

INSTALLING A FOOT OPERATED BILGE PUMP

This installation procedure has been developed and improved over the past several years, installing several footpumps into GRP construction NDK/SKUK and Valley Sea kayaks. These kayaks have been mostly kayaking instructors' personal boats. The footpumps have needed a very rugged and functional installation for a single user – no adjustability.

We have not tested any methods to install a footpump to kayaks without sturdy GRP bulkheads, and would not recommend doing that. The pump is pushed quite hard when operated, might break a foam or plastic bulkhead loose from the hull. This would cause an even more serious situation than the original cockpit flooding problem as water would be able to enter the front hatch, which is one of the compartments giving a sea kayak its emergency flotation.

Materials:

1. Bosworth Guzzler 450 or 400 bilge pump with modifications for making it a Kayak Foot Pump. The dimensions in this installation procedure are for a Guzzler 450.



2. Non-collapsible hose, length depending on the inlet and outlet position..
4. Through-the-hull fitting. Find one with a large inside diameter in order not to throttle the outflow (Marine Store)
5. SS316L or A4 hose clamps (3), 30 mm nominal diameter
6. SS316 L or A4: 1/4 in or M6 threaded rod. x about 1 m length. Nylock nuts (8), regular nuts (4), std washers (8), fender washers (4). Screw lock compound (e.g. Loctite).
7. Plastic hard pipe, PVC-works well, about 20 mm OD, 1 m length

8. Neoprene washers and/or Fast Cure Marine Adhesive (Sikaflex-291 in Europe, in U.S. find a product that will adhere well to Stainless Steel and GRP)
11. Denaturated alcohol, rags
12. Acetone
13. Gloves, respirator, safety glasses

Tools:

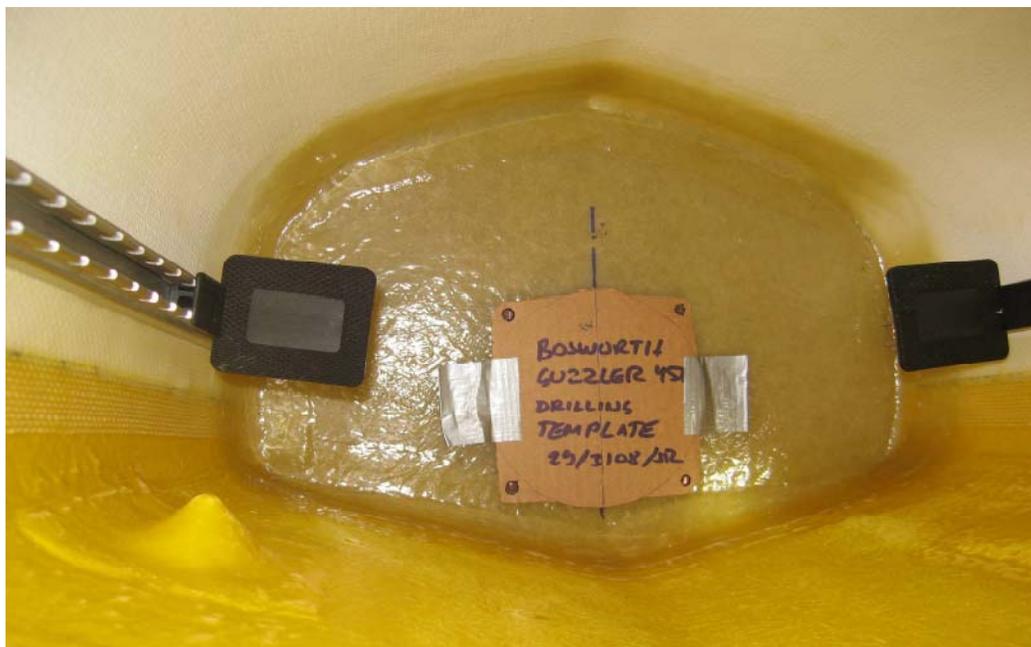
1. Felt tip permanent marker
2. Template for marking hole location
3. Tape measure.
4. Cordless drill & drill bits. Angle grinder w/metal cutting disc.
5. Hacksaw, narrow belt sander, fine file.
6. Channel-Lock pliers, 2 socket sets w/at least one deep 10 mm sockets Adjustable Pliers (pipe wrench-type)
7. 25 mm or 1 " cylindrical drill bit
8. < 25 mm dia cylindrical sanding bit .
9. ¼" Socket set
10. Narrow belt sander, 'powerfile'.
11. ShopVac vacuum cleaner

Work procedure

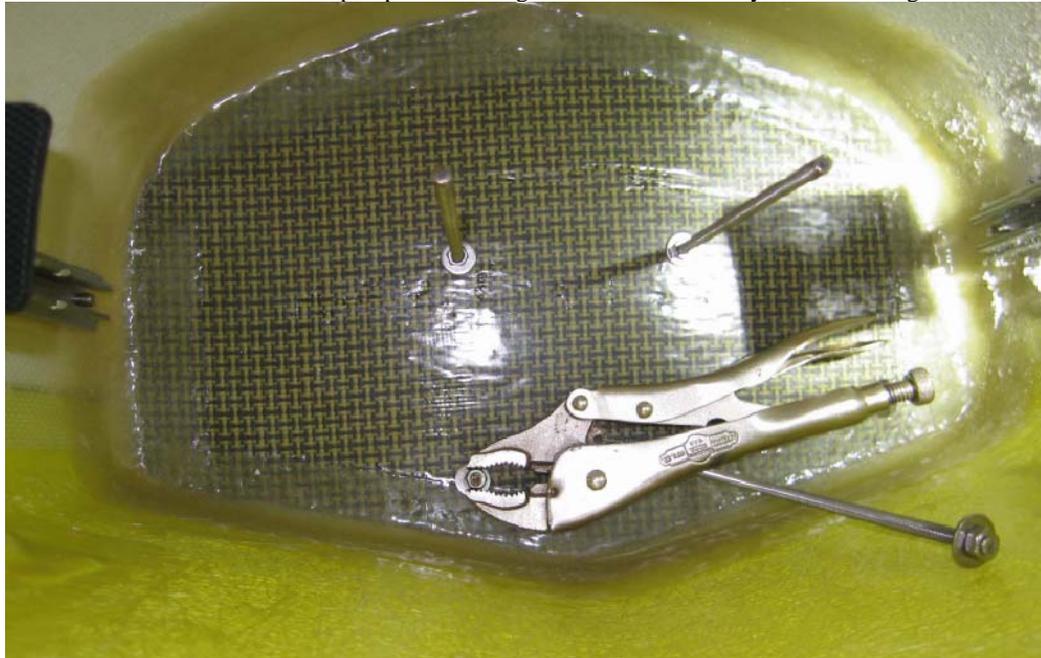
FOOTPUMP PRE-ASSEMBLY

Please note: The kayak is shown upside down in most pictures, because the most practical way of installation work is to have the kayak sitting upside down on a pair of sawhorses. This will allow you to use your both hands for actual work, sitting on a bench with your upper body inside the cockpit. Please also note, that the pictures are taken from installations to several different kayaks. Hardware, hul color, etc. may be different between the pictures.

1. Adjust the kayak's footpegs correctly for the paddler. Measure distance from footpegs surface to front bulkhead's surface = L
2. Measure and mark the centerline of the bulkhead.
3. Test and mark correct vertical placement for bilge pump. Generally as high up as the kayak's deck allows in most kayaks and size of paddler's feet . The Guzzler 450 allows mounting almost up against the deck as both hoses can be directed down.



3. Drill 6,5 mm holes through front bulkhead at the marked locations
4. *Horizontal location should be such that footpump pedal's surface is roughly even with footpegs, when correctly adjusted for the paddler.* Cut 4 sections of plastic pipe to a length of $D=L-d$, where d is the height of the footpump from mounting surface to pedal's surface. In a Bosworth Guzzler 450 foot pump $d = 62$ mm.
6. Cut 4 sections of 1/4 in or M6 threaded rod to a length of $D + 22$ mm. Use either the angle grinder or a hacksaw. Hacksaw is more work. Clean the threads.
7. Test install the pump to the bulkhead with the hardware and spacers. From the bow towards stern: Nylock nut, Fender washer, bulkhead, fender washer, regular nut, plastic spacer pipe, footpump bracket, regular washer, Nylock.
 - First put on the Nylock towards the bow
 - Assemble each rod to the bulkhead. Use Vise-Grip pliers to hold the regular nut and turn with a power drill & 10 mm socket from the front hatch.
 - It is easiest to secure the pump in with a regular nut instead of a Nylock at this stage





8. Test with the paddler in the kayak for perfect fit.
9. Mark any extra length of threaded rod sticking out above the surface of the nut.

HOSES

10. Find a good spot for Bilge Exhaust on either the seam of the kayak or on the deck as you prefer. A deck mount will spray you when operated against the wind, but can be easily secured by a wine bottle cork when not in use. A seam mount will be more frequently under water, but will not spray you when operated. A seam mount requires at least a duckbill-type exhaust valve, preferably both valves.



- Recommended spot in a standard Explorer/Romany is directly above the Yakima footpeg screw on the seam.
- Drill a Dia 25 mm hole.
- Grind the hole slightly larger with a < 25 mm sanding drum on a powertool
- Mark the outside dia of the fitting's flange on the seam
- Grind off the seam putty underneath the flange to get a more flush fit



11. Clean the area with Denaturated Alcohol and install a fitting into the hole using Sikaflex-291 (a bead on the hull, starting a couple of mm outside the hole and going almost up to the flange diameter) slightly out + in when the fitting is tightened.
 - Use masking tape to avoid S-291 from squeezing on the hull when tightening the bilge connector – it is not easy to clean up neatly. Try masking both the fitting's front surface as well as the hull immediately outside the fitting flange's diameter. then apply S-291
12. Test for approximate length of suction hose and exhaust hose. Cut to length, and test again.

FINAL ASSEMBLY

The idea is that the threaded rods get mounted permanently and watertight to the front bulkhead, that pump can later be serviced or replaced by just opening the nylocks holding the pump. Rods will stay in place.

13. Disassemble hoses and pump and hardware (except for the already permanently installed exhaust fitting)
14. Cut M6 rods to exact length. Clean alle metal parts with Denaturated alcohol and let dry.
15. It ia best to do the assembly with tha kayak upside down on a kayak sawhorse
 - Assemble Nylock nuts to one end of the threaded rods with Loctite
 - Let harden
 - Add fender washers to the rods
 - Apply a bead of S-291 under the fender washer

- Put the assembly in through front hatch/6.5 mm hole
 - Put on a fender washer and a regular nut from the cockpit side. Apply Loctite to the very end near the bulkhead
 - Secure the nut with a Vise-Grip (large)
 - Tighten the assembly from the front hatch side with a cordless tool, torque setting 7
 - Let dry (at least the 15 min to set the Loctite)
16. Mount suction and exhaust hoses on the pump so that any sharp ends of hose clamps face away from paddlers feet
 17. Mount footpump with spacers, washers and Nylocks in place. As the fit of the rods is still unlikely to be exact, either:
 - Grind off extra length carefully with a narrow belt sander
 - Exchange Grinding Nylocks to new ones after grinding flush
 - Put extra washers under the Nylocks
 - Cap the ends with plastic screw protectors or crown nuts
 18. Mount exhaust hose to outlet
 19. Clean cockpit of the kayak with a vacuum cleaner and wipe with Denaturated Alcohol



ACCEPTANCE TEST

20. Pour a bucket of water into the cockpit with the kayak on a sawhorse
21. Tilt the kayak sideways towards the Exhaust outlet and check for any water dripping out
22. Put the kayak on its bow (upright) and check for any water dripping into the front hatch
23. Put the kayak on a soft surface and use the footpump to pump the water out.

SKILLS DEVELOPMENT

Now that you have a footpump in your kayak, it is a good idea to practice the most effective method of self-rescue: Re-Entry and Roll, then pump the kayak dry with your footpump as you continue paddling. Practice it with realistic gear and conditions (where you intend to paddle) with a good instructor.