Building notes for the MI Bateau 12, strip plank version

Before you start, please read our online tutorials. We will often refer to our online tutorials. 90% of the questions about building are answered in those files. If, after reading the HowTo files, you still have an unanswered question, please post your question on our message board. We usually respond in a few hours.

Our technical support web site bateau2.com features a large number of tutorials and help files about the methods and materials used to build this boat. Together, those HowTo files constitute a complete boat building manual for our material. Please read the HowTo files before building your boat. The instructions below are sufficient to build your boat but if you want more information, in addition to the material freely available at our web sites, we recommend books about strip plank boat building in general:

- Strip Plank Boat Construction by Paul Fisher
- Canoecraft: An Illustrated Guide to Fine Woodstrip Construction by Ted Moores
- Building an Adirondack Guideboat: Wood Strip Reproductions of the Virginia by Michael J. Olivette and John D. Michne

and, if you can find it:
- The Adirondack Guide Boat by Kenneth and Helen Durant.

Those books are a good introduction to boat building in general but if there is any conflict between their specifications and ours, you must respect ours.

Beware in particular of scantlings for sheathed strip given by other designers. The only published scantlings for sheathed strip are based on polyester and woven glass and can not be used for our boats.

We assume that the builder is familiar with the use of epoxy and fiberglass.

When planning the building of this boat, please do not try to solve every little “problem” from the start. Many apparent difficulties will disappear as the building progresses. It is important to have a clear idea of the complete building process but it is not necessary to understand every detail before building the hull.

Since this design is also available in a multi-chine plywood version, you will find the text referencing this boat as the “strip version”.

Overview:

We propose 3 types of strip plank construction:
1. Foam strips with thick glass skins.
2. Traditional cedar strips with glass skins
3. Plywood strips with glass skins.

The foam strip is the easiest and fastest building method. It also produces a lighter and stronger boat, a true foam sandwich boat. Unlike cedar, the foam sandwich is not subject to changes due to temperature or moisture.
The foam strips are easy to shape. They are held together with Raptor fasteners, this eliminates the need for special clamps and make the assembly fast and easy.

The traditional cedar strip hull is built like most other strip boats but we simplify the hull framing. Our framing is done in the style of composite boats stem, chines and keels are heavy fiberglass.
We consider the strips to be the core of a sandwich material and use glass skins on each side. Those glass skins are much thinner than in the foam sandwich method.
You can use either plain rectangular section strips or bead and cove ones.
This method is labor intensive but it is the only one that can produce a varnished boat hull.
Many good books were written about strip planking with cedar strips and you can build your boat as
described in those books or use the method we describe in our notes. There is more than one way to build a good strip plank boat but in all cases, please respect our fiberglass scantlings.

The plywood strips method is also labor intensive but the material is easily available. The resulting hull is slightly stronger and more stable than a cedar strip boat. In this case, stable means resistant to changes in temperature and moisture content.
A composite sandwich is very stiff and the hull requires less framing than a traditional wooden boat. A good gunwale and coaming, breasthooks and 3 seats are sufficient framing.
In all cases, the strip glue and laminating resins are made from epoxy. We use the same molds system for all 3 methods.
For each method, a jig made from transverse molds and bow molds are set up. That jig is planked with strips.

**Building the jig:**

![Diagram of a jig](image)

The jig for the strip version is made of transverse molds and bow molds set up on a table or strongbacks. The “table” can be as a narrow as a pair of 2x4’ 12’ (3 m) long (in metric, a 2x4 is a wooden beam, a wide board, about 40 by 80 mm).
It can also be made from plywood sheets on sawhorses. What we show in the picture is large, about 168 by 56” (425 x 140 cm).
The molds are made from particle board (MDF). We use a 2x4 to brace it but any method is valid.

We named the molds starting from the middle.  
The first mold A is located 6” from the middle of the boat. From there, each mold is spaced 12".  
If you use a butt block for the bottom, it will fit between the molds.  
Since the boat is symmetrical, we will use the word bow for each end.

The outline of the molds for the three versions are the same. Since the foam strips are 1/4” thicker, this  
will result in a slightly larger boat: 1/2” (12 mm) more in overall beam.  

The foam strips are flimsy and require a mold every 12" but for the stiffer plywood and cedar strip version,  
one mold every 24” is sufficient. This means, for the wood strip version, use A, C F, E and the bow mold.

We use a baseline located 2” above the line that joins the two ends of the boat.  
That baseline will be the top of your table or strongbacks.  
When cutting the molds, mark the sheer line, it will help align the first strip.  
Also mark the center line to align the molds on the table.  
Draw a centerline on the table supporting the molds. Draw the molds location lines every 12”.  
When installing the molds on the table, we always measure from the “small” side. This is our reference  
side. The small side is the face of the mold closest to the ends.

This means that you always position the molds using the face closest to the ends. It also means that if you  
have a spacing of 12”, that spacing is measured between two reference sides. In the case of a 1/2” thick  
mold, this produces an open space of 12” minus 1/2” = 11.5”.  

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Explained another way: mark all the mold location lines on the table, every 12” but always install the molds with their thickness towards the middle of the hull. For molds 1/2” thick, cut a spacer 11.5” long and use it check molds alignment.

The bow mold is made of 3 layers of particle board and butts against the last mold. Cut the parts, line them up along their longest side, glue or screw and fasten to the table and the last mold (F).

The picture does not show bracing or cleats.
Cover the edges of all the molds with plastic sheeting (polyethylene). We do not want the epoxy to bond to the molds.
The bow mold is covered with minimum 3 layers of heavy plastic sheeting.
The 12 mm MDF should take the strip screws without splitting but you may prefer to reinforce the edge of the MDF with one or several cleats as in the picture below.
Planking:

Note: we do not bevel any parts. Epoxy glue does require a gap.

Foam sandwich version:

**Bottom panel:**

Start by installing the bottom panel.

*(cut - exact specifications in the complete version)*

To reduce the need for outside fairing, lightly grind down the foam where the tape will be applied, about 1/16” (2 mm) deep.
The foam bottom panel is fiberglassed on the two sides with a light woven cloth before installation on the jig. See scantlings at the end of these notes.
Use temporary screws to install the bottom on the jig. As for all of our boats, use as few screws as possible. Deck screws or drywall screws are perfect. Use small diameter screws.
The screws will be removed before the final outside fiberglass layer and the holes filled with epoxy putty.
With the bottom panel installed, proceed to the strip planking.

**Strips cutting (foam):**

You can either plank the hull with plain foam strips or fiberglass at least one side of the foam panel with a light cloth before cutting the strips.
To fiberglass the foam with one layer of light glass before cutting the strips has two advantages: the strips will be stiffer and we can join two panels to produce full length strips. It is easier to produce a fair hull with glassed strips.
We recommend and will describe that method.
Fiberglass one side of two foam sheets butted together with a light woven cloth. Note that we do not tape the two sheets together before the application of the cloth. A layer of tape would create a flat spot.
Once the resin is fully cured, cut the 1” (25mm) wide strips.

**Strip planking (foam):**

Start from the sheer line.
The sheer line is coplanar. This means that the first strip bends only in one direction. It is easier and guarantees a fair hull.
Take your time to install the first strip. It will define the lines of the boat.
The length of that strip is about 164” (4615 mm) with a seam in the middle.

As we progress towards the chine, the strips will become shorter. We must pay attention to the location of the seam and alternate them. To do this, we start one strip at one end and start the next one from the other end.
If you cut the strips from standard 7’ long foam sheets, the seam between the two first strips will be offset by only 8” (20 cm) but since this happens around the middle of the hull where curvature is minimal, it will not create an unfair spot.
Closer to the chine, the distance between the alternate seams will increase.

Back to our first strip. We install the foam strips with the glass skin on the inside.
See the plans for a detail view of the seam at the bow and stern. There again, we do not bevel. We will shape the bow with a grinder before applying the outside glass skin. Epoxy will fill the small gap easily.
The first strip is epoxy glued at the ends and screwed to the molds.
Do not over tighten the screws. Screws that are too tight will produce a flat. Let the first strip just make contact with the edges of the molds and stem pieces.
We aim for fairness first.

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Once you are satisfied with the shape of your first strips, one on each side, proceed with the next one. Foam strips are held together along their edges with Raptor double barbed nails (copulas). Copulas are pushed half way in the strip edges ready to install. The builder push down and presses the strips against the previous one.
If Raptor copulas are not available, the builder can use tooth picks but it will be more difficult to get a good fit between strips.

The copulas are available at

The copulas will stay in the foam.
Always work symmetrically adding strips on one side then on the other.

Cut the second strip to size. Push Raptor copulas at intervals of about 12” (30 cm) in the second strip. Spread epoxy glue along the edge of the sheer strip. Push the second strip in position. We like to start from the middle. Put a few screws through the second strip in the molds and at the ends. Proceed the same way for all the other strips. Once you reach the chine, you will have to cut the ends of the strips to fit the bottom panel. Install them dry, draw a line from the inside with a pencil and cut to fit. A tight fit is not required: we will fill gaps from inside with a light micro balloon putty. At the bow, build a concave fillet about 1/2” radius (12 mm). Fair, remove the screws and apply

(cut - exact specifications in the complete version)

Beware of excess epoxy at the ends. We do not want to glue the strips to the bow molds. The bow molds are covered with several layers of plastic sheathing but epoxy may penetrate through the screw holes. During the installation of the strips, regularly check the inside for epoxy runs. The runs are easy to remove when wet but hard to sand after the cure, especially on a concave surface (the inside of the hull). Once all the strips are in place, fill the gaps between them with a light epoxy putty made with micro balloons. Let it cure and fair.
Apply the outside fiberglass, see scantlings at the end of these notes.

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Always overlap at the ends and chine.

The outside is ready for fairing and primer. Fairing and priming can be done at this stage or later.

Flip the hull with or without the molds.
Block and support the hull. If the hull was not pulled from the jig, remove the molds.

Prepare for the inside skin: grind down epoxy runs, fill all gaps with a light epoxy putty.
Build strong stem pieces at the ends (bows) with multiple layers of fiberglass tape, see plans and scantlings.
Grind foam down at the ends, about 2" total (5 cm), build a putty fillet, lay several layers of fiberglass tape.
Reinforce chine with fiberglass tape.
Cover the whole inside with specified layers of glass: see scantlings.
Always offset the edges of the fiberglass tape.
Fair and paint with primer.

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Gunwales, breasthooks and seats are installed the same way in all versions, see further down in these notes.

**Cedar strips:**

Start by installing the bottom. The bottom panel is made of 12 mm plywood. The two bottom pieces are either spliced with fiberglass, one layer of biaxial tape 12 oz. 45/45 6" wide (300 gr 15 cm) each side or joined by a butt block.

An inside butt block is another good method to join the two bottom parts: 12 mm ply, 8" wide (20 cm). If you use a butt block, think of the interference with the last strip at the chine: leave a small gap or grind the edge down.

For the cedar strip planking we outline our preferred method. Feel free to build the boat by other methods described in books about strip boat building.

Cedar and plywood strips are screwed to the molds, not to each other.

Some builders like to use wedge type clamps to hold strips together. We do not find them necessary, screws in the molds should be sufficient to properly line up the strips.

Start from the sheer line.

The sheer line is coplanar. This means that the first strip bends only in one direction. It is easier and guarantees a fair hull.

Take your time to install the first strip. It will define the lines of the boat.

The length of that strip is about 164" (4615 mm).

As we progress towards the chine, the strips will become shorter.

See the plans for a detail view of the seam at the bow and stern. There again, we do not bevel. We will shape the bow with a grinder before applying the outside glass kin. Epoxy will easily fill the small gap and the epoxy putty line will produce a better bond than a tight fit.

The sheer strip is screwed to the molds and the ends.

Do not over tighten the screws. Screws that are too tight will produce a flat. Let the first strip just make contact with the edges of the molds and stem pieces.

We aim for fairness first.

Once you are satisfied with the shape of your first strip, one on each side, proceed with the next one.

Always work symmetrically adding strips on each side.

Cut the second strip to size.

Spread epoxy glue along the edge of the sheer strip.

Install the second strip. We like to start from the middle but it is not an absolute rule. Drive screws through the second strip in the molds and at the ends.

Proceed the same way for all the other strips. Once you reach the chine, you will have to cut the ends of the strips to fit the bottom panel.

Install them dry, draw a line form the inside with a pencil and cut to fit.

A tight fit is not required: we will fill gaps from inside with a wood flour putty.

Beware of excess epoxy at the ends. We do not want to glue the strips to the bow molds. The bow molds are covered with several layers of plastic sheathing but epoxy may penetrate through the screw holes. During the installation of the strips, regularly check the inside for epoxy runs. The runs are easy to remove when wet but hard to sand after the cure, especially on a concave surface (the inside of the hull).

Once all the strips are in place, fill the gaps between them with a light epoxy putty. A light putty is made with micro balloons.

Let it cure and fair.

Apply the outside fiberglass, see scantlings at the end of these notes.

Overlap chine and bow.
The outside is ready for fairing and primer.
Flip the hull with or without the molds.
Block and support the hull. Remove molds if the hull was not pulled from the jig.

Prepare for the inside skin: grind down epoxy runs, fill all gaps with a light epoxy putty.
Build a smooth radius at the ends over the stem pieces.
Cover the stems with multiple layers of fiberglass tape, see scantlings.
Reinforce chine with fiberglass tape.
Cover the whole inside with specified layers of glass: see scantlings.
Always offset the edges.

Fair and paint with primer.
Gunwales, breasthooks and seats are installed the same way in all versions, see further down in these notes.

**Plywood strips:**

The plywood strip hull is built exactly as the cedar strip boat with one exception: the plywood strips are shorter and do not run the full length of the hull.
There are two ways to solve that problem:

- assemble two plywood panels in a longer one before cutting the strips or
- use shorter strips butted against each other, assembled on the hull.

To fabricate long plywood strips, we join two plywood panels with a fiberglass splice. The fiberglass splice is made of one layer of biaxial tape 12 oz. 45/45 6” wide (300 gr. 15 cm).
Grind the plywood down where you apply the fiberglass tape to avoid a difficult to fair fiberglass bump.
Those who have the skills or tools can scarf two plywood panels together.
The handling of the long panels is more difficult but it eliminates the need for temporary blocking, a method we describe further.

To build the hull with plywood strips, follow the method described for cedar strips but alternate the
fiberglass splices. This is easily done by starting one strip from one end of the hull and the next one from the other end.

To join shorter strips during the planking of the hull you must use temporary butt blocks 4 to 6” (10 to 15 cm) long, same width as the strips, on the inside of the hull
We do not want that butt block to touch epoxy: wrap it in several layers of heavy plastic sheathing. The two strip lengths can be joined with the butt block before installation on the jig if you prefer but beware of interference with the molds.
Staples work well to join the strips and butt blocks.
Butt blocks can be removed as soon as the resin is cured.
This method is labor intensive but if the room is not available to splice two plywood sheets together and cut long strips, it may be the only alternative.

Details:

The finishing is to the builder's preference. The hull is stiff and does not require frames: solid fixed seats are sufficient to insure transversal stiffness.
We show caned seats, canoe type. Those seats are available from online or mail order companies at a low price. For example, Hamilton Marine sell caned seats for $33.00, less than the cost of the materials (2010).
The caned seats are supported by cleats epoxy glued to the sides: ¾" square (20 mm).

The breasthooks shape and dimensions are suggestions. A breasthook is required and the dimensions we show are a minimum but that part can be made larger or even become a small deck.
The breasthooks are epoxy glued to the sheer clamp with an epoxy fillet under their topside edge.

The rubrail and inwale we shown are a minimum. You can make them larger but not smaller. The rubrail and inwale assembly is structural and necessary to the stiffness of the hull.
The rubrail and inwale assembly is shown as an open girder rail. It is an option, you can build it solid but the open rail is lighter and looks better.

The oarlock centers are located at 11” (27.5 cm) from the edge of the seat. This is a good average location: adjust in function of the oarsman preference.
The oarlock backing plate is made from plywood or high density foam, 4 x 8” (10 by 20 cm), epoxy glued. Oars should be around 8’ long (240 cm).

U bolts can be installed at the bow on plywood or high density foam backing plates. A 1/2” wide (12 mm) SS strap can cover the bow.
Fiberglass scantlings:

Please follow our scantlings. There are other scantlings for sheathed strip published in books or available on the Internet but those are based on polyester and old bulky fiberglass like mat and roving. Our scantlings use a stronger laminate made from directional glass or woven cloth in an epoxy matrix and is much stronger. Do not substitute woven glass for biaxial.

When applying the glass, always overlap the wide fabric over all edges: bow, chine-bottom by about 6". Offset all edges by at least 1".

If Divinycell is not available, Airex or CoreCell of the same thickness and density can be substituted but DO NOT USE insulation foam.

Foam sandwich scantlings:

(cut - exact specifications in the complete version)

Cedar and plywood strips scantlings:

(cut - exact specifications in the complete version)

BOM:
About fiberglass usage: it is theoretically possible to use less wide fabric by covering the side and half the bottom in one piece. This is very difficult to do: the turn at the chine will create wrinkles and air bubbles. We calculated fiberglass usage based on fabric 50" wide cut lengthwise to fit over the sides and bottom with a 6" overlap. This also creates a double thickness required for stiffness.

Resin usage is based on 45% glass content and includes waste and putty. Fiberglass quantities include waste.

Foam strips version:

(cut - exact specifications in the complete version or fee online study plans)

Plywood version:

Strips (cedar or plywood): 484 linear feet. If cut from standard plywood sheets = 2 sheets 6 mm. Gunwale and rubrail strips to builders preference, see plans for minimum section. Sheer line is 164" long. If build as designed, total rubrail length = 28'. 2 layers of inside rail with inserts = 62' total.

(cut - exact specifications in the complete version or fee online study plans)

Cedar strip version:

Gunwale and rubrail strips to builders preference, see plans for minimum section. Sheer line is 164" long.
If build as designed, total rubrail length = 28'. 2 layers of inside rail with inserts = 62' total.

(cut - exact specifications in the complete version or fee online study plans)

How to draw the molds full size:

This is the mold we will use as an example:

The type of units doesn't matter, the procedure is identical in all unit systems.

**Step 1:**

Start by drawing a centerline.
Add a baseline: this will be the bottom of your mold.
The baseline is perpendicular to the centerline.
Draw the sheer line. The sheer line is above the baseline, parallel to the baseline.
Draw a line for the bottom of the hull, parallel to the sheer and baseline.

**Step 2:**
Mark the width of the bottom and the width of the hull at the sheer.

**Step 3:**
Draw parallel lines above the sheer line at regular intervals until you reach the bottom line. The distance between those lines is shown on the plans. That dimension is marked TYP. TYP means typical, a
dimension that is repeated.

Step 4:
Mark the width of the mold on each of those lines.

This is done on the two sides.

Step 5:
Join the marked points.
To draw the curve from the bottom to the sheer, use a flexible batten or a thin PVC pipe. We show pictures of the procedure in our online tutorials.
All other lines are straight.
Note the sheer line. We will use it line up the topside plank or panel. The centerline must also be clearly marked to line up the molds.