

**A/S BØRRESENS
BAADEBYGGERI**

REINFORCEMENT OF THE BOTTOM

Bottom reinforcement can be divided in the following levels:

1. Reinforcement of the bottom floor timber ribs (between the front edges of the berths).
2. Extra layer of glass fiber in the bottom (from the rounding of the bottom and out to the front edge of the berths)
3. Reinforcement in the bottom around the mast support.
4. Carbon fiber frame (rib) at the entrance (way down).
5. Complete reinforcement of the bottom (requires dismantling of the berths, etc.).

Bottom reinforcement is needed if the following can be observed:

A. Cracks in the corner between the bottom floor timber ribs and the hull.

B. If you under a sailing trip find that the bottom "works" a lot.

Alternatively, this can also be established in the following way: with the boat moored in the harbor you stand on the bottom floor timber rib where the lifting fitting is (if you do not have this mounted in the boat, it is the second rib from aft) with one leg on each side just next to the front edges of the berths, and then you quickly shift your weight from one leg to the other. You will then experience at a certain frequency of the weight shift that the keel swings with you.

If problem A is experienced, 1 + 2 are needed.

If problem B is experienced, 4 + 5 are needed.

Real stiffness cannot be obtained by doing 1 + 2, but only by doing 4 + 5. For Danish built boats with sail number 62 and upwards, no reinforcement is needed unless the boat has been experiencing extreme tensions/actions.

BEFORE YOU START you have to make sure that the boat does not change its shape during the process.

This can be assured by a proper support of the boat. I.e. the boat must stand on the keel, but the weight of the hull and accommodation must not "hang" on the keel. Therefore, it is necessary that the hull is supported by solid pillars, e.g. at the rudder case and about 2' in front of the keel. In addition, put on each side 2 pillars, preferably one at the bulkhead at the mast and one where the benches in the cockpit end.

This is especially important when doing the repair(s) (4 and) 5.

GENERELLY ABOUT GLASS FIBER REPAIRS:

You cannot just put glass on top of the interior surface in a glass fiber boat. First you have to clean the surface thoroughly with glass fiber degreaser or wash it very thoroughly with acetone (remember good ventilation + mask as always when you work with poisonous vapors).

Then the surface must be grinded with sand paper no. 40.

Repair 1

The floor must be removed. If there is loose/cracked glass fiber it must be removed. Degrease and grind. Round the edges on the floor timber ribs with sand paper or with another suitable tools.

Put 2 x 4 layers of 400 gram mats (some of it may be roving) on the aft edge and upper edge of the ribs.

On the fore edge of the floor timber ribs and under its flange you then put 4 x 450 gr. mats. In common for all these mats is that they must extend somewhat out on the hull. From 5-15 cm. (2-6 inch) = smooth thinning.

Hereafter grinding and topcoat (= gel coat + wax (no-stick) if nothing else shall be fixed.

Repair 2

From where the rounding ends in the keel box and up to the front edges of the berths you reinforce with 2 x 3 layers of 450 gr. mats.

At the aft edge of the keel it is important to have the mats glued so far down as possible,

+ put eventually some small pieces in the sharp edge.

Repair 5

Before you dismount the floor, berth bottoms and berth fore edges it is recommended to note all measures and to make models of angles and width on the berth front edges.

It is also recommended to make a line with a pencil on the berth front edges so you know how far up you should remove the teak veneer since you may want to glass on this side of the berth front edges also. You should also mark on the H-frame at the entrance/way down how the berth front edges stay here, since you eventually need to cut a hole in the H-frame so that the berth front edges can be extended and with a wedge be bolted to the bulkhead under the cockpit.

Remove the floor, berth bottom and berth front edges.

The whole bottom area up to the triangle list in the hull where the berth bottom is screwed to the hull must be cleaned and grinded.

EITHER: Reinforce and extend the floor timber ribs so that they become 1.5 cm higher at the center and extend all the way up where the foam in the hull starts.

It is many layers of glass which have to be put on at some places. Front and aft edges should be reinforced as under repair 1.

OR: You choose to mount completely new floor timber ribs. These can be ordered from the Borresen ship builder www.borresen.com.

Before you remove the old floor timber ribs you must ensure that the boat is properly supported!

In order to have the right curvature in the floor, you make a model of the height of the floor timber ribs (from a 2.2 m long wooden board).

The floor timber ribs are cut free. Save them as models or make a model *before* they are removed.

Cover the keel top with plastic so the keel bolts are not covered with glass.

Put 2 x 450 gr. mats everywhere from keel to the triangle list +

2 layers of 450 gr. mats from the bottom rounding to the triangle lists. (It is not down in the keel box that the boat hull is soft, but it is from the rounding and up to the triangle lists).

Adjust the new floor timber ribs. It does not matter if there are some distance

between the rib and the hull, e.g. $\frac{1}{2}$ - 1 cm.

Electrical compass saw with diamond blade is very good.

The floor timber ribs are attached by small pieces of glass fiber (4 on each) such that they are placed correctly in relation to the curvature model template, but remember that they must be about 1.5 - 2 cm higher than the old ones.

The floor timber ribs are glassed on the front and back side with 2 x 4 layers of 450 gr. mats, which are thinned out on the hull, (ca. 5-15 cm out on the hull). From the elbow in the rib, the 4 layers should lay on top of the ribs.

The berth front edges can with a wedge be extended about 25 cm in under the cockpit, where it is secured with bolts, glue or glass fiber.

The berth front edges can also be fixed to the bulkheads under the cockpit with a piece of stainless steel (e.g. 5x50x300 mm, NOTE! Measure it yourself or make first a piece in wood as a model).

Upper edge of the berth front edge should have the same height as they had before, thus you need to make larger cut outs in them. The teak veneer can eventually be removed on the front side under the floor so that they can be glassed on both sides (remember the floor is higher now!).

(Translated from Danish by Bjerne S. Clausen on January 2, 2005)