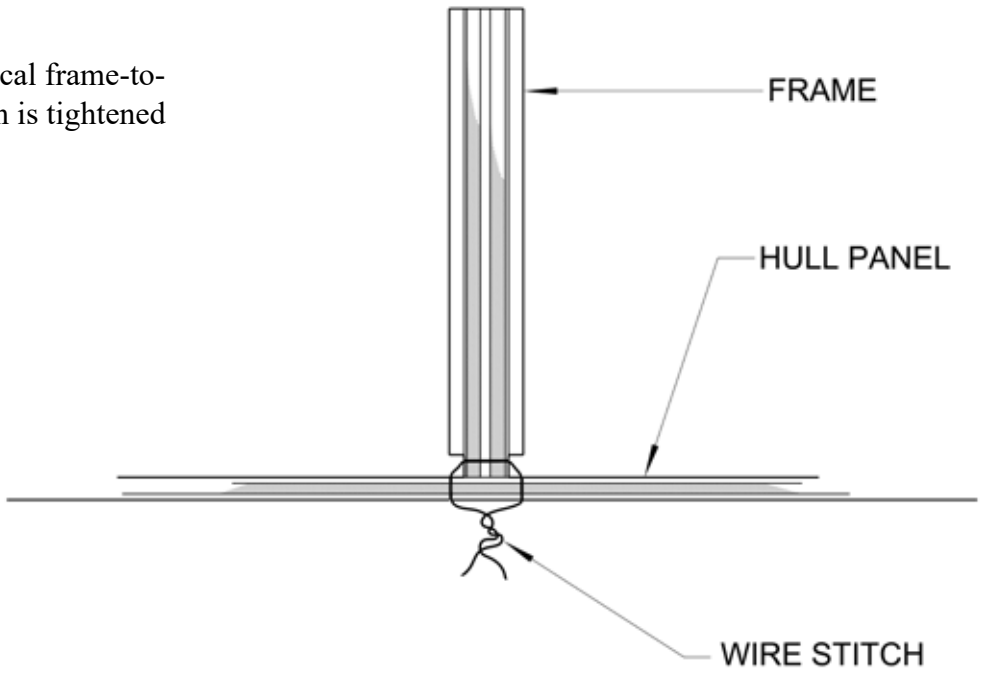
With three panels stitched loosely on each side, you're ready to install the frames. Drill out any epoxy-filled stitch holes with the 1/16" (1.5mm) bit. Feed a few wires into the frame and bend them down into an inverted "U".



Holding the frame just above the panels, slip the wires from the frame into their corresponding holes on the hull panels...

...and lower the frame into place. The tenons on the frame will fit, with a bit of persuading, into the mortises machined into the hull panels.

Here is a cross-section of a typical frame-to-panel stitch. Note that the stitch is tightened on the OUTSIDE of the hull.

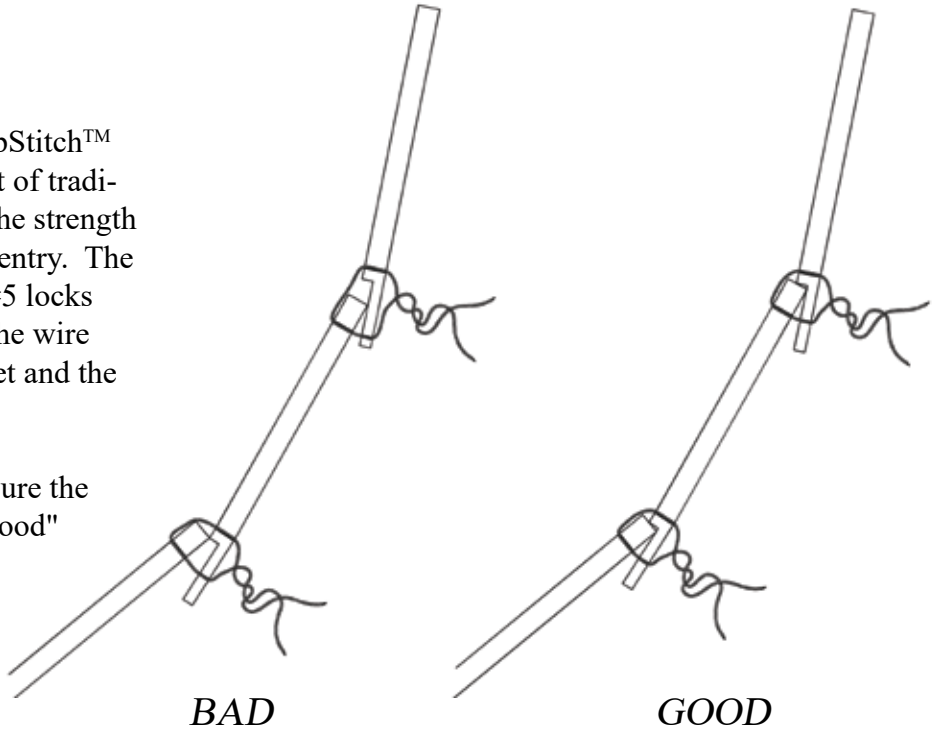


After frame 1 is installed, work your way aft until all five frames are stitched to the hull panels.

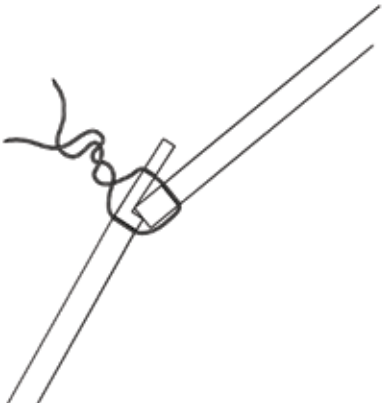
Travis adds panel #4 to the hull assembly. With his assistant manning the camera, he's found it easier to begin in the middle and work his way towards the ends.

With panel #5 we introduce the LapStitch™ joint; the stitch-and-glue equivalent of traditional lapstrake planking, with all the strength benefits and none of the fancy carpentry. The rabbet on the lower edge of panel #5 locks into the top edge of panel #4, and the wire stitch passes through both the rabbet and the stitch hole just above it.

As you wire in your panels, make sure the joints match those shown in the "Good" image to the right.



Here's a cross-section showing a typical stitch through a LapStitch™ joint.



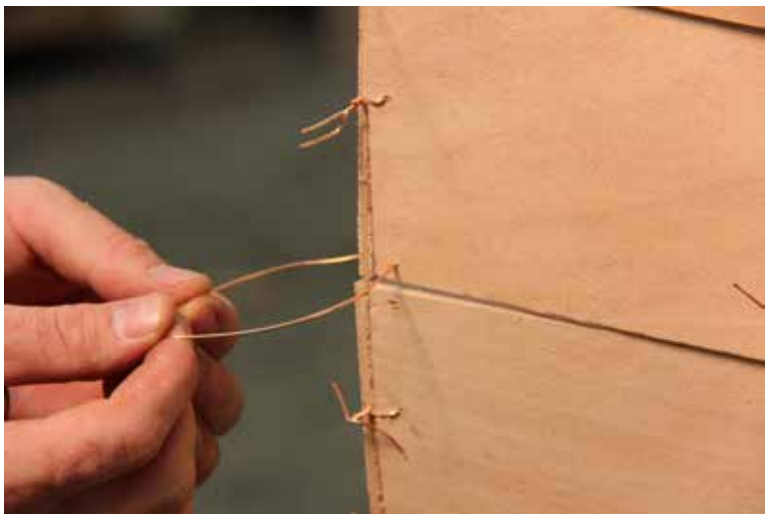
A helper makes hull stitching much faster!

With five panels per side stitched in place it's time to bring together the bow. Insert the wires through the stitch holes...

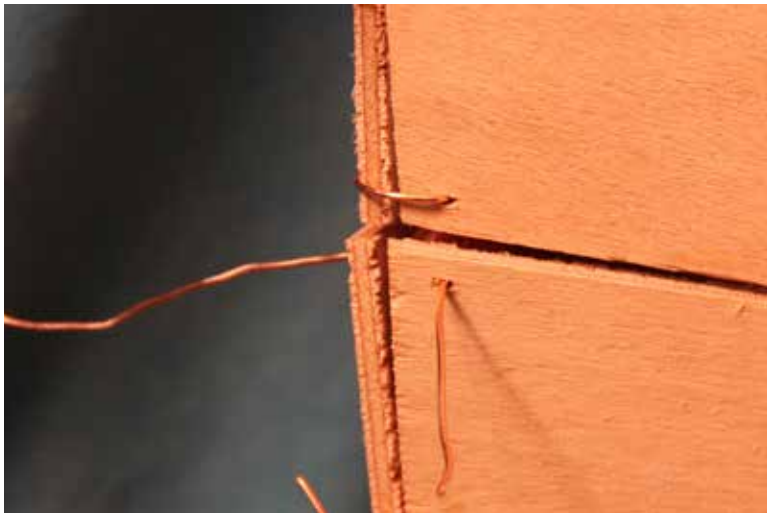
...And tighten them from the outside.

Here's a good view of the bow treatment: the rabbets terminate a few inches from the stem and the panel overlaps taper to zero at the very tip of the bow.

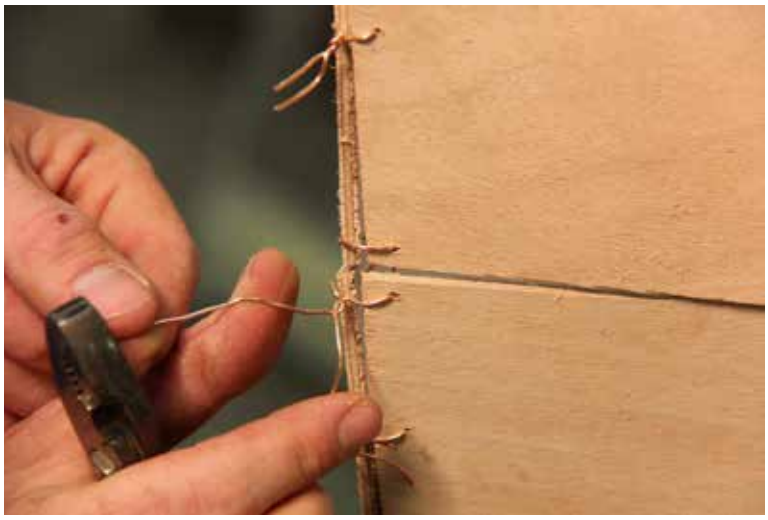
At the "four corners" intersection of the panels, feed an extra-long wire stitch through the bottom two holes from the outside...



... Then feed the wires back out through the top holes in the panels below.



Twist the wires together and tighten, drawing all four panels together with a single stitch.



Panel #7, also known as the "sheer strake," is 6mm instead of 4mm plywood, for extra strength when your boat is getting bashed around at the dinghy dock.

It's stitched on just as with the other planks.

The transom sits INSIDE the hull planking.

The hull panels will overhang the transom slightly. This overhang will be sanded flush later.

Feed the wires through the transom and the corresponding holes in the panels...

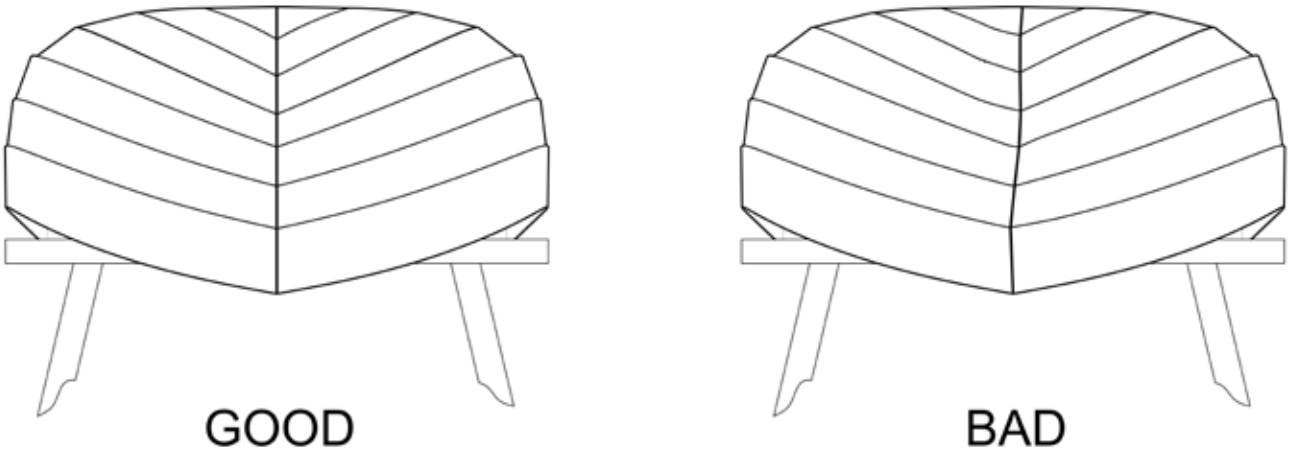
...and tighten them from the outside.

You're going to break some wires when you stitch the bow together and install the transom. This happens. It helps a lot to have a helper who can hold parts in position while you tighten the wires.

With all wire stitches in place, flip the hull over on the sawhorses to begin the process of tightening the stitches.

Don't rely just on twisting the wires to draw the panels together–close the gaps by hand and take up the slack by twisting the wires with your electrician's pliers. Pause every so often to check the overall shape of the hull.

The stem, viewed from the bow, should be perfectly straight and perpendicular to the sawhorses. If it looks good to your eye, it probably is!



Your stitches should be tight enough that no light can pass through the gaps, but not so tight that they warp the panels. Note in the images below that in the photo to the right we've overtightened a stitch and introduced a hollow to the otherwise fair curve of the panel edge.

Here, the panel edge strikes a clean, fair curve from stem to stern.

And here the stitch is drawn too tight at the rabbet and the fair curve interrupted by an unsightly hollow.

Installing the Breasthook

The breasthook strengthens and helps shape the bow of Tenderly. Kit builders receive the part in two halves, which must be glued together prior to installation.

Use a few pieces of masking tape on the top of the breasthook assembly to hold the parts together.

Thicken epoxy with wood flour and brush a thick coat onto the mating surfaces. Squeeze the two halves together and clean up the excess glue.

Flip the breasthook right-side up and set it atop a mixing cup to cure. The weight of the two parts, hinged together with tape on the centerline, will create sufficient clamping pressure.

When the epoxy has cured, try the fit inside the bow.

The outside edge will need to be beveled so that the breasthook fits flush against panel #7 on both sides.

Clamp the breasthook in place and use a bevel gauge to take the angle...

...and transfer the angle to a bench sander.

(You may also use a sharp block plane or palm sander to shape the breasthook).

Work the breasthook on the sander until you're satisfied with the fit.

Mix up a batch of epoxy thickened with Cell-o-fill and brush a thick coating onto the mating surfaces of the breasthook.

Use a long bar clamp to pull the breasthook into the stem...

And clamp the sides in place. Note the scraps of wood protecting the parts from being dented by the clamps.

Use a plastic spreader to clean up the squeezed-out epoxy from beneath the breast-hook. You won't be able to sand it later!

While the breasthook is critical to shaping the bow, the quarter knees can wait on installation.

You'll be applying a large structural fillet to bond the transom to the hull, and having quarter knees installed will complicate that job.

But you'll need to mask off where they go, or you'll be chiseling out hardened epoxy later when it comes time to bond them in place!

Perform a trial fit of the quarter knees...

...and mark their locations on the transom and the #7 panels.

Use masking tape to protect the quarter-knee contact surfaces.

Applying Structural Fillets

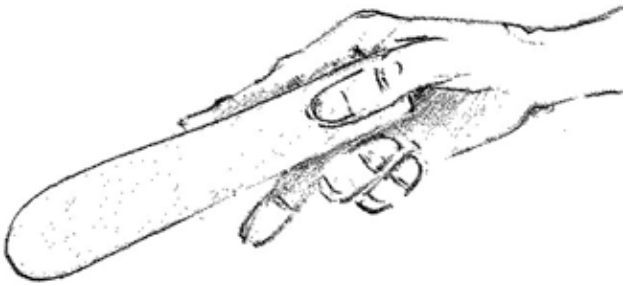
Structural bonding of the hull assembly begins by creating epoxy fillets where the frames and the hull panels meet.

For this step the epoxy should be thickened with wood flour, and the consistency should be similar to that of smooth peanut butter.

Mix up about 6oz (175ml) of resin and hardener, then slowly add wood flour until you reach the desired consistency. As a simple test, if you hold your mixing stick in midair outside the cup, the epoxy should stay put without oozing off the stick.

Line a second mixing cup with a gallon (4 liter) pastry or freezer bag and scoop the epoxy into it. You'll be using the bag to dispense the epoxy mix, just like icing a cake.

Squeeze the epoxy into one corner of the bag and snip off the end with shop scissors. (Don't use the nice ones from the kitchen drawer!)



You'll need a few filleting tools like this one *(left)* to smooth the epoxy in the seams. These are basically giant tongue depressors, made of thin plywood and shaped at one end with radii ranging from 3/8" (9mm) to 1" (25mm).

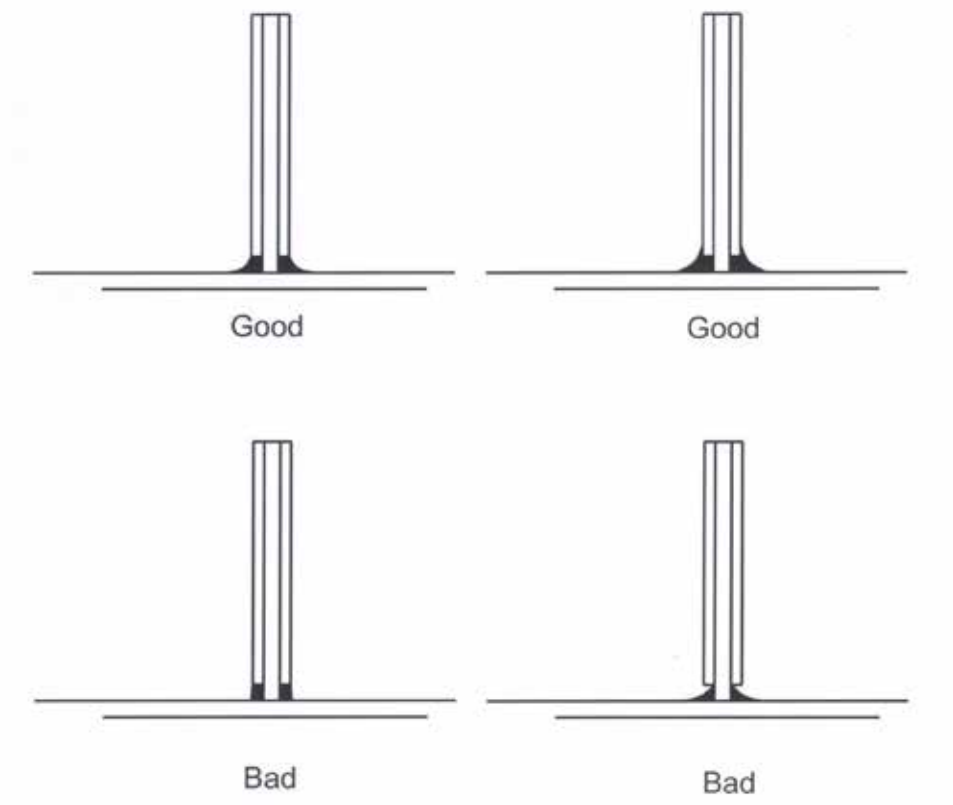
Dispense the epoxy in a 3/8" (9mm) bead along the intersection of the frames and hull panels.

Use a 1/2" (12mm) radius fillet tool to smooth the epoxy along the frame. Start on one side and, with a smooth firm stroke, draw the tool to the end of the fillet, maintaining a constant angle along the whole length. Use lots of pressure on the fillet tool, and avoid dabbing at the epoxy with short strokes.

Smooth fillets make strong and beautiful boats. Half the job is cleaning up the excess epoxy! Use a plastic spreader or metal scraper to police up all the leftover epoxy on the hull panels...

...and on the frames themselves. Neglect this step, and you'll double your build time with extra sanding.

Remember that a good-looking fillet is a strong fillet. Excess material is added weight, and voids are weak points. Here are some sample cross-sections of frame fillets.

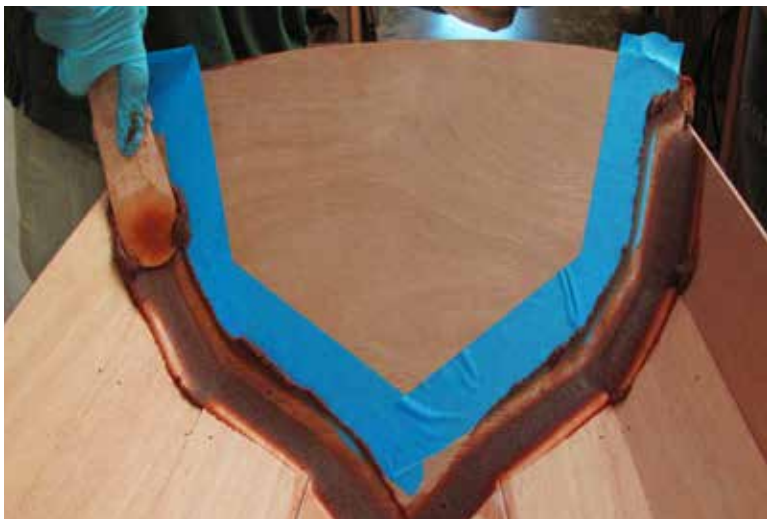


Here's a close-up of a well-executed fillet. Note the smoothness and consistency in the shape of the fillet, and the absence of any epoxy globs on either side of it!

Use a 1/2" (12mm) radius filleting tool for the stem. Your stem fillet will extend from the underside of the breasthook all of the way to frame #1.

Use a larger, 1" (25mm) radius filleting tool to smooth the thickened epoxy at the transom. Here, masking tape facilitates the clean-up process. Once the fillet is smooth, remove the excess material simply by peeling off the masking tape.

(Annapolis Wherry Tandem)



The large fillet at the bow must be reinforced with a strip of fiberglass tape. You'll want to place the 'glass tape BEFORE the epoxy fillet gels to insure a good bond between the fillet and the tape.

Cut the fiberglass tape a few inches longer than necessary...

...and gently press it into the bow fillet.

The tape is cut so that it just reaches frame #1.

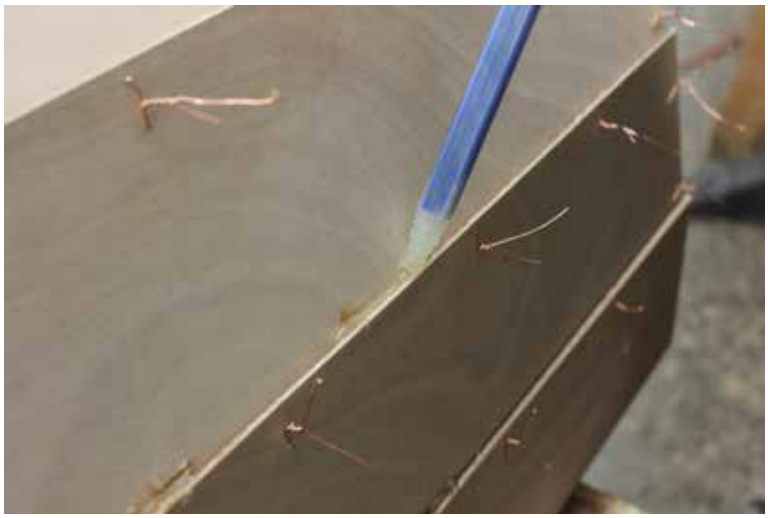
Smooth the tape, and with sharp scissors cut small "darts" (triangular cut-outs) where it wrinkles.

Mix up a small batch of epoxy resin and hardener (no fillers) and brush it into the fiberglass tape.

Apply epoxy until the tape becomes translucent, and clean up any excess epoxy with a dry brush or plastic spreader.

Tack-Welding the Hull

Allow the epoxy from your filleting work to cure for 24 hours, then flip the hull upside-down on your sawhorses. In this step you'll be "tack-welding" the hull seams with small beads of epoxy so that the stitches may be removed.



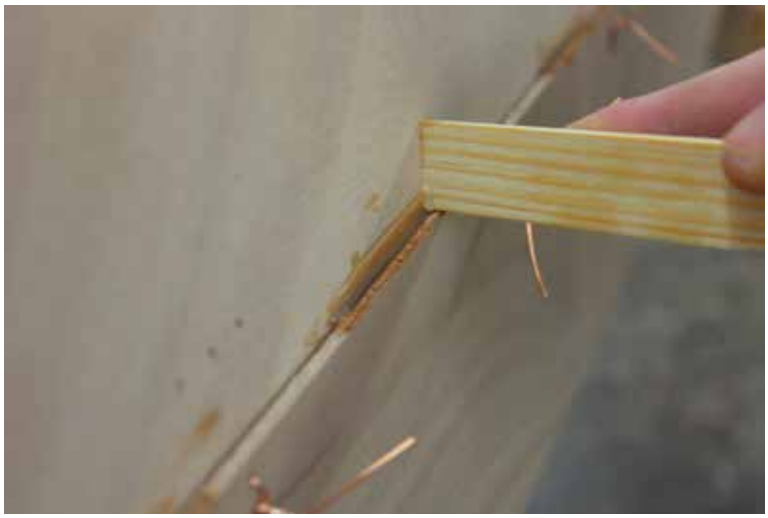
Here, you have a few options. On the easy (but more expensive) end of the spectrum is the pre-mixed epoxy cartridge, such as Gluezilla by MAS or Six10 by WEST SYSTEMS. These allow you to pop the tube in your caulk gun, pull the trigger, and release a bead of perfectly mixed epoxy paste into the panel laps.

The more usual method is to mix Cell-o-fill with the epoxy to a gravy consistency. The epoxy mix is drawn into disposable plastic syringes and injected into the seams as shown here.

Whatever your application method, dispense short beads of epoxy into the laps. The epoxy should penetrate deeply into the seams.

Leave plenty of room around the stitches.The wires will be easier to remove if they aren't embedded in epoxy, but don't worry too much if you get epoxy on the stitches.

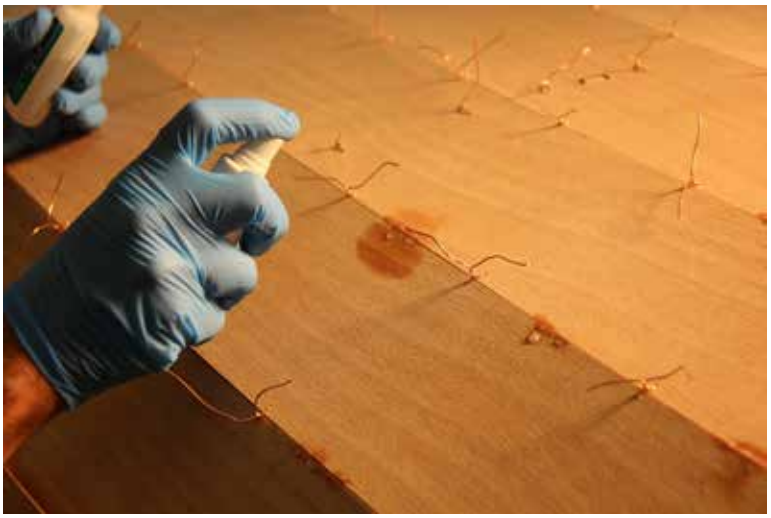
Use a plastic spreader or a bit of scrap wood to scrape the excess epoxy from the tack welds. Don't try to create finished epoxy fillets during this step; you just want enough epoxy in the seams to hold the panels together, with no excess to have to sand off.



The hull seams on the bottom six planks of the hull have tighter "corner-to-corner" joints, without the LapStitch™ feature. To tack-weld these seams, dispense a slightly thinner batch of epoxy from your syringes to penetrate these seams.

We took a shortcut and used CA (cyano-acrylate) glue for our tack-welds. A bottle is included in kits. Dab a few drops of CA between the wire stitches...

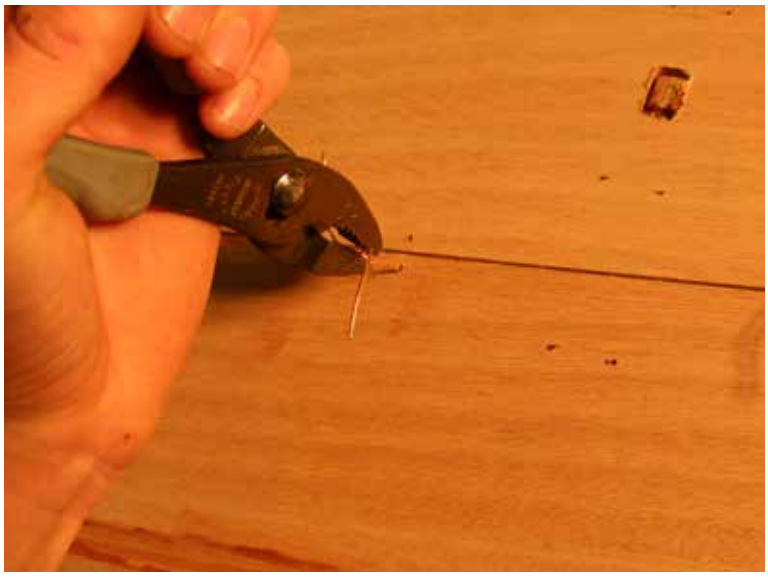
...and spray the glue with accelerant. It cures in minutes.



Allow the epoxy tack welds to cure for 24 hours, and then remove all the stitches, including the ones holding frames, stem, and transom.

Snip the stitches on the inside and extract them gently with pliers from the outside.

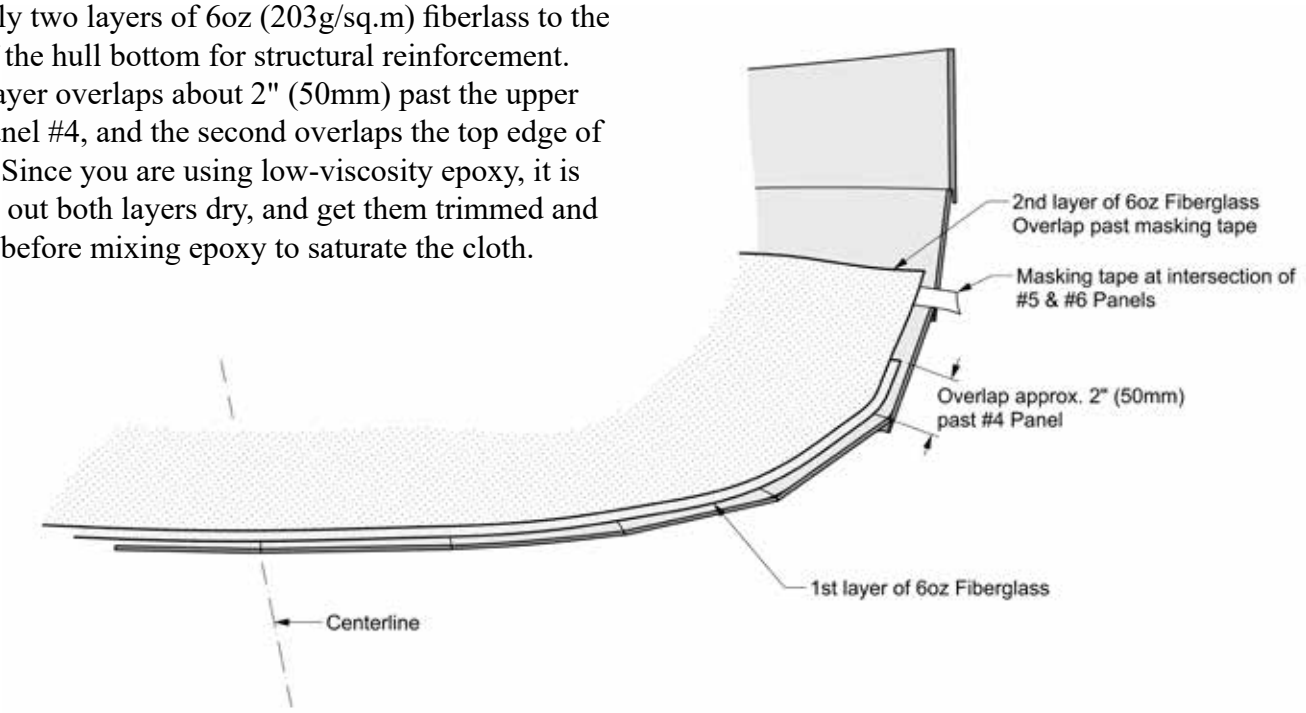
Are some of the stitches on frames, stem, and transom too entombed in epoxy to pull out? No problem! Stubborn stitches can be trimmed flush with the panels on the hull exterior. One of the reasons we use copper is that it sands easily.



A more aggressive approach is to heat the offending stitch with a heat gun. This softens the epoxy and allows for easy removal.

Fiberglassing the Interior

You'll apply two layers of 6oz (203g/sq.m) fiberlass to the interior of the hull bottom for structural reinforcement. The first layer overlaps about 2" (50mm) past the upper edge of panel #4, and the second overlaps the top edge of panel #5. Since you are using low-viscosity epoxy, it is best to lay out both layers dry, and get them trimmed and smoothed before mixing epoxy to saturate the cloth.



With the hull free of stitches, the interior hull bottom is smoothed in preparation for the fiberglass cloth.

Use a random orbital sander with 120-grit paper to knock down any blobs of epoxy or rough spots.

If your epoxy tack-welds have leaked through the panel seams, use a heat gun and a metal scraper to clean up the excess. This tends to be faster and neater than sanding.

Dust will prevent adhesion, and crumbs of epoxy will create weak and unsightly bubbles in the fiberglass sheathing. Thoroughly vacuum the interior...

...then wipe the hull down with a clean, lint-free rag and denatured alcohol.

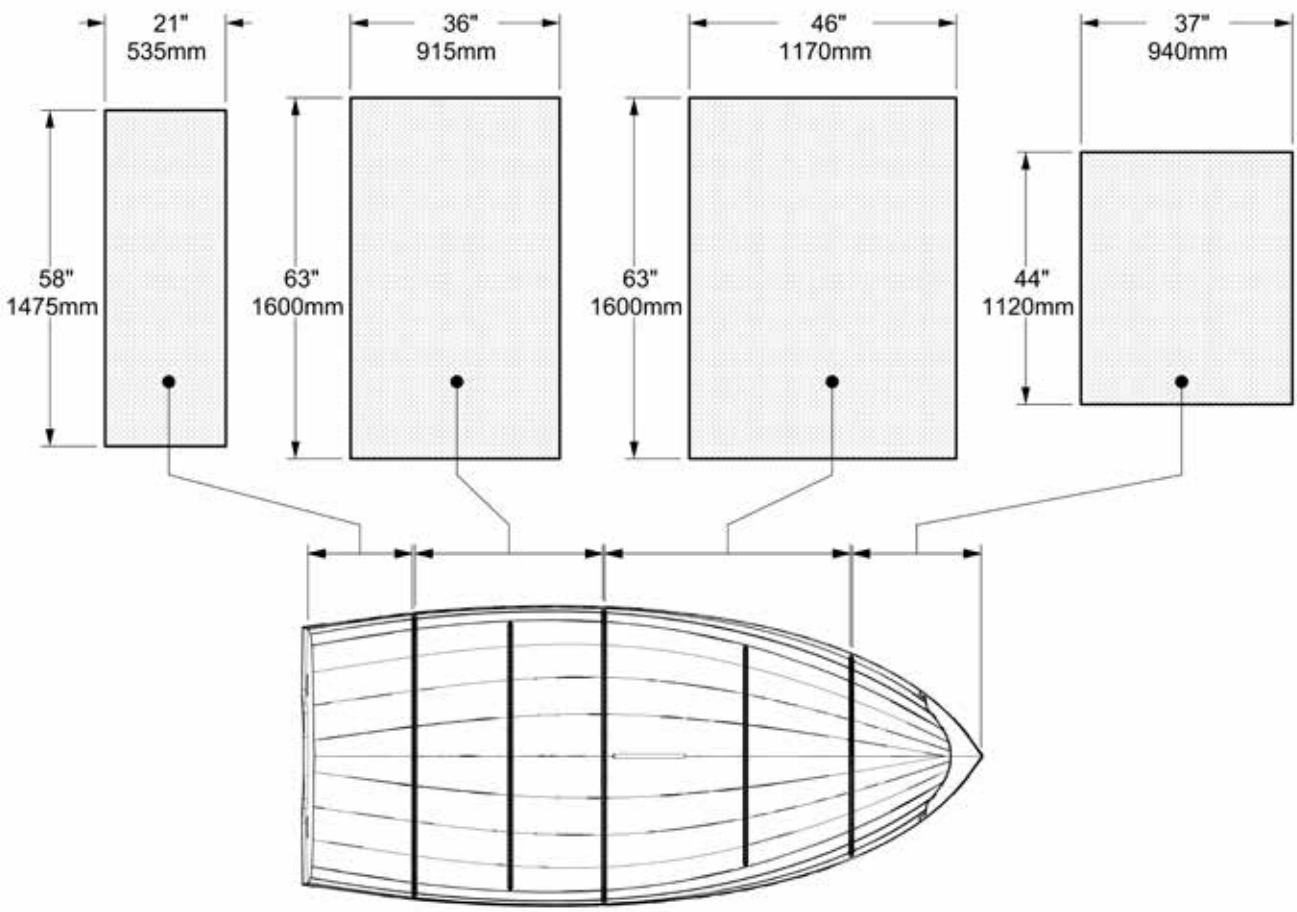
Fiberglass cloth covers hull panels 1, 2, 3, 4, and 5.

Apply masking tape along the lower edge of panel 6 so that no epoxy sticks to panel 6.

Clear your workbench, clean off the dust, and unroll a few yards from your roll of fiberglass cloth. Using the diagram below as a guide, cut "blanks" of cloth to fit between the frames. Note that these dimensions are slightly over-sized: dry fit the blanks in the hull and trim them *in situ* to fit.

Interior Fiberglass "Blanks"

Cut TWO EACH, as there are two layers of fabric on the hull interior



You'll need a clean work surface for measuring and cutting the fiberglass cloth. If the fiberglass picks up random bits of sawdust or glue, it will give you hassles during the application.

Dry-fit the fiberglass and trim the blanks with sharp scissors to fit neatly in each frame "bay."

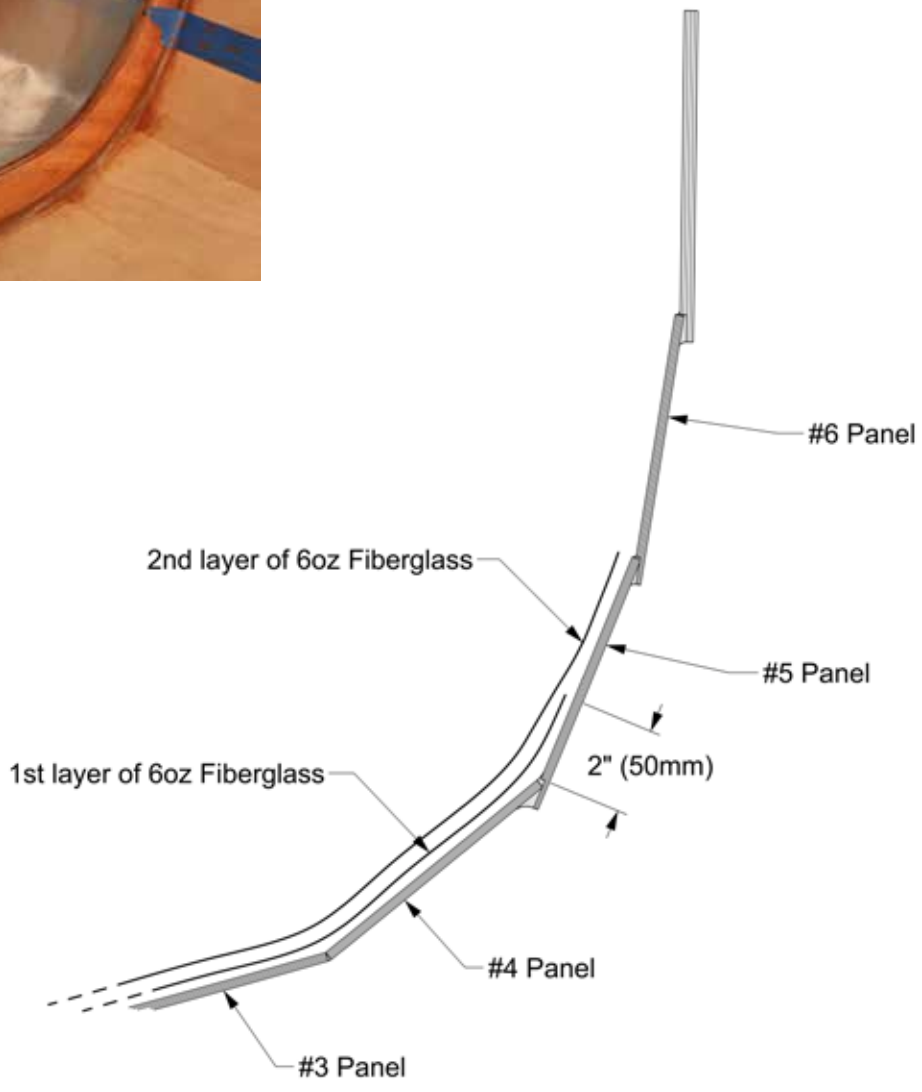
The ideal fit of the fiberglass has the fabric just lapping up onto the epoxy fillets at the frames, and no more.

To avoid creating a stress riser at the seam between panels 5 and 6, the two layers of fiberglass are staggered as shown in this cross section.

The first layer of fabric laps up onto panel 5.

The second layer reaches the top of panel 5.

Take your time trimming the fabric – you have all of the time in the world until you mix epoxy – and be sure this detail is executed neatly for optimal strength and a clean appearance.



In the bow compartment, the fiberglass requires careful trimming to conform to the three-dimensional shape.

(We're using electric scissors in the photo. These make quick work of cutting the dry fiberglass.)

Once you've trimmed the forward section of fiberglass to fit, remove it and use its shape as a template to cut the second layer.

We cut the fiberglass in the bow section into right and left halves, with a bit of an overlap down the center, to make them easier to manage.

Remove your trimmed fiberglass blanks and store them on a clean surface nearby, carefully ordered and labeled so that they can be replaced quickly and in the right order.

Fiberglass won't bend around sharp corners - whether they are inside or outside corners. You'll need to fill the panel seams with thickened epoxy before laying down the fiberglass cloth for good.

Mix up a batch of epoxy thickened with wood flour to the same peanut butter consistency you used for the structural fillets a few pages back.

Dispense small beads of epoxy along the panel seams, starting at one end of the boat...

...and working your way to the other.

Create small, neat fillets with a filleting tool...

...and use a plastic spreader to clean up every bit of excess.

The fiberglass will be laid atop this epoxy filler immediately. Why? Because you'll get a much stronger bond between hull and fiberglass if it's in place before the filler has cured.

Doing every step from Page 73 to Page 77 requires an uninterrupted block of at least several hours. If you don't have time to do it all at once, fill and 'glass just a few frame bays at a time.

Place both pre-cut layers of fiberglass in the hull, aligning them carefully.

Mix up about eight ounces (235ml) of epoxy, this time with no thickeners in it. That's enough to start; you'll mix more as needed.

Dump the epoxy on the 'glass and use a clean, flexible plastic spreader to work the epoxy into the fabric. Always start in the center of the boat and work your way out. This will help smooth any wayward wrinkles as you saturate the cloth.

The low-viscosity epoxy provided in kits will saturate both layers of fabric readily. Continue to work the fabric gently with the spreader, removing all wrinkles.

Add more epoxy only if the cloth shows white or cloudy spots. Just as with the daggerboard trunk sides, you're looking for the fiberglass to turn completely clear while the texture of the cloth remains prominent. Any pooling of epoxy is unnecessary weight and more to sand later.

We've moved forward to the next section. Note how smooth the fiberglass is as we start to pour the epoxy. The smoother the 'glass when you start, the less time you'll spend fighting wrinkles.

Work from the center out to one side first, then hop around to the other side to complete the section.

Note that the epoxy reaches the masking tape, but not beyond it. You'll be trimming away the excess fiberglass later along the lower edge of the masking tape.

The forward compartment is the trickiest, and thus was left to the end.

If you have difficulty keeping the fiberglass in place while you dispense the epoxy, use a small piece of masking tape or a push-pin to hold the fabric steady.

Switch from your plastic spreader to a disposable chip brush for the hard-to-reach areas.

From your supply of fiberglass, cut small patches approximately 4" (100mm) long and just wide enough to fit the limber holes in the frame bottoms. You'll need 6 in total. Without these little patches, the small depressions under the limber holes between the fiberglass layers would hold standing water, and standing water is a recipe for rot!

Brush a little unthickened epoxy under the limber holes...

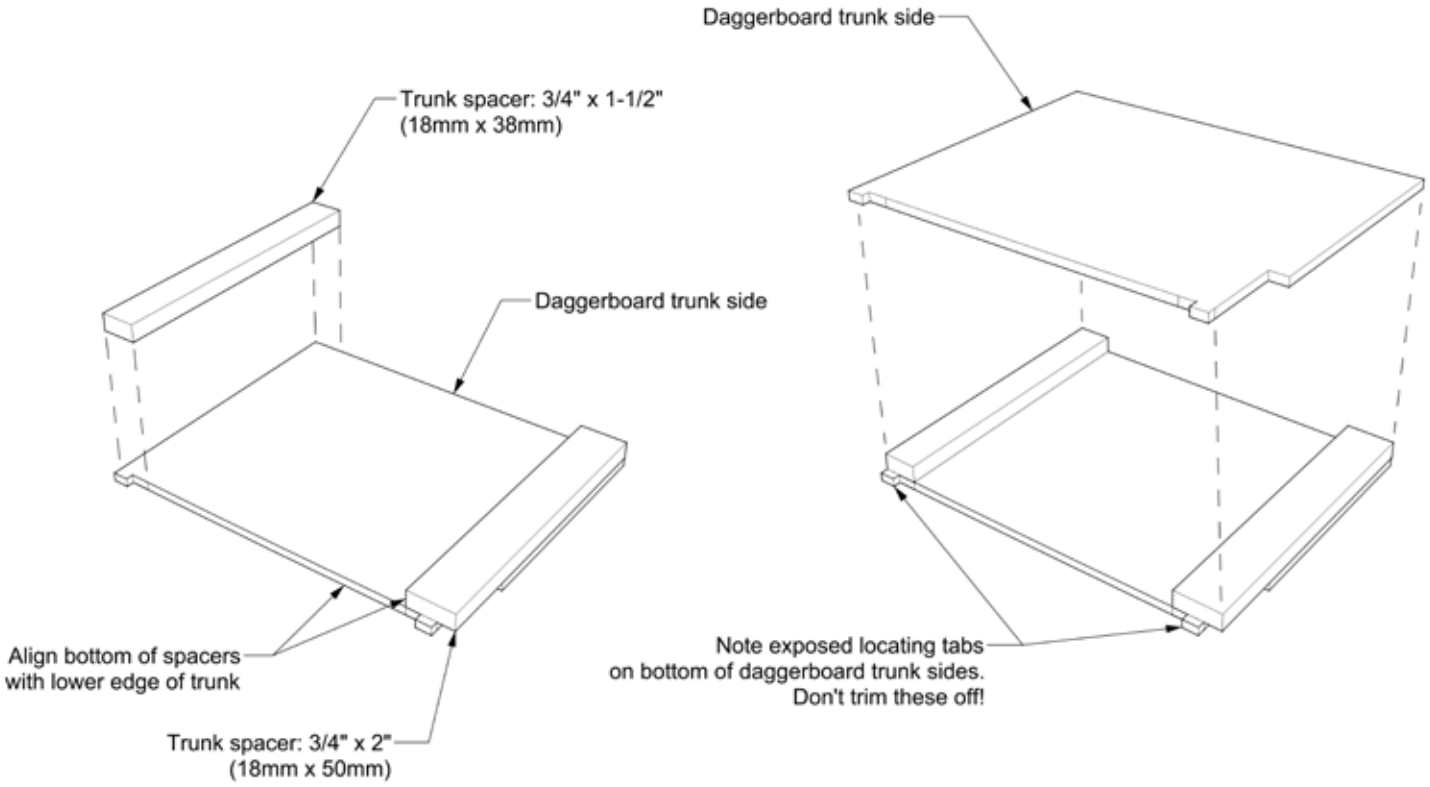
... and slide the fiberglass patches into place. The pre-epoxied surface will help hold the small patches steady while you brush on enough epoxy to saturate the 'glass.

Allow the epoxy to gel; it will feel dry to the touch, but a bit rubbery. This will be 1-3 hours after application.

Once the epoxy has gelled, run a sharp razor knife along the seam between panels 5 and 6 to trim the excess fiberglass cloth. The masking tape lifts off at the same time, leaving a clean edge.

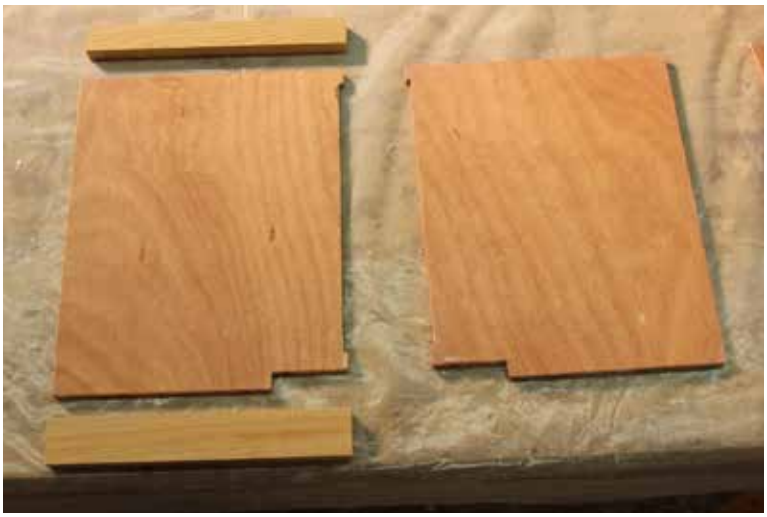
Assembling the Daggerboard Trunk

Having wrapped up one of the biggest jobs of the build–fiberglassing the interior–reward yourself by tackling a small one: the assembly of the daggerboard trunk and trunk plug.



The daggerboard trunk assembly comprises the two trunk sides (which you've fiberglassed already) and two solid timber spacers.

You have two timber pieces for the trunk spacers with different shapes. The wider of the two (2" x 3/4" or 50x18mm) is glued to the edge of the trunk sides that are notched at the bottom. Study the diagram above for detail of the assembly.



Sand the inside faces of the daggerboard trunk with 120 grit sandpaper until the surfaces are smooth.

Mix up a batch of epoxy, thickened to jam consistency with Cell-o-fill, and brush a generous amount onto one face of each trunk spacer.

Position the trunk spacers on one of the daggerboard trunk halves. Orient the fiber-glassed faces so that they become the interior faces of the trunk. The 'glass is there to protect the wood from abrasion as the daggerboard slides in and out of the dark and wet trunk.

Apply a coat of epoxy to the mating and inside faces of the trunk spacers. These inside faces must be protected from water intrusion, and it's easiest to do so now before the opposite side of the trunk is installed.

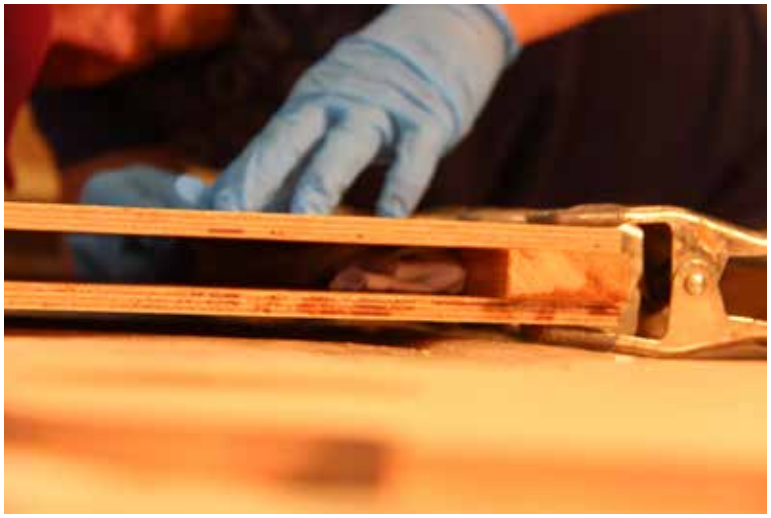
Position the second daggerboard trunk half. (Again, fiberglassed side facing in.)

Check the alignment of the parts. The trunk spacers should be flush with the forward and aft edges of the trunk sides, and flush with the bottom of the trunk, so that the small alignment tabs protrude beyond the bottom of the spacers.

The timber spacers will extend beyond the top of the trunk. You'll trim these off later, once the epoxy has cured.

Clamp the assembly together with a few spring clamps and clean up the excess epoxy.

Epoxy will have squeezed out inside the trunk, too. Wrap a clean cloth soaked in denatured alcohol around a piece of scrap wood and wipe away the excess epoxy. Any blobs or drips left behind will be cruelly difficult to excise once the epoxy has cured, and may interfere with the daggerboard's operation.



When the epoxy has cured on the dagger-board trunk, trim the exposed bit of timber spacer from the notch in the trunk sides. This notch will slip over frame 3 when you install the trunk.

Take care not to cut too far into the trunk sides! Discard the chunk of wood you've removed. Also trim off the excess length of timber protruding from the top of the trunk assembly.

Fit a 3/8" (9mm) round-over bit to your router and dress the forward and aft edges of the daggerboard trunk. Don't round the top or bottom edges, nor the notch you just cut out.

A quick pass with a bit of 120 grit sandpaper will finish the job.

Assembling the Trunk Plug

The trunk plug keeps water from sloshing into the boat while rowing or towing.

It's a rectangular piece of 12mm (1/2") okoume with a 12mm rabbeted cap that drops into the daggerboard trunk whenever you aren't sailing. It's basically a short version of the daggerboard.

Fit your router with a 1/4" (6mm) round-over bit and dress the outside edges of the trunk plug and cap for a neat appearance.

Use epoxy thickened to a putty consistency with wood flour to coat the mating surfaces of the trunk plug.

(This sort of job is perfect for using epoxy left over from other tasks.)

Drop the spacer into the rabbeted cap and clean up the excess epoxy. Make sure that the cap and the trunk plug are exactly perpendicular as the epoxy cures.

Prepping the Exterior Bottom for Fiberglass

As with the interior, the exterior of the hull must be absolutely smooth and sterile, free of voids and sharp corners, before you sheathe the hull in fiberglass.

Here's a handy tool for cleaning up the lap joints: wrap bit of sticky-back 120-grit sandpaper over one edge of a piece of scrap wood.

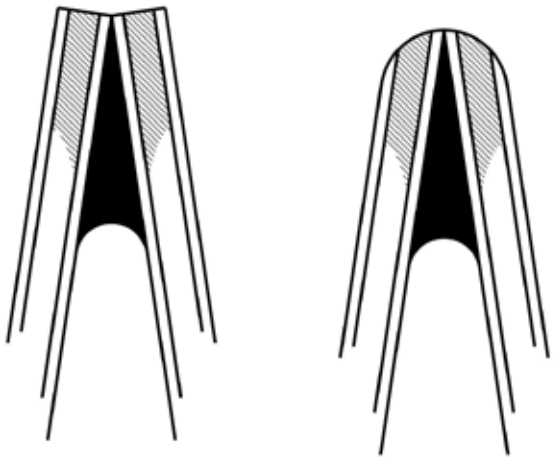
Place the non-sandpapered side of the block against the hull and run the sandpaper edge along the lap joints. This will knock down any epoxy lumps in the seams without marring the hull surface. Sand in long, smooth strokes, and check the fairness of the laps periodically to insure you don't over-sand.

Smooth the stem with a grinder, random orbital, or rasp.

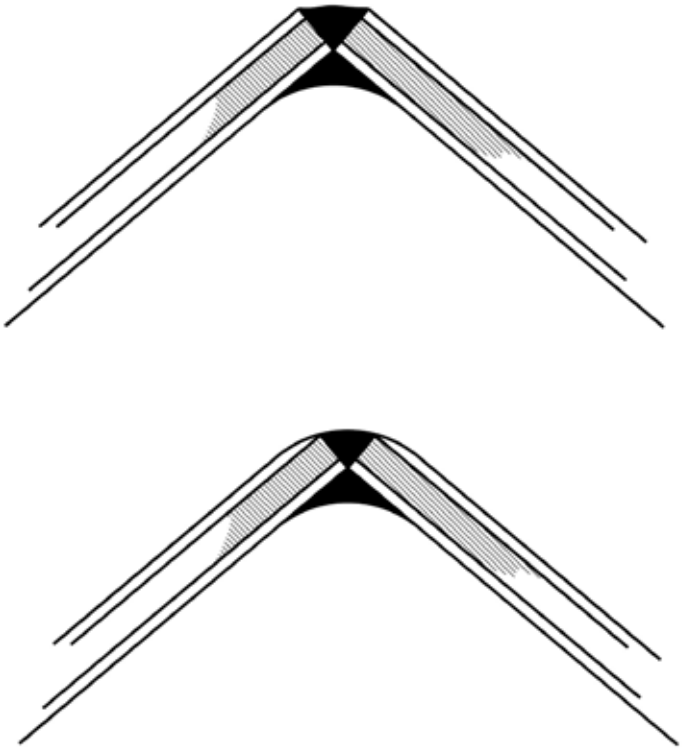
You'll be removing quite a bit of material to round the stem, and this is an efficient way to do so.

Getting the stem rounded correctly is critical for good fiberglassing work. Fiberglass won't turn a sharp corner, as you know, and for long-term durability a blunt, rounded stem will hold up better.

On the left, we see the stem in cross section the way it looks as you begin this step. On the right, the corners have been knocked off to create a smooth radius.

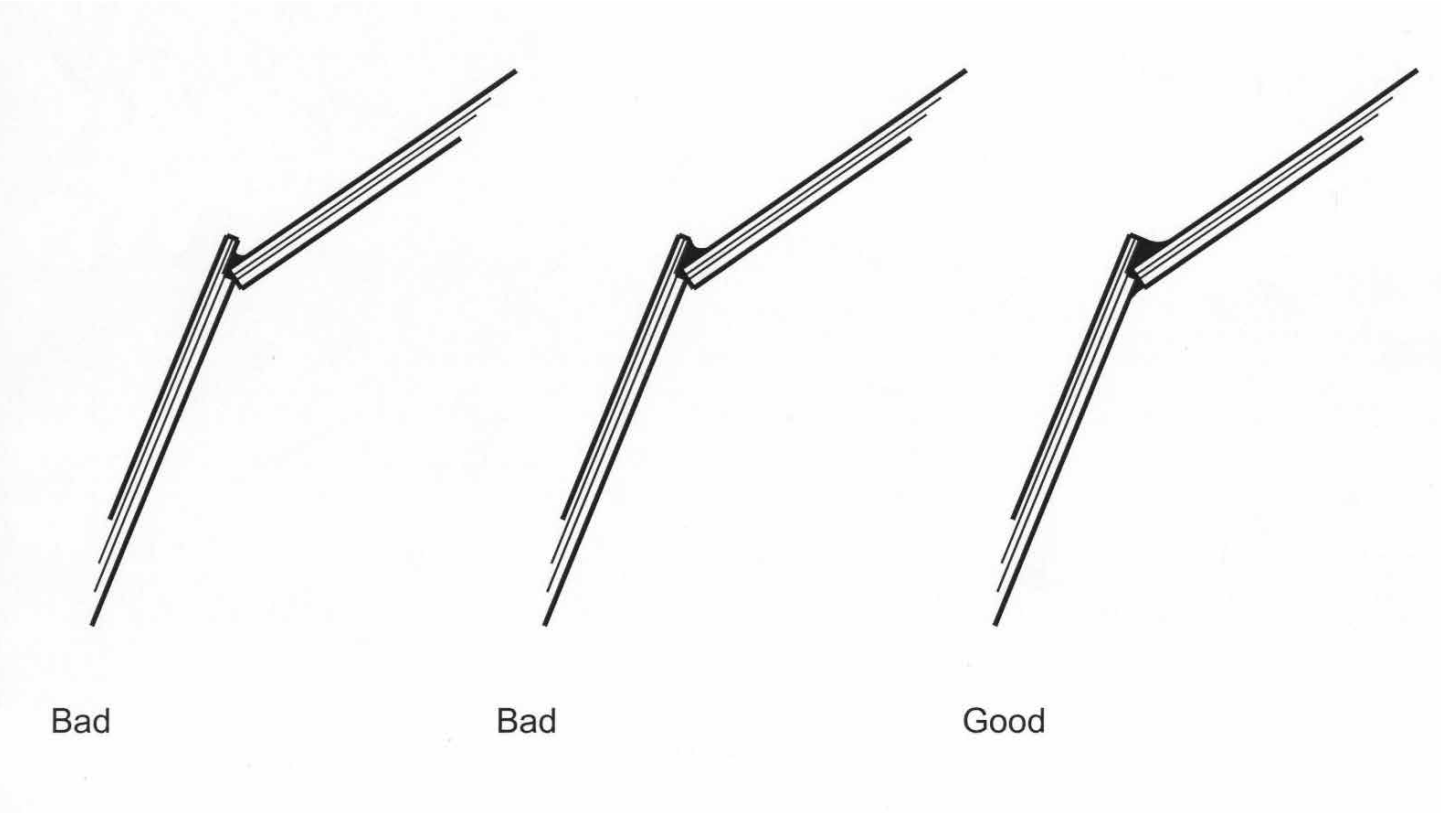


Further back along the hull, the keel meets at a more gentle angle. This, too, needs to be rounded neatly, as in the lower cross-section here.



The hull panels overhang the transom a little.

Sand the ends flush, taking care not to sand into the transom panel itself. Almost everyone will varnish their transom!



Until now, the seams on panels 5, 6, and 7 have just been "tack-welded." In this step we'll finish adding structural epoxy.

Here's a cross section illustrating the ideal seam fill. The epoxy should come right to the top of the lap.

Mix epoxy thickened with wood flour to a peanut-butter consistency, transfer it to a "pastry bag," and run a bead along the lap joints on panels 5, 6, and 7.

Smooth the epoxy with a 1/4"-3/8" (6mm-9mm) filleting tool.

Be fastidious in cleaning the excess epoxy with a plastic spreader.

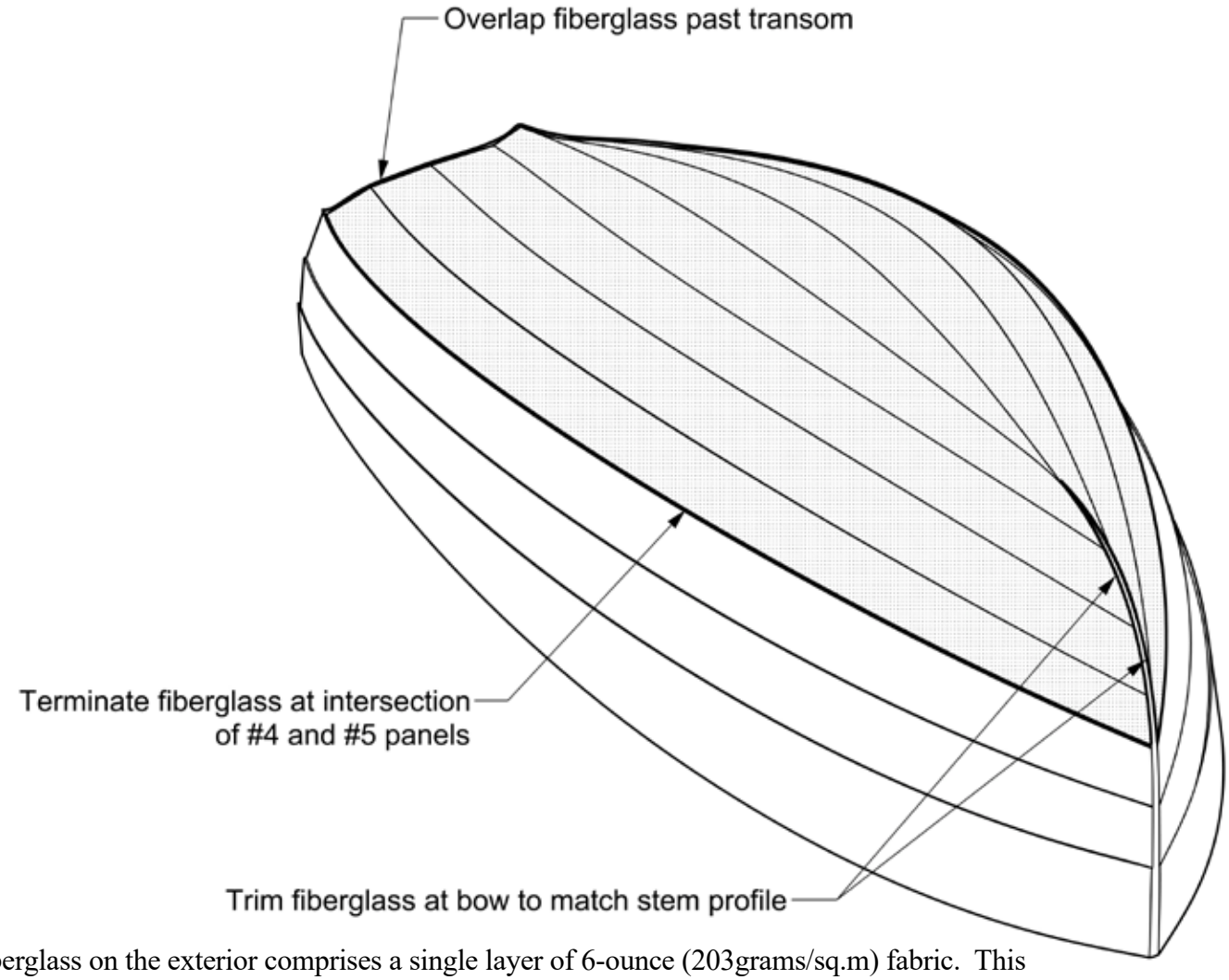
Panels 1, 2, 3, and 4 aren't lapped like the upper panels, but you still need to fill the small gaps at the seams. With firm pressure, force the epoxy into the gaps by drawing the spreader across the seam...

...And scrape off the excess epoxy.

The mortises for the frame tenons must be filled with thickened epoxy. If the tenons stand proud of the hull panels, sand them flush first.

Apply thickened epoxy and wipe away the excess.

Fiberglassing the Exterior Bottom



Fiberglass on the exterior comprises a single layer of 6-ounce (203grams/sq.m) fabric. This sheet of 'glass covers the bottom eight panels of the boat. It's trimmed at the intersection of panels 4 and 5.

In Tenderly's case, the fiberglass is not wrapped over the stern onto the transom, but is cut flush. The transom is taped off to protect it.

The masking tape is trimmed flush to the planking with a razor blade.

Once you're sure the bottom of the hull is absolutely clean of dust, epoxy crumbs, and debris, spread a single layer of 50" (127cm) wide fiberglass across the hull bottom.

Smooth it out by hand.

At the bow, trim the fiberglass down the center. Then cut off the overhanging flaps on either side to match the profile of the stem.

(Photo on right: Chester Yawl)

Trim the fiberglass along the sides of the hull, following the intersection of panels 4 and 5.

Take your time smoothing the wrinkles out of the fiberglass, using your hands. It should hug the hull like a skin.

To start, mix about eight ounces (235ml) of epoxy resin and hardener.

Pour the epoxy onto the bottom middle of the boat.

Work forward and aft from the middle, saturating the fabric with clean plastic spreaders.

If you end up with too much epoxy pooling in one place, use the spreader like a bulldozer to move it to a dry section.

Here's a close look at the fiberglass tucked neatly into the lap joint between panels #4 and #5.

Note, also, the 'glass overlapping the transom by a few inches.

If you wind up with a little extra fiberglass at the stem, either fold it over to the opposite side...

...Or trim it off with your shop scissors.

Before the epoxy on the hull bottom has cured, place a 3" (75mm) wide strip of fiber-glass tape along the stem, starting about at frame #1.

Smooth the tape against the hull with a plastic spreader...

...and saturate the cloth with unthickened epoxy. A disposable chip brush is the right tool for this job.

Fiberglassing complete! Allow the epoxy to cure for 24 hours.

Once the epoxy has cured, use a sharp razor knife to trim the excess fiberglass at the transom...

...and along the panel 4 - 5 intersection down the sides of the hull.

Later, the bottom of the hull will require at least two additional coats of epoxy to "fill the weave" on the fiberglass.

We recommend waiting on this until the outwales and skeg have been installed, so that you can seal those structures inside the epoxy "envelope" at the same time.

An obvious question arises: Why two layers of fiberglass on Tenderly's interior, but only one on the outside? The answer has to do with the properties of fiberglass cloth. It's much stronger in tension than in compression. A surface-puncturing force, like hitting a submerged rock, puts the exterior fiberglass in compression and the interior fiberglass in tension. Thus, we concentrate more fiberglass on the inside for puncture resistance.

This fiberglass schedule has proven extremely strong and durable in our demo models.

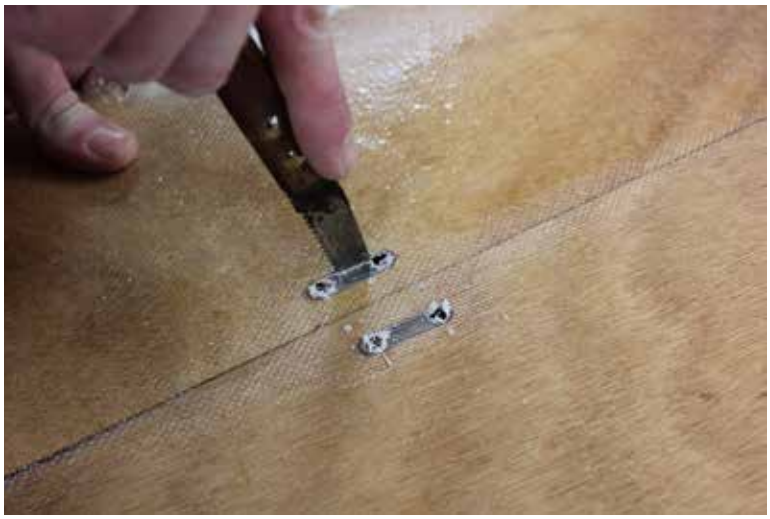
Of course, if you anticipate subjecting your Tenderly to unusual abuse, there's no harm in adding another layer of fabric on the exterior. This will add quite a lot of weight, as much as ten pounds, so keep that in mind, but it'll make the bottom even stronger.

Installing the Seat Supports

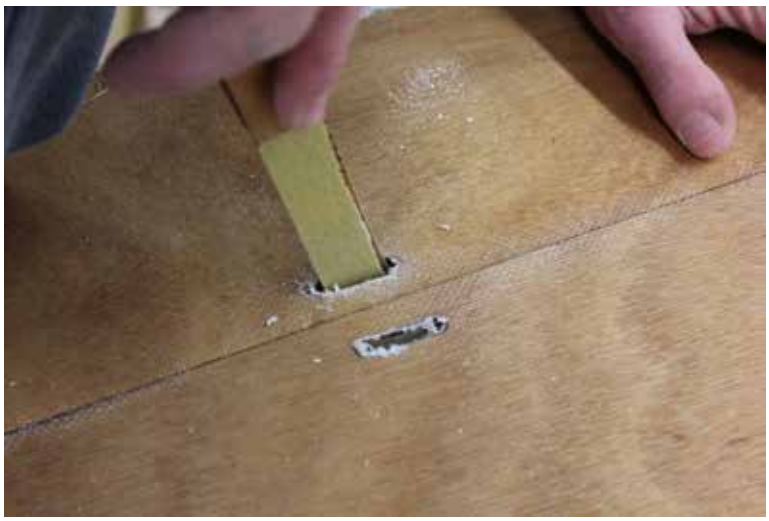
The daggerboard trunk serves as the central support for the middle seat. To fit the seats, you'll need to install the trunk in the boat temporarily. The tenons on the bottom of the trunk slip into the mortises in the hull bottom between frames 2 and 3.

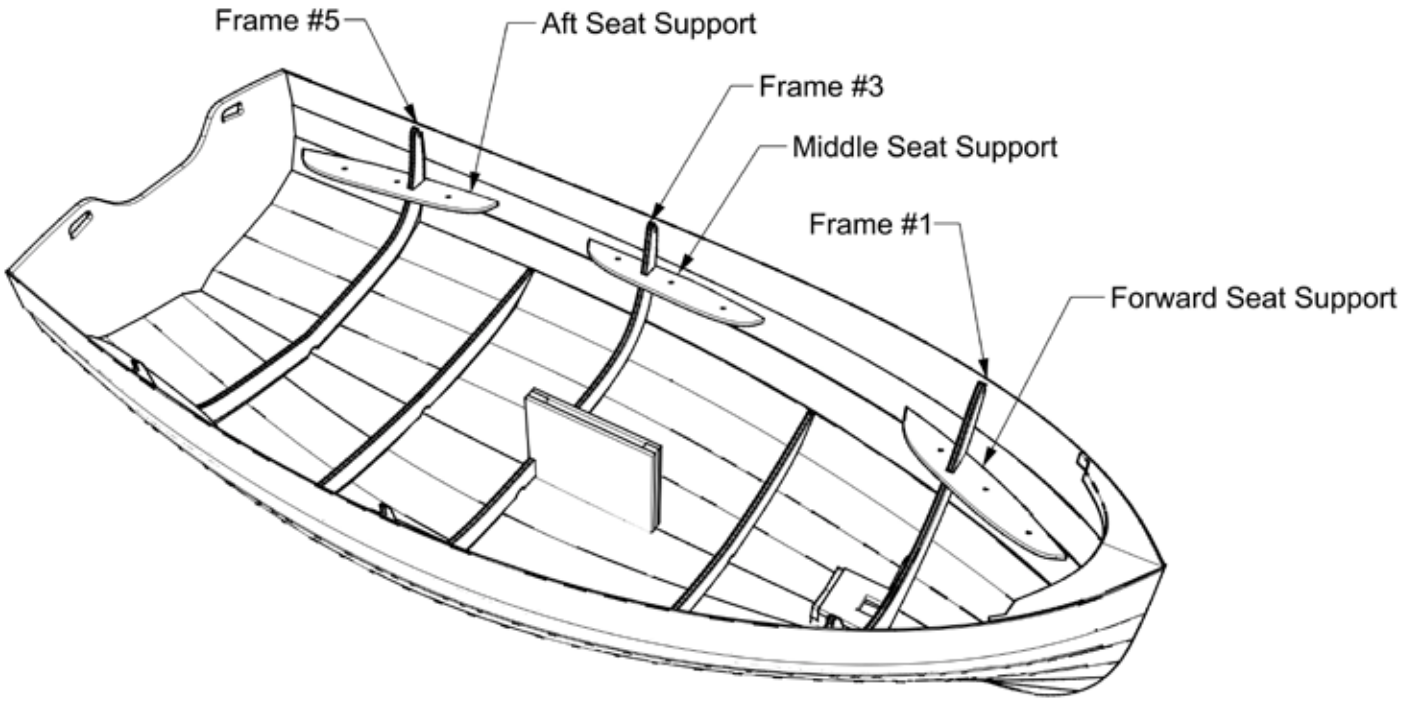
These mortises are covered with fiberglass, of course. Fit your drill with a 1/4" (6mm) bit and drill through the fiberglass in the mortises...

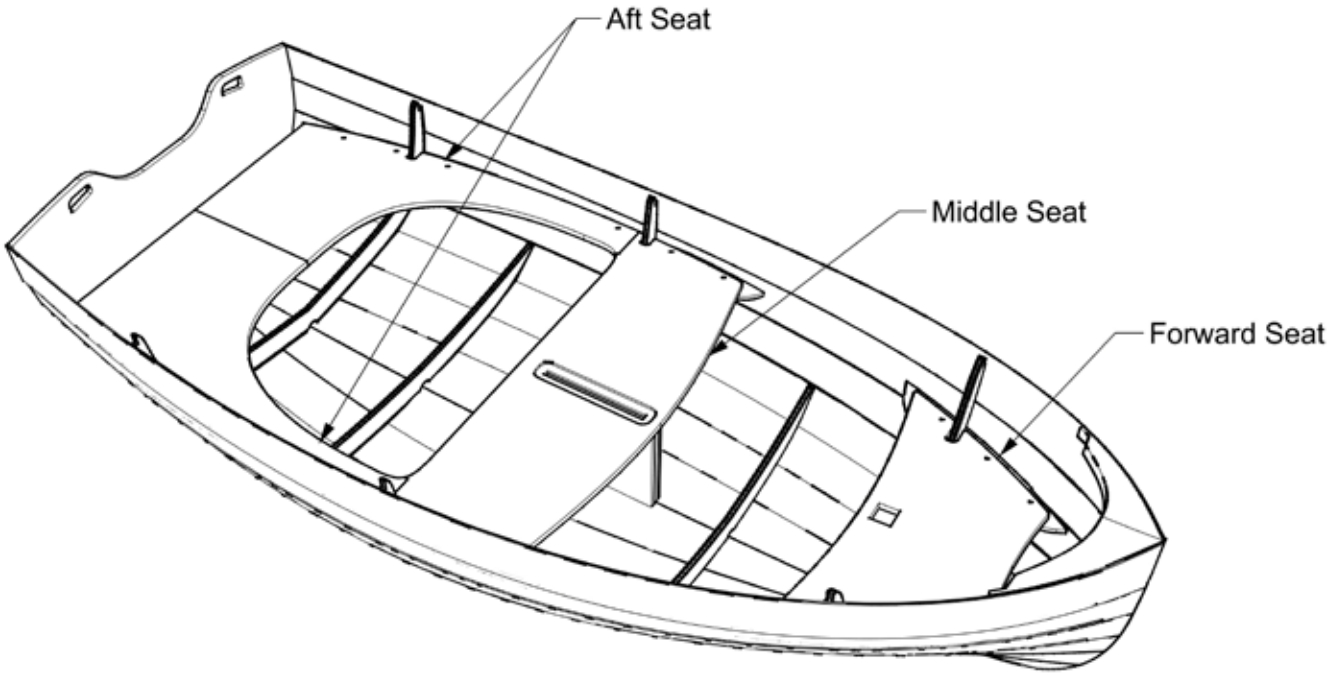
...and excavate the 'glass with a small knife or bonsai saw.



A bit of sandpaper on a mixing stick makes quick work of cleaning up the mortises so that the daggerboard trunk will drop into place.







Locate the forward seat supports by slotting them into the corresponding notches in frame 1. The outboard edges of the supports should make contact with the hull panels.

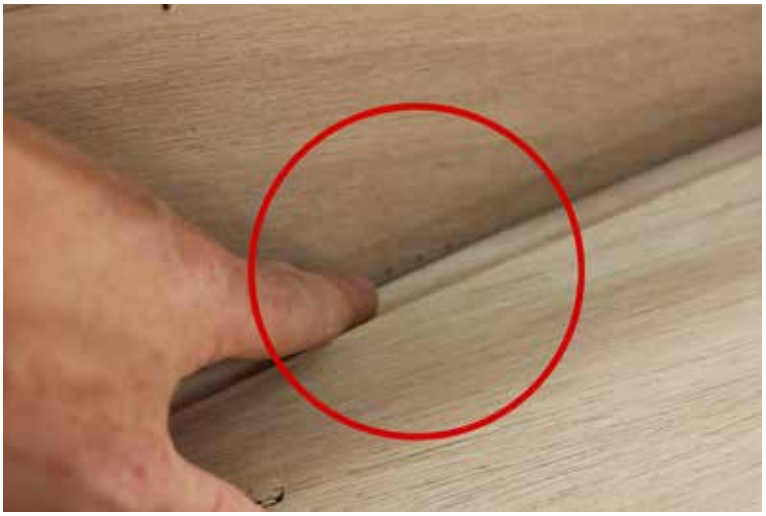
Lower the forward seat onto the supports...

...and clamp the seat in place at the four corners as shown.

Clamping the seats to the seat supports will ensure that everything is aligned correctly.

In kits, you'll spot a series of 3 small computer-drilled holes in the hull planking forward and aft of the frame.

These are the alignment marks for the seat supports. Tweak the supports until the top faces of the seat supports line up with these marks.



The aft seat is up next for a trial-fit. The aft seat is in two halves. For fitting purposes, use a piece of sturdy scrap wood to clamp the two aft seat halves together as shown here.

Slot the seat supports into frame 3 and frame 5.

Lower the aft seat assembly onto the seat supports and clamp it into place.

Kit builders will find CNC-drilled alignment marks for the seat supports. You may need to touch up the notches in the frames with a rasp so that the seat supports fit neatly against the hull.

And finally the middle seat. Slip the daggerboard trunk into place, with the notch positioned over frame 3. File away at the mortises in the hull bottom and the notch until you get a good slip-fit. The bottom of the trunk should make contact with the hull without any gaps.

Lower the middle seat onto the seat supports and daggerboard trunk...

...and clamp it in place.

Spend a few minutes checking to make sure the seat supports line up with the CNC-drilled alignment marks, and that the seats are resting flat upon the supports.

The seat supports will be tack-welded into place, in preparation for structural epoxy attachment.

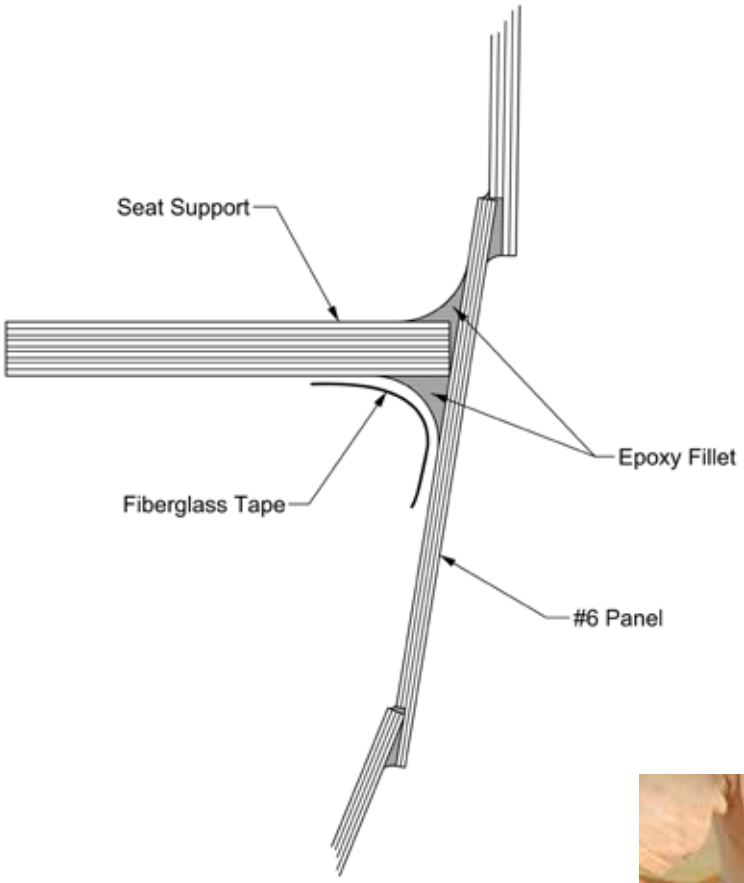
Use a few dots of CA glue to glue the seat supports to the hull panels. If any CA dribbles down the side of the hull, clean it off right away with a rag so that it doesn't stain the finish.

Make sure you don't glue the supports to the seats accidentally!

Work your way around the boat until all the seat supports are tacked-welded in place with CA glue.

Give each of the seat supports a quick tug to make sure that they are rigidly tack-welded, and add more CA glue if not.

When satisfied, un-clamp and remove the seats.



Those CA glue tack welds aren't very strong. Now it's time to bond the seat supports in place permanently. They need to be very strong.

This cross-section shows what comes next: An epoxy fillet on the top, and another epoxy fillet on the underside backed up with fiberglass tape.

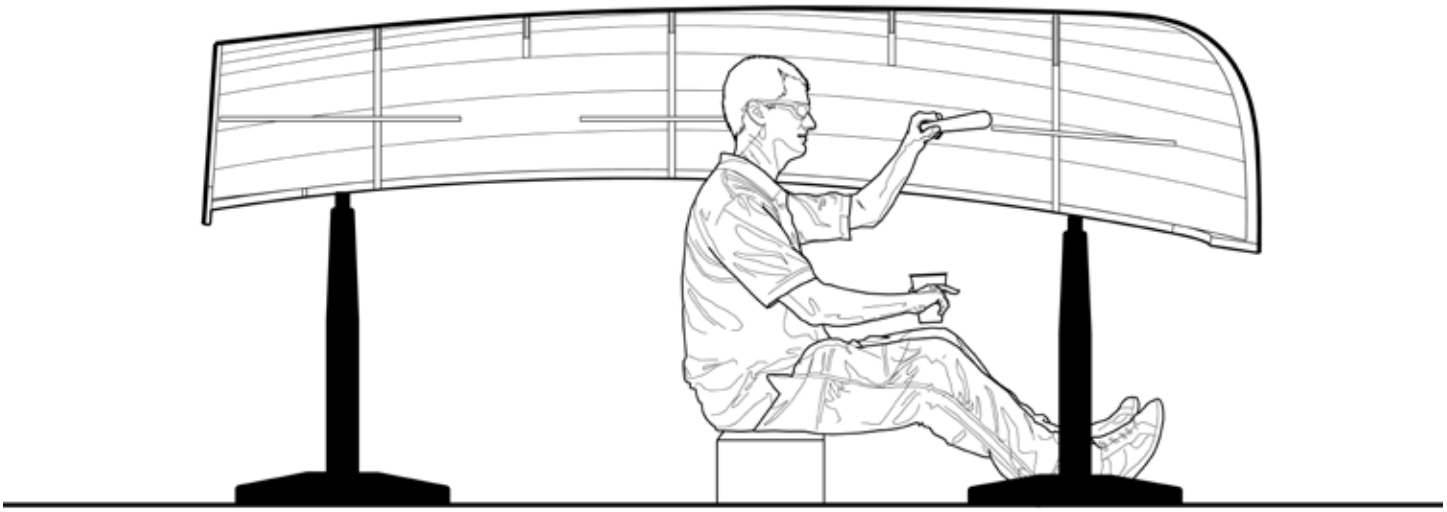
Mix up a batch of epoxy thickened with wood flour to the now-familiar peanut butter consistency. Dispense a thick bead where the seat supports meet the hull panels. The bead of epoxy continues around the frame, as shown here.

Use a 1/2" (12mm) radius fillet tool to smooth the epoxy along the hull panels...

...And around the frames.

As always, clean up the excess epoxy obsessively. These fillets are going to be visible in a varnished boat!

The joint between the seat supports and the hull must be strengthened further with an epoxy fillet and a layer of fiberglass tape on the underside.



Neat work on the undersides of the seat supports will be hatefully awkward if you don't flip the boat over on the sawhorses. Once this is done, the undersides of the seat supports are within easy, ergonomic reach of a builder seated beneath the upturned boat.

Make up a bag of epoxy thickened with wood flour to a peanut butter consistency.

Apply the epoxy on the underside of the seat supports where they meet the hull.

Smooth the fillets with a 1/2" (12mm) diameter filleting tool, and clean up any excess.

The underside of each support will receive two lengths of fiberglass tape: one on either side of the frame. Measure the length of tape needed for each segment...

...and cut the fiberglass tape to length on the bench. You'll need 12 pieces in total, varying from 8" to 12" (200-300mm) in length.

Cover your workbench with plastic sheeting and mix a cup of epoxy without thickeners.

Use a disposable chip brush to saturate the individual sections of fiberglass tape with epoxy, right there on the bench where it's easy to control.

Transfer the epoxy-saturated tape to the undersides of the seat supports. Center the tape on the epoxy fillets so that half of the tape laps onto the hull and the other half onto the underside of the seat support.

Press the tape into the fillet and smooth it out by hand. Fill any dry spots on the fiberglass tape with unthickened epoxy and a disposable brush.

Installing the Quarter Knees

If you have any thickened epoxy left over from the seat supports, now is a good time to glue the quarter knees into place.

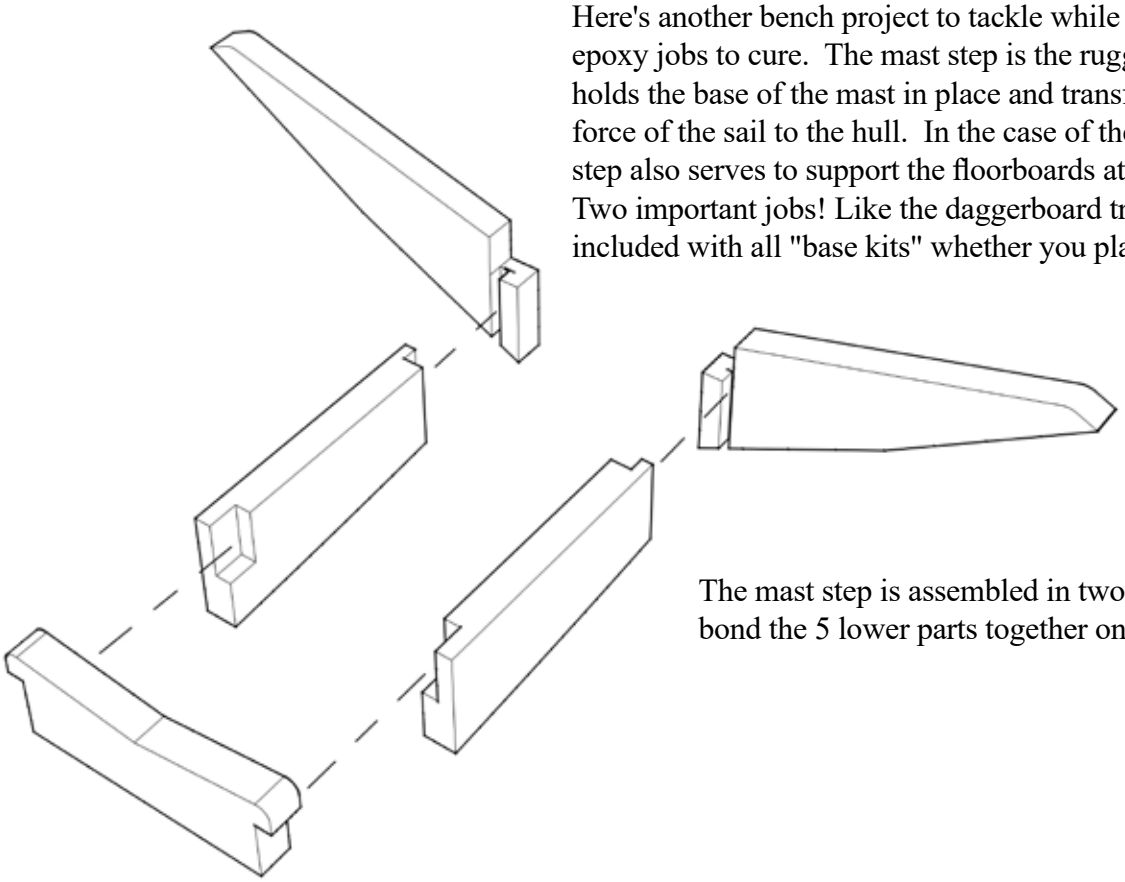
The exposed interior edges of the quarter knees benefit from 3/8" (9mm) roundover with the router.

Brush a thick coating of epoxy onto the mating surfaces.

Clamp the quarter knees in place. The top faces should be flush with the top edges of panel 7.

Note that the knees are installed *perpendicular* to the #7 panel. They don't follow the angle of the top of the transom.

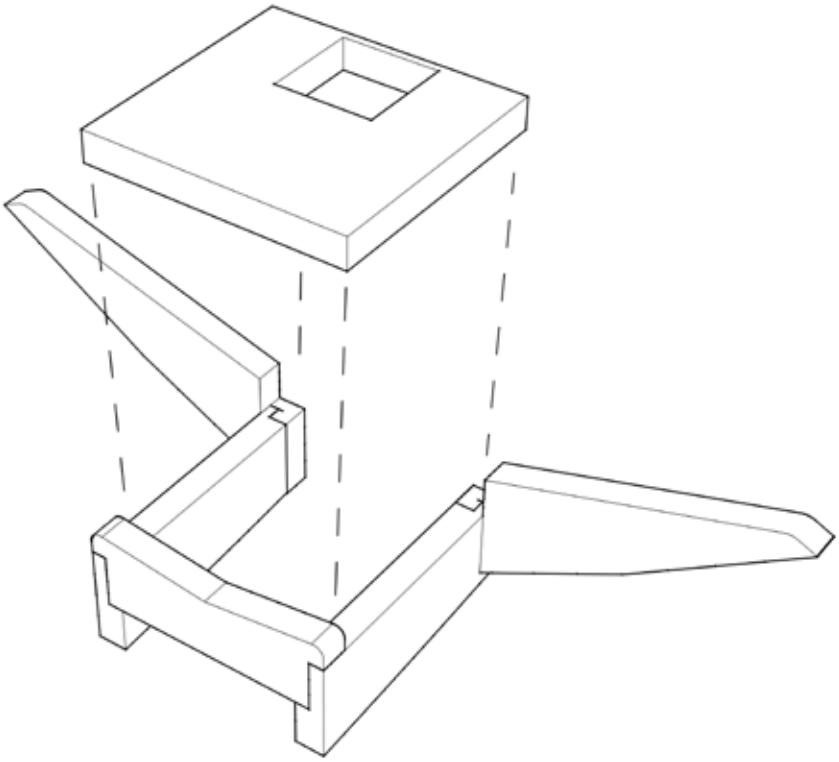
Assembling the Mast Step



Here's another bench project to tackle while you're waiting for other epoxy jobs to cure. The mast step is the rugged little module that holds the base of the mast in place and transfers some of the driving force of the sail to the hull. In the case of the Tenderly, the mast step also serves to support the floorboards at their forward termini. Two important jobs! Like the daggerboard trunk, the mast step is included with all "base kits" whether you plan to sail or not.

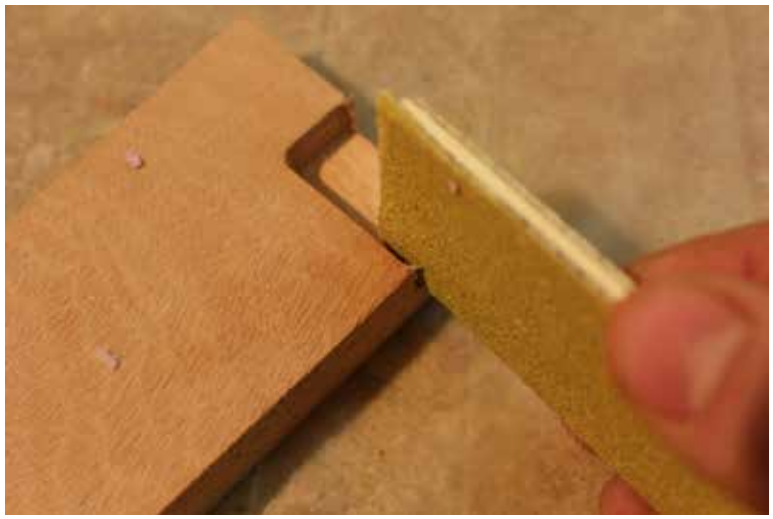
The mast step is assembled in two stages. First, you'll bond the 5 lower parts together on your workbench...

... then you'll glue the assembly into the boat and add the top plate.



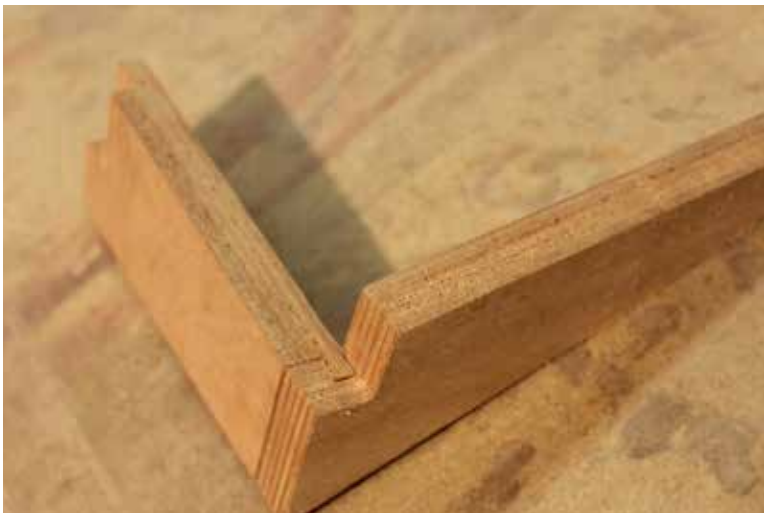
Protect your bench with plastic and lay out the mast step parts.

You'll need to dry-fit the parts before breaking out the epoxy. Here, the CNC machine has left small nibs at the corners of the rabbets. These must be sanded away so the parts fit properly.



Test fitting the parts.

The side pieces mate with the forward "wings" with a tongue-and-groove joint. Check the joint for a tight slip-fit.

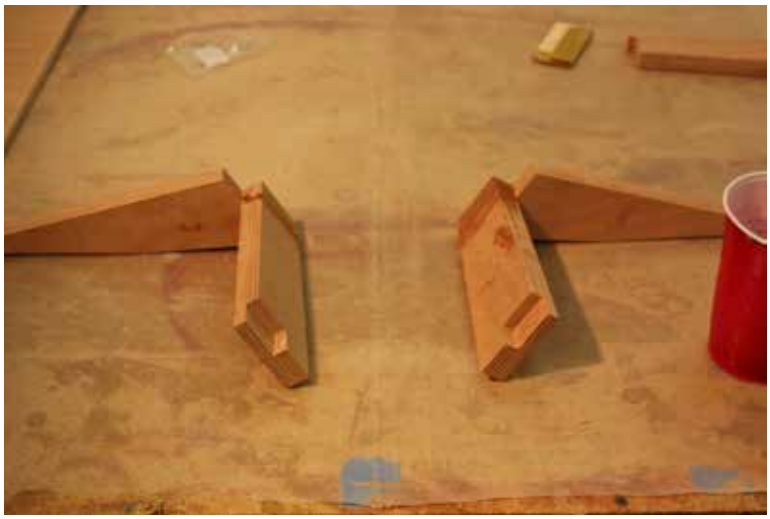


When you're satisfied with the fit of the assembly, mix up a batch of epoxy thickened with Cell-o-fill and brush it on the mating surfaces of the parts.

Slot the parts together and wipe off the squeezed-out epoxy.

Here's a close-up of the correct fit of the "wings" and mast step sides.

No need to clamp these parts, as the tongue-and-groove joints will hold them together while the epoxy cures.

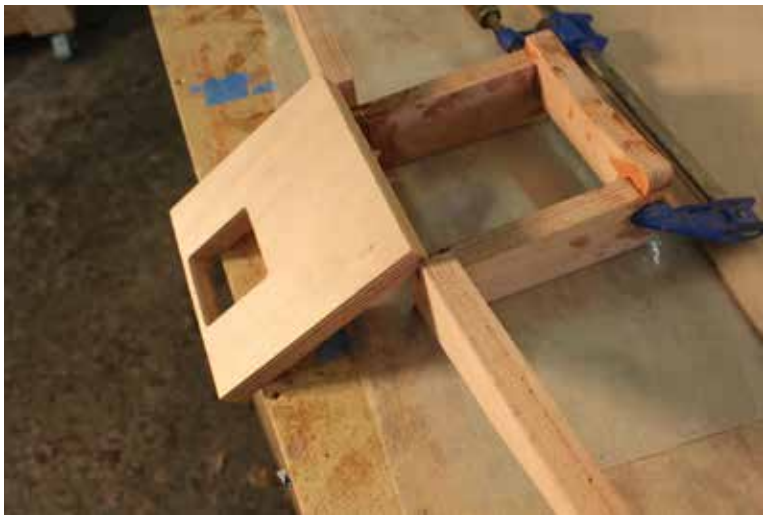


Brush a bit of Cell-o-fill thickened epoxy on the mating faces of the T-shaped mast step part...

...And add it to the assembly.

Use a bar clamp to hold the parts together while the epoxy cures.

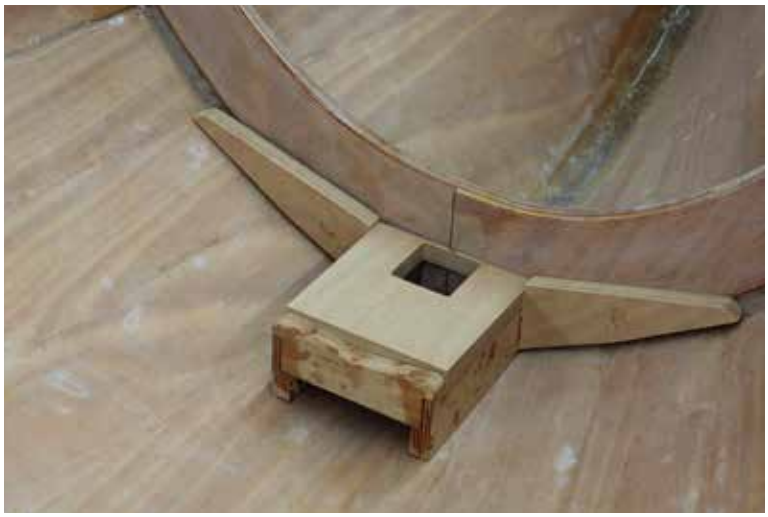
You can wedge the mast step top between the two "wings" to prevent the assembly from being squeezed while the epoxy cures. Just make sure you don't accidentally glue it in place!



Installing the Mast Step

Before mixing up epoxy, you'll need to dry-fit the mast step assembly. It sits on the hull bottom and against the aft face of frame 1.

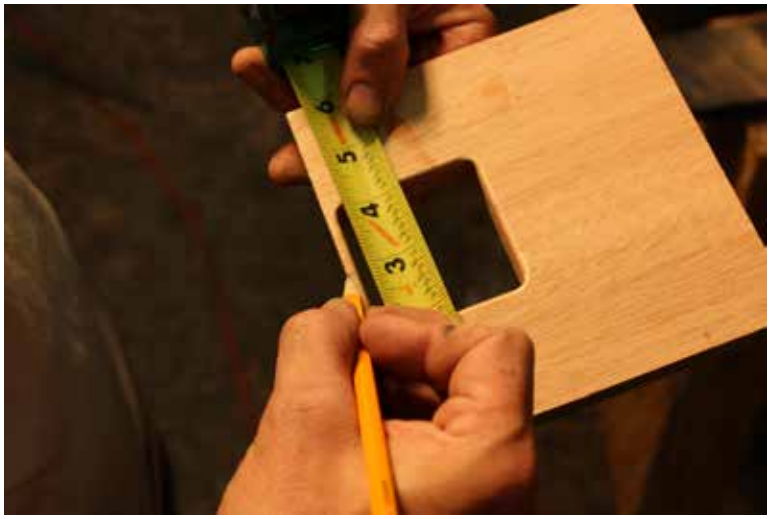
Note that we're showing the mast step top in place (the rectangular piece of 18mm plywood with the hole cut out for the mast.) You haven't bonded this piece to the assembly yet, but you'll want it on hand to facilitate locating the mast step.



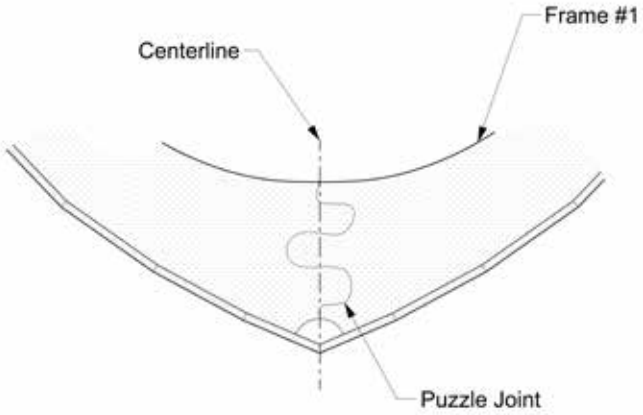
The epoxy fillet on frame 1 will prevent the mast step assembly from snugging flush against the frame.

Sand away at the mating faces of the mast step until the unit fits neatly in place. The "wings" should lay flat against frame 1.

Now to center the assembly: Mark the center of the mast step top, as shown here:

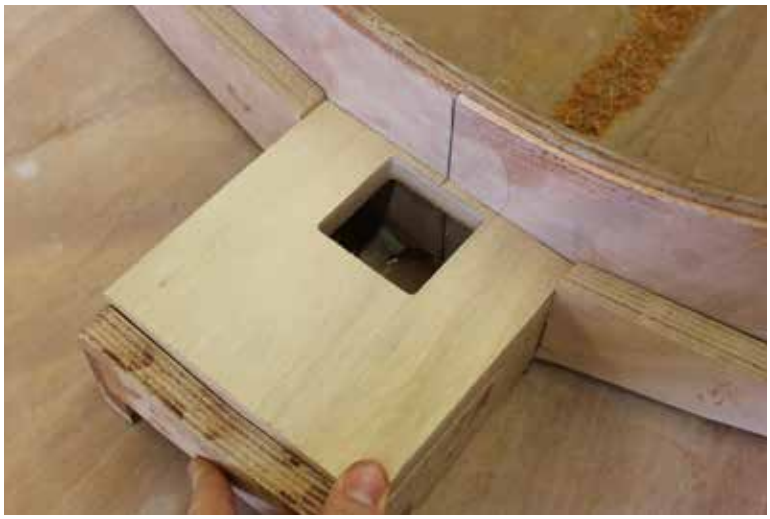


And mark the centerline of frame #1. Here's a handy trick: If you connect the ends of the puzzle joint (top and bottom) with a straightedge, you'll have your centerline – no measuring required!

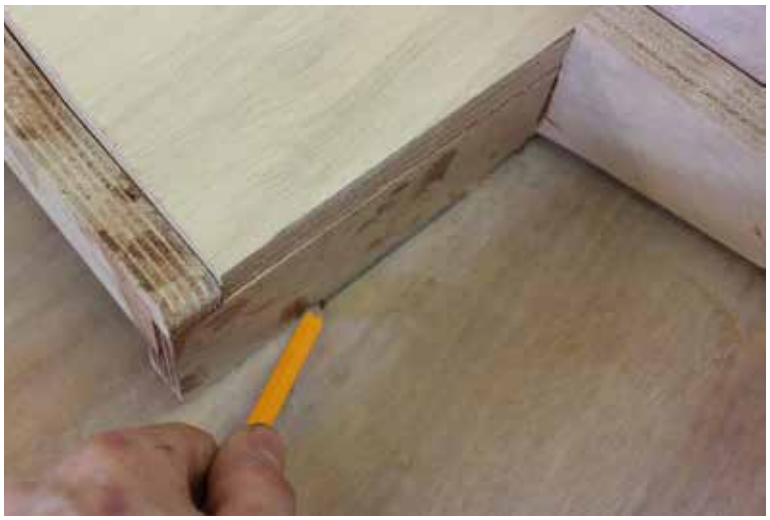


Pop the mast step top back into the mast step assembly and line up the center marks.

Note that the opening for the mast is adjacent to frame 1!



Mark the position of the mast step on the hull bottom with a pencil.



Remove the mast step and mix up a bag of epoxy thickened with wood flour. Apply a generous bead to the bottom of the step...

...and to the mating faces of the "wings"

Place the mast step back in the boat and line up the sides with the marks you made earlier.

Clamp the assembly to frame #1. Here, we've reintroduced the mast step top to the assembly to double-check our alignment.

With the mast step firmly clamped in place, remove the top...

...and run a bead of thickened epoxy around the entire assembly, inside and out.

Smooth the thickened epoxy into a proper fillet with a 1/2" (12mm) diameter filleting tool.

Tenderly has a big sailing rig and the mast step needs to be very strong. Better to make these fillets too large rather than too small!

Take care to cleanly excavate any squeezed-out epoxy from the top of the "wings." No fillets needed, here! These serve as a landing for the floorboards, and an epoxy fillet would interfere with the fit of the floorboards.

Brush a coat of unthickened epoxy onto the inside faces of the mast step assembly and the underside of the mast step top to seal these surfaces.

Mix up a bag of epoxy thickened with wood flour to gravy consistency (not quite as thick as required for filleting). Brush the epoxy onto all the faces that mate with the mast step top...

Lower the top into place.

Add a brick or heavy weight to the mast step if necessary.

Scrape off the squeezed-out epoxy and allow the assembly to cure for 24 hours.

Installing the Daggerboard Trunk

The bottom of the daggerboard trunk, more than virtually any other part on the boat, will spend its time in the shallow pool of water that collects in the bilge. The plywood endgrain wants nothing more than to soak up this water. Seal the endgrain of the trunk forever with a liberal application of unthickened epoxy. This will soak into the wood.

Be careful to wipe drips from the inside of the trunk - they'll be nearly impossible to remove once the epoxy has cured!

Now mix up a putty of wood-flour thickened epoxy and smear the mating surfaces of the daggerboard trunk.

Lower the trunk into place.

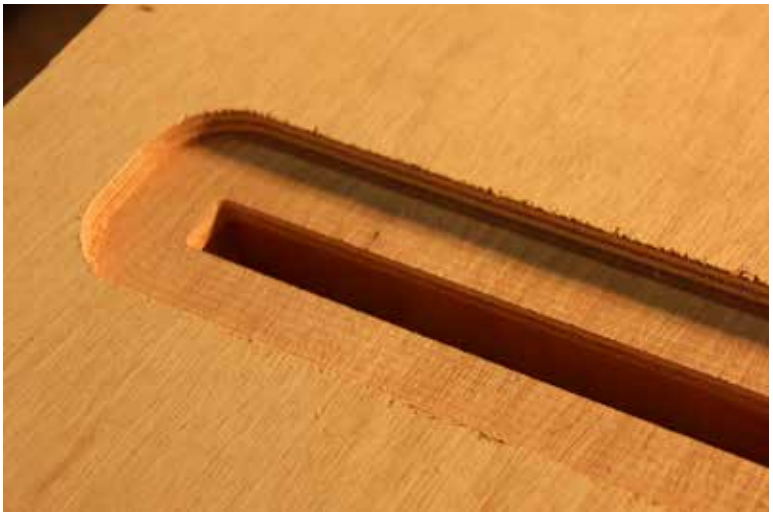
Note how the notch in the daggerboard trunk interfaces with frame 3.

Before the epoxy cures, lower the middle seat gently onto the top of the daggerboard trunk and the seat supports.

Center the seat from side to side. The easiest way is to measure the gap between the frame and the notch in the seat on each side as shown here.

Use a few spring clamps to lock the seat to the seat supports.

Now adjust the daggerboard trunk so that the inside of the trunk lines up perfectly with the cutout in the seat, as shown here:



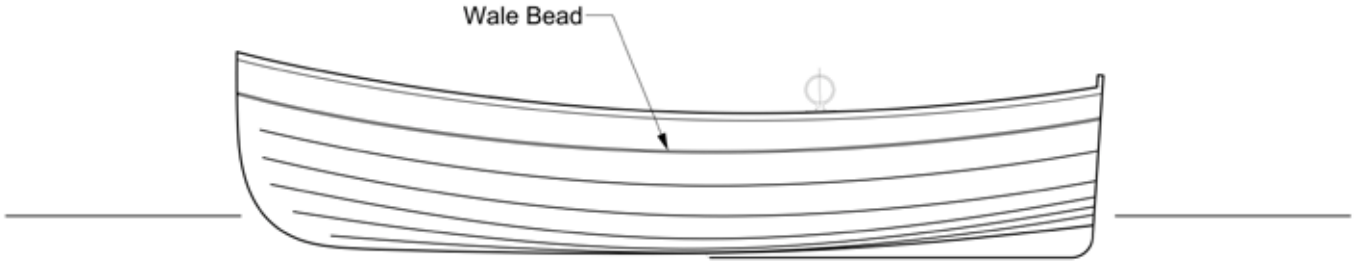
Drop the trunk plug into the daggerboard trunk to keep the parts in alignment while the epoxy cures.

Dispense a bead of thickened epoxy around the base of the daggerboard trunk...

...and smooth the fillet with a 1" (25mm) diameter filleting tool. Note the epoxy squeezing out where the trunk notches over frame 3, evidence of good, strong joinery.

Scrape off the excess epoxy with a plastic spreader.

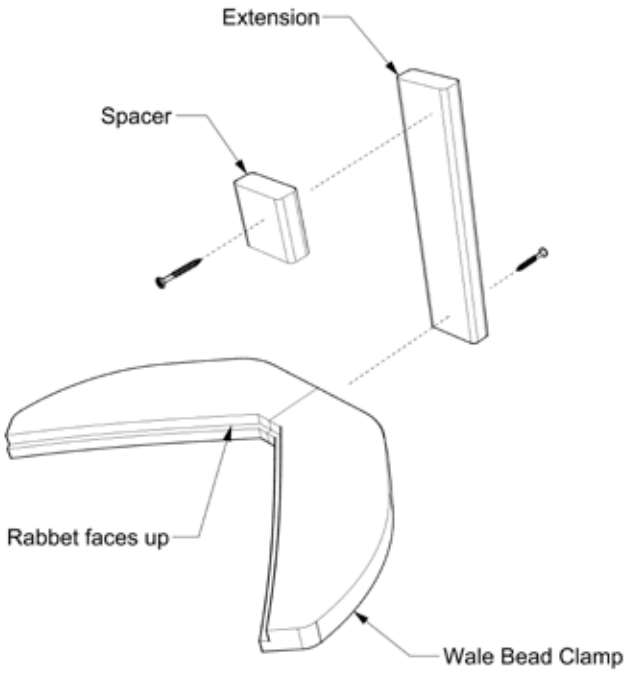
Installing the "Wale Beads"

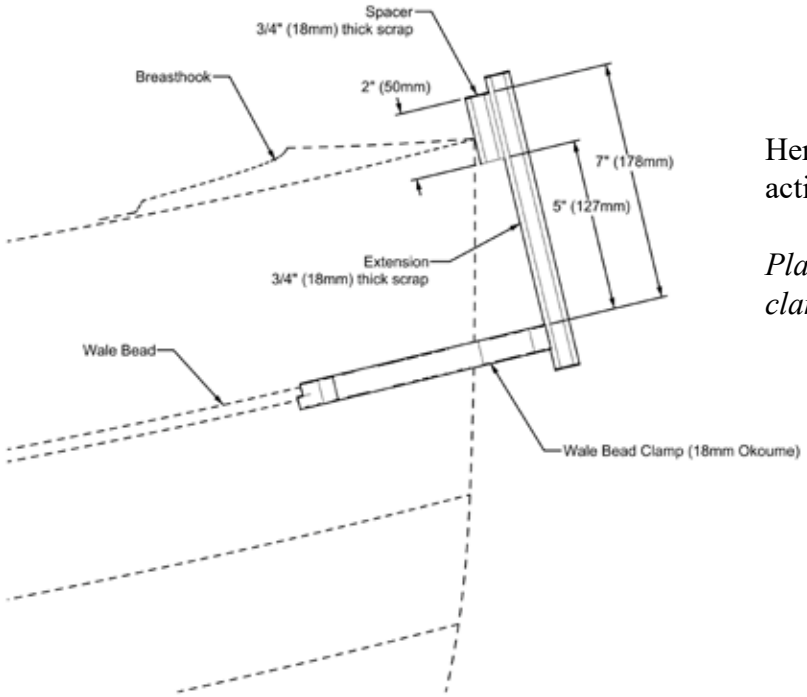


Though not necessary for Tenderly's structural integrity, the 3/8" (9mm) square wale beads on the lower edge of the #7 panels highlight the sheerline of this elegant dinghy and are worth the extra work. We spent quite a while studying the classical boatbuilding texts to identify the correct term for this piece of trim. Technically, that's all it is, *a piece of trim.* But one authoritative source suggested "wale bead" so that's what we're going with.

Attaching those long, skinny rails to the lower edge of the #7 panels could be tricky, especially at the bow. In kits we've included a CNC-cut jig to handle the attachment of the wale beads at the bow. The wale-bead clamp is an odd-shaped piece of 18mm (3/4") okoume sized to fit over the bow at the top of the #6 panel, with a rabbet on either side to hold the wale beads.

The clamping jig is completed with an "extension" and a "spacer" (see the drawing, right). These parts are included in the kit. You'll need a couple of drywall screws to fasten everything together.





Here's a side view of the wale bead clamp in action at Tenderly's bow.

Plans builders have full-sized patterns for the clamping jig.

Fasten the wale bead clamp assembly together with a few drywall screws.

Line the rabbets with a few layers of packing tape to prevent the clamp from becoming a permanent feature of your boat!

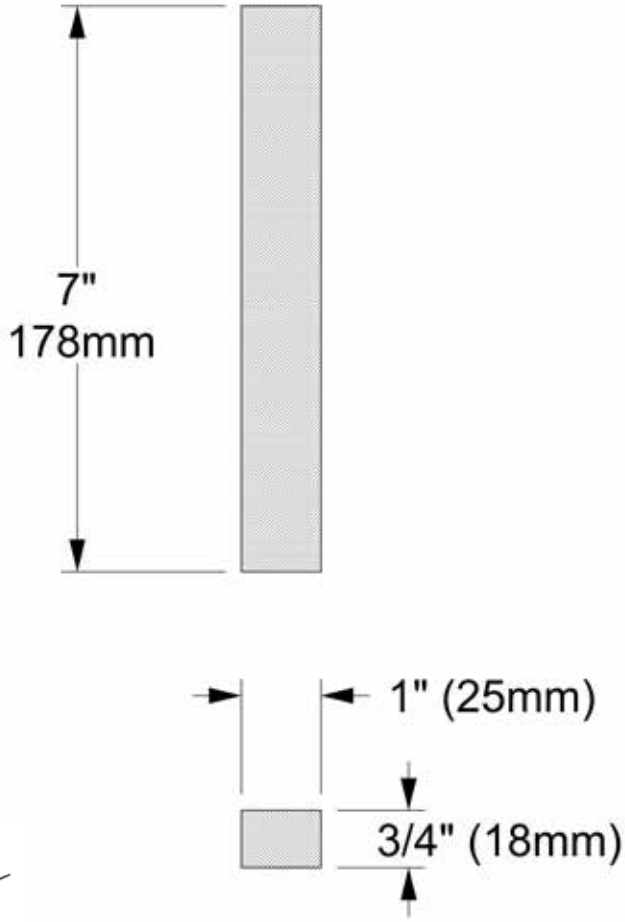
Position the clamp against the bow, with the rabbet bottom resting right at the top of the #6 hull panels. Secure the jig with a bar clamp to the breasthook (note the small wood pad we've used to prevent the bar clamp from denting the wood). The bar clamp should apply compression directly below the spacer block on the wale bead clamp assembly.

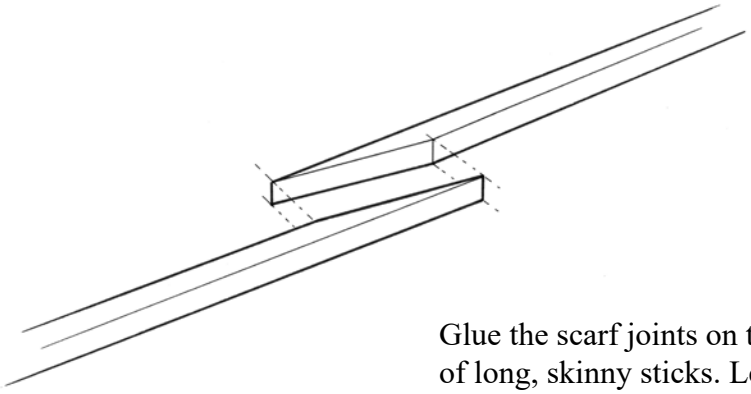
Here's a close-up of the properly located wale bead clamp. Note the gap between the clamp and the hull panel at the rabbet: this is where you'll install the wale bead itself.

Grab two-dozen spring clamps and have them ready.

Cut two-dozen 7"-long (175mm) clamp sticks from scrap wood, as in the diagram here.

You'll need these clamping sticks to hold the wale bead in place along the length of the hull while the epoxy cures.





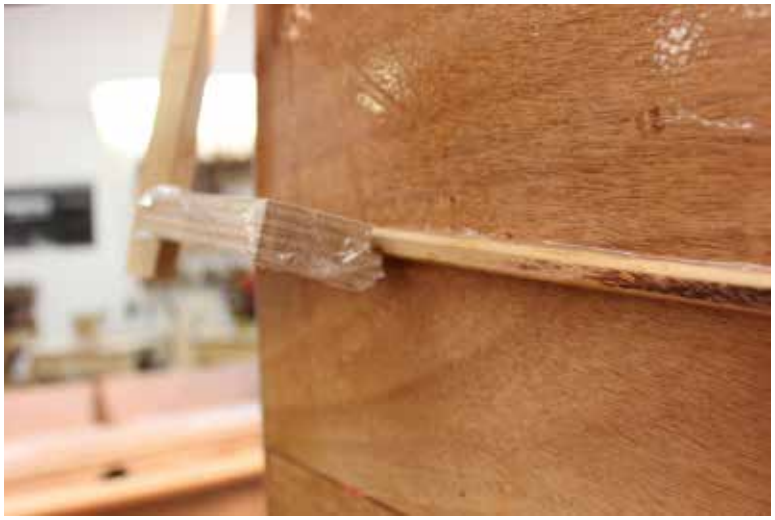
Glue the scarf joints on the two wale beads to create a pair of long, skinny sticks. Let this cure overnight, then sand the joint smooth.

With your clamps and sticks at the ready, mix up a batch of epoxy to gravy consistency with Cell-o-fill. Coat the first few feet of the mating face of one wale bead.

Slide the forward end of the wale bead into the wale bead clamp, to within an inch (25mm) of the stem.

The wale bead is glued to the bottom of the #7 panel, and follows the lower edge of the #7 panel from stem to stern.

The wale bead clamp in action at the bow:



Snug the wale bead up to the hull with spring clamps and clamp sticks. The sticks are clamped up at the rail; they apply sufficient clamping pressure down low to hold the wale bead in place while the epoxy cures.

Add a few clamps, then brush more thickened epoxy onto the next section of wale bead.

(It's tempting to coat the whole length of the wale bead in advance, but when we tried this we got epoxy all over the place.)

Clamps should be spaced at most 10" (250mm) apart.

Continue along the length of the boat, checking the wale bead often for "fairness."

The wale bead should strike a clean, smooth curve along the hull. Sight the rail from one end of the boat, and then the other, and adjust if necessary to eliminate any unsightly wobbles.

A wavy wale bead would be worse than no wale bead at all.

Allow the wale bead to overhang the transom. You'll trim the excess once the epoxy has cured.

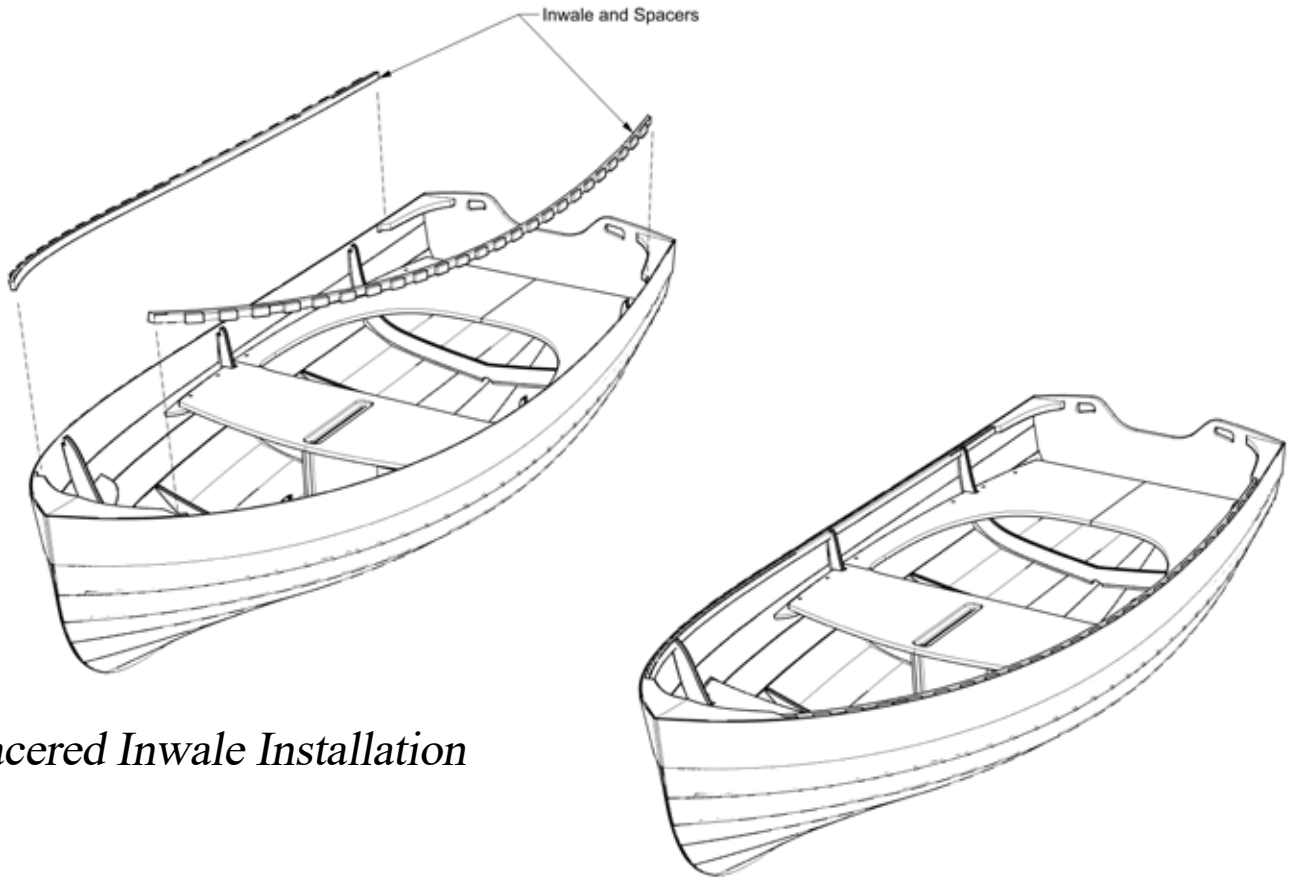
Use a bar clamp hooked through the transom handle cutout to lock the last bit of wale bead in place.

Here's Travis micro-adjusting the wale beads one last time. You'll do the same until you're absolutely happy that they describe a smooth, fair curve!

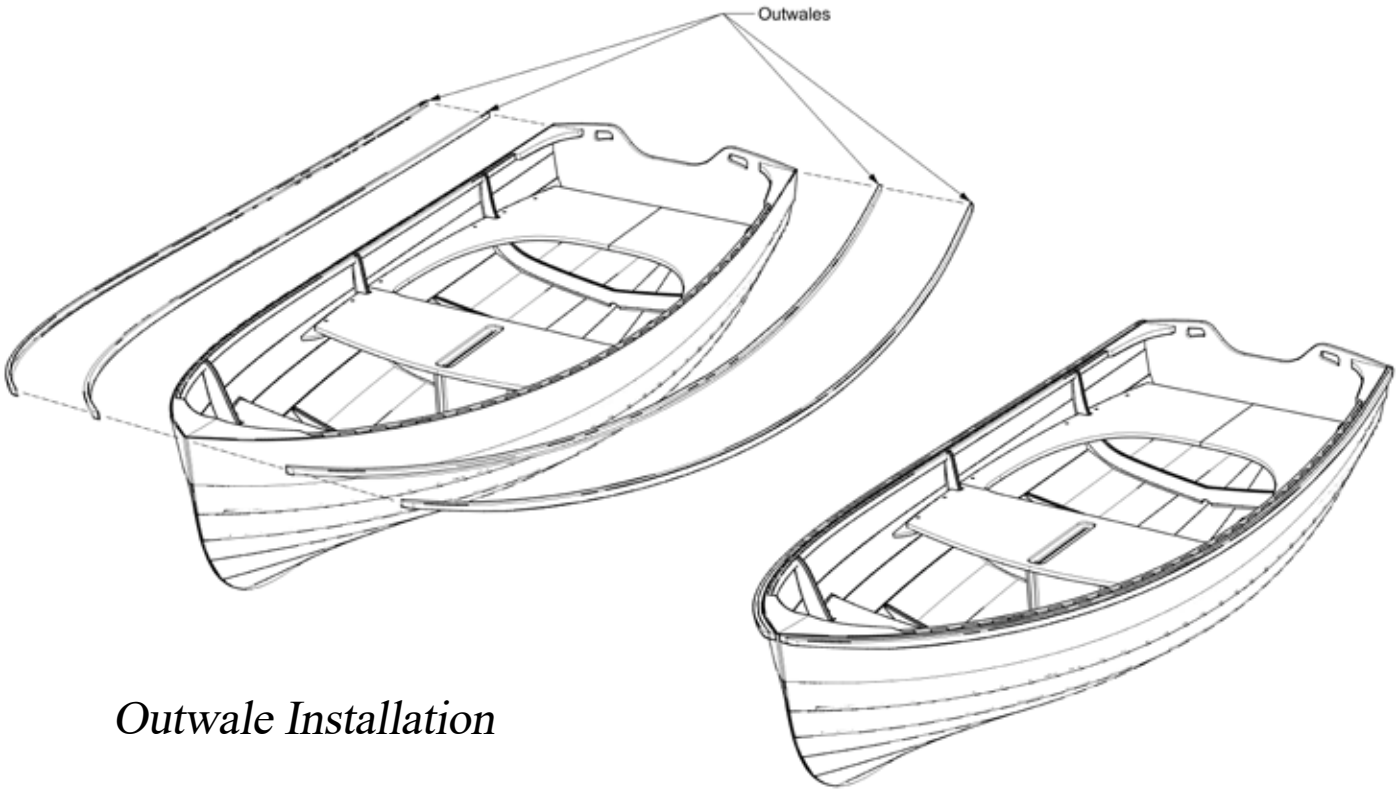
As always, finish this operation by cleaning up the excess epoxy.

Installing the Inwales and Outwales

Besides the obvious structural role of the inwales and outwales, the boat just doesn't look very "finished" until these are in place. "Spacered" or "scuppered" inwales are an old-fashioned feature, optional on some CLC boats. They look so nice that we decided they should be a standard feature on Tenderly.



Spacered Inwale Installation



Outwale Installation

The outwales are composed of two layers of 1/2" x 7/8" (12mm x 22mm) timber, and the inwales, a single layer. You'll need to join the inwale and outwale sections to full length by gluing the parts together with scarf joints.

Clear off your workbench and lay out the rail sections. You'll need a flat, level working surface so that the rails cure perfectly straight.

Mix up a batch of epoxy thickened to jam consistency with Cell-o-fill and slather the mating faces of the scarfs.

Press the scarfs together...

...and hold the parts in place with two spring clamps per scarf joint while the epoxy cures.

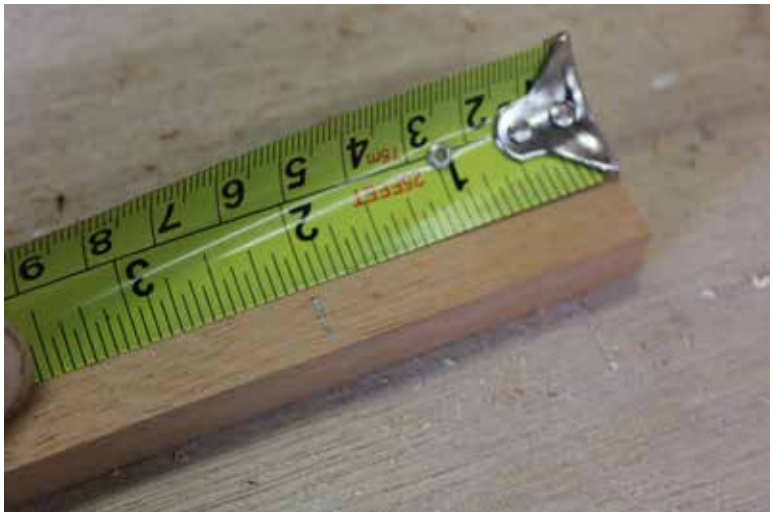
NOTE: *The following instructions are arranged to allow you to install spacers, inwales, and outwales in one gigantic step. This is fast and expedient but many builders may find it too many balls to keep in the air at once. It is perfectly acceptable to break these steps down, and, for example, install spacer blocks one day, inwales the next, one layer of outwales the next day, and finally the last layer of outwales.*

The slower sequence will lower your heart rate. Otherwise, hang on for the ride!

Spacer blocks for the inwales are cut from 3/8" x 7/8" (9mm x 22mm) mahogany stock.

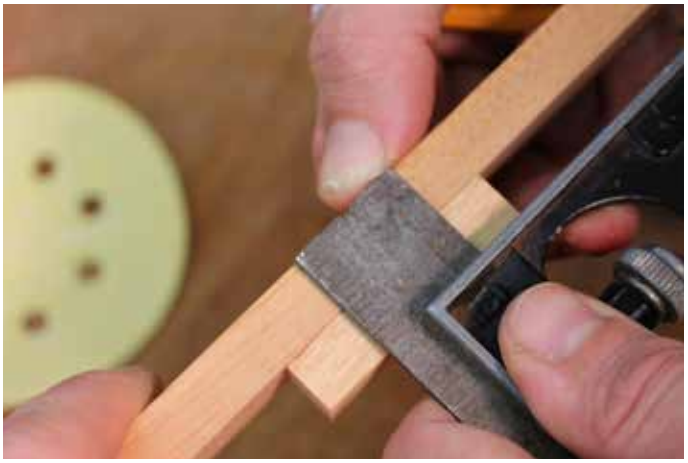
There's no right answer to the proper length and spacing; we encourage you to experiment.

We found that 2" (50mm) long blocks spaced between 1-3/4" and 2" (44mm - 50mm) apart looks just right for this little yacht.



If you have a miter saw, clamp a bit of scrap to the fence as a stop to set the length of the spacer blocks. Then you can run the stock spacer material up against the stop and mass-produce spacer blocks.

Depending on how you space the blocks, you'll need to mill 60 or more of them.



The tops of Tenderly's frames are notched to accept the spacer blocks, but you may have to trim the notch for a perfect fit. Measure the thickness of the combined inwale and spacer block, and transfer that depth to the frame tops.

Trim away at the frame until the spacer and inwale fit snugly in the notch.

Rather than measuring out the space between each block, it is easier to have a few pieces of scrap cut to length to act as spacing tools.

Clamp a spacer block in place, use your measuring block to set the spacing, then clamp the next block.

Dry-fit the spacer blocks on one side of the hull, adjusting the spacing until you're happy with it.

Mark the locations of each block on the hull with a fine-pointed pencil.

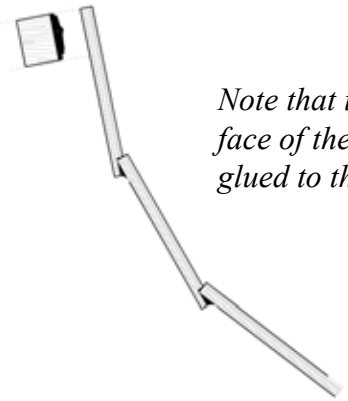
We cheated the spacing of our blocks at the bow so that everything fit neatly. It's more important that the spacer blocks LOOK good than to be spaced along the length of the boat with Euclidean precision.

While you may fudge the spacing between the blocks, make sure the spacing on both sides of the boat match! Here's one last look at the dry-fit exercise before we bond the spacer blocks in place permanently.

At this point you have two options. You can mix up a batch of thickened epoxy and bond the blocks in place, using the same spring clamps to hold them while the epoxy cures. OR, proceed to the next page for a marathon outwale/spacer block lay-up. This is how we did it, to save time. With a clever use of clamps and screws (and several interruption-free hours), you can glue up the spacer blocks, inwales, and outwales. ALL in one operation.

Sand away the excess epoxy on the inwale and outwale scarf joints. Don't overdo it and make the rail too thin!

Mix a small cup of epoxy thickened to jam consistency with Cell-o-fill. Coat the first 36" (1m) of the 7/8" (22mm) tall mating surface of an outwale section.



Note that the TALLER face of the outwale is glued to the boat.

Position the outwale on the #7 panel, flush with the top, and drill a 1/8" (3mm) counter-sunk pilot hole through the outwale into the breasthook.

Drive a #8 x 1" (25mm) stainless steel flathead screw into the outwale...

...and add two more screws as you wrap the outwale around the bow.

Pre-drill for these carefully! Splitting the rail is a real danger at this early stage.

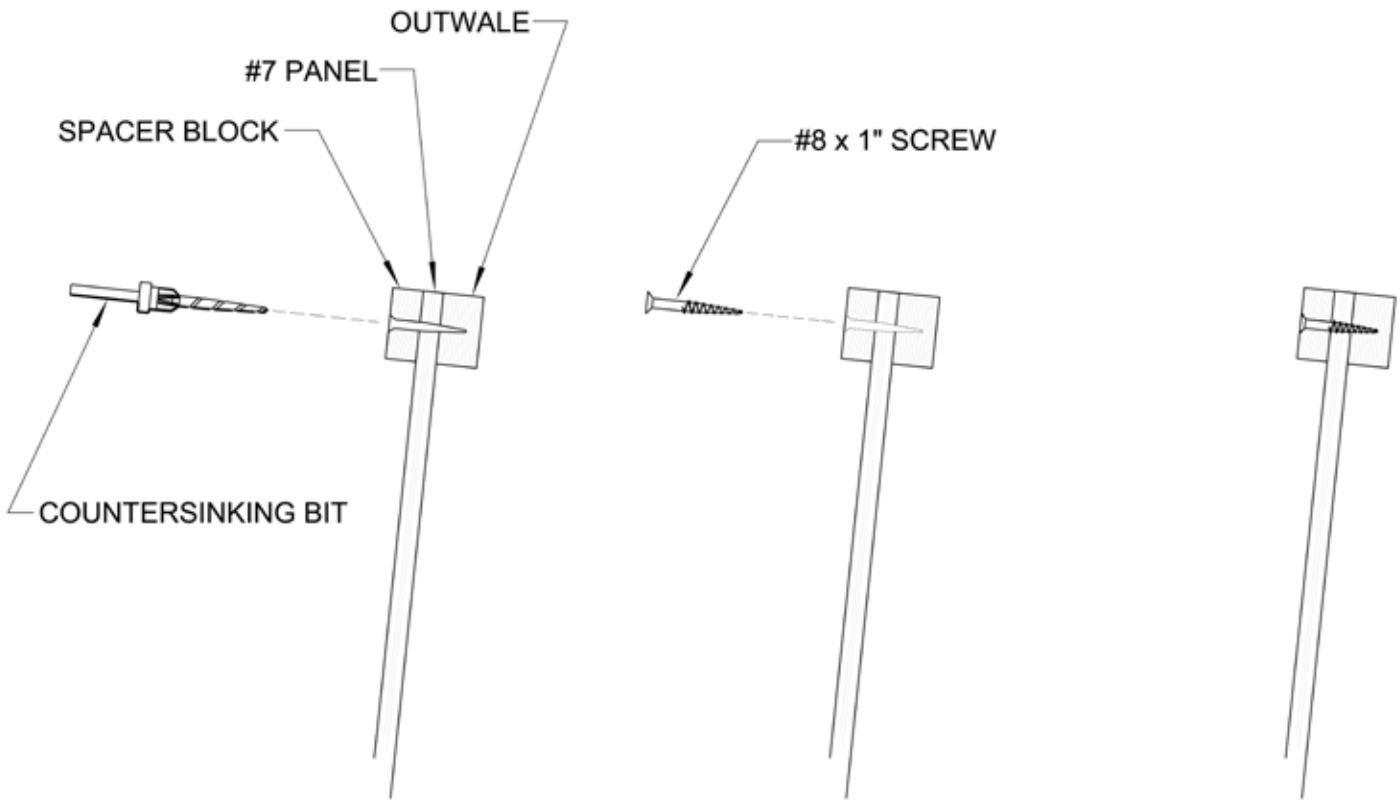
Next, brush the mating face of the first spacer block with thickened epoxy...

...And place it on its marked spot inside the hull. Use a single spring clamp to hold both the spacer block and outwale in position on the hull.

Note the addition of a helper. It can be done solo, but this is not recommended for beginners.

Make sure the spacer block and outwale are perfectly flush with the top of the #7 hull panel. The squeezed-out epoxy indicates a tight joint.

Drill an 1/8" (3mm) countersunk pilot hole through the block, through the side of the hull, and into the outwale.



Drive a #8 x 1" (25mm) stainless steel flathead screw into the block.

The screw is centered in the spacer block, goes through the side of the hull, and into the outwale.

If the block splits, you need to adjust your countersinking bit to better match the #8 screw. If the screw goes all of the way through the outwale, you are countersinking too deeply.

Now slather the next few feet of outwale with your thickened epoxy mix...

...and proceed to the next block.

Continue this procedure down the length of the hull. If you're unable to drive a screw through a spacer block due to frame interference, simply drill the pilot hole and drive the screw from the outwale side, as shown here.

Once you get to the quarter knees, clamps won't work. So just as you did next to the breasthook, drive a few screws through the outwale and into the quarter knee at the stern end to lock the part in place. Clean the excess epoxy with a plastic spreader; the photo shows the outwale being cleaned up.

On the inside, wipe between the spacer blocks with a clean rag soaked in denatured alcohol.

You may stop here for the day if you like, but since you used screws instead of clamps, you may drive onwards if you feel ambitious.

Cutting the inwale to length is probably the closest thing to serious boat carpentry you'll encounter in the whole Tenderly project.

Use a bevel gauge to capture the angle of the inwale notch on the breasthook...

...And transfer the angle to the inwale.

Trim the inwale end with a Japanese pull saw.

Note how we're using the boat as a workbench, with a bit of scrap wood beneath the rail to protect the boat.

(Skerry)

Clamp the inwale into place at the breasthook so that the stern end of the inwale may be fitted.

Slip the inwale into the frame notches and clamp it in place every 6" (150mm) or so.

You want to go to the trouble of clamping the entire rail in a dry-fit so that you get the correct length at the stern.

Allow the extra length of inwale to extend past the quarter knee. Transfer the angle of the quarter knee notch to the underside of the inwale.

Cut the excess material off at this line with a Japanese pull saw. Cut the inwale perhaps a millimeter too long. If you get lucky, the inwale will pop into place with a bit of firm pressure. If not, a quick sand will trim it down to length. Better to cut the inwale a little long than to fill an awkward gap with epoxy!

Check the fit of the inwale and, if it's still a touch too long...

...file away at the end with a rasp or sanding block.

A few tries and we've nailed a perfect fit!

Remove the inwale and mix up a batch of Cell-o-fill thickened epoxy. Brush the epoxy onto the mating surfaces of the spacer blocks, breasthook, and quarter knees.

Slip the forward end of the inwale into the breasthook...

...and then pop in the aft end. You'll need a helper and a few spring clamps to draw the inwale into the spacer blocks.

You can either clamp the inwale in place with a multitude of spring clamps and call it a day, or–if you're feeling ambitious–add the second layer of the outwales!

Coat the mating face of the outer outwale with Cell-o-fill thickened epoxy.

Drive a #8 x 1" (25mm) screw with a finish washer (for better clamping pressure) through the end of the second outwale into the first outwale.

You will be removing this screw once the epoxy cures.

Use a bar clamp to draw the outwale into the hull at the breasthook.

3" (75mm) spring clamps are wide enough to span the sandwich of inwale, spacers, and outwales.

We used a bar clamp as a helper while positioning the inwale exactly atop the spacer blocks. Note the pads of scrap wood protecting the inwales and outwales from being dented by the bar clamp.

Keep adding clamps down the length of the rails, making sure that both inwales and outwales are flush with the top of the #7 panel as you go.

As at the breasthook, you can use a large spring clamp or a bar clamp to span the quarter knee while clamping the outwale.

A spring clamp holds the outer outwale layer against the inner layer where the excess sticks out past the transom.

Put your best epoxy cleaning skills to work and remove every last drip from under the inwales and spacer blocks. Wipe the area down with a rag soaked in denatured alcohol.

Use a few dry foam brushes to clean the excess epoxy between the spacer blocks. Rigorous clean-up is absolutely essential at this stage.

Any leftover epoxy will be difficult and very unpleasant to sand once it has cured.

Don't forget to clean up the undersides of the outwales while you're at it!

Cutting Out the Daggerboard Slot

Time to put a hole in the boat! Flip the hull over and mark a point on the centerline somewhere between the two pairs of tenons that locate the daggerboard trunk.

If you do not plan to sail your Tenderly Dinghy, you may skip this step, and leave the daggerboard trunk sealed from the outside. If you change your mind, you or a subsequent owner can mill out the slot.

With a 1/2" (12mm) drill bit, make a hole at your mark...

...and drill a second hole an inch (25mm) or so forward or behind it. Connect the holes with a keyhole saw to make a slot.

Cautious work with the keyhole saw will work well to open the slot the full length of the trunk.

A shortcut is to fit your router with a 1/2" (12mm) "flush-trim" bit. Your goal is to cut a slot in the hull bottom with the bit bearing riding against the inside of the daggerboard trunk. Set your bit about 1" (25mm) deep. This is way deeper than required to cut through the plywood bottom, but it will zip off any epoxy that may have squeezed out when you bonded the trunk to the hull.

A bottom-bearing flush-trim bit.

When you've completed the cutout, swap a 1/4" (6mm) roundover bit into the router...

...and round off the edge of the cutout.

You'll be installing the skeg next. You can use the thickened epoxy from that project to fill in any gaps between the trunk and hull bottom that you may have exposed.

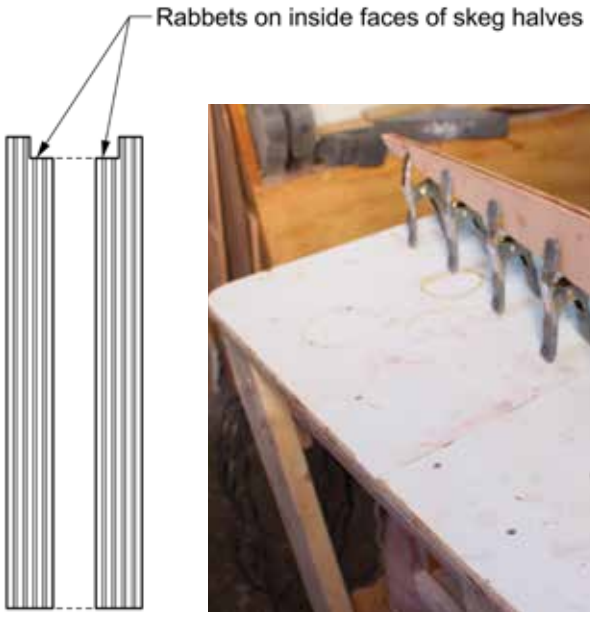
Installing the Skeg

The long skeg contributes to Tenderly's tracking and well-mannered towing. It's assembled from two layers of 9mm (3/8") okoume. Lay the halves on your workbench and note the rabbeted edges: these mark the inside faces of the skeg halves.

When joined, the two rabbets will form a groove that will help you locate and center the skeg on the hull bottom.

Slather the skeg mating surfaces with wood-flour thickened epoxy and press the halves together.

Clamp the parts together and let the epoxy cure for 24 hours.

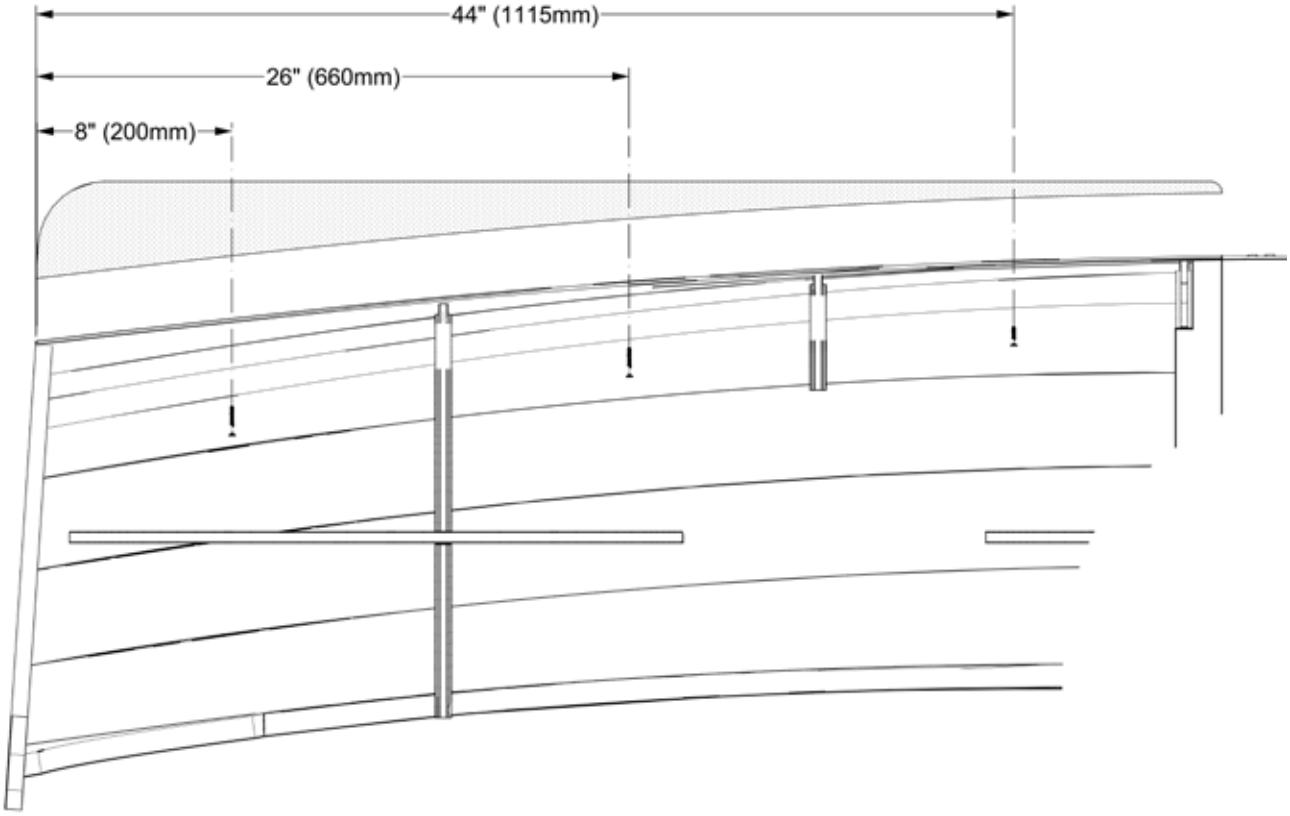


The skeg runs from just aft of the dagger-board all the way back to the transom. Sand the hull bottom where the skeg will mount with 120-grit sandpaper. This will give the epoxy a stronger bond.

Dry-fit the skeg to the hull bottom. The aft end of the skeg should sit flush with the transom. Note any gaps between the skeg and the hull...

...and shape the skeg with a rasp until you have a seamless fit.

Apply a 3/8" (9mm) roundover to the exterior corners of the skeg with a router. (Leave the mating edges sharp.)



You'll use a few screws to hold the skeg rigidly in place while the epoxy cures.

The diagram above shows the locations of the screws driven through the bottom of the hull.

Note that you'll use two 1-1/4" (32mm) flat-head wood screws, and one 3/4" (18mm) screw for the shallower forward end of the skeg.

Drill 1/16" (2mm) pilot holes through the hull bottom on your marks, from the outside.

Fit the skeg to the hull bottom, and line it up straight with the hull centerline. It should be perfectly plumb (vertical).

Have a helper hold the skeg plumb and straight. Crawl under the hull with a #8 (3mm) countersinking drill bit chucked into your drill.

Drill up through the bottom into the skeg, countersinking each hole slightly.

Apply epoxy thickened with wood flour in a generous bead along the rabbeted edge.

Position the skeg on the bottom of the hull and have a helper hang on for dear life.

Drive the screws into the skeg through the hull bottom. Start at the aft end and work your way forward, checking alignment as you go.

The screws lock the skeg in place.

Apply a large bead of peanut-butter-consistency epoxy where the skeg meets the hull...

...And smooth the epoxy with a 1" (25mm) diameter filleting tool.

Skegs can get banged up, so this needs to be a pretty strong epoxy fillet. As always...clean up the excess!

Use any leftover epoxy to fill the mortise and tenon joints of the daggerboard trunk.

Fill any gaps between the hull bottom and the trunk at the daggerboard cutout.

Allow this epoxy to cure thoroughly.

Shaping the Rails

Shaping the outwales begins with trimming them off at the stem and transom. Use a Japanese pull saw to remove excess rail material quickly.

Rails always look best with a nice taper sweeping towards the end.

Use a simple pattern to ensure that port and starboard sides are identical!

(Skerry)

Rough out the shape with a rasp, sander, or chisel.

(Annapolis Wherry Tandem)

Finish it off with a block plane and sandpaper. A smooth, gradual taper is what you're after.

The stern ends of the outwales look nice with a simple radius curve. In this case, the base of a plastic cup looks like the perfect template.

We cut a few rough facets with a pull saw.

Then dressed up the shape with a sharp block plane, rasp, and sandpaper.

There are a few ways to clean up the tops of the outwales and inwales. On one end of the spectrum, the sharp block plane is a satisfying way to dress these faces, but time-consuming.

At the other end, there's the beltsander - an unwieldy, high powered tool capable of removing material quickly. Very often TOO quickly.

We opted for the middle ground and smoothed our rails with a random orbital sander fitted with 80-grit and 120-grit sandpaper.

Dress the ends of the wale beads with a small rasp or chisel and smooth the edges with 120-grit sandpaper.

Use a router with a 1/4" or 3/8" (6mm or 9mm) round-over bit to dress the inwales.

The hull frames prevent a continuous sweep along the rail with the router. Use a bit of sandpaper to smooth the intersection between rail and frame.

You can use the router to round-over the outwales, too, but do so carefully! The grain is in tension here and apt to start a "running splinter," which is aggravating at best.

To avoid picking up a splinter, round the edges in several passes, lowering the cutting bit a little with each pass.

We have often abandoned the router entirely and simply rounded the edges of outwales with a sander.

Coating the Interior and Exterior with Epoxy

When you've finished shaping the rails it's time to add the final coats of epoxy all over the boat.

You'll need to "fill the weave" of the fiberglass cloth in the bottom and fully coat every exposed wooden surface.

A foam roller makes quick work of the panels between the frames, but here we've chosen to use a regular chip brush to dispense the unthickened epoxy.

Coat the outwales and inwales with a disposable chip brush.

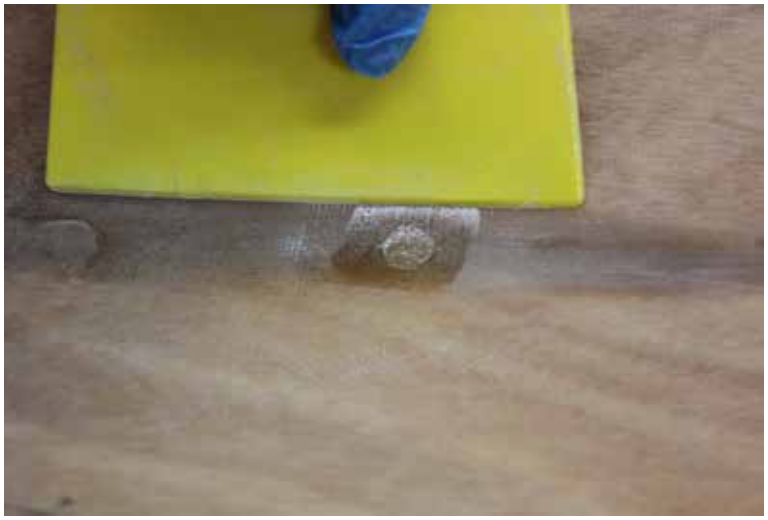
Don't forget the top of the daggerboard trunk.

Coat the undersides of the quarter knees, breasthook, and seat supports!

If you leave the boat upside down for storage, water that collects here will work its way into the wood unless these areas are thoroughly protected.

Using some leftover thickened epoxy, deposit a few drops atop the countersunk screws holding the skeg...

...and clean up the excess with a plastic spreader.



You'll need to coat the entire hull exterior with at least two more coats of unthickened epoxy. This will fill the weave of the fiberglass and seal the bare wood on the skeg, sides, and transom. With the hull upside down, now is a good time to get started.

You can apply coats within 6-8 hours of each other without sanding between coats. Use a short-nap foam roller...

...or a plastic spreader to quickly cover large areas of the hull with unthickened epoxy.

Use a disposable chip brush for the details, such as the underside of the outwales and the panel edges.

Once your final coat of epoxy has cured fully, sand the hull exterior smooth with 120-grit sandpaper. If you plan on finishing the hull "bright" (varnished), you'll need to sand the hull again with 220-grit sandpaper.

A finished surface will have a uniform grey-white color, a matte finish, and no little glossy pits.

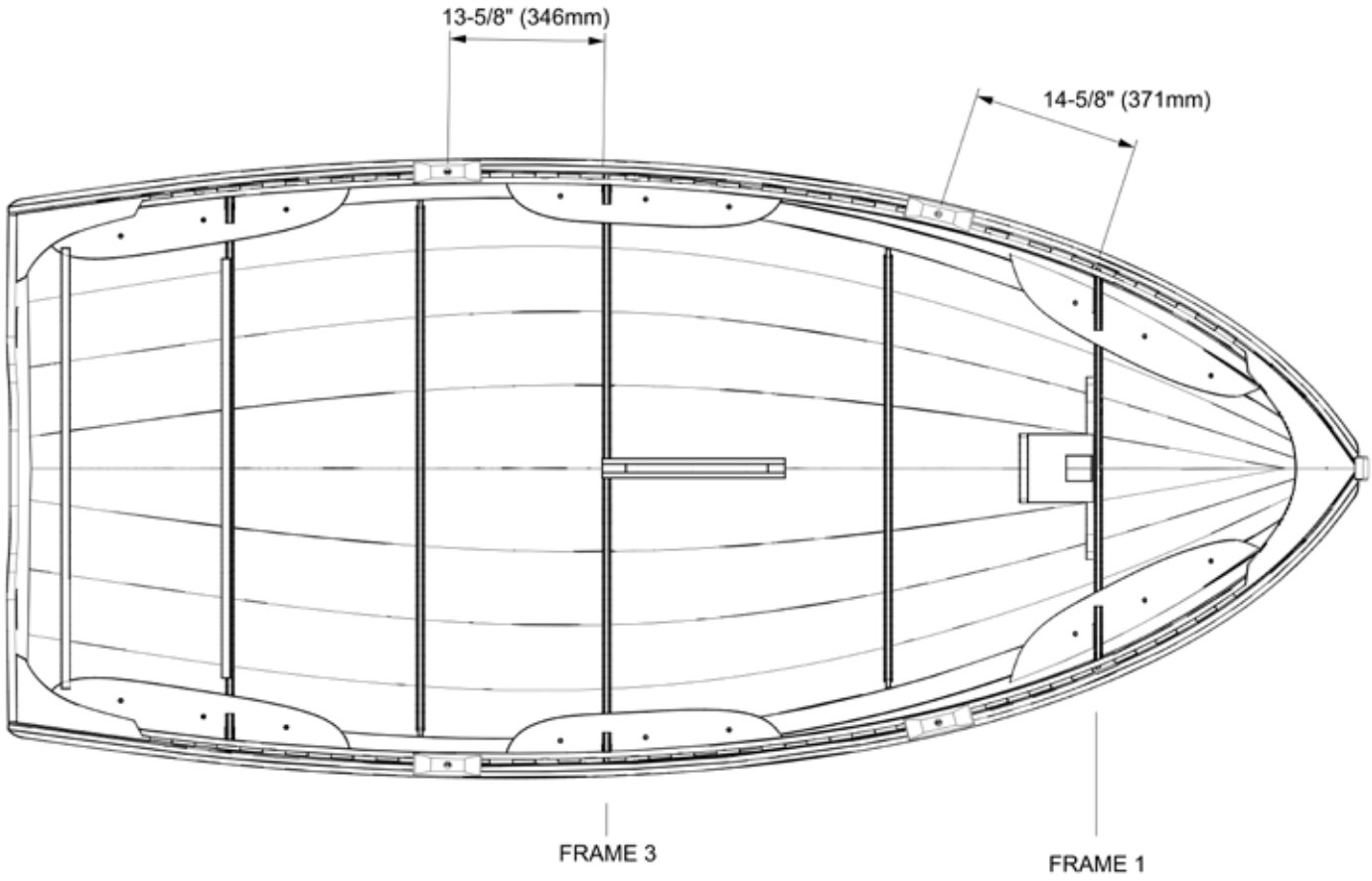
Use a foam block sander to smooth the areas where the random orbital won't fit...

...and tackle the lap joints with a block of scrap wood wrapped in sandpaper.

Even the most patient and skilled builders will sand through the epoxy and into bare wood in places. This is especially easy to do at the lap joints and panel edges. Simply re-coat the offending areas with epoxy and sand again! Repeat until the hull is smooth and no bare spots remain.

Fitting the Oarlock Risers

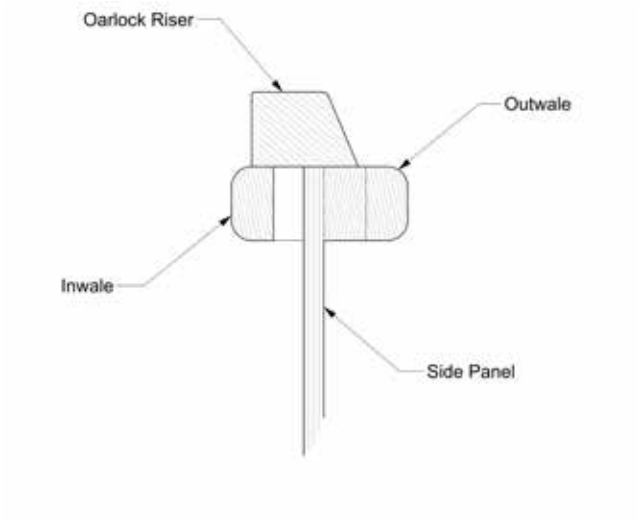
Oarlock risers aren't just for looks; they're necessary to elevate the oars above the inwales and outwales to prevent interference while rowing. The kit includes a single pair, to be installed just aft of frame 3. If you'll often have passengers aboard, you'll want to add another station up forward. This allows the oarsman to sit in the bow and the passenger(s) to sit aft, keeping the boat level on her lines.



Using the diagram above, mark the center locations of the risers on the wales.

Mark a centerline on each oarlock riser.

Dry-fit the oarlock risers atop the wales by lining up the center marks.



The more vertical of the two oarlock riser sides should face inboard, or towards the center of the boat.

Twist in the wales may cause the risers to not sit perfectly flat atop the wales.

If this is the case, shave the bottom with a block plane or sanding block until the risers sit flat on the wales without any gaps at the corners.

Brush epoxy thickened with Cell-o-fill on the bottoms of the oarlock risers.

Secure the risers on the marks with a few spring clamps...

...and wipe up the excess epoxy with a clean rag soaked in denatured alcohol.

Once the epoxy has cured, soften the hard edges of the risers with a bit of 120-grit sandpaper.

Mask off the perimeter with masking tape...

...and coat the risers with unthickened epoxy.

Part 2: Seats, Floorboards, and Finishing

Preparing the Seats and Floorboards

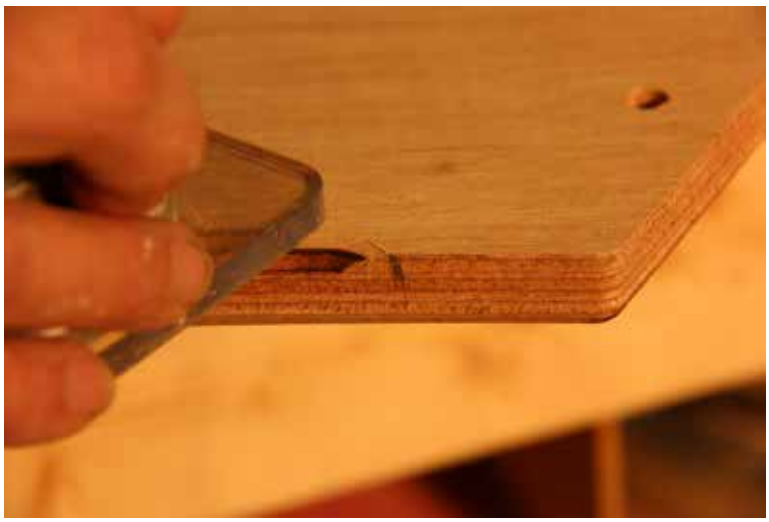
As with any other part of the boat, the seats and floorboards must be dressed, coated with epoxy, sanded, and finished with either paint or varnish. Since they're fastened to the boat with nuts and bolts and screws, most of the work can be done "on the bench."

We chose to round the edges of the seats over with a 3/8" (9mm) router bit, and suggest you do the same. The round-over gives the seats a finished look and is easier on your shins when moving about in the boat.

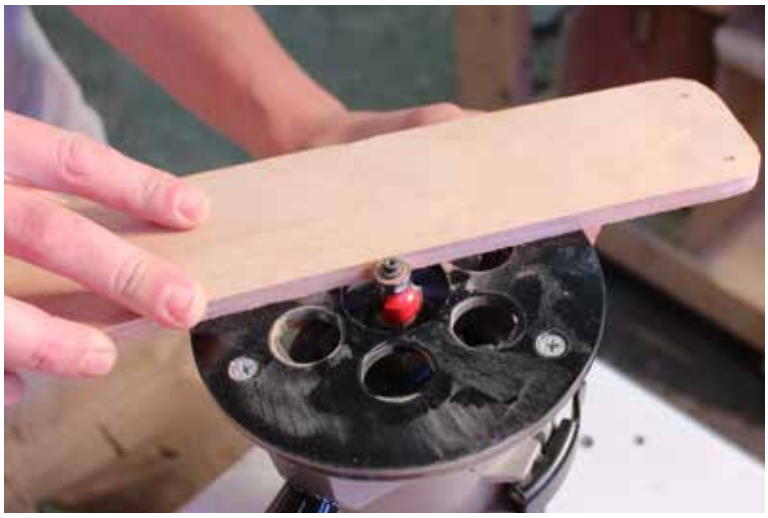
But before you take the router to the seat edges...

...dry-fit the seats atop the seat supports and mark where the two meet. Your round-overs will stop wherever the seat makes contact with a seat support.

Here's a close-up of the round-over stopped where the seats rests on the seat support. Notice the pencil mark.



The upper edges of the floorboards are given a 1/4" (6mm) round-over while you have the router handy.



Dry-fit the floorboards in the hull, starting at the center and working outwards.

Grab a handful of #8 x 1" (25mm) oval head wood screws. Line up the pre-drilled pilot holes at the aft end of the center floorboards with the center of frame #5.

Drill a shallow 1/8" (3mm) hole in the frame for each of the screws.

Drive two screws through the holes into the frame. No need for epoxy or sealant yet, as this is just a trial fit.

Work your way forward, drilling holes in the frames and driving screws until all of the floorboards are fastened to the frames.

CNC-cut tabs in the kits will ensure perfect spacing between the floorboards.

When you're satisfied with the dry fit of the floorboards, pull out all the screws and remove the floorboards.

The holes in the frames are an invitation to rot. Mix up unthickened epoxy and fill each of the screw holes in the frames with epoxy. Though you'll be installing the floorboard screws with silicone sealant, the epoxy provides one extra level of rot protection in this vulnerable area of the boat.

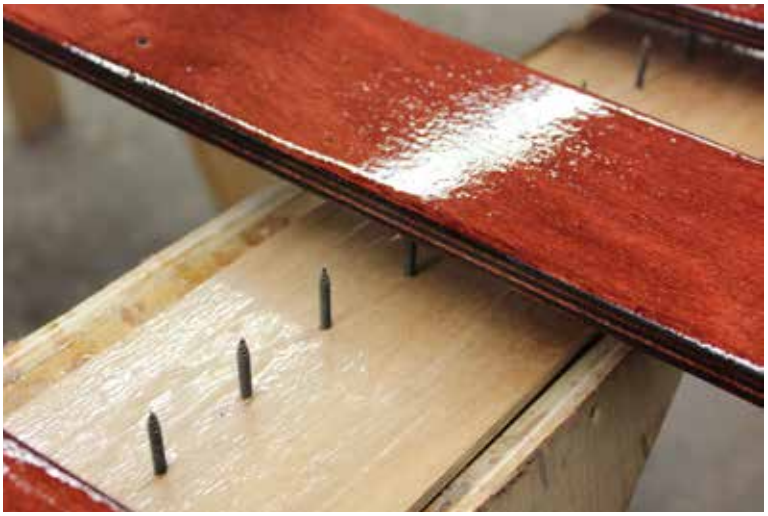
Once the epoxy has cured, touch each hole again with a drill bit in a drill to clear any excess epoxy.

Like the rest of the boat, the floorboards must be fully coated in epoxy.

You'll notice that our floorboards have suddenly taken on a deep red hue. This is no trick of the camera - we chose to stain the seats and floorboards to contrast the varnished okoume interior. We work with the alcohol-based Behlen Solar-Lux stain. This product is available at clcboats.com, along with detailed instructions for its use.

WARNING: *Not just any stain works with epoxy. It needs to be water- or alcohol-based, and you should try coating a stained test panel with epoxy before attempting to use stains. Only bare wood may be stained.*

Floorboards and seats require a minimum of two coats of unthickened epoxy to seal the wood.

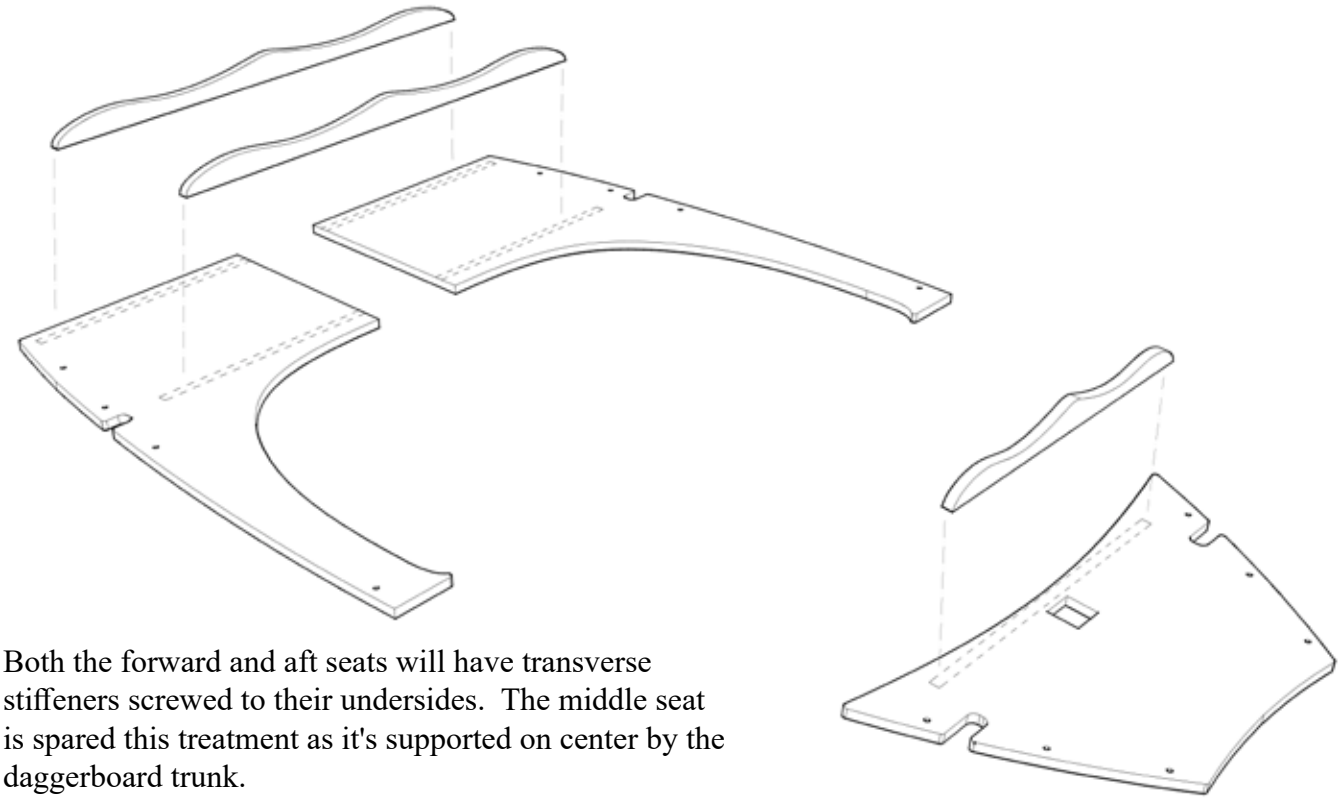


Here's an old boatbuilder's trick for laying out epoxy on both sides of a part: Drive a few dozen drywall screws through two pieces of scrap ply and place them, as shown, on top of your sawhorses. You'll apply epoxy to one face, first, then flip the part and rest it on the screw tips. The tiny divots left by the screw tips will disappear with the next coat of epoxy.

Use the same screws-in-board technique to coat both faces of the seats simultaneously. We used a short-nap foam roller.

When the final coat of epoxy has cured, sand the parts smooth. Start with 120-grit and work your way to 220-grit sandpaper if you plan on varnishing. Use a random orbital sander hooked up to a dust-collecting vacuum for the flat faces, and sand the edges gently by hand.

Fabricating the Seat Stiffeners

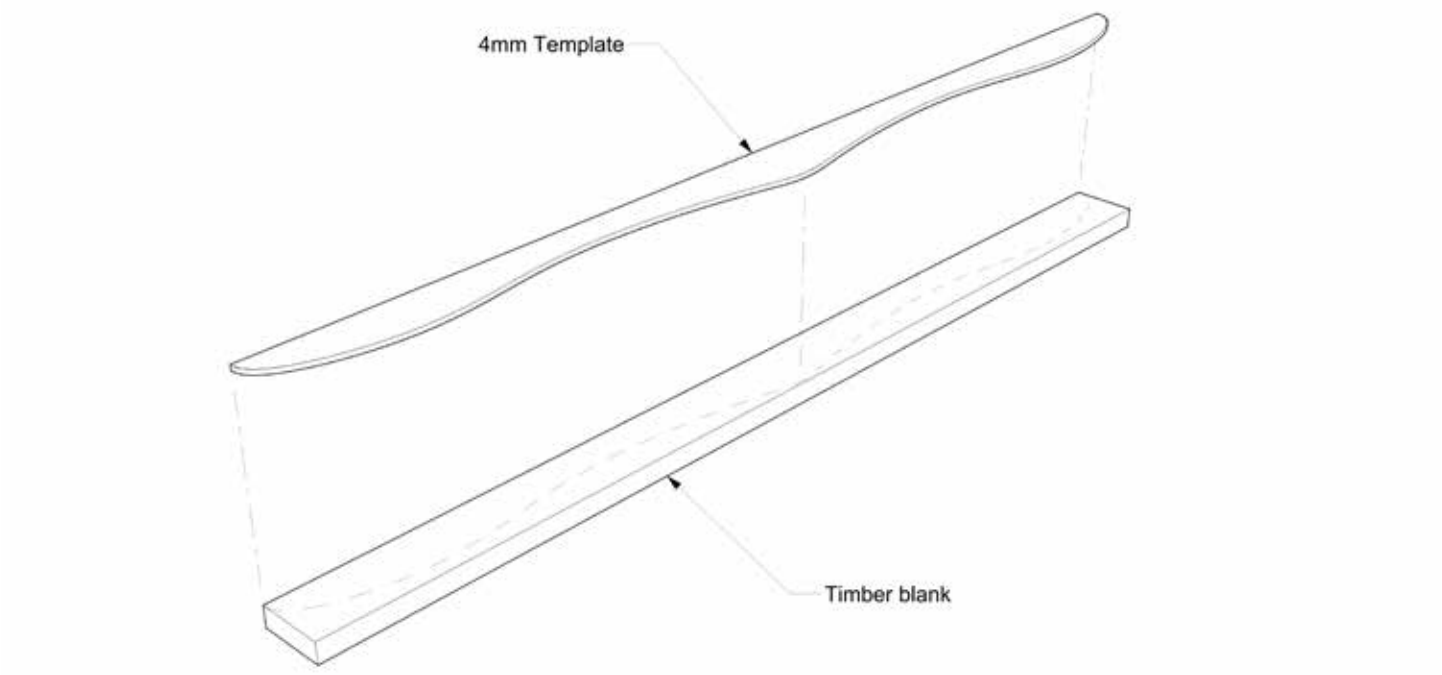


Both the forward and aft seats will have transverse stiffeners screwed to their undersides. The middle seat is spared this treatment as it's supported on center by the daggerboard trunk.

Seat stiffeners are cut from three pieces of 2-1/4" x 3/4" (57mm x 18mm) timber.

The seat stiffeners are structural, but also decorative. We cut a nice classical ogee shape into ours. You can improvise your own decorative shape; just don't make them so thin that the seat breaks when you sit on it! The minimum height is 1-1/8" (28mm) to preserve structural rigidity.

If you aren't feeling artistic, kit builders received three CNC-cut templates to shape the stiffeners; plans builders have full-sized patterns. If you're using the templates, place them atop the timber blanks and trace the outline.



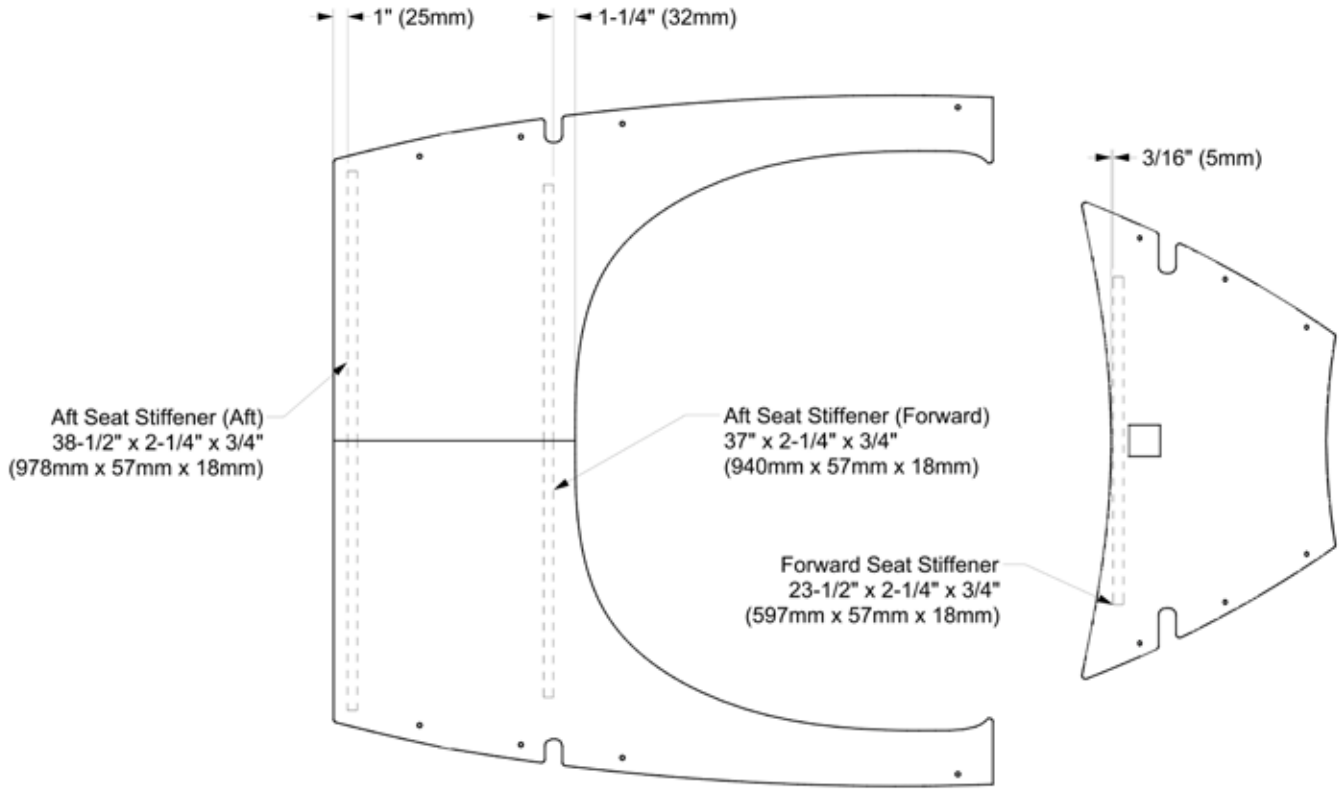
Cut the blanks to shape with a bandsaw or sabersaw.

Clean them up with a sander. We chose to dress the exposed edges with a 3/8" (9mm) round-over router bit, and suggest you do the same.

Coat the seat stiffeners with unthickened epoxy. Rather than attempting to balance the stiffeners on screw tips while coating, drive the screws about 1/2" (12mm) into the stiffeners to support them while you brush on the epoxy.

Apply at least two coats of unthickened epoxy to the seat stiffeners and, once the epoxy has cured, sand them smooth.

Installing the Seat Stiffeners

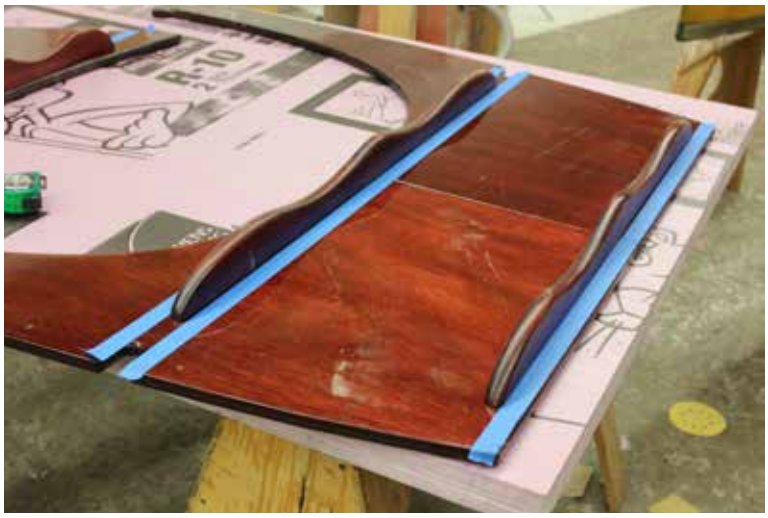


Use the diagram to identify and locate the seat stiffeners on the forward and aft seats.

Position the seat stiffeners on the undersides of the seats, and mark their outlines. We used a few strips of masking tape, but a pencil will do as well.

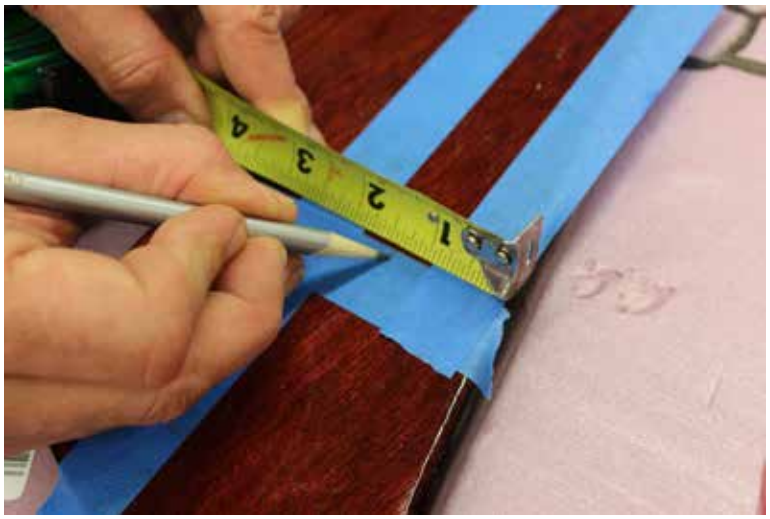
In kits, holes have been drilled for you in the seats for the seat stiffener fasteners. This makes it easy to locate the seat stiffeners correctly. Thus kit builders may skip the next two pages.

Plans builders will find the seat stiffener locations in the full-sized patterns, easy enough to transfer across.



Locate the forward seat support in a similar fashion.

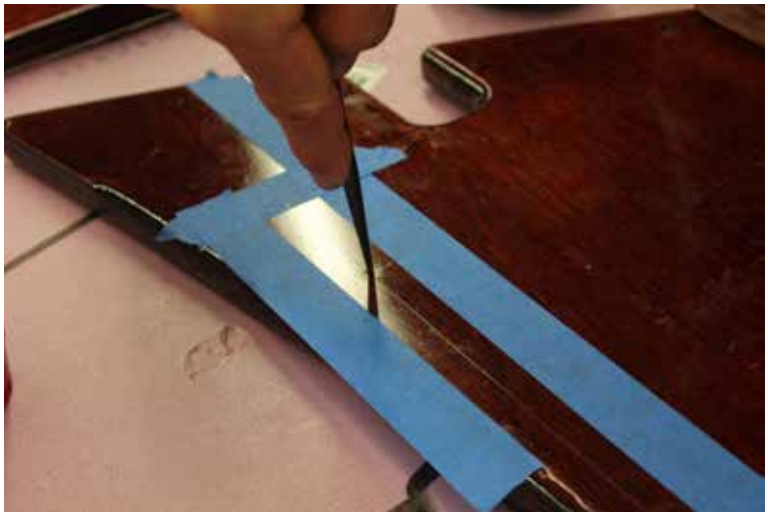
Mark the centers of the stiffeners on either side of the seat...



...and strike a centerline between the points.

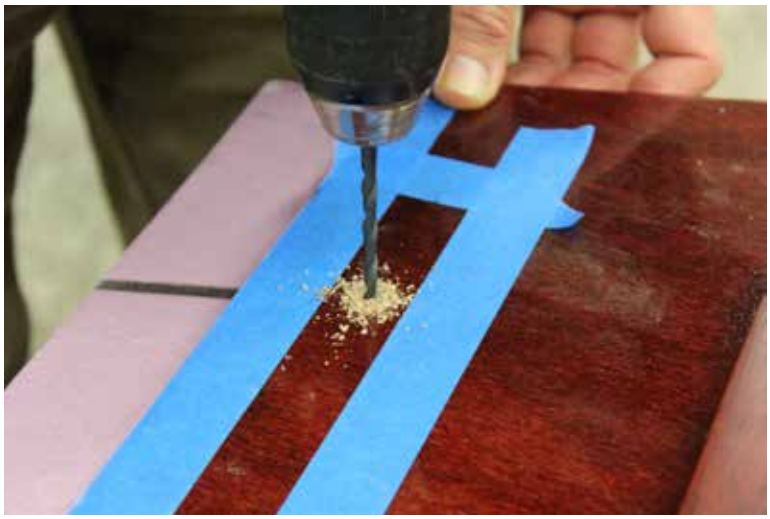
The seat stiffeners are screwed to the seats, WITHOUT epoxy, to allow you to disassemble the seats in the future for refinishing.

Four screws for the forward stiffener, and six screws for each aft stiffener. Use an awl or a punch to mark out the evenly-spaced screw locations on the seats.



Use a 1/8" (3mm) bit to drill pilot holes through the seats.

(These holes have been drilled for kit builders by the CNC machine.)



Spread a bead of clear silicone sealant on the mating face of the forward stiffener...

...and clamp the stiffener to the forward seat.

Now flip the seat assembly and drill pilot holes into the seat stiffener from the top down.

Squeeze a bit of silicone sealant into the screw holes.

Drive #8 x 1-1/2" (38mm) stainless steel flathead wood screws through finish washers into the seat and stiffener assembly.

Compared to screwheads countersunk into the seats, water is much less likely to get under finish washers and into the wood.

Now move on to the aft seat. Trim the masking tape between the two halves.

Coat the mating face of the two stiffeners with silicone sealant and clamp them to one of the rear seat halves.

Fasten the first seat half to the stiffeners with screws, then clamp the second half in place.

Drill pilot holes in the stiffeners...

...and drive the fasteners home. Don't forget to add a dab of silicone sealant to each hole before you screw the parts together!

Set the seats aside where they won't get scratched.

Finishing the Interior

Save for the bolt-in parts, your Tenderly is now completely assembled. It's all over but the sanding!

For a small boat, there's quite a bit of surface area to sand in the interior. This is a good "pizza party" job for you and a few helpers. Use a random orbital sander hooked up to a shop vac for the broader, accessible surfaces. Begin sanding with 120-grit sandpaper, and finish with 220-grit on any surface that is to be varnished. When (not if) you cut through the epoxy and into bare wood, patiently re-coat with epoxy and sand again once cured.

You can sand the fillets smooth by hand with a bit of 120-grit sandpaper, and use a foam sanding block to flatten the areas where the random orbital sander won't fit.

Surfaces prepped for varnish should have a uniform cloudy matte white texture, and be smooth to the touch. Don't worry, the cloudy surfaces will turn perfectly clear again when varnish is applied!

With the sanding complete, wipe down the entire interior with denatured alcohol and a few clean rags. Repeat this process several times with fresh rags to be sure you've removed all contaminants and debris.

If you're applying both paint and varnish to the interior, you'll need to mask off the separate sections and apply your finish in multiple stages. Use solvent-proof "Fine-Line" tape to strike a clean edge, and supplement the masking with regular masking tape to increase the drip buffer zone.

Use only a marine-grade varnish with UV stability, such as Interlux Schooner Varnish. If you choose to apply a satin varnish, such as Interlux Goldspar, do so only after applying a few base coats of marine-grade gloss, as the satin contains no UV protection.

Apply the varnish in very thin coats. Thick coats will run and sag. Start in the center and work your way out and up. Here, we're using one foam brush to apply the varnish and a second dry brush to "tip out" the varnish in the narrow bow section.

A small "solder" brush is a useful tool for applying varnish between the inwale spacers.

Varnish the rails last.

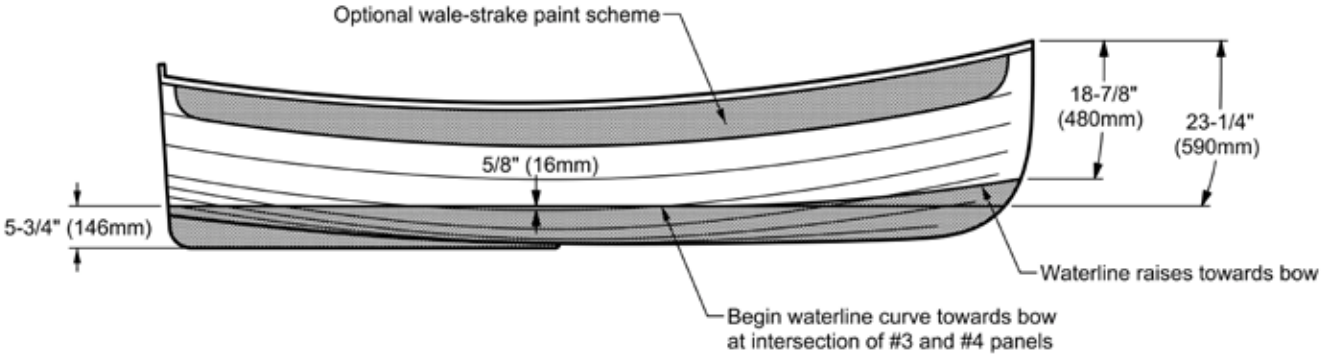
How many coats of varnish? If you're using a good marine-grade varnish such as Interlux Schooner, we recommend a minimum of three and a maximum of five. Fewer than three and you aren't getting the UV protection the epoxy needs, or a good-looking deep gloss.

More than five and you're obsessing. Our demo model Tenderlys got three coats of gloss and two coats of satin on the interior.

While the shop is clean and the varnish open, apply a few coats of varnish to the floorboards and seats.

We mixed Interlux's nonskid powder into the last coat of varnish on the floorboards for safe footing while aboard. (You'd think this would make the varnish cloudy, but it looks amazingly good.)

Finishing the Exterior



If you anticipate keeping your Tenderly in the water for more than a week at a time, you'll want to protect the bottom below the waterline with herbicidal anti-fouling paint. Such paints should be applied directly to the sanded epoxy on the hull bottom.

Or perhaps the boat won't spend more than a few days at a time in the water, but you'd like to paint the bottom to contrast the varnished topsides, as we did. Either way, you'll need to strike a waterline. The diagram shows the recommended scheme for locating the proper waterline. Note that the upward sweep of the waterline at the bow is just for looks.

Following the dimensions above, mark the middle and ends of the waterline along the hull. Beg or borrow a laser level. Prop the hull up perfectly level to the floor.

Project the laser onto the hull. Adjust the laser level until the line connects the marks you made at the transom and at the middle of the hull, and transfer the line onto the hull with a pencil.

Use only a high quality, solvent-proof tape, such as 3M's "FineLine," to mask the waterline. Pull an arm's length of tape from the roll with one hand, and use the other to stick the tape along the marks. Gently sweep the tape up towards the marks at the bow, and sight down the length of the tape to check for fairness. If you see any dips or wobbles, remove the tape and try again. No matter how well finished the rest of the boat is, a wavy waterline will bring the old salts to tears.

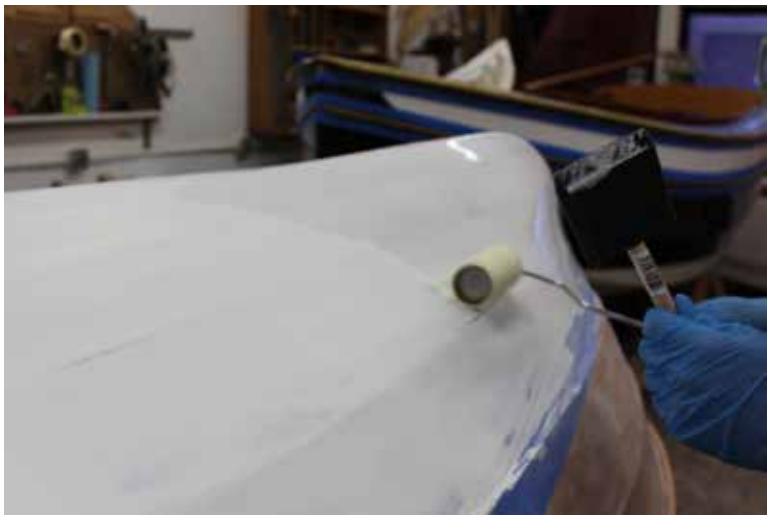
If you're using herbicidal bottom paint, you should apply the paint directly over the sanded epoxy bottom.

If you're painting with a marine polyurethane, you'll need to prep the surface with a few coats of high-quality enamel primer to improve adhesion and gloss.

You can use a foam brush to paint the skeg...

...and a short-nap foam roller along the hull bottom.

Roll the paint on in approximately 3 sq.ft (1 sq.m) sections....



...and use a dry foam brush to "tip" out the bubbles by brushing lightly perpendicular to the direction you rolled. Always brush from a dry, unpainted surface onto the freshly-laid paint. Starting your stroke on the wet paint will inevitably leave a brush mark.

See our website, ***clcboats.com***, for more painting and varnishing tips and tricks.

If you're applying primer, sand between coats with 220-grit sandpaper.

If you're applying bottom paint, two coats should be plenty, and they rarely require sanding between coats.

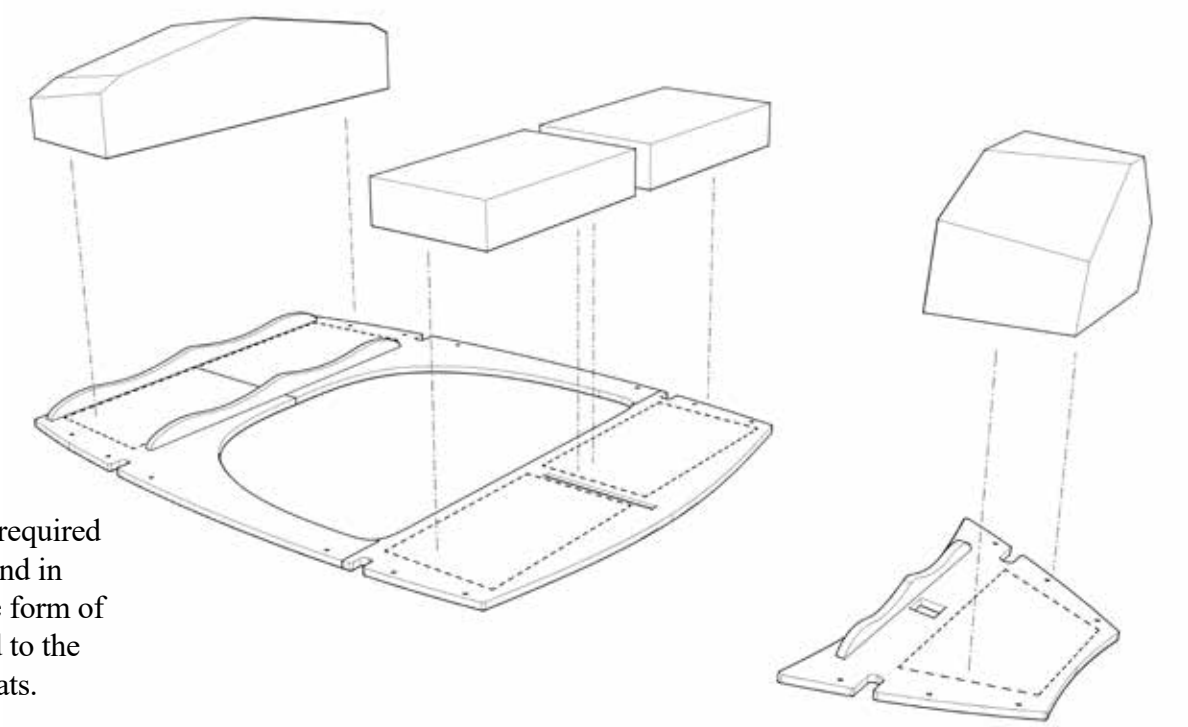
If you're applying topside paint, such as Interlux Brightsides, you'll want between three to six coats over two coats of primer. Rough up the surface between coats with a Scotch Brite pad. Before the final coat of paint, use 400-grit wet-sanding paper to really flatten the finish.

After your final coat of bottom paint has fully cured, mask the paint edge to prep for the topsides paint or varnish with Fine Line tape.

To insure complete coverage, set the masking tape a fingernail's thickness back from the edge of the paint, as shown here:

You're ready to paint or varnish the topsides. As always, prep the surfaces by wiping them down with denatured alcohol and clean rags.

Fabricating the Flotation Blocks

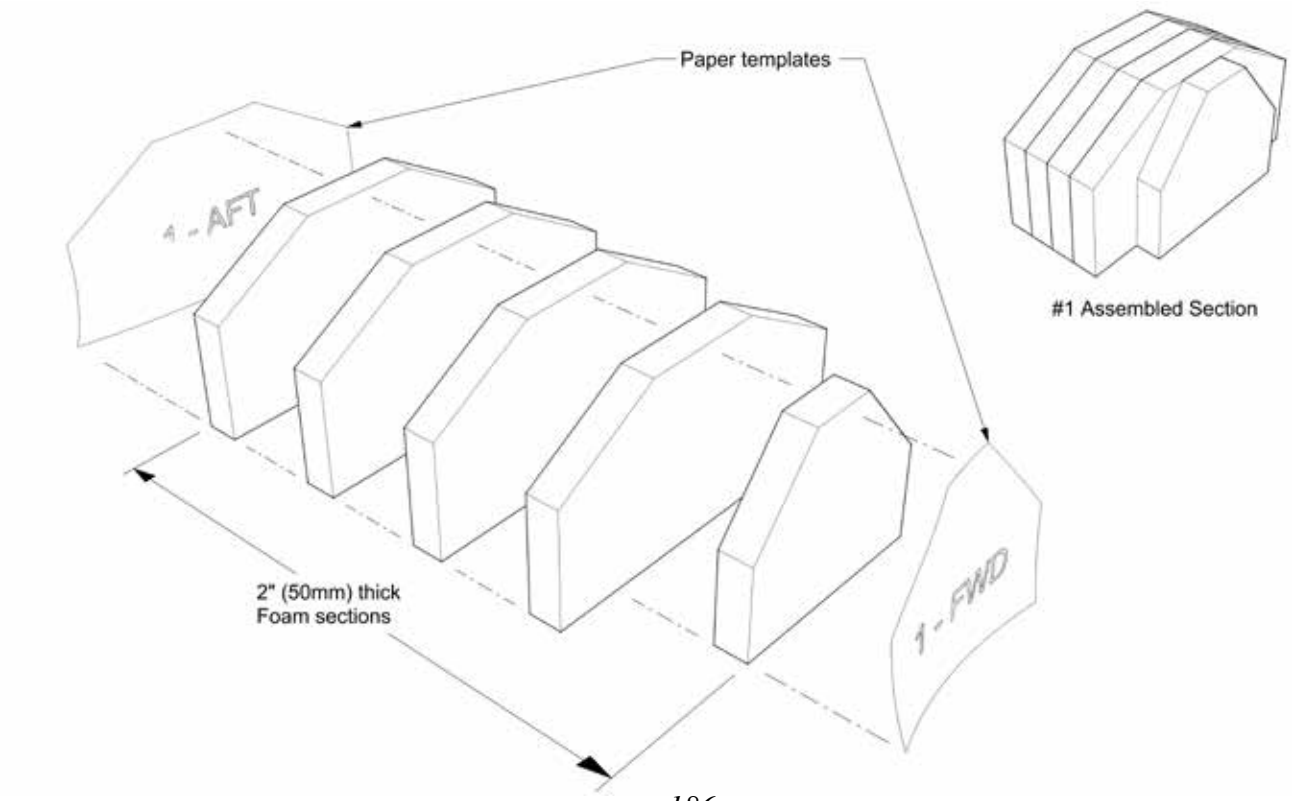


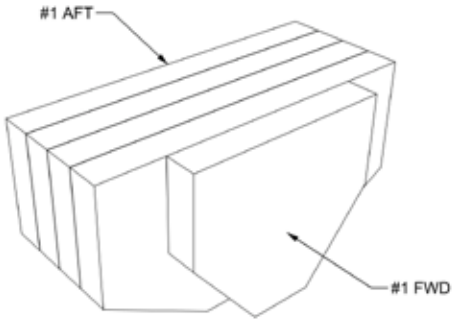
Positive flotation is required on any small boat, and in Tenderly it takes the form of foam blocks bonded to the undersides of the seats.

This extra flotation will make it possible to bail out the hull in the event of swamping, and it will keep the hull stable when filled with water.

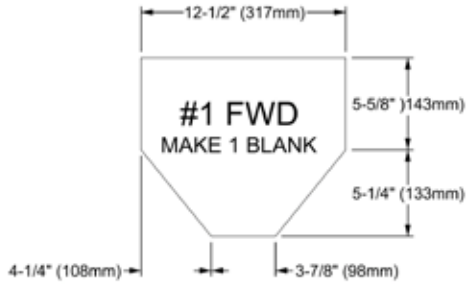
Because the foam is bulky and difficult to ship, yet inexpensive and available at any home center, we do not include this foam in the kits. The foam blocks are fabricated from stacked layers of 2" (50mm) thick blue or pink insulation foam. It's cheap, easy to shape, and doesn't melt or deform when glued with epoxy.

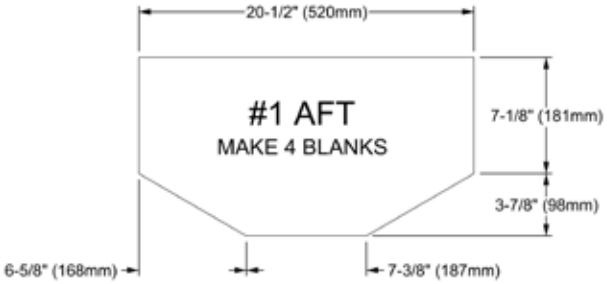
Paper templates for cutting the foam should be made from the diagrams on the following page.

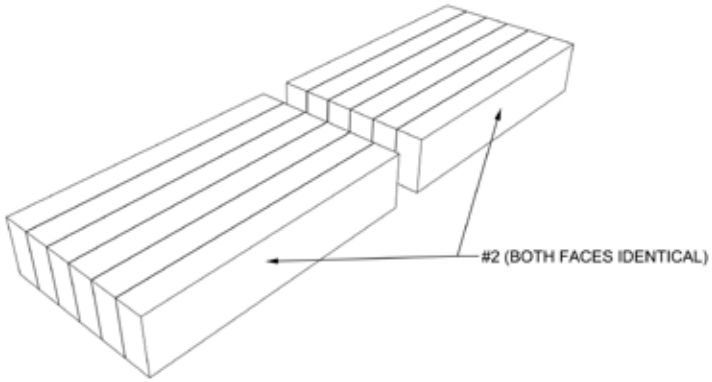




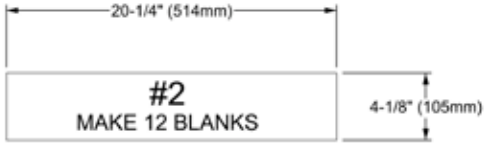
#1 - UNDER FORWARD SEAT

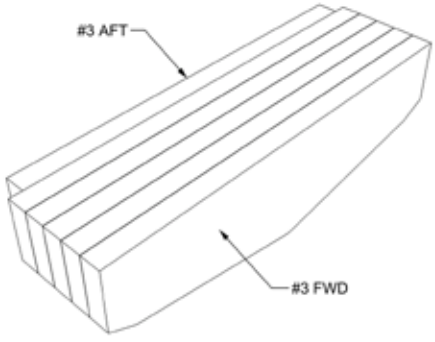




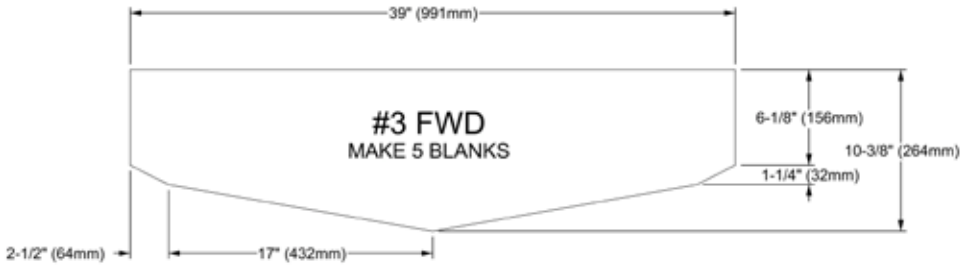


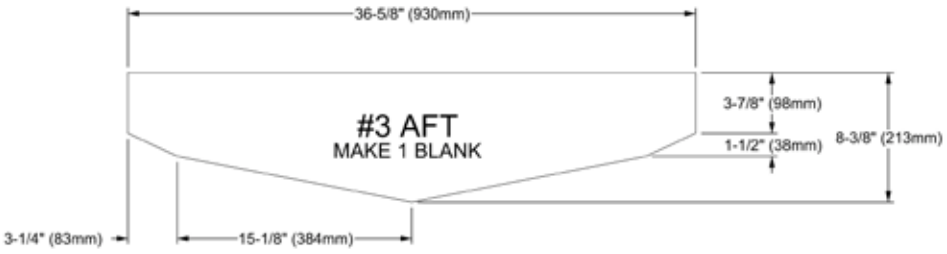
#2 - UNDER MIDDLE SEAT





#3 - UNDER AFT SEAT

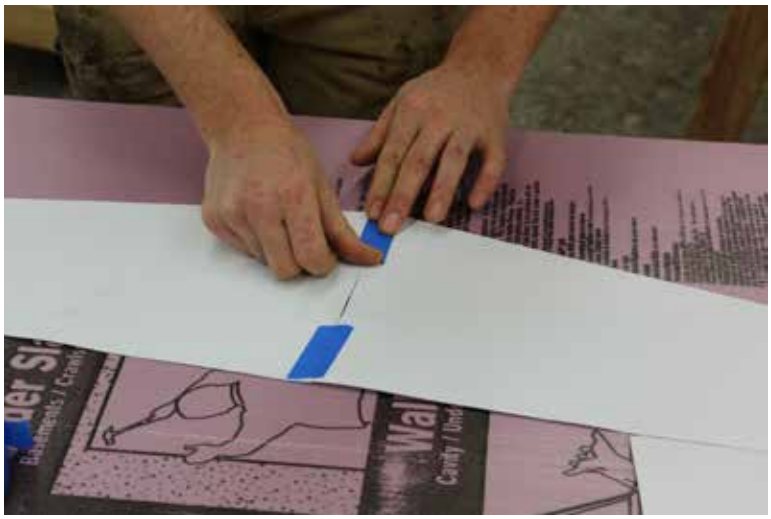




Use the diagram to cut templates (paper or cardboard) for the foam sections. This layout assumes the use of 2" (50mm) thick foam. If you're using a different thickness, adjust the number of blanks as necessary.

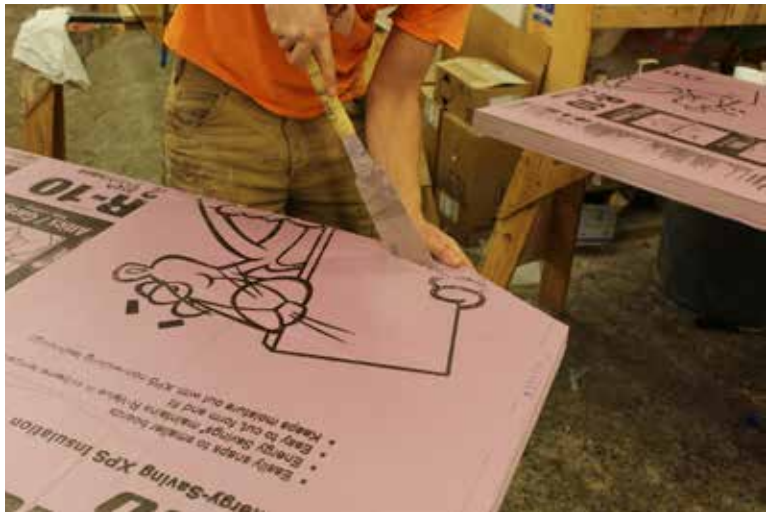
Lay out your foam on a few sawhorses and cut out the templates.

Join the template halves with a few pieces of tape...



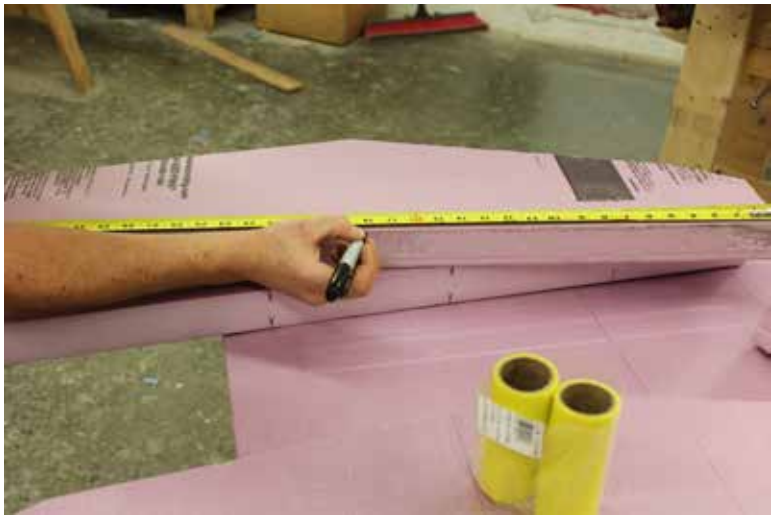
...and place them on the foam. Trace the outline of the pattern with an ink marker.

Use a sharp handsaw to cut the foam along the lines. We used a Japanese pull-saw.



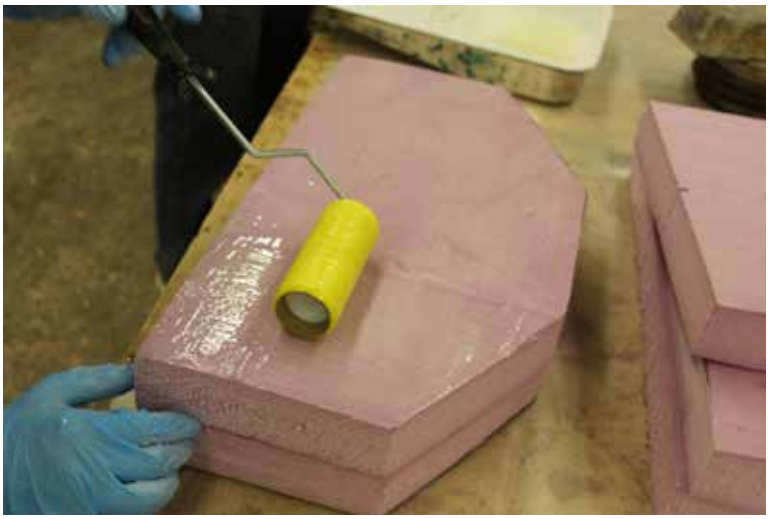
For the polygon shapes of #1 and #3 sections, you may find it easier to cut the foam into appropriately-sized rectangles first, and then cut the angles.

Mark the centers of each section along the top edge to aid in alignment when you glue the blanks together.



Stack the parts for a dry fit. Here's the #1 block, ready for gluing.

Mix up a batch of epoxy thickened to thin gravy consistency with Cell-o-fill. Use a foam roller to coat the mating faces.



Use the center marks to align the sections.

It doesn't take much clamping pressure. A couple of bricks or a heavy tool box will do atop each stack of foam.

Allow the epoxy to cure for 24 hours.

When the epoxy has cured, start shaping the blocks with a hand saw. We found a traditional cross-cut saw worked best for the deep cuts.

Cut the facets on the #1 and #3 blocks with the hand saw. You can begin to see how the blocks will fit neatly beneath Tenderly's seats.

Use a random orbital sander and 80-grit sandpaper to finish shaping and smoothing the flotation blocks.

Fit the foam blocks in their respective compartments. They should sit flush with the tops of the seat supports without making contact with the hull or frames.

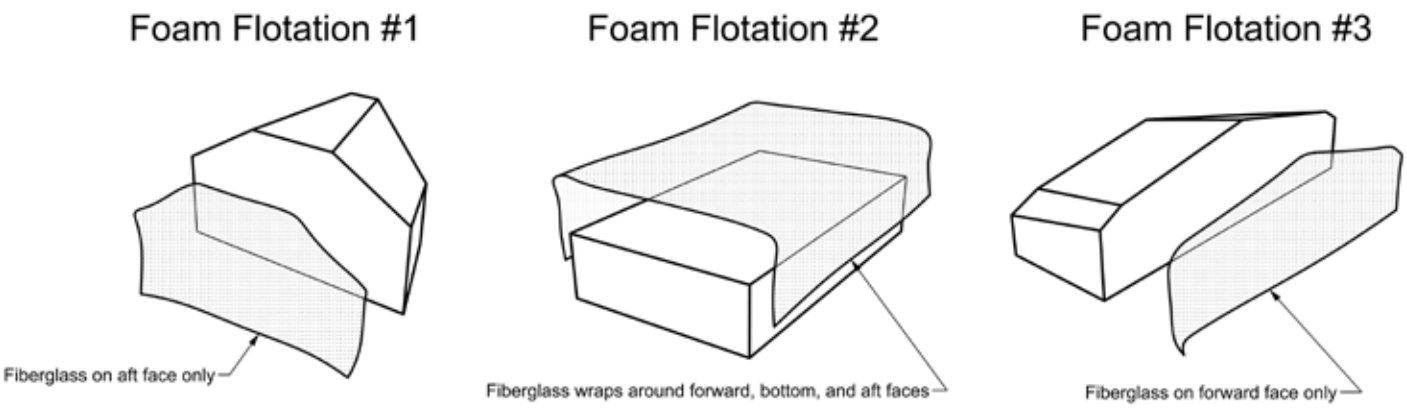
Dry-fitting the #1 block ahead of frame #1:

When you're satisfied with the rough shape, finish-sand the blocks with 120-grit sandpaper. Be sure to round the corners (save for those that contact the seat bottoms), as rounded corners hold up better.

Mix up a batch of unthickened epoxy and coat the foam blocks. Allow the epoxy to seep into the seams between the sections.

If the foam blocks aren't as smooth as you like, you can fair them with epoxy putty. Mix wood flour into the epoxy and apply it with a plastic spreader.

The epoxy coating alone makes the foam blocks reasonably durable and ding-proof. Given how hard our demo boats are used, we elected to sheathe the flotation blocks with fiberglass. This added time and weight, but the flotation blocks are much more rugged as a result.



Here's how we sheathed the flotation foam in fiberglass cloth and epoxy.

Cut the fiberglass cloth a little wider than necessary. Place the rectangular #2 blocks, upside-down on a workbench covered in sheet plastic.

Drape the fiberglass over the parts and smooth it out with your hands.

Saturate the fiberglass with a coat of unthickened epoxy.

Here we're positioning fiberglass on the aft face of the #1 block:

Here's the fiberglass being bonded to the forward face of the #3 block:

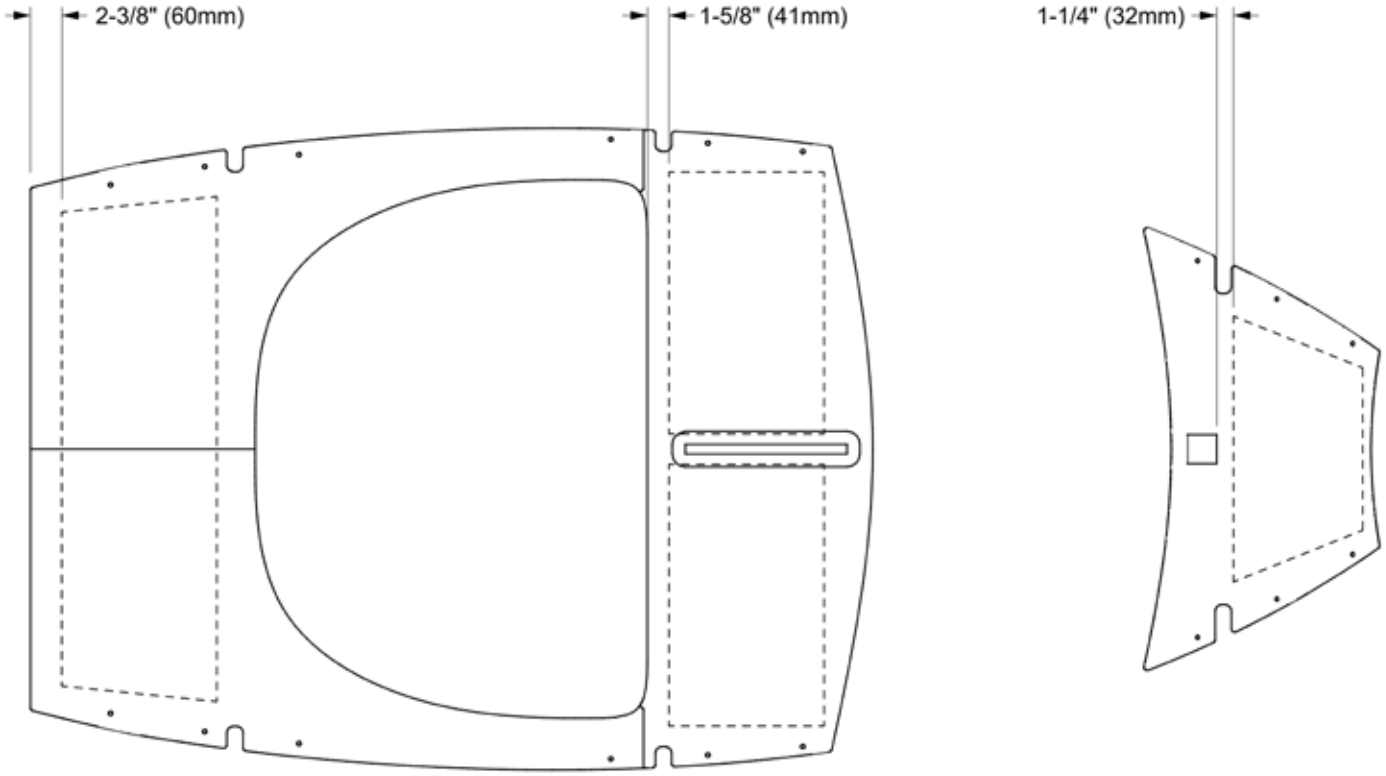
When the epoxy has cured, trim off the excess fiberglass. Add another coat or two of epoxy to fill the weave of the fiberglass.

Sand the parts smooth with 120-grit sandpaper.

In a well-ventilated space, finish the foam blocks with a few coats of ordinary exterior semi-gloss spray paint. (We used Rustoleum.)

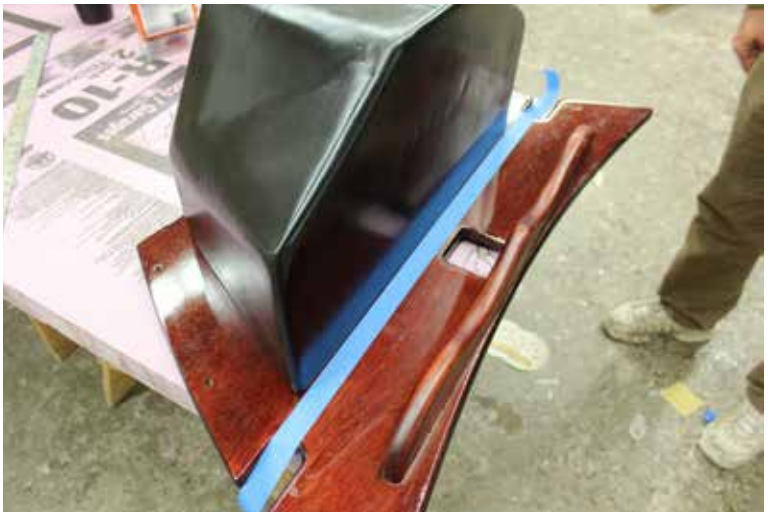
We suggest a dark, neutral color to compliment the varnished interior. We painted the foam blocks black in both of our demo models.

Gluing the Flotation to the Seats

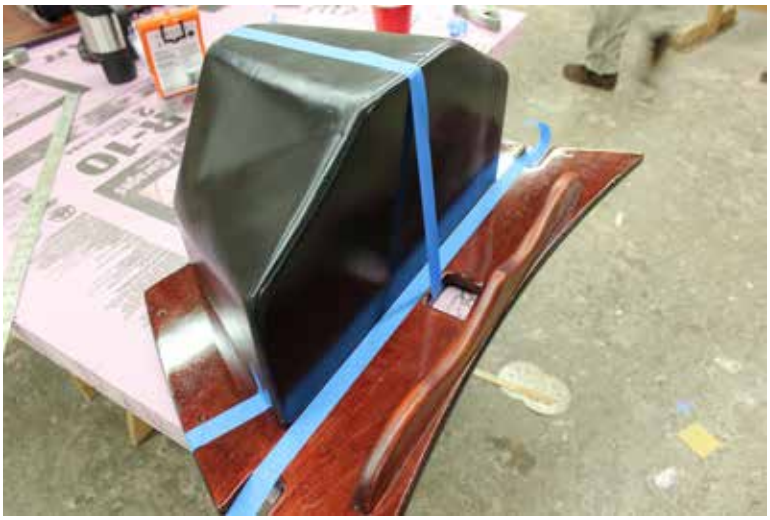


The foam flotation blocks must be bonded to the seat undersides with epoxy. Use the diagram to get a rough location. Ultimately, the blocks need to be positioned so that they don't interfere with the hull or frames when you install the seats.

Mark the foam block locations on the seat undersides with a few strips of masking tape.



Strap the blocks to the seats with tape...



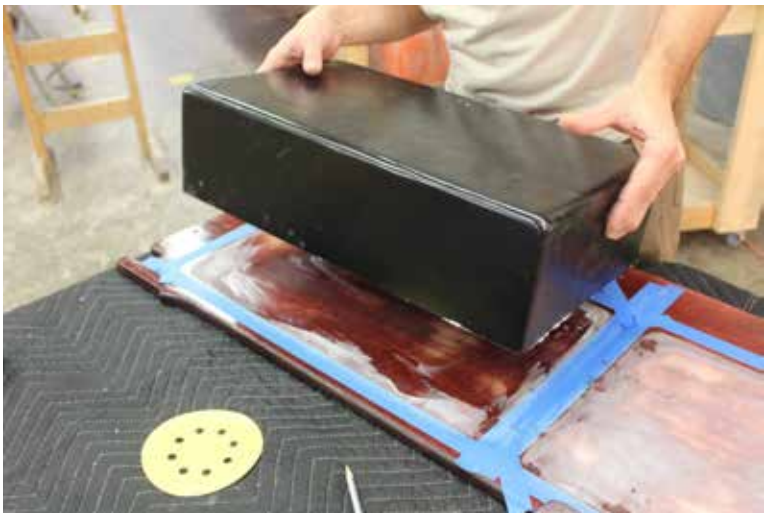
...and perform a a trial-fit of the assemblies.

Adjust the block locations if necessary, but make sure they don't interfere with the mast (forward seat) or daggerboard trunk (middle seat).

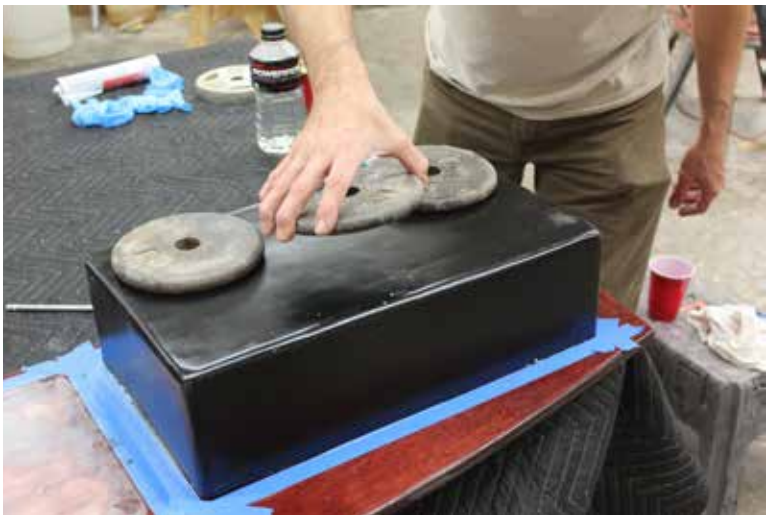
Mask off the bonding area on the seat undersides with tape, and scuff the surfaces with 120-grit sandpaper.

Mix up a batch of epoxy thickened with Cell-o-fill to jam consistency and slather the mating surfaces of the foam blocks.

Set the blocks in place...



... and clean up the excess epoxy. Use a few weights to hold the foam blocks in place while the epoxy cures.



Installing the Floorboards and Seats

The floorboards are fastened to the frames with #8 x 1" (25mm) stainless steel ovalhead wood screws with finish washers. The floorboards are quick to install, and quick to remove. If you find the need to re-finish the floorboards, simply unscrew them from the boat and carry them into the shop.

Place the floorboards in the boat and grab a few dozen screws and finish washers.

Coat the screws with clear silicone sealant...

...and drive the screws through the pre-drilled holes into the hull frames. Start with the centerline floorboards and work your way outboard, using the small CNC-cut tabs to maintain consistent spacing between the boards.

Here's a close-up of the floorboards, installed.

The forward ends of the floorboards rest atop the mast step "wings," as shown here.

One screw each is plenty at the forward ends.

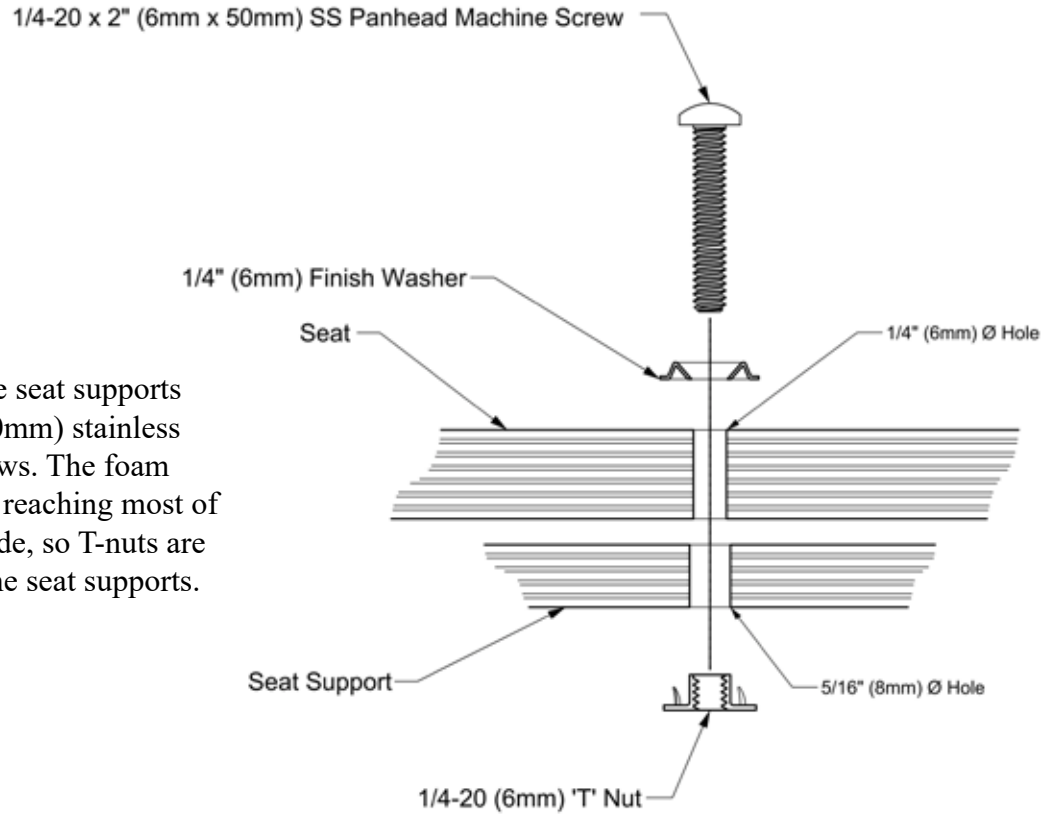
With the floorboards installed, you're ready to bolt in the seats.

Line up the daggerboard cut-out in the center seat with the daggerboard trunk. The inside edges should be perfectly flush - side to side, fore and aft.

Drill two 1/8" (3mm) countersunk holes through the center seat into the daggerboard trunk spacers...

...and drive in two #8 x 1-1/4" (32mm) flathead screws. Don't forget the silicone sealant in the holes!

Make sure the seats are centered on the frames and drill through the pilot holes in the seats into the seat supports with a 1/4" (6mm) drill bit.



The seats are fastened to the seat supports with 1/4-20 x 2" (6mm x 50mm) stainless steel panhead machine screws. The foam flotation prevents you from reaching most of the fasteners on the underside, so T-nuts are used on the undersides of the seat supports.

Remove the seats, and enlarge the holes you drilled in the seat supports from 1/4" (6mm) to 5/16" (8mm) to take the shafts of the T-nuts.

The T-nuts need to be installed on the undersides of the seat supports. They need to be fixed in place before the seats are bolted down for the last time.

Our solution for this was to drill a 1/4" (6mm) hole in a piece of 3/4" (18mm) scrap lumber *(left)*. Next, drive the 1/4-20 machine screw through the scrap lumber, finish washer in place.

Coat each T-nut in clear silicone caulk so that water can't creep into the holes and rot the seat supports.

Position the T-nut beneath the hole in the seat support, and drive the 1/4-20 machine screw through the scrap lumber.

Cinch the machine screw very tight, so that the T-nut's teeth are pulled into the underside of the seat support.

Remove the machine screw and install the rest of the T-nuts.

Set the seats back in place for the last time.

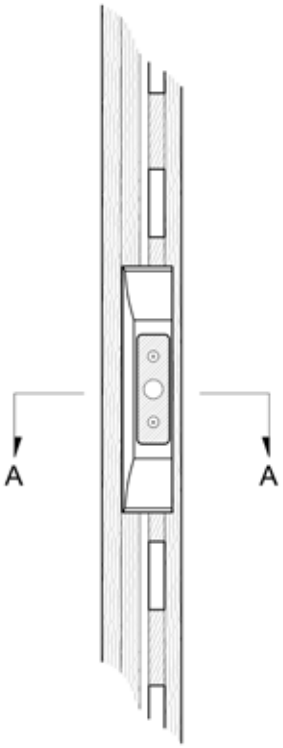
Coat the holes with clear silicone sealant...

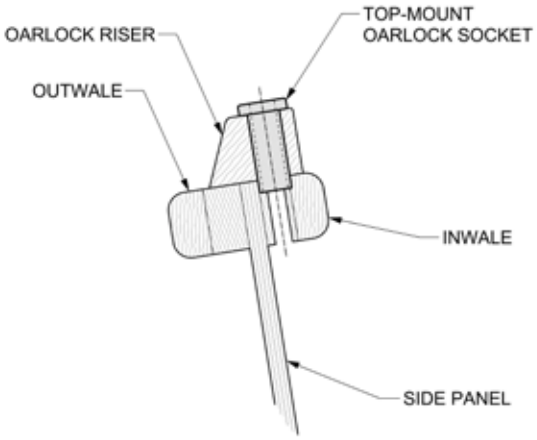
...and drive the machine screws into the T-nuts.

This results in a very rugged seat installation, which can nevertheless be removed with ease for maintenance or repair.

Stand back and admire your work! Sundry hardware and the sailing rig are all that remain.

Outfitting





SECTION A-A

The oarlock risers must be drilled for the oarlock sockets.

Tolerances are tight, here. Place the hole too far inboard and you'll drill away most of the inwale. Too far outboard and you'll drill into the side panel.

Find the center of the oarlock riser's length-wise facet...

...and its center athwartships.

Use an awl or punch to mark the hole center.

Drill a hole in the oarlock riser sized to match the oarlock socket. The true hole size is brand-dependent, but most oarlock sockets require a 3/4" to 1" (18mm - 25mm) diameter hole.

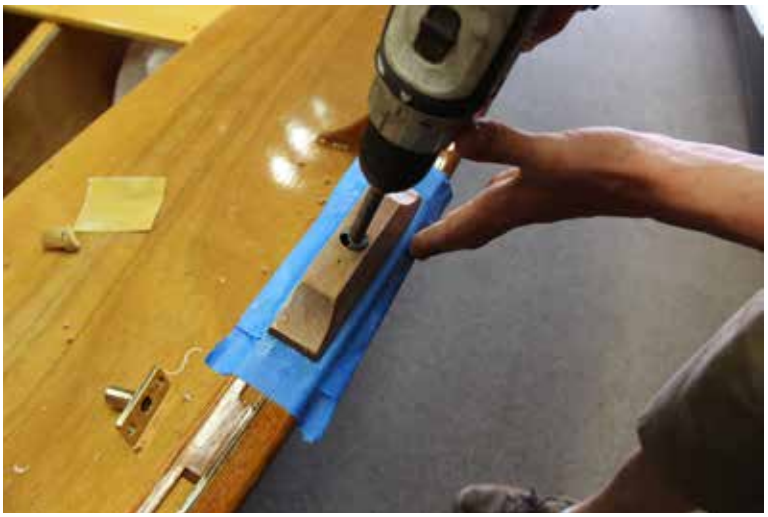
To prevent the horror of a drill bit "tear out" on the underside of the inwale, we clamped a sacrificial block beneath the inwale to catch the drill bit as it emerged.

(Southwester Dory)

Drill into the riser and inwales only as deeply as needed to accommodate the depth of the oarlock socket. (It won't be all of the way through.)

One more hole to drill: a slightly smaller hole right through the bottom of the outwales, to accommodate the shaft of the oarlock itself. This is usually 1/2" (12mm); pull out your oarlocks and give them a try. The oarlocks should slide in and turn easily.

(Southwester Dory)



Our oarlock sockets had a bit of "flash" left over from the casting. Here, we're relieving the sharp edge of the hole with a countersink bit to allow the oarlock sockets to seat flat on the riser.

Seal the bare wood in the hole with a bit of unthickened epoxy. A disposable epoxy syringe is just the tool for the job.

Drill 3/16" (4mm) pilot holes for the #10 screws that will secure the oarlock sockets in place.

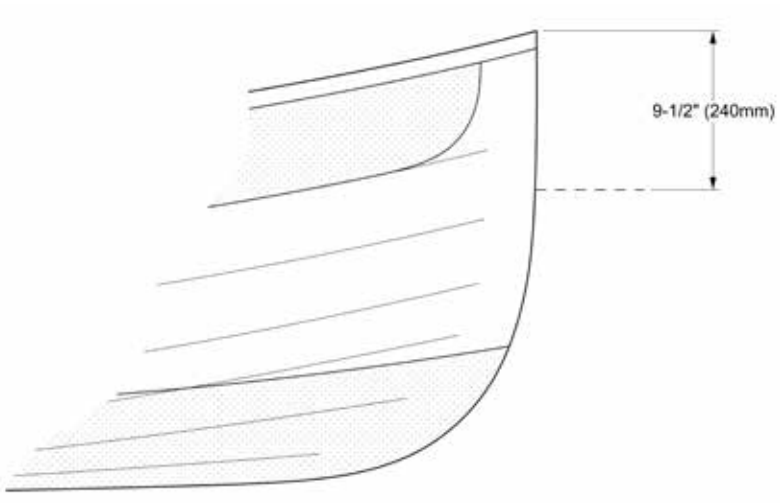
Dab a bit of clear silicone sealant in the screw holes...

...and on the oarlock sockets.

Screw the oarlock sockets into place with #10 x 1-1/4" (32mm) bronze wood screws.

Whether for towing Tenderly or tying up to the dinghy dock, you will need a permanent "painter," or bow line. While you may be inclined to bolt a bronze or stainless bow-eye to the stem for the painter, we've chosen the simple solution: a hole drilled in the stem and a knot in the painter to prevent it from pulling out.

Attach the painter at least 9-1/2" (240mm) down from the top of the stem to insure well-mannered towing.



First, drill a 1/8" (3mm) pilot hole centered perfectly on the stem. Then widen the hole with a 7/16" (11mm) drill bit.

Soften the hole edges with a large countersink bit or round-headed grinding bit to prevent chafe on the painter.

Using a solder brush or cotton swab, coat any exposed wood in the painter hole with unthickened epoxy.

Use denatured alcohol to clean the excess epoxy from the painted or varnished surfaces surrounding the hole. We recommend at least two coats of epoxy to ensure the plywood edges are fully sealed against water intrusion.

Once the epoxy has cured, run a 3/8" (9mm) line through the hole and tie a stopper knot inside the stem.

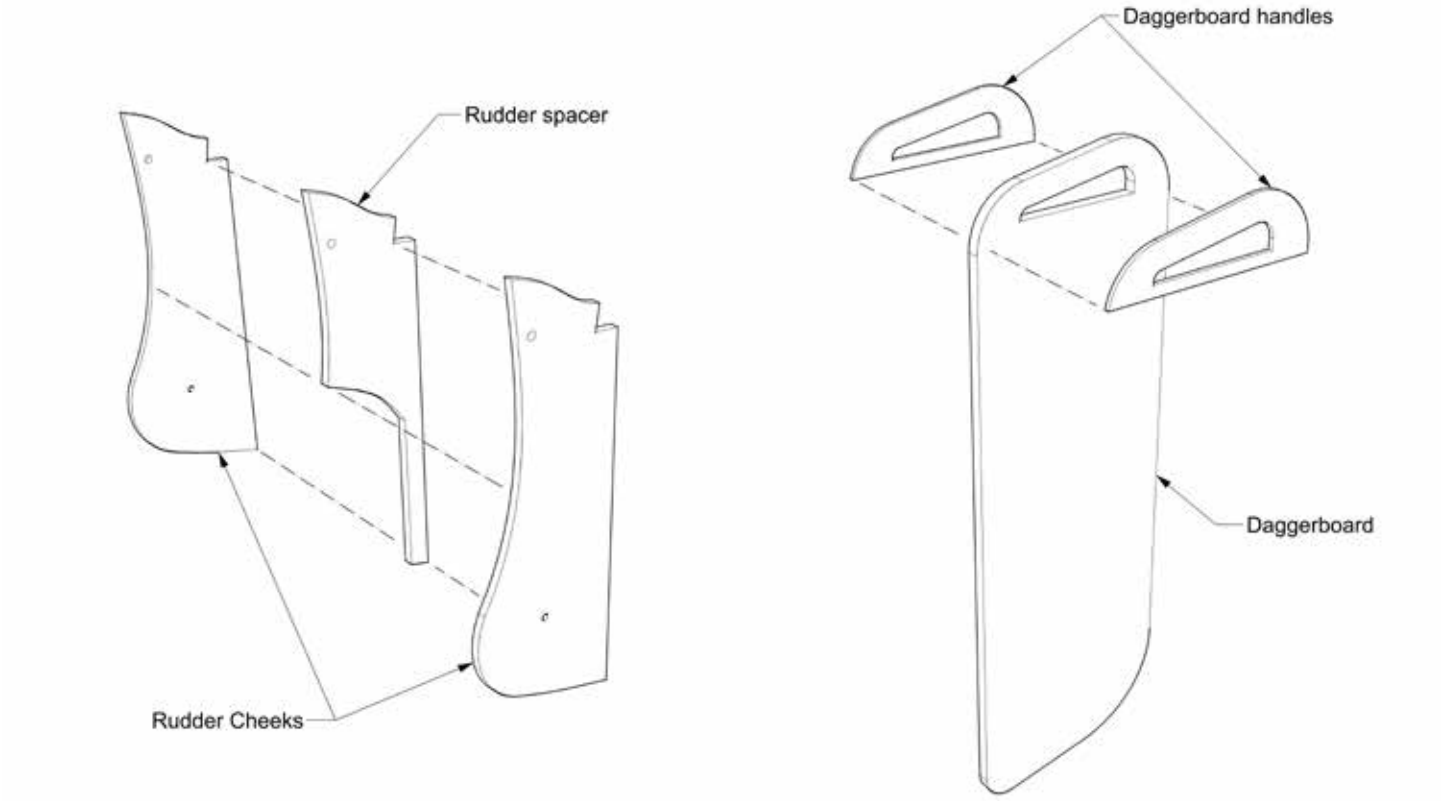
This scheme has the advantage that the painter may be retracted through the hole into the boat for stowage.

Part 3: The Daggerboard and Rudder

Assembling the Rudder and Daggerboard Parts

The daggerboard and rudder are absolutely crucial for good sailing performance. The daggerboard creates the dynamic lift necessary to sail upwind. Without it, the best you'd do is a few degrees either side of dead downwind!

The daggerboard is assembled from a single layer of 12mm (1/2") okoume, with two 6mm (1/4") cheeks to form a handle. The rudder is of the "kick-up" type, with a blade that rotates in a "cassette" to facilitate beaching or sailing in shallow waters. The rudder blade itself is a single layer of 12mm (1/2") okoume, and the cassette is assembled from a 12mm (1/2") spacer between two 6mm (1/4") "cheeks."



This diagram shows the basic assembly of the rudder cassette and daggerboard. These make good bench projects while you're waiting for epoxy to cure on the hull assembly.

As with the daggerboard trunk, you'll need to sheathe the inside faces of the rudder cassette cheeks with fiberglass for abrasion resistance. Cut the fiberglass a little larger than necessary, drape the inside faces of the cheeks, and saturate the fiberglass with unthickened epoxy.

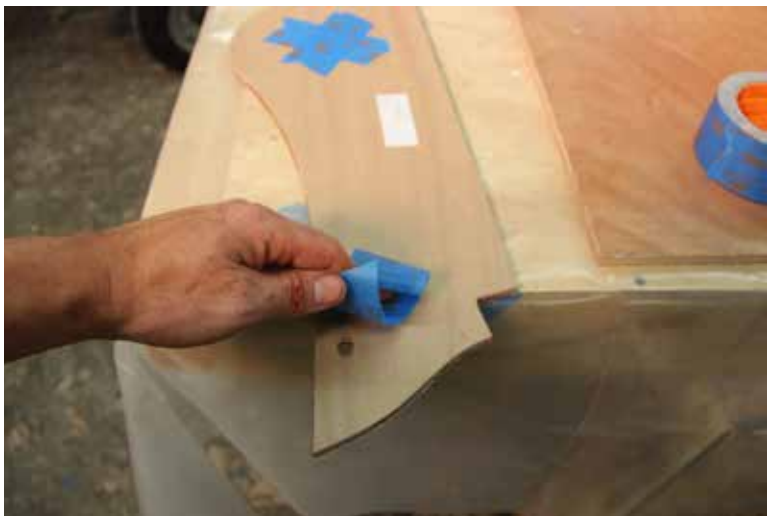
Bond the daggerboard handles to the daggerboard with epoxy thickened to paste consistency with Cell-o-fill.

Align the handles at the top of the daggerboard...

...and hold them in place with a few spring clamps while the epoxy cures.

Once the epoxy on the rudder cheeks has cured, trim the excess fiberglass with a sharp razor blade.

On the outside faces of the rudder cheeks, cover the pre-drilled holes with a few pieces of masking tape.



Trim the fiberglass from the holes on the inside faces of the cheeks, and fill the holes with unthickened epoxy. While you're at it, brush on a final coat of clear epoxy to fill the fiberglass weave.

Once the epoxy on the rudder cheeks has cured, sand them smooth with 120-grit sandpaper. Prepare the cassette parts for assembly and mix up a batch of epoxy thickened with Cell-o-fill. Coat one face of the spacer with the epoxy mix...

...and place it on the inside face of one of the cassette cheeks.

Coat the exposed mating face of the spacer with the same epoxy mix (and be sure to fill up the pre-drilled hole).

Add the second cassette cheek. Clamp the parts in place and clean up the excess epoxy.

Wrap a clean rag soaked in denatured alcohol around a mixing stick and use this tool to remove the squeezed-out epoxy from the inside faces of the cassette.

Cured blobs of epoxy will prevent the rudder blade from fitting properly.

Once the epoxy has cured, clean up the rudder cassette with 120-grit sandpaper on your random orbital sander.

Apply a 1/4" (6mm) round-over to the exterior edges with a router...

...and finish off with a light sanding by hand.

All exposed surfaces of the rudder cassette should receive at least two coats of unthickened epoxy.

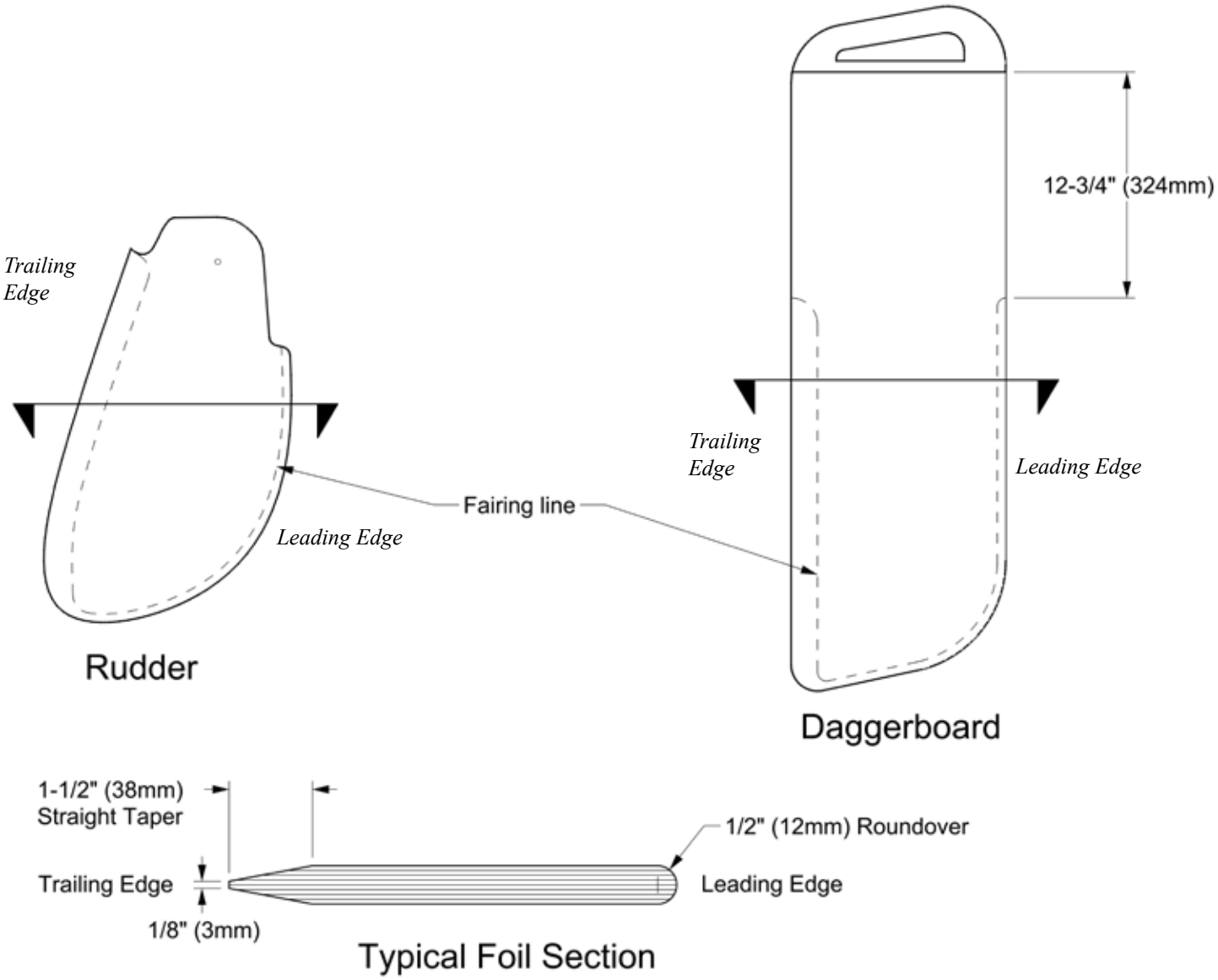
Use the router to apply a 3/8" (9mm) round-over to the daggerboard handle edges, both inside and outside.

Shaping the Foils

To maximize lift and minimize drag, you'll need to carefully shape the leading and trailing edges of both the daggerboard and rudder. Water is 784 times more dense than air. Crudely-shaped daggerboards and rudders inflict a great deal of drag on a sailboat. (50% of all hull drag is generated by the daggerboard and rudder, by many accounts.)

For the leading edges, you can either use a router to apply a 1/2" (12mm) diameter round-over (using a 1/4" or 6mm round-over bit), or you can spend a little extra time to fair the edge by hand into a bullet-shaped leading edge. The trailing edges of the foils receive a straight taper over 1-1/2" (75mm).

Follow the diagram below to mark off the sections to be faired on the rudder and daggerboard.



Once you've marked off the fairing lines, tackle the trailing edges with a sharp block plane. Use the glue lines as guides: if they're fair and follow the curve of the trailing edge, your taper is straight. If they're wavy, keep planing! Leave a 1/8" (3mm) "flat" along the trailing edge.

Finish your trailing edge tapers and leading edge round-overs with 120-grit sandpaper on a sander.

Note the even glue layers in the plywood, indicating a smooth, consistent taper.

(Southwester Dory centerboard)

Check the fit of the rudder blade in the cassette, with the rudder pivot bolt in place. The rudder blade is 12mm; so is the spacer in the cassette. It's going to be a tight fit, whereas it should rotate easily.

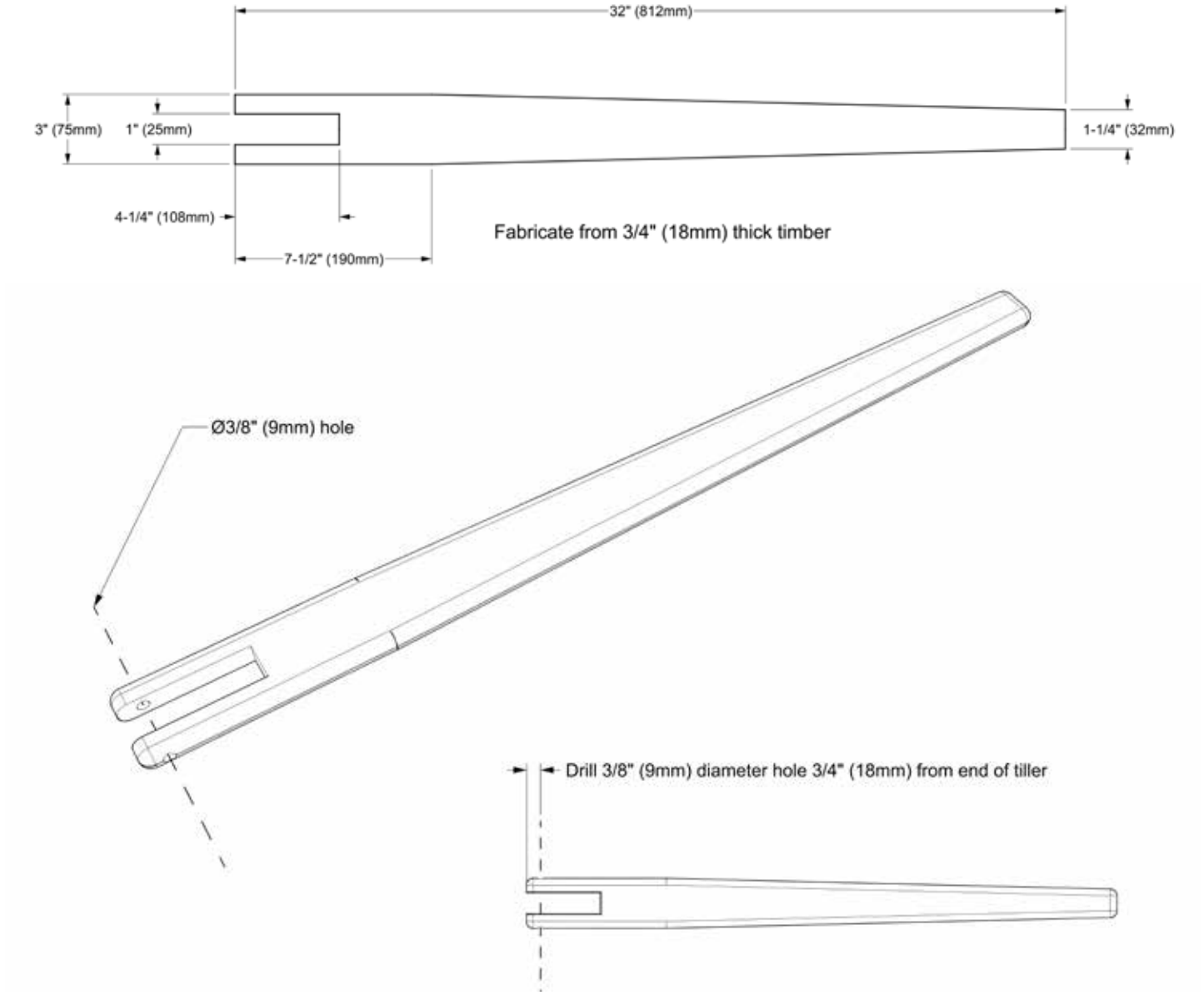
You will need to reduce the thickness of the top of the rudder blade by a fraction where it rotates in the cassette. A sander with 80-grit paper makes fast work of this. Give it a couple of tries in the cassette until it rotates freely.

(Passagemaker Dinghy rudder)

When the foils are faired to satisfaction, coat them in at least two layers of unthickened epoxy. Make sure to fill the pivot hole in the rudder with epoxy while you're at it!

The finished and varnished daggerboard:

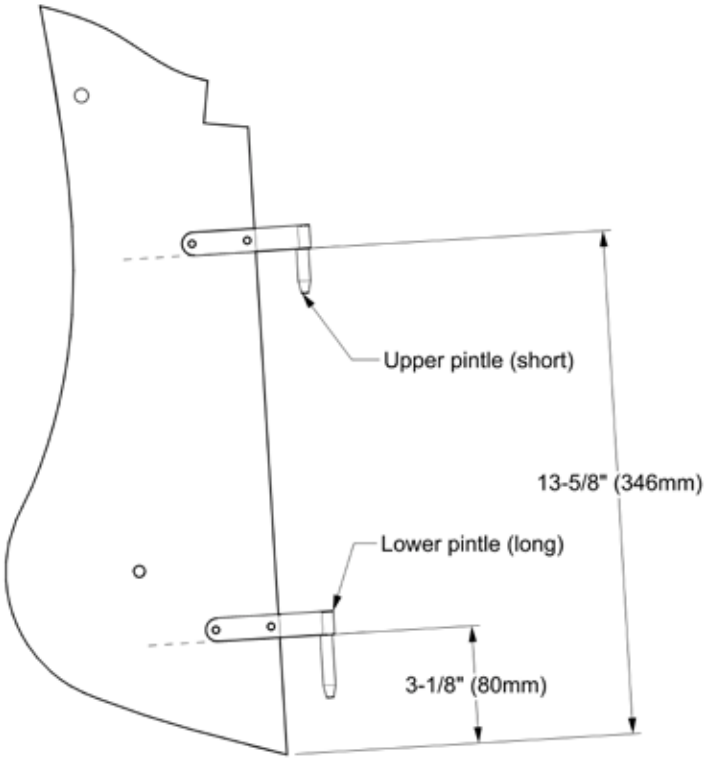
Assembling and Mounting the Rudder and Tiller



Kit builders will receive their tillers cut to size and shape, requiring only a rounding of the edges and a hole drilled for the pivot bolt. Plans builders will construct their tillers from a stong, attractive wood like mahogany using the dimensions above.

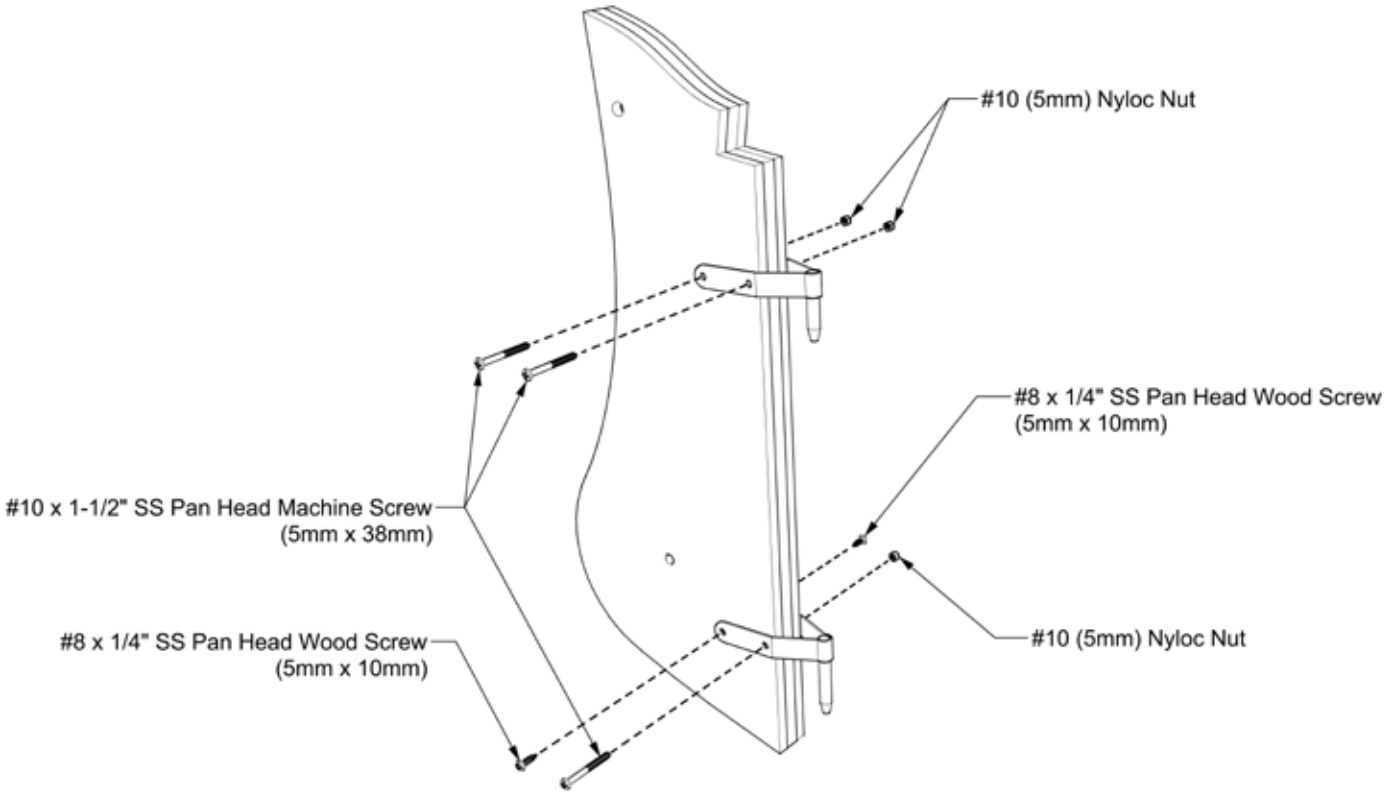
At minimum, you'll protect the tiller with a few coats of UV-resistant varnish. Better yet, apply a few coats of unthickened epoxy first, as the varnish will hold up better over a sanded epoxy coating.

The tiller is attached to the cassette with a single 1/4" (6mm) bolt. To combat long term wear, drill the bolt hole with a 3/8" (9mm) bit, fill the holes with unthickened epoxy, and then drill again with a 1/4" (6mm) bit once the epoxy has cured.



The rudder is hinged on the transom more or less like a door. Instead of door hinges we have peculiar bits of hardware called "pintles" and "gudgeons." Pintles (the parts with the pins) bolt to the rudder, and gudgeons mount on the transom surface. Use the diagrams on this page to locate the pintles on the rudder cassette and fasten them with the appropriate hardware as shown below.

The upper pintle should have a short pin, and the lower pintle a long pin. This makes installing the rudder lots easier when the boat is in the water and you're hanging over the transom.



Measure and mark the pintle locations on the rudder cassette.

Use an awl or punch to mark the fastener locations...

...and drill 3/16 (5mm) pilot holes through the cassette for the #8 x 1-1/2" (38mm) machine screws. If you can, use a drill press for this job to make sure the holes are plumb.

Note that instead of a machine screw, the aft lower pintle holes get a pair of short panhead screws driven into the cheeks from either side. A machine screw passing through the cassette at this location would prevent the rudder blade from pivoting!

Coat the fasteners with clear silicone sealant.

Here's the small #8 x 1/4" (6mm) screw used in the lower pintle.

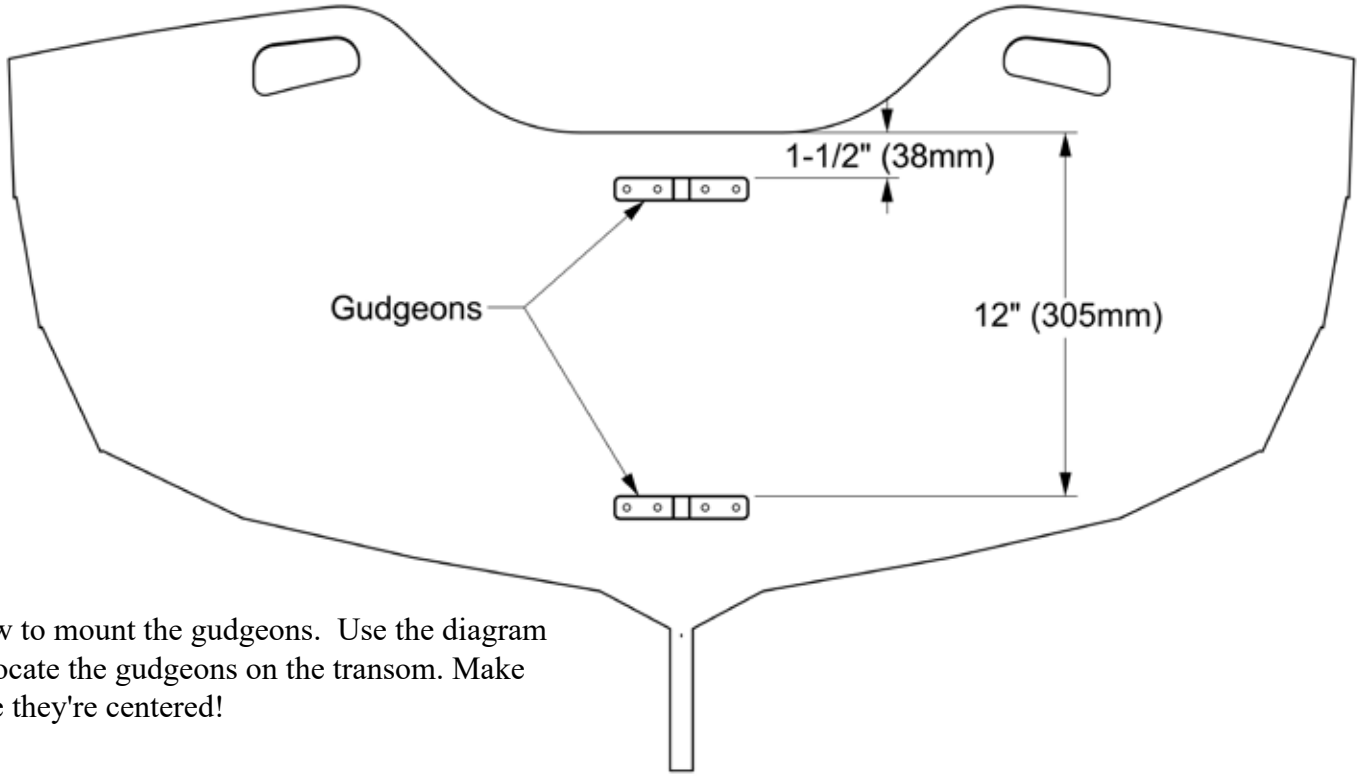
Drive the fasteners through the pintles into the cassettes and tighten the lock nuts.

The bolt holes in the rudder and cassette have been filled with epoxy at this point. Re-drill them with a 5/16" (8mm) bit.

To assemble the rudder you'll need a 5/16 x 2" (8mm x 50mm) carriage bolt, fender washer, and star knob. Slide the rudder into the cassette and line up the bolt holes.

Insert the carriage bolt through the holes. Slip the fender washer over the bolt and tighten down the star knob.

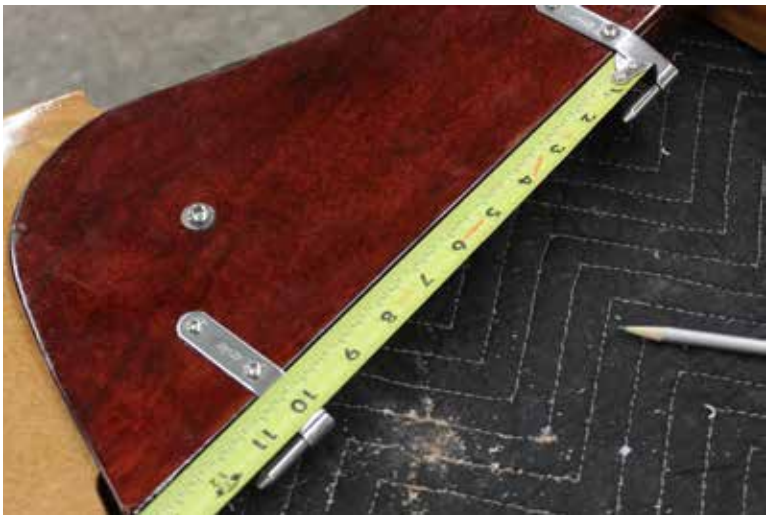
When sailing, you'll adjust the star knob so that friction holds the rudder blade in the down position. But it should be loose enough that the rudder blade kicks up if you run aground.



Now to mount the gudgeons. Use the diagram to locate the gudgeons on the transom. Make sure they're centered!

Use a few pieces of masking tape to mark the center of the transom and the locations of the rudder gudgeons.

Check the distance between the two pintles on the rudder cassette...



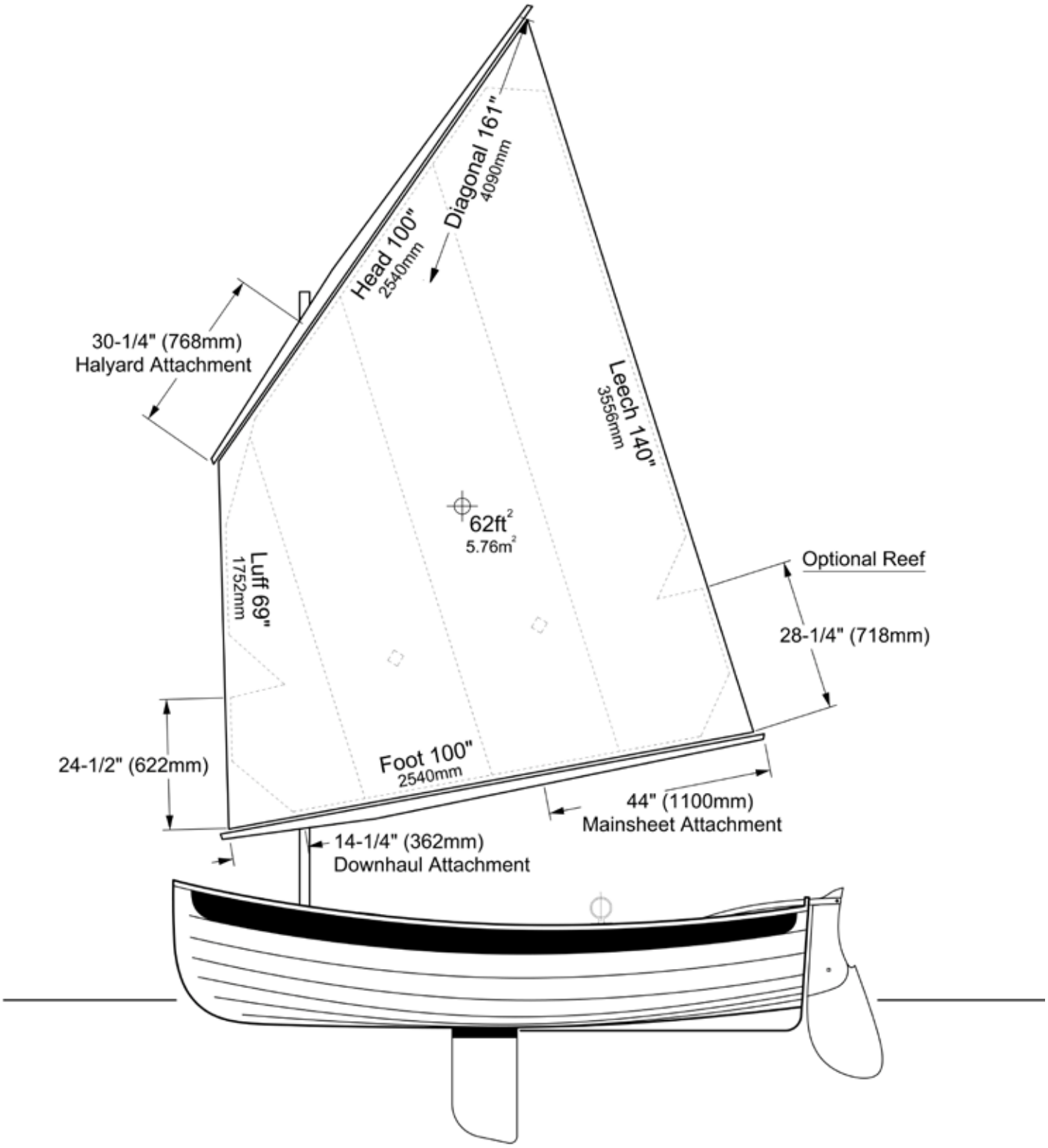
...to make sure it matches the distance between the gudgeon locations on the transom.

When you're satisfied with their placement, mark the holes for the gudgeons and drill them out with a 3/16" (5mm) bit.

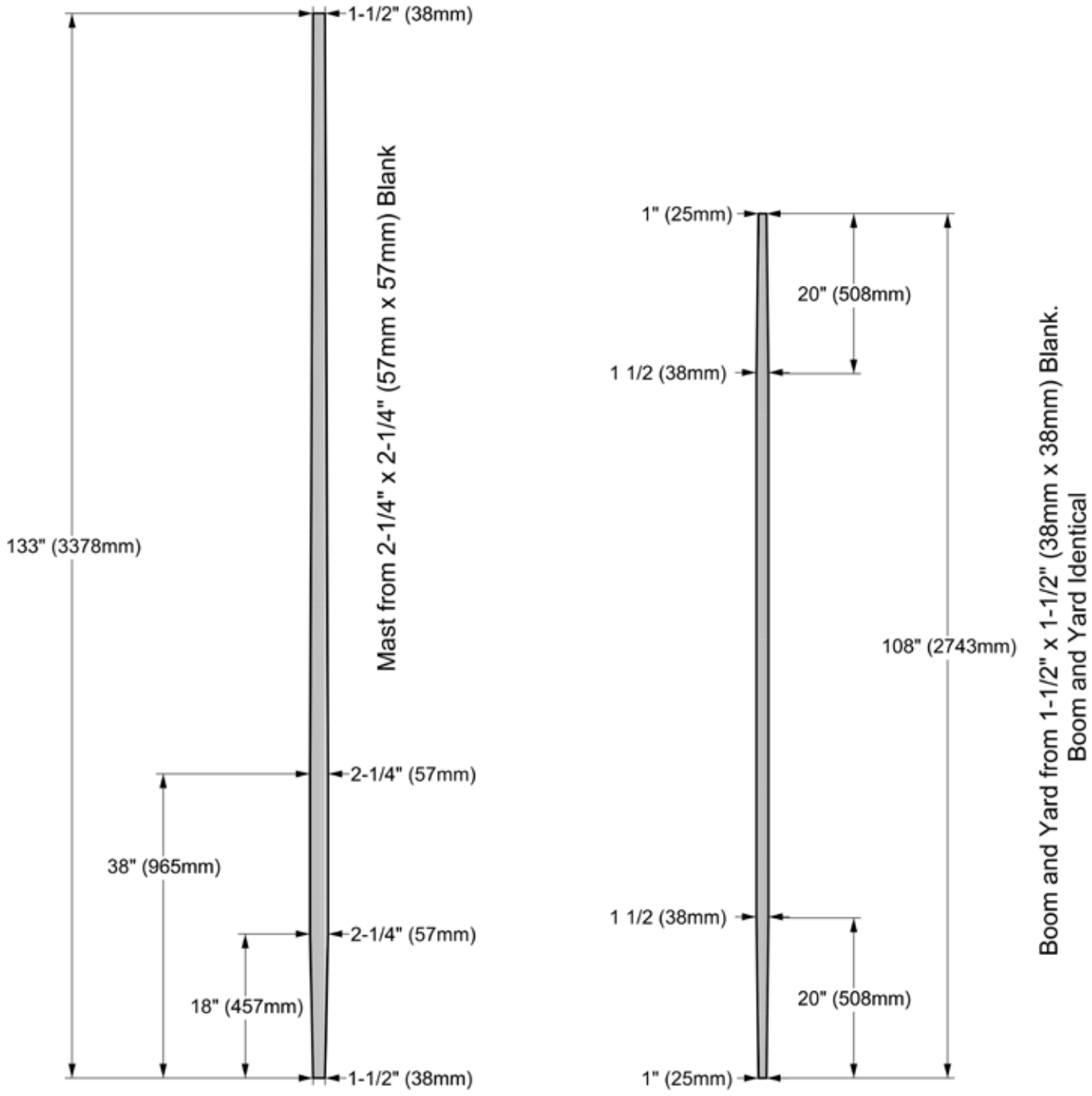
Attach the gudgeons to the transom with #10 x 1-1/4" (32mm) stainless steel machine screws, washers, and lock nuts. Coat the screws liberally with clear silicone sealant and clean up the excess when you've torqued down the nuts.

The "stop tang" is small L-shaped piece of stainless steel that functions as a sort of gate to prevent the pintles from popping out of the gudgeons inadvertently. It's installed with a single #6 x 3/4" (18mm) screw. In the upright position *(left)*, the pintle is locked in place. Rotate it 90 degrees *(right)* to remove the rudder.

Part 4: The Sailing Rig

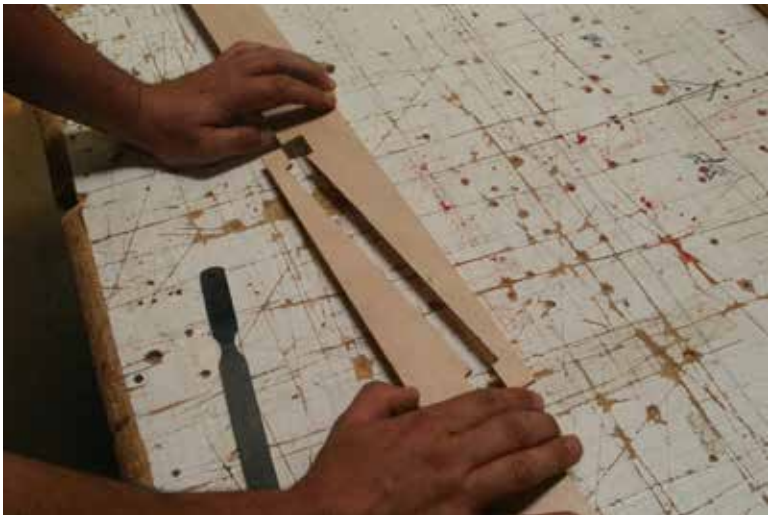


Building the Mast, Boom, and Yard



Kit builders have mast "blanks" ready to assemble and shape. Scratch-builders will need to collect up some clear spruce, pine, or fir, and laminate and scarf it into blanks. Knots are fine up to the size of a pencil eraser. You can use three thicknesses of 3/4" (18mm) timber, or two thicknesses of 1-1/2" (36mm) timber to get the required thickness for the mast, or any combination that works. Whatever you do, don't be shy about cutting down to the dimensions shown here. We've noticed that spars tend to creep heavier as builders cut outside the lines and "leave a little extra" for strength. Tenderly's spars have plenty of extra designed into them for tough sailing, and adding weight will inhibit the boat's sailing performance.

Kit builders will find in their sailing component kits plywood patterns for the mast's profile. The patterns have a "puzzle joint" so we can ship them.

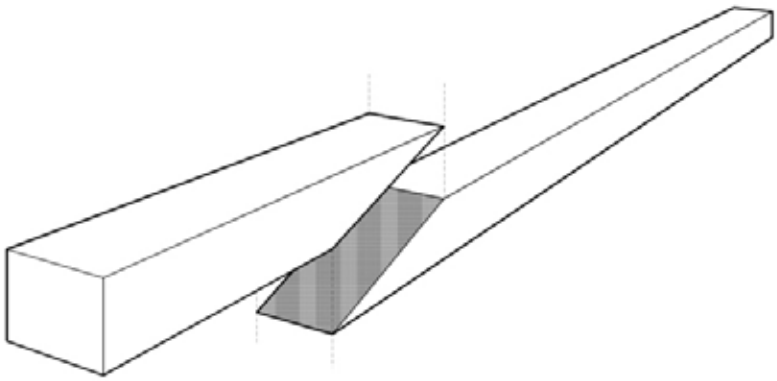


You'll trace the patterns onto the mast as shown on the following pages.

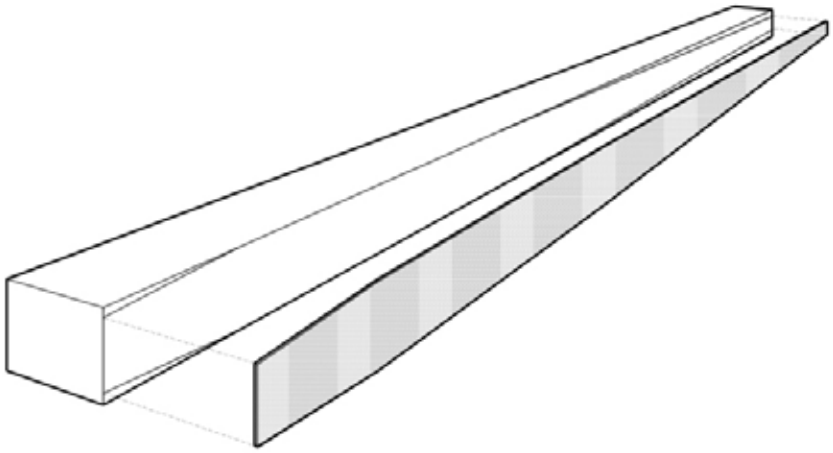
All of the tapers on the mast are straight–it's very quick to transfer the measurements from the plans to the mast blank if you're working from plans.

Spar shaping is hard to photograph, so we're switching to line art for this step. Flip the page.

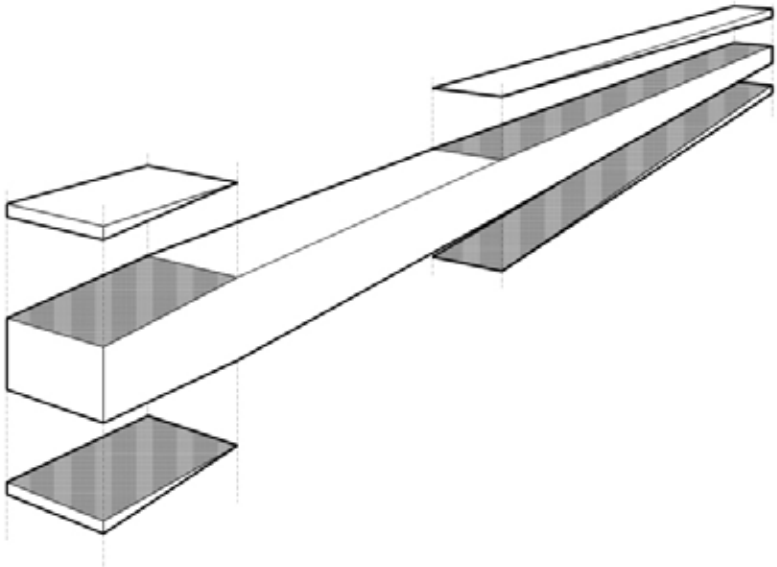
Step 1: All kit builders, and probably most scratch-builders, will assemble mast and boom blanks with scarf joints. You've had plenty of practice with scarf joints. Thicken your epoxy with Cell-o-fill to a jam consistency and clamp the scarfs together.



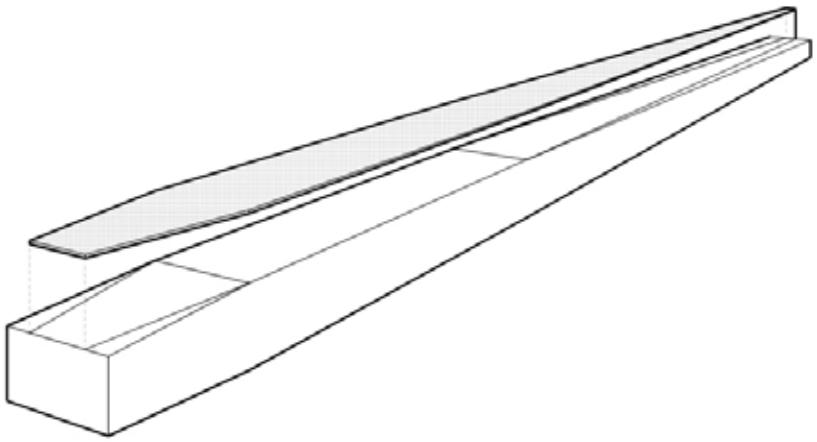
Step 2: Sand the cured scarf joints, then lay out the taper on the left and right sides of the mast. In the drawing, the forward face of the mast is up, and the aft face is down.



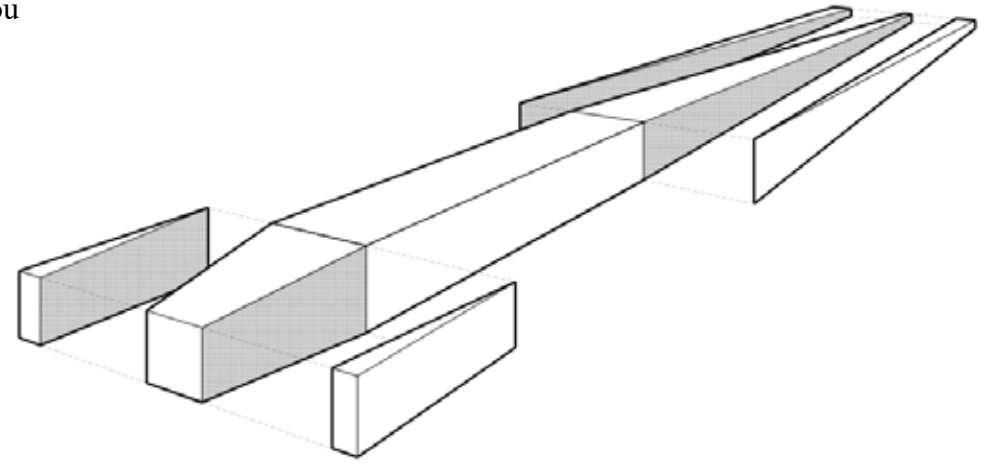
Step 3: Remove a short wedge at the bottom and a long wedge at the top. We use a bandsaw for this, but you can use a powerful circular saw, a power planer, or just elbow grease and a sharp plane. Make sure the new faces are smooth; you can finish up with a beltsander if you have one.



Step 4: Flip the blank 90 degrees and trace the same pattern again.



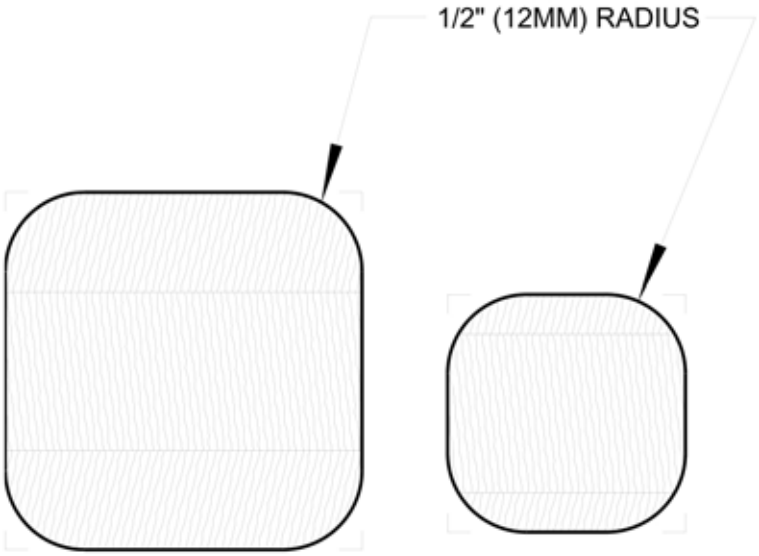
Step 5: Four more big cuts, and you have a mast tapered on four sides.



A circular saw with a sharp, thin blade offers great control and tends to cut “plumb” and straight. This is a great tool for cutting the tapers in the mast.

Use a sharp plane to clean up all four sides of the mast. A beltsander is good for the final smoothing steps.

The square-sectioned mast is ugly and heavy with sharp corners. We used a router with a 1/2-inch (12mm) round-over bit to knock the corners off. This looks great, and saves a lot of weight where it matters the most–up in the air.



With a big router bit, you need to take several passes, cutting a little each time, or you risk splitting the mast.

You can create these round-overs with a block plane and sander if you don't have a router.

The boom and yard are just straight sticks, 1-1/2" (38mm) square, with the last 20" (500mm) tapered down to 1" (25mm) square.

The halyard goes through a 1/2” (12mm) hole centered an inch (25mm) down from the top of the mast.

The correct way to drill a hole through wood like this is to first create a pilot hole, then drill from either side, meeting in the middle. Otherwise, you might create a grisly “tear-out” when the big bit emerges on the other side.

The halyard needs to run smoothly though the hole. We used a router and a round-over bit to “flare” the hole neatly. Thus treated, there is almost no friction on the halyard.

The boom and yard need 5/16” (8mm) holes at each end, centered about 1” (25mm) from the end of each spar.

Here, we’ve clamped the spar to a piece of scrap to avoid “tear-out” on the backside.

A countersinking bit works to “flare” these smaller holes.

The finished hole, with a neat “flare” to prevent friction on lashings.

We hung the three spars from the ceiling in our tall shop to apply varnish.

We recommend 3-4 coats of a marine-grade varnish for an attractive and durable finish.

We don’t epoxy-coat the spars, though this WILL make them even more durable. Epoxy-coating sticks like these is hard work and adds many hours.

Rigging the Spars

When the varnishing is complete, the spars are ready to rig.

A pair of cleats are centered on the mast 28” (710mm) above the butt end.

Use #8 x 1-1/2” (38mm) screws to fasten the cleats to the mast.

The cleats are positioned on the port and starboard faces of the mast.

The hole at the top of the mast for the halyard should be oriented side-to-side, in other words, with the openings on the same faces as the two cleats.

Find a clean space to lay out your sail, which will be laced permanently to the boom and yard.

We used 1/8” (3mm) line for these lashings.

Start by lashing the sail to the holes at the ends of the boom and yard. We’ll call these lashings “outhauls.”

The outhauls are a double loop of line, like this:

Tie a square knot in the outhaul.

To prevent the square knot from working loose, add simple overhand “stopper knots” as shown here.

The sail should be stretched very tightly by the outhauls at all four corners.

Exactly HOW tight the outhauls should be for best sail performance is a matter of practice and experience. If you’re unsure, it’s better to have the outhauls too tight than too loose.

Each grommet on the head and foot of the sail is lashed around the spar. We used two loops each. These lashings should be tight enough to bring the sail in solid contact with the spar, but not so tight that the tension of the sail can’t be adjusted with the outhauls.

We were lucky to have the carpeted showroom floor at CLC available for laying out and lacing on our lug sail.

Halyard and downhaul attachment points are shown on page 227. Where these are attached really matters for sail balance!

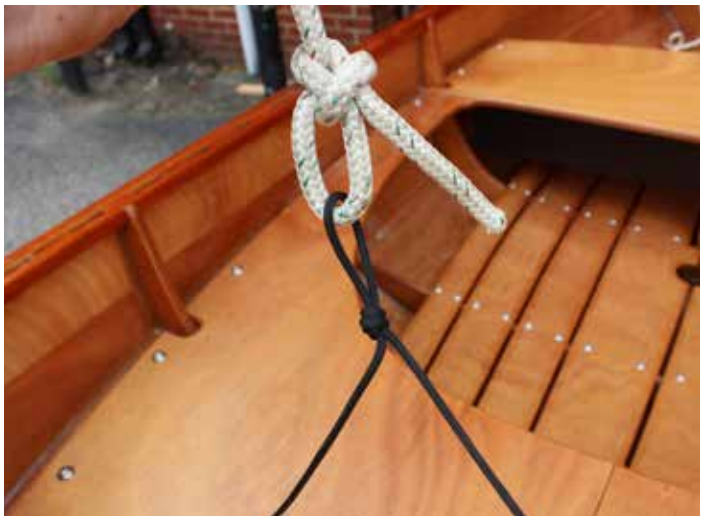
The measurements are from the center of the grommet in the corner of the sail.

Halyard and downhaul are 1/4” (6mm) low-stretch line. Here’s the knot we used, a clove-hitch around the spar followed by two half-hitches.

We used a hot-knife to cut off all of the excess lashing line, right up against the stopper knots.

The mainsheet attaches to the boat with a bridle strung from one quarter knee to the other. You can attach the bridle with bronze or stainless pad-eyes, or simply drill a hole through the knees as we've done here. The hole should be at least 1/4" (6mm) in diameter.

Soften the holes edges with a countersink bit, and coat the exposed wood with a bit of varnish.



The bridle itself is a length of 3/16" (5mm) diameter line with a loop in the middle and knots in the ends to prevent it from pulling through the knees.

To get the correct height for the bridle, center the boom as shown in the photo here. When the mainsheet is tight, the bridle should nearly reach the boom, with only a few inches of mainsheet left.

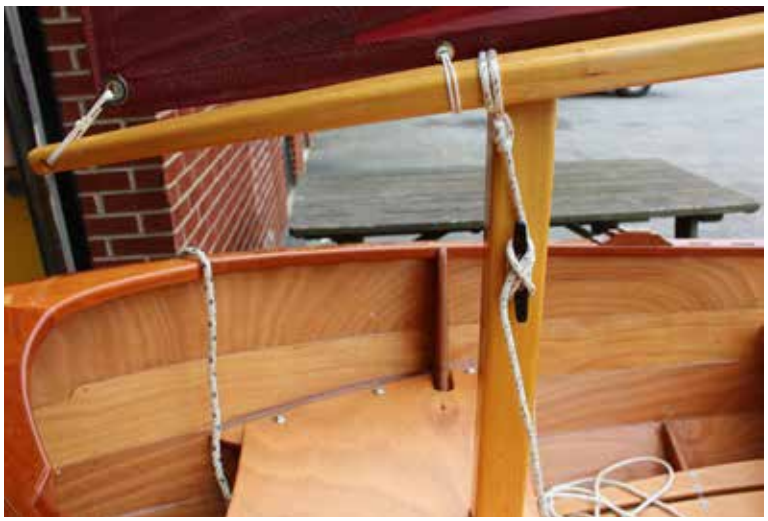
The mainsheet is knotted to the loop in the bridle with a tight bowline. *(Right)*

The halyard runs through the hole at the top of the mast...

...and down to one of the cleats at the base of the mast.

Use the cleat on the other side of the mast for your downhaul attachment.

While sailing, expect to tighten the downhaul periodically, as it will stretch.



Run the mainsheet from the bridle through the two blocks on the boom. This is a simple and effective way to rig the mainsheet without the hassle of adding more hardware to the boat.

As with any small dinghy, we don't recommend adding a cleat for the mainsheet. The sheet loads are light with the balanced lug rig, and cleats always seem to jam right when you're trying to avoid a capsize!

The aft mainsheet block, lashed to the boom with 1/8" (3mm) line.

The mainsheet block in the middle of the boom.

Here's the finished and rigged Tenderly, looking smart and making good speed to windward.

Before your first launch, plan a leisurely driveway rigging session. This will allow you to sort everything out, get the line lengths correct, and in general understand how it works. There's nothing worse than trying to get all of the rigging done the first time at the launch ramp, while everyone's standing around awaiting the christening. At CLC, we literally "sail" the boats on all points in the parking lot, shifting the trailer around as needed, so that there are no surprises when we get to the water.

Always wear a life jacket and carry a bailing bucket. If you're new to sailing, start out in warm water!

Using an Outboard Engine

Provision for outboard power was designed into Tenderly from the start.

Bigger is NOT better when it comes to engines. Tenderly is rated for a maximum of 2-1/2 horsepower. Because this is not a planing hull, you're going to go about six knots, or the speed limit in most harbors.

A larger engine will just dig a deeper hole in the water and the boat will probably display several types of instability.

With a full payload and a 4-stroke 2HP Honda outboard, Tenderly scoots along.

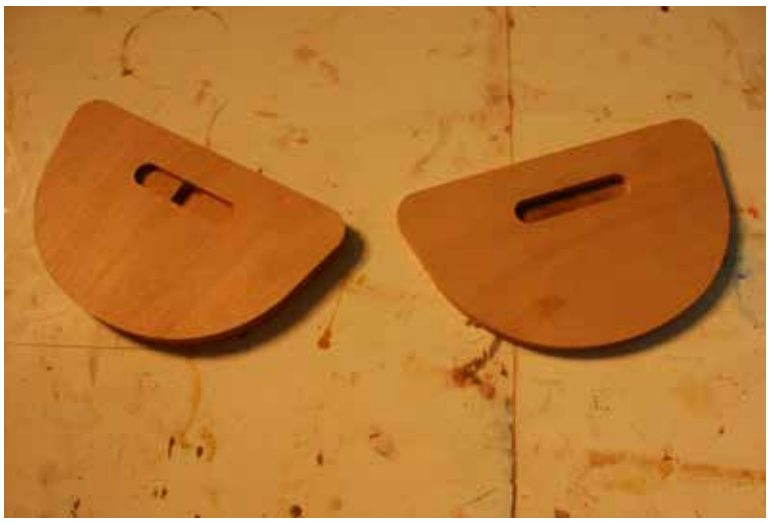
Tenderly's 18mm-thick transom should be protected with motor pads like these, to give the outboard clamps plenty of meat to grab, and to help distribute the loads.

Simple enough, but there's a problem: the top rudder gudgeon is very much in the way of the typical outboard clamp, and any pads added to the transom.

After trying several schemes with middling success, we devised a clean solution for those who are both sailing and motoring.

If you aren't sailing, this is easy: just make up the motor pads and glue them to the transom permanently, at some point before page 159.

Sailors need a removable motor pad that fits over the upper gudgeon. There's an 18mm pad on the transom exterior and a 12mm pad on the transom interior, both with mortises machined to fit over the gudgeon hardware.



These are available from CLC, cut on our CNC machine.

Exposed corners should be given a round-over with a 3/8" (9mm) bit.

Like everything in the boat, the motor pads should be coated in epoxy.

We followed this with sanding and coats of varnish.

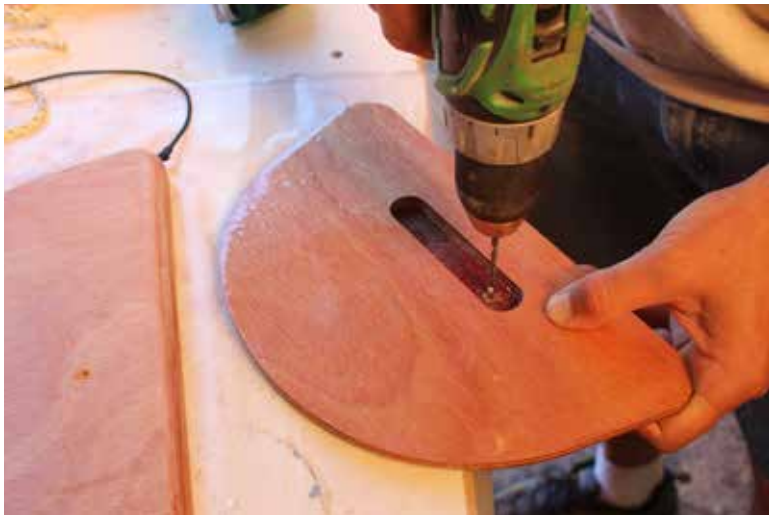
Check the motor pads for a clean fit over the gudgeon hardware.

In use, the motor pads are fixed rigidly in place by the mortises that fit over the upper gudgeon.

A pair of removable motor pads are just the sort of thing that slip overboard and float away with the tide.

Thus, some sort of lanyard arrangement is wise to help keep them from getting lost.

Holes are drilled in the mortises...

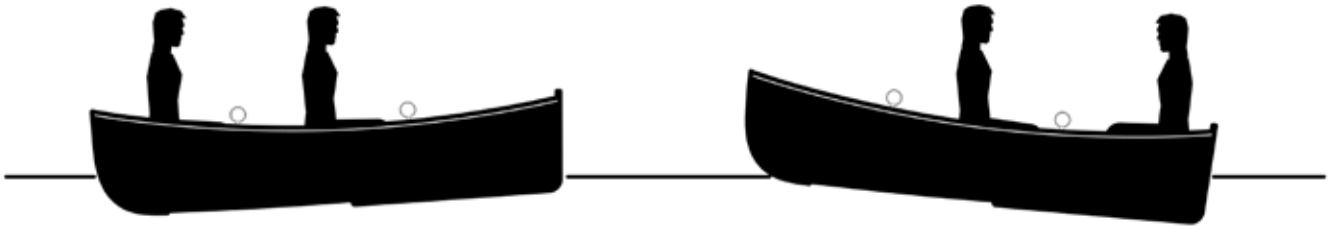


...and a 1/8" (3mm) length of line passed through the holes.

Stopper knots are added on either side. The knots are contained inside the mortises.

The lanyard keeps the motor pads together, while allowing them to fit over the transom.

Proper Weight Distribution

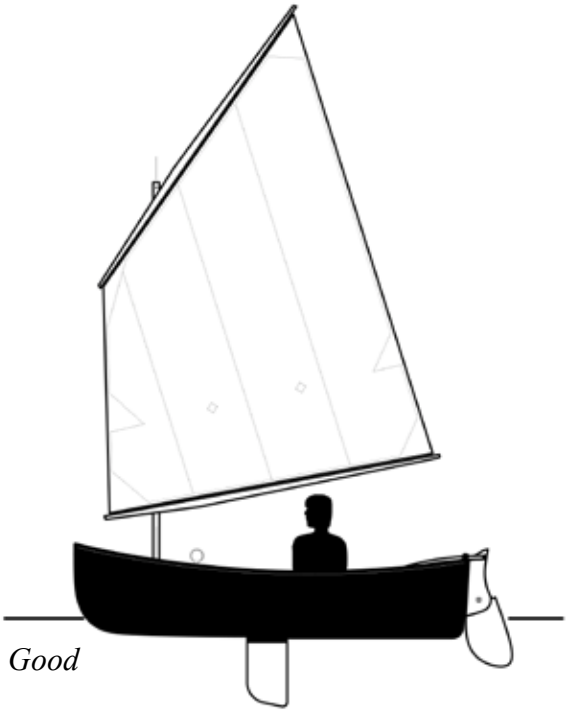


Bad *Bad*

One of the joys of our job is getting boats like Tenderly out to demos so people can give them a whirl on the water.

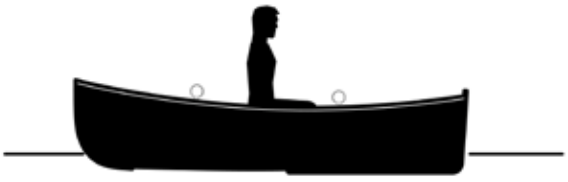
One of the frustrations is watching the boats leave shore with the crew seated in the wrong place, so that the bow or stern is waving in the air. This is uncomfortable for the crew, inefficient for the boat, and looks lubberly to everyone watching.

Distribute crew weight so that the boat floats level!

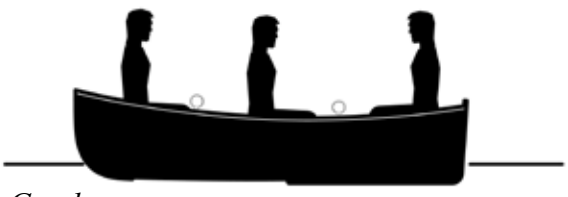


Good

Good



Good



Good

Trim is important whether you're sailing, powering, or rowing.

When rowing solo, distribute your groceries between the bow and stern and row from the center seat.

With a single passenger aboard, shift to the forward seat for rowing.

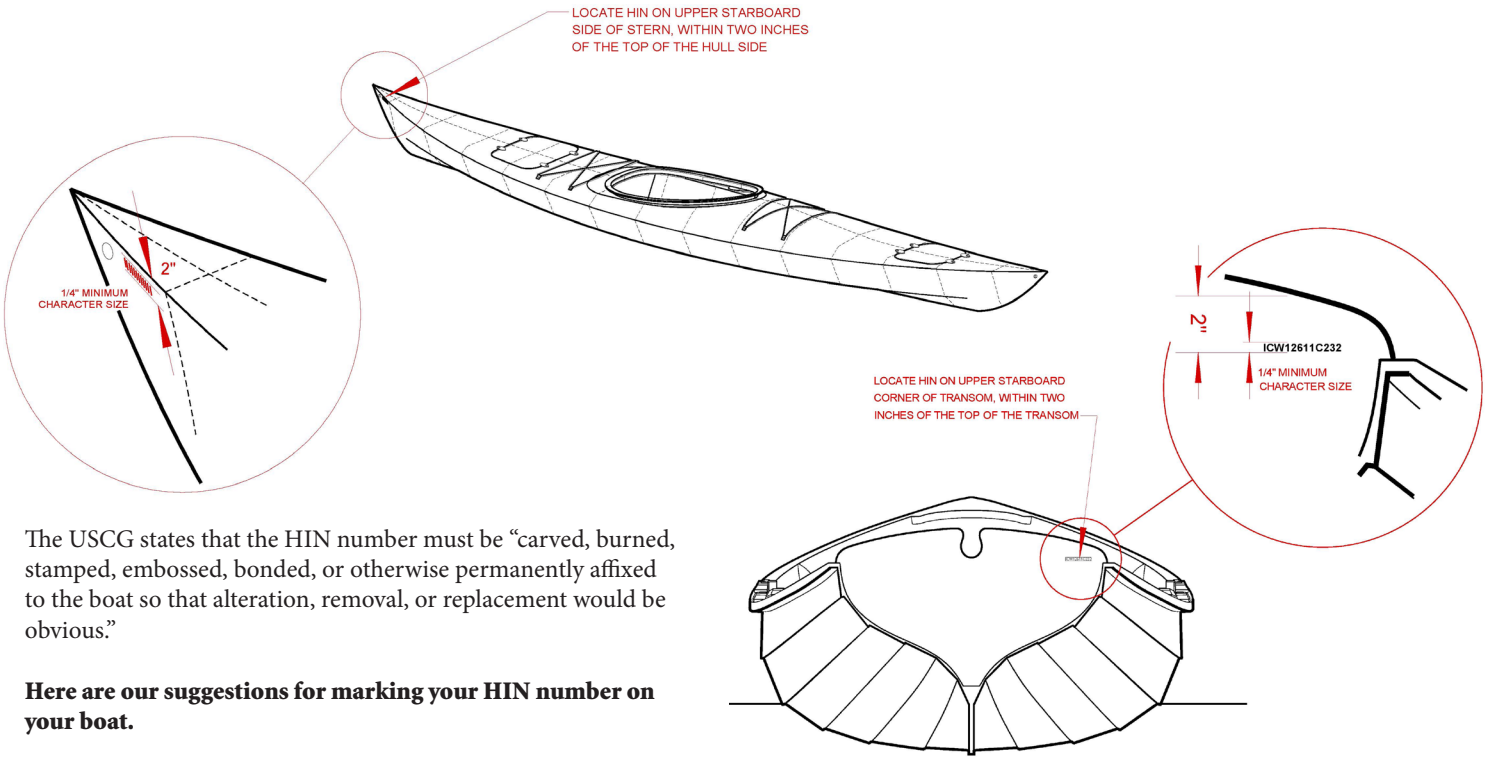
With a big load, row from the center with passengers seated fore and aft.

Placing the Hull I.D. Number (HIN) on Your CLC Boat

Although you built your boat from a kit, the US Coast Guard requires that kit boats carry a Hull I.D. Number (HIN). This can assist rescuers if your boat is found adrift, and it helps law enforcement track a stolen boat.

The HIN for your Chesapeake Light Craft kit boat may be found on the original sales invoice for the kit, as well as the copy of the invoice sent to your email address. (If you have lost the invoice or email, CLC maintains records of all HIN numbers.)

The HIN is placed on the boat in two locations mandated by the USCG: the "Primary," that is visible, and the "Duplicated," which is hidden. **Here's where to place the Primary HIN on boats with transoms or pointy sterns:**



The USCG states that the HIN number must be "carved, burned, stamped, embossed, bonded, or otherwise permanently affixed to the boat so that alteration, removal, or replacement would be obvious."

Here are our suggestions for marking your HIN number on your boat.

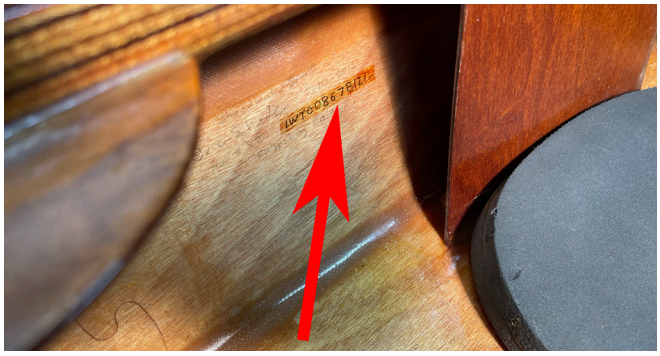
1. Pencil! Yes, a pencil. Hear us out! BEFORE the HIN location has been coated in epoxy and/or fiberglass, write your number with a sturdy, slightly blunt pencil point. Press down hard so that the characters actually dent the wood slightly. Be careful not to sand off the HIN number in subsequent steps; if you do, "emboss" the number again in pencil. Beneath fiberglass and/or several coats of epoxy, the HIN number will be as secure, or more secure, than one molded into a factory-built boat.

2. Use a soldering iron to burn the HIN number into the wood, again BEFORE you've coated the area with epoxy or fiberglass.

3. Print the HIN number in dark lettering on rice paper and laminate the rice paper beneath epoxy and/or fiberglass. Rice paper, readily available at craft stores, will turn clear once coated with epoxy, leaving your inked HIN perfectly visible. This will only work in areas where you intend to use varnish or some other clear finish over the epoxy.

4. Letter or number stamps: These are readily available at hardware or craft stores. Just make sure the lettering is 1/4" tall. As above, you should stamp your letters into the boat BEFORE overcoating the area with epoxy and fiberglass.

5. Order a stamped plate online. These can be epoxied into the hull ruggedly enough that attempts at removal or alteration will be obvious, per USCG rules.



On kayaks, the Duplicate HIN is generally located in the cockpit. This one was written in pencil and over-coated with epoxy.

The Duplicate HIN on this Peeler Skiff is on a bulkhead beneath a seat.

Placing your USCG Capacity Plate on Your CLC Boat

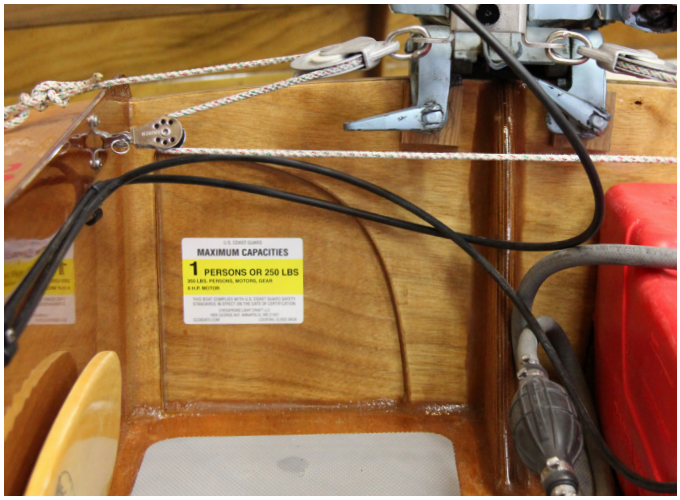
Boats built from kits are required by the US Coast Guard to display capacity plates if they are of a certain size and displacement. (Broadly speaking, CLC's kayaks and canoes do not require them; sailing dinghies, skiffs, and any boat with a motor will have a capacity plate.)

Please affix the capacity plate included with your kit in a visible location on the inside transom of your completed boat. These photos show acceptable locations for capacity plates, including those without transoms.

Stickers are applied after the last coat of paint or varnish. Before you place the sticker, make sure to clean the surface with denatured alcohol and a clean rag for permanent adhesion.

Many thanks! Please contact us if you have any questions at all.

Tenderly Dinghy



Cocktail Class Racer

Northeaster Dory

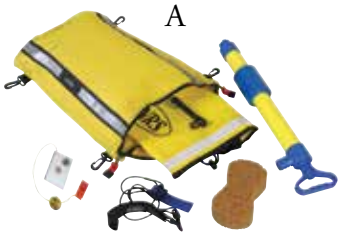
Lighthouse Tender Peapod

Tenderly Dinghy Gear

This is a small selection of our tools, supplies and accessories. Call **410.267.0137** *or visit* **clcboats.com** *for our complete catalog of tools, supplies, and accessories.*

A. NRS Deluxe Touring Safety Kit
B. Fitted Canvas Cover
C. Vista PFDs from NRS
D. 8' Spoon or Flat Blade Oars
E. Trailex Lightweight Trailers

A



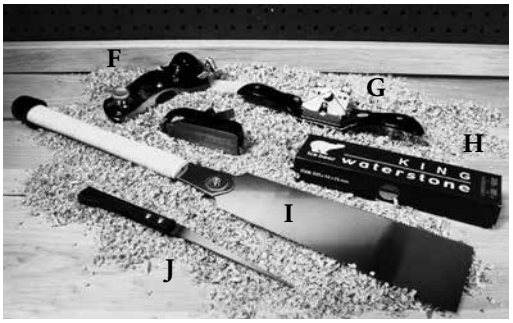
B

C

D

Boatbuilding Tools

F. Low Angle Block Plane (1-3/8" x 6")
G. Stanley Spokeshave
H. Waterstone
I. Japanese Saw
J. Bonsai Saw
K. Super-hard Milled Scraper (set of 4)
L. Sliding T-Bevel (1/2" x 6-1/4" x 7")
M. Plastic Epoxy Spreader
N. Epoxy Syringe
O. Shinto Saw Rasp
P. MAS Rapid Cure Mini Kit
Q. MAS Handy Repair Kit



K

L

M

N

O

P

Q

Finishing

R. Interlux Brightsides Paint
(Yellow, Fire Red, Sea Green, Dark Blue, Hatteras Off-White, White, Sapphire Blue, Black. Other colors available.)
S. Interlux Schooner Varnish
T. Interlux Goldspar Satin Varnish
U. Chip Brush
V. Foam Brush
W. Roller Frame
X. Foam Roller Covers
Y. Fine Line Tape

R

S

T

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V

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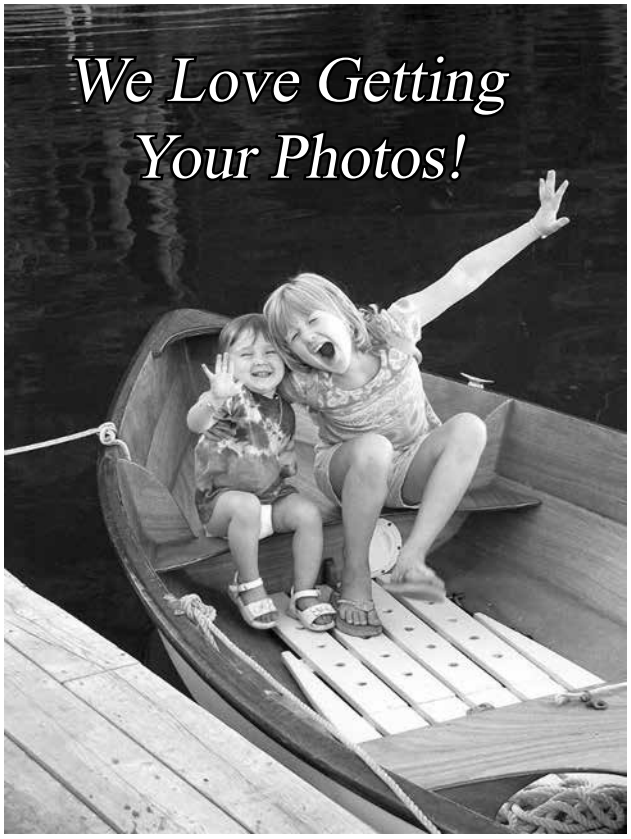

Email photos to photos@clcboats.com
or mail a CD or prints to:
Chesapeake Light Craft, LLC
1805 George Avenue
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