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Boats properly stored ashore and winterized are most likely to hit the water without damage and be ready for on-the-water fun come spring.

It's that time of year again. The leaves have started to change color, and the nights are getting longer and cooler. Before the mercury dips below freezing, you need to prepare your boat for the coming winter. At its most basic, winterizing means draining any water aboard or replacing it with enough of the right kind of antifreeze to protect against the lowest temperatures your boat might experience.

Fresh water expands in volume by about nine percent when it freezes and can push outwards with a force of tens of thousands of pounds per square inch. That expansion can crack an engine block, damage fiberglass, split hoses, or destroy a refrigeration system overnight. An analysis of ten years of freeze claims from the BoatU.S. Marine Insurance claim files found that more than

three-quarters involved cracks in the engine block or the exhaust manifolds that occurred because water remained in the engine or cooling system during a hard freeze.

Those claims come from all over the country, not just from the states that get snow every year. Boaters in the frozen North know they need to winterize, so their freeze claims almost always involve a problem with how the boat was winterized. In the temperate South, the claim files include many more claims where the boat wasn't winterized at all, or where the boater was depending upon a heater to keep the engine from freezing and the electricity went out.


Most of those who don't winterize, or don't winterize properly, only find out something is wrong in the spring when brown froth starts spewing through a crack

in the side of the engine block or what looks like chocolate milk appears on the dipstick. Repairing freeze damage takes time and all too often involves a complete engine replacement. By the time the boat is in working order, a good part of the boating season will have been lost. Winterizing most boats takes from an hour to a day. Unless you are located in Hawaii or the Florida Keys, we recommend winterizing your engine if you will be laying up the boat for even a few weeks to minimize the chances that a sudden freeze will put it out of commission next season.

While winter layup lists can run to

several pages and take a month of Sundays to complete, many of those lists include maintenance and cosmetic items that, while nice, don't make it any more likely your boat will get through the winter unscathed. Even if we have the best of intentions in September when we put together our fall work list for the boat, life tends to get in the way, and all too often we find ourselves rushing to the boat the weekend before a hard freeze is forecast. At that point, all we have time for are the essentials that will protect our boat from damage.

In this brochure, you'll find the list of items that would have prevented more than

95 percent of the freeze claims handled by the BoatU.S. Marine Insurance Program in the past decade. Of course, every boat is different, and you'll want to add other items from the owner's manuals for your boat and the additional equipment it carries. The pullout checklist in the center of this brochure, on pages 8 and 9, can serve as the starting point for creating your own winterizing list that will maximize your boat's chances of coming through the winter without damage. You can also find the checklist on our website at: BoatUS.com/Seaworthy/checklist-winter. 

Storing Your Boat

If you really want to make your boat happy, store it indoors, in a climate-controlled facility with a backup generator in case the electricity goes out in a storm. For most of us, indoor storage is not even an option - it's either not available or not affordable. Our choices come down to hauling the boat out and storing it on the hard, or leaving it in its slip in the water.

While storage in the water lets you use your boat during warm spells and gets you out on the water earlier next spring, keeping boats out of the water reduces the chance of damage from a number of different causes including:

Sinking

If owners don't regularly visit boats kept in the water, they become vulnerable to the slow failure of a small underwater fitting that might have been noticed and fixed otherwise.

Storm damage

Boats stored in the water are much more vulnerable to damage due to the rise and fall in water level, high winds, and torrential rains that accompany strong winter storms.

Blisters


Storage ashore may also be less expensive over the life of a boat because a hull that

gets the chance to dry out for several months each winter is less likely to develop blisters than a hull that remains in the water.

Theft

Boats stored in gated or patrolled facilities are much less likely to be stolen. A boat on a trailer in the street looks like a box of money on wheels to a thief.

In general, our claim files suggest that a boat is less likely to sustain damage - in the short and the long run - if left for long periods on land rather than in the water. On the other hand, since water retains heat longer than air, boats surrounded by air are more vulnerable to a sudden freeze than boats surrounded by water. Boats kept ashore must be winterized, and it must be done earlier than if they were in the water because dropping temperatures will affect them sooner.

Wherever you end up keeping your boat, if you do not plan to use it for a month or more, you need to winterize it. Then, when the meteorologist tells you to break out the long underwear, you can rest easy instead of making a mad dash for the boatyard. 



Boats stored in water over winter are vulnerable to sinking damage if a hose or thru-hull fails.

Storage Ashore

To say that a boat is better off stored on land is to assume it will be resting on something that provides adequate support. In most cases, damage ashore occurs slowly as hulls get distorted due to a lack of support, creating problems ranging from poor engine alignment to broken stringers and bulkheads. To prevent that damage, pay careful attention to exactly how your boat is laid up.

Custom-Made Cradles

Custom-made cradles are designed specifically to support critical areas of a boat - its engines, bulkheads, and keel. Custom-made cradles provide better support than any of the alternatives, but don't store your boat on a cradle that was built for a different model boat. Steel cradles are best, but wooden cradles will also do the job if they have been inspected for deteriorated wood and corroded fastenings. Shipping cradles are probably OK, but most will require some modification to improve lateral support before they can be used for winter storage.

Jack Stands

Storing cradles in the off-season is problematic at crowded boatyards, which instead rely on a combination of screw-type jack stands, blocks, and timbers to support hulls. Your boat's manufacturer may be able to supply you with a blocking plan, indicating where blocks and jack stands should be placed to provide the best support for your boat. Or you can work with the yard manager to devise one yourself using a diagram of your boat. Save the plan and give a copy to anyone who hauls the boat in the future.

Jack stands should be placed as far out from the boat as practical to support the boat in high winds, with at least three per side for boats over 26 feet and additional supports at overhangs. The weight of the boat can easily force a jack stand base deep into mud, sand, or asphalt. Even clay that seems brick hard can become a quagmire in heavy spring rains, allowing stands to



A boat stored ashore needs to be properly supported to make it through winter unscathed.

loosen, shift, and spill the boat. Placing a sheet of plywood under each base and using safety chains to connect the stands will help to stabilize the support upon which your boat rests.

Jack stands stabilize the boat, but most of the boat's weight usually rests on its keel. Some boats have specific requirements to support the keel, and at least one manufacturer warns against putting weight on the keel. If the marina manager isn't familiar with your boat, check your manual or contact the manufacturer.

Keels must be supported by wide timbers or blocks - the wider the better to distribute the load. On power-boats, additional support is usually recommended under inboard engines, fuel tanks, and heavy machinery. With outboard and sterndrive boats, weight should be taken off the transom by lowering the drive units onto a block.

After the boat is blocked, sight along the hull and keel to make sure the jack stands aren't depressing the hull. (You should also check in about two weeks, after it has settled.) The boat must also be level, or water could pool and cause stains, mildew, and/or gelcoat problems.

Dry Storage Racks

An increasing number of boats are being stored ashore on dry storage racks. These racks are designed for "typical" boat hulls, but can't always be adjusted to support unusual or atypical designs. If you have doubts about the support provided by a rack, consult a marine surveyor or consider an alternative winter location such as a trailer, which has adjustable rollers or pads that can be adapted to different boats. If storing your boat in a dry storage rack, whether in a climate-controlled facility, a shed, or outside, check with the boatyard about specific requirements for fuel tanks to prevent fires.

Trailers

In addition to being adjustable, trailers have the advantage of being mobile. Ideally, you'll take your trailerable boat to a gated, secure storage facility for the winter. If that's not an option, store it somewhere that avoids overhanging tree branches, which can break off in winter storms. Don't park too close to buildings with sloped roofs, or an avalanche of ice and snow may cause considerable damage to your boat. If storing a deep-draft

sailboat on a trailer, you will need to provide additional lateral support using extra jack stands along each side. To reduce windage, unstep the mast of any trailerable sailboat.

Lifts

Storage on lifts can be the best of both worlds, with most of the advantages of hardstand storage while still allowing you to use your boat when the weather is balmy. But the BoatU.S. Marine Insurance claim files show that lifts do not fare well in hurricanes and strong nor'easters. Wind, waves, and surge can shift the boat, and torrential rains or heavy snow can increase the boat weight to the point of breaking the lift. If you live in an area with strong winter storms, or if your lift is exposed to fetch from the direction of the prevailing storm winds, it's better to store your boat on its trailer. Otherwise, make sure the hull is properly supported and will drain efficiently, and inspect your lift wires, chains, and fittings carefully before tucking your boat in for the winter. A cover is even more important for a boat stored on a lift (see page 6 for more on covers). As with boats stored on the hard, the hull is exposed to the air, so make sure to winterize well before the freezing temperatures arrive. ⚠️



Rain or snow can make a boat too heavy for its lift.

WINTER BATTERY CARE

On small boats that aren't left in the water, you may want to take your batteries home and put them on a trickle charger. If you chose to keep them aboard, here are some tips: Top up wet-cell batteries with electrolyte. Make sure battery cable connections are tight and free of corrosion – clean them if necessary with a pot scrubber or emery board. Coat the connections with a corrosion inhibitor like Boeshield T-9. Leave the batteries hooked up to a marine charger that has a float setting or leave them unplugged but charge them up completely at least once a month.

Batteries left on an automotive trickle charger for long periods of time run the risk of boiling off the electrolyte and, at the extreme, exploding. Today's batteries do best when charged using a marine "smart charger" that varies the charge based on differences in battery chemistry and matches charging voltage to what the battery can accept at different

stages of the charging cycle. When buying a marine battery charger, look for the following features:

- A three-stage charger with bulk, absorption, and float stages (or a four-stage charger with an additional pre-float stage) and battery type selection
- Output of 25-40 percent of the battery bank capacity in amp hours
- Temperature sensing at the batteries for automatic adjustment of charger output
- Equalization phase for use with flooded cell batteries
- Ignition protection if installed in a gasoline engine room space

Storage In The Water

Whenever the boat is stored in the water, it's in a pitched battle to keep out all the water surrounding it, and that battle gets considerably more difficult when ice might damage a thru-hull or bilge pump, when the electricity might go out causing batteries to go flat, and when snow buildup in the cockpit might submerge above-waterline fittings. If you are going to leave it in the water, make sure you pay careful attention to the following areas as well as to your battery (see sidebar, page 4).



Protect your boat from damage with proper dockline arrangements and fenders.

Thru-hulls and other below-waterline openings

If the boat must be left in the water, all thru-hulls, except those for cockpit drains, have to be protected by closing all seacocks and gate valves. If your boat has thru-hulls below the waterline that can't be closed, it should be stored ashore for the winter. Raising and refurbishing a boat that sinks is a daunting job that can keep the boat in the repair yard for many weeks over the spring and summer. And all thru-hulls, especially the ones for the cockpit drains, must be double-clamped with stainless steel hose clamps where possible. When water freezes, it expands and will lift a poorly secured hose off a fitting.

After the seacock or gate valve has been closed, remove the hose so that it drains and then use an absorbent cloth or turkey baster to remove any residual water, which can freeze and crack the body. Reinstall the hose immediately and secure the two hose clamps.

Thru-hulls above the waterline are not required to have seacocks and most don't. That doesn't mean that these thru-hulls aren't vulnerable. Ordinary plastic thru-hulls crack and deteriorate in sunlight, but that won't sink the boat until the weight of ice and snow in the cockpit forces the thru-hull below the water. Plastic thru-hulls near the waterline are especially vulnerable and should be replaced with bronze or Marelon.

Removable knotmeter impellers and depthsounder transducers, if any, should be

removed and replaced with locking dummy plugs. And if your stuffing box (where the propeller shaft exits the hull) is dripping, adjust the nut until the dripping stops. Check for leaking in the rudder stuffing box(es) if your boat has one.

Exhaust Ports

It is advisable to plug exhaust ports when a boat is stored in the water because if snow piles up on the stern, exhaust ports get pushed below the surface. Plugging exhaust ports will also prevent unwanted guests from finding their way aboard. There have been several claims involving muskrats chewing their way through parts of the exhaust system, sinking the boat. Don't forget to remove plugs in the spring!

Bilge Pumps

If the bilge pump runs, it means your boat is taking on water - or, to put it another way, your boat is sinking (albeit slowly). There's no acceptable amount of leaking. Make sure the bilge is free of any debris or oil that might clog the pump or interfere with the switch, and that the bilge pump is wired directly to the batteries (with a fuse) so that it will operate when all of the switches are turned off at the main panel. Also check the operation of bilge pumps. After you've cleaned the bilge, add enough nontoxic antifreeze to trigger the float switch. Bail or sponge the remainder out.

Drain Plugs

Drain plugs must be out for the winter to prevent freeze damage, and if you don't have to worry about hurricanes, that's all that needs to be said. But if you're in a hurricane-prone area and you shrinkwrap the boat before hurricane season is over, purchase a one-way drain plug. That way, water would only get into the boat if the cover were ripped off, and then the drain plug would allow water out, but not in.

Docks And Docklines

Nylon lines stretch and absorb shock, which is good, but this stretching chafes the lines against chocks and other contact points. Chafe guards should always be used on lines when the boat is left unattended for long periods of time. Ready-made, polyester chafe protectors are available from marine chandleries or you can make your own out of heavy-duty polyester and Velcro.

A dockline is usually the culprit when a boat sinks after being caught under a dock. This occurs more frequently in the winter, probably because of the stronger winds and higher tides. Centering the boat in the slip and using long docklines and springlines led at shallow angles will help to keep the boat well away from the dock. If your boat is tied to pilings, consider using TideMindors or other systems designed to allow the line to slide easily up and down the piling without getting caught. ⚠️

To Cover Or Not To Cover

Custom-made winter covers, typically canvas or synthetic, are a terrific benefit to your boat's gelcoat and general well-being. Some skippers mistakenly believe that biminis, which shield the crew from glaring sun, will also protect the boat from freezing rain and snow. Quite the contrary - expensive biminis tend to get ripped apart or age prematurely while doing nothing to protect the boat. Biminis should be stowed below, or better yet, taken home and cleaned over the winter. More frugal skippers seem to think that a few tarps stitched together with a spiderweb of lines qualify for winter duty. In the first serious storm, these end up shredded, and in their death throes they often deposit large amounts of snow and ice into the boat they are supposed to be protecting.



This fire started when an owner unfamiliar with the process tried to shrinkwrap his boat. Shrinkwrapping is a job best left to professionals.



Frozen meltwater can damage thru-hull fittings.

A good well-supported cover offers many benefits. It keeps leaves and debris from clogging scuppers and causing the boat to flood when a downpour comes or the snow melts. It keeps snow from accumulating in the cockpit and forcing the boat underwater

in its slip or damaging thru-hull fittings on boats on the hard when meltwater freezes. It protects the deck from pooling water that can lead to delamination and freeze damage. And it protects gelcoat on the deck and coach roof from the elements, extending its life.

The best covers are custom made from canvas. With any custom cover, a frame, either wood or aluminum, should be used to circulate air and prevent pooling on the cover. Vents should also be built into the cover to encourage ventilation and reduce mildew. Never secure the boat's winter cover to the jack stands or support blocks because the stands can be yanked out during a strong blow.

Though shrinkwrapping is very effective at keeping rain and snow out, it will also trap moisture inside and create horrendous mildew problems if vents aren't used along the entire length of the cover. Another problem: Cabins and decks painted with two-part polyurethane paints may peel or bubble where the shrinkwrap touches it. Inserting a series of foam pads between the hull and cover allows condensation



Plastic tarps typically will begin to shred after the first blow, leaving your boat unprotected.

to escape. Finally, don't shrinkwrap the boat yourself. All it takes is a moment of inattention to ignite the shrinkwrap, and if the fire occurs inside the cover, it might not even be visible right away. This is one job best left to the pros. ⚠️

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Boat's Name: _____ Length: _____ Model: _____

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Email: _____

ENGINE ROOM

ENGINE(S)

- Fill fuel tanks and add stabilizer to gasoline
- Change oil and filter
- Change fuel filters/separators in engine(s)
- Check coolant level in freshwater-cooling system and add coolant if necessary
- Run antifreeze through raw-water-cooling system
- Make sure water strainers are filled with antifreeze
- Fog cylinders in gasoline engines
- Top up battery electrolyte level and put batteries on marine charger

INSTALLED GENERATOR

- Change oil and filter
- Change fuel filters/separators
- Check coolant level in freshwater-cooling system and add coolant if necessary
- Run antifreeze through raw-water-cooling system
- Make sure water strainers are filled with antifreeze

OTHER SYSTEMS

- Flush and fill air conditioning and refrigeration system with antifreeze
- Run antifreeze through watermaker and pickle as per owner's manual

OUTBOARDS

- Fill installed fuel tanks and add stabilizer
- Flush engine with muffs and fresh water.
- Turn off fuel supply and fog while running (Note that some newer outboards have an automatic winterizing feature)
- Drain gear case and add fresh lubricant
- Store unit in lowest position
- Inspect/replace anodes
- Empty fuel from portable 4-stroke tanks into car tank and take them home for storage

OUTDRIVES

- If water intake is in lower unit, flush and run antifreeze through using muffs
- Drain gear oil and add fresh lubricant
- Inspect/replace anodes

BELOW DECKS

- Pump out holding tank and add antifreeze to head
- Drain water heater and bypass it
- Drain freshwater system and run antifreeze through it
- Run antifreeze through live well, deck washdown pump, etc., per owner's manual
- Drain shower sump and other places where water pools
- Remove food
- Open lockers to air
- Take home cushions or store on their sides
- Take home portable electronics
- Close propane valves and take home portable canisters
- Verify bilge pump and switch operate properly
- Clean and dry bilges
- Secure all ports and hatches
- Turn off all circuit breakers except for bilge pump and smoke/vapor alarms

IN THE WATER

- Close all seacocks except for cockpit drains
- Plug exhaust ports
- Check docklines and chafe guards – center boat in slip
- Add or adjust fenders for proper placement

BEFORE YOU GO

- Tie off tiller/steering wheel
- Cover/shrinkwrap boat
- Lock cabin and leave spare key with marina manager

Engines and Drives

No matter what kind of engine you have, there are three essential winterizing steps:

Change the oil and oil filter

Residual acids and moisture left in the crankcase over the winter can pit bearings and other vital engine parts, so it is important to change the oil just before laying up the boat. For best results, run the engine for a few minutes to lower the oil's viscosity and allow it to pick up impurities. Shut off the engine, change the oil, and replace the filter. Restart the engine and run for about a minute to circulate the fresh oil to internal parts. While it's running, check to make sure the oil filter isn't leaking.

Change the fuel filter and stabilize the fuel

Replace the fuel filter and/or change the fuel filter canisters. Like the oil filter, the fuel filter should be checked for leaks while the engine is still running. If your boat runs on gasoline and your gasoline has ethanol in it (E10), the ethanol will absorb moisture over the winter. If it absorbs enough water, the ethanol can separate from the gasoline, creating a caustic mixture at the bottom of your tank that can damage the engine. This process, called phase separation, can only be completely prevented by emptying the tank. If that isn't practical, add stabilizer to keep the gas from oxidizing over the winter, then fill the tank to 95-percent full to allow for expansion. A tank that's almost full has less "lung capacity" to breathe in moist air, so the ethanol is less likely to be able to absorb enough moisture to separate.

Drain the water from the engine or use antifreeze

This is the part that seems most often to confuse owners. Mistakes in this step lead to the vast majority of the freeze claims in the BoatU.S. Marine Insurance files. Exactly how this is done varies from one type of engine to another, as described below.

Inboards

Most boat engines use water drawn from outside the boat to cool the engine. In raw-water-cooled engines, seawater is pumped directly through the engine block casting, head assembly and exhaust manifold, and then returned overboard with the unwanted heat. In freshwater-cooled engines, there are actually two systems - a raw-water side that cools the coolant/water mixture (freshwater) in a closed-loop system, which in turn cools the engine.

Winterizing the freshwater side simply involves making sure its year-round permanent coolant is an adequate mixture to meet the manufacturer's recommendations for your locality, typically a 50/50 mix with water. The coolant you use in the freshwater system is not the same as what you will use on the raw-water side of the engine (see sidebar on page 14) - ethylene glycol is effective but highly toxic. With the engine at room temperature, slowly remove the cap on the expansion tank and check the mixture with an antifreeze hydrometer. If the coolant is rusty or dirty, it needs to be drained and replaced with a fresh mixture. (Resist the temptation to use more than 50 percent coolant. An overly rich mixture will congeal, with 100 percent coolant turning to

a solid gel at -8 degrees F.)

There are two methods of winterizing a raw-water-cooled engine or the raw-water side of a freshwater-cooled engine: draining the system and leaving it dry, or filling it with winterizing antifreeze (propylene glycol).

The preferred technique for inboard engines, circulating antifreeze throughout the cooling system, is better for an engine. It is also far less likely to result in freeze damage as long as the engine is run long enough to circulate the antifreeze to every part of the cooling system.

Draining an engine must be thorough as small pockets of water can crack expensive parts. To drain, check the engine manual for the location of all petcocks and open them. If water fails to drain freely from a petcock, it could be clogged with rust or debris. Remove the petcock and free the opening with a tool or coat hanger. Don't forget also to drain the sea strainer, seacock body, and water lift muffler if installed.

Note that in raw-water-cooled engines a thermostat blocks water flow in some cooling passages until the engine heats up. To be thoroughly protected, raw-water-cooled engines must reach operating temperature and the thermostat must be



Water expands when it freezes and not properly winterizing your engine can lead to a cracked block, necessitating engine replacement.



Even a short freeze can cause expanding ice to crack a manifold.

open before adding the antifreeze. In cold weather, it could be difficult to keep the thermostat open. One method is to remove the thermostat, a simple job on most engines. It can be left out for the winter, but don't forget to reinstall it in the spring along with a new gasket.

To winterize the engine with anti-freeze, you'll need a five-gallon bucket, and enough antifreeze for your engine and related plumbing (at least two gallons). If your engine takes a lot of antifreeze, you might also need a helper to add antifreeze to the bucket as needed. To circulate antifreeze through the engine:

- If the boat is in the water, close the intake seacock.
- Fill a five-gallon bucket with undiluted non-toxic antifreeze. Have additional antifreeze handy if you know your boat takes more than that or if you've never winterized before. You can use any leftovers in the boat's plumbing systems.
- Remove the raw water intake hose from the seacock (this is sometimes difficult, as hose clamps and hoses may be mechanically frozen in place) and insert the end into the antifreeze in the bucket.
- Start the engine and run at idle until antifreeze discharges from the exhaust outlet for 30 seconds or more.
- For gasoline engines, fog the cylinders (see below), which should stop the engine.

- Secure the intake hose back on the seacock.

On some boats, it can be very difficult to reach the intake hose for the engine or to get it off the seacock. A variety of products have been designed to make getting antifreeze into the engine possible without removing that hose, such as three-way valves that attach to the seacock or the sea strainer, funnels that fit inside the sea strainer, and reservoirs with hoses that can be run to the raw-water intake. Google "boat winterizing products" and you'll find a selection. If you choose to use one of these, just be certain that the antifreeze reaches everything downstream of where you are adding it, not just upstream.

In addition to the bucket and the antifreeze, for gasoline engines you'll also need a can of engine fogging fluid or light motor oil, and some plastic sheeting and duct tape.

If a fuel valve is installed, turn it off once antifreeze is coming out of the exhaust and run the carburetor dry. For the last 10 seconds or so of engine operation, spray the fogging fluid into the flame arrester on the carburetor. Light oil can be trickled down the carburetor if fogging fluid is not available. This may stall the engine, which is OK. Finally, wrap duct tape around the flame arrester and cover the top of the engine with plastic after it has cooled. This helps prevent corrosion from forming on internal engine parts. Attach a tag somewhere as a reminder about the duct tape, which will prevent the engine from starting next spring.

Sterndrives

Because there are different types of stern-drives, check your manual for winterizing specifics. Some inboard/outboard (I/O) engines take in cooling water from a thru-hull in the engine compartment, and some take it in through the outdrive. With I/Os that use a thru-hull, the outdrive will be protected once the engine has had antifreeze run through it because the

GREEN WINTERIZING TIPS

- Use less toxic propylene glycol antifreeze.
- If practical capture any antifreeze in a bucket when flushing to prevent overboard discharges.
- When performing engine work, place an oil-only absorbent pad under the area to catch drips or small spills.
- Use small containers of oil and other hazardous cleaners; small containers mean smaller spills.
- Keep containers near the center of the boat to minimize the chance of an overboard spill.
- Temporarily plug all scuppers and drains and disable your bilge pump while performing maintenance. (Be sure to turn the bilge pump back on when finished.)
- Look for used oil and antifreeze recycling at your marina and dispose of hazardous wastes properly. Visit earth911.org to learn about local waste disposal.

antifreeze also runs through the outdrive.

Other models may require the use of "muffs" to first flush and then run antifreeze through the drive. For those drives, warm up the engine with the muffs, then use a five-gallon bucket of antifreeze plumbed to the muffs and run the engine until it's all been run through. Afterward, all outdrives should be stored in the down position to prevent water from entering the exhaust hub of the propeller. In cold weather, any accumulated water in the outdrive can freeze and ice may expand and crack the housing.

While not technically necessary for winterizing, it makes sense to drain and fill the outdrive oil now. It's not very difficult and will protect your outdrive from the effects of worn-out oil over the winter while letting you hit the water faster in the spring.

Lower the outdrive as far as possible and drain the oil by removing the lube drain/

WINTERIZING CONTRACTS

BoatU.S. Consumer Protection receives complaints every year from boat owners who thought the marina would winterize their boat but the marina didn't do it or didn't know they were supposed to. Disputes arise when the marina and the boat owner don't have a well-defined contract that spells out exactly what's to be done.

The term "winterizing" doesn't have a universal meaning and your definition of winterizing and theirs may be completely different. Telling someone to winterize the engines and freshwater system doesn't mean they'll also close the seacocks and winterize the head.

Insist on a written contract that clearly lists every job necessary to protect your boat and has a firm time frame, beginning well before the first typical hard freeze. Include language that specifies not to de-winterize until you authorize it in case something comes up and you won't be using the boat through the next winter. Pay with a credit card if possible. If the boat didn't get winterized properly per the contract and you have damage, you can dispute the charges with your credit card company, which gives you more leverage. Also, don't assume that the marina will routinely inspect your docklines and bilge unless you specifically pay for the service. If your marina won't be checking on your boat over the winter, you'll need to do it yourself or make arrangements with your dockmates.

On all too many of our freeze claims the owner says, "But I thought the yard was going to take care of that!" Whatever you expect to be done, spell it out in writing.



Store outdrives and outboards in the down position so water can drain; otherwise ice can crack the housing.

fill screw at the bottom and the vent plug screw at the top. Keep in mind that refilling your outdrive oil is counterintuitive; new oil must be pumped UP into the outdrive; never refill from the top port or vent hole. Pump fresh oil into the drive from the drain hole at the bottom until fluid appears out the vent hole at the top. Install the vent screw, which slows the lube from coming back out the drain, and then replace the drain/ fill screw quickly. It's a good idea to put new gaskets on the plugs. If your boat has a reservoir in the engine compartment, fill it also.

Outdrives are expensive and have become a frequent target for thieves. Even if the boat is kept in your driveway, consider taking the outdrive off and storing it in your garage or basement for the winter.

Outboards

Consult your engine's owner's manual or service manual before you begin. Today's engines (especially four-stroke and direct-injected two-stroke outboards) may have special winterizing, flushing, and maintenance instructions, so follow them closely. For example, Evinrude's E-Tec outboards feature a self-winterizing mode in the engine's electronic programming. It's simple to do by following the instructions in the winterizing section of the owner's manual, yet if you don't know about it, you might be tempted to try it the traditional way. If

your engine is still under warranty, and you don't winterize it according to the manufacturer's instructions, you could easily void the warranty coverage.

While winterizing procedures vary somewhat for older engines versus newer ones, and for two-stroke versus four-stroke outboards, the basics are the same.

- The engine's gas tank must be filled and treated with stabilizers or drained completely.
- The engine should be flushed according to the manufacturer's instructions. Sometimes, this doesn't involve running the engine at all; newer engines have a garden hose fitting that allows for a quick flush without starting the engine. Check your manual for specifics.
- The engine's lubricants (engine oil for four-stroke outboards, and lower unit gear lube for all outboards) should be drained and refilled, and the fuel filters changed. Water or other contaminants must be flushed out and replaced with fresh fluids before winter. Any water present in the gear case, for example, will sit on steel shafts and bearings over the winter, coating them with rust.
- Run the engine (use a small portable tank

that has stabilizer mixed in it if you've drained the main tank. Use ear muffs for cooling water to get the oil and lower unit lubricant warm before draining. This will make it flow easier and also get any contaminants in suspension so they drain instead of sitting inside. Change the oil filter when you change the oil.

■ After treating the fuel and running the engine for a few minutes, the engine should be "fogged" with a storage lubricant. This protects the internals (bearings, seals, and rotating surfaces) with a thin film of lubricant, which helps keep rust and corrosion away. With the engine running, inject fogging oil through the carburetors or electronic fuel injection (EFI) system air intakes in such a way as to "flood" the engine with oil until it begins to smoke, then continue fogging it until it stalls. Fogging can also be done with the engine shut down; in this case, the spark plugs are removed and the oil is sprayed into the cylinders, rotating the flywheel to distribute the oil. Store the engine in the running (tilted down) position; otherwise water that gets in through the hub can freeze and crack the lower unit housing. If possible, take smaller outboards home for safekeeping.



PHOTO BY JOHN TIGER

Changing the lower unit oil will help protect your boat from worn out lube over the winter.

Jet Drives

Personal watercraft (PWC) and other boats with jet drives need to be winterized, too. Because there are so many different types, consult your owner's manual for instructions specific to your boat. As with other engines, change the oil, oil filter, and fuel filter and stabilize the gasoline. In most cases, removing water from the engines

and drives of PWCs simply involves starting them out of the water and moving the steering lock-to-lock a few times for about 30 seconds - any longer can overheat the engine. Run the engine like this two or three times. If you fill up your gas tank and add stabilizer first, the treated gas will circulate in the engine while you're getting the water out. Larger jet drives may need to be winterized by a qualified shop. ⚠️

Plumbing

While most of the BoatU.S. Marine Insurance freeze claims involve the engine or exhaust manifolds, that's not the only place where freezing water can cause serious damage. Plastic plumbing fittings, pumps, and marine heads can all be cracked by ice. Pipes, valves, and pumps in potable water systems can freeze and split open. As with engines, winterizing the plumbing systems aboard consists of replacing the water with antifreeze.

FreshWater System

Simply draining the freshwater system isn't enough, as water will almost certainly have pooled somewhere, and will freeze over winter. Running antifreeze through the system will ensure that there is no

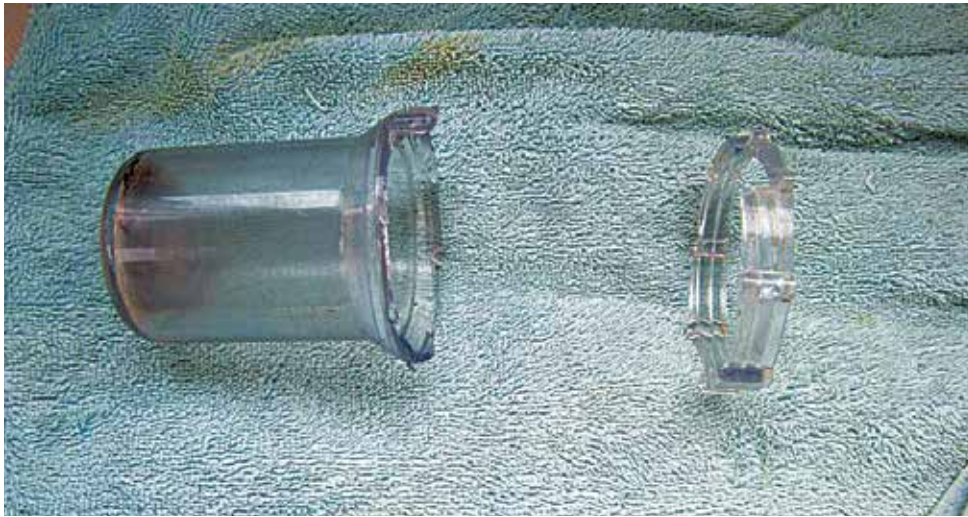
water in the system to freeze. Keep in mind that engine coolant (ethylene glycol) should NEVER be used in a freshwater system, as it is very toxic and cannot be reliably purged from the system in the spring. Here's how to winterize a freshwater system:

- 1.** The dockside freshwater hookup, if you have one, should be shut off on shore and the hose drained and stowed.
- 2.** Go below and open all water outlet spigots to drain the onboard freshwater tank(s). When water sputters from the outlets, close them and pour two or three gallons of nontoxic propylene glycol antifreeze (more if you have a hot water heater) into the tank. Note: If you drain the

water heater and rig a bypass from the inlet to the outlet, you'll save a lot of antifreeze.

- 3.** Open the outlets farthest from the tank and run until the antifreeze flows out. Close, and work backward toward the tank, repeating the procedure at each outlet - you may need more antifreeze than you think. Do this with both the hot and cold outlets.

If the boat is in the water, pour anti-freeze into the sink drains and close the seacocks. If the boat is on the hard, open all seacocks to make sure they've drained completely, then close all but the cockpit seacock. If there is water in the shower sump, drain it too.



If a strainer is not drained or filled with anti-freeze, it can crack and possibly sink your boat.

Marine Heads

Heads without holding tanks:

- Pour disinfectant into the bowl, and pump throughout the system.
- Close the intake seacock, disconnect the hose, and put it in a bucket of nontoxic antifreeze.
- Pump the antifreeze through the head, reconnect the hose, and close the remaining seacock.

Heads with holding tanks:

- Empty the holding tank and pump disinfectant and then antifreeze through the bowl and into the tank (and through the “Y” valve if you have one). Close all seacocks.

Marine sanitation systems:

- Consult owner’s manual.

Air Conditioners

There are two ways to winterize an air conditioner. You can drain the system, including the raw-water pump and strainer, if that’s possible. But as with freshwater systems, enough water often remains in low points of the system to cause damage. The better alternative is to remove the raw-water intake, and place the hose in a bucket of non-toxic propylene glycol antifreeze and run the pump until you’re certain antifreeze comes out of the discharge line. No need to run the air conditioning, but clean out the air filter and raw-water filters first so that the whole system is ready to go come spring.

Bilge and Other Pumps

If your boat is in the water, you don’t need to (or want to) winterize your bilge pump(s), but they need to be checked so you know they’re working. If your boat is being stored ashore, run antifreeze through them or blow out the discharge lines if you can. Most centrifugal bilge pumps are self-draining and don’t need any special care. Make sure that anchor washdown pumps, live well pumps, and any other raw water pumps don’t have water left in them. Don’t forget to sponge out live wells, fish boxes, lockers, and other places where water might have accumulated.

ANTIFREEZE

Antifreeze is antifreeze, right? Wrong. Not only are there different kinds, the temperature at which they freeze is different, too. And that’s important because if they do freeze, your boat is likely to be damaged.

Antifreeze for winterizing engines and freshwater systems is not the same as the coolant you put in your engine’s heat exchanger (the boat equivalent of a radiator). Ethylene glycol, the chemical used in coolant, is highly toxic, and winterizing antifreeze must be nontoxic because it goes in drinking water systems and may eventually go overboard. The antifreeze you use in your engine and plumbing systems aboard must also have the proper freeze protection to keep your systems safe at the lowest possible temperatures your boat may face.

For drinking water and raw water systems, choose antifreeze that contains propylene glycol, which is safe and tasteless, and one that has rust inhibitors for engine protection. Most importantly, check the freeze rating, but be aware that the numbers used don’t correspond to what you may think. A typical antifreeze labeled for minus 50 degrees Fahrenheit will only protect PVC water pipes from bursting down to about minus 10 degrees and will actually begin freezing at about 15 degrees above. At 50 below, it’s a solid chunk of ice, capable of cracking an engine block. Play it safe and use an antifreeze that is rated well below any temperature you’re likely to experience.

Most winterizing antifreeze must be used full strength – don’t dilute. When pumping antifreeze into your engine or freshwater systems, don’t shut down as soon as you see the antifreeze come out of the faucet or engine exhaust. The antifreeze first mixes with the water already in the system and has to displace all of it before the antifreeze can protect fully. It’s better to invest in a couple of extra gallons than end up with a cracked block at the beginning of next season.

NOTE: Manufacturers of some heads, such as the Raritan PH II, advise against using nontoxic antifreeze because it may soften the gaskets. If you use toxic antifreeze, do not pump it overboard. Detach the outlet hose for the head and pump it into a bucket, then recycle it at your marina.

ELECTRIC HEATERS

A heater is no substitute for properly winterizing a boat! Numerous freeze claims over the years have proven that point again and again. If you're tempted to leave your boat with a heater running this winter rather than winterizing, consider these examples:



1. The owner of a 24-foot Bayliner in Portland, Oregon never got around to winterizing his twin gas engines and instead put a heater in the engine compartment. Like a lot of other people, the owner probably didn't think about the fact that power outages

most often occur right when you need electricity most – when the worst winter weather hits. An ice storm came through just before Christmas, downing power lines and cutting off power to the heater long enough to freeze the water in the blocks. The next spring, when the owner fired up the engines, instead of heading out for the first cruise of the season, he limped back to the dock with the manifolds from both engines cracked and spewing water. Because the marina was busy with launching and recommissioning boats for the season, the repairs couldn't be completed for weeks.



2. This 27-foot Rinker was "winterized" by placing a space heater in the engine room. The boat, which was afloat in her slip in Alabama, caught fire when the extension cord used to power the heater shorted where it had old damage. The boat was destroyed and damaged another boat as well as the dock.

Other boats have been lost when the heater itself has caught fire, when the heater has ignited something combustible inside the boat, or when the heater has been tipped over by a large wake that rocked the boat. Even lightbulbs in the engine room have caused fires.

Don't rely on an electric heater to keep your boat safe this winter – it may not, and it might even destroy your pride and joy. Heaters can actually increase mold and mildew because the heated air causes condensation on cold surfaces like metal portlights and hatches. Winterize your boat, even if you live in an area that seems safe from hard freezes. It only takes a couple of hours to prepare a boat properly – or to destroy an engine in a cold snap if the power goes out.



No one wants to end up like the poor guy in the photo! So don't plan on staying away too long. Visit your boat every few weeks to make sure lines are secure, drains haven't become clogged, bilges are dry, etc. Checking the boat is especially important after heavy storms or extended cold spells. If you have friends at the marina, arrange to check each other's boats whenever possible. 🚩

This would be a good time to see if ice and freeze coverage is included in your boat insurance policy. Even the most competent do-it-yourselfer can make a mistake, and in many policies, ice and freezing damage is excluded unless you purchase special coverage (for a modest cost).

Is Your Boat Insurance All It's Stacked Up To Be?

If you're caught without enough coverage

in the months your boat isn't in the water, you could be facing a huge out-of-pocket expense. Significant snow and ice can cause even the sturdiest storage facility to come down like a house of cards. It's an Act of God, and without insurance, you could be stuck paying for the salvage of your boat, and the total cost to repair or replace it.

That's why BoatU.S. only offers policies with year round coverage, on the water, the trailer and in storage.



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