DuraKore®

composite strip planks











- Lightweight
- Extemely high strength-to-weight ratio
- High impact and fatigue resistance
- Superior sound and thermal insulation properties
- High moisture resistance
- Positive flotation
- Excellent cost effectiveness
- Renewable natural resource

DuraKore® Strip Composite Technique represents a technological breakthrough that simplifies the process of building a custom, one-off composite boat for the amateur builder and professional builder alike.

The DuraKore Building System combines the best elements of traditional wooden boat building techniques with advanced, lightweight, composite materials.

Builders can construct a stronger, lighter 'composite' boat faster and easier than with traditional wood construction techniques. For example, DuraKore weighs up to 67 per cent less than an equal thickness of Western Red Cedar, yet is actually stronger.

The amateur builder will find that DuraKore is easy to handle and does not require the use of complicated tooling or moulds. Construction proceeds in small, logical steps.

The professional builder will find that DuraKore allows construction of a very competitive boat in terms of strength-to-weight, stiffness-to-weight, and durability, at a cost significantly less than other forms of one-off construction. DuraKore is also ideal for building running plugs and prototypes, allowing production builders the opportunity to recoup a good deal of new-model tooling costs.

DuraKore strip planks consist of an end-grain balsa core sandwiched between timber veneers. Planks are supplied as 300mm x 2400mm sheets and are pre-scarfed to facilitate joining.

Planks are manufactured in a controlled environment and under-go strict Quality Inspections, at all stages during the manufacturing process, to ensure dimensional stability and consistent thickness.



Kato G-force 2000 Speciale
Designed by Schionning Designs
Built by Noosa Marine, Australia

DuraKore Strip Planks rigid end-grain balsa (150kg/m³) with timber veneer on both sides

Order Code	Plank Thickness	Nominal Weight kg/m²
DK009	9mm	3.0
DK013	13mm	3.7
DK016	16mm	4.2
DK019	19mm	4.6
DK025	25mm	5.6
DK030	30mm	6.1

- DuraKore Strip Plank size 300mm x 2400mm
- All timber used in the manufacture of DuraKore is harvested using sustainable methods.
- vdL Composites reserves the right to alter specifications without prior notice.



DuraKore planks are pre-scarffed to facilitate joining.

Core Mechanical Properties

Lightweight closed-cell ProBalsa® boasts one of the highest strength-to-weight ratios of core materials in use today. Its compressive strength, impact and fatigue resistance, and shear strength are extremely high.

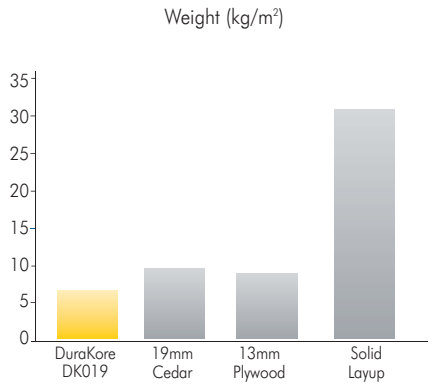
Nominal Density	ASTM C-271	155 kg/m³
Tensile Strength perpendicular to the plane	ASTM C-297	13.5 MPa
Tensile Modulus perpendicular to the plane	ASTM C-297	3.52 GPa
Compressive Strength perpendicular to the plane	ASTM C-365	12.7 MPa
Compressive Modulus perpendicular to the plane	ASTM C-365	4,100 MPa
Shear Strength	ASTM C-273	3.0 MPa
Shear Modulus	ASTM C-273	166 MPa
Thermal Conductivity @ +23°C	ASTM C-177	0.064 W/m.K

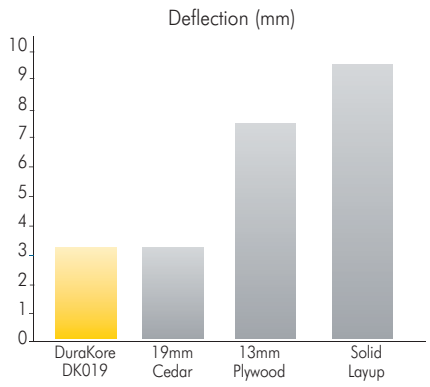
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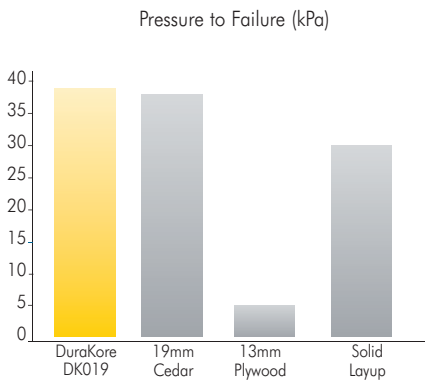
Material Comparisons

	Weight (kg/m²)	Deflection (mm)	Pressure to Failure (kPa)
19mm DuraKore/ T750 each side	7.6	3.2	38
19mm Cedar/T750 each side	9.5	3.2	37
13mm Plywood	8.1	7.4	5
Solid Layup 9x C600+M225	31.4	9.5	30

Flexural Bending Test Results







Basics of Boat Building

Before unpacking DuraKore, you must build the mould frames to which DuraKore will be attached. Mould frame construction and frame set up are covered very thoroughly in "The Gougeon Brothers on Boat Construction".
Lofting is the process of translating the small scale lines from the designer's drawings into the full scale of the actual boat size. It is a complex, time consuming procedure, and a critical procedure that affects the final appearance and performance of a boat. While some will want to perform this task, many (especially first time builders) may wish to have CNC routed frames supplied by vdL Composites if their plans are computer generated.

Before lofting, or ordering CNC routed frames, and constructing mould frames, you must decide between using a male mould or a female mould configuration. In a male mould configuration, the boat is built upside down, over the mould frames. In a female configuration, the boat is built right side up, on the inner of the mould frames. Each has its advantages and disadvantages.

Construction and Set Up of the Mould Frames

There are many excellent resources that describe mould frame construction and set up procedures in detail. Here are a few recommendations vdL Composites make due to the unique nature of the DuraKore Strip Composite technique.

• Make certain the material you use to build the mould frames (such as plywood or chip board) will hold the screws or nails you will use to attach the DuraKore strip planks.

• DuraKore generally requires fewer mould frames than other methods of one-off construction. The mould frames can be spaced up to 1050mm apart, depending on hull shape and DuraKore thickness. In areas of greatest curvature, additional mould frames should be used. If possible, discuss mould frame spacing with the designer of your particular boat or the technical staff at vdL Composites.

• When using male mould frames, do not position them directly on the floor, but rather attach them to a strong-back that is high enough off the floor to allow access to the interior of the hull, even after all the DuraKore strip planks are attached. This will enable you to scrape off excess epoxy that squeezes from between the strips before it hardens.

• Once the temporary mould frames are constructed and set up, cover all edges that the DuraKore strip planks will be attached with plastic packaging tape. This prevents any epoxy that squeezes out from adhering to the temporary mould frames.



Male Mould Frames

When using male mould frames, a boat is built upside down by attaching DuraKore strips to the outer of the frames, laminating the outer skin, removing the hull from the frames and turning it over, then laminating the inner skin and adding stringers, bulkheads and interior framing.

Advantages :

• It is much easier to work from the outside of the boat while attaching the DuraKore strips.

• The hull needs to be turned only once; after laminating and finishing the outer skin.

Disadvantages :

• The hull structure can lose shape if pulled from the mould frames during the turning procedure, so a number of the temporary mould frames must be left in place when turning, or a number of permanent mould frames (such as bulkheads) must be incorporated in the mould frame set up.

• When building over male mould frames you must crawl underneath the overturned hull form to scrape excess epoxy/filler that squeezes from beneath each strip plank; or, if left until after turning, you must sand the cured excess before proceeding with lamination.

Female Frames

Advantages :

• As a result of the hull being built right side up with the interior exposed, the inner skin can be laminated and all permanent interior stiffeners, stringers, and bulkheads can be fitted before removing the hull from the mould frames, thereby holding the hull shape true during the turning procedure.

Disadvantages :

• Unless your work space is over twice as long as the boat you are building, you must lift each DuraKore strip plank up and over the shear of the mould frame in order to position them inside the frames. This can be awkward because of the flexibility of the strip planks, especially when one edge is covered with epoxy.

• Due to the fact the DuraKore strip planks are fitted inside the frames, the work of fitting each strip plank near the centre line can be awkward, since you must stand on the structure, straddling the area while the strip planks will be positioned.

• The hull form must be turned twice. First to laminate and finish the outer skin, then to return it to its upright position.

The choice of using male or female mould frames depends on a variety of factors such as work area, the number of people available to assist in construction, complexity of hull shape, and sometimes designers specification.

Tools & Equipment

With a few exceptions, the tools required by the DuraKore Strip Composite technique can be found in most work-shops. Following are those tools common to most work-shops as well as a few exotic tools that, while not absolutely necessary, can make the job easier.

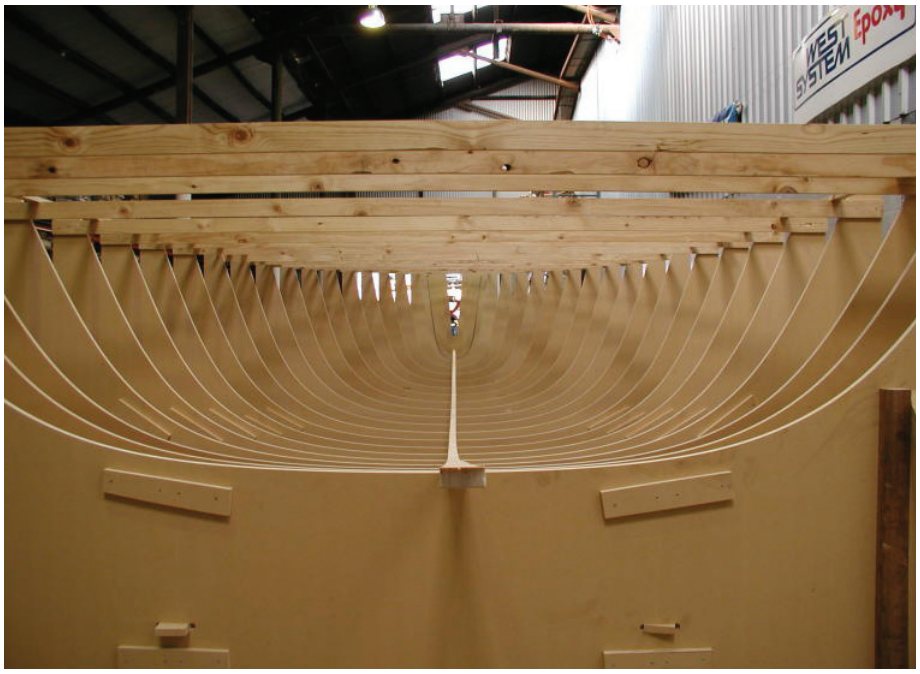
Among the hand tools you may require are a hammer, paint rollers, block plane, crosscut saw, wide putty knife, utility knife, back saw, scissors, assorted clamps, screw drivers, standard drill bits, chisel, level, tape measure, staple gun, and a chalk line.

Among the necessary power tools are a circular saw, a disc sander, an electric drill and a belt sander.

vdL recommends a standard 300mm Tungsten Carbide blade to cut the DuraKore planks. This is blade is for multi purpose use but predominantly used for timber. We recommend the Stehle brand : Model No: 50100032 30mm Bore, 72WS, 3.2mm Width.

Special tools include plastic squeegees, a notched floor tile trowel, a fairing batten, a short sanding block and a long sanding block.

Other sundries you should have on hand include disposable rubber gloves, protective skin cream, polyurethane foam roller covers, paint roller pans, plastic mixing containers, disposable paint brushes, sandpaper (80, 120 and 220 grit). Scotchbrite pads, sheetrock screws, staples and plastic packaging tape.



Storage

DuraKore strip planks should be stored flat, out of direct sunlight, and kept dry and clean.

Safety

Avoid inhalation and eye contact with machining dust. Wear protective equipment such as hearing protection and safety glasses during cutting operations, and gloves to avoid cuts. Use guards as per machinery manufacturers instructions.

Epoxy and DuraKore

Epoxy resin, often in combination with various fillers, plays an integral part in the DuraKore Strip Composite Technique.

1. vdL Composites recommend WEST SYSTEM® 105 resin/hardener mixture is used to seal the DuraKore planks before scarfing.

2. A mixture of resin, hardener and 403 Microfibres high density filler is used to glue the scarfed DuraKore planks to make the length of the boat under construction.

3. A mixture of epoxy, hardener and 405 Filleting Blend low density filler is used to glue the edge of its adjacent strip during “planking”.

4. A mixture of epoxy, hardener and 403 Microfibres is used to fill any gaps between strip planks and to fill nail/screw holes after the nail/screws have been removed.

5. Resin/hardener is used to laminate the fibreglass reinforcements on either side of the DuraKore.

6. Finally, a mixture of resin, hardener and 410 Microlight low density filler is used to make a fairing compound for final fairing of the hull and deck.

Working with Epoxy Resins, Hardeners & Fillers

Most problems related to the proper curing of epoxy can be traced to the wrong ratio of resin and hardener. Accurate measurement and strict adherence to manufacturer’s instructions are critical. Essentially, error-free epoxy mixing involves three separate steps:

1. Dispense and measure the proportion of resin and hardener into a mixing pot. Begin with a small batch if you are unfamiliar with the pot life or coverage of the epoxy.

2. Stir the two ingredients together thoroughly with a wooden mixing stick (2 minutes is recommended). Scrape the sides and the bottom of the pot as you mix. Use the flat end of the mixing stick to reach the inside corner of the pot.

3. When fillers are required, stir them into the epoxy AFTER the resin and hardener have been thoroughly mixed.

If you are going to be using the mixture out of a roller pan, mix it thoroughly in a mixing pot before transferring it to the roller pan. **DO NOT USE** a power mixer unless you thoroughly scrape the sides and corners of the mixing pot while mixing.

WEST SYSTEM 301 dispensing pumps mount directly onto the resin and hardener containers and have been calibrated to deliver the correct mix ratio with one full pump stroke of each.









Amine Blush

Amine blush is a by-product of the epoxy curing process that appears as a wax-like film on epoxy surfaces during the final cure phase. The blush is water soluble and can be easily removed, but can clog sandpaper and inhibit subsequent bonding if not removed. Wash the surface with clean water and an abrasive pad, such as a 3M Scotchbrite pad. Dry the surface with plain white paper towels to remove dissolved blush before it dries on the surface. After washing with the abrasive pad, the surface should appear dull. Sand any remaining glossy area with 80 grit sandpaper.

When to Sand

If you can make an impression in the epoxy with your thumbnail, it has not cured hard enough to require sanding, and recoating without sanding is possible. Sanding is only necessary after final cure has been reached – generally if the surface has been allowed to stand for 12 to 24 hours. If there is any doubt or if the surface feels waxy, allow the epoxy to cure fully and then sand.

Safety

Epoxy resin rarely causes skin sensitisation. Hardeners, however, are considered skin irritants and sensitisers, though their toxicity is greatly reduced when mixed in the proper ratio with resin. Adequate handling precautions must be taken and the safeguards recommended by your epoxy manufacturer and supplier should be strictly observed.

Construction Preparation

After unpacking the DuraKore planks, precoat both sides with epoxy resin/hardener mixture to stabilise the moisture content of the plank before ripping the planks into strips and scarfing them to the desired length.

After coating, the ends of the planks are scarfed together and bonded with a high density powder modifier/epoxy mixture to the length of the boat. The planks are then ripped into strips with a hand held circular saw. The strips will easily bend and conform to the shape of your hull.

The number of DuraKore planks needed to form a DuraKore strip plank depends on the length and shape of the boat under construction. A typical 9m boat would require DuraKore strip planks made up of four 2400mm planks. However, it is not necessary to plank the entire hull with 9m strip planks. The initial, or master, plank is generally attached close to the chine or curve of the bilge. As the planking process progresses and the strip planks begin overlapping the centreline or the shear, the span between uncovered mould frames decreases and shorter strip planks can be cut to fit these areas.

** vdL Composites can calculate the correct square meterage of DuraKore required for your boat from designers specifications.*



Building a plywood table at a comfortable height for working is a great back saver when compared to working off the floor. The table must be the length of the longest strip being constructed. That is, if you are gluing five 2400mm DuraKore strips together to form a strip 12 metres long, your table must also be 12 metres long.

On the table you can scarf the planks together before ripping them into strips and later set up a holding jig to edge glue the strips. We recommend the table be 500mm wide and the length of the boat with a 100mm high edge to butt the planks against.

Edge Gluing DuraKore Strip Planks

As each DuraKore strip plank is attached to the mould frames its edge must be glued to the edge of the adjacent strip plank with epoxy and low density filler mixture 405 Filleting Blend to the consistency of peanut butter. The epoxy/filler can be applied to each strip one at a time, or to a number of strips in a "buttering" jig.

If the consistency of the epoxy/filler is too thin, it will run out from between the strip planks. Conversely, if the mixture is too thick it will not wet out the edge of the strip plank, preventing a good bond. It is a good idea to experiment by gluing a few sample strips.

If you are working alone it is probably easier from a handling standpoint to apply the epoxy/filler to the edge of one strip at a time.

An easy method is to fill a plastic zip-top bag with the mixture, snip one corner with a pair of scissors and squeeze the mixture out in a bead on the edge of each strip plank, much like a baker using a pastry bag. When working your way down from the master strip plank it is easier to apply the bead of epoxy/filler to the strip plank before attaching it to the mould frames. If you are lucky enough to have help, work will progress much faster with the use of a "buttering" jig.

"Buttering" the DuraKore Strips

Applying epoxy to the edges of your DuraKore strips is a significant part of the work of building with DuraKore. You need a quick, efficient, clean method of applying the epoxy/filler mixture to the edges of the DuraKore strip planks. We call the process of applying an epoxy/filler mixture to the edges of the strips "buttering", because of its similarity to spreading butter on a slice of bread.

The buttering can also be assembled on your table and should hold enough strip planks for a crew to "butter" and attach to the mould frames comfortably within the constraints of the epoxy's gel time. Generally, we have found that two strips for each person in the crew is about right. For example: a crew of three will be able to "butter" and attach six strip planks comfortably with the working time of the epoxy.

The jig is simply a matter of making little wooden blocks and screwing them to the table at 600mm intervals. You then place the suitable number of planks on edge between the blocks and the back edge of the table and push a timber wedge between the block and the strips to hold them firmly in place.

Place the strip planks in the jig – they should fit snugly – and pour or spread the epoxy/filler over the exposed edges. Using a squeegee or trowel, wider than the jig, to distribute a smooth, even layer of the epoxy/filler over the edges of all the strips. The strip planks are now ready to attach to the mould frames.



After removing each bundle of strip planks scrape any excess epoxy/filler from the jig before it cures. It is important to keep the jig clean, especially the two top edges that guide the trowel while smoothing the correct thickness of epoxy/filler over the strip planks. If enough epoxy cures on the jig to reduce its effectiveness, remove and replace the layer of protective plastic packaging tape.

Planking the Boat :

Positioning the First or “Master” Plank

As outlined in “The Gougeon Brothers on Boat Construction” the location of the master strip plank is very important, because it determines the direction and amount of curve that all succeeding strip planks will follow as they approach either the keel or the shear. Improper location of this master strip plank might cause the strip planks approaching the shear to become overly curved, while the strip planks that are approaching the keel might hardly curve at all. The goal is to locate the master strip plank about midpoint along the hull and in an arc that will allow the strip planks installed on either side of it, to bend about the same amount as they approach the keel or the shear.

The simplest method of determining the location of the master strip plank is to determine and mark the mid-frame locations at various points along the hull. Establish these positions by measuring along the perimeter of the mould frames between the keel and the shear, starting in the middle of the hull and working towards the ends.

Once you have located and marked the point on each mould frame which is equidistant from both the keel and the shear, position a strip plank along the marks and temporarily nail it into position.

CAUTION! Never position a strip plank joint against a mould frame. Forcing a nail through one of the glued joints could cause it to break.

Using your eye as a guide, move the strip plank as needed to achieve a fair curve that still intersects the mid-frame marks as closely as possible. Once this is accomplished, extend the strip plank arc to achieve a fair curve over the unmarked fore and aft frames.

Using your eye as a guide, move the strip plank as needed to achieve a fair curve that still intersects the mid-frame marks as closely as possible. Once this is accomplished, extend the strip plank arc to achieve a fair curve over the unmarked fore and aft frames.

Installing this strip plank will give you a better idea on how the planking will lie on the rest of the hull. Measure either up or down from the strip plank at various points on all mould frames to get a sense of what the rest of the strip planks will look like as they approach the shear and/or keel. As you work out the planking direction, try to determine which curves in the hull are the most severe and establish the best angle for negotiating them. Compare this with the angle of the master strip plank.

Another factor which might affect placement of the master strip plank is the amount of compound curve toward the shear compared with the compound curve toward the keel. The bottoms of boats are usually compounded more than the topsides. This may indicate that the master strip plank should be curved more toward the shear where the strip planks might be more easily bent edgewise due to lack of compound curvature.

When you have lined up the master strip plank and made final adjustments fasten it to each of the mould frames. Sheetrock screws with large washers work well.

With the master strip plank in place you are ready to begin edge gluing and attaching the remainder of the DuraKore strip planks.



Attaching DuraKore to the Mould Frames

The DuraKore strip planks are attached to the edges of the mould frames with temporary fasteners that are removed after the epoxy/filler on the edges of the strip planks cures. Sheet rock screws work best. Use washers on the screws so you don't drive the screw heads through the DuraKore veneer.

At this point, you will have attached the master strip plank to the mould frames and, if working alone, have the first strip plank ready to attach. If using a "buttering" jig, you will have the first bundle of strip planks "buttered" with epoxy/filler on one edge and ready to attach. Proceed as follows:

1. With enough people to support the entire length of the DuraKore strip plank (because of the length, each strip plank by itself is very flexible), carefully lift the first strip plank and place it, epoxy side down, on the top edge of the master strip plank, when working up from the master strip plank. Be careful not to locate any glued joints over the mould stations. Also, stagger the joints so that the joints on one strip plank do not line up with the joints on the adjacent strips.
(If you are working alone, without a "buttering" jig, apply a bead of epoxy/filler to the top edge of the master strip plank, then carefully rest a strip plank on top of the master strip plank, setting it gently into the bead of epoxy/filler when working up from the master strip.

When working down from the master strip, run the bead of epoxy/filler on the top edge of the next strip plank and press it epoxy side up, under the master plank. You will probably need to use some form of support or bracing to hold the strip planks in place while fastening, especially at each end.

2. Beginning at the centre mould frame, press the strip plank firmly against the master strip plank. A small amount of epoxy/filler should squeeze from between the two strip planks on both the inside and outside surface. (If no epoxy/filler squeezes out, you are not applying enough. If the mixture that squeezes out runs down the surface of the strip planks you are applying too much.)

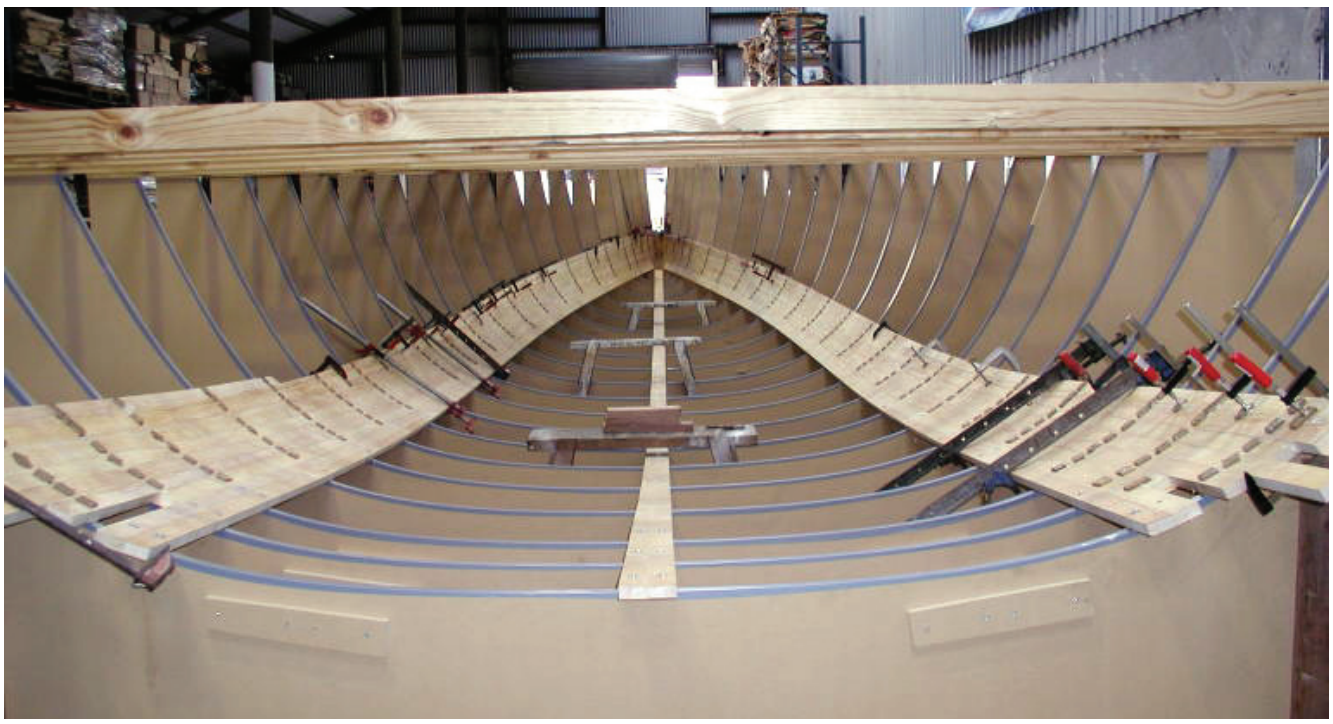
3. Screw the strip planks to the edge of the centre mould frame being careful not to drive the head of the screw through the veneer of the DuraKore.

If you are fastening over male mould frames use alloy screws and the epoxy/filler to attach the strip planks to any permanent mould frames, that is, those that will remain inside the completed hull.

4. From the centre mould frame, first working forward then aft, repeat steps 2 and 3 at each mould frame. (You may find it easier to start at the transom or bow and work forward to back, rather than starting at the centre mould frame.) There is no hard and fast rule on where to begin; it's governed only by what works best for you.

In rare situations, extreme curvature may make it difficult to force the strip plank to follow the curve without snapping. When this happens, cut a number of slits in the backside of the strip plank, cutting through the veneer and the balsa to the backside of the second veneer. Do not cut through the second veneer. Cut the slits parallel to each other and perpendicular to the desired bending direction. The degree to which a DuraKore strip will bend depends on its thickness.

5. As each successive strip plank is attached to the mould frame its veneered face must be flush with the face of the previous strip plank. Some misalignment may occur between the stations, which must be corrected.



Fairing

During the actual construction process, it is important to keep the veneer side of each DuraKore strip flush with the veneer of the adjacent strips in order to keep a fair form and reduce the amount of fairing later on. "Fairing strips" greatly aid this effort.

Cut a 1200 x 2400 x 3mm ply into 50mm wide strips of varying lengths (600 x 1200mm). Then cover the strips with plastic packaging tape to prevent them from adhering to any epoxy that squeezes out from between the DuraKore strip planks.

The fairing strips described will help keep the strip planks properly aligned. Staple the fairing strips to each strip plank to draw them flush. Continually monitor progress to make sure the strip planks are going on in nice fair curves without the appearance of bumps or bulges.

6. After attaching a number of strip planks – the exact number is governed by the gel time of the epoxy – scrape off the excess epoxy/filler that has squeezed from between the strips on both the inside and outside surface before it hardens. This will save a great deal of sanding later.

7. Whether planking over male or female frames, the ends of the strip planks will extend beyond most areas of the hull, requiring little or no fitting. However, along the centreline the strip planks from one side of the hull will butt into the strip planks from the other side. On the first side of the hull, trim the strip planks along the centreline after the planing is complete. Snap a chalk line and cut a clean, straight edge with a circular saw.
On the second side of the hull use a back saw to cut and fit each strip plank where it intersects the centreline. Use the same epoxy/filler mixture used for edge gluing to glue the trimmed ends to the planks on the first side of the hull.

8. After the entire hull is strip planked and the epoxy/filler gluing the edges of the DuraKore has cured, rough trim all the strip planks that extend beyond the shear and transom. Rather than trim the planking flush with these surfaces, allow them to extend an inch or two to provide a little extra area for laminating. Later, after you have completed laminating, you can trim the planking flush with the desired surface.

9. Remove all temporary fasteners holding the strip planks to the mould frames. Do not remove fasteners holding strip planks to permanent mould frames. Instead, make certain they are countersunk flush with the outside veneer surface.

Sanding High Spots

The DuraKore Strip Composite Technique creates a fair hull form, requiring very little in the way of fairing. The initial stage, prior to laminating, generally consists of a small amount of sanding to smooth any rough areas.

1. Use a belt sander or disk sander with 80 grit sand paper to knock off any ridges of cured epoxy/filler mixture that protrude from between the strip planks.

2. Lightly sand the entire hull surface with 80 grit sand paper.

3. Using the fairing techniques described in "The Gougeon Brothers On Boat Construction", find and sand smooth any high spots so that they blend in with the overall surface area. While sometimes unavoidable, try not to sand through the DuraKore veneer.



Filling Low Spots

In most cases, no more fairing will be required before laminating the initial structural skin. However, it is best to check for any low spots that might require fairing. Follow the fairing guidelines outlined in "The Gougeon Brothers On Boat Construction" to check the hull surface for any low spots. If there are no low spots, prepare the surface for laminating the structural skin; sand the entire surface with 80 grit sand paper, vacuum and clean.

Sealing the Surface

After sanding smooth, vacuum the surface to remove all dust, debris and contaminants. Coat the DuraKore surface with resin /hardener to fill any minute surface imperfections and porosity in the hardwood veneer and allow curing for 24 hrs minimum. Use a paint roller with an 800 WEST SYSTEM foam roller cover to spread a uniform coating of epoxy/hardener. Allowing the sealing coat to cure.

Laminating the Structural Skins

After sanding and cleaning the surface, you are ready to begin laminating the structural skin (outer skin if using male mould frames, inner skin if using female mould frames). The reinforcement is applied to a DuraKore surface that has been coated with wet epoxy as follows:

1. Unroll the reinforcement and pre-fit it over the hull form, cut is so that several excess inches extend beyond the surface end. During pre-fitting make sure to overlap the reinforcement edges by 50mm. After pre-fitting, roll up each segment of reinforcement neatly and set it aside momentarily.

2. Roll a heavy coat of mixed epoxy onto the DuraKore surface. Cover only as much area as you can comfortably laminate within the constraints of the epoxy gel time.

3. Unroll the first segment of reinforcement over the wet epoxy and position it carefully, in most cases surface tension will hold it in place. If you are applying the reinforcement on a vertical surface you may want to wait until the epoxy becomes tacky. Work out any wrinkles by lifting the edge of the cloth and smoothing from the centre with your gloved hand or a squeegee.

4. Apply a second coat of epoxy with a foam roller. Apply enough epoxy to thoroughly wet out the fabric.

5. Squeegee away excess epoxy before the first batch begins to gel. Drag the squeegee over the fabric, using even-pressured, overlapping strokes. The object is to remove excess epoxy that could cause the fabric to float off the surface, while avoiding the creation of dry spots caused by squeegeeing too hard.

6. Trim the excess reinforcement after the epoxy has reached its initial cure. The fabric should cut easily with a sharp utility knife.

7. Abrade the surface thoroughly with a Scotchbrite pad, and then repeat steps 1 through 7 for each layer of laminate. The use of a “peel ply” between each layer of reinforcing fabric, if allowing to cure between layers (If applying wet-on-wet, peel ply need only be applied to the final layer) will improve surface finish and reduce or eliminate the need for sanding. Peel ply is a lightweight, woven nylon fabric with a finish to which epoxy will not adhere.

Place the peel ply over the wet-out reinforcement and work it into the epoxy with a squeegee. Once the epoxy has cured, the peel ply can be pulled off to leave a clean, textured surface that will require little, if any, sanding and is ready for the next layer of laminate or final fairing.

If you are building over male mould frames finish the exterior surface before turning the hull and laminating the inside structural skin. If you are building over female mould frames add the permanent interior stiffeners, stringers and bulkheads before removing the hull from the stations and turning it over to laminate the outer skin.



Final Fairing

1. Prepare the surface as required.

2. Make a fairing compound with mixed resin/hardener and 410 Microlight fairing compound.

3. Using a notched squeegee, apply the fairing compound to the surface and allow to cure. The ridges left by the notches are much easier to sand than solid material.



4. Once the tops of the ridges have been sanded, fair with 80 grit sand paper and a long sanding block. Use a straight-edged squeegee to trowel a second application of fairing compound over the surface, filling the grooves. The compound should be flush with the ridges, leaving only minor sanding before finishing.

5. Check for fairness with the fairing batten, following the procedures outlined in "The Gougeon Brothers On Boat Construction".

6. Repeat steps 1 to 4 until the fabric overlaps are covered and the hull is fair.

Final Epoxy Coating

A final epoxy coating is required over the fairing compound to provide an effective moisture barrier and a smooth base for final finishing. Apply a minimum of two coats of mixed epoxy (three coats if sanding between coats is to be done) for an effective moisture barrier, as follows:

1. Prepare surface as necessary

2. Mix only enough resin / hardener as you can apply during the pot life of the mixture. Pour the mixture into a roller pan.

3. Load a roller with a moderate amount of epoxy mixture. Roll the excess out on the ramp part of the roller pan as soon as it is mixed thoroughly .

4. Roll lightly & randomly over an area approximately 600mm x 600mm to transfer the epoxy evenly over the area.

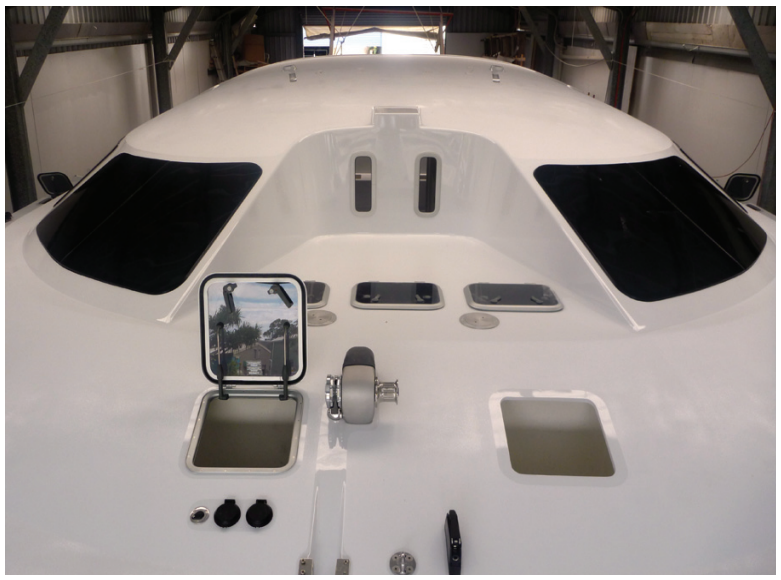
5. As the roller dries out increase pressure to spread the epoxy into a thin, even film. Increase coverage area if necessary to spread the film thinner and more evenly.

6. Finish the area with long, light, even strokes to reduce roller marks. Overlap the previously coated area to blend both areas together.

7. Coat as many of these small working areas as you can with each batch. If a batch begins to thicken before it can be applied, discard it and mix a fresh smaller batch.

8. Drag a foam brush lightly over the fresh epoxy in long, even, overlapping strokes after each batch is applied. Use enough pressure to smooth the stipple, but not enough to remove any coating.

9. Apply second and subsequent coats of epoxy following steps 1-8. Make sure the previous coat has cured firm enough to support the weight of the next coat. To avoid sanding or using a Scotchbrite pad between coats, apply all coats in the same day.



Hardware Installation

Cleats, stanchion bases, winches, sail tracks, and other pieces of hardware come under high strain and require special treatment of the deck where they are bolted down. Timber, plywood, or epoxy-glass plugs must replace the balsa core in these areas. These plugs prevent crushing the core when the bolts are tightened, and they also block water intrusion into the balsa core of the composite laminate

Finishing

Final finishing is important for cosmetic reasons and to protect the epoxy from ultraviolet light.

1. Allow the initial epoxy coat to cure thoroughly.

2. Wash the surface with a Scotchbrite pad and water.

3. Sand to a smooth finish. The amount of sanding required will depend on how smoothly you applied the final epoxy coatings and which finishing system you choose.

If there are runs or sags in the epoxy, begin sanding with 80 grit paper to remove the highest areas. Sand until the surface feels and looks fair; then switch to 120 grit wet or dry paper. Wet sanding is preferred by many people, because it reduces sanding dust. After all the scratches from 80 grit paper are removed, switch to 220 grit paper, then on the finest grit that meets your needs. If a primer is to be used, 80 grit is usually sufficient.

After you are satisfied with the texture and fairness of the surface, rinse the surface with fresh water and dry it with clean paper towels. Proceed with your final coating operation, following the specific instructions of your paint or coating system supplier. It may be a good idea to make a test panel to determine required surface preparation and finish compatibility.



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