





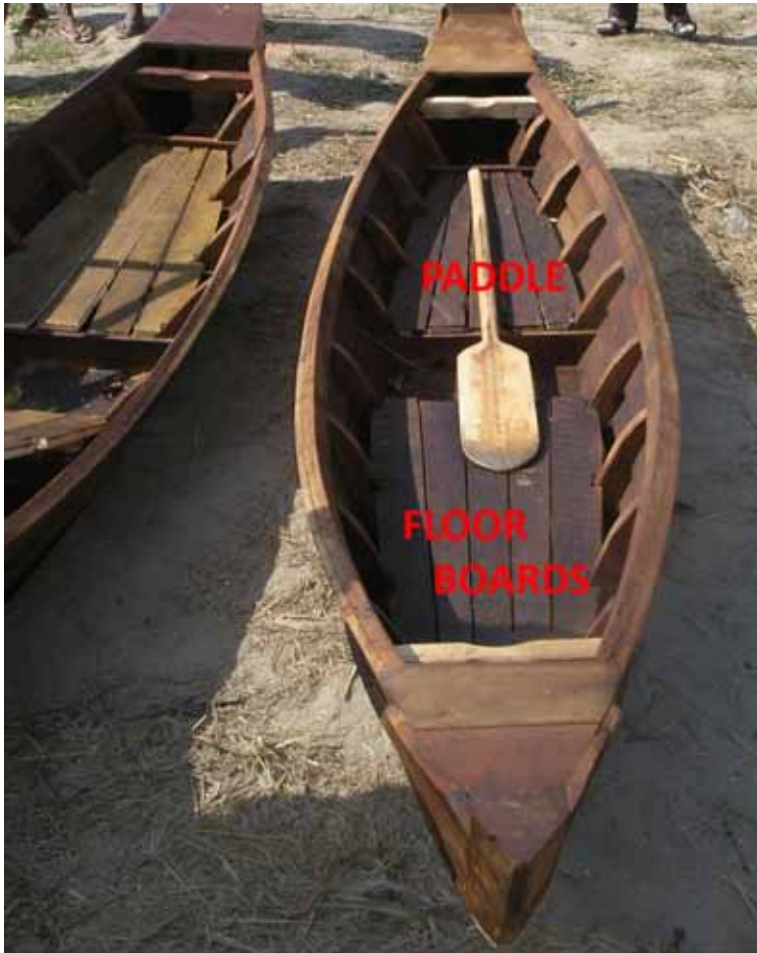



<p><b>60</b>    <b>12 ft &amp; 18 ft</b> <b><u>Putty seams</u></b></p> <p>Putty is made up to a traditional recipe using a natural powder (see right) and oil, either cooking or diesel.</p> <p>The putty is rolled into lengths and worked into the seams.</p> <p>Note: This process will need to be regularly repeated to keep the boat watertight.</p>	 The image shows two parts of the putty preparation process. On the left is a yellow plastic bag with Burmese text and a circular logo. On the right, a person's hands are shown rolling a piece of putty into a long, thin, rope-like strip on a wooden surface.
<p><b>61</b>    <b>12 ft &amp; 18 ft</b> <b><u>Treat timber</u></b></p> <p>A timber treatment is made to a traditional recipe using diesel and engine oil. The mixture is applied all over the boat inside and out.</p> <p>Note: 1) This process will need to be regularly repeated to keep the boat in good condition. 2) This treatment is potentially harmful to the environment and humans.</p>	 A person with long dark hair is shown from the side, applying a dark, viscous liquid to the interior surface of a wooden boat hull. The person is wearing a dark shirt and a watch.
<p><b>62</b>    <b>12 ft &amp; 18 ft</b> <b><u>Finished boat</u></b></p> <p>The boat is now ready for the final details.</p>	 A finished wooden boat is shown on a wooden stand in an outdoor workshop. The boat is made of light-colored wood and has a curved hull. Other wooden parts and tools are visible in the background.

<p><b>63</b></p>	<p><b>12 ft &amp; 18 ft</b>  <b><u>Final fastenings</u></b></p> <p>A few days after the completion of the boat, the planks will have dried a little, and movement and shrinkage will have taken place. At this point, it is necessary to put the final fastenings in. These are required where the top plank overlaps the lower plank (or stringer).</p>	
<p><b>64</b></p>	<p><b>12 ft &amp; 18 ft</b>  <b><u>Final fastenings</u></b></p> <p>Two equally spaced fastenings are required between each frame.</p> <p><b>12 ft</b> – The fastenings required are: 38-mm nails.  <b>18 ft</b> – The fastenings required are: 50-mm nails.</p> <p>Pre-drill the nail holes (see step D in section 6.1).</p>	
<p><b>65</b></p>	<p><b>12 ft &amp; 18 ft</b>  <b><u>Final details</u></b></p> <p>Final details are designed to suit local preferences.</p> <p>In some areas, it is necessary to fit transverse frames in the bow and stern; these are used for various purposes, including securing the boat.</p>	



<p><b>66</b> <b>12 ft &amp; 18 ft</b> <b><u>Final details</u></b></p> <p>Final details are designed to suit local preferences.</p> <p>Other details will include:</p> <p>Floorboards. See Section 4 for material requirements. These should be easily removable and in general not fitted in the middle frame space of the boat because this is used for bailing water.</p> <p>Paddles/oars. These need to be built to suit the user's requirements. Oars will need slots in the side of the boat and support posts.</p>	
<p><b>67</b> <b>12 ft &amp; 18 ft</b> <b><u>Mast support</u></b></p> <p>A mast support may be added to suit local preferences. This will typically consist of:</p> <ol style="list-style-type: none"> <li>1) a transverse of 75 mm x 38 mm, fixed to a frame between the top of the lower side plank and the top of the upper side plank;</li> <li>2) a block or transverse fixed to the keel below this.</li> </ol> <p>Both parts have a hole for the mast of about 40 mm to 50 mm. The mast support should be fitted at frame 7 on the 12 ft design and frame 9 on the 18 ft design.</p>	


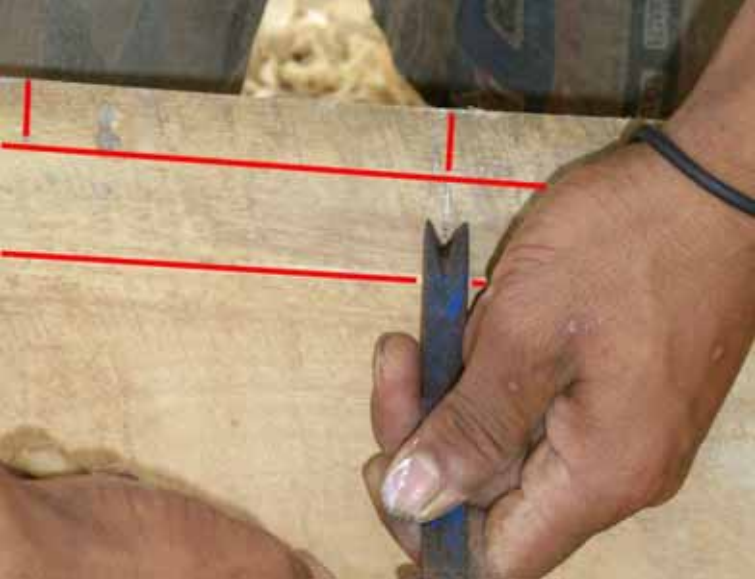
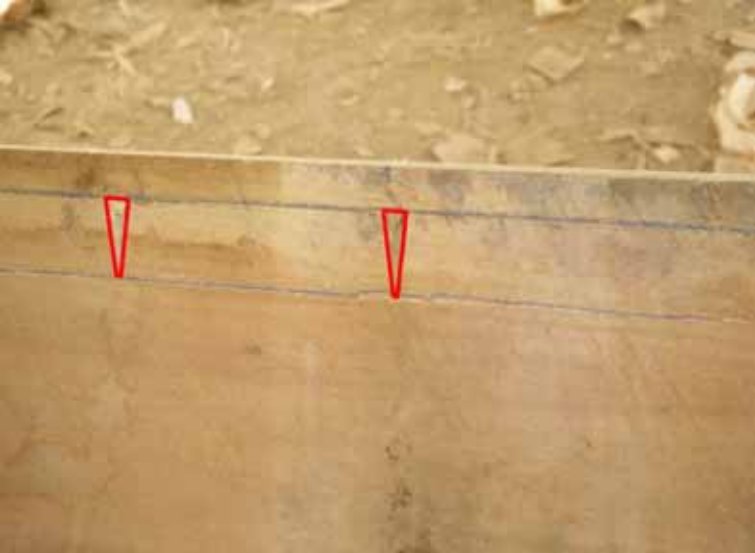
**68** **12 ft & 18 ft**  
**Launch**

After launch, the boats are likely to leak initially. This is normal since it takes a little time for the planking to swell up now that it is in the water. If the problem is serious, more putty may need to be applied in the seams below the water.




At this stage, before the boats are in regular use, it is very important to ensure that they don't dry out in the sun, since this will cause shrinkage of the timber. It is best to keep the boats in a shaded area or in the water until they are handed over to the users. Alternatively, they can be filled with leaves or wood shavings, which may be kept wet.






## 6.1 EDGE NAILING OF PLANKS

<p><b>A <u>Mark nail positions</u></b></p> <p>When edge fastening, planks slots need to be cut for the nails. Mark these out carefully to ensure that the nails are in the correct positions.</p> <p>Two nails are used between each frame, and the slot is cut between two lines; the first is 1 x the plank thickness from the edge and the second is about 2.5 x the plank thickness from the edge.</p>	
<p><b>B <u>Cut nail slots</u></b></p> <p>Using a sharp V-shape chisel, cut the nail slots in the marked positions. The depth of the slot at the line closer to the plank edge should be just sufficient to accommodate the nail head.</p>	
<p><b>C <u>Finished nail slots</u></b></p> <p>The finished nail slots should be neat and regularly spaced.</p>	



<p><b>D</b> <u><b>Pre-drill holes</b></u></p> <p>To ensure that planks do not split, pre-drill the nail holes in the plank edge. The drill should be one size or 1 mm smaller than the nail.</p> <p><b>Note:</b> In general, it is good to pre-drill nail holes in all locations, but it is particularly important to do so where the nails are close to the edge or end of the timber.</p>	
<p><b>E</b> <u><b>Insert nails</b></u></p> <p>Insert the nails into the pre-drilled holes.</p>	
<p><b>F</b> <u><b>Nailing</b></u></p> <p>Use a punch to drive the nails fully into the slots. Care should be taken not to split the planks.</p> <p><b>Note:</b> In general, it is good to countersink nail holes by at least 3 mm in all locations. When not edge nailing, this can be done with a drill the same size as the nail head.</p>	

## 6.2 ADDITIONAL INFORMATION

<p><b>G</b> <u><b>Protection of joints</b></u></p> <p>To ensure that water does not settle between components and cause rot, it is desirable to protect the enclosed surfaces.</p> <p>This may be done with the timber treatment (see step 61) or by painting with primer. An alternative is to use a thick and flexible compound called "mastic". This can be done cheaply by using the locally available components shown in the photograph.</p>	
<p><b>H</b> <u><b>Protection of joints</b></u></p> <p>The paint or mastic should be applied to the surface to be jointed before fastening.</p> <p>Note: Where pre-drilling is required, this should be done before applying the paint or mastic.</p>	
<p><b>I</b> <u><b>Protection of joints</b></u></p> <p>A completed joint.</p> <p>Note: The paint or mastic should squeeze out of the joint once assembled.</p>	

## 7. BOATBUILDING GUIDELINES

### 7.1 Introduction

The guidelines are applicable to boats less than 7 m in length and operating at speeds of less than 12 knots. It is possible that some boat types may be outside the scope of these guidelines or not practically able to meet all sections. However, the intention is to provide useful information to organizations and authorities involved in building small boats.

### 7.2 Timber

Timber should be well seasoned with a moisture content of 15 to 20 percent, of good quality and free from splits, sap wood and significant knots. The timber should be selected from available species known to have a locally proven record in boatbuilding with good resistance to rot. Keel and underwater planking should preferably have some resistance to marine borers.

### 7.3 Planking

Hull planking should be from continuous lengths where possible.

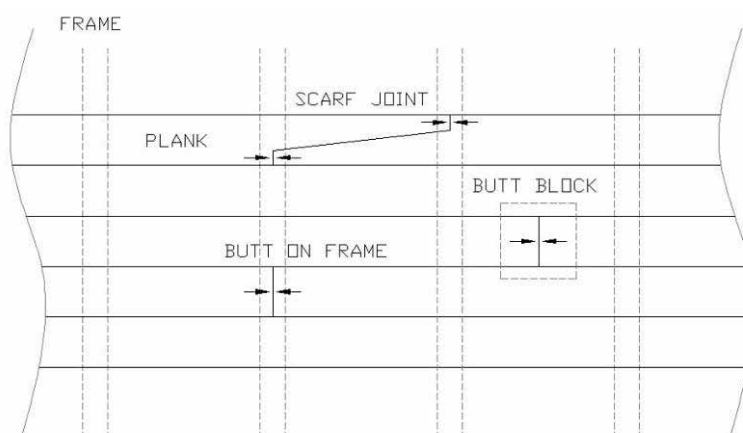
The width of planks should be kept as small as practical, preferably less than eight times the plank thickness.

Planks should have two fastenings at each frame; wide planks should have three fastenings at each frame.

Hull planking should be of a thickness which is suitable for the size of boat and the frame spacing. And in general planking of 15 mm or less should not be used.

Planks should be fitted tight together; the gap between planks should be less than 1 mm. The seams between planks may be caulked with an organic material such as oakum and then filled with flexible waterproof filler.

Joints in planks may be made by one of the following methods: on a frame; between frames using butt blocks on the inside of the planking; or by a scarf joint spanning two frames.





## 7.4 Frames

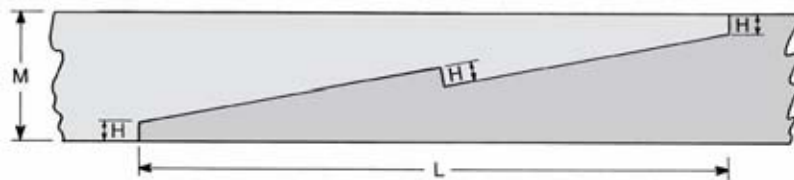
Frames should be sawn from timber where the grain follows the shape of the frame.

It is preferable for the bottom frames or floors to be bolted to the keel, and washers should be used under the head of the bolt and the nut.

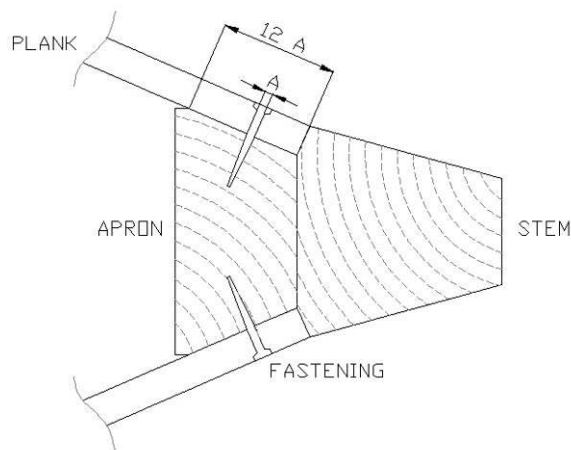
All frame components, especially the end grain, should be primed before assembly.

## 7.5 Keel and other components

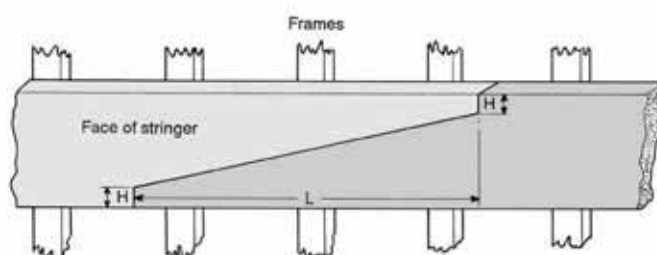
The keel should preferably be in one length. If necessary, the keel may be joined with a scarf joint of length  $(L)$   $5 \times$  keel height  $(M)$  with end notches of depth  $(H)$   $0.2 \times$  keel height. The scarf should be bolted together.



The width of the stem should be the same as the keel. The landing of the planking on the stem should preferably have a length of  $12 \times$  the diameter of planking fastenings to avoid splitting the end of planks.



Inwales and stringers should run continuously from stem to transom, and where possible, be of a single length of timber; where joints are required, the illustration below shows the requirements. On larger boats, it is good practice for the bilge stringer to be bolted in place.



The transom should be constructed in the same manner as the hull. It is preferable for the transom to be connected to the keel with a knee bolted in place.

It is preferable to use a knee at the keel to stem joint. For boats of less than 6 m in length, it is recommended that the knee extends at least 150 mm along each joint and be bolted in place.

All components should be primed before assembly.

## 7.6 Deck

Deck planking should be of the same thickness as the hull sides.

## 7.7 Fastenings

Hot-dipped galvanized nails and bolts should be used throughout the boat; alternatively, stainless steel grade AISI 316 fastenings may be used except for planks under the waterline. Electroplated fastenings are not recommended.

Bolts should preferably have a hexagonal head and nut fitted with large washers. The minimum bolt size used should be 6 mm. The bolts in the keel assembly should be at least 8 mm in diameter.

To avoid splitting timber, the minimum distances to the end and edge of timber parts should be as follows:

Bolt diameter	Minimum end distance	Minimum edge distance
Up to 8 mm	60 mm	35 mm
10 mm	70 mm	40 mm

Planks should be fastened to the frames with nails of round or square section of the following dimensions.

Planking thickness (mm)	16	19	22
Minimum nail diameter (mm)	4	4	5
Minimum nail length (mm)	50	60	60

Nails should have a head of diameter of at least 2 x the nail diameter and should be countersunk 3-5 mm, and the head covered with waterproof, flexible compound.