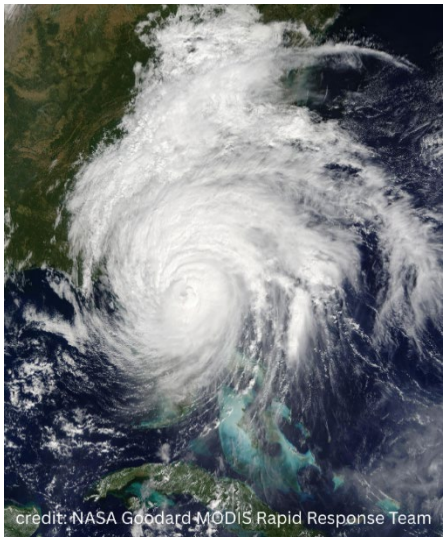
Pumpouts and Dump Stations: Considerations for Increased Durability

Introduction



Boating facilities are, by their very nature, in hazard-prone areas. They are located in a dynamic aquatic environment where conditions can change at a moment's notice. Facilities need to be prepared for numerous situations that affect various aspects of the property. Some events have a fair amount of lead time such as hurricanes whereas others may have less warning such rouge waves and tsunamis.

It is good to keep in mind the types of disturbance that can affect your marina. Knowing the risks associated with each threat is the first step; knowing how to secure your equipment is the important next step this document aims to help with.

Common threats include but are not limited to:

- Flood (hurricanes, storm surge, excessive rain, rouge waves, tsunamis)
- Sustained high winds (severe thunderstorms, hurricanes, strong weather systems)
- Fires (wildfires, structural fires)
- Extreme low water (hurricane reverse storm surge, extreme low tides, droughts)

Each issue presents unique challenges. This document provides guidance specifically to keeping sewage pumpout and dump station equipment safe (or as safe as possible) from extreme weather disturbances. Having your infrastructure designed for disturbances will make it easier to protect from an event.

This document provides general tips for consideration. Always follow all permits, codes, and laws. Consult with licensed professionals and manufacturers for technical support.

Infrastructure Component Considerations

The left column contains each item for consideration. The right column indicates the relevant scenario or unit type; more than one may be listed.

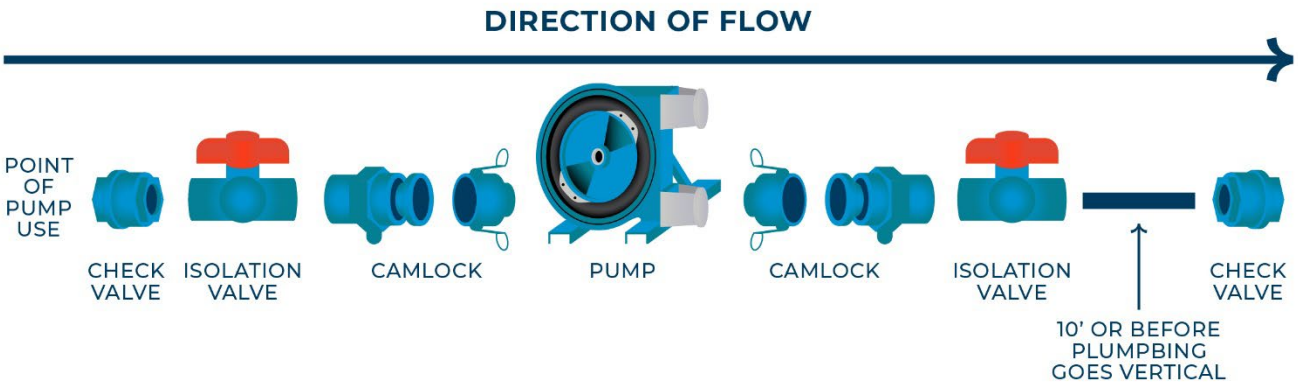
Electrical

The entire **control panel should be UL 508A listed**, not just the individual components within the panel.	All units
Use **GFI (Ground Fault Interrupter) or GFI-rated breakers** for all electrical components of the pumpout/dump system to prevent electrical shock hazard. ○ Many pump systems use VFD (Variable Frequency Drives) and may have compatibility issues with GFI breakers. Notify the manufacturer if you have a GFI breaker so the pump can be configured appropriately.	All units

	Ensure you have an **NEMA (National Electrical Manufacturers Association) 4X disconnect switch** for the pump. 4X is not submersible, but it is airtight and watertight.	All units
	Use a **watertight connection outlet/plug** (such as Hubble) for the power/plug and controls. This will allow the pump to easily be disconnected and moved.	Flood
	Order a control panel separate from the pump/dump (many pumps come with a control panel mounted to the pump). **Mount electrical controls in a safe location outside the flood zone**. Remember that using electrical equipment that was submerged can be a fire hazard. Note: If the pump uses VFD (Variable Frequency Drives) the control panel must stay within a certain distance to the pump; consult with the manufacturer for further details.	Flood

Plumbing

	Install isolation valve at inlet & outlet of a pump (note this should be secured in a way so it cannot be accidentally turned off by the public). This will help with troubleshooting issues.	All units
	Install check valves, which allow flow to only go in one direction. Check valves should be installed at the inlet of the pump and either approximately 10 feet from the pump outlet or before the outlet plumbing goes vertical.	All units
	Install a camlock/ quick-connect union at pump inlet and outlet so it can be moved/relocated.	Flood



	Make sure you **have an isolation valve for the plumbing where it transitions from underground to aboveground**, and/or at the lift station. ○ A “curb stop” valve is recommended (and may be required by the municipality) so if lines get broken, sea water will not backflow into the sewer lines.	All units
	Non-flexible piping considerations. Piping should be resistant to crush forces and UV if exposure to these risks is expected. ○ HDPE pipe (fusion welded or electrofusion welded) is better at resisting impact damage than PVC Schedule 40 or 80. It is also more durable in areas with seasonal freezing potential. However, HDPE requires specialty tools and skilled labor for installation and repairs. ○ Schedule 80 PVC has a thicker wall and is preferable to Schedule 40 PVC when considering crushing impacts. However, its cost is significantly more. ○ It is recommended to protect exposed PVC from UV through appropriate means such as paint, tape, etc.	All units

	○ DWV (Drain, Waste, Vent) plumbing is not pressure rated and not recommended. Note: The Clean Vessel Act (CVA) grant may recommend HDPE piping and may only fund replacement after a specified number of years. The CVA grant may allow for exceptions in certain cases; contact your state CVA staff for more details.	
	Flexible piping considerations. Flex piping should be UV rated and used where flexibility is required to allow for movement that will accommodate tidal differences, storm surge, flooding, and drought. ○ HDPE piping can be corrugated to allow for movement. ○ Hydraulic pressure line (similar to fuel lines) may be a good flexible piping option. ○ The following are not recommended: PVC flex, PEX, EPDM. ○ Never glue PVC pipe to PVC hose for use in pumpout plumbing.	All units
	For floating docks, ensure **plumbing is located within the dock frame**. If water levels drop low enough for the dock to be grounded out, it's important the plumbing is not in contact with the ground and holding the weight of the dock.	Extreme low water
	Consider a **secondary/booster pump or lift station if there's a large amount of vertical lift** required. This will increase the life expectancy of the equipment. Consult with equipment manufacturers.	Extreme low water
	For in-slip systems, **install isolation valves** at each finger (based on dock design and layout) **to isolate sections of plumbing**. This will allow you to 'shut off' just a finger if the plumbing breaks or is damaged while the remainder of the system can stay online. Additionally, it will allow you to more easily identify the location of plumbing issues.	All in-slip units
	For in-slip systems, consider **flush mounted connections**; they are less likely to be a trip hazard or get damaged by dock carts, people tying up to them, etc.	All in-slip units
	For performance considerations, **reduce 90 degree turns**. Two 45-degree turns are better over a longer distance than one 90-degree turn. Wyes are available in both HDPE and PVC, which will significantly reduce friction loss when having a lateral connection in an in-slip or multi-hydrant system. 	All units

Pump

	Pumps gear boxes should be sealed, and **motors should be totally enclosed** (this is generally standard practice among the pump manufacturers in the United States). This is good for all pumps in the marine environment but is especially important to help protect the pump in the event of complete water submersion.	All units/ Flood
	Consider pump location. • A **floating dock is preferable to a fixed dock** so it can move with water levels. Be sure to consult your dock manual or contact the dock manufacturer to verify that your floating dock can adequately support the weight and weight distribution of the pumpout and/or dump station equipment. • If you locate the pump on a fixed dock or land, it is not recommended to elevate the pump without consulting the manufacturer. Elevating the pump	Floods/ Droughts

will reduce static suction lift, making it 'work' harder and compromising it from functioning optimally.	
Ensure the **pump enclosure is secured to the deck or slab**.	All units/ High winds
Consider **equipment that is movable** so it can be relocated to a safe location when extreme weather is imminent. This can be accomplished with the traditional mobile pumpout cart with the pump and hose on the cart. The cart may have a holding tank for waste or connect to in-slip plumbing. It can also be a stationary pumpout that is bolted down to a removable 'frame', skid mounted, or mounted on a movable trailer that can be hauled away as part of storm prep. For a removable stationary unit, consider: ○ Strategically installing plumbing 'unions' or camlock quick connect connections. ○ Using a watertight plug for electrical connection. ○ Placing the frame below dock level and covering the hole after removal for safety.	Flood

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This document was developed collaboratively by Florida Department of Environmental Protection, Florida Sea Grant, Oregon Sea Grant, Maryland Department of Natural Resources, and Texas Parks and Wildlife Department with guidance from pumpout manufacturers including Edson, EMP Industries, and Keco. The products shown/referenced are for illustration only. The authors of this document do not promote, endorse, or recommend any product, service, or manufacturer.

Funded through the Florida Department of Environmental Protection through a grant from the US Fish and Wildlife Service.

Maintenance

Weekly

- Run water through the system once a week to make sure there are no issues and clear out the piping. Running the pump also exercises the gear boxes, which dry out if not used.
- Visually inspect condition of parts including nozzle, ball valve, sight glass, external hose, on/off button, housing, etc.
- Check for leaks by listening for a slight whistle sound and/or using a dye tablet.
- Listen to motor for any banging or other irregular sound which can indicate an issue.

Monthly

- Test automatic shut off timers. Test timers by turning the pump on using the green on button. The pump should start up. Let it run and time how long it takes to shut itself off, it should be 10 or 15 minutes.
- Test GFI outlets and breakers by using the test/reset button to ensure they are functioning properly.
- Test time to prime the pump, it should be under a minute. To prime, put the nozzle in large trash can of water or waterway and let run. Once primed you should notice the flow of water through the pump is quick. Note: sometimes pumps do not 'lose their prime' and will work quickly once turned on.
- Run a 5-gallon bucket test. Once the unit is primed, time how long it takes to empty a 5-gallon bucket of water. 10 seconds or less is excellent, 11-30 seconds is okay, 31 seconds or more is poor, and the unit should be looked at further for issues.
- Consider purchasing a vacuum gauge and take a vacuum gauge reading at the end of the nozzle. The optimum vacuum pressure is 22 inHg, but anything over 15 inHg is good. Note that vacuum gauges are great tools for troubleshooting issues. Don't have a gauge and need help troubleshooting? Contact your CVA program, some programs have gauges on hand and can come do a site visit to help assess issues.

As needed

- Replace nozzles often, usually quarterly, but maybe twice a year depending on usage.
- Replace sight glass as needed, usually annually. Note PVC sight glasses break easily from UV exposure and are not recommended.
- Replace external hose as needed, about every 2 years; max life is 5 years.
- Replace ball valves as needed; we recommend Banjo-style valves, which are easier to turn because they have more leverage.
- Peristaltic pump internal hose should be replaced after about 800 hours of run time. Note: these do not store well and should be purchased as needed.
- Diaphragms should be replaced after about 1,000,000 cycles
- Rebuild kits should last 5-10 years.
- Use an appropriate marine lubricant, such as WD-40 or a similar product, to prevent rusting and corrosion.

Extreme Weather Checklist

This checklist is organized in order of priority. The first item(s) listed should be conducted first. The last item(s) may not be possible due to time constraints before evacuation is needed and/or equipment limitations.

Flooding/ Hurricane/ Storm Surge/ Tsunami

- ☐ Turn off electrical.
- ☐ Turn off/close curb stop valve.
- ☐ Disconnect all electrical and plumbing to allow for dock movement.
- ☐ If possible, remove pump and relocate to a safe location, elevated from risk of flooding and sheltered from extreme wind.

Post- Flooding/ Hurricane/ Storm Surge/ Tsunami

- ☐ If equipment was submerged, flush all non-electrical components with fresh water as soon as possible.
- ☐ Use an appropriate marine lubricant, such as WD-40 or a similar product, on metal after flooding to prevent rusting and corrosion.
- ☐ Assess electrical panel, if it was submerged or has moisture in it open the panel (but keep it turned off) to allow it to dry out. Use an appropriate marine lubricant, such as WD-40 or a similar product, on control panel and electrical components.
- ☐ If electrical was submerged by water, work with a licensed electrician. Do not turn power back on until inspected by a licensed electrician. Using electrical equipment that was submerged can be a fire hazard.