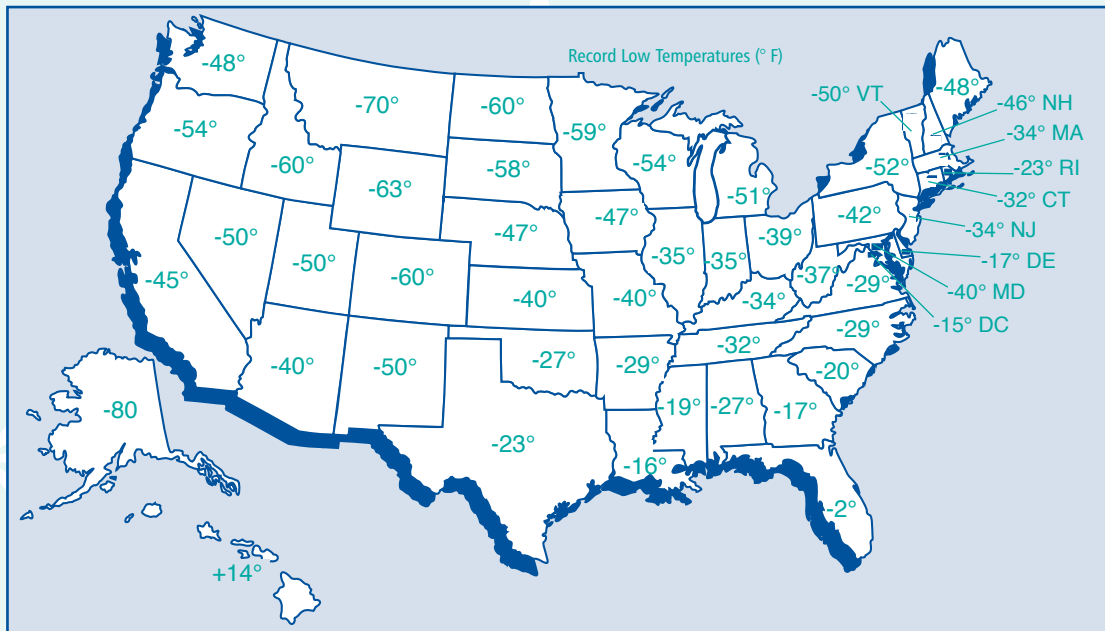


# SEAWORTHY

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## Who Needs to Winterize?

Of all 50 states, which would you guess had the most freeze-related claims? Alaska? Maine? Michigan? Guess again. An examination of the BoatU.S. Marine Insurance claim files found that balmy California had more winterizing claims than any other state, including any of the "deep-freeze" states. While winters may be much colder in the deep-freeze states, the bitter temperatures are a fact of life and preparations for winter are taken very seriously. But in the more temperate states, like California, Florida, Texas, Louisiana, Alabama, and Georgia, winter tends to be relatively comfortable with only an occasional cold spell. As one Sacramento, California skipper said (Claim #929281A), "We don't think much about freezing weather because it never happens...well, almost never."

# Storage Ashore

In some parts of the country, where winter means several months of bitterly cold weather, storing boats ashore is the norm. In warmer climates, however, ice and snow may occur infrequently, and the choice between storage ashore and storage in the water is open to discussion.

Storage in the water means you might get a jump on the boating season next spring. On the other hand, boats stored ashore (on high ground) won't sink. If you have a choice, storage ashore is a safer bet.

One note of caution: The vast majority of the claims in temperate states involved boats that were being stored ashore. Since water retains heat longer than air, boats surrounded by air are more vulnerable to a sudden freeze than boats surrounded by water. Even a brief cold spell that lasts only a night or two can do considerable damage. *In temperate states, boat owners must winterize engines and freshwater systems, especially when boats are stored ashore.* In deep-freeze states, boats stored ashore must be winterized sooner than boats stored in the water.



## Supporting Hulls

To say that a boat is better off stored on land is to assume it will be resting on something that provides adequate support. According to one industry expert, three times as many boat hulls are damaged by mishandling ashore than are damaged in the water. Some of the boats on shore are damaged suddenly when they are blown over by windstorms. Many others are damaged slowly because hulls have been distorted in storage, creating problems ranging from poor engine alignment to broken stringers and bulkheads.

## Cradles

The most reliable support is provided by custom-made cradles that are designed specifically to support critical areas of a boat—its engines, bulkheads, and keel. (Don't store your boat on a cradle that was built for a different model boat.) Steel cradles are best, but wood

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.

Despite the advantages, storing cradles in the off-season is often a problem at many crowded boatyards, which instead rely on a combination of screw-type jack stands, blocks, and timbers to support hulls. Most boatyards do a competent job of positioning the supports, but it never hurts to discuss technique with the yard manager before the boat is hauled.

You could also take a cue from commercial vessels, which have their own blocking plans indicating where blocks and jack stands should be placed to provide the best support for your boat. Manufacturers may be able to supply you with a plan, 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

With jack stands, the stand should be perpendicular to the hull so it directs the boat's weight toward the ground. Misalignment of a stand will force it out as the load is applied. Even if the stand is aligned perfectly, safety chains must be used to prevent stands from slipping out from under the hull.

Jack stands should be placed as far out from the hull as practical to support the boat in high winds, with at least three per side for boats over 26' and additional supports at overhangs. Plywood must be placed under each base to prevent its sinking into mud, sand, or asphalt. Even when stands rest on clay that seems brick hard, they can be loosened by heavy spring rains, shift, and spill the boat.

While jack stands must be placed properly to prevent the boat from falling over, most of the boat's weight usually rests on its keel. Some boats have specific requirements for support of the keel, but 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 powerboats, additional support is usually recommended for inboard engines, fuel tanks, and heavy machinery. With outboard and outdrive 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. (Check again in two weeks, after it has settled.) The boat must also be level, or water could pool and cause stains, mildew, and/or gel coat crazing. Finally, *never* secure the boat's winter cover to the jack stands or support blocks. There are many accounts in the claim files of boats that fell over after stiff winds filled the covers and yanked the supports from under the hulls.

## Wondering Where to Store Your Boat This Winter?

### BoatU.S. Casts a Vote for Storage Ashore

There are at least two good reasons to store a boat ashore for the winter: 1. A fiberglass hull that is out of the water for several months each year is less likely to develop blisters. 2. A boat stored ashore on high ground is less likely to sink. The pictures show two of the ways boats can sink over the winter, even when they have been "properly" winterized.

*Top:* The boat was shoved underwater by weight on the transom during an unusually severe North Carolina snowstorm (Claim #030002). While a cover would certainly help, the most effective solution is to store boats with low freeboard ashore for the winter.

*Bottom:* In a similar claim, a sailboat in Maryland sank when its plastic thru-hull was shoved underwater by the weight of snow. The intake was broken by ice (the surveyor who inspected the damage suspected that it was already cracked) and water flowed into the boat (Claim #970106).

## Storage on Racks and Trailers

An increasing number of boats are being stored ashore on dry storage racks. These racks are designed to support "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 and pads to support critical areas.

The exception is deep-draft sailboats. Trailers are designed to support these boats when the wind is on the bow and are rarely wide enough to provide adequate protection for boats with deep keels when strong winds are on the beam. To provide additional lateral support, use extra jack stands along the hull and unstep the mast to reduce windage. Centerboard boats will probably be OK on a trailer, especially if they are secured to the trailer's frame and the mast is unstepped.



# Storage in the Water

Failure to close thru-hulls is a major cause of loss in the BoatU.S. insurance program. In a recent study of 40 winter-related claims, seacocks or gate valves left open caused or contributed to the sinking of *seven* of the boats in the sample group. Whenever a boat is stored in the water over the winter, thru-hulls, with the exception of the ones for cockpit drains, must be closed or the boat could be on the bottom next spring. And all thru-hulls, especially the ones for the cockpit drains, must be double-clamped with stainless steel hose clamps at each end. This is critical. When water freezes, it expands and will lift a poorly secured hose off a fitting. The hose itself is also important. Lightweight hose and PVC tubing can rupture or crack. Use only a heavily reinforced hose, especially at cockpit drains.

If your boat has thru-hulls below the waterline that can't be closed, either because they are mechanically frozen open or broken (typical with gate valves, which is why they are not recommended), it should be stored ashore for the winter.

Seacocks are closed by moving the handle *down* so that the handle is parallel to the hull. Gate valves are closed by turning the wheel *clockwise*. 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 eliminate any residual water, which can freeze and crack the nipple. (Taking off the hose also assures you that the valve has closed properly.) Reinstall the hose immediately and secure the two clamps.

It should be noted that 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 deteriorate in sunlight and break. When boats are shoved underwater by the weight of snow and ice in the cockpits, they sink. Plastic thru-hulls near the waterline are especially vulnerable and should be replaced with bronze or Marelon (the latter is the only type of plastic approved for marine use by U.L.).

## Other Thru-hulls

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, tighten the nut until the dripping stops. (Remember to loosen the nut in the spring, so that you don't burn up the packing material.) While you're crawling around back there, check the rudder stuffing box if your boat has one.

## Exhaust Ports

It is advisable to plug exhaust ports when a boat is stored in the water because snow piles up on the stern, and exhaust ports get pushed below the surface. Water then gets into the exhaust system and maybe the cylinders. If this happens, the pistons rust and the engine is ruined. Plugging exhaust ports is certainly less

critical when a boat is stored on land, but some skipper feel that even corrosive air can harm cylinders. (Don't forget to remove plugs in the spring!)

## Docks and Dock Lines

Nylon lines stretch and absorb shock, which is good, but this stretching works—chafes—the line against chocks and other contact points. Chafe guards should always be used on lines when the boat is left unprotected for long periods. Ready-made chafe protectors are available from BoatU.S. and West Marine, or you can make your own using garden hose.

Blustery winter winds can cause extreme tides, which cause problems if a boat isn't well secured. Short or poorly placed lines are typically the culprit when a boat sinks after being caught under the dock. Longer spring lines should be arranged to keep the boat well away from the dock. Arrange the lines with the bitter ends at the dock so the boat can be adjusted without going aboard.

*Note:* Snow and ice can make docks treacherous in the winter. Proceed with caution and make sure someone



is nearby to help, should you slip and fall. Consider wearing a PFD when you visit the boat in the winter.

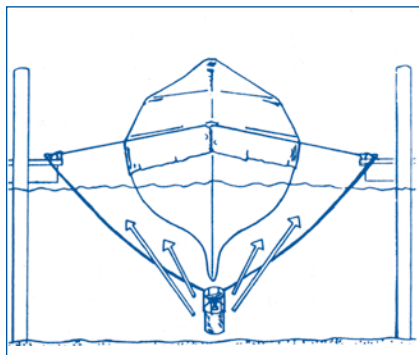
## Batteries

You may want to leave a battery aboard to operate a burglar alarm or an automatic bilge pump. These are both useful in the winter, but *don't* expect an automatic pump to overcome bad deck, cabin, or hull leaks—not in the summer or winter. The pump, battery, or float switch can fail, leaving the boat unprotected. A boat with chronic leaking problems should be dry-stored and repaired ASAP.

If you do leave a battery aboard, make sure the cells are filled with distilled water and fully charged so they don't freeze. Frozen cells ruin a battery. Clean the terminals with baking soda, and rinse with cold water. Coat terminals and cables with petroleum jelly to prevent rust. If you don't need a battery aboard, take it home and do all of the above anyway, preferably sooner than later. Store it in a cool dry room.

## Deicers

A submersible circulating deicer can make storage in the water possible in freeze areas while reducing the chance



of damage ranging from hull scarring to dislodged thru-hulls and sinking. Deicers prevent ice from forming around a boat by bringing up warmer water from the bottom and by creating turbulence at the surface. Strategically placed, a deicer can keep a boat floating in a pool of relatively warmer water. (Systems in the boat, however, must still be winterized.) A deicer often can be shared by two or more boats, reducing the cost for each owner. Optional thermostats are available that conserve electricity. Dock pilings, which can be forced up in the grip of the ice, can also be protected by a deicer. A note of caution: deicers run on shore power and prolonged winter power outages can allow the ice to close in.

# Winterizing Contracts

*"I thought the yard would take care of that!"* A casual agreement to take care of the boat, or worse, an assumption that a marina will automatically protect the boat from a freeze can have chilling results:

Claim #920726. The skipper was seriously ill, so he called the boatyard and casually asked if they could winterize his houseboat. *No problem!* The boat was hauled and blocked. The engine's cooling system was drained and non-toxic antifreeze flushed throughout the freshwater system. Unfortunately, an expensive winter cover that had been stored below was left untouched in a locker and the boat was left to endure the harsh Minnesota winter *au naturel*. Snowfall after snowfall piled on its decks and water trickled into the cabin at the corners causing serious structural damage.

## Better Write Than Wrong

Every fall, the term "winterize" is tossed about loosely by owners who think it has some universal meaning that is instantly comprehended by marina operators. Winterize what? Maritime attorneys make a good living helping boat owners and marinas resolve disputes over what work was or wasn't supposed to have been done on boats and engines. Usually these legal disputes involve the cost of repairs, but when winterize isn't spelled out, they typically involve much bigger costs, like raising the boat or replacing the engines.

If you're not going to winterize your boat yourself, select a repair facility that is competent to do the job and then spell out in writing exactly what is supposed to be done. It would be helpful if all marinas insisted on written contracts, but many don't and it may be up to you to take the initiative. Don't assume anything. Telling someone to winterize the engines and freshwater system doesn't mean they'll also close the seacocks and winterize the head. Whenever you will be unable to attend to the boat for a long period of time, a separate document is required with a marina or contractor to look after things.

Another mistake is to assume that the marina will routinely inspect your dock lines and bilge over the winter. If you won't be able to visit your boat regularly, look at your marina contract to see if routine inspections are included. (They probably aren't.) Many marinas offer these inspections, but at an extra cost.

Whatever you want done, spell it out in writing. Make sure you and your marina are on the same wavelength.

# Winterizing Engines

Engines don't like to be idle, even for three or four months over the winter. BoatU.S. Marine Insurance claim files contain many stories of engines that froze and failed after skippers failed to winterize their engine properly. *Generally, engine blocks that freeze and crack are not covered by a boat's insurance policy.*

But even if the engine makes it through the winter, a half-hearted winterizing effort will come back to haunt you as the engine gets older and wears out prematurely. Unless it is winterized properly, moisture, acids and corrosion will continue unabated. Winterizing the engine is one job that is truly critical; follow the steps below and consult your manual for specifics.

## Oil and Fuel Systems Gas and Diesel

*Step 1: Change the Oil.* 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 suspend contaminants. Shut off the engine, change the oil, and replace the filter. Rub oil on the filter's gasket to help it seat better.

Restart the engine and run it 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.

*Step 2: Replace the Fuel Filters.* Replace the fuel filter and clean the fuel filter canisters if reusable. Like the oil filter, the fuel filter should be checked for leaks while the engine is still running.

## Understanding Cooling Systems Raw Water or Fresh Water

Most boat engines use water drawn from outside the boat to cool the engine. In some engines, this "raw water" is pumped through the engine block casting, head assembly and exhaust manifold, and then returned overboard with the unwanted heat.

In fresh water cooled (FWC) engines, there are actually two systems— a raw water side that cools the closed-loop system of fresh water, which in turn cools the engine. Winterizing the fresh water side simply involves making sure it's year-round permanent coolant is an adequate mixture of antifreeze and water to meet

the manufacturer's recommendations for your locality, typically a 50/50 mix. 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% antifreeze. An overly rich mixture will congeal, with 100% antifreeze turning to a solid gel at -8° F.)

There are two methods of winterizing a raw water-cooled engine or the raw water side of a fresh water cooled engine: draining the system and leaving it dry, or filling it with antifreeze. Draining 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, corrosion or debris. Remove the petcock and free the opening with a tool or coat hanger wire. Don't forget to drain the sea strainer, seacock body and waterlift muffler if installed.

The second technique, circulating antifreeze throughout the cooling system, is better for an engine's cooling system, assuming that the antifreeze you use also contains rust inhibitors. Before circulating antifreeze in a raw-water cooled engine, you need to consider that a thermostat blocks water flow in some engine passages until it heats up. To assure the engine is thoroughly protected, be sure the engine reaches operating temperature to open the thermostat before adding the antifreeze. In cold weather, it could be difficult to keep the thermostat open. Some mechanics suggest using a heated antifreeze solution. Another 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.

## How to Winterize the Raw-Water Cooling System

### The Basics

If you opt to winterize the engine with antifreeze, you'll need a five-gallon pail and enough antifreeze for your engine and related plumbing (two gallons of antifreeze should be enough). Additional steps should be taken to winterize gasoline engines, which require a can of engine fogging fluid or light motor oil, and some plastic sheeting and duct tape.

# Coping With Ethanol

For the past few years, states have been switching their requirements for oxygenated gasoline from a mix of MTBE (an ether) to a blend of 10% ethanol, an alcohol made primarily from corn. One of the unfortunate properties of ethanol is its ability to attract and absorb water. Ethanol-enhanced gasoline can absorb roughly 10 times as much water as MTBE and still burn safely through the engine. But if ethanol becomes saturated, which can happen when it sits for long periods, the ethanol separates from the gasoline, forming two separate solutions. This is called phase separation and it's bad news for the engine. An engine won't run on the (water-soaked) ethanol solution, which sinks to the bottom of the tank and is corrosive. With any fuel that will be sitting for a long time, it is important to add stabilizer—an antioxidant—to extend the life of the fuel. (E-10 and gasoline with MTBE have the same shelf-life—a year.) What a stabilizer won't do, how-

ever, is prevent phase separation. The only practical way to prevent phase separation is to top off the tank to 95% full (to allow for expansion). A tank that's almost full reduces the flow of air into and out of the vent, which reduces condensation on tank walls. Any condensation that does form will be absorbed by the gasoline.

## DO

- Add Stabilizer.
- Top off the tank (to about 95% full).
- Use your boat frequently during the season so that gasoline doesn't go stale in the tank.

## DON'T

- Leave the boat's tanks partially filled.
- After letting the boat sit idle over the winter, don't then let it also sit idle over the summer. Use your boat!

There are two similar techniques, depending on whether the boat being winterized is in the water or on land.

***If the boat is afloat:*** Close the intake seacock and loosen the hose (this is sometimes difficult, as hose clamps and hoses may be mechanically frozen in place). Reopen the seacock. Start the engine and while it's warming up, fill a five-gallon pail with antifreeze. Turn off the engine and close the seacock. Remove the intake hose from the seacock and insert it onto the pail of antifreeze. Start the engine and run at idle until antifreeze discharges from the exhaust pipe.\* Shut off the engine and secure the intake hose back on the seacock.

***If the boat is out of the water:*** Close the intake seacock, remove the hose, and put it in the five-gallon pail along with a garden hose feeding water at a slow rate, just enough to keep up with the engine's need. Start the engine. When the engine is thoroughly warmed up, turn off the hose and pour in the antifreeze. Run at idle until antifreeze discharges from the exhaust pipe.\* Shut off the engine and secure the intake hose back on the seacock.

### \* Variations with Gasoline Engines/Carburetors

If a fuel valve is installed, turn it off about halfway through the process to run the carburetor dry. (Note: you may want to have extra antifreeze available in case the gasoline takes longer than anticipated to empty the carburetor.) Stored gasoline gets gummy and can cause problems in the spring. For the last ten 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. It is hard to see and could be overlooked in the spring, which would prevent the engine from starting.

## More on Antifreeze

Automotive type (ethylene glycol base) antifreeze traditionally has been used for winterizing marine engines. However, it has fallen into disfavor for this purpose because it is toxic. When the engine is started in the spring, the cooling system flushes, dumping the antifreeze overboard. BoatU.S. recommends non-toxic propylene-glycol antifreeze used for winterizing potable water systems as an environmentally safer alternative. When using it for engine winterization, look for the type specified for engines or add a rust inhibitor. (Never use the old alcohol type antifreeze, it is volatile and has been known to cause a fire in a boat.)

## Diesels

In one respect, diesel engines endure winter better than gasoline engines—no carburetor to gum up. At the same time, a diesel is more at risk to the ravages of rust and corrosion. Besides being a very expensive piece of machinery to rebuild or replace, a diesel often requires professional, factory-trained service people to work on certain components, such as the high-pressure

fuel pump, fuel injectors, and, on many recent engines, a turbocharger. The fuel system on a diesel is also very critical and demands an extra degree of attention.

*Small Sailboat Diesels:* Change oil, transmission fluid, and filters. Drain and clean all fuel filters. Replace fuel elements and gaskets. Bleed all air from the fuel system.

On engines equipped with a hand crank, “fogging” can be done by slowly pouring about two ounces of engine oil

into the intake pipe or manifold while hand cranking the engine. DO NOT use the starter to turn the engine while pouring the oil or serious engine damage could result.

Tape the openings of the intake and exhaust manifolds to keep moisture out of the cylinders.

For large diesels, fogging the engine or squirting oil in the cylinders should NOT be attempted unless specifically recommended by the manufacturer. It is usually preferred to drain the raw-water system rather than filling with antifreeze. Be sure to drain from all low points. Remove the water pump cover and impeller. The blade of the impeller bent against the pump housing can take a set during storage.

**In the spring, diesels, especially large engines, can benefit from some extra steps before starting.**

1. Prime the raw-water pump to prevent it from starting dry.
2. Remove the air intake screen to reach the turbocharger. Disconnect the pressure line at the turbocharger. Using an oil can, pre-lube the turbocharger bearings while turning the turbocharger by hand. Reassemble.
3. Prime the fuel system with clean diesel fuel. Rotate the engine 180° and reprime to ensure fuel has passed through the injectors, which depend on the fuel for cooling and lubrication.
4. Check to see that injector racks, stop lever, and emergency shutdown are working freely.
5. While holding the stop button in, crank the engine for about 15 seconds. (Never crank a starter more than 30 seconds.) Repeat this four or five times to circulate oil. Start normally.

## Water Pumps

The water pump’s rubber impeller should be removed for the winter so it doesn’t get a set. Don’t forget to put it back before starting your engine next spring. (As a reminder, one savvy BoatU.S. member says he always stores the impeller with his ignition key.)

## Transmissions

Check the dipstick. If the oil looks milky (indicating water) or dirty, drain and add fresh lubricant.



## Portable Electric Heaters

*Keep Them At Home for the Winter*

Claim #0328281A. A boat that has been properly winterized doesn’t need a portable electric heater (or light bulbs) to keep it warm and snug over the winter. Boats aren’t puppies. Closing seacocks and winterizing the various systems guarantee the boat’s security far better than a portable electric heater, which, to the contrary, is a bona fide fire hazard on a boat.

The skipper on the boat above had done a proper job of winterizing the engine freshwater systems, etc., but felt the heater would give his boat some “extra protection” during an especially severe cold spell.

In a similar claim, a BoatU.S. Member in Maryland used a heater in the engine room to keep it warm until he got more time to winterize the boat properly. During the night the electricity went off long enough for the water to freeze and bend the engine’s bronze sea strainer. The boat sank. (Claim #945673A.)

## Outdrive Lower Units

This is a job best done on land. With the bow of the boat slightly up, lower the outdrive unit as far as possible. Drain the gear case and add fresh lubricant. Water or metallic shavings indicate a broken seal. Have the unit pressure-tested by a mechanic if you suspect you have a problem. (With an I/O engine, an alternative to draining the system is to circulate antifreeze using one of the gadgets that connect the intake on the lower unit to a jug of antifreeze.)

Outdrives are expensive and a popular 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

If possible, take smaller outboards home for safekeeping. To winterize, follow the instructions below and consult your manual for specifics. With four-stroke outboards, you'll need to change the oil and filters. See the instructions for inboards or consult your owner's manual.

*Cooling System.* Start the engine and flush the cooling system with fresh water until it reaches normal operating temperatures. (Various devices are available to adapt a garden hose to the engine intake.) Make sure all gear housing drain holes are open.

*Fuel System & Powerhead.* Disconnect the fuel line from the tank, start the motor, and inject fogging fluid (a light lubricating oil) into the carburetor just before the motor stops. This procedure prevents corrosion of the powerhead parts. (Fogging fluid has rust inhibitors that are lacking in regular two-cycle motor oil.) Next, remove the spark plugs; clean and replace any that look worn. Clean the fuel pump filter. Lubricate carburetor and choke linkage, cam follower, starter spindle, throttle shaft bearings, and gears. Consult the manufacturer's lubricating chart for specifics.

*Lower Unit.* This should be drained and new gear oil added. When you loosen the drain plug, watch to see if water or oil comes out first. Water or metallic shavings indicate that you need to replace the seal. If you're not sure, have the unit pressure-tested by a mechanic.

## Props

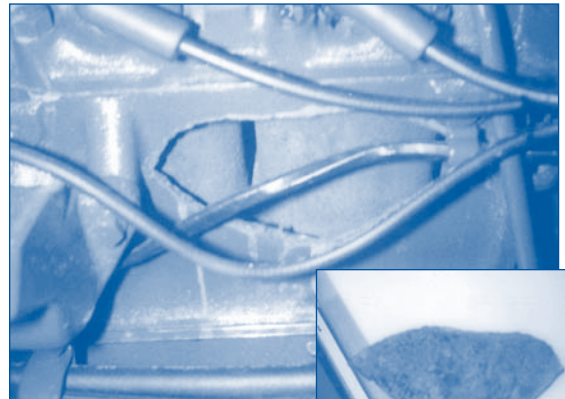
Damaged props slow the boat, cause vibration, and increase fuel consumption. Winter is the best time to have dinged and/or pitted props refurbished.

## Fuel Tanks

Top off the fuel tank(s) and use additives to inhibit fuel's degeneration (this is especially important with ethanol-enhanced gasoline). There is a twofold advantage to topping off tanks: With gasoline, it is safer because fumes are minimized, and you will also minimize the possibility of condensation corroding the tank. When you're filling the tanks, leave room for the gas to expand.

## Air Conditioners

There are two ways to winterize an air conditioner. With the first, you drain the system, including the raw-water pump and strainer. Or you can also close the intake seacock, place the intake hose in a bucket of nontoxic antifreeze, and then run the air conditioner until the antifreeze is running from the exhaust. When the system has been winterized, seal the engine air inlets with plastic and tape to protect the unit from moist air.



## Clogged Petcocks



This engine was ruined after a hard freeze fractured the block. Although the petcock (just below the fracture) had been opened when the engine was winterized, the surveyor's report concluded the valve had become clogged by debris as the block was being drained. The boat's owner discovered the piece of metal (inset) in the bilge as he was preparing the boat in the spring. Checking the valve with wire, or running antifreeze through the system, would have prevented the damage (Claim #990890).

# Down Below

Over the winter, most marinas are like floating ghost towns with little to deter prowlers. A locked cabin is only a partial deterrent. Electronics and any other valuables that can be dismantled should be taken home for safe-keeping. If you have an EPIRB, make sure it won't be activated accidentally.

Besides electronics, all flammables—spare cooking fuels, charcoal, paints, thinners, and varnish—should be stored ashore, preferably in a tool shed away from the house. All are fire hazards. Portable propane canisters should never be stored below on a boat, even during the season, as the canisters can rust and leak. Leave at least one fully charged fire extinguisher in clear sight.

Take home all foodstuffs, including canned and bottled goods. Bunk cushions should be propped up, or better yet, taken home. Open various locker doors, hatches, icebox lids, etc., to circulate air and inhibit mildew. Metal zippers on cushions will benefit from a few squirts of a light lubricating oil.

## Potable Freshwater Systems

Any freshwater system, automatic or manual, should be winterized using nontoxic antifreeze in the tank and throughout the system. Merely draining the system can leave residual water to burst pipes and possibly destroy the pump.

Nontoxic antifreeze is available from BoatU.S. and West Marine, or—the old salt's trick—you can use cheap vodka as a readily available substitute. Although the latter works well and is safe, the alcohol may deteriorate hoses. Engine antifreeze (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.

*To Winterize the Freshwater System:* The dockside freshwater hookup, if you have one, should be shut off on shore and the hose drained and stowed. Next, 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 antifreeze (more if you have a hot water heater) into the tank. Next, open the outlets farthest from the tank and run until the antifreeze flows out. Do this with both the hot and cold outlets. Close, and work backward toward the tank, repeating the procedure at

each outlet. Finally, pour antifreeze into the sink drains and close the seacocks.

## Hot Water Heaters

Water heaters are usually emptied as the freshwater system is drained. See manufacturer's literature for specific instructions.

## 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 manufacturer's literature.

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# On Deck

If your boat could talk, it would ask, perhaps plead, for a winter storage cover. Winter covers, typically canvas or synthetic, are a terrific benefit to your boat's gel coat and general well-being. Canvas covers tend to last longer but are also more expensive than their synthetic counterparts.

With any cover, a frame, either wood or aluminum, should be used to help circulate air and prevent pooling. Merely draping an old tarp over a cabin may do more harm than good.

Shrink wrapping is used by some boatyards to keep boats dry over the winter. With shrink wrapping, heat is applied to a sheet of thin plastic so it fits snugly over a frame. At the end of the season, the plastic cover is thrown away or recycled. While shrink wrapping is effective at keeping moisture out, it can trap moisture in and create horrendous mildew problems. Another problem: Cabins and decks painted with two-part polyurethane paints may peel or bubble. Vents should be used along the entire length of the cover. Inserting a series of foam pads between the hull and cover also allows condensation to escape.

Finally, 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 absolutely nothing to protect the boat. Biminis should be stowed below or, better yet, taken home and cleaned over the winter.

## Trailers

Like boats, trailers need some attention in the fall so they'll still be rolling in the spring. Hubs that have been immersed in water during the season must be cleaned thoroughly with kerosene and then butyl alcohol before being repacked with grease. Rusted areas on the frame should be sanded, primed, and repainted. Tires should be inspected, especially the sidewalls, which tend to crack and wear out before the treads. If possible, remove the wheels and add support blocks under the frame rails to prolong the life of the tires, minimize sagging on the springs, and discourage theft.

## Masts, Rigging, and Sails

Ideally, a sailboat's mast should be unstepped and stored in a shed over the winter with plenty of support

along its entire length. Unstepping the mast reduces windage and is especially helpful when the boat is stored on land. Unstepping also eliminates rig vibration, which is one source of cracked fittings, especially lower fittings, as vibration tends to travel downward. Cracked fittings are often the culprit when boats are dismasted. If you unstep the mast, while it's down, be sure to check the fittings for tiny cracks and signs of corrosion that could spell trouble next season.

If the mast must be left up, relax the entire rig by loosening shrouds and stays, which should have some (but not too much) give when pressed with the palm of your hand. By keeping a record of the exact number of turns you've taken on each turnbuckle, you can quickly retune the rig next spring. Tie off the halyards as well; besides driving liveboards crazy, slapping halyards scar the mast.

Sails should be stowed below or taken home. Fold or roll them neatly so they'll last longer. You can also add to sails' longevity by taking them to a sailmaker for a bath. Smaller sails can be cleaned in your own bathtub using one of the sail cleaners available.

Finally, even if your boat is stored ashore, secure the wheel/tiller to keep the rudder from swinging all winter.

## Last-Minute Details

Before heading home, see that the marina manager has an extra companionway key (no need to leave an ignition key) labeled with your boat's name, your address, and your phone number so that you can be contacted in an emergency. Before leaving, double-check all of the locks and give the boat a reassuring pat on the gunwale.

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 guide is intended to help boat owners avoid damage from ice and freezing by winterizing boat and machinery. Manufacturer's instructions and owner's manuals should always be consulted before carrying out any procedure described herein, and followed when in disagreement with this guide. We make no warranties, expressed or implied, by any statements contained herein.

# Winterizing Checklist

Boat's Name: \_\_\_\_\_ Your Name: \_\_\_\_\_

Marina: \_\_\_\_\_ Telephone: \_\_\_\_\_

## List All Equipment Needed to Lay Up Boat

| Product                    | Quantity |
|----------------------------|----------|
| 1. Nontoxic Antifreeze     | _____    |
| 2. Engine Antifreeze       | _____    |
| 3. Crankcase Oil           | _____    |
| 4. Fogging Fluid           | _____    |
| 5. Plugs for Exhaust Ports | _____    |
| 6. Fuel Additives          | _____    |
| 7. Extra Lines             | _____    |
| 8. Chafe Guards            | _____    |
| 9. Storage Cover/Supports  | _____    |
| 10. Tools                  | _____    |

Have Fuel Tanks Been Topped Off?

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## Boats Stored Ashore

Is Boat Level to Prevent Damage from Pooling Water?

Is the Boat Adequately Supported at Bulkheads, Engines, and Keel?

If Boat Is on Jack Stands, Is Plywood Beneath each Base, and Are the Stands Chained Together?

## Equipment Stored Ashore

| Equipment        | Storage Location | Equipment  | Storage Location |
|------------------|------------------|------------|------------------|
| 1. Electronics   | _____            | 7. Bimini  | _____            |
| 2. Dinghy        | _____            | 8. Battery | _____            |
| 3. Outboard/Fuel | _____            | 9. _____   | _____            |
| 4. Sails         | _____            | 10. _____  | _____            |
| 5. Galley Fuel   | _____            | 11. _____  | _____            |
| 6. Ship's Papers | _____            | 12. _____  | _____            |

## Boats Stored in the Water

Indicate Location and Whether Thru-Hull Is Closed and Double-Clamped

Thru-Hull \_\_\_\_\_ LOCATION  
 Closed   
 Double-Clamped

Thru-Hull \_\_\_\_\_ LOCATION  
 Closed   
 Double-Clamped

Thru-Hull \_\_\_\_\_ LOCATION  
 Closed   
 Double-Clamped

Knotmeter Impeller   
 Dummy Plug Inserted

Thru-Hull \_\_\_\_\_ LOCATION  
 Closed   
 Double-Clamped

Depth-Sounder   
 Dummy Plug Inserted

Thru-Hull \_\_\_\_\_ LOCATION  
 Closed   
 Double-Clamped

Thru-Hull \_\_\_\_\_ LOCATION  
 Closed   
 Double-Clamped

Rudder and Stuffing Boxes Tightened