Deep Storage

Yacht owners sometimes opt out of boating not just for a season or two, but for years—with the current economic recession offering examples galore. Such prolonged boat-storage calls for a lengthy list of special measures by the service yard, which we delineate here.

Text and photographs by Steve D'Antonio

Above—*Important differences between seasonal storage, which typically lasts no more than six months, and deep storage that can last for a year or more, determine how a yard crew should prepare a boat that's just been hauled.*

Several months ago a client called with a question, the fourth of its type I'd received in a little over a year: "I'm going to store my 56′ [17m] boat ashore for two or three years, in Spain. What do I need to know?"

These queries got me thinking about the broader topic, and led to the article that follows.

Although hard use under way does take its toll, disuse *is the real nemesis of most machinery aboard any boat. Making the effort to store boats properly pays dividends at recommissioning time. The navies and commercial fleets of the world that store vessels for extended periods refer to it as* mothballing*; others call it* hibernation*, or simply* long-term layup*. I call it* deep storage*. Essentially, it means tucking a boat away for prolonged storage in a manner that preserves rather than diminishes the gear, fittings, equipment, and the boat itself. For purposes of our discussion, the storage period is assumed to be a year or more—longer than your average winterization period.*

As a boatyard operator, here's what you should know about long-term storage for today's complex, systems-intensive boats, and how you can most effectively serve your customers.

Inspection

The intent of preparing a boat for deep storage is to minimize deterioration and decay. So, it makes little sense to store a boat that's riddled with existing or potential problems—particularly problems that could be exacerbated during storage. Inspect the entire boat with an emphasis on finding faults, flaws, and defects that may manifest themselves (or worsen) in storage. An inventory of all equipment and systems will allow you to obtain the documentation and guidelines from various equipment manufacturers regarding deep storage. If

Before deep storage, inspect for subtle flaws such as a worn-out or leaking hatch gasket seal **(top left),** *as well as more obvious defects or damage.* **Top right—***Cracked and worn-out Cutless bearings won't get any better during long storage; but it makes little sense to replace them prior to years-long storage when they won't be used. Make a note to install new ones at recommissioning.*

the boat already has such an inventory, or if the owner is enrolled in a document- and boat-management program such as SeaKits (www.seakits.com), then most of this work has already been done, and that boat's owner has access to virtually all the owner's and instruction manuals through the company's program.

If the boat is to be stored outside, pay special attention to water ingress points: hatches, ports, windows (fixed *and* opening types), as well as doors and other penetrations. Ensure that gaskets, latches, clamps, or other securing mechanisms are functioning properly, especially if they're required for establishing and maintaining a watertight seal. *Lightly* lubricating flexible gaskets with silicone-based grease (avoid petroleum-based products on rubber or rubber-like materials) will help preserve them and the seals they provide. Move on to deck hardware, being very mindful of drains and scuppers. These must function properly to prevent water accumulation and possible leakage in the boat. Examine hoses that are connected to these drains, and replace them if they show any sign of cracking, rot, or exposed wire.

Inspect all engines—propulsion, wing (auxiliary), and generator (hereafter referred to as "engines")—as well as running gear, shafts, thrust and Cutless bearings, propellers, and struts. Any damaged, worn, corroded, or defective equipment should be noted. In some cases, it makes sense to simply flag a problem but wait to initiate repairs until the boat is returned to service. Many components—particularly rubber, flexible, or so-called "soft" ones—will deteriorate in storage. If an item considered noncritical while the boat is in storage (a Cutless bearing, for instance) is in need of replacement, then wait until recommissioning is imminent. Similarly, for components such as an autopilot pump or VHF radio that include a warranty period, replacing these only to have the warranty expire in storage makes little sense.

A complete inspection of the boat's electrical system is vital, if any part of it is to remain active in storage. It's not unusual to maintain bilge pump operation as well as battery chargers, dehumidifiers, and fans for boats that are stored both short and long term. If shore power is to be connected—as it nearly always will be, even if it's just for periodic battery charging—then there must be no doubt about its safety and integrity. Check that the shore-power cable itself is in good condition and that the boat's receptacle and the cable's ends show no evidence of overheating or arcing.

Because of their potential for leakage, short-circuit heat generation, explosion, and fire, the boat's battery banks and individual batteries and associated cables must be included in the electrical inspection. Batteries in poor condition, or ones that are leaking or sulfated should be disposed of and replaced with new batteries *provided*

A burned shore-power cord requires immediate replacement if the boat will be powered at any time during its layup.

the boat will require DC power during deep storage. If it won't, then defective batteries should still be removed, but replacement should await recommissioning. Note that a *charged* battery will not freeze, but a *discharged* battery might. Once a battery has frozen, it's often permanently damaged. Do not attempt to recharge a battery that's suspected of having been frozen—until it's been tested with a digital conductance-type analyzer.

Inspect all the boat's remaining "systems." This lengthy list includes: raw- and potable-water plumbing and components; sanitation plumbing and components; steering; fixed fire-fighting gear; thruster(s); stabilizer(s); windlass; reverse-osmosis watermaker; heating, ventilation, and air-conditioning; bilge pumps; fuel fill, vent, and distribution plumbing. Identify all defects and potential problems, and act on the ones that are critical to the well-being of the boat while it's in deep storage. Prepare a formal inspection report, which documents a baseline condition for the boat *before* it enters storage—and give it to the boat owner.

Also, create a deep-storage log, wherein a detailed description of each storage procedure, as well as the steps for its reversal, are clearly recorded—with notes and diagrams, if necessary. Assume that crew members who help prepare a boat for deep storage may *not* be around or available when it's recommissioned.

Label or tag gear and equipment that should not be used until the boat is recommissioned, including any switch, ignition, or control. Whenever possible, equipment and components disassembled during deep-storage preparation should be reassembled. Putting together dozens of potable water or fuel-system plumbing fixtures three or four years after they've been disassembled is time consuming, costly, and difficult. Disassembled components also run a greater risk of being moved, lost, contaminated, or damaged.

Deep-Storage Conditions and Questions

To establish the best plan, identify under what conditions the boat will be stored. Appropriate storage depends on the *type of boat* (wooden boats clearly have special storage needs), along with *where* and *how* it will be stored. Will it be inside, and if so, climate controlled—or not? Outside but covered? Inside a partial shed? Or, as in most cases, simply exposed to the elements? I've supervised the deep storage and long-term care of many different types of boats under varying conditions, and it's clear: inside storage is preferred, climate controlled where that luxury is available, with a custom-made cover, shrink-wrap, tarps, and uncovered options following in that order of preference.

Boats stored under cover, or inside and in climate-controlled conditions, can be more easily and more frequently ventilated without concern for water ingress from deck, port, and hatch leaks. Wooden boats, of course, have specific needs all their own.

The boat's ability to "endure" long-term storage has at least as much to do with the quality of its construction as with how well it's stored. Well-built boats graced with high-quality, properly installed systems tend to fare better under storage conditions than poorly built boats or boats whose initial material and gear selections were apparently not made based on their durability or longevity under a *normal* service regimen. If the boat is not well built and/or its systems are poorly installed or of lower quality, then its deep-stored conditions *often* have a greater impact on its preservation, along with the amount of recommissioning work required.

It's a perverse fact of boat life that poor-quality boats need *better* storage conditions than do high-quality boats in order to "survive" deep storage.

How long will the boat be stored? This question determines possible procedures and options: in particular, the state of tankage. Generally, if storage is two years or less, then diesel fuel can be stored aboard. I've successfully stored diesel-powered boats with fuel aboard for as long as three years. Fresh fuel was placed in the tanks, stabilized with the maximum allowable concentration of stabilizer (some stabilizer manufacturers allow for increased dosage for greater storage life), and polished monthly. The tanks must be clean and free of water when storage begins, or a serious problem can quickly develop.

Potable-, gray-, and black-water tank storage is also affected by duration. If the boat will be winterized, then this question becomes moot: *all tanks must be empty.* For boats stored in warmer climates, emptying the potable water tank may be optional. Some argue that water tanks should be left full and dosed with chlorine, but I prefer to empty all water tanks—potable, gray, and black—for deep storage.

Will the boat be attended or checked regularly? Preferably, bilges will be checked for water accumulation, battery state-of-charge monitored and augmented, and fuel polished (if it remains aboard). A leaking cover, overt signs of deterioration, and insect or rodent infestation can be identified and corrected.

Geography is significant in how successfully a boat survives deep storage. Regions with especially high humidity and heat will naturally place a greater strain on the deep-stored boat. Extreme shifts of temperature in short periods

Left—*All batteries (even the sealed type) that are stored aboard will require maintenance.* **Above—***Battery banks and monitoring systems on deep-stored boats should be periodically inspected by a knowledgeable electrician. He or she should visually check connections, case condition, and voltage, and monitor temperatures while charging.*

of time create condensation inside the hull as well as in equipment such as tanks, electrical enclosures, engine blocks, generators, and electric motors. In either of these climates, consider employing either stand-alone or fixed integrated dehumidifiers. Not all dehumidifiers can be left in an automatic mode when exposed to freezing or near-freezing temperatures, so make provisions for continuous, unattended condensate drainage. Permanently installed systems such as Dryzone (www.dryzone.ca) are designed to operate under virtually all storage conditions.

Even if moisture and condensation are not issues, you must consider general boat ventilation. Solar vents are excellent at circulating air through a boat, and reducing odors and mold. If the boat is covered, though, they will clearly not operate. Installing and wiring (with proper over-current protection) low-volume fans in temporary hatch or port fixtures are alternatives. No matter how the fans are wired, they should be balanced so that air is being drawn in as well as exhausted.

Ventilation can be a double-edged sword. In regions subject to rapid temperature extremes, ventilating the boat might be a liability. For instance, after several weeks or months of freezing temperatures, if a warm, moist air-mass arrives, then ventilation fans circulating this moisture-laden air through a boat will have a condenser effect. Water will accumulate on cold objects—particularly metal, but also fiberglass and wood—leading to rust, corrosion, and finish damage. An alternative to "always on" ventilation is supervised or automated periodic ventilation, which runs only when the temperature inside the boat is about the same as the outside temperature.

How will the bilge drain? Initially, if a boat is not prone to leakage, this may not develop into a serious problem. But if a hose, deck drain, or other weather-deck fitting fails, where will water accumulate, and how will it find its way overboard? Bilge pumps are the obvious answer; however, they won't work if the batteries are winterized or the bilgewater freezes. Garboard plugs are a common solution to ensure that boats don't "sink" while stored ashore over a period of years.

Will the boat have access to electricity while in storage? If so, then battery chargers, dehumidifiers, remote security, and temperature, smoke, and humidity monitoring systems can operate. Otherwise, or if electricity is not reliable, then make provisions for better maintenance.

As mentioned earlier, depleted batteries can suffer irreparable harm and become vulnerable to freeze damage. This happens frequently in stored boats when batteries go dead and remain flat for some time. When the cells are recharged, all seems well again. But once the boat begins cruising, the owner discovers the batteries have only a fraction of their former capacity—because they've sulfated. For a large bank, such neglect is not only costly, it can create distrust of the yard.

Depending on conditions and bank size, maintenance charging may be possible with an appropriately sized solar panel, or through periodic connection to yard power. If batteries are to be charged while the boat is in storage, then they must be periodically checked: to ensure that charger and/or float voltages are correct, and electrolyte levels in flooded batteries are up; and to confirm the charger is functioning properly.

I've seen battery banks that have suffered over- or under-charging because the charger: malfunctioned, or its protocols were inadvertently changed; or its temperature compensation probe failed, was inadvertently removed, or got damaged.

Because AGM and gel batteries have very low self-discharge rates, you can charge this type of battery infrequently without causing damage. I've routinely seen AGM batteries endure a year of storage with virtually no discharge. Given enough time, though, the smallest parasitic load—a carbon-monoxide or liquid-propane gas detector, pilot light, or backlight—will deplete even a large battery bank.

If you opt for the "infrequent charge" protocol, then ensure it by disconnecting batteries so that *no* loads are present—that is, make certain there are no cycling loads, and test the amperage draw on the bank. You can also completely disconnect the bank from the boat's electrical system, but remember, this means the bank will be unavailable to operate bilge pumps, lights, or other equipment in the event of an unforeseen leak, or an emergency.

Clearly, if a boat is to be stored in a region where winterization is common practice, then *deep* storage will add a few specific and important steps.

Engines

Engines should be run on a freshwater flush for at least 30 minutes prior to changing oil and charging with nontoxic antifreeze. Even if the boat will not be subject to freezing temperatures, flushing the raw-water portion of the cooling system with winterizing antifreeze (proprietary nontoxic, corrosion-inhibiting, propylene glycol) will minimize corrosion. Before deep storage, replace all engine fluids: crankcase oil, transmission fluid, and the coolant if it hasn't been replaced in more than a year. Upon recommissioning, analyze the coolant to determine the status of its corrosion inhibitors.

Crankcase oil should be replaced before the engine is run for the last time; i.e., before running nontoxic antifreeze through its raw-water cooling system. This circulates clean oil throughout the engine. Once fluids have been changed and the engine has run for the final time, seal the air intakes and crankcase ventilation ports and exhaust outlets with weatherproof plastic adhesive tape. Tag the boat's helm(s) and engines with a warning against an attempted start until air seals have been removed.

Transmission manufacturers often provide specific procedures for long-term gear storage (the demarcation is usually one year or longer). A typical long-term storage protocol calls for intentionally over-filling the transmission with the standard gear lubricant, essentially submersing all parts. After filling, rotate the output shaft several times, and then drain the oil to the normal "FULL" mark on the dipstick. Next, seal the breather, dipstick tube, and any other openings with waterproof tape (high-quality electrical tape works well—provided the surface is thoroughly cleaned of all oil residue). Grease exposed moving parts and linkages. Every three or four months the output shaft should be rotated several times. Tag the transmission indicating that it's been placed in deep storage, and include a space where subsequent rotations can be logged.

Top—*Even if a stored vessel will not be subjected to freezing, all water systems will benefit from being treated with an anti-corrosive nontoxic antifreeze solution.* **Bottom—***Fluids such as crankcase and transmission oil should be replaced, and the equipment operated just prior to deep storage.*

Raw-Water Components

Like the engines, all appliances with raw-water plumbing—including air-conditioning and refrigeration condensers, stabilizer coolers, and wash-down systems—should receive a 30-minute freshwater flush prior to deep storage or winterization. And, like engines, even if not subject to freezing temperatures, most raw-water "breathing" gear will benefit from being charged with nontoxic antifreeze. Reverse-osmosis watermakers typically require flushing as well, and charging with a proprietary storage chemical. Follow the deep-storage instructions provided by the manufacturer to avoid damage to the membrane and pumps.

Seacocks should be cleaned of any marine growth and lubricated with a heavy, marine-rated waterproof grease. I prefer Lubriplate's Marine Wheel Bearing Grease (www.lubriplate.com). In boats not stored under cover, seacocks that drain decks, cockpits, and other weather areas *must be left open.* Close all other seacocks for deep storage.

All seacocks should be lubricated with appropriate grease prior to storage. Leave seacocks for deck drains open; and close all others to keep out insects and rodents.

Fuel Systems

Diesel fuel systems and fuel tanks require special attention prior to deep storage. There are essentially two choices:

- In the first, tanks are filled to no more than 90% capacity with fresh, clean, high-quality diesel. If the tanks are contaminated with water or biological colonies and to a lesser extent asphaltine, then storage will only exacerbate the problem, because the presence of water encourages biological growth, especially in warm climates. It's critical that tanks be inspected *and cleaned if necessary* prior to deep storage. As the tanks are filled, add the maximum allowable stabilizer. Biocide additives are unnecessary—provided the tanks are free of water. To ensure that stabilized fuel reaches fuel filters and injection systems, fuel stabilization should come before any other engine-related storage procedures. Do *not* cover or close fuel vents; these must allow for air expansion and contraction as the temperature changes.

If a boat is equipped with a polishing system, then stored fuel should be polished monthly. If it's not, consider installing a polishing system prior to deep storage, or having the fuel polished by a portable ground unit at least quarterly. (Note: Depending on

Any fuel stored on board must be fresh, clean, and stabilized. Add stabilizer, then operate all gear long enough that the stabilized fuel cycles from the tanks—to ensure it runs through all filters and equipment.

the duration of storage, the labor to set up a portable unit and access the tanks on multiple occasions might cost more than installing a fixed polishing system. For a detailed discussion of fuel polishing, see my article in *Professional BoatBuilder* No. 112.)

• The second option is only for tanks equipped with inspection ports for access to every baffled chamber. Empty the tanks completely, open them, clean them, and periodically inspect them for condensation or water. *Do not leave the tanks open during storage.* Fuel in primary and secondary filters should be removed, and bodies of the primaries cleaned. Stabilize the fuel remaining in the engines and the rest of the system by adding stabilizer and running all equipment as previously described.

How much moisture enters a tank via a tank vent *during storage?* In my experience, the answer depends on (to cite a few factors) the size of the tank, the duration of storage, and the number and range of heating and cooling cycles. Having inspected many empty or partially full fuel tanks in stored boats during every season of the year, I've never seen condensation, and the only evidence I've seen of moisture vapor has been light rust on the surfaces of steel tanks. Still, if only a small amount of moisture enters the tank via the vent, it's likely some mold or bacteria spores will as well. The latter will become the seed crop for potentially serious biological growth in even the smallest amount of water that accumulates at the bottom of a fuel tank.

Although it's tempting to seal off fuel and other tank vents, even on empty tanks, it's not recommended. With dramatic swings in air temperature it's possible for a tank to be damaged by pressure or vacuum. One solution to water vapor and spore intrusion is a vent desiccant system designed for boats under way as well as those in storage.

Soft Parts, So Called

Raw-water pump impellers—particularly the blades compressed by the pump's cam—do not endure

Soft parts, particularly impellers and belts, often suffer the most in deep storage. Because they are relatively inexpensive, it's best to make a note to replace these components when the boat is commissioned at the end of a lengthy layup period.

deep storage well. Remove them after the engines have been flushed and "stabilized" with nontoxic antifreeze. Belts will also suffer during deep storage. At the very least, belt tension should be eased, and if the boat remains in storage for more than two years, it's worth replacing belts at recommissioning.

Because they are typically devoid of paint, the sheaves over which belts turn are prone to severe rust. If the engine is run after this rust has formed, it may damage new belts. Either remove the belts, dress the sheaves with 200-grit sandpaper, and paint them (the paint simply prevents corrosion in storage, it quickly wears off when the engine is started); or simply spray the sheaves with corrosion inhibitor. In the latter case, the inhibitor must be removed when the engine is recommissioned, and the belts must be renewed. Finally, be sure to tag the engine and the helm or generator start stations, indicating that the impellers and belts have been removed or sheaves coated with corrosion inhibitor.

Right—*Quality and construction of hoses and other soft parts vary among manufacturers and applications. This cracked hose obviously needs to be replaced at recommissioning.* **Far right, top—***Carefully inspect soft components before a boat enters, and when it emerges from, deep storage. Some components may survive extended storage well, but others that seemed adequate at the start of storage will need to be replaced.* **Far right, bottom—***Manufacturers of proprietary components such as stuffing boxes may specify a standard calendar-based replacement interval, regardless of condition.*

The clock is always ticking for rubber and flexible components such as belts, hoses, impellers, and seals, even the spare ones. Consider replacing as many of these components as possible at recommissioning. Also, *before* deep storage avoid amassing large inventories of spare soft parts.

Heavy-duty, high-quality raw-water hoses, particularly those that carry the SAE J2006R "Marine Wet Exhaust Hose" rating, supplied by recognized and respected manufacturers, often serve admirably for 10 or more years. If, however, an eight-year-old boat is placed into deep storage for two or more years, hoses that were considered serviceable when entering layup may no longer be so upon emerging from deep storage. Low-quality hoses, on the other hand, often begin deteriorating before the boat has been commissioned the *first* time. Those hoses will not survive deep storage, so carefully inspect them before storage. Because hoses on engines are typically not as durable and long lasting as those designed for raw-water use, they should be replaced every four to six years or at the first sign of deterioration. It makes sense to replace such components when the boat is brought out of deep storage, particularly after the four-to-six-year period. Be sure to include such recommendations and notations in the deep-storage log for the owner's review.

And, remember to inspect hose in stuffing boxes. The rule of thumb I've developed over the years is replacement every five years, or at the first sign of cracking, delamination, or other distress. Some dripless-stuffing-box manufacturers not only mandate replacement at the five-year mark, *they also prohibit the use of ozone generators*, which are known to accelerate the deterioration of soft parts such as rubber hose.

Hydraulic Fin Stabilizers

For boats equipped with hydraulic stabilizers (and other associated hydraulic gear such as thrusters, windlasses, and cranes), the fins should be pinned for storage. While replacement of the hydraulic fluid is not specifically required for deep

Prior to deep storage, fluids for hydraulic components such as stabilizers and thrusters should be examined by a fluid-analysis lab. If they're found to be contaminated with water or other foreign material, replace them; and find and correct the source of contamination. Fluids should be analyzed again when the boat goes back into service.

storage, consider it. Prior to storage, operate the system and draw and analyze an oil sample to determine whether the oil should be replaced. When the boat is recommissioned, if the stabilizer/hydraulic system utilizes a stand-alone raw-water pump, check it for free rotation. After the system has operated for at least 30 minutes, take an oil sample to determine the oil condition and possible water contamination.

Corrosion

Metal components such as engine blocks, equipment enclosures, strainers, pumps, electric motors, untinned bus bars, and electrical terminals should be inspected for rust and corrosion. If there's deterioration, it's best to clean and repaint these items before deep storage. Then spray all items with a corrosion inhibiter. There are dozens of anti-corrosion products on the market. Each boatyard has its preferred product, and the last one I managed was no exception: we favored CRC 6-56 (www.crcindustries.com), a light petroleum-based liquid that can be sprayed from an aerosol can or from a refillable pump spray bottle. Because they're petroleum based, inhibitors should not be used near flame or on live electrical contacts. These comparatively light oils can be washed off by a stream or spray of water, or rain. For more permanent corrosion control on battery terminals, steering linkages, electrical connections, mild steel fasteners, and in areas that may be subject to bilge water or the elements, my preference is for another CRC formulation called Heavy Duty Corrosion Inhibitor. This coating comes only in an aerosol spray, and after being applied it semi-dries to a slightly sticky wax-like consistency. It's virtually impossible to inadvertently remove or wipe off, although it's easily cleaned off with a mild solvent such as mineral oil.

Remind whoever does the application at your yard to wear personal protective gear when spraying an aerosol product in enclosed spaces.

Potable Water

Deep storage of potable-water systems requires a two-pronged approach. First, you must prevent damage that results from freezing, not just disuse. Second, the cleanliness and integrity of the system must be maintained. Winterization and sterilization details of, and practices for, these systems can be found in the American Boat & Yacht Council's *Standards and Technical Information Reports for Small Craft*, section H-23 "Installation of Potable Water Systems."

The ABYC punchlist includes treating stored water with chlorine; and then draining tanks, water heaters, and accumulators. Filter elements should be removed. If compressed air is available, blow out water lines with less than 40 psi (2.8 kg/cm^2). If the boat will not be subject to freezing temperatures, then the system can be reassembled. It's important that no fittings, valves, or connections be left open and vulnerable to contaminates such as dust, debris, mold, or rodent droppings. If the boat will be exposed to freezing temperatures, then nontoxic antifreeze should be run through all plumbing—with the

If a stored boat will be exposed to the elements, inspect it regularly to clear clogged deck and portlight drains. A few leaves or pollen washed into the wrong place can cause untold amounts of water damage to an otherwise watertight vessel.

exception of storage tanks and water heaters. If tanks and water heaters are drained, they'll suffer no ill effects when exposed to freezing temperatures even if a small amount of water remains—provided that water has room to expand, as ice. Any water that remains in associated valves or plumbing, though, has the potential to cause damage if allowed to freeze.

The water tank's vent, as previously mentioned, should not be permanently capped. It can be temporarily plumbed inboard to keep out dust, mold, and bacteria spores. To prevent entry of dust, dirt, or insects, always cover the inboard end of the vent hose with a clean rag that's been washed in clean fresh water. Affix a tag to the potable-water pump circuit-breaker indicating that the system has been decommissioned, and that the vent is *not* plumbed for standard use.

Cabin and Deck

To aid air circulation and ventilation, and to discourage mildew, clear the cabin and accommodation spaces of as much gear, clothing, food, and personal effects as possible. Prop open doors, hatches, cabinets, refrigerators, and freezers. If the boat is to remain outdoors, cover the insides of windows and ports to reduce solar heating, and the fading of fabrics and joinerwork.

Often overlooked are the drains below sliding windows, known for their propensity to clog and cause water damage below—even under ordinary use.

For deck gear and equipment, treat all moving components— such as locks, hinges, latches, and gaskets—with silicone grease. Clean debris from hatch and port gutters and drains. Test drains with water rather than by a simple visual inspection. Service the davits, cranes, and windlasses according to their manufacturer's requirements for deep storage. This may call for, among other things, lubricating and replacing gearbox fluid, and applying corrosion inhibitor to electrical contacts and connections.

Remove all gasoline, gasoline containers, and LP gas from the boat. Outboard motors should receive their own deep-storage treatment and be placed under cover where possible.

Safety equipment such as life rafts, EPIRBs, flares, CO detectors, and fire extinguishers should be catalogued, and expiration or recommended service dates recorded in the storage log. Because parts may need to be ordered and subcontractors relied upon, this list can be acted on *before* the boat is to be recommissioned.

Finally, even if the boat is to be stored under cover, exterior gelcoated hull and cabin surfaces as well as deck hardware and equipment should be cleaned and heavily waxed to minimize oxidation. For *painted* areas, follow guidelines established by paint manufacturers. Note that some two-part products such as Awlgrip specifically recommend against waxing.

The success of deep storage is directly related to the care with which you prepare a boat for a hiatus from service. With proper planning, assessment, and attention to detail, moving a boat from active use to deep storage and back again can appear to be a seamless transition.

I urge you to keep in mind that the effort described here is unequivocal: well worth the yard's time and the owner's investment. PBB

About the Author: *For many years a full-service yard manager and now a contributing editor of this magazine, Steve works with boat builders and owners and others in the industry as "Steve D'Antonio Marine Consulting Inc." McGraw-Hill is about to publish his book on marine systems.*