Protecting Your Boat Against Severe Weather

Texas Sea Grant College Program

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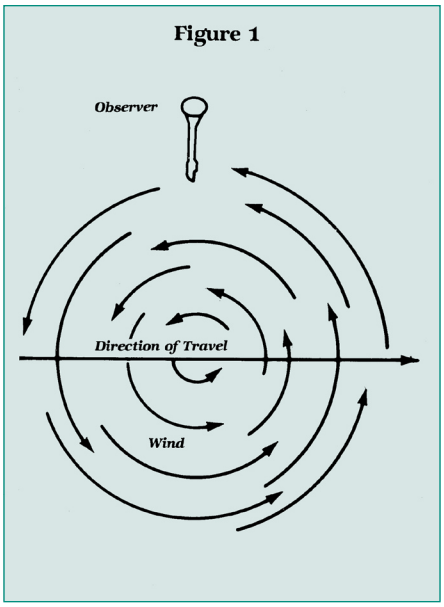
by Dewayne Hollin
Texas Marine Advisory Service

Boatowners along the Texas coast should consider hurricane preparation part of normal boat maintenance. The entire coast is vulnerable to extended severe weather and, in many cases, extreme devastation caused by hurricane-related tidal surges, winds, waves and rain during hurricane season, June through November. The best protection for you and your boat is advance planning. Deciding what to do before severe weather strikes gives boatowners a chance to test and evaluate their plans before an emergencv. Plus, a hurricane or severe storm can develop and change direction quickly. When a weather warning is issued, there is little time to protect your boat from the approaching storm if you haven't already planned what to do and gathered and practiced with the necessary equipment. Remember, a hurricane or severe storm can develop and change direction quickly.

This publication outlines procedures that can help protect boats during severe weather. Following these procedures will not exempt a boatowner from legal responsibility if his boat causes damage to other property, nor will it ensure that a boat or its occupants will escape damage and injury. However, knowing what to expect from a hurricane, what storm warnings mean, and how to best prepare your boat, can help increase chances that your boat can withstand or avoid possible damage.

This publication includes a brief dictionary of hurricane and severe weather terms; a description of hurricanes and accompanying weather; a general checklist of preparations for severe weather; lists to evaluate a variety of places to moor or store boats and steps to follow for each alternative; a list of ground tackle; descriptions of safe dry and wet storage areas; a list to analyze the risks to your boat at its current location; and advice on what to do after the storm and if a boat is damaged.



Hurricanes and Accompanying Weather

Hurricane winds may reach up to 200 rnph and tornadoes often accompany hurricanes, carrying their own wind and rain threats and causing severe damage and casualties. Unfortunately, a variety of other weather hazards usually accompany hurricanes. Ten- to 20-foot storm surges, which generally cause the most property loss during a hurricane, can rip boats from their moorings. Lowering barometric pressure causes sea level to rise drastically and, at the same time, higher tides and winds are pushing water shoreward and rain is adding even more water to already rising bay waters and seas. Rising water and high winds can batter, heavily damage, sink or even destroy boats.

The position of your boat and property relative to the center of the hurricane will determine the degree of force and damage you experience. You can rely on National Weather Service reports to determine your position.

If, as the storm approaches you head on, you see a clockwise shift of motion in the storm, you are about to encounter the "right" or most critical quarter of the circular motion of the hurricane (See Fig. 1). For example, if you are facing east, the storm motion veers southeast. This "right" quarter produces three critical forces: greater wind velocity, tidal surge and the most intense rainfall. Depending on the storm's intensity, maximum tidal surge is normally about 15 to 20 miles to the right of the hurricane eye (the relative calm area in the center of a storm).

The "left" quarter of the storm has less force than the right quarter, but is still dangerous. Since the "left" quarter is the back side of the hurricane, winds will blow from the coast to the sea, changing the direction of wave action against boats and reducing water depth. Your moorings should be set to handle this change.

When a hurricane threatens, monitor storm reports and keep a log and display of the hurricane's position using a hurricane tracking chart. Hurricane eye positions are given by latitude and longitude to the nearest one-tenth of a degree, but since the eye position does not indicate the true possible impact of the hurricane, you should plot an area 100 to 200 miles wide or 50 to 100 miles on either side of the eye, to reflect the potential danger zone.

General Steps for All Boatowners

The key to protecting your boat from winter storms, hurricanes or any severe threatening weather is planning, preparation and timely action. The following checklists are meant as guides only. Each boatowner needs a plan unique to his type of boat, the local boating environment, the severe weather conditions likely to occur in that region and the characteristics of safe havens and/or plans for protection.

1. Prior to the storm season, develop a detailed plan of action to remove your boat from the storm area to a previously identified safe haven to secure your vessel in the marina, or to take your boat to a previously identified hurricane hole. Specifically identify and assemble needed equipment and supplies. Keep them together and test your plan to see if it works before storm season.
2. Arrange for a friend to carry out your plans if you are out of town during the storm season.
3. Check your lease or storage rental agreement with the marina or storage area. Know your responsibilities and liabilities as well as those of the marina.
4. Consolidate all records including insurance policies, vessel registration, equipment inventory, lease agreement with marina or storage area, and telephone numbers of appropriate authorities, i.e. harbor master, Coast Guard, insurance agent, National Weather Service, etc., and keep them in your possession. These may be needed when you return to check on your boat.
5. Maintain an inventory of items removed and left on board. Items of value should be marked with social security numbers.
6. Before a storm threatens, analyze how you will strip the boat and how long it will take so you will have an accurate estimate of the time and work involved. When a storm is pending, and after you have made anchoring or mooring provisions, strip the boat of all movable equipment such as canvas, sails, dinghies, radios, cushions, biminis and roller furling sails and lash down everything you cannot remove such as tillers, wheels, booms, etc. Make sure the electrical system is cut off unless you plan to leave the boat in the water, and remove the battery to eliminate the risk of fire or other damage.
7. Close and seal openings and tape any windows that may break from the wind force.

In addition to these general steps, which should be considered no matter where you plan to leave your boat during a hurricane or other severe weather, the following specific steps should be taken depending on the option you select.

Trailerable Boats

1. Determine the requirements to load and haul your boat to a safe area. Be sure your tow vehicle is capable of properly and adequately moving the boat. Check your trailer—tires, bearings and axles should be in good condition. Too often a flat tire, frozen bearings or a broken axle prevents an owner from moving a boat.
2. Once at a "safe" place, lash your boat to the trailer and generously place blocks between the frame members and the axle inside each wheel. Let about half the air out of the tires, then fill the boat one-third full of water to help hold it down. (The blocks will prevent damage to the springs from the additional weight of the water.)
3. Secure your boat with heavy lines to fixed objects. Try to pick a location that allows you to secure it from four directions since winds in a severe storm tend to rotate and change direction.

Non-trailerable Boats in Dry Storage

Determine the safest realistically obtainable haven for your boat and make arrangements to move your boat there. When selecting a "safe" location, be sure to consider whether tides could rise or surge into the area. Wherever you choose to locate your boat for the duration of the storm, lash the boat to its cradle with heavy lines and, based on the weight of the boat, consider adding water to the bilge to help hold it down.

Non-trailerable Boats in Wet Storage

The owner of a larger boat, usually one moored in a berth, has three options:

1. Remain in the marina berth
2. Moor the boat in a previously identified safe area
3. Haul the boat

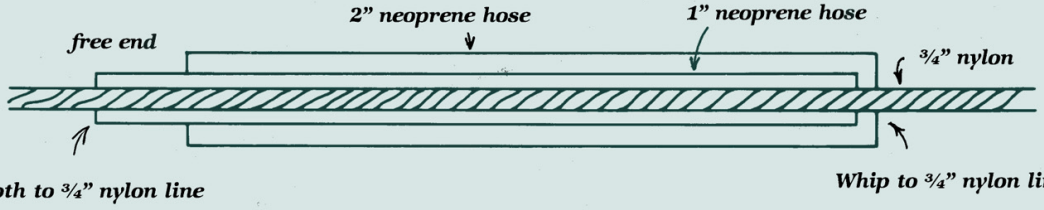
Each action requires a separate strategy. Another alternative, running from the storm, is not encouraged along most of the Texas coast and should be used only as a last resort.

1. Steps to Remain in Place—Wet Storage

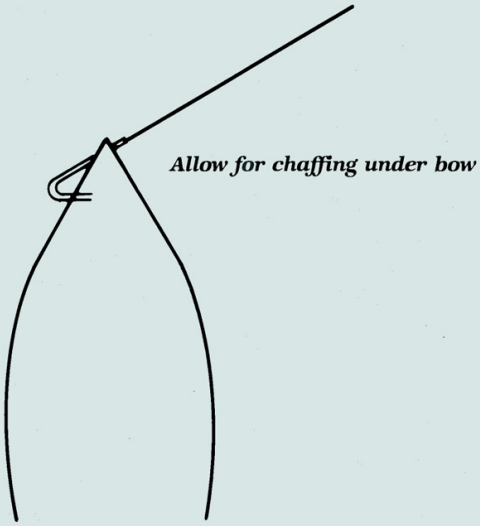
1. Top fuel tanks and change filters prior to storm season to ensure that engines can be easily started and will run to accommodate any measures needed to protect the craft. Also top off freshwater tanks aboard the boat, because fresh water may not be available after the storm.
2. Prior to the severe weather season, obtain necessary lines, chafing gear, fenders or ground tackle. Don't wait until the storm is at hand to test your plan. Try it out beforehand. Stripping and securing a boat is a difficult, time-consuming task and often a boatowner is simultaneously concerned with securing a house and protecting family members.

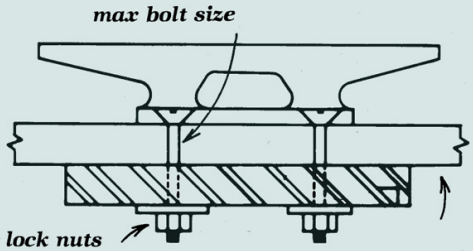
   For boats remaining in the harbor:
   - Double all lines.
   - Rig crossing spring lines fore and aft.
   - Attach lines high on pilings to allow for tidal rise or surge.
   - Make sure lines will not slip off pilings.
   - Inspect pilings and choose those that seem strongest and tallest and are properly installed.
   - Cover all lines at rough points to prevent chafing. Wrap with tape, rags and rubber hoses, etc.
   - Install fenders to protect the boat from rubbing against the pier, pilings and other boats.
   - Monitor the tide and storm, if possible, and adjust lines as circumstances change. Make allowances for rising and falling tides.
3. Some fixed pier marinas provide "tide risers" or self-adjusting mooring guides that allow lines to move up or down the piling during tidal changes. These "tide risers" are for the convenience of the boater and will hold the boat under most storm conditions, but most harbor masters prefer that boaters use double lines during storm conditions with lines also attached directly to the pilings. Some marine hurricane protection programs suggest that "tide risers" not be used for hurricane mooring and that dock lines be secured directly to pilings.
4. Assess the attachment of primary cleats, winches and chocks. These should have substantial back plates and adequate stainless steel bolt sizes (Fig. 2).
5. Batteries should be fully charged and checked to ensure their capability to run automatic bilge pumps for the duration of the storm. Consider backup batteries. Disconnect all electrical devices except bilge pumps.
6. Radio equipment for monitoring weather information should be available ocnstantly during the storm threat.
7. Do not stay aboard. Winds, even during small hurricanes, can exceed 100 mph and tornadoes are often associated with these storms. First and foremost, safeguard human life. Saving a person that chooses to stay aboard may be virtually impossible.

Figure 2



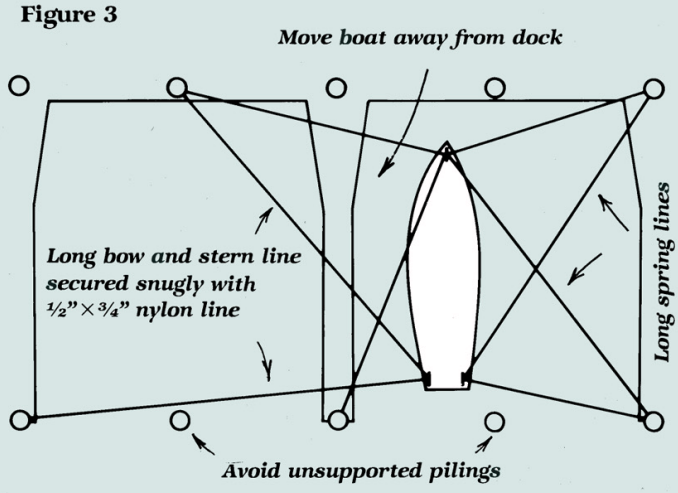
CHAFFING GEAR





REINFORCED CLEAT

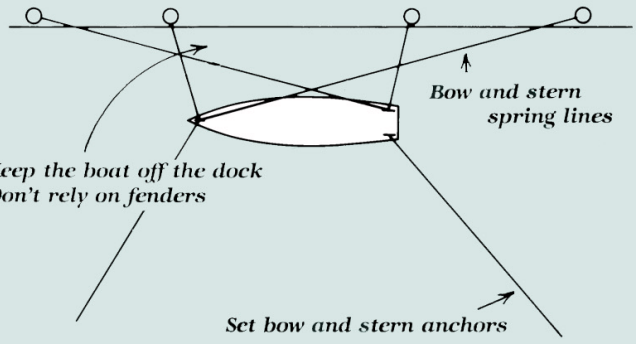
Figure 3



NOTE: ● *Max 1 boat/two slips*
● *Secure lines directly to pilings, avoid self-adj. mechanism on pilings*

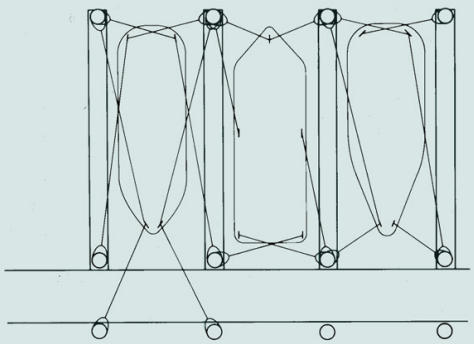
Figure 4

MOORING ALONGSIDE A DOCK



Secure line across water to tree or other dock if possible

Figure 5



STORM MOORING EXAMPLES
Four lines plus four spring lines is the best method. Mooring lines should span as far as possible. Lines may span to piling on other slip provided your neighbor does the same.
Spider web method will work only if all boats use the same method.
Use chaffing gear.

2. Steps to Moor a Boat in a "Safe" Area

1. Research potential safe areas prior to hurricane season and select one on the basis of the nature of the storm. Particular concern should be given to hurricanes and severe weather conditions from storms passing north or south of your location. Requirements for a safe haven will be substantially different according to your relative position to the storm. Ensure that water depth is sufficient to deal with changing water levels that could result from the storm (Fig. 6).
2. Practice runs should be made to determine accessibility, depth of water and location of bridges, and to locate aides or obstructions to navigation, objects on which to secure lines and best areas to drop anchors. Keep in mind that drawbridges may not open during storm evacuations. Leave early for your safe harbor or you may not have time to get to or find a place for your boat. Be sure your mooring location does not block the passage of other boats into a waterway with moorings. Cooperation is vital. You need to act safely and prudently, and make sure you have appropriate radio equipment to monitor weather reports constantly so that you do not get caught unprepared in a bad situation.
3. Install fenders to protect the boat from rubbing against other boats.

Continued

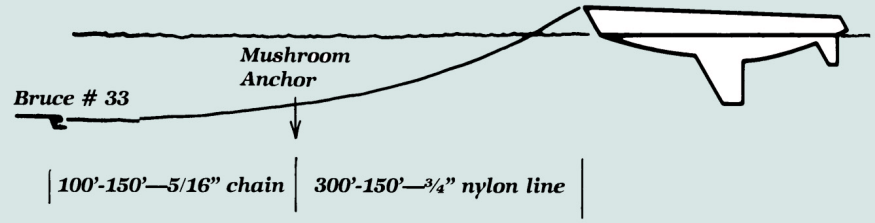
Dry Storage Safe Area Hurricane Hole Characteristics

Figure 6

Consider the nature of the severe weather approaching, the nature of the boat you are protecting and your position in relation to the on-coming system. Select an area that:

- Affords natural protection from storm surge
- Provides adequate depth to moor your boat
- Is not likely to experience an undue amount of floating debris
- Is not likely to be subject to severe tidal surge or rising tides
- Is reasonably accessible from your permanent storage area
- Is not subject to excessive competition for mooring
- Is not located in a navigable waterway
- Has bottom characteristics that facilitate proper anchoring techniques and/or moorings

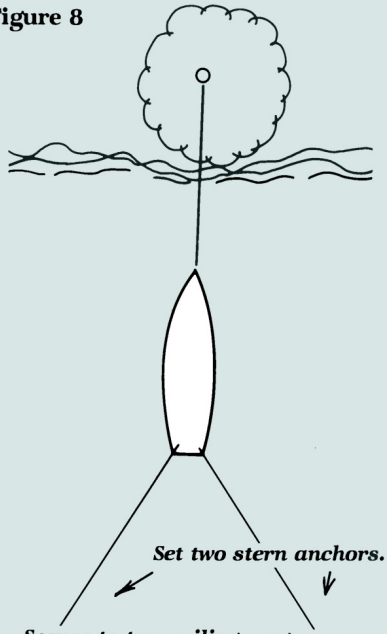
Figure 7 ***DOUBLE CHAFFING GEAR***



GALVESTON BAY ANCHOR SYSTEM—Set two Bruce or CQR anchors on 100'-150' 5/16" chain and 300' three-strand nylon line, with a 50-100# Mushroom anchor shackled on the boat end of the chain, attached to the boat with a ¾" nylon bridle with double chaffing gear. Set two anchors at approximately 10° angle.

Set two anchors at approximately 10° angle.

Figure 8

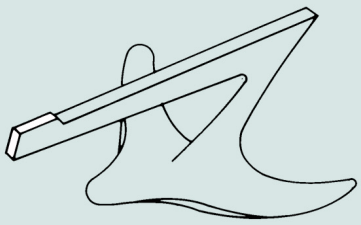


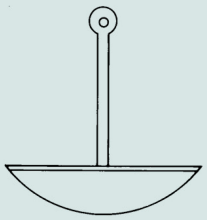
Secure to tree, piling, auger or other fixed object on windward shore. Set two stern anchors.

Figure 9

The Bruce anchor will bury deeper the harder the boat pulls, and will hold a 360° rotation. After surviving the storm, the anchor may be so deep it will have to be sacrificed.

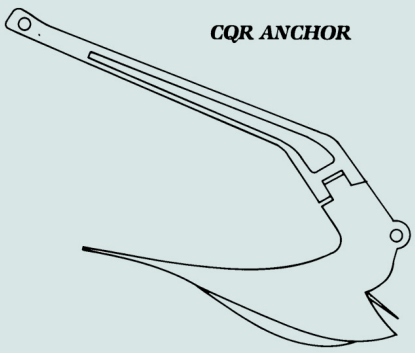
BRUCE ANCHOR





MUSHROOM ANCHOR

CQR ANCHOR



2. Steps (continued)

Make preparations for transportation to take you safely from the moored boat back to land.

After returning to shore, carefully take anchor bearings on the boat to monitor movement.

Sample mooring techniques are illustrated in Figures 3, 4 and 5. Anchoring principles are covered in Figures 7, 8 and 9.

3. Steps to Haul a Boat

1. Be sure that the marina can, in fact, haul your boat and safely store and secure your boat quickly. In past storms, owners have based their plans on this assumption only to find that the marina could not meet the sudden demand for hauling, leaving owners unprepared and with no alternative plans. Have a prearranged contract for hauling and an alternative plan.
2. Ensure that the boat will be hauled to a safe location and properly secured. An area subject to tidal rise or surge is not a viable alternative.
3. Make plans in advance to get safely from your boat's refuge site to wherever you plan to stay during the storm. When planning your route, consider the possibility of flooded roadways, excessive traffic and other storm-created hazards.

Ground Tackle System

A ground tackle system might include:

- Double anchors set at a narrow angle (less than 45 degrees).
- Two 45-pound Bruce anchors or a combination Bruce and Plow anchor.
- 100 to 150 feet of 5/16 inch chain, followed with 300 feet of 3/4 inch nylon anchor rope.

Double or triple chafing gear on a bridle through the chocks, with enough chafing gear to protect the line should it wrap around the bow of the boat.

After cleating, the bridle can be led to the primary winches and then to the primary cleats (as backup).

With this system, take time to set each anchor hard by backing down on each for several minutes or turning the boat around 180 degrees and setting the anchor with the boat in forward gear, then turning the boat head-to-wind to secure the anchor to the tow. Use extreme caution in anchoring with this system.

The Danforth anchor is more difficult to set hard in the mud bottom: it does not dig as deeply as the Bruce and the Plow anchors. Once loose, it tends to skip along the bottom.

Checking Out the Marina/Storage Facility

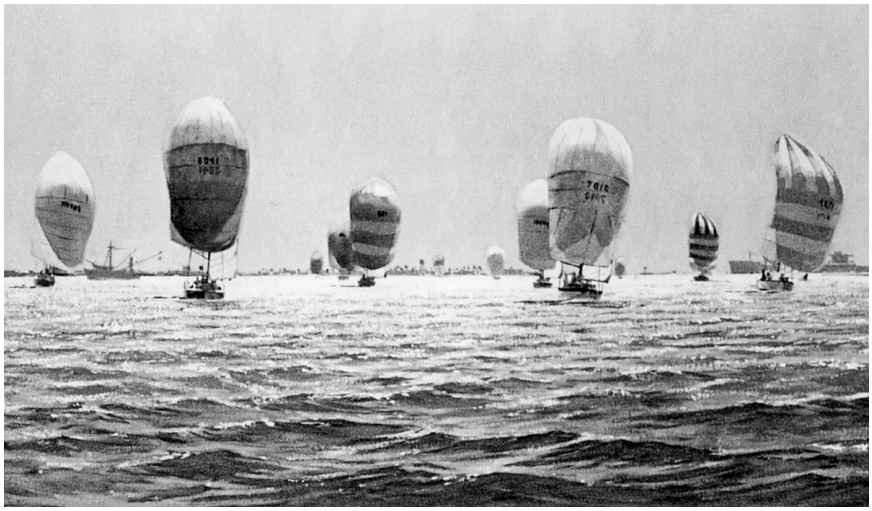
After carefully reviewing severe weather conditions likely to jeopardize your boat and analyzing alternative methods to protect your boat, you should carefully consider the degree of risk to your craft at its current location. The following checklist can help you analyze risks:

Does the marina/storage area have a severe weather preparedness plan? The owner/operator should be able to answer "yes" to a majority of the following questions:

- Is there a detailed standard operating procedure for severe weather that clearly outlines what staff reactions should be to various severe weather conditions? Is there a disaster preparedness kit for that particular marina outlining responses to particular weather conditions?
- Is there a formal communication system that spells out the need for boatowners to react properly to impeding storms and that outlines the requirements they need to fill to protect their craft and to fulfill their responsibilities to the facility?
- Does the owner/operator have a battery operated NOAA alert radio system and a portable AM/FM radio system to allow the staff to keep up to date on weather and changing local events that could affect the severe weather preparedness plan? Should you consider adding a radio system that has a weather channel and a VHF radio for marine communications?
- Is the facility adequately staffed and equipped and are employees trained to effectively and efficiently carry out the severe weather plan?
- Is there a formal program to train boatowners in methods and their responsibilities to plan, prepare and protect their boats? Remember, it is not the marina's responsibility to prepare the boat for severe weather; the boat owner must make ready the boat by following the severe weather preparedness plan.
- Is there a plan, or have specific provisions been made, to haul and remove large boats that are dry or wet stored from the tidal surge area?
- Have safe wet areas been identified and have owners been advised about the requirements to properly anchor their boats in these areas in a timely fashion?
- Is there a plan for removing trailerable boats?
- Have evacuation routes been identified and owners notified of the same?
- Are pilings where craft are moored of adequate size, properly installed and properly maintained to restrain craft during severe weather?
- Are pilings structurally sound?
- Is the facility properly designed and maintained to minimize the risk of damage to boats from airborne debris?
- Is the facility in an area that has been subject to substantial rising tides or tidal surge in the past? (Facilities located on the bay front in the upper quadrant of a storm traditionally receive greater tidal surges than bay front facilities on the opposite lee shore.)
- Is the facility located in an area that provides natural protection for stored boats (land mass, elevation, etc.)?
- Is there a possibility that buildings or other developed areas nearby could be dismantled by severe weather, sending debris airborne that could strike and damage boats?
- Is the facility subject to floating debris?

What to Do after the Storm

1. Safeguarding human life is more important than protecting or checking on your boat. Driving may not be safe after the storm. Wait to check on your boat until travel hazards are removed. Boatowners should be aware of hazards such as dangling wire, fuel leaks, weakened docks. bulkheads, seawalls, bridges, pilings floating under the water, etc. Take your records, including insurance policies, your marina lease agreement, a list of authorities to contact, etc., with you to facilitate any prompt action needed to protect your craft.
2. An owner is obligated to take reasonable measures to protect his craft if it is damaged or in jeopardy, even though the craft is insured. Conduct a thorough check for seaworthiness and damages. Report your findings immediately to your insurance agent.
3. Make sure you know the insurance company 's responsibilities, your responsibility to the company and what you are required to do to try to protect the craft from further damage. Understand the surveyor's responsibility and his relationship to you and the insurance company.
4. If the boat is submerged, after raising it, pickle the engine immediately. If the boat is obstructing a navigable waterway, you must try to remove it immediately.
5. If your boat was damaged but not submerged, check it over thoroughly for seaworthiness, potential damages, leaks or equipment losses before attempting to move it, in the event of damage to your vessel or another person's property, obtain full details and report them to your insurance company promptly.



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General Procedures to Process a Vessel Damage or Loss Claim

Once you determine you have a loss, the following steps should be taken to process your claim:

1. For the record, photograph the damaged vessel and make a list of all damages and suspected problems. If the vessel is in peril, take all necessary steps to preserve the vessel and prevent further damage. Do not begin repairs other than those necessary to prevent further damage.
2. Promptly call your insurance agent to report the claim or loss. Estimate the percentage of damage — cosmetics, water damage, total loss, etc.
3. Contact repair yards to get estimates for repairs. You do not have to wait for an adjuster/surveyor to get estimates.
4. An adjuster, insurance company surveyor or independent surveyor acceptable to the insurance company will be instructed to survey the damaged vessel. The boatowner can elect to hire a second independent survey of the vessel. The boatowner should arrange to accompany the surveyor on the initial damage survey.
5. Have your inventory list, receipts, inventory pictures, pictures of damages and repair estimates ready for inspection by the adjuster/surveyor. You will need to provide both a "proof of loss" and "release/payment order."
6. After conducting the survey, the survey files a surveyor's damage report with the insurance company, and may send a copy to the boatowner, if required.
7. The boatowner files a statement of loss with the insurance company explaining what took place, when, where and why. It includes specific lists of known damages along with sketches or drawings.
8. In the event of a dispute, the procedure is for the boatowner to hire a second surveyor/adjuster, at his expense, to represent his side of the dispute. A third party will be designated to listen to both sides and arrive as a decision. In some cases, it may be necessary to involve your attorney in the state insurance commission.
9. If the boatowner agrees on the estimates and firms to do the repairs, the insurance company issues a check with both the repair firm and boatowner/mortgagee listed as payees on the check.
10. When the work is completed to the boatowner's satisfaction and approval, the check is co-signed and the repair firm is paid.
11. Keep in mind that, with all the confusion accompanying the aftermath of a hurricane, the underwriters will first settle claims having all the appropriate paperwork completed.
12. In the event of a total loss, when it comes time to settle the loss, be prepared to surrender the vessel's documentation papers, original insurance policy, any remaining equipment and the damaged vessel.
13. If a total constructive loss of the vessel exists, a check is issued by the insurance company to the boatowner and mortgagee, usually for an amount equal to the agreed value of the fair market value of the vessel.

Severe Weather Terms

Advisory —A message released by a hurricane center, usually at 6-hour intervals, updating information on the storm or hurricane, including watches and warnings whenever they are in effect. A special advisory is a warning given any time there is a significant change in weather conditions or change in warnings previously released. An immediate advisory updates information in advisories at 2- to 3-hour intervals, whenever a watch or warning is in effect.

Flash Flood Watch - Flash flooding is possible within a designated area.

Flash Flood Warning - Flash flooding has been reported or is imminent and people in affected areas should take necessary precautions.

Gale Warning - A warning of sustained winds within the range of 39 to 54 miles per hour.

Hurricane - A tropical cyclone (a storm that rotates counterclockwise) with sustained winds of 74 mph or greater.

Hurricane Advisories - Messages issued by the National Hurricane Center summarizing all coastal warnings in effect, including hurricane watches, a description of the storm, its position, anticipated movement and prospective threat of landfall.

Hurricane Watch - The first alert when a hurricane poses a possible, but as yet uncertain, threat to a certain coastal area. Small craft advisories are issued as part of a hurricane watch advisory.

Storm Warning - When associated with a hurricane or tropical storm, a warning of sustained winds in the range of 55 to 73 mph.

Small Craft Warnings - When a hurricane or tropical storm threatens a coastal area, small craft are advised to remain in port or not to venture into the open sea.

Storm Surge - A rise in tide caused by a hurricane as it moves over or near the coastline. It can be much higher than mean sea level with high, breaking waves, higher than the normal tidal rise.

Tornado Watch - Tornadoes and severe thunderstorms are possible in your area.

Tornado Warning - A tornado has been detected in your area. Take shelter.

Tropical Depression - A rotary circulation at the surface of the water with a sustained wind speed of 38 mph or less.

Tropical Disturbance - A moving area of thunderstorms of tropical origin that maintains its identity for 24 hours or more.

Sea Grant
Marine Advisory Service

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