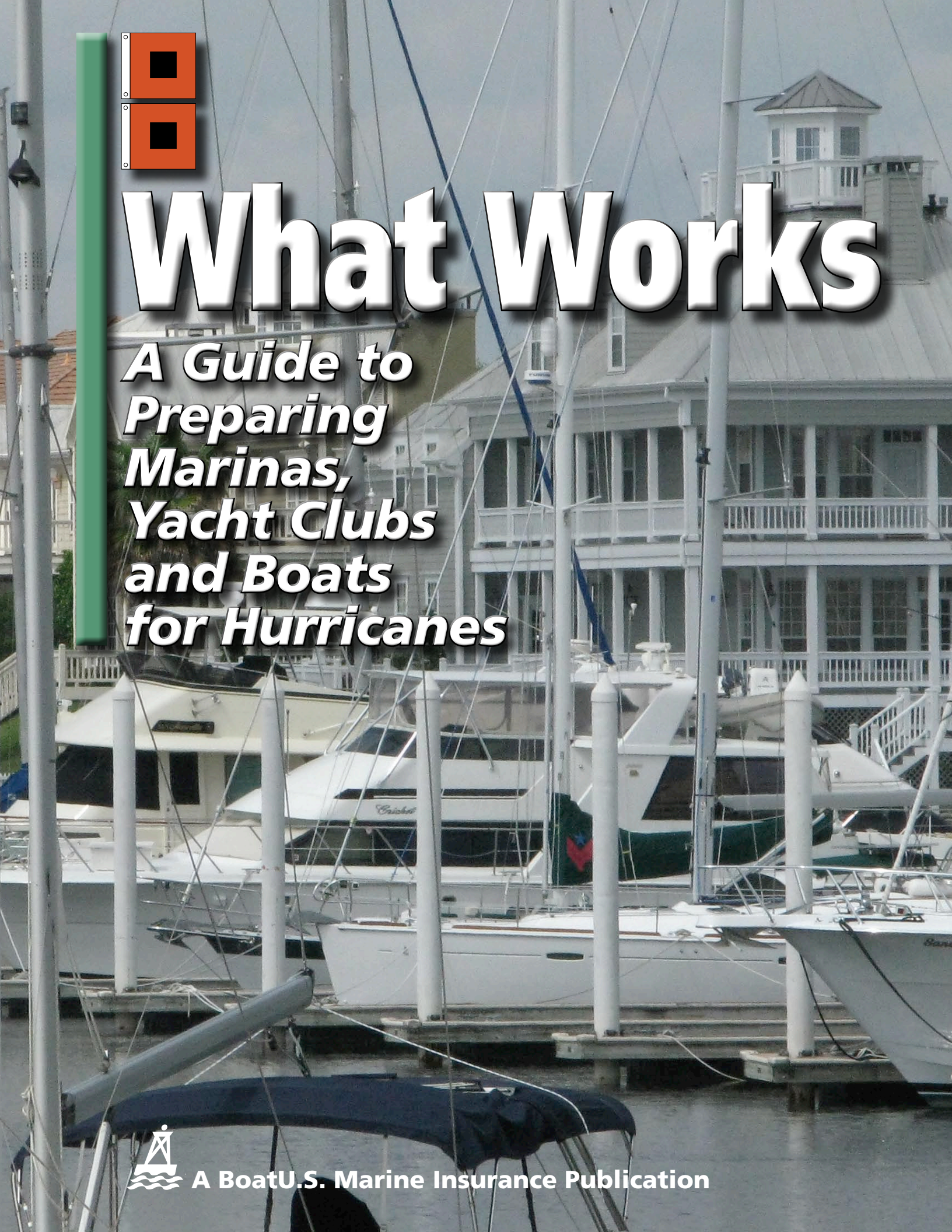

What Works

A Guide to Preparing Marinas, Yacht Clubs and Boats for Hurricanes

A BoatU.S. Marine Insurance Publication

The single most important determinant in how well a facility will fare in a storm is its location. A marina that is only protected from open water by a two-foot-high seawall, like the one shown on the left, will need a far different plan than one that is surrounded by land, like the one on the right. The photos of the two marinas—Watergate Yachting Center and the Waterford Harbor Marina—were taken several days after Hurricane Ike had passed over the area.

Preface

Immediately after Hurricane Ike had battered the Texas Gulf Coast, one of the more unusual sights in the stricken area was the Waterford Harbor Marina in Kemah. While all of the other marinas nearby were littered with broken docks and damaged boats, Waterford looked as if had been protected by a magical unseen bubble. Not a single boat at Waterford had been sunk or, with the exception of a few torn biminis, even damaged. It was, as one observer said, "uncanny."

There was no bubble or even luck involved in the marina's good fortune. Waterford is in an almost ideal location, sheltered from wind and waves on four sides by land that rises well above sea level. As for the dreaded surge, the marina has floating docks, which are held by in place by sturdy pilings that rise 16 feet above normal high tide.

Very few marinas are as well protected or as sturdily constructed as Waterford and, as you might expect, most suffered much more damage. The same could be said for marinas in the areas that were battered by monster hurricanes like Isabel, Wilma, Charlie, Jeanne, Ivan, Frances and Katrina. *Most* of them were badly damaged. But some marinas, even those in locations that are far from ideal, have discovered ways to greatly reduce the impact of passing hurricanes. They may not have fared as well as Waterford, but it was close.

Sebastian River Marina in Florida, for example, is only protected from a three-mile fetch of open water by a two-foot high seawall. The marina's lack of protection, not surprisingly, resulted in extensive damage when Hurricane Frances passed through the area in 2006. Three weeks later, when Hurricane Jeanne came ashore at Sebastian River, there was very little damage, even though Jeanne proved to be a far more powerful storm than Frances.

Doug Hillman, who owns Sebastian River Marina, said he had learned a lot from Frances and was determined that his marina would fare better in the next storm. Unlike Frances, where a majority of the boats had been in their slips, Hillman and his crew worked from dawn to dusk prior to Jeanne; 56 boats with an average size of 40 feet had been hauled out and strapped down and only four were left in the water.

The strategy worked even better than he had anticipated. Although the wind had been on the beam for part of the storm, and even though there had been three feet of seawater in the parking lot, the straps held and the boats remained upright. The marina facility itself, especially the fixed wood docks, had been damaged but, considering the fury of Jeanne and the devastation to other nearby facilities, Sebastian River Marina fared well.

There are many other marinas with similar stories. If nothing else, the massive hurricanes that have battered the Atlantic and Gulf coasts the past few years have been a good opportunity to study what works when boats and marinas are prepared for hurricanes. In 2007 and 2008, BoatU.S. hosted a Marina Hurricane Preparation Symposium in Orlando, Florida with the lofty goal of reducing the sort of devastation from monster storms that threatens to damage our entire industry. A majority of the speakers were marina owners whose facilities had been through hurricanes. Some had fared better than others but all had gained valuable firsthand knowledge of what can be done to reduce damage.

Much of that knowledge has been summarized on the following pages. While location may be an important predictor in how well a marina will survive in a hurricane, as Doug Hillman demonstrated, it is certainly not the sole predictor.

What Works

Strategies: *Floating Docks with Tall Pilings*

At most marinas, it's the surge and not the wind that does most of the damage. That's especially true of marinas with fixed wood docks, which in most areas is the majority of marinas; wood is readily available, relatively inexpensive, and easy to install. In a storm, however, wood pilings and fixed docks have proven to be susceptible to both vertical and lateral forces—they're pushed over and pulled out. Even if there are no boats, fixed wood docks are often badly damaged. The solution at more and more marinas faced with rebuilding has been to install floating docks, which allow the boats to rise and fall with the surge, *if* the docks have pilings that are tall enough to accommodate the surge.

The Floating Docks at Columbia Island Marina

The 382 boats at Columbia Island Marina in South Arlington, Virginia are all moored at floating docks. During Hurricane Isabel, the surge rose an astounding 14 feet, which in years past would have resulted in widespread damage when docks and boats floated free. But when the docks at Columbia Island were rebuilt several years ago, pilings were driven into the bottom that tower 18 feet above normal water levels. As a result, Isabel's powerful surge remained a comfortable distance—four feet—from the tops of the pilings. The docks stayed put and none of the boats were damaged.

While forces on pilings at a fixed dock are both lateral and vertical, the forces on a fixed dock are entirely lateral, meaning the forces of wind, waves, and especially the boats will be trying to push the pilings over. Wood pilings aren't up to the stresses that are encountered on a floating dock, which are often extreme when the dock rises near the top during a surge. Instead of wood, pilings at floating docks today are either concrete, spun concrete, steel or more recently, fiberglass. Concrete or steel pilings last 30 to 50 years. Tests done on fiberglass pilings have shown they could last up to 300 years. Only the steel pilings require some maintenance—periodically resurfacing the steel with coal tar epoxy where the surfaces have been worn by the vertical movements of the floating docks.

While floating docks with tall pilings have proven to be resistant to even major hurricanes, floating docks with shorter pilings, paradoxically, have proven to be extremely vulnerable. In almost every major hurricane, there has been at least one marina that was destroyed when floating docks were lifted above the pilings and carried away with boats still attached. The photo shown here was taken at Bayland Park Marina in Texas shortly after Hurricane Ike.

While floating docks with tall pilings have proven to be one of the best places to secure boats in a hurricane, one of the most vulnerable, paradoxically, is floating docks with *shorter* pilings. The shorter the pilings, the less likely they will accommodate the surge; it's not uncommon for every dock—and all of the boats—at a marina to be lifted above the pilings and carried away. That's what happened at Masonboro Marina in North Carolina as well as Bayland Park Marina in Texas, to cite but two examples, where dozens of docks and boats wound up in battered clumps ashore.

One thing that has worked in marina owners' favor is the National Weather Service's statistical information on past storms, which is used to arrive at the engineering specs for any given marine facility. The likely surge heights and wind speeds can now be predicted using NWS data going back more than a century. Engineers,

who have routinely designed buildings to withstand certain wind speeds, will put their engineering stamp on docks as well as buildings. For marina owners looking to get a discount on insurance, that's a significant benefit.

After Hurricane Ivan destroyed in September 2004, Jon Naybor was faced with a mountain of tough decisions, none more daunting than whether to spend a considerable sum of money to make his Pensacola, Florida facility much more "hurricane resistant." Ivan had wiped out his business; the wood docks and pilings were destroyed and most of the boats (43 out of 50) were sunk. Naybor, the former president of a publicly held engineering company, carefully studied the available options and decided to have his marina rebuilt with floating docks and spun-concrete pilings. Naybor says the new docks cost roughly three times as much as the standard fixed, wood docks but he considers it an investment: "In this new age of severe weather and unaffordable insurance premiums, the industry's best defense is to engineer, design, and build facilities that are better able to survive extreme storms."

The rebuilt Palm Harbor Marina looks radically different than it did before Ivan. To accommodate the surge in future storms, the pilings that secure the floating docks tower 18 feet above the water and are made of spun concrete, which is 20 percent stronger than conventional concrete pilings. There are docking systems that are even stronger (and more expensive), but after consulting an engineering company, Naybor decided on his current system based on load calculations, cost and the potential storm conditions at Palm Harbor.

The photo on the top shows Mahogany Marina after it had been devastated by Hurricane Ivan in 2004. The docks and 43 of the 50 boats at the marina were completely destroyed. The rebuilt facility, renamed Palm Harbor, shown in the bottom photo, was tested the following year when the eye of Hurricane Dennis, a Category 3 storm, passed within 20 miles. There was no damage to the docks or boats.

Why I Started a Hurricane Club

By Rocky DeSimone

After the significant destruction to my facility from the 2004 Hurricane season (Frances and Ivan), it became clear that we needed to make some changes. In retrospect, one of the best was to launch a "Hurricane Club," which allows slip holders to have their boats hauled by prior arrangement whenever a hurricane warning is posted. The Club has made it easier to write a more realistic hurricane plan and will help to avoid the chaotic last-minute telephone calls from panicked boat owners that inevitably precede the arrival of a hurricane. The Hurricane Club also has proven to be a worthwhile revenue source.

How does this club idea work? I know of several marinas that have hurricane clubs and each is different. In our case, we made a realistic assessment of how quickly we could haul and block boats, which was then used to arrive at a "cap" on the number of plan participants. Payment to join the club must be made *in advance,* before the start of the hurricane season. When vessels are hauled prior to a hurricane, the costs will often be reimbursed, at least in part, by many insurance companies.

Most of our slip holders live nearby and when a hurricane threatens, we require them to strip their boats (dodger, covers, outboard motors, dinghies, etc.) before they're hauled. We will also do the work, but for an additional fee.

Other details you'll need to consider: when to put the plan into action; how much to charge; whether the deposit rolls over to the next year if it isn't used; and how you're going to decide who will be included in the club if you receive more applications than you can realistically accommodate (we did). Note that at some marinas, club membership is mandatory for all slip holders.

Whatever plan you make, be sure your attorney examines all of the club's legal aspects. He or she should address any legal ramifications that might occur if, for whatever reason, you are unable to haul out a vessel.

In 2007 and 2008, the Hurricane Club was activated and was a very successful operation with a smooth transition into the assigned plan. There were lessons learned and incorporated and refined for future operations.

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J. Rocky DeSimone, a retired Naval officer, was employed as general manager of PSMC, a large marina in Northwest Florida, for 11 years.

Strategies: *Boats at Fixed Docks*

When Hurricane Ike had passed through the Houston area, one of the harder hit facilities was the Houston Yacht Club, which is only protected from the breaking waves on Galveston Bay by a two-foot-high seawall. Before the storm, a few of the boats were moved to more secure facilities and survived. Of those that remained in the harbor, Ross Tuckwiller, HYC's genaral manager, noted that the ones that did best had been stripped of sails and canvas and were prepared by their owners with more lines and longer lines.

Using more and longer lines often pays off. This was one of the boats at the Houston Yacht Club that survived Ike.

If boats must be left at fixed docks, adding more lines and longer lines to many different pilings is essential. When everyday (shorter) nylon lines are used, they are more likely to fail because they can't stretch enough to accommodate a significant surge. In some instances, lines have held and pilings were pumped out of the bottom by the rising water and up/down motion of the boat. When longer lines are used, boats are better able to rise and fall with the surge, which takes much of the strain off lines and pilings. There are also devices (see below) that can be used on conventional pilings to help boats rise and fall with the surge.

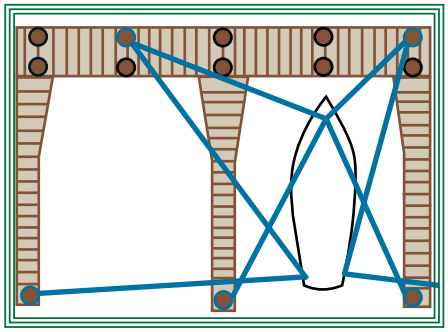
Damage to boats and docks can also be reduced by moving boats to larger slips. The longer and wider the slip, the further boats will be from pilings. After Sonny Middleton at Dog River Marina moves the facility's larger boats to a hurricane hole, he can then move the remaining (smaller) boats into the slips that were vacated by the larger boats. It's a plan that has worked well.

While prepping boats usually gets good results, it's often difficult to find people to do the prepping. Some owners will show up but many more will be too busy boarding up their homes. The latter is also a concern with marina employees. Two solutions: One is the Captains Locator Service (www.boatus.com/procaptains), which is a list of professionals who can move boats to hurricane holes or prep boats in their slips. The other solution is from Phil Hale, at Martha's Vineyard Shipyard in Massachusetts, who keeps a list of former employees and local boat owners who are willing to work at the yard on short notice. The cost of prepping boats can be passed along to boat owners, and in many instances, partially reimbursed by insurance companies.

A Rising Tide Lifts Some Boats More Readily Than Others

TideMinders

TideSlide



Longer Lines

Strategies: *Securing Boats Ashore*

People who have watched boats in hurricanes that were stored ashore on jack stands say the boats are constantly being buffeted back and forth, ever so slightly. Over time, the movement can work the jack stands that support the hulls out of position, which results in the boat falling over. In major hurricanes, at least a few of the boats stored ashore at every marina have been blown over. And at some marinas, almost all of the boats stored ashore have been toppled over. While boats ashore tend to suffer less damage in hurricanes than boats stored in the water, the extent of the damage ashore remains significant—broken bulkheads, smashed hulls and, on sailboats, broken masts.

The boat above was blown over, despite being secured to earth anchors, by a combination of windage (masts) and too much stretch in the nylon lines (note the slack in the lines to the boat on the left). Jack stands on the leeward side buckled.

In the past few hurricanes, a technique emerged that promises to minimize damage from boats being blown over: Strap them to the ground. Doug Hillman at Sebastian River Marina calls securing boats to the ground in high winds "common sense." Scott Watson at Indiantown Marina says they always secure boats to the ground whenever they're stored ashore. He estimates that in Wilma, Frances and Jeanne, the technique reduced the number of boats that were blown over by two-thirds. The same is true of boats at Puerto del Rey Marina in Puerto Rico, Swan Point Marina in North Carolina and at the Hinckley Company Marina in Florida. As Watson said, "Securing boats to the ground damn sure helps."

The straps accomplish several things. First, they hold the boat more securely against the jack stands so that there is less movement and less chance of the jack stands working loose. Second, if a jack stand were to topple over, straps will sometimes keep the boat upright or, depending on how the boat is secured, at least soften the impact by providing some restraint as the hull falls over.

Indiantown Marina, St. Lucie Waterway, Florida

The idea of strapping down boats in hurricanes seems to have arisen spontaneously at many different marinas, from Florida to North Carolina to Puerto Rico. While the idea is the same, no two techniques are exactly alike. Different marinas use different anchors and different straps, with some of the techniques being more sophisticated than others. All have their advantages and disadvantages.

Helical Anchors Screwed into the Ground— *Swan Point Marina, Sneads Ferry, North Carolina and Indiantown Marina on the St. Lucie Waterway, Florida*

Betty Myrick said her husband got the idea from mobile homes: anchors that screw into the ground to provide stability in high winds. He bought the anchors at a local hardware store, screwed them in by hand, and then used straps from a flatbed trailer to secure the boat. Other people at the marina, which is 80 percent powerboats, liked the idea and soon it was being widely copied. Before Hurricane Floyd, Myrick said a man came by with a gas-powered drill that put the anchors in quicker and with far less effort. It was crude

but it worked. All of the boats with straps and anchors held; others that weren't supported were blown over.

Like Swan Point, Indiantown Marina uses screw anchors that are drilled into the ground. Unlike Swan Point, Indiantown Marina is predominately sailboats, which are far more vulnerable in high winds. Scott Watson, Indiantown's owner, said they use four-foot helical anchors with round eyes, which are set into the ground using a posthole digger. He says it takes two men 10 to 15 minutes to install a helix. Boats are then secured with 10,000-pound ratchet straps, which he says have very little stretch.

Sebastian River Marina, Sebastian, Florida

With anchors that screw into the ground, holding power is dependent on the density of the soil. Royce Randlett, who is president of Helix Moorings Inc., a company in Maine that sells helical anchors primarily for moorings, says any soil, no matter how loosely packed, offers at least some resistance and helps secure the boat. Randlett says they buried an anchor in loosely-packed "sugar sand" in the Florida Keys and found that a 5 ½-foot screw anchor had 2,600 pounds of resistance.

Watson says the anchors at Indiantown are secured into typical "Florida sandy soil" and notes that the longer the anchor has been embedded in the soil, the more holding power it seems to provide. The marina includes two straps per stored boat and will supply more for a fee—$30 per anchor and another $20 for the strap.

The marina was especially hard hit by Wilma and 33 of the 506 boats ashore were blown over when anchors were pulled out. Several other boats lost jack stands but, thanks to the straps, stayed upright. How many boats would have blown over without the straps? Watson has no way of knowing for certain, but he estimates that there would have been over 100 and that the damage to each boat would almost certainly have been worse.

Helical Advantages: Easily installed and inexpensive. Has the potential to provide significant holding power.

Disadvantages: Holding power is dependent on the type of soil, which could get mushy in the heavy rainfall of a hurricane.

Eyes Embedded in Concrete Pavement—*Sebastian River Marina, Sebastian, Florida*

At Sebastian River Marina, straps to the boats are secured to eyes set in concrete. Doug Hillman, Sebastian River Marina's owner, drilled holes into his concrete parking lot and tapped threaded sleeves into the holes. He then screwed eyebolts into the sleeves. As the bolts were tightened, the sleeves spread out at the bottom, which secured the bolts to the concrete.

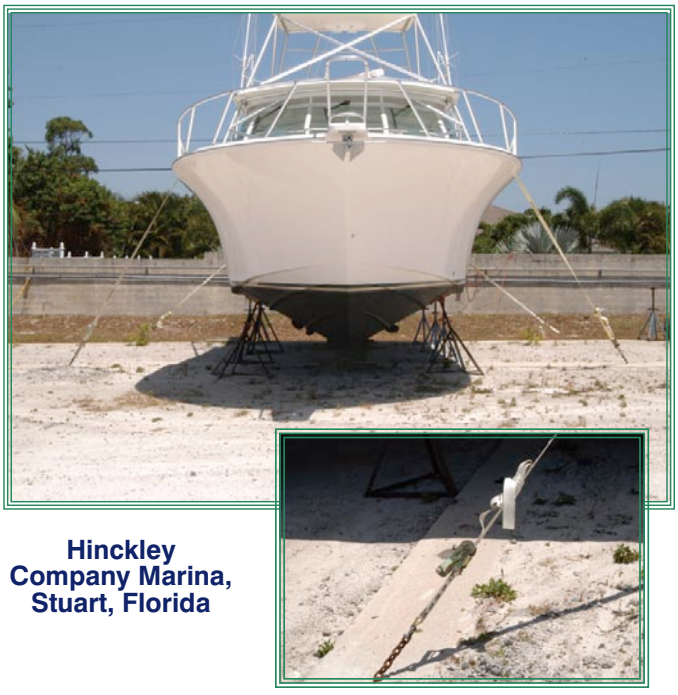
Before storms, boats are strapped to the eyes with 5/8-inch, three-strand nylon line. The system works so well that none of the 56 boats, with an average size of 40-feet, stored ashore in Hurricanes Jeanne and Frances were blown over. It is worth noting that the wind was often on the beams of the boats and the parking lot was flooded with three feet of water.

Advantages of Concrete Pavement: Tremendous holding power.

Disadvantages: Expensive, if you have to start from scratch.

Chain and Eyes Embedded in Concrete Runners—*Hinckley Company Marina in Stuart, Florida And Puerto del Rey Marina in Fajardo, Puerto Rico*

While anchoring boats to eyes embedded in concrete clearly has tremendous holding power, not many marinas have large (and expensive), concrete parking lots. A third alternative to anchor boats ashore in storms is to use long concrete runners set into the dirt, sand, or gravel parking lot.



Hinckley Company Marina, Stuart, Florida

Straps are most effective when they're amidships.

At the Hinckley Company Marina in Stuart, Florida, the runners are about two feet wide and run the length of the parking lot. Using two-inch nylon straps, boats are secured to lengths of ½-inch chain embedded in the concrete. The two-inch nylon straps have a breaking strength of 30,000 pounds and are ratcheted tight to minimize movement. All of the 178 boats at Hinckley were stored ashore and most were held in place by the nylon straps secured to the concrete runners. (A few that were away from the runners couldn't be strapped down.) Three of the boats that were strapped down were blown over in Hurricane Frances and two in Jeanne. According to Hinckley's Gary Rolfe, the ground became so wet that the boats' supports sank into the mud. All but one were repairable.

An almost identical system, with long concrete runners, is used in Puerto del Rey Marina in Puerto Rico. Instead of straps, Puerto del Rey had originally planned to use 3/8-inch galvanized steel cables and turnbuckles. The system promised to be almost indestructible but Daniel Shelley, the marina's owner, said boat owners were unwilling to pay the additional cost for cables. It was never tested in a major storm and the marina now uses polyester straps.

Advantages of Concrete Runner: Quicker to install and less expensive than concrete pavement. Tremendous holding power.

Disadvantages: Not many. Keel blocking can sink in mud causing the boat to shift; this could be corrected with gravel or wider supports beneath the keel.

Tying Down Boats: *Straps that Don't Stretch Work Best*

When a boat rides out a hurricane in the water, either at a mooring, at anchor or at a dock, nylon line is essential for absorbing shock. Without nylon's energy-absorbing stretch, anchors, cleats and even pilings could be yanked out. When boats are stored ashore in hurricanes, the reverse is true: Nylon line used to secure boats to anchors in the ground will stretch, putting tremendous pressure on leeward jack stands. In the photo on page four, the nylon lines that were being used to anchor the boat stretched and the leeward jack stands buckled. Polyester doesn't stretch, at least not much, and also has a much higher breaking strength than nylon, which is why it's best for securing boats ashore.

Where lines are secured is also important. Daniel Shelley, who owns Puerto del Rey Marina in Fajardo, Puerto Rico, notes that people tend to secure vessels on land the same way they're secured in the water—with lines at the bow and stern. The latter provides no lateral stability and does almost nothing to protect a boat. On land, lines should be secured as close to *amidships* as possible, which is where a vessel is most vulnerable to high winds.

Straps at River Forest Yachting Center in Stuart, Florida.

Unstepping Masts

Although no one has put a number on it, sailboat masts create a horrendous amount of windage. When Hurricane Ivan battered Pensacola Shipyard and Marine Complex in 2004, all of the sailboats stored ashore that had their masts up were blown over. Conversely, the few sailboats that had their masts unstepped (and all of the powerboats) stored ashore remained upright.

After Ivan, Rocky DeSimone, the marina's manager, bought a portable crane that allows PSMC employees to pull a mast in about 30 minutes, if mast wiring is disconnected and turnbuckles are loosened by owners. Whenever a storm threatens, an arrangement has also been made with two portable crane subcontractors to assist in the mast-pulling effort.

PSMC, Jacksonville, Florida: Using their portable crane, masts can be pulled fairly quickly—in as little as a half hour if the electrical wiring harnesses are disconnected and turnbuckles loosened.

Gunwale to Gunwale?

Dave Hillman at Sebastian River Marina thinks blocking boats gunwale to gunwale in long rows with blocks of foam between each boat would go a long way to preventing damage. Boats that were only eight- to 15-feet wide individually would be 50' to 60' wide collectively. In addition to strapping them to each other, the boats would also be strapped to the ground individually using earth anchors or eyes set in concrete. Even strapping as few as two boats together would have a significant advantage over strapping them down individually.

Two considerations: First, Hillman says the yard manager would need to have some feeling as to how the boats are going to go together; placing a boat with towering gunwales next to a boat with low freeboard wouldn't work. Also, the yard would need to have a hydraulic trailer or forklift; a travel lift would not allow the boats to be placed gunwale to gunwale. The technique would also allow the marina to store more boats in the same area. Hillman calls the idea of storing boats collectively with straps "bulletproof."

Strategies:
Moving Boats to Hurricane Holes

When it became likely that Katrina would come ashore in Alabama, Sonny Middleton, the owner of Dog River Marina in Mobile, Alabama, began giving employees assignments from a list that he had prepared months before. Dog River is a good size facility, with 40 employees and 100 slips. Like many marinas in the sunny South, a large percentage of the boats at Dog River are owned by people who live out of state. At most marinas, these boats are typically ignored before a hurricane; canvas isn't removed, extra lines and chafe protection aren't added. The result, not surprisingly, is that they are far more likely to break free and damage other boats. At some marinas, the solution has been to make arrangements with absentee owners to haul their boats and block them ashore. Boats are safer stored on shore if they will be safely beyond the surge. That's not the case at Dog River, however, which sits in a low-lying area that's only a foot or two above normal high tide.

A strategy that worked beautifully: Boats from Dog River Marina in Alabama were taken up the Tenn-Tom Waterway by professional captains. Using multiple anchors and lines to shore, all of the boats survived with no damage. Boats that remained at the marina weren't so fortunate.

Before the start of the hurricane season, Sonny makes arrangements to have professional captains available to take the marina's larger boats further inland to hurricane holes further up the Tenn-Tom Waterway. One of the marina's workboats is used to ferry the captains back and forth to the marina. This exodus of boats upriver results in many empty slips at Dog River, which allows the remaining boats, typically the smaller boats, to be moved into wider slips. This keeps them further away from pilings, and the use of longer lines means that the boats can rise more readily with the surge. The system has been used successfully at Dog River several other times in past hurricanes.

Most recently, the technique was used prior to Hurricane Katrina in 2005 when almost 60 boats were moved upriver and secured using multiple anchors and lines to shore. Some of the boats were moved by the professional captains and others by their owners. Katrina's winds at Dog River topped out at 80 mph, a far cry from the 145-mph winds that devastated much of Mississippi and Louisiana. Katrina's surge, however, was a different story. Even after the hurricane was well inland, water continued to pile into the marina, finally topping out at 15 feet. The worst damage was to the boats in Dog River's covered shed. Some of the larger sportfishermen that remained in the shed were lifted up to the rafters by the surge. In all, four of the boats at the marina were completely destroyed. Sonny said, in his 50 years, these were the first boats he'd lost in a hurricane.

Using multiple anchors and lines ashore greatly increases the chances boats will survive in a hurricane hole.

He says he learns something from each hurricane and this time it was about the surge. In the past, Sonny had never worried much about surge but that won't be the case next time. He won't leave boats in the covered slips again and he won't leave them in open slips either; larger boats need more room in a hurricane. He's already talked to more captains so that next time hurricane

warnings are posted, he can move *all* of the larger boats upriver.

A slightly different strategy of moving boats was used before Hurricane Frances at the Diamond 99 Marina in Melbourne, Florida. Ed Carter, who owned Diamond 99, didn't have a travel lift, a forklift or, for that matter, a boatyard where he could store boats. What he did have was a hurricane hole nearby. Since boats at his docks are vulnerable even in a moderate blow, boat owners at Diamond 99, by prior arrangement, usually take their boats to a hurricane hole whenever a hurricane warning has been posted. Ed supplies a boat to shuttle people back once their boats are anchored. In some cases he even supplies extra anchors.

In Frances, 65 boats were anchored at the hurricane hole using at least two and, in some cases, three anchors. Even though the slow-moving Frances pounded the area for more than a day, 48 of the boats received no damage, six were slightly damaged, usually by boats that broke loose, and 12 were badly damaged. That was in sharp contrast to the six boats that remained at Diamond 99's docks, all of which were destroyed—five had sunk and one was washed up onto the highway.

Prior to Hurricane Isabel coming ashore in 1995, several of the boat owners at Jordan Point Yacht Haven in Hopewell, Virginia opted to take their boats to a hurricane hole—a large, well-protected gravel pit further up the James. The remaining boats—a total of 80—were hauled and blocked ashore in two neat rows facing the water. All of the slips were empty. Jordan Point is open to a three-mile stretch of open water on the James River.

Jordan Point Yacht Haven

The wind blew across the long, unprotected fetch of the James River (that can be seen under the shed), destroying the docks and sheds. Even though all of the boats were damaged, the decision to haul and block them ashore before the storm meant that most would survive. Dan Rutherford, a marine surveyor on the BoatU.S. Field Catastrophe Team, estimates that 75 percent of the boats in the parking lot were repairable. Had those same boats remained in the water, all would likely have been bashed against pilings and sunk. Blocking the boats ashore averted another costly problem: pollution from leaking fuel.

During the night, Isabel's eight-foot surge and six-foot breaking waves destroyed the vacant wood docks and then rose 12 feet over the banks, lifting all 80 boats off their jack stands and floating them against a hill behind the parking lot. The boats, none of which were strapped down, were then bashed against each other for several hours, leaving them in mangled piles when the surge had finally receded.

Jordan Point has since replaced its fixed wood docks with floating docks and 18-foot steel pilings. A breakwater has been placed around the perimeter, although it isn't tall enough to protect the boats in a significant storm surge. Should another hurricane like Isabel be forecast, Mike Winn, Jordan Point's owner, says his plan is to move all of the boats to the gravel pit and raft them together. That worked well before, and while strapping down boats would almost certainly reduce the level of damage suffered in Isabel, he thinks his marina's proximity to a nearby hurricane hole is an even better alternative.

Strategies: *Moorings*

Hundreds of moorings were pulled out when Hurricanes Bob and Gloria swept through New England. Probably an equal number failed because of chafe.

Moorings have the advantage in a hurricane of allowing a boat to face the wind and rise and fall with the surge. In theory, this should mean boats on moorings do at least as well or even better than boats at docks. In practice, however, that hasn't been the case. Hundreds of boats on moorings were destroyed in 1991 when Hurricane Bob swept up the New England coast. Some of the damaged boats came to grief because lines chafed, but many others, about half, were wrecked because the mooring anchors—half-buried mushrooms and inadequate dead-weight anchors—proved to be woefully inadequate in the face of Bob's wind, waves, and tidal surge. Three months after Bob, even more moored boats were damaged when the infamous Halloween northeaster swept up the New England coast.

One reason for the widespread destruction of boats had to do with scope: Shallow harbors like the one in Marion, Massachusetts, meant that the 11-foot surge reduced the normal 4:1 scope to less than 2:1. The angle of pull, which had been 14 degrees, was reduced to 50 degrees during the storm. In his book *Permanent Yacht Moorings*, first published in 1938, Ridsdale Ellis illustrated how holding power drops steadily as the angle of pull increases to 25 degrees, at which point holding power suddenly takes a precipitous drop.

Necessity is the mother of invention, and one of the more interesting innovations to come out of the two New England storms was the development of the helical anchor, which is screwed into the bottom using specialized equipment and offers tremendous holding power, even when scope is reduced. While they still remain a small percentage of the total number of moorings, there are now almost 10,000 helix moorings that have been installed in the U.S. and Caribbean. Fifteen years ago, there were only a handful, mostly in the Caribbean.

A study by the BoatU.S. Foundation, *Cruising World* magazine, and Massachusetts Institute of Technology (MIT) in 1993 found that a 500-pound buried mushroom could be pulled out with 1,200 pounds of pull (supplied by a 900-hp tug); an 8,000-pound dead-weight (concrete) anchor could be pulled out with 4,000 pounds of pull. A helical anchor, however, could not be pulled out and the strain gauge recorded 12,000 pounds of pull—its maximum—before a shackle burst apart. (In an earlier test with a larger tug, a strain gauge registered 20,800 pounds before the hawser snapped.)

Reducing Chafe

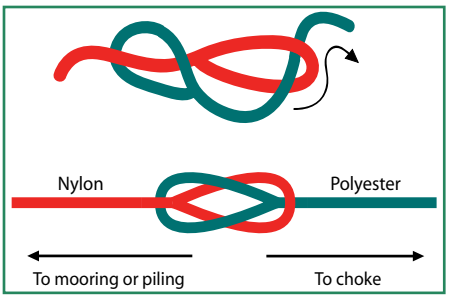
Aside from anchors pulling out, the other reason so many boats

Testing Mooring Anchors

Results of a mooring anchor test in Rhode Island that was sponsored by BoatU.S., *Cruising World* Magazine, and the Massachusetts Institute of Technology (MIT) Sea Grant Program. Scope was between three- and four-to-one. The test was conducted using a 65-hp tug that was powered by twin 450-hp engines.

Mooring Anchor Type	Helical Screw	Dor-Mor	Mushroom	Concrete Blocks	
		650 lbs.	500 lbs.	2,000 lbs.	8,000 lbs.
Resistance Force (in lbs)	12,000 lbs. No Breakout	4,500 lbs. At Breakout	1,200 lbs. At Breakout	800 lbs. At Breakout	4,000 lbs. At Breakout

wound up strewn over the rocky beaches of New England after the storms was chafe. In ordinary conditions, a mooring chain's weight acts as a shock absorber to absorb energy. In a gust, the chain is lifted off the seabed and its weight pulls the boat forward (the catenary effect). In a hurricane, a mooring chain will be bar-taut with no catenary effect, which means the tremendous energy from wind and waves has to be absorbed solely by the nylon pennant or pennants. Without the elasticity of the nylon, the mooring anchor, shackles, chain, and/or the boats cleats are almost certain to be yanked out or busted apart. In extreme weather conditions, however, nylon pennants have proven to be extremely vulnerable to failing internally (heat) as well as chafe (abrasion). The further a cleat is from the chock, the more likely it will be stretched back and forth across the chock and eventually fail, either from abrasion and/or heat buildup. Two things to keep in mind: 1. When a line is bent sharply down to the water, only about *half* of the rope's fibers are taking the load. 2. Line starts to deteriorate at 300º F, and at 350º it will have lost half its strength.



Using a polyester line from the cleat through the chock, secured to an existing nylon line to the piling or mooring, gives you better protection from chafe (polyester is 10 times more chafe resistant than nylon), while also absorbing shock. Lines should have eye splices with at least five tucks.

A cleat that is located on the rail is ideal because the line won't be compressed as tightly, won't generate as much heat, won't be abraded, and will be more likely to weather the storm intact.

When cleats are located back from a chock, stretch at the chock is inevitable and chafe protection is critical. Various types of hoses—PVC, garden hoses, and even fire hose—have the potential to reduce compression at the chock as well as protect the line against external chafe, which is good. But any hose that is impermeable prevents cooling water from reaching a rope's fibers and the pennant is more likely to build up heat and fail internally. The best way to reduce the chances of the line failing at the chock is to use something like polyester chafe protectors, which allow water in to cool the rope's fibers.

One alternative is to use bridles made with both polyester and nylon (see diagram). This has the advantage of being more chafe resistant at the chock while still absorbing energy. The two lines should be spliced (with at least five tucks) rather than joined with a knot, which would significantly reduce breaking strength.

Another way to reduce the chances of a pennant failing in a storm would be to use something other than chain—something that would continue to absorb energy. The most promising solution is polyurethane, which is sometimes used to anchor floating docks. Polyurethane is durable and is advertised to last 20 years with no maintenance. The real value, however, at least in a storm, would be its elasticity. Unlike chain, which has no elasticity, polyurethane will continue to absorb energy and reduce shock loads on a moored boat in extreme weather, which greatly reduces the strains on the pennants as well as the anchor and cleats.

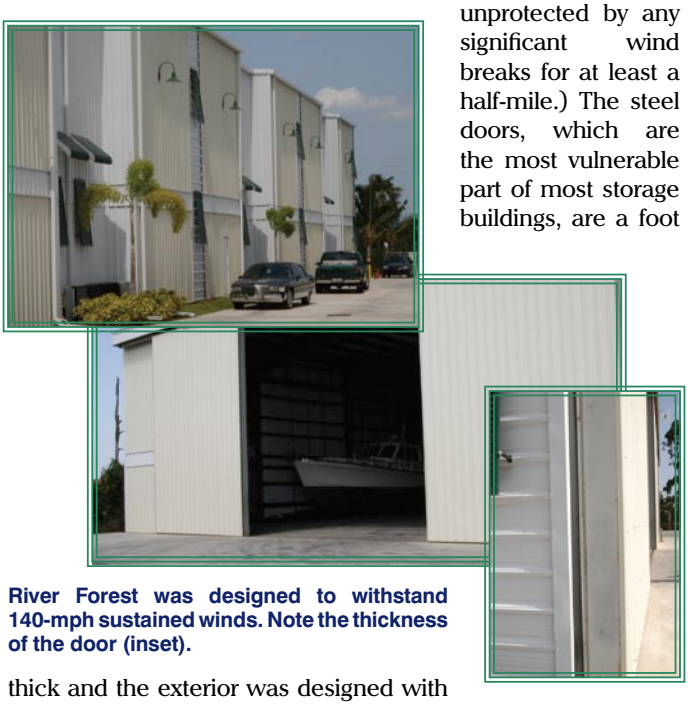
Older buildings have proven to be especially vulnerable. This one went over in Ivan.

What About Dry Stacks?

In almost every major hurricane, dry stack buildings have proven to be vulnerable. In Hurricane Wilma alone, three large steel storage racks with thousands of boats were collapsed by the storm's 115-mph winds. Like most storage racks that are damaged in hurricanes, these were older structures, which were built to a less stringent standard than those being built today. In addition to lighter construction, older racks have a tendency to have been "loosened" over time by earlier storms as well as rust.

How old is old? In Florida, construction standards in most counties were upgraded after Hurricane Andrew, which means that newer racks—those built after 1992—are far more likely to have been built with more (and heavier) structural supports.

A good example of a stoutly built, newer building is the one at River Forest Marina in Stuart, Florida. The 300' x 150' x 36' high steel building is built to withstand 140-mph *sustained* winds in an "Exposure C" setting. (Exposure C means the building is unprotected by any significant wind breaks for at least a half-mile.) The steel doors, which are the most vulnerable part of most storage buildings, are a foot thick and the exterior was designed with a "flying buttress" pattern that, aside from making the building more aesthetically appealing, also adds strength. The cost to upgrade the building, according to River Forest's manager, John Smith, was about 20 percent more than merely building it to the minimum code.



River Forest was designed to withstand 140-mph sustained winds. Note the thickness of the door (inset).

Protecting *Yourself* from the Storm

By Richard McAlpin

Much attention has been given to protecting marina facilities and boats during a hurricane, but it is equally important to protect yourself, as a marina owner, from vessel owners seeking compensation for hurricane-related damage. This article will outline a few important considerations for inclusion in your marina's dock contracts and hurricane plan. Note, however, that changes should be reviewed by a local admiralty attorney. Dock contracts are based on state laws and will vary from jurisdiction to jurisdiction. Here in Florida, Statute §327.59 says that a marina operator may dictate what a vessel owner must do as a condition of using the marina, including the types of cleats, ropes, fenders, and other measures a vessel owner must employ. The statute also permits the marina operator to secure the vessel within the marina to minimize damage to the vessel, the marina, private property and the environment. The statute also makes clear that marina operators may charge a reasonable fee for such services.

Florida Statute §327.59 also allows marina operators to add a clause in the marina contract, stating that the marina may take steps necessary to secure *or remove* the vessel if the vessel owner fails to do so. The clause must be in a font size of at least 10 points and in substantially the following form:

> ***NOTICE TO VESSEL OWNER:***
>
> The undersigned hereby informs you that in the event you fail to remove your vessel from the marina promptly (timeframe to be determined between the marina owner or operator and the vessel owner) after the issuance of a tropical storm or hurricane watch for (insert geographic area), Florida, under Florida law, the undersigned or his or her employees or agents are authorized to remove your vessel, if reasonable, from its slip or take any and all other reasonable actions deemed appropriate by the undersigned or his or her employees or agents in order to better secure your vessel and to protect marina property, private property, and the environment. You are further notified that you may be charged a reasonable fee for any such action.

Section 4 of Florida Statute §327.59 provides that a marina operator shall not be held liable for damage incurred to a vessel from storms or hurricanes. Likewise, the marina is held harmless for actions taken to secure the vessel unless such damage is caused by intentional acts or negligence by the marina operator, its employees and/or agents.

What §327.59 won't do is allow marina operators to require that vessel owners remove their vessels after a hurricane watch or warning has been issued. The purpose of §327.59 is to ensure that protecting the lives and safety of vessel owners was placed before the interests of protecting property.

Implied Standards

Regardless of where you live, marina operators are expected to exercise reasonable diligence to provide a safe berth and to warn a person lawfully using its facilities of any unexpected hazard or deficiency of which it may have knowledge, or should have knowledge, in the ordinary course of diligence. If one of your docks is missing a plank, for example, you're obligated to have it fixed and in the meantime to warn people that a hazardous condition exists. What you are not obligated to do is guarantee the safety of vessels.

Contracts Between Marina and Vessel Owner: *Six Considerations For Protecting Yourself After a Hurricane*

1. Make sure the rental agreement specifies what vessel owners must do in order to berth their vessels at the marina. This can include requiring that the vessel owner carry certain levels of liability insurance, and in some jurisdictions, name the marina as an additional insured under the policy. The rental contract may dictate the measures a vessel owner must employ as a condition of use of the marina, including the types of lines, cleats, and fenders on the vessel.

2. The rental agreement should make clear that vessel owners are a part of your hurricane plan and that their participation in the plan is part of the contract between the marina and the vessel owners.

3. The rental agreement should explain that the marina does not owe the vessel owner a duty to prevent damage to their vessel in the event of a storm. However, it should also make clear that if the marina operator has to secure the vessel because vessel owners fail to take steps to adequately prepare the vessel for a storm, the marina will charge them reasonable rates for such preparation.

4. The rental agreement should include a clearly written exculpatory clause stating that the marina operator is not liable for damages to the vessel.

5. The rental agreement should make clear that the vessel owner will be liable to the marina for damages caused by the vessel owner's failure to properly secure the vessel.

6. The rental agreement between the marina and the vessel owner should be clear and concise. Make sure you and your attorney review all of the materials given to vessel owners by the marina to ensure that the exculpatory clauses are identical. Conflicting exculpatory clauses can negate their enforceability.

Have a Detailed Hurricane Plan

It is important that you have a detailed hurricane plan and that you follow it. The hurricane plan should clearly explain what the marina will do to prepare for the possibility of a hurricane and what steps are required by the vessel owner. To help you get started, there is a generic plan at the back of this booklet. You can also visit the BoatU.S. Hurricane Resource Center web site (http://www.boatus.com/hurricanes), which has various hurricane plans that marinas around the country have implemented.

Your hurricane plan should specify what has already been done to prepare the marina for hurricanes, what will be done when a hurricane watch or warning is issued, what will be done when a hurricane makes landfall, and what steps the marina will take after a hurricane or tropical storm has passed. The plan should specify what vessel owners are required to do in the event a hurricane is expected to make landfall in your area.

Make sure that everything for which a vessel owner is responsible is clearly detailed in your hurricane plan and practice with vessel owners so they know what to expect when the plan has to be implemented. Include information about the costs vessel owners will be charged for any services to protect their vessel prior to a storm.

Whose Jurisdiction?

In general, contracts for wet storage will fall under a Court's admiralty jurisdiction. However, admiralty jurisdiction over contracts for dry storage of vessels varies among states. For example, in *Mederna v. Gombo's Marina Corp.*, the District Court for the Northern District of Illinois held that a contract to provide seasonal dry storage to a yacht was within admiralty jurisdiction. Conversely, in *Latin American Property & Casualty Ins. Co. v. Hi-Lift Marina, Inc*., the Eleventh Circuit held that a contract for the dry storage of pleasure boats was not subject to admiralty contract jurisdiction.

There are additional concerns a marina operator must consider regarding vessel storage, including implied standards to which marina operators must adhere, contractual obligations based upon the marina contract, and various liabilities that may arise depending on the nature of the vessel storage.

Review Your Contracts and Plans With an Attorney

Remember, it is important that you review your marina contract and hurricane plan with a local admiralty attorney. He or she can help you determine whether your contracts are effective, enforceable, and legal. Just as preparing your marina for a hurricane can limit your damage when the storm comes, a little time spent on your contracts can limit your damage after the storm has passed.

****

Richard J. McAlpin is a Florida Board Certified Admiralty & Maritime and Civil Trial Lawyer at McAlpin Conroy, P.A. He holds the highest attainable rating "AV" from the Martindale-Hubble Law Directory.

Bailment or Lease?

When only moorage is provided by the marina operator, or the vessel owner has access to the vessel, the relationship between the marina operator and the vessel owner is generally that of a lessor and lessee.

However, where a marina operator accepts possession of the vessel exclusive to the vessel owner, such as when it accepts possession of the vessel for repairs or dry storage, the relationship between the marina operator and vessel owner is that of a bailee and bailor. This is an important distinction because loss or damage to the vessel while it is in the exclusive possession of a marina operator/bailee carries a presumption of negligence on the part of the marina operator/bailee.

These determinations can vary among jurisdictions, so it is important that you review your rental contracts with a local admiralty attorney.

Marina Hurricane Preparation Plan

A Sample for Writing Your Own Plan

I Evaluating Your Marina

Your entire plan begins by evaluating the storm-worthiness of your marina. Things to consider:

- **Natural barriers that may or may not offer protection from breaking seas.**
  -Boats that are likely to be exposed to breaking waves will have to be stored ashore or moved to a hurricane hole.

- **The height of the marina facilities and boat storage areas above the likely surge.**
  -High ground is good; low-lying marshes are bad.

- **The type of docks (floating vs. fixed) and pilings.**
  -With floating docks, pilings must be tall enough to accommodate the surge.
  -With fixed docks, wide is better; boats in narrow slips are more vulnerable than boats in wider slips.
  -Older concrete pilings lack resiliency and have proven to be vulnerable in storms.

- **Boat storage racks.**
  -Racks built recently are more likely to have been built to a higher standard and are more likely to survive hurricane-force winds. Conversely, older storage racks are likely to have been built to a more relaxed standard and will also have had more time to corrode and "work."

II Developing a Hurricane Plan

Any plan should take into account the boats, docks, buildings, office, and office supplies.

• Contact former employees and boat owners who might be willing to join the regular staff to assist with hurricane preparation. Put together a "Hurricane Team" list with contact information (cell phone numbers) and tentative assignments. Remember: Time will be limited and staff will also need to prepare their own homes. Talk to key staff now to get an idea of their availability prior to a storm.

• Even if docks are well protected, boats tend to suffer less damage if they're stored ashore *on high ground* (storage ashore may not be advisable at all facilities). The draft of boats to be stored is also a factor; powerboats blocked ashore are less vulnerable to high winds than deep-draft racing sailboats with tall masts.

If you're going to haul boats, you must first get an idea of how many boats you can haul per hour. And since there may only be a few hours, you'll need to prioritize which boats will be pulled first. This can be done by asking for a deposit—first to pay, first to be served. Consider starting a "Hurricane Club" where boat owners pay for preparation services in advance.

• Marinas that aren't well protected and/or don't have the capability of hauling boats will have to plan on moving boats to a nearby hurricane hole. These plans must be communicated to slip holders well before hurricane season. At one Melbourne, Florida marina that has no storage area and only a low barrier protecting the slips, boats are provided to ferry customers from the hurricane hole back to the marina. Extra lines and anchors are also available. Another marina in Florida has a list of paid captains who are available to move boats to a more secure location inland.

III Things to Do Now

Consider what gear is essential to preparing your marina for a hurricane and have it available. Examples include smaller emergency generators (and fuel), plywood, nails, all of which will be in short supply once a warning is posted. Do you have enough jack stands to support boats in a storm (two per side won't be sufficient)? Other equipment you'll need includes flashlights, communication radios, batteries, pumps, yellow caution tape, extra fuel, duct tape, boat hooks, water, drinks and food. The latter can be used to feed staff during cleanup after a storm.

• Read the fine print in your own marina's insurance policies and, if necessary, review with your agent. Pay careful attention to what is *and isn't* covered by your business interruption insurance and make adjustments accordingly. (Note: Once hurricane warnings are posted, insurance companies won't allow you to make changes.)

• Unless you're prepared to take care of all of the boats in your yard, cooperation from boat owners is essential. Review your marina dock contracts to make sure it spells out the boat owners' responsibilities in the event of a hurricane.

Specific hurricane preparation requirements should be written down now so that they can be posted on the marina's web site. (Aside from posting it on the web site, include a copy with the slip renewal contract.) Requirements include stripping the boats (biminis, sails, dodgers, dinghies, etc.), extending lines to more distant pilings, doubling lines, adding chafe protection and fenders. Shore power cords must be unhooked. Lines should be adjustable from the dock. Extra lines should be left in the cockpit. Dinghies on storage racks must be lashed down. Get the name of an alternate person who can prepare the boat in the owner's absence. Post the names and contact information of boat owners on the web site. This will allow owners to contact someone else, in the event that he or she won't be able to prepare their own boats.

Specify that an owner will be billed for any services necessary to prepare a boat in their absence. (Don't forget that your own marina workboats will also have to be prepared.)

• Contact local governments to find evacuation policy in the event of a hurricane, including which bridges are liable to be

closed. Also, provide a list of nearby hurricane holes on your web site.

• Paint the edges of the dock white so that missing planks will be more visible when the docks are underwater.

• Consider building concrete hurricane moorings with pad eyes that can be used to strap down boats stored ashore.

• Obtain a sufficient number of oil containment booms to handle multiple submerged boats.

IV At the Start of Hurricane Season

• Update emergency contact information for boat owners, including cell phone numbers and e-mail addresses. If you need to reach a lot of people quickly, use customers' email addresses at work. (Correspondence from their boatyard tends to be read immediately.) If necessary, follow up later with a phone call.

• Routinely back up all computer office files.

• Take photos of facilities, inventory, machinery and valuable tools for insurance purposes.

• Make up laminated photo ID tags to give to the Hurricane Team. This may help get staff back into restricted areas after the hurricane.

• Contact boat salvors. Making arrangements now is much more likely to a bring quick response after the storm. The same is true of building and dock contractors—making contact before the storm is more likely to get you assistance sooner when the storm has passed.

• Don't rely on local TV, radio or even the weather channel for reliable predictions. Make it a habit to check various weather sites on-line to find one that is easy to use and accurate. For practice, use this site to track all hurricanes during the season, regardless of where they're headed. Sites that give detailed (lat/lon) predictions include the Weather Underground, BoatU.S. and NOAA. NOTE: The official sites have sometimes made plotting mistakes, including some that were over 100 miles off. To assure accuracy, plot the predicted coordinates yourself on a tracking chart.

V When a Hurricane Watch Is Posted

• If you haven't done so already, begin preparing marina facilities and boats.

• Contact all members of your Hurricane Team and review assignments. With large staffs, this may be done with a few key people who will then communicate it to their charges. Post assignments in the office.

• Post updated storm information outside the main office.

• Contact boat owners and refer them to hurricane prep information posted on your web site. Remind them that they are responsible for preparing their boats.

• Contact a rental truck agency and a storage facility in the event you'll need to evacuate computers, office equipment and paperwork. If necessary, make reservations (which you can cancel if they're not needed). Other equipment you may want to rent includes larger generators as well as a temporary office trailer. Now is the time to collect any emergency gear on your list that isn't already on hand.

• Notify suppliers and have them hold shipments until you give them the OK.

• Move all hazardous materials to a safer location on high ground.

VI When a Hurricane Warning Is Posted

• Hook up and test emergency generators.

• Respect hurricane evacuation plans mandated by the city or county. Don't ask anyone to stay in the area if a storm is considered "dangerous."

• If the hurricane's impact is expected to be minimal, ask for volunteers who may be able to help adjust lines during the storm.

• Shut down electricity and water on the docks.

VII During the Hurricane

• Good luck.

VIII After the Hurricane

• Rig oil containment booms around all sunken boats.

• Photo-document damage for insurance purposes. If possible, contact your insurer. (Remember: The squeaky wheel gets the oil.)

• Contact contractors you'll be needing to rebuild. Be aware that a lot of "contractors" and "salvors" will be showing up who aren't full-time professionals (an understatement). Work only with the contractors you're familiar with, preferably the ones you contacted before the storm.

• Begin debris cleanup. Make two piles—debris that is reusable and debris that will be hauled away.

• Boat owners may volunteer to help clean up. At one marina, hot dogs and cold drinks were served to staff and volunteers.

• With rebuilding, start with the largest slips first, as these bring in the most money.

• Keep customers and suppliers apprised of your rebuilding schedule.

****

For more sample hurricane prep plans, go to:
http://www.boatus.com/hurricanes/marina_plans.asp

Hurricane Preparation Worksheet

Boat's Name_____Length____Model__

Your Name_____

Address_____

City_____State_____Zip_____

Phone Day_____Night_____

Alternate Caretaker (If you are not available):

Name_____

Address_____

City_____State_____Zip_____

Phone Day_____Night_____

Has Boat Keys?____Access to Hurricane Equipment?____

Boat's Current Location_____

Marina Name/Address_____

Slip #

List All Equipment Needed to Prepare Boat:

	Equipment	*Current Location*
1.	Extra Lines	
2.	Chafe Protectors	
3.	Fenders	
4.	Anchors	
5.	Swivels	
6.	Shackles	
7.	Duct Tape	
8.	Plugs (Exhaust ports)	
9.		
10.		

List Equipment to be Stripped from Boat

	Equipment	*Storage Location*
1.	Electronics	
2.	Dinghy	
3.	Outboard/Fuel	
4.	Sails	
5.	Bimini	
6.	Galley Fuel	
7.	Ship's Papers	
8.	Personal Effects	
9.		
10.		

Planned Location During Hurricane_____

If at a Dock_____

Location, (If different than current location)_____

If at a Hurricane Hole:

Travel time by water from present location_____

Are there any bridges that would need to be opened?____

If yes, will they be open prior to hurricane?_____

Has owner of surrounding land been contacted?_____

How will you get ashore?_____

Type of bottom?_____Depth_____

Additional anchors needed_____Size(s)_____

Types_____

Additional Lines #_____Length_____Size_____

Additional Chain #_____Length_____Size_____

Chafe gear_____Swivels_____Shackles_____

If at a Mooring/Anchorage

Has the mooring been inspected within the last six months?_____

How will you get ashore?_____

Types of bottom:_____Depth_____

Mooring lines should be extended_____to increase scope

Additional anchors needed: #_____Size_____

Additional chain: #_____Size_____

Chafe gear_____Swivels: Shackles_____

Diagram of proposed hurricane/Docking/or Mooring location

If Stored Ashore

Windage reduced by stripping sails, furling gear, bimini, and antennas?_____

Extra blocking available for storm conditions?_____

What arrangements have been made for hauling?_____

Storage location_____

Contact name (marina/property owner)_____

Phone #_____

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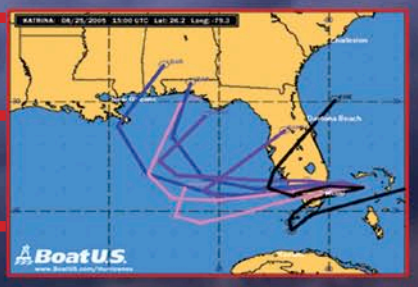

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