

An aerial photograph of a hurricane, showing the dark eye in the center surrounded by swirling white and grey clouds. The image is the background for the entire page.

HURRICANE PREPAREDNESS

Prepared For
The Coastal Soil and Water Conservation District
and the
Coastal Georgia Resource Conservation and
Development Council

Through a Grant
From
The U.S. Federal Emergency Management Agency

GUIDELINES FOR MARINAS

Acknowledgments

This publication is based on the *Hurricane Preparedness Guidelines for Georgia Marinas* originally published by the Marine Management Company under a grant from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce (Grant Number NA870Z0115). Grateful appreciation is expressed to Paul Glenn of the Marine Management Company for his excellent research and development of the *Hurricane Preparedness Guidelines for Georgia Marinas*. Appreciation is also extended to the staff of the Georgia Department of Natural Resources, Coastal Resources Division, Coastal Management Program and the staff of the University of Georgia's Marine Extension Service for their invaluable help with this project.

Hurricane Preparedness Guidelines for Marinas includes a compilation of policies and practices that are used at marinas around the United States and are generally accepted throughout the marina industry. Much of the content was provided through the generosity of numerous Sea Grant College Programs, State Extension Services, the International Marine Institute, private marinas and from documents produced by marina managers.

Using Hurricane Preparedness Guidelines for Marinas as a tool for severe weather planning will help the marina operator prepare for, respond to, and recover from hurricanes and severe weather. Following these guidelines, however, will neither assure damage prevention, nor will it necessarily exempt the marina operator from being held responsible for any damages. Those involved in the writing, publication and distribution of Hurricane Preparedness Guidelines for Marinas assume no liability for any damage or injury that may occur in the use of these guidelines.

Photography and Illustration Credits

Photography for this project was supplied through the generosity of the NOAA Photo Library available on the web at www.photolib.noaa.gov/search.html

Manual was printed by The Darien News

Prepared by
Grant Services & Consulting, Inc.
136 Blythe Beach Drive
Brunswick, Georgia 31523
(912) 399-2633

June 2002

01944.189.2002

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

Table of Contents

Introduction

- A. Why Hurricane Guidelines for Marinas?
- B. When To Take Action

SECTION I Hurricane Information for Marina Managers

- A. Hurricane Terminology
- B. Hurricane Categories
- C. Saffir-Simpson Hurricane Scale
- D. Knowing What To Expect
- E. Estimating Storm Force at your Location

SECTION II Marina Hurricane Design Considerations

- A. Relevant Terminology
- B. Issues of Concern
- C. Basic Planning Considerations
- D. Factors to be Addressed
- E. Basin Planning
- F. Land Planning
- G. Channel Entrance & Wave Attenuation
- H. Inner Harbor Structures
- I. Marina Systems
- J. Useful Tips

SECTION III Marina Policy Issues Regarding Hurricane Preparedness

SECTION IV Initial Marina Management Planning for Hurricanes

- A. Evaluate the Marina Protective Characteristics and Damage Potential
- B. Evaluate the Marina Fleet
- C. Evaluate and Define the Marina Employee Instruction Program
- D. Define Boat Owner Contract Requirements and Owner Instruction Program
- E. Evaluate Your Current Hurricane Preparedness Plans
- F. Prepare a Hurricane Preparedness Kit
- G. Conduct a Full Facility Housekeeping

SECTION V Marina Hurricane Preparedness Plan – An Example

- A. Introductory Comments
- B. Hurricane Information
- C. Summary of Hurricane’s Eye Marina Hurricane Preparedness Plan
- D. The Hurricane Response Team
- E. Hurricane’s Eye Marina Management Policy Regarding Hurricane Preparation
- F. Hurricane’s Eye Marina Hurricane Plan – Preseason
- G. Hurricane’s Eye Marina Hurricane Plan – Condition 5: Season Starts (June 1)
- H. Hurricane’s Eye Marina Hurricane Plan – Condition 4: Storm in the Vicinity
- I. Hurricane’s Eye Marina Hurricane Plan – Condition 3: 72-48 Hours to Landfall
- J. Hurricane’s Eye Marina Hurricane Plan – Condition 2: 48-36 Hours to Landfall
- K. Hurricane’s Eye Marina Hurricane Plan – Condition 1: 24 Hours to Landfall
- L. Hurricane’s Eye Marina Hurricane Plan – Condition 0: Hurricane
- M. Hurricane’s Eye Marina Hurricane Plan – Return and Recovery

SECTION VI Insurance Claims

- A. Before the Storm
- B. After the Storm

SECTION VII Appendix

- A. Marina Hurricane Preparedness Kit Inventory Sheet
- B. Boat Owner Hurricane Readiness Questionnaire
- C. Emergency Response Phone Numbers
- D. Hurricane Preparation Instructions for Boat Owners

SECTION VIII Selected References

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

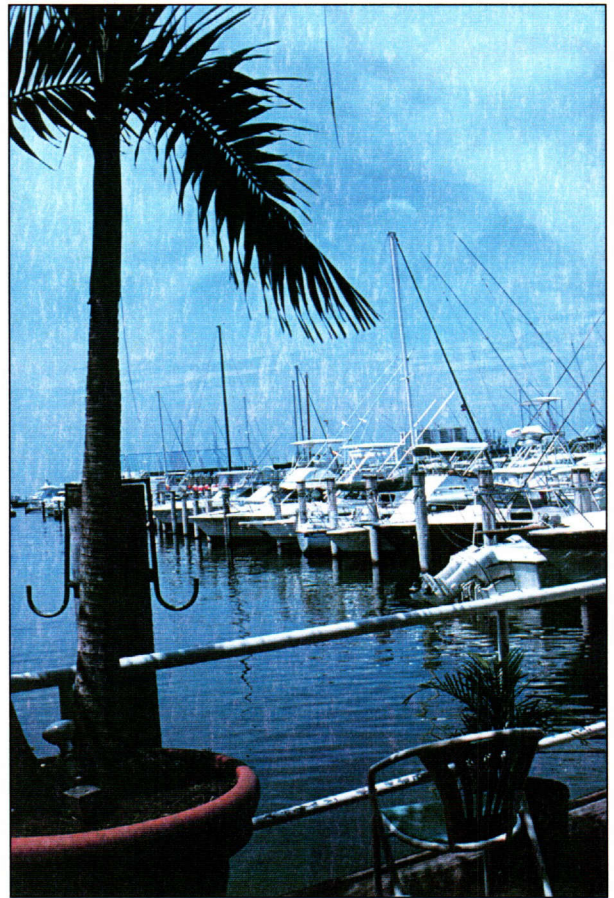
Introduction

A. Why Hurricane Guidelines for Marinas?

Successful preparation for a hurricane depends on how early and how orderly we act. Boat owners and marina operators all along the coast should consider hurricane preparation part of normal boat and marina maintenance. Just a few unprepared boats can inflict incredible damage on a marina, as can unsecured facilities and equipment. Marina managers must begin early in developing a formal written plan, including suggestions and diagrams. Hurricane Preparedness Guidelines for Marinas contains procedures agreed acceptable by the U. S. Federal Emergency Management Agency. These guidelines, when tailored into a plan for your facility and operation can be an important asset to your business.

Although these procedures are accepted as "standard," it is very important to be aware that each procedure may or may not be suitable for your business. Read the manual, analyze your marina, and change the manual to fit your operation. Have your final plan reviewed by your attorney.

General timetables must be implemented for the various stages of hurricane preparation. Preseason marina repair and maintenance is vital to hurricane preparation, as is employee and customer training. When a storm threatens, there will not be time for these activities. Marina operators and staff must be well into preparation procedures during the U. S. Weather Service Hurricane WATCH Phase. After a hurricane watch is issued, timing becomes critical. This is the time for quick and decisive action in wet slip evacuation, securing dry storage boats and preparing other areas of the marina - even though chances may be great that the storm will not hit. Remember - wet slip evacuations mean boats must be anchored and crews returned ashore in time to prepare and possibly to evacuate their homes. Dry rack tie down operations can require several teams and many hours for completion. This operation has to be done prior to darkness, rainfall, or high winds. All boats, docks, buildings, and equipment must be secured by the time a hurricane WARNING is issued. Specific actions must occur as much as 72 to 36 hours prior to a call to evacuate the area and at least 24 hours prior to storm landfall. Remember that agency timetables refer to landfall of the hurricane EYE - severe weather can significantly precede the eye. Duties should be delineated in early planning. However, be prepared to make changes depending on storm characteristics, including the probability of a direct hit and the expected intensity of the storm.



Recreational fishing boats at San Juan Bay Marina, Puerto Rico.

Early action depends, of course, on early storm threat notice. Marina personnel must be taught to be aware of tropical weather conditions and to immediately report any storm news to their supervisors.

A marina hurricane preparedness plan needs to be specific. For example, your plan should include if/which dry rack boats will be tied down and define the amount of personnel and time required to do so. Describe necessary materials and equipment and their locations for the job. The plan also needs to be realistic. If you encourage (recommended) or require (not recommended) wet slip evacuation, suggest alternative locations that provide storm protection. If your plan recommends evacuation to a hurricane hole, boats and boat operators will be needed to bring people back (no one should stay aboard during a hurricane). Require each boat owner to submit hurricane readiness information at the beginning of the season. The boat owner may not be available at the time of a storm, so an alternate caretaker should be named. Another approach is for a marina to be contractually authorized to carry out the owner's plan (without liability). Establishing a written agreement with fee structures for emergency care by the marina will encourage owners to tend to their boats. Few marinas are staffed to secure the marina and unattended boats. Consider organizing emergency teams of dedicated boat owners to be called on when a storm is approaching. Boat owners are encouraged to volunteer when they realize the ultimate cost of disaster will fall on them in the form of the loss of the marina for their use, and perhaps higher insurance premiums, higher marina slip rentals, or both. Controlling damage after the hurricane is important, but often omitted from planning. This can save time and money for marinas and boat owners.

To successfully implement a hurricane plan someone must be in charge - a decision-maker. The marina manager, owner, or yacht club commodore must set the plan in motion and deal with contingencies. This person must be familiar with weather service warnings and storm tracks. Well-trained and organized staff and volunteer teams, with specific assignments will do the actual work of preparing for the storm. Each team should review its tasks, assign individual responsibilities, and identify needed equipment.

Be aware that preparation plans may work only for lower category hurricanes. Certainly, landfall by a Category II or stronger storm would result in major damage to marine facilities and boats. We prepare in order to minimize damage or for a "near miss". For a major storm our efforts may or may not be adequate - but the job must be done quickly for safety's sake. Remember - to attempt to secure boats at a marina while under storm influence is at the risk of the lives of marina personnel, boat owners, and volunteers. An approaching hurricane is a potential killer - the inconveniences of early action are a small price to pay for safety.

A final word – be prepared to evacuate personnel from the marina when directed by your local County Officials as recommended by The Emergency Management Agency!

B. When To Take Action

The track of a storm - whether or not it will hit land and where - remains highly unpredictable despite vastly improved forecasting methods. Years of low storm activity often have been the years of the greatest hurricane disasters. Alicia, Gloria, Hugo, and Andrew were the only

major storms to come ashore in the United States in recent years, and each caused record damage. It is clear that waiting until a storm's arrival to act is almost certainly inviting disaster.

A **hurricane "WATCH"** is posted when hurricane conditions pose a threat to a specified coastal area, usually within 36 hours. However, keep in mind these advisories are issued for all interests, not just for marinas and boats. Some hurricane observers believe waiting for a watch to be posted also may be too late to adequately prepare boats or marina facilities.

A **hurricane "WARNING"** is posted when sustained winds of 74 mph or higher are expected within 24 hours or less – probably too late to adequately prepare boats or marina facilities. Securing the home and evacuating the family become the primary focus at this point.

Implementation of the marina hurricane plan needs to begin when a hurricane is a substantial possibility -prior to the issuance of a "watch". Waiting longer may mean attempting to make preparations during times of heavy demand from customers to remove boats, during diminishing weather conditions and with employees and volunteers becoming increasingly restless to tend to family and home. Also, for evacuating boats, bridges may be locked down and the safer harbor you chose may be filled.

What if the storm turns away? Hurricane preparation procedures are like fire extinguishers and life jackets; the good news is when they are not put to the test.

Important Notes In Text

In some sections of *Hurricane Preparedness Guidelines for Marinas*, there are important **Notes** for management to consider. These Notes are in Italics.

(For example)

***NOTE:** Check the wording in all sections with your Marina's attorney, insurance company, and top management staff.*

Such Notes are meant to help Managers make decisions when changing this document into their customized Marina's Hurricane Preparedness Manual. The Notes are flags to indicate where further research and changes are thought to be necessary. The NOTES should be treated as alerts to Management that important questions exist, laws may differ, and/or that several options exist for decision.

***NOTE:** The Notes contained throughout this document are NOT meant to be seen by all Employees or Customers and should not appear in your edited Manual's final copy.*

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

SECTION I

HURRICANE TERMINOLOGY AND INFORMATION FOR MARINA MANAGERS

A. Hurricane Terminology

Tropical Disturbance: A moving area of concentrated showers in the tropics, which maintains its identity for 24 hours or more.

Tropical Depression: An area of disturbed weather associated with low pressure and wind circulation at the surface. Highest sustained winds are less than 39 mph.

Tropical Storm: Same as above except highest sustained winds range from 39 to 73 mph.

Hurricane: Same as above except highest sustained winds are 74 mph or higher.

Advisory: A message released by a Hurricane Center, usually at six-hour intervals, updating information on the storm or hurricane including watches and warning whenever they are in effect.

Special Advisory: Same as Advisory but is issued whenever there is a significant change in any information previously released.

Intermediate Advisory: Updates information contained in Advisories at 2 to 3 hour intervals whenever a watch or warning is in effect.

Gale Warning: Wind speed of 39 – 54 mph expected.

Storm Warning: Wind speed of 55 – 73 mph expected.

Hurricane Season: June 1st through November 30th.

Hurricane Watch: A hurricane may threaten your area.

Hurricane Warning: A hurricane is expected to strike your area within 24 hours or less.

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

Tornado Warning: Tornado detected in your area, TAKE SHELTER.

Storm Surge: A rise in water level above normal levels due to wind stress or, in the case of a hurricane, wind stress plus very low atmospheric pressure. Storm surge can raise water levels 17 to 20 feet causing extreme flooding. The impact worsens because the deeper water levels caused by storm surge allow larger waves to approach and break on otherwise protected structures.

B. Hurricane Categories

Category 1: Winds 74 to 95 MPH - 4 to 5 foot storm surge. Damage primarily to shrubbery, trees, and unanchored mobile homes. No real damage to other structures. Some damage to poorly constructed signs. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorage torn from moorings.

Category 2: Winds 96 to 110 MPH - 6 to 8 foot storm surge. Considerable damage to shrubbery and tree foliage; some trees blown down. Major damage to exposed mobile homes. Extensive damage to poorly constructed signs; some damage to roofing materials on buildings and some window and door damage. No major damage to buildings. Coastal roads and low-lying escape routes inland cut by rising water two-four hours before arrival of the hurricane's center. Considerable damage to piers. Marinas will flood and small craft in unprotected anchorages may be torn from moorings.

Category 3: Winds 111 to 130 MPH - 9 to 12 foot storm surge. Foliage torn from trees and large trees blown down. Practically all poorly-constructed signs blown down; some damage to roofing materials of buildings; some window and door damage; and some structural damage to small buildings. Mobile homes destroyed. Serious flooding at coast and many smaller structures near coast destroyed; low-lying escape routes inland cut by rising water three-five hours before the hurricane's center arrives.

Category 4: Winds 131 to 155 MPH - 13 to 18 foot storm surge. Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows and doors; complete failure of roofs on many small residences; complete destruction of mobile homes. Major damage to lower floors of structures near shore due to flooding and battering by waves and floating debris.

Category 5: Winds 156 MPH and above - 18 foot and above storm surge. Shrubs and trees blown down; considerable damage to roofs of buildings; all signs down; very severe and extensive damage to windows and doors; complete failure of roofs on many residences and industrial buildings; extensive shattering of glass in windows and doors; some complete building failures; small buildings overturned or blown away and complete destruction of mobile homes. Low-lying escape routes inland cut by rising water three-five hours before the hurricane's center arrives.

C. Saffir-Simpson Hurricane Scale

Storm Category	Barometric Pressure (Inches)	Winds (MPH)	Storm Surge (Feet)
1	28.94	74 – 95	4 – 5
2	28.50 – 28.91	96 – 110	6 – 8
3	27.91 – 28.47	111 – 130	9 – 12
4	27.17 – 27.88	131 – 155	13 – 18
5	27.17	155	18+

D. Knowing What To Expect ⁽¹⁾

Preparing a marina and boats for a hurricane means defending against wind, rain, waves, and high water; all in proportions rarely experienced. Damage is usually due to a combination of factors.

SURGE

The damaging influence of high water, or storm surge, is often underestimated in preparing a marina or a boat for a storm. Storm surge raises the water level far above normal high tide, cutting off roads, forcing evacuation, and lifting boats above their docks and pilings. Surge accounts for major damage because it puts docks underwater as the boat tries to float above.

Surge is the result of several factors. Due to low barometric pressure, the ocean surface is drawn upward forming a mound about one foot higher than the surrounding ocean. Large swells generated by the storm reach land first, while storm winds drive water towards the coast. As the storm makes landfall, water levels 10 to 20 feet above normal high tide are possible. Determining storm surge values is highly dependent on the slope of the continental shelf in the landfall region. The values for storm surge in the Saffir-Simpson Hurricane Scale are estimates only. The actual storm surge value (in feet) is also dependent on the storm's forward speed, tide level and degree of dredging activities on the coastline. Storm surge is typically greater on a coastline when a storm's forward speed is fast; however, for inlets, sounds and bays, the surge can be greater during slower moving storms because the wind will have more time to pump water into these areas. Surge is responsible for extensive flooding and much of the loss of life that accompany a hurricane. Dangerous high tides can reach outward 20 to 50 miles from the storm's center. Surge makes extra length and positioning of dock and mooring lines critical.

WIND

A hurricane, of course, brings high winds. Wind speeds of 70 to 130 mph are common, and winds of over 200 mph have been recorded. What may be less understood is the force created by such winds. When wind speed doubles, the wind pressure quadruples. When the wind speed increases, the damage it causes increases at a much greater rate. This illustrates the importance of reducing a boat's windage by removing as much rigging, canvas, and deck gear as possible, and facing the bow toward the greatest exposure.

WAVES

Waves in the ocean have tremendous energy and can reach mountainous heights. But even in relatively small harbors, sounds, and lakes, waves can build to surprising heights. In a hurricane, it is not unusual for steep, breaking waves three to six feet high to pound normally peaceful harbors. Sea walls, barrier beaches, and other structures that normally protect docks and moorings are submerged by the storm surge. This has the effect of greatly extending the “fetch,” or distance, over which the wind can generate waves.

RAINFALL

Rainfall of 6” to 12” within 24 hours is normal during a hurricane with extremes of 24” having been recorded. Typically, the slower the forward speed of the storm, the more rainfall. A rough method to estimate rainfall in inches is to divide the forward speed of the storm into 100. A hurricane that struck Puerto Rico in 1928 is estimated to have dumped over two and a half billion tons of water on the island. Boats that are spared the worst high water and wind still can be sunk by the torrential rain. Cockpit decks are seldom 100% water tight; and the ability of a bilge pump and battery to handle rain accumulation is greatly overestimated. Deck drains and pump discharges located near the waterline can backflow when waves and rain put drains under water.

TORNADOES

Tornadoes are sometimes spawned by hurricanes. Of the 46 people who died during Hurricane Carla in 1961, 11 were killed by tornadoes. Little can be done to protect a boat from a tornado. The possibility of a “twister,” however, is a strong reason for you, your family, and your boat, if it is trailerable, to be far from the coast when a hurricane makes landfall.

E. Estimating Storm Force at your Location

Your marina location relative to the path of the hurricane will determine the force and damage you may expect. Plot the storm path from National Weather Service Reports. Hurricane winds run counter-clockwise, and the greatest wind speed, tidal surge, and heaviest rainfall will be to the right of the storm’s eye when looking in the direction of its path. Depending on the storm’s intensity, the maximum tidal surge will be 15 to 20 miles to the right of the eye.

The left quadrant of the storm as you look in the direction of its path has less force than the right side, but is still dangerous. Should the storm pass directly overhead, you will experience winds reducing to minor gusts within the eye until the “back side” of the hurricane arrives. When this happens, the winds will reverse direction and will be at or near the intensity experienced on the front side of the storm. It may take as long as 30 minutes for the eye to pass. Remember to anticipate a change in wave direction and reduced water depth when the backside of the storm arrives.

(1) Source: BOAT/U.S. Marine Insurance Damage Avoidance Program



Recreational fishing boats at Lewes Marina - Lewes, Delaware.

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

SECTION II

Marina Hurricane Design Considerations

A. Relevant Terminology

Bulkhead: A wall subjected to varying hydrostatic water pressure plus waves on one side and hydrostatic and soil pressure on the other. Bulkheads can have several failure modes and should be designed by a licensed structural engineer.

Design Loads: Forces that must be carried by the structure being designed. Vertical loads include the Dead Load (the weight of the structure) and the Live Load (the "extra" load imposed on the structure by people, baggage, etc.). The live load may move about. On floating structures, freeboard is specified under both dead load and live load conditions. The buoyancy of walkways and wooden support beams will apply an upward vertical loading to fixed, pile supported structures when they are submerged. These forces must be addressed for severe storm conditions. Horizontal loadings caused by wind, current and boat or debris impact must be included, and the forces must be applied at the correct location. Under maximum design conditions, such as imposed by a hurricane, the forces would be applied near the top of the pile. The vibratory nature of these forces can have a more detrimental effect than a load applied smoothly in one direction.

Design Period: The projected recurrence period for a storm of a given strength. The design period indicates the probability that a storm of that magnitude may occur in any given year.

Recurrence Period (Yr.)	5	10	25	50	100
% Chance in Any Given Year	20%	10%	4%	2%	1%

Fairway: The clear distance between two rows of docked boats that is traversed when leaving or entering a slip. When no strong currents or wind forces exist, the fairway should be 1.5 to 1.75 times the length of the longest docked vessel.

Fetch: The length of water over which wind waves are generated. Longer fetches allow higher waves.

Freeboard: The height of the structure above design water level.

Pile Cap: The device that provides a connection between the pile and the structure being supported by the pile. This is a critical link in the design of pile supported structures because it must transmit all the horizontal and vertical forces to the pile without becoming detached.

Riprap: A protective layer of quarry stone, usually well graded, with a wide size limit and randomly placed to prevent erosion and scour. The size of the stone is dictated by the expected

wave energy. In severe wave climates, a larger, more uniform layer of stone called the armor layer may be placed on top of the riprap.

Scour: The removal of underwater material by waves and currents, especially at the base or toe of a shore based structure such as a bulkhead. Scour is increased during severe storm events because the storm surge provides deeper water thus allowing larger waves to reach the bulkhead.

Significant Wave Height: The average height of the highest 1/3 of the waves of a given wave group.

Storm Surge: A rise in water level above normal levels due to wind stress or, in the case of a hurricane, wind stress plus very low atmospheric pressure. Storm surge can raise water levels 17 to 20 feet causing extreme flooding. The impact worsens because the deeper water levels caused by storm surge allow larger waves to approach and break on otherwise protected structures.

Tidal Range: The difference in height between consecutive high and low waters. The tidal range for Spring Tides (which occur at or near the time of the new or full moon) is larger than the tidal range for Neap Tides (which occur near the time of quadrature of the moon, i.e. half moon points).

Tide: The rise and fall of the water level caused by the gravitational attraction of the sun and moon. Astronomical tides do not take into account the potentially large changes caused by weather. There are several tide water levels that are used as references in marine design and they include:

- **MHW** - Mean High Water is the average high water elevation over a 19-year astronomical cycle.
- **MHHW** - Mean Higher High Water is the 19 year average height of the higher high waters of a semi-diurnal tide which exists when an area has two high tides each day rather than a diurnal cycle with only one high water per day.
- **MLW** - Mean Low Water is the average low water elevation over 19 year astronomical cycle.
- **MLLW** - Mean Lower Low Water is the average height of the lower of the two low waters of a semi-diurnal tide cycle.

Waves: Periodic undulation of the water surface normally generated by wind or boat wakes. The three important parameters of waves are wave height, wave period (the time between 2 subsequent wave crests), and direction. Although it seems obvious that higher waves have more energy, it may not be as apparent that long period waves (10 to 15 seconds) have more energy than short period (2 to 4 second;) waves. Wave data is most often hindcast; that is, computed using known wind velocities over measured fetches to predict wave heights and period. If available, data taken from wave gages that measure actual wave height, period, and direction is much preferred over hindcast techniques. In shallow water, under most conditions, the wave can be no higher than 80% of the water depth.

B. Issues of Concern

In marina design, perhaps the greatest concern lies in the almost total lack of established design standards and building codes nationwide. Design and construction of even the smallest marina is complex, multi-disciplinary and requires a number of considerations combined with a vast array of data requirements. Each facility is site specific, market specific, environment specific, and use specific. Proper engineering and design of a marina requires the involvement of licensed design professionals who are experienced in marina planning, design, and construction. The lack of established design standards and building codes increases the need for professional involvement.

It is difficult to establish the exact failure mode of structures during a hurricane. The combination of forces is varied and difficult to predict and does not necessarily follow a set of formulas or a laboratory experiment. Only by looking at a number of installations with various types of construction can we begin to identify patterns of failures that are conclusive and translatable into design standards and/or codes. Some design solutions should be obvious and historical in their application, but with new materials, new inexperienced marine design personnel, outdated design guidelines, inexperienced marine contractors, and developers that are attempting to construct marina projects as economically as possible, the need for guidance in marina design has never been greater. The above factors combined with a growing interest in boating and the need to protect boaters, marina investors, marina insurers, adjacent property, and the public at large, make the development of modern marina design standards a top priority.

Assuming that very good design standards and criteria are available and usable by competent marina designers, there are many marina projects that still never have any involvement by registered design professionals. Many of these projects utilize designs developed by contractors or dock builder/manufacturers. Often, building permits and inspections by building officials are not required on marina projects. If inspection is required, the inspectors often do not know what to inspect. They have no code requirements to enforce. Insurance companies are insuring marinas without knowing the standards of the design used. Lending institutions, likewise, know little of the design or the performance potential of marinas.

Environmental and resource agencies have, in the past, reviewed marina permit applications with little concern for navigation, boater safety, economic feasibility, or public access to the water. The location, design, construction and operation of marina facilities is now being determined by agencies that have greater knowledge about, and positive concern for, marinas.

The remainder of this Chapter is intended as a preliminary introduction to marina planning and design concepts related to significant storm events. This information shall be useful for inexperienced design professionals, marine product manufactures, new or prospective marina owners and others who wish to become familiar with marina planning and design concepts. It is not a definitive design document, and the writers assume no responsibility for its use.

C. Basic Planning Considerations

- First: Hire a licensed design professional and require her /him to at least review and seal all drawings and specifications provided to you. If possible, let design professionals be involved in the permitting process.
- Second: Develop and commit in writing to a specific severe weather operation policy. The design professional should be requested to provide cost/benefit trade-offs during the decision process.
- Third: After receiving a written severe weather operations plan the marina design professional should use the best reasonably available technology and judgment to predict design loads that will actually be applied throughout the marina. The design return period on hurricanes should be balanced against the expected life of the marina, and compliance with local codes and ordinances. Keep in mind that codes are minimum design criteria and increased strength and reliability may be more economical in the long run.

The recommended design period for hurricanes (wind and tidal surge) is normally 50 years (2% probability, in any given year) and 25 years (4% probability in any given year) should be considered the absolute minimum design period. This is true even if the expected life of the offshore facilities is less than 25 years. Operation plans that assume boats will leave the marina are detrimental and unrealistic. Even if boat owners were willing to remove their boats, they may be unable to get to their boats or they may be prevented from moving their boats due to severe weather or channel obstructions. If they do move their boats, passing transients may dock in the empty slips.

- Fourth: In order to protect the public, government agencies have a responsibility to set minimum hurricane planning and design criteria and to require the involvement of licensed professionals in marina design. The marina design professional should exhaust this source in his quest for applicable design data.
- Fifth: Dock manufacturers' literature is developed to assist in marketing docks. Claims about performance during past hurricanes can be misleading. Marinas are extremely site specific. Do not rely completely on dock manufacturers' literature, especially those that promote standard designs for specific wave heights, wind loads, etc. Dock manufacturers and suppliers should be required to submit design calculations and documents showing that they comply with site-specific marina design requirements. The number of years in the dock manufacturing business, a history of performances in hurricanes and the service provided after the storm are important criteria to consider when selecting and specifying dock manufacturers.

D. Factors to be Addressed

Marina Siting: Select sites that offer protection from hurricanes.

Wind: Velocity, direction and duration are critically important in the design of dry stack facilities, and winds also apply forces to docked boats which translates into forces on docks and pilings and other anchor systems. Potential wind blown missiles include dock boxes, signs, dinghies, sheet metal panels from buildings, and all other unsecured loose objects. Navigation of vessels into or out of the marina or the use of marina equipment such as fork lifts may be severely restricted.

Waves: Height and period are important because they determine the force on the dock system as well as on the land/water interface (either bulkheaded or ripraped shoreline). Waves affect not only boats moving into, out of or within the marina but may restrict movement of personnel on docked vessels and prevent access to or from vessels on either fixed or floating docks or swing moorings.

Tides and Storm Surge: The combination of these provides the base elevation to which waves and required freeboard must be added. Begin with the level of high water (Mean Higher High Water, MHHW, is a good choice), and add the increased water level due to storm surge to get the basic starting water level. For example, a mean spring tide at Ocean City is +4.2 ft above Mean Low Water plus a 17-ft storm surge similar to that seen in Charleston during Hugo (1989) equates to +21.2 ft. For this extreme example a fixed, pile supported walkway or dock at an elevation of 21.2 ft would be level with the still water level and even 3.0 ft waves would create serious problems for individuals using the facility. In the case of a floating dock, the freeboard of the dock must be added to pile lengths just to keep the dock from floating away! The implications of the combined effects of tide and storm surge on landside facilities at the marina are obvious.

Currents: Currents have the same effect on boats and docks as the wind except that the force is applied to the portion of the boat below the waterline. Currents may vary in both velocity and magnitude due to changing tides. During severe storm events, currents may carry a significant amount of large debris, which adds additional impact forces to boats and docks when they are struck.

Soils: Soils must be tested by a licensed soils engineer to determine horizontal bearing capacity relative to the forces applied by wind forces on the boats and through the docks. One boring per 10,000 square feet of area may be sufficient but these must be taken in the vicinity of the piles offshore, not at an on-shore location chosen simply for convenience. For fixed pile supported walkways and docks, vertical bearing capacity is required along with the ability of the pile to withstand the buoyant forces of a totally submerged dock system. Soil borings must be deep enough to define the total strata that the piles penetrate, plus an additional 5 feet.

Access: Access is of concern during storms for those desiring to leave the marina or seeking shelter within it. Access will be hindered by high, gusty winds, large irregular waves, and possibly strong currents carrying much debris. Harbor entrance channel widths should be at least 100 ft and even using these criteria movement into or out of the marina may be prevented by other boats sinking in the channel. Bridges may remain closed and may be inoperable after the storm.

E. Basin Planning

Geometry: Because much of the wave energy striking a vertical bulkhead will be reflected, long parallel opposing bulkheads should be avoided. Round corners should be included along bulkheads and sloping banks protected with riprap or paving blocks should be used where possible to dissipate the wave energy.

Dredging Depth: Dredged depths should not be excessive. The excess dredged depth is expensive to dredge, disposal of the material is costly and the increased depth will raise the cost of anchoring the docks because piles will need to be longer (to support the docks) and larger in diameter (to withstand the additional bending moments).

F. Land Planning

Parking: Anticipate that all boat owners will be spending two or three hours on their boat 24 to 48 hours prior to the storm. One parking spot for each two wet slips for recreational boaters plus two parking spots for each commercial fishing vessel should be adequate unless local building codes dictate otherwise.

Pedestrian Access: Sidewalks, walkways, and gangways should be lit, above water and well marked should they become submerged due to storm surges. Walkways that are expected to become submerged should be well maintained and designed without steps or other obstacles that could pose a tripping hazard when hidden under water. Provide sturdy post on railings to mark the edge of the walkway and to provide handholds.

Ancillary Buildings: An ancillary building should comply with local building codes but should also be protected from impact damage due to flying and floating debris. "Floating debris" could include a 50-ft boat that has broken away from its moorings, a broken pile, or a piece of floating dock. Documents, equipment, and supplies needed immediately after the storm to provide security, minimize additional damage, and begin recovery should be secured in a safe, dry location. A well designed storm drain system, especially behind bulkheads and seawalls will minimize erosion or possible collapse when the storm withdraws. Buildings should be designed without canopies or wings, and tall trees should be located away from structures. Miscellaneous equipment such as ice machines, drink machines, etc. should be located in structures or in areas that will minimize their potential for wind and water damage. Facilities should be located at elevations higher than the expected tidal surge. Trailers should be secured with hurricane anchors.

Emergency Access: Emergency access lanes should be addressed when laying out the facility. These should be marked in accordance with local fire code requirements.

G. Channel Entrance & Wave Attenuation

Jetties and Breakwaters: These aids to navigation may provide sheltered water while entering or leaving the area of the marina but the level of protection they afford and even the survivability of the structure itself may be in question, depending on the severity of the storm. To be of value during a severe hurricane the riprap or armor stone must be of sufficient size to protect the structure from the increased design wave height incurred during the storm and the height of the structure must be sufficient to provide the desired wave attenuation. Consider possible overtopping during the storm surge in defining the height of the structure.

Wave Attenuation: Additional wave attenuation may be required within the marina to maintain an acceptable climate for boaters to move about on their boats in preparation for the storm, especially if long period waves can approach the marina from the open sea by passing straight through the entrance channel.

H. Inner Harbor Structures

Basin Perimeter: All basin perimeters must be designed for the selected storm recurrence interval. Bulkheads designed by a licensed structural engineer should withstand the oncoming storm as well as remain intact during the receding tide without excessive scour of the backfill behind the bulkhead, which could cause failure of tiebacks and subsequent failure of the entire structure. The inclusion of bulkhead returns and good drainage through filter cloth and weepholes will reduce scour. As previously mentioned, a sloping armored perimeter has several advantages, including reduced reflection of wave energy, but it also requires additional space within the marina and rough surfaces may pose a hazard to boats.

Fixed Docks: The fixed docks must be designed for vertical and horizontal forces. All fixed structures must be designed to withstand upward vertical forces caused by total submersion of the structure and any connected appurtenances. Fixed docks and pile-supported walkways should use split pile caps bolted with double dip galvanized hardware. Pile caps spiked onto piles will disconnect from the piles when submerged due to uplift forces caused by the buoyancy of the decking, stringers, etc. Dock boxes shaped like polystyrene tubs and securely attached to the fixed walkways will provide additional buoyancy and apply an upward force to either separate the walkway from the pile or pull the pile out of the ground. On fixed, pile supported structures, either a metal connector or adequate lap must be provided in butt and lap joints to prevent the joists from becoming dislodged from the joints. The beam joints should be staggered rather than locating all the joints in a line over the pile cap, which would then act like a hinge rather than a continuous beam. Connection hardware, such as cleats, must be adequately sized for the moored vessel and must be bolted through the dock using appropriately sized galvanized or stainless steel hardware.

Floating Docks: When floating docks are in the plans, they should be designed for full slip loading unless there are absolute assurances that the boats will be removed. The design must account for hurricane wind load and storm surge simultaneously with a Spring high tide. If the marina is adjacent to critical shipping lanes or vital installations that might be affected if

the floating docks are damaged or dislodged and boats sunk, serious consideration should be given to increasing the design storm recurrence interval. Commercial dock systems may perform better than locally built, contractor constructed docks. In addition, the owner should be aware that the manufactured systems may also lend themselves to easier repair and reinstallation. Ancillary equipment (utilities, dock boxes, etc.) should be integrated into dock systems that will make hurricane preparation and recovery easier (e.g. removable power pedestals, dock boxes, gangways, etc.). Since most failures occur due to pile failures, a licensed professional should assure that the piles are of adequate diameter, have adequate penetration and are of adequate height to account for the high tide, storm surge, wave heights, and adequate freeboard for the dock. Connection hardware sized adequately for the moored vessel and bolted completely through the dock with galvanized or stainless steel hardware is essential.

Moorings: If open moorings are used, both bow and stern moorings should be installed to keep boats properly oriented, reduce swing and provide an additional factor of safety. Proper inspection and preventive maintenance of swing moorings may be more difficult than for fixed or floating docks, but is absolutely essential.

Gangways: High wind loads can make gangways fly horizontally and flap in the wind. The hinge connection on the gangway undergoes torsion and the gangway is subjected to racking forces. Unless gangways are disconnected, the waterside end may be forced above the floating docks and utilities trapped between the dock and the gangway. Utilities should be nested securely under the gangway with a loose loop connection at the bottom to allow movement where the gangway meets the floating dock. The floating dock may be crushed as well but increasing the dock offset may alleviate dock damage.

The gangway hinge should allow for torque from twisting and racking by the gangway during the storm. A better solution might be to put quick disconnect couplings on the utilities and the gangway and remove the gangways just before the storm arrives.

Dry Stack Facilities: The dry stack facilities must withstand the extreme wind forces exerted on the large but lightweight structure. Tremendous uplift forces are applied to the foundation. Failures begin as the metal skin on the sides and roof peel away leaving the remainder of the structure and the racks to independently withstand the wind loads. Special attention should be paid to uplift forces on the roof structure. Rack supported roof structures may require additional design analysis.

Launch Facilities: Launch facilities may become overburdened with boaters attempting to remove their boats during the inclement weather preceding the hurricane. The inclement weather may require extra time for tie downs and boaters may be shorthanded due to limited time available to get help before the impending storm. Therefore, extra staging areas may be required due to additional loading time. Marine travel lifts may also keep the launch ramp busy, and the inclement weather will hinder travel lift and forklift operations. Assume that all operations will be at about one-half normal speed during the period of inclement weather before the storm.

I. Marina Systems

Fueling: Fuel pumps should be installed above the high tide plus storm surge elevation for the selected design storm and fuel tanks must be counter weighted sufficiently so that they will not rise if they become both empty and completely submerged in saturated soil.

Sanitary System: Landside sanitary holding tanks must be designed and counter weighted so they will not float when empty and completely submerged. The cover should be bolted down during the storm to prevent escape of the sewage.

Electric and Communications: Transformers and utilities on floating docks will be destroyed when the docks are lost and associated items such as power pedestals, gas pumps, lights, pump-outs, dock boxes, etc. will also be damaged and lost. Transformers should be located on land whenever possible and the other items should be removed and stowed. Radio antennas should be designed to withstand the maximum wind velocities expected.

Hazardous Waste: Waste oil, antifreeze, and other hazardous waste should be designed to meet the local, state, and federal requirements. Storage areas should be designed to be above the floodplain.

Other Systems: Trash and Debris containers such as dumpsters should be well anchored and secured to prevent them from floating away and becoming hazards. They will be needed immediately after the storm.

J. Useful Tips

The following comments come from a variety of sources over several years. They are but some of the numerous factors that are considered in marina design.

- ❑ Dock assemblies are usually connected with halted semi-rigid joints to act as a continuous beam or are hinged to allow flexibility. Hinges between docks experience damage because motions or forces are applied for which they were not designed.
- ❑ Be alert for new materials that offer improved resistance to hurricanes or can be easily repaired.
- ❑ All hardware in the marina environment should be hot dip galvanized or stainless steel.
- ❑ All piles must be chemically treated or be naturally resistant to decay and marine borers, such as the tree Greenheart (*Nectandra rodioei*). Piles should be inspected at six-month intervals for decay or rot, cracking or splitting, or wasting away by infestation by marine borers.
- ❑ Docking systems should be designed with a balanced approach. This does not preclude designing selected parts to a lower level of strength, allowing certain portions to be sacrificed to prevent total loss of the system.

- When designing fixed, pile supported walkways, the decking should be designed to fail before the handrail fails. The deck structure and piles should be designed to fully withstand the wind, external impact, and uplift forces of the storm.
- A failed pile can cause an entire system to collapse. Design piles for the most extreme event.
- When rebuilding after a hurricane, do not merely replace failed parts and pieces but upgrade piles and other selected structures so that similar failures are prevented or minimized in the next storm.
- If the entire marina cannot be designed to hold the boats during a hurricane, design a portion of the marina to withstand the storm.
- Hurricane protection is a combination of design and operation. What is not covered by design should be covered by the marina operation, evacuation, and recovery plans.
- Whatever is not covered by design must be covered by insurance or it is at risk.
- Keep copies of marina permits, design drawings, and shop drawings in a secure, watertight location.
- Floating breakwaters and wave attenuators are ineffective for wave periods longer than approximately 4.0 seconds.
- Repairability of docks should be a design consideration.
- Small cracks in bulkheads that allow backfill material to escape when overwashed should be repaired using engineering fabric or other techniques, and kept in good condition.

Summary

Some marina failures are inevitable due to the exposure and the dynamic nature of the marina environment. Most observed failures, however, result from inattention to design details, poor layout or marina planning, lack of maintenance, shoddy product manufacture, lack of understanding of what a marina is and who it serves or underestimation of storm effects. A true cost-benefit analysis should be made of all marina components and attractive, low, first cost products scrutinized as to their suitability for the intended use and environment. When considering marina survivability during a hurricane or similar severe storm events, the aforementioned effects are magnified considerably.

Recognition

This chapter was developed in conjunction with information published by Jeff Bliemel, Coastal Engineer, in the *Maryland Guidebook for Marina Owners and Operators on Hurricane and Severe Weather Preparedness*.

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

SECTION III

Marina Policy

Marina Management Issues Regarding Hurricane Preparedness

Summarized here are marina liability and economic issues of concern to national industry management. The intention of this section is to bring attention to the issue. More on how to address the issue is contained in subsequent sections of this manual.

- ❑ **Economic Incentives:** Developing and implementing a marina hurricane preparedness plan can require a significant investment of time, money, and effort. Return on the investment may be expected in the form of reduced facility damage, reduced business interruption, and reduced insurance costs. The real question being: “Is the cost of doing nothing affordable?” Doing nothing can mean increased risk of liability litigation for renter losses due to inadequate preparation, increased marina damage due to inadequate preparedness, and potential fines and civil penalties, plus clean-up cost for oil, sewage or other pollutants as a result of inadequate preparedness.
- ❑ **Legal Review:** A version of marina hurricane plans should be written for and distributed to wet slip and dry storage customers. It is advisable to have an attorney review the draft, which should then become an attachment to the marina rental contract.
- ❑ **Marina Insurance Considerations:** Marina insurance is normally underwritten with consideration to fire, casualty, liability, and associated hazards. Be aware that storm and flood damage is usually considered, but not as well defined and, in general, depends on the marina location and local topography. The normal insurance coverage for fire, casualty, liability, etc. is available from many underwriters who may or may not provide flood or wave damage insurance. Insurance coverage for damage associated with high winds and flooding may be only partially incorporated within flood insurance. Your insurance agent should be consulted to ascertain that coverage is adequate. Business interruption insurance should be considered when developing your insurance program. The marina insurance agent should want to review your hurricane plans. The agency’s company risk management program may have useful advice to add. The fact that you have a well thought out plan attests to good management and the marina that is managed to survive a storm is likely to survive other hazards.
- ❑ **Boat Owner Insurance:** The rental contract should require each tenant to have a comprehensive yacht insurance policy. This will allow timely salvage operations and will minimize potential for claims against the marina for damage to the boat or to damages caused by one boat to another. (The rental contract should specify that a boat owner is responsible for the damages his boat inflicts on another boat or to marina property – *if he fails to take prudent efforts to properly secure the boat for the storm*).

- **Hold Harmless Agreement:** The rental contract should include a provision holding the marina harmless for accidental damage caused when the marina takes prudent emergency action before or during a storm and for salvage work done by the marina or salvage contractors. The agreement can not cover intentional sinking, setting a boat adrift, or any other acts by the marina that clearly increase likelihood of damage.
- **Typical “Hold Harmless” Clause:** Notwithstanding any other provisions of this contract, (renter) agrees to hold harmless (marina), its officers, members and employees, for accidental damages occurring during, or resulting from, actions taken while conducting storm preparation and salvage operations. Emergency storm preparations and salvage operations include any activity which (marina), harbormaster or officers deem necessary to protect persons from injury or property from damage, other than intentional acts that clearly increase the potential for damage to (renter’s) boat.
- **Avoid "Bailment":** A bailment is a legal relationship between persons arising when one delivers personal property to another in trust for specific purpose with the understanding the property is to be returned or otherwise properly accounted for.
- **Mandatory Wet Slip Evacuation:** Both boats and the marina will suffer less damage if boats are not left tied to docks during a hurricane. However, lessons learned from hurricane disasters in other states clearly indicate that mandatory evacuation requirements can lead to human safety issues and liability to the marina. Consensus is to make it clear to boat owners that their boats will have a better chance at survival if evacuated and give them information and assistance to encourage the decision to voluntarily evacuate. Remind renters of their interest in avoiding damage to the marina that could affect the availability of a place to dock and the future cost of slip rentals. In some cases, local boat relocation plans have been developed and areas of storm refuges or Harbors of Refuge have been identified. Storm refuges are also identified in waterway guides, sailing directions and other publications.
- **Dry Stack Evacuation:** The marina rental contract should clearly state that evacuation by trailer is preferable. Hurricane history indicates that unloaded racks systems will fare better. Again, make it clear to owners that their boats will have a better chance at survival if evacuated. Give them information and assistance to encourage the decision to voluntarily evacuate. Some dry stack operators feel that if boats are left in the racks they should be tied down. There is no consensus here and whether or not tying down is preferable depends on many factors, such as rack design if the system is closed, and if manpower is available. If boats are tied or otherwise secured, the rental agreement must define the time at which trailer loading will cease in order to complete the process.
- **Marina Obligations In Securing Boats:** What the marina will and will not do to prepare or secure a boat for a hurricane must be clearly spelled out in the rental contract. Clearly is a key word – any gray areas in a contract will work against you.
- **Boat Owner Emergency Plans:** Rental contracts should require information to be kept current in the form of a “hurricane readiness questionnaire” clause. *Refer to Appendix B for an example*

of a Boat Owners Hurricane Questionnaire. The worksheet outlines storm preparation requirements by the marina and how the boat owner plans to comply, including absentee owner provisions, allowance to move, contact list, removal of gear from the boat or dock box, etc. It will define the boat owner's commitment to the marina plan.

- ❑ **Command System:** The marina Hurricane Preparation Plan must state who declares preparation, who is in charge and who does what and when. The notification mechanism must be defined. The Hurricane Preparation Plan should become rental contract attachment.
- ❑ **Safety Consideration:** Throughout the hurricane plan, in the rental contract and other related correspondence, safety of employees and boat owners should be stressed as being the overriding consideration in hurricane preparation and decision making.



Stacked recreational fishing boats along Ocean Avenue at Wantagh, Long Island, New York.

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

SECTION IV

Initial Marina Management Planning for Hurricanes

The initial planning phase must occur prior to hurricane threat – preferably well before hurricane season. Preparing a marina for an approaching hurricane is a formidable task and will be performed under duress – not a time for last minute planing. These are advance-planning steps:

A. Evaluate the Marina Protective Characteristics and Damage Potential

The following are facility and location characteristics to consider when developing your individual hurricane preparedness plan:

- Determine marina elevation above sea level.
- Determine possible direction and size of waves, and wind exposure.
- Determine predicted surge levels (Storm Surge Inundation Zones from the Sea, Lake, Overland Surge from Hurricanes or SLOSH models).
- Determine potential flooding from upland .
- What are potential storm effects on the marina? Predict potential protected areas.
- Determine the availability of “hurricane holes” or “Harbors of Refuge,” plus distance, protection of route, and estimated anchorage capacity.
- Assess adjacent upland damage potential; consider structures, utility corridors, topography, vegetation, etc.
- Assess structural aspects of and damage potential to docks and piers: piling size and type, type of docks and direction of slips, wood or concrete, cleat sizes and strength, berth layout, seawall protection, etc.
- Assess bottom characteristics, depths, and estimates of holding capacities.
- Assess structural aspects of and damage potential to buildings, including dry racks.
- Assess shut off and/or disconnect mechanisms for utilities (overhead lines, exposed water, electrical and fuel lines to docks).
- Finally, determine how safe the location is for marina employees and customers, the location of the nearest shelter and the evacuation route.

B. Evaluate the Marina Fleet

What can you expect in terms of storm readiness of individual vessels and how might the marina be impacted if all or part of the fleet is left tied to the docks during a hurricane. Much of this information must be obtained via a boat owner questionnaire. *Refer to Appendix B for an example of a Boat Owners Hurricane Questionnaire.*

- Estimate rental occupancy during hurricane season.
- Estimate potential transient traffic expected.
- Assess potential missile debris.

- ❑ Estimate number of boats from other local marinas or docks.
- ❑ Inventory occupant types - power or sail, number, size, etc.
- ❑ Identify boats with local and absentee owners.
- ❑ Evaluate evacuation and anchoring capability of each vessel.
- ❑ Identify vessels that may be hauled, either at the marina or elsewhere.
- ❑ Determine which boats may not evacuate.
- ❑ Identify dry storage boats that will evacuate via trailers.
- ❑ Identify windage or other problems for each vessel, should it be left in the marina.

C. Evaluate and Define the Marina Employee Instruction Program

Marina employees will ultimately carry out the majority of the Hurricane Preparation Plan. To do so effectively and safely they must be well informed and well trained. Keep in mind that they have families and personal property to prepare also. Employees require the following items of instruction:

- ❑ Develop a written Hurricane Preparation Plan tailored to the marina and communicate the plan.
- ❑ Describe exactly what is expected in case of a hurricane threat (reporting and attendance requirements – before, during, and after the storm, storm duties, marina personnel evacuation procedures, allowances for preparing family and home, etc.). This should be in the marina employee handbook.
- ❑ Specify the chain of command.
- ❑ Outline timetables for storm preparation and cleanup.
- ❑ Provide specific training for assigned storm preparation duties, e.g. securing dry rack or wet slip boats, office equipment and equipment, etc.
- ❑ Provide associated emergency training, e.g., CPR, fuel spill, fire, etc.

D. Define Boat Owner Contract Requirements and an Instruction Program

An effective marina Hurricane Preparation Plan requires compliance by boat owner and effort on his part. The task will go smoother if the boat owner accepts the plan. The manner and how well the plan is conveyed are critical in encouraging voluntary evacuation.

- ❑ Communicate legal requirements in the rental contract (these are items required of every renter for the safety of the marina, personnel, and other vessels), such as:
 - ❑ Wet slip and dry storage evacuation policies
 - ❑ Management rights and responsibilities to board, move, or to secure vessels
 - ❑ Liability insurance coverage requirements
 - ❑ Boat owner responsibility for damage done by his boat to marina property and other boats (if prudent effort is not taken to prevent that damage from occurring)
 - ❑ Boat owner responsibility regarding removal of sunken boats and environmental damage
- ❑ Attach, as a clause, the Hurricane Preparation Plan to the rental contract.
- ❑ Also, attach the Marina Rules & Regulations, which generally describes potentially variable requirements, such as preparation services available and rates for absentee owner storm preparations.

- ❑ Communicate the Hurricane Preparation Plan and begin actual preparation via mailings and seminars.
- ❑ Provide checklists and hints for securing boats – dockside, at anchor, and ashore.
- ❑ Plan best slip and rack reassignments for hurricanes and communicate those assignments.

E. Evaluate Your Current Hurricane Preparedness Plans

Establish a Hurricane Preparedness Plan review schedule. Make plan revisions to include new procedures or equipment that makes the plan better and more complete. The best way to evaluate your plan is to test it. Dry rack tie-down practice sessions, for example, will provide information on time and number of people required, who is and isn't capable of working at heights and proficient with knots and equipment used. Wet slip evacuations may be tested by a simulated evacuation in the form of a marina sponsored "Hurricane Preparation Party". The party activity should include a "how to" anchoring clinic, followed by wet slip boats cruising to local hurricane holes to practice anchoring. This effort will make customers more comfortable with the skills and equipment required in evacuation and will effectively encourage voluntary evacuation.

F. Prepare a Hurricane Preparedness Kit

The materials and equipment needed to prepare the marina for a hurricane should be purchased prior to hurricane season. Establish a secure location(s) for the "kit," determine which employees will have access to the kit and require those employees to provide management with a kit inventory report at specified intervals during the season. Some items may be kept as marina retail inventory – at emergency supply quantities. *[Refer to Appendix A for an example of a typical hurricane preparedness kit inventory checklist].*

G. Conduct a Full Facility Housekeeping

Conduct a full facility housekeeping and "field day" or "field-week" operation annually. Sometime in the spring or just prior to the hurricane season inspect and clean up all open areas and structures within your facility. This should include, but is not limited to, the following:

- ❑ Remove all debris, trash and unnecessary items from open areas.
- ❑ Trim all trees and shrubs and dispose of cuttings.
- ❑ Secure all trash bins and dumpsters in protected service areas.
- ❑ Store or otherwise secure all materials and supplies. Move them inside or to protected areas if possible.
- ❑ Dispose of or secure all salvaged or abandoned hulls, equipment and pails.
- ❑ Inspect and service as necessary all building walls, roofs, windows and doors.
- ❑ Inspect, service and/or repair as necessary all docks, piers, wharfingers or stepfingers and pilings.
- ❑ Inspect and service as necessary all electrical and lighting installations, all fuel and natural gas supply and dispensing equipment.
- ❑ Inspect and have serviced as necessary all fire fighting equipment both portable and fixed installations. Consider having fire-extinguishing equipment serviced by a professional service just prior to hurricane season and inspected by facility personnel on a monthly basis thereafter.

- ❑ Inspect and service as necessary all lifesaving equipment such as life jackets, work vests, life rings and lines, life rafts or rescue vessels.
- ❑ Check first aid supplies and replenish.
- ❑ Check all dry storage areas and racks for soundness and security. Note protection afforded same and consider associated hazards and risk of contents.
- ❑ Inspect and service all hauling equipment such as mobile lifts, hydro-lifts and railways.



A sea of masts at Seattle Marina - Seattle, Washington.

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

SECTION V

Marina Hurricane Preparedness Plan – An Example

HURRICANE PREPAREDNESS PLAN

For

HURRICANE'S EYE MARINA

(Distribution: marina personnel, boat owners and volunteers)

January 2002

A. Introductory Comments

The order of priority when preparing Hurricane's Eye Marina for a hurricane is (1) Protect human life, (2) Seek to prevent or minimize personal injury, (3) Reduce the exposure of property to damage, (4) Minimize damage to property that cannot be relocated and (5) Seek to restore normal operations as quickly as possible. Having a workable plan in advance and being able to implement the plan in a timely and effective manner is the key ingredient in achieving these prioritized goals.

The most dangerous and most critical task is securing boats, which may move about and damage the marina and other boats. The marina is not a viable sanctuary for boats of any type during a direct hurricane hit. Experience has proven that marina docks and boats are most likely to survive a hurricane if all boats are evacuated. The wet slips and dry racks are not designed to accommodate boats during heavy winds and/or storm surge. These elements tend to push and pound boats against pilings, docks, and other vessels. The floating docks may rise over the tops of piling and become adrift. Dry racked boats are in danger of being moved by wind or being lifted into racks above with tide surge. Increased weight of water-filled boats could collapse the rack system. The management of Hurricane's Eye Marina strongly encourages early evacuation of all boats in wet slips and dry storage to a previously identified safe haven.

Of course, circumstances may prevent evacuation of some boats. This plan, in addition to describing evacuation procedures, outlines best practices for securing boats in the marina. The plan also describes procedures for communicating and carrying out hurricane response for all other aspects of the marina – before, during, and after the storm.

[Note: This section is an example Hurricane Preparedness Plan for a generic marina. It is your responsibility to tailor this plan to your own marina by deleting or adding information or procedures as appropriate to your site and operation. For example, consider the timing of task actions – those in this example may not conform to your operation. Be aware that this is only an example, a guideline - as such it is not all-inclusive - some elements needed for your plan may be incomplete or missing. Refer to other sections of this publication and to Selected References (Section VIII) for more information.]

Once you have developed your own draft plan, have it reviewed by your attorney. Then, print final draft copies and distribute to marina employees and boat owners. Don't expect the plan to be learned and accepted without training sessions for everyone involved. Don't expect the plan to be good forever. Review it on a regular basis - especially after training sessions and after implementing the plan as response to a hurricane threat. You will continually learn better ways from your own experience and from the experiences of others in the marina business[.]

Preparing for a hurricane successfully depends on how early and how orderly we all act - although chances may be great that the storm will not hit us. Remember - wet slips must be evacuated, boats anchored, and crews returned ashore in time to prepare and possibly to evacuate their homes. This plan calls for tying down boats left in the open dry rack buildings. The tie down operation requires 4 teams of two at least six hours for completion - which has to be done prior to darkness, rainfall or high winds. We must be well into preparation procedures during the U.S. Weather Service Hurricane WATCH Phase. All boats must be secured by the time a hurricane WARNING is issued, our actions must occur as much as 24 to 36 hours prior to an Emergency Management Agency call to evacuate the area and at least 24 hours prior to storm landfall.

Previous storms have taught us that dry rack boat tie-downs, especially, must begin soon and be completed methodically. Trailering or moving boats to wash racks for securing of contents must be terminated early in the "watch" phase to allow marina personnel to secure the facility and evacuate the area. Marina management will conduct an annual survey of all dry storage customers to assess how many own trailers and whether they would evacuate prior to the hurricane watch phase. Marina personnel only will conduct tie-down. Boat owners must understand that boats will not be untied once secured.

Early action depends, of course, on early storm threat notice. Marina personnel and boat owners are encouraged to be aware of tropical weather conditions and to immediately report any storm news to their supervisors.

This Hurricane Preparedness Plan outlines the procedures Hurricane's Eye Marina will follow throughout hurricane season and during hurricane watches, warnings, as well as during and after a hurricane. Marina customers are contractually required to be familiar with this plan (as well as the marina rental contract and marina regulations).

Timetables for implementing the various stages of the plan will depend on the storm's forward speed/direction, probability of a storm hit, and the expected intensity of the storm. We will, of course, coordinate our timetables with those of the local Emergency Management Agency.

Be aware that these Hurricane Preparedness Plans may work only for lower category hurricanes. Certainly, a Category II or stronger storm at this location will result in major damage to the boats and marina facilities. We prepare in order to limit the damage or in hopes of a "near miss." For a major storm our efforts may or may not be adequate - but the job must be done quickly in order for all personnel to evacuate to safety. Remember - to attempt to secure boats while under storm influences is at the risk of the lives of marina personnel, boat owners, and volunteers. An approaching hurricane is a potential killer - the inconveniences of early action are a small price to pay for safety.



Recreational fishing boats home port at the Sportsplex Marina - Port Aransas, Texas.

B. Hurricane Information

Marina employees and boat owners should take the time to learn about hurricanes. Storm formation, the history of hurricanes and hurricane preparation is a fascinating subject. An in depth understanding will not only make you more valuable to the marina and boat preparation efforts - but may save the lives of you and your family. There are many good hurricane references available for you to check out at the Marina office.

[Note: There is a vast amount of information marina managers may include at this point in their own Hurricane Preparedness Plan. Other sections of this publication contain general information you may want to present to your employees and customers. Also, refer to Section VIII for selected hurricane references].

C. Summary of Hurricane’s Eye Marina Hurricane Preparedness Plan

[Note: numbering of conditions may be found to be unfeasible because of the necessity for marinas to act on an earlier timetable to complete preparations prior to weather deterioration, bridge closings and non-business related evacuation requirements. Remember that these time frames are based on landfall of the hurricane EYE. Storm conditions will affect your preparation well in advance of eye landfall.]

Condition	Activities
<u>Preseason</u>	Review and revise plans, lists, and inventories. Generate customer awareness and conduct employee training.
<u>Condition 5</u> Season Starts (June 1)	Normal operation. Monitor weather and continue hurricane awareness – ensure all parties have updated plans.
<u>Condition 4</u> Storm in Vicinity	A storm has developed and could pose a threat to coast. Assemble Leaders of the Hurricane Response Team to evaluate threat and review Hurricane Plan.
<u>Condition 3</u> 72 – 48 Hours to Landfall by the Hurricane Eye	A storm is threatening. Activate the full Hurricane Response Team. Begin implementation of Hurricane Preparedness Plan.
<u>Condition 2</u> 48-36 Hours to Landfall by the Hurricane Eye	A hurricane may strike within 36-48 hours. Complete securing of marina and boats. Hurricane WATCH has been issued by the National Hurricane Center and the County Emergency Management Agency probably recommends voluntary evacuation of islands and other low-lying areas. Determine marina closing and employee evacuation schedule. Establish limited entry.

<u>Condition 1</u> 24 Hours to Landfall by the Hurricane Eye	High probability of strike. Hurricane WARNING has been issued by the National Hurricane Center. Evacuation should be completed.
<u>Condition 0</u> Hurricane Conditions	Winds and flooding could stop further evacuation efforts. Hurricane Response Team maintains communication if possible.
<u>After the Storm</u> Return and Recovery	Reestablish communications. Conduct search, rescue, damage assessment, salvage, and cleanup.

D. The Hurricane Response Team

Marina management recruits the Hurricane Response Team (HRT). This team is involved in all phases of hurricane preparation at the marina and is recruited by Marina management. The purpose of the team is to help develop and implement the marina Hurricane Preparedness Plan, thereby maximizing human safety, while minimizing damage to the marina and boats. The HRT includes marina employees, boat owners and other volunteers. HRT members, representing both marina and boat interests are in the best position to help educate other employees and boat owners – resulting in maximum acceptance and compliance with the plan. The Hurricane Preparedness Plan is premised on full cooperation of all employees and marina customers to act according to the plan.

Hurricane Response Team Leadership:

1. Marina Manager/Owner - HRT Chairman
2. Marina Secretary - Communications Coordinator
3. Office Manager
4. Dry Storage Manager
5. Wet Slip Manager
6. Ship's Store Manager
7. Restaurant Manager
8. Repair Service Manager
9. Hurricane's Eye Boat Club Commodore
10. Two Boat Owners Each from Wet Slips and Dry Racks.

[Note: These are examples of job categories, etc. - use exact titles and employee names in your marina's management structure. You may have additional marina personnel, such as night security guards, tenants, or contractors who should be included in this process. Consider including neighboring businesses, fire and police departments, and entities of the local community, as appropriate, in the marina HRT.]

E. Hurricane's Eye Marina Management Policy Regarding Hurricane Preparation

[Note: These are marina liability issues of concern to industry management nationally. Consider incorporating these policies into your marina employee handbook, customer rental contract, marina regulations and/or your hurricane plans as appropriate.]

Marina Employees

Hurricane Response Team membership includes all marina employees. Unless instructed otherwise, marina employees will answer to the appropriate supervisor listed above during hurricane response.

There will be no excused absences once the marina is in Hurricane Condition III (a storm is in the vicinity). It is uncertain how long crewmembers will be required to be on duty during storm preparation. Therefore, at first notice of a storm there will be staggered relief shifts to allow each person time to go home to prepare their homes and families. This will be done well in advance of anticipated storm effects (as much as 2-3 days in advance).

Each employee must have a plan prepared for his/her personal preparation and evacuation in order to effectively reduce his/her required leave time, so other crewmembers can have adequate leave time. The marina manager will schedule leave time, with team leaders going first, in order to return to preparations as soon as possible. Each employee is strongly advised to attend Hurricane Preparedness Clinics given by the marina manager or his/her designee.

Marina Responsibility

The marina is not responsible for damage to any boat from storms or any other act of God. In the event that a boat is likely to cause bodily harm, loss of life, or damage to property; for example, on fire or sinking, the marina reserves the right to take any prudent action necessary to ensure the safety of its customers, employees or property. Any costs incurred in doing so will be charged to the boat owner.

Hold Harmless Agreement

The boat owner holds the marina harmless for accidental damage caused when the marina takes prudent emergency action before or during a storm and for salvage work done by the marina or salvage contractors. Emergency storm preparations and salvage operations include any activity which marina management deems necessary to protect persons from injury or property from damage, other than intentional acts that clearly increase the potential for damage to the renter's boat.

Boat Insurance

To be eligible for storage at the marina, boat owners must provide proof of a comprehensive boat insurance policy. This will allow timely salvage operations and will cover damage to the boat or to damages caused by one boat to another. The rental contract specifies that a boat owner is responsible for the damages his boat inflicts on another boat or to marina property – *if he fails to take prudent efforts to properly secure the boat for the storm.*

Wet Slip Evacuation is Strongly Advised

Both boats and the marina will suffer less damage if boats are not left tied to docks during a hurricane. However, lessons learned from hurricane disasters in other states clearly indicate that mandatory evacuation is nearly impossible to conduct. Also, mandatory evacuation requirements can lead to human safety issues. The marina wishes to make it clear to boat owners that their boats will have a better chance at survival if evacuated. Remember that it is in everyone's best interest to avoid damage to the marina - damage to the marina could affect the availability of a place to dock and the future cost of slip rentals.

Notice to evacuate wet slip boats will be the decision of the Hurricane Response Team according to guidelines in this Hurricane Preparedness Plan. The marina manager will issue the call to evacuate. The marina will not evacuate boats unless that becomes the prudent and necessary safety action. Evacuation is not mandatory, but strongly advised. Evacuation must be done early enough to allow wet slip boat owners time to safely and properly anchor their boats and to return.

We hope to provide information and assistance to encourage the decision to voluntarily evacuate. Marina management will work to increase the boat owner's knowledge and comfort level for evacuating. In addition to sponsoring evacuation and anchoring clinics, through the Hurricane Response Team, return shuttle boats from local anchorages will be provided.

Dry Stack Evacuation is Strongly Advised

Evacuation of the dry racks by trailer is the safest course of action for your boat. Hurricane history indicates that unloaded racks systems will fare better. Marina management feels that if boats are left in the racks at Hurricane's Eye Marina, they should be tied down – although conditions or circumstances may prevent doing so. Marina personnel only will conduct tie-down, however, the marina assumes no obligations in tying or otherwise securing dry rack boats. This is a time consuming and dangerous task. Any attempt to tie down boats must be completed before foul weather. Boat owners must be aware that, there will be an announced cut off time after which loading on trailers will cease in order to complete the tie down process.

Boat Owner Emergency Plans

The rental contract requires information to be kept current in the form of a "Boat Owner's Hurricane Readiness Questionnaire." This questionnaire outlines storm preparation requirements by the marina and how the boat owner plans to comply, including absentee owner provisions, allowance to move, contact list, removal of gear from the boat or dock box, etc. It defines the boat owner's commitment to the marina plan.

Boat Handling Ceases When Winds Reach Sustained Speed of 25 Knots

Launching, recovering, or otherwise handling a boat is unsafe when wind speed reaches 25 knots. Forklift, elevator and crane operations will cease at that time.

Command and Notification System

Marina management will assemble a Hurricane Response Team as an advisory panel to assist in improving the hurricane plans. The group will assist in implementing the plan during a storm threat. The marina manager makes the final decision on all policy and procedure recommended by the HRT. Notification of policy is in three forms: (1) the annual Rental Contract, (2) posted Marina Regulations, and (3) this Hurricane Preparedness plan. Notification of changes will occur by mail, 30 days prior to implementing change.

Safety Consideration

The overriding consideration in hurricane preparation and decision making in the marina Hurricane Preparedness Plan is the safety of employees and boat owners. Preventing damage to property is secondary to human safety.

F. Hurricane's Eye Marina Hurricane Plan – Preseason

[Note: From this point, for each "Condition," specific duties are outlined for management, the Hurricane Response Team, the Communications Coordinator, wet slip boat owners, dry storage boat owners, and the various areas of marina operations. The areas of marina operations included as examples here are marina office, dry storage, wet slips, service shop, and ships store. Your marina may have restaurants or similar owned or leased businesses on site. Specific plans will have to be developed for each, but much of what is outlined for the marina office, ships store and service shop should be applicable.]

During "Preseason," prior to June 1, when hurricane season begins each year, there is no hurricane threat. This is the time to review the marina Hurricane Preparedness Plan and update or revise it as necessary. Hurricane awareness and "How To" boat preparation clinics will be conducted for our customers. The marina crew will receive hurricane training. The marina will be inspected and housekeeping and maintenance will be done with storm readiness in mind.

Responsibilities in Preseason are:

Marina Manager

- Reassess marina emergency procedures policy.
- Review the marina rental agreement to ensure clarity of renter liability for property damage and personal injury. Specify that vessel owners will be billed for services and materials necessary for preparation, response, and recovery.
- Contact the County Emergency Management Director and _____ each spring to review:
 - Overall disaster plan
 - Emergency assistance communications
 - Wet slips evacuation concerns, considering such factors as severe weather drawbridge policy, boat evacuation routes, safe harbors, etc.
 - Regional map of the marina's location with respect to storm surge, flood plain, wind damage potential, evacuation routes, and bridge locations
- Review and update the detailed map of the marina showing locations of utility equipment and power shutoff points, sources of auxiliary power, potential hazard areas such as from fallen objects, trees, poles, etc.; emergency equipment and supplies, communication equipment, first aid stations and escape routes.
- Identify items for evacuation in each department of the marina (Department managers to develop check lists).
- Review and revise Hurricane Preparedness Plan as necessary.
- Review membership of the HRT and fill any vacancies.
- Remind boat owners of responsibilities during hurricane season (letter prior to June 1).
- Hold Hurricane Preparedness Plan training to include personal and family safety for marina personnel, HRT, and volunteers.
- Emphasize cross training. Each person will have tasks as assigned in their own work area, but must be prepared to assist elsewhere when necessary.
- Supervise /inspect all areas of the marina for pre-hurricane season safety, housekeeping, repair and maintenance. Correct problems immediately! *(Suggest developing an inspection checklist).*
- Verify with insurance agent that marina is adequately insured, particularly for wind and water damage. Keep current photographs of marina facilities on file and ensure that any

applicable specifications required by the insurance policy (the fine print) have been met. Have this confirmed in writing.

- Review listings for repair and salvage companies. Pre-qualify companies with references, proof of insurance, performance bonds and releases.

Hurricane Response Team

- Review Hurricane Preparedness Plan (as revised for current year).
- Assist Marina manager with marina housekeeping, repair, and maintenance inspection program.
- Update hurricane contact lists and distribute among HRT:
 - Agency and storm forecast emergency numbers
 - Marina Employees, wet slip and dry rack customers (See Communications Coordinator)
 - Materials and service vendors and contractors.

Communications Coordinator

- Organize and train a communications team. Include the Store Manager on this team. Be aware that communications is the key element in successfully carrying out the Hurricane Preparedness Plan. The communications team has the responsibility to make equipment available and to make certain that communication takes place between marina management, the HRT, the various marina departments and boat owners.
- Plan a communication system with boat owners, including name, address, and telephone number of designated caretaker in the event they are out of town during hurricane season.
- Update employee emergency contact list.
- Post and maintain a phone number list to include: Emergency Management Agency, insurance agent, pre-qualified repair and salvage companies, utility companies, fire department, police and Marine Patrol, rescue service, hospital, and employees
- Inventory marina handheld radios and weather alert radios.

Dry Storage Boat Owners

- Submit or update your “Boat Owner’s Hurricane Readiness Questionnaire” on file at the Marina Operations [*Refer to Questionnaire at Appendix B*].
- Review your boat liability insurance policy. The boat owner can be liable for damages caused by his boat.

Wet Slip Boat Owners

- Submit or update your “Boat Owner’s Hurricane Readiness Questionnaire” on file at the Marina Operations [*Refer to Questionnaire at Appendix B*].
- Review your boat liability insurance policy. The boat owner can be liable for damages caused by his boat.

Marina Operations – Office

- Conduct pre-hurricane season housekeeping (*Suggest developing an inspection checklist*).
- Obtain transportation (rental trucks, trailers, etc.) for evacuating marina materials and equipment for each department. Develop a listing of rental agencies to call.
- Obtain off-site rental storage if necessary.

Marina Operations – Dry Storage Manager

- ❑ Conduct pre-hurricane season housekeeping, repair and maintenance of dry storage facility.
- ❑ Inspect and service rack system, doors and building.
- ❑ Inspect and service outside/wash racks.
- ❑ Inspect and service hauling equipment (forklift, travel lift, jib crane, railway, hydrolift, etc.).
- ❑ Inspect and clear storm drains. *(Suggest developing an inspection checklist)*

Marina Operations – Wet Storage Manager

- ❑ Conduct pre-hurricane season housekeeping, repair and maintenance of wet slip facilities and equipment *(Note: Suggest developing an inspection checklist).*

Marina Operations – Ships Store Manager

- ❑ Conduct pre-hurricane season housekeeping, repair and maintenance of store and related retail areas *(Note: Suggest developing an inspection checklist).*
- ❑ Participate in planning and training sessions with Communications Coordinator.
- ❑ Inventory hurricane response kit(s) - replenish as necessary.

Marina Operations – Repair Service Manager

- ❑ Conduct pre-hurricane season housekeeping, repair and maintenance of repair facility and equipment. *(Note: Suggest developing an inspection checklist).*
- ❑ Perform repair and maintenance to all emergency equipment.
- ❑ Perform repair and maintenance to all marina vehicles and boats.

G. Hurricane's Eye Marina Hurricane Plan – Condition 5, Season Starts (June 1)

In Condition 5, beginning June 1 when hurricane season begins each year, there is no hurricane threat. This is the time to begin conscientiously monitoring the US Weather Service Radio and the Cable Weather Station for development of tropical systems. We will continue to heighten hurricane awareness and intensify pre-storm readiness.

Responsibilities in Condition 5 are:

Marina Manager

- ❑ Monitor weather forecasts.
- ❑ The marina will use two sources of weather information to trigger Condition 4:
 - a. National Weather Service/NOAA
 - b. County EMA
- ❑ Review membership of the HRT and fill any vacancies.
- ❑ Convene HRT for an inspection of the marina and boats for hurricane readiness.
- ❑ Hold Hurricane Preparedness Plan clinics for boat owners *(seek program sponsorship by local agencies, vendors and services).*
- ❑ Meet with managers of each department and marina office to develop a prioritized list of equipment, records, stock, etc. for evacuation. Mark these items for quick identification

and prepare a checklist. Consider the value of the item to getting business back in progress after a hurricane.

Hurricane Response Team

- ❑ Continually monitor weather forecasts.
- ❑ Assist marina manager in a full facility hurricane readiness inspection.
- ❑ Work with marina management to prepare and conduct hurricane preparation clinics and drills to instill a high degree of hurricane awareness and readiness among boat owners.
- ❑ Organize a shuttle boat operation for returning wet slip evacuees. Devise a schedule format and recruit experienced volunteers with shuttle boats.

Communications Coordinator

- ❑ Develop assignment sheet for marina handheld radios to issue to employees and volunteers.
- ❑ Assemble/train team of 3 (with backups) for the emergency call network (in addition to store manager).

Dry Storage Boat Owners

- ❑ Attend hurricane preparedness clinics held by the marina Hurricane Response Team.
- ❑ Prepare your boat evacuation plan – file it with the marina as required [*Note: Refer to Questionnaire at Appendix B*].
- ❑ Make your boat and trailer evacuation ready.
- ❑ If you have no trailer, keep your boat ready for storms by keeping the bilge plug pulled and canvas down.
- ❑ Review your boat insurance policy with your agent keeping marina contract requirements in mind.

Wet Slip Boat Owners

- ❑ Attend hurricane preparedness clinics held by the marina Hurricane Response Team.
- ❑ Prepare your boat evacuation plan – file it with the marina as required [*Note: Refer to Questionnaire at Appendix B*].
- ❑ Make your boat evacuation ready.
- ❑ Practice your evacuation and storm preparation plan.
- ❑ Review your boat insurance policy with your agent keeping marina contract requirements in mind.

Marina Operations – Office

- ❑ Update the office equipment and records evacuation plan. Mark items for quick identification at evacuation. Records to remove:
 1. Rent Roll
 2. Cash register receipts, records, and cash
 3. Petty cash box
 4. Inventory records
 5. Customer's contracts
 6. Budget and planning records
 7. Marina Manager's files

- 8. Computer, software and backed up files
- Meet with managers of each department to determine materials and equipment to be evacuated and determine transportation requirements
- Determine who will drive rental trucks and pull loaded trailers. Submit plan to marina manager for approval.

Marina Operations – Dry Storage Manager

- Review files for dry storage “Boat Owner’s Hurricane Readiness Questionnaire” – follow-up to obtain information as necessary.
- Check, repair and/or replace all rack tie down lines.

Marina Operations – Wet Storage Manager

- Review files for wet storage “Boat Owner’s Hurricane Readiness Questionnaire” – follow-up to obtain information as necessary.
- Check and tighten dock cleats and pile guide fastenings.

Marina Operations – Ships Store Manager

- Double check Hurricane Kit inventory.
- Update plan (checklist) for evacuating and securing store stock.
- Update “last minute order checklist.”
- Prepare and sell “Hurricane Preparedness Kits” for boat owners.

Marina Operations – Repair Service Manager

- Update the plan (checklist) for evacuation tools, parts, and service records .

H. Hurricane’s Eye Marina Hurricane Plan – Condition 4, Storm in the Vicinity

In Condition 4 there is a tropical depression, tropical storm, or hurricane within a 1,200-mile radius of the marina. This is the time to assemble the Hurricane Response team to evaluate the threat to the area and to develop a preliminary action timetable for this particular storm.

All marina employees are to make contact with their supervisor. Plan to be called to duty at or before Condition 4.

Be aware that progression from Condition 4 to Condition 0 – hurricane in progress, can happen swiftly!

Responsibilities in Condition 4 are:

Marina Manager

- Schedule and conduct meetings with HRT to determine threat potential and action time tables.
- Meet with Communications Coordinator and volunteer team to review Communications strategy and requirements.
- Meet with each marina department head to review Communications strategy and requirements.

- ❑ Review list of preselected equipment and records to be evacuated in each department.
- ❑ Confirm with marina office readiness to secure rental trucks for evacuation.
- ❑ Meet with dry rack and wet slip managers and review “Boat Owner’s Hurricane Readiness Questionnaire” on file for each boat. Obtain updates from boat owners as required
- ❑ Determine the number of absentee boat owners expected.
- ❑ Schedule marina crew for storm duties. Include "shore leave" for crew to prepare homes and families.
- ❑ Coordinate securing marina facilities, equipment and boats.
- ❑ Delegate supervision of volunteers. Assign HRT member for follow-up on each.

Hurricane Response Team

- ❑ Evaluate the storm threat potential by plotting the advance and assessing weather reports.
- ❑ Determine a timetable for action for this particular storm.
- ❑ Initiate notification of wet slip boat owners.
- ❑ When the storm is perceived as a threat, the HRT activates Communications.
- ❑ Provide uniform written statements to the Communications Coordinator on storm position and any activation timetables.
- ❑ Assemble the shuttle volunteers for briefing.

Communications Coordinator

- ❑ Assemble members of the communication team for briefing on the storm as advised by the HRT.
- ❑ Disseminate only information from the HRT, as approved by marina manager, regarding the storm to maintain standard information and to minimize confusion.
- ❑ Keep a list of persons not reached on the first call and continue to repeat this call list.
- ❑ Log each call made notifying boat owners (record message, time of call, recipient of notice or no answer).
- ❑ Distribute handheld radios as advised by marina manager.
- ❑ Perform initial communications regarding the storm and status of preparedness plan implementation to marina employees, volunteers and boat owners as directed by the marina manager.
- ❑ Conduct telephone alert of volunteers.
- ❑ Begin maintaining “storm notice posting” at the marina office. Post storm information on bulletin board outside of store (to reduce the traffic of curious on-lookers in the store).

Dry Storage Boat Owners

- ❑ Ensure your “Boat Owner’s Hurricane Readiness Questionnaire” is current and complete and on file at the Marina Operations.
- ❑ Make final readiness checks on your boat trailer and on your towing vehicle.

Wet Slip Boat Owners

- ❑ Ensure your “Boat Owner’s Hurricane Readiness Questionnaire” is current and complete and on file at the Marina Operations.
- ❑ Keep an adequate inventory of storm gear aboard and maintain dock and anchor lines of proper size and condition.

- ❑ Check your primary and alternate evacuation anchorages – reevaluate your evacuation plans.
- ❑ Adhere to the marina dockage contract provision that all boats must be able to get underway under its own power.

Marina Operations – Office

- ❑ Meet with department managers to assist with preparing items for evacuation.
- ❑ Place tentative order for rental evacuation transportation and storage units.

Marina Operations – Dry Storage Manager

- ❑ Perform storm readiness inspections on area and equipment.
- ❑ Assemble rack tie down crew and begin moving boats that will not be evacuated to intended securement sites.

Marina Operations – Wet Storage Manager

- ❑ Perform storm readiness inspections on area and equipment.
- ❑ Closely inspect floating docks and piers for potential problems. Pay special attention to areas where wave action will be severe.
- ❑ Ready extra line, chafing gear and fendering.

Marina Operations – Ships Store Manager

- ❑ Perform storm readiness inspections on area and equipment (refer to checklist).
- ❑ Distribute Hurricane Kit Supplies as directed by marina manager.
- ❑ Order fuel, ice and ____.
- ❑ Mark supplies in store stock for marina use to avoid depletion of stock by customer demands.
- ❑ Review the checklist for merchandise, store records, and cash that are to be evacuated.

Marina Operations – Repair Service Manager

- ❑ Perform storm readiness inspections on area and equipment (refer to checklist).
- ❑ Review the checklist for tools, parts, and service records that are to be evacuated.

I. Hurricane’s Eye Marina Hurricane Plan – Condition 3: 72-48 Hours to Landfall

In Condition 3, we are under a storm threat. This is the time to activate the full hurricane response team and to be well into implementation of the Hurricane Preparedness Plan. Everyone should frequently monitor radio, TV, or NOAA Weather Radio for official bulletins of the storm’s progress. Also, everyone should review needs and working condition of emergency equipment, such as first aid kit, flashlights, and battery-powered radios.

All marina employee leave is canceled – everyone is to report to their supervisor.

Responsibilities in Condition 3 are:

Marina Manager

- Visit with each employee to increase his or her personal level of preparedness and to encourage prompt return to work after the threat passes.
- Continually visit each marina area to inspect work progress.
- Prepare to issue a notice that evacuation of wet slips and dry racks is recommended.

Hurricane Response Team

- Evaluate the storm threat potential by plotting the advance and assessing weather reports.
- Advise manager on timing of issuing a notice that evacuation of wet slips is recommended. Do this very early in the U. S. Weather Service Hurricane WATCH stage in order that boats may be clear of the slips by the U. S. Weather Service Hurricane WARNING stage.
- Issue a notice that evacuation of dry racks is recommenced early in the WATCH stage. The notice will include the deadline for access to boats in the racks. After this deadline boats in dry storage will not be loaded for trailering or moved to wash racks for securing of contents. This is an effort to eliminate untying of boats already secured and prolonging preparation efforts and marina personnel hazard exposure.
- Activate the wet slip evacuation shuttle volunteers.
- Be prepared to step up preparation timetables if forward speed and intensity increase.
- As time allows, work with marina crew in assigned areas with boat evacuation, rack tie down, and general facility preparations.
- Chair of HRT will report progress report hourly to Communications Coordinator.
- HRT will initiate the wet slip evacuation shuttle operation.

Communications Coordinator

- Maintain constant radio contact with marina manger and HRT.
- Continue efforts to contact boat owners to relay HRT messages.
- Maintain storm information on bulletin board outside of store.
- Receive and log boat evacuation or preparation information. Designate a courier to convey information to wet slip and dry rack managers by carbon copy note.
- Post evacuation and return shuttle information schedules, with records of who departs and who returns (assign volunteer to this).
- Notify suppliers to hold shipments until further notice.

Dry Storage Boat Owners

- Evacuation of your boat to safety is strongly advised
- Secure your boat according to your plan.
- Be aware that any costs associated with securing a boat at the marina will be charged to the boat owner.
- Advise the marina of your intention and schedule for evacuating your boat by trailer.
- Be aware that trailer loading will terminate when wind speed reaches 25 knots – or at a specified time to allow completion of marina storm preparations, so plan to move early.
- The marina will assist only with launch and recovery as weather conditions permit.

Wet Slip Boat Owners

- Evacuation of your boat to safe anchorage or to haul out is strongly advised
- Secure your boat according to your plan.
- Act soon ...Bridges will be locked down.
- Advise the marina of your intention and schedule for evacuating your boat by water or to take to a yard for haulout.
- Regarding evacuation shuttle service provided by the HRT:
 - HRT Volunteers will post shuttle schedules outside of marina office. Volunteer shuttle boats are free – until 24 hours prior to predicted hurricane landfall. Efforts will be made to have commercial captains available - AT A FEE - after volunteers are relieved of shuttle duties. (Establishing a cut off for free volunteer shuttles was the result of lessons learned from Hurricane Hugo, procrastinating captains put many volunteers in a situation where they were still shuttling when they should have been at home preparing their own property and families.)
 - Each captain shall file his evacuation plan at a shuttle control point outside of marina office (destination, number of crewmembers, estimated time to secure boats, etc.). PLEASE - LIMIT CREW TO AVOID OVERLOADING SHUTTLE BOATS. Notify the control point upon return to the marina.
 - Through coordination with the HRT, automobile transportation back to the marina will be provided from _____. This will reduce shuttle time.
 - The HRT Volunteers will organize evacuation crews for absentee boat owners if desired.
- Boats left docked at the marina should have extra lines, fendering and chafing gear.
 - Secure the boat according to the diagram posted at the marina.
 - Anticipate that the floating docks may float off of the piling.
 - The marina may be unusable to secure unattended boats.
- Be aware that any costs associated with securing a boat at the marina will be charged to the boat owner.
- Once your boat is secured, leave it and don't return once the wind and waves are up.
- Under NO circumstances should you ride the hurricane out on your boat.**

Marina Operations – Office

- Secure a rental truck for evacuation of preselected office equipment and records.
- Coordinate materials and equipment evacuation needs for each department.

Marina Operations – Dry Storage Manager

- Alert dry rack crew to tie down schedule.
- Load trailer boats for evacuation on first come, first serve basis.
- Launch boats only for evacuation by water.
- Periodically check progress of all crews.
- Once notice is given to secure all boats:
 - Move all upper rack boats possible to lower racks prior to tying.
 - Start 2 man crews tying boats in bottom racks, to warm up and to ensure everyone is tying knots correctly.

- ❑ As soon as possible, when crews are ready, move them to top racks, then mid racks and finish up with bottom racks. Remember that it is essential to complete upper rack tie downs prior to nightfall, high winds, or rain. It will probably take 4 crews of 2 as much as 6 hours to complete the job.
- ❑ Put all boats in dry racks if possible. Secure outside racks.
- ❑ PULL boat plugs and LOWER canvas. The additional weight of water in boats could collapse the rack system.
- ❑ Manager will inspect knots and plugs/canvas after crews pass. Ensure that proper knots are being used. Improper tie downs will be a waste of a lot of very dangerous work..
- ❑ Ensure crew is working with extreme caution, wearing non-skid shoes, hard hats, and safety harnesses.
- ❑ Terminate work in upper racks if conditions warrant (high wind -25 Knots, rain).

Marina Operations – Wet Storage Manager

- ❑ Assist evacuating boats and shuttles getting underway and returning.
- ❑ Assist with launch and haulout.
- ❑ Continue fuel dock operations.
- ❑ Determine best locations for boats likely to be left in the marina.

Marina Operations – Ships Store Manager

- ❑ According to the checklist, prepare merchandise, store records, and cash that are to be evacuated.
- ❑ As confusion in the stores mounts, close for retail business in order to assist with communications and to begin securing the store and contents for storm. (Remain open for ice and hurricane supply items until the situation is prohibitive).

Marina Operations – Repair Service Manager

- ❑ According to the checklist, prepare tools, parts, service records and cash that are to be evacuated.
- ❑ Launch marina boat for use as needed in securing wet slips, then fuel, check equipment and supplies, then load to evacuate by trailer.

J. Hurricane’s Eye Marina Hurricane Plan – Condition 2: 48-36 Hours to Landfall

In Condition 2, a hurricane may strike within 48-36 hours – a hurricane WATCH has been issued. This is the time to complete securing of marina and boats. The Emergency Management Agency probably has recommended voluntary evacuation of islands and other low-lying areas by this time. Marina management, in consultation with the HRT will determine marina closing and employee evacuation schedule. Entry to the marina is limited at this time to employees, members of the HRT and boat owners in the process of evacuation.

Responsibilities in Condition 2 are:

Marina Manager

- ❑ Make continual checks of storm readiness preparations in all departments.

- ❑ Determine security requirements as confusion mounts. Reducing unnecessary traffic at the marina may require a Security Guard.

Hurricane Response Team

- ❑ Evaluate the storm threat potential by plotting the advance and assessing weather reports.
- ❑ Be prepared to step up preparation timetables if forward speed and intensity increase.
- ❑ Assist marina manager in checks of storm readiness preparations in all departments.

Communications Coordinator

- ❑ Prepare communications equipment and contact lists for evacuation.
- ❑ Put pre-qualified repair and salvage companies on stand-by.

Dry Storage Boat Owners and Wet Slip Boat Owners

- ❑ Be securing your boat according to your plan as filed with the marina.

Marina Operations – Office

- ❑ Back up computer files.
- ❑ Print out general ledger to date.
- ❑ Process and mail all outgoing mail.
- ❑ Get travelers checks as required by marina manager.
- ❑ According to the checklist, load office equipment and files for evacuation.

Marina Operations – Dry Storage Manager

- ❑ Facilitate boat evacuation by trailer until announced deadline.
- ❑ Secure area flags, trashcans, carts, furniture, fire extinguishers, and other loose items that can be affected by wind.
- ❑ Secure dinghies, day sailors and outside dry rack boats.
- ❑ Place marina cart on the dinghy trailer for evacuation.
- ❑ According to the checklist, load dry storage customer and operations files for evacuation.

Marina Operations – Wet Storage Manager

- ❑ Secure area flags, trashcans, carts, furniture, and other loose items that can be affected by wind.
- ❑ Assist evacuating wet slip boats and wet slip boat owners asking to haul out.
- ❑ According to the checklist, load wet slip customer and operations files for evacuation.
- ❑ Marina Operations – Ships Store Manager
- ❑ According to the checklist, load merchandise, store records, and cash for evacuation. Coordinate transportation with Marina Office.
- ❑ Inventory and order fuel and ice.
- ❑ Consolidate frozen items into 2 freezers, if possible.
- ❑ Freeze or release live bait once pump is shut down. Do early enough to allow freezing before electricity goes off.
- ❑ Set up 12v batteries to power VHF during electrical outages.
- ❑ Carefully monitor sales of ice, batteries, flashlights, rope and other storm supplies. Retain an adequate stock for marina's use.

- ❑ Relocate merchandise that cannot be evacuated, but could be damaged by flooding. Ensure that storage room doors and vents are tightly secured with plywood and plastic.
- ❑ Assist Communications Coordinator as required.

Marina Operations – Repair Service Manager

- ❑ According to the checklist, load tools, parts, service records, and cash for evacuation. Coordinate transportation with Marina Office.
- ❑ Coordinate boarding up of all windows at store, office and service shop.
- ❑ Secure area flags, trashcans, carts, furniture, fire extinguishers, and other loose items that can be affected by wind.
- ❑ Secure containers for used oil, antifreeze and other environmental hazards.

K. Hurricane’s Eye Marina Hurricane Plan – Condition 1: 24 Hours to Landfall

In Condition 1, there is high probability the hurricane will strike – a hurricane WARNING has been issued. This is the time to have completed evacuation efforts. Marina management will announce marina closing and employee evacuation schedule. Everyone will stand by to evacuate. Entry to the marina is limited at this time to employees, members of the HRT.

Everyone should continue to closely monitor radio, TV, NOAA Weather Radio, or hurricane Hotline telephone numbers for official bulletins. Follow instructions issued by local officials. **LEAVE IMMEDIATELY IF ORDERED TO DO SO.** Under any circumstances - leave areas that might be affected by storm tide or a stream flooding.

Anyone working on the docks or near the water is required to wear life jackets.

Responsibilities in Condition 1 are:

Marina Manager

- ❑ Prepare to evacuate.
- ❑ Account for all personnel and clientele.
- ❑ Arrange for transportation.
- ❑ Make final checks of storm readiness of all departments.
- ❑ Prevent unnecessary traffic at the marina.
- ❑ Base a decision to evacuate on recommendations from local authorities and the condition of evacuation routes.
- ❑ Evacuate customers, essential files, records, equipment and personnel when premises are secured or immediately on order from the Emergency Management Agency.

Hurricane Response Team

- ❑ Evaluate the storm threat potential by plotting the advance, assessing weather reports and listening to County Emergency Management Agency instructions.
- ❑ Be prepared to step up preparation timetables if forward speed and intensity increase.
- ❑ Advise marina manager on final evacuation timing.

- ❑ Assist marina manager in final storm readiness checks.
- ❑ Organize post-storm rendezvous.

Communications Coordinator

- ❑ Communicate evacuation order as directed.
- ❑ Communicate post-storm rendezvous.
- ❑ Maintain telephone and radio operations as long as possible.

Dry Storage Boat Owners

- ❑ Stay clear of the marina, unless you are a member of the Hurricane Response Team.
- ❑ Have completed all storm preparation efforts for your boat. Complete securing home and evacuating family as instructed by the County Emergency Management Agency.

Wet Slip Boat Owners

- ❑ Stay clear of the marina, unless you are a member of the Hurricane Response Team.
- ❑ Have completed all storm preparation efforts for your boat. Complete securing home and evacuating family as instructed by the County Emergency Management Agency.

Marina Operations – Office

- ❑ Evacuate office equipment and files.

Marina Operations – Dry Storage Manager

- ❑ Dry rack tie-down should be completed.
- ❑ Prepare a list of boats left in marina and photograph each.
- ❑ Use forklift to assist with removal of heavy items from docks.
- ❑ Fuel and then park forklifts at highest ground point. Park boat elevators in down position.
- ❑ Marina boats: fuel and equip for trailering and evacuate when appropriate with designated vehicle.

Marina Operations – Wet Storage Manager

- ❑ Assist wet slip evacuees as required.
- ❑ Stand by to position breakwater across marina entrance with proper markings in place after evacuation efforts are complete.
- ❑ Secure any boats not evacuated.
 - ❑ Prepare a list of boats left in marina and photograph each.
- ❑ Lash dock boxes to cleats and wire/lock tops closed.
- ❑ Secure all dock carts ashore.
- ❑ Wire shut all power centers covers. Use 3" strips of wire.
- ❑ Remove and carefully secure hanging fish scale (careful not to damage calibration).
- ❑ Decommission and secure fuel docks, including pumpout station (remove all oils and other inventory).
 - ❑ Remove hose reels and other removable items.
 - ❑ Lash dispenser covers to the frames.
 - ❑ Seal fuel storage tanks.
 - ❑ Close all valves.

- Disconnect ramps and pull/ secure ashore.
- At last call for evacuation remove life rings and fire extinguishers from floats.

Marina Operations – Ships Store Manager

- Collect and consolidate Hurricane Kit materials and equipment not in use.
- Complete final boarding of building.

Marina Operations – Repair Service Manager

- Connect gas generator when power loss is experienced. Have two 5-gallon cans of gas at standby.
- When appropriate, cut power, water and natural gas to all marina buildings (open all major circuit breakers).
- Stand by to disconnect floating dock power cables, water and fuel lines if tidal surge is expected.
- Stand by to disconnect dock ramps and to secure docks to fixed pier pilings.
- Double check readiness of emergency pumps and secure on service truck.

L. Hurricane’s Eye Marina Hurricane Plan – Condition 0: Hurricane

In Condition 0, we will be under hurricane influence. No boat or marina preparation will occur. Concern is for personal and family safety only.

Responsibilities in Condition 0 are:

Marina Manager, Hurricane Response Team, Communications Coordinator, area managers and employees

- Remain in safe shelter.

Dry Storage Boat Owners and Wet Slip Boat Owners

- **Remain in safe shelter; do not be aboard in a Hurricane!**
- One of the most dangerous mistakes a skipper can make is to stay aboard during a hurricane. There is little, if anything, a skipper can do to save a boat when winds are blowing 100 mph, tides are surging, and visibility is only a few feet.

M. Hurricane’s Eye Marina Hurricane Plan – Return and Recovery

After the hurricane has passed, everyone is advised to remain in a protected area until announcements are made on radio or TV that dangerous winds and flooding have passed. Telephone communications may not be possible. Listen to public radio broadcasts for this information. Marina personnel are expected to return to the marina as soon as possible to begin the cleanup process and to return the marina to operating conditions.

Controlling damage after the hurricane is important. This can save time and money for the marina and boat owners. Someone with authority must be available to work with salvors, owners, and insurance representatives and provide security to limit access to the property. We will admit only boat owners, authorities, insurance personnel, and only those contractors and surveyors on

assignment. Salvage operations will be discussed with owners and their insurance companies before moving damaged boats. Calling insurers with a description of conditions at your marina will help expedite removal of boats as well as the payment of salvage bills and claims.

If there have been high waters, be careful of snakes or other animals that may have gotten into buildings or other high points.

Responsibilities in Return and Recovery are:

Marina Manager

- Communicate with HRT and assemble at a designated time and place.
- Re-enter marina when cleared by local emergency management.
- Prepare to assist in search and rescue activities.
- Conduct a safety inspection and document damages photographically before permitting customers on the property. If necessary, request assistance from the Emergency Management Agency, fire department, utility companies, or police.
- Clearly mark and blockade hazard areas; be particularly careful of fallen electrical lines and leaking fuel.
- Deploy containment equipment for liquid spills.
- Designate spokesperson(s) for media, insurance, and customers.
- Evaluate boat condition reports as provided by wet and dry storage managers. Prepare reports for customer notification by Communications Coordinator.
- Contact local or state agencies regarding necessary permit requirements for rebuilding.
- Begin clean up and repair procedures only after insurance company has been contacted and legal documentation of damage has been accomplished.
- Determine the priorities for getting the marina back in business – make assignments to HRT accordingly.

Hurricane Response Team

- Assist marina manager with damage assessments and planning a repair schedule.
- Make recommendations for improving the marina “Hurricane Preparedness Plan” (in writing within two weeks of Hurricane).

Communications Coordinator

- Set up and supervise operations center, log in all arrivals and departures.
- Contact employees not returned.
- Contact repair and salvage companies as directed.
- Contact customers to report boat condition and when marina is estimated to be open to inspect boats.

Dry Storage Boat Owners and Wet Slip Boat Owners

- Remain clear of the marina until notified.
- Review insurance policy and prepare to evaluate and report damages to insurance agency.

Marina Operations – Office

- Assist Communications Coordinator.
- Restore offices to operation as soon as possible.

Marina Operations – Dry Storage Manager

- As approved by manager:
- Evaluate boats in dry storage and submit a report to manager.
- Put forklift and other lifts in service.

Marina Operations – Wet Storage Manager

- As approved by manager:
- Evaluate boats in wet storage and submit a report to manager.
- Prepare Marina boat for launch.

Marina Operations – Ships Store Manager

- Obtain and account for emergency equipment issued.
- Assist Communications Coordinator.

Marina Operations – Repair Service Manager

- Assemble recovery equipment inventory – lifts and cranes, tractor, winches, blocks and tackle, lift slings, etc.
- Work with qualified electrician to check out all circuits and electrical equipment.
- Assist manager.

“We’re all in this together” Captain Ahab

I have read, understand, and agree to Hurricane’s Eye Marina “Hurricane Preparedness Plan”.

Print name: _____, Employee ____, Boat Owner: ____

Signed: _____

Date: _____

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

SECTION VI

Insurance Claims

Although we have an extensive and well-thought out plan to protect the marina and boats during a hurricane, it is necessary to buy insurance against loss and liability. Be aware that insurance is not a passive product. Select an agent experienced and knowledgeable in the marina business to ensure buying the right coverages. You must know the responsibilities of you and others to



Hurricane Andrew - boat damage at Black Point Marina. Wind and surge from this category 4 storm tossed boats around like toys.

ensure you will collect for damages. The best advice for ensuring collection of due damages is to prepare your property against loss, damages or liability - as if you have no insurance.

A. Before the storm

Both marina managers and boat owners should know the following:

- where your insurance papers are,
- that your policy is updated,
- what is and what is not covered,
- what your responsibilities are,
- what your agent's responsibilities are and
- that you have photographs of your property and inventories of equipment and contents.

Marina

Marina insurance is normally underwritten with consideration to fire, casualty, liability, and the associated hazards, plus loss of revenue or business interruption coverage. Be aware that storm and flood damage is usually considered, but not as well defined and, in general, depends on the marina location and local topography. The normal insurance coverage for fire, casualty, liability, etc. is available from many underwriters who may or may not provide flood or wave damage insurance.

Insurance coverage for damage associated with high winds and flooding may be only partially incorporated within flood insurance. Your insurance agent should be consulted to ascertain that coverage is adequate. Business interruption insurance should be considered when developing your insurance program. The marina insurance agent should want to review your hurricane plans. The company's risk management program may have useful advice to add. The fact that you have a well thought out plan attests to good management and the marina that is managed to survive a storm is likely to survive other hazards.

Boats

To be eligible for storage at most marinas, boat owners must provide proof of a comprehensive yacht insurance policy. This will allow timely salvage operations and will cover damage to the boat or to damages caused by one boat to another. The rental contract specifies that a boat owner is responsible for the damages his boat inflicts on another boat or to marina property – *if he fails to take prudent efforts to properly secure the boat for the storm*. Know your marina rules and regulations and know your responsibilities for your boat and for the marina.

Guidelines for securing boat insurance:

- The policy should be an “All Risk,” agreed hull value policy. With this policy form, causes of loss not covered must be specifically excluded in the policy provisions. In case of a total or constructive loss, the amount of insurance stated on the declarations page is paid to the owner without deduction for depreciation.
- This “All Risk” policy form typically covers boating equipment normally carried for safety or navigation, both aboard and when separated from the boat and stored ashore. It should specifically extend coverage to dinghies, tenders or trailers. Owners should check the specific provisions in their policies as they vary from company to company.
- Dock boxes and contents would be considered personal property in most programs and are not automatically covered in the boat policy. Owners should check to ensure exactly what personal effects are covered and if the dock box and contents are included.
- Boat owners should purchase both Hull and Protection and Indemnity (P&I) coverage. P&I is marine liability coverage.
- Coverage for the cost of removing wrecks is normally in the policy's liability section. If the boat liability is under the owner's homeowner policy, chances are there is no wreck removal coverage.

B. After the storm

Once you determine you have a loss to insured marina property and/or a boat, the following general steps should be taken to process your claim:

- ❑ Photograph the damaged property and make a list of all damages and suspected problems. If the property is in peril, take all necessary steps to preserve the property and prevent further damage. Do not begin repairs other than that necessary to prevent further damage. Repairs to prevent further damage may include beginning clean up to remove salt, mud, sand, etc. and to flush, dry and start machinery. Hire a mechanic if necessary – this should be covered under “Sue and Labor” in your policy.
- ❑ Promptly call your insurance agent to report the claim or loss. Estimate the percentage of damage – cosmetics, wave damage, wind damage, water damage, total loss, etc.
- ❑ Contact repair companies to get estimates for repairs. You do not have to wait for an adjuster/surveyor to get estimates.
- ❑ An adjuster, insurance company surveyor or independent surveyor acceptable to the insurance company will be instructed to survey the damaged property. The owner can elect to hire a second surveyor, at his own cost, to conduct an independent survey of the property. The owner should arrange to accompany the surveyor on the initial damage survey.
- ❑ 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”.
- ❑ After conducting the survey, the surveyor files a surveyor’s damage report with the insurance company, and sends a copy to the owner, if required.
- ❑ The owner 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.
- ❑ In case of a dispute, the owner will hire a second surveyor/adjuster, at the owner’s expense, to represent the owner’s side of the dispute. A third party will be designated to listen to both sides and arrive at a decision.
- ❑ If the owner agrees on the estimates and companies to do the repairs, the insurance company issues a check with both the repair firm and owner/mortgagee listed as payees on the check.
- ❑ When the work is completed to the owner’s satisfaction and approval, the check is co-signed and the repair firm is paid.
- ❑ 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.
- ❑ If a total loss of the property exists, the insurance company issues a check to the owner and mortgagee, usually for an amount equal to the agreed value or the fair market value of the property.

- ❑ In case of total loss of a vessel, be prepared to surrender the vessel's documentation papers, original insurance policy, any remaining equipment, and the damaged vessel.

Remember!!

If the property is insured, and damages have occurred, a report of loss and/or damage should be made to the insurance agent and/or company as soon as possible. A telephone call will suffice to put them on notice. This should be followed up with a written notice. Provide all the details that you can on this first notice, such as:

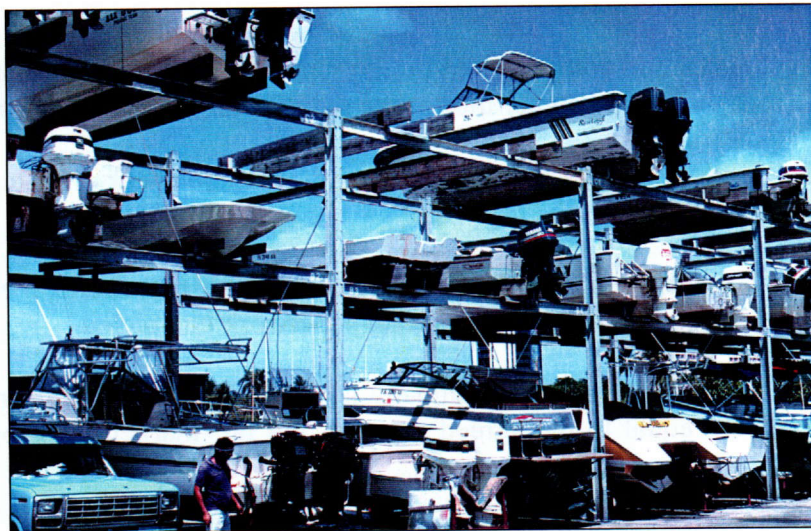
- ❑ exact location of property,
- ❑ structural condition of property (e.g., holes in hull or floating docks),
- ❑ did the vessel partially sink and is the machinery and/or interior wet, etc.,
- ❑ are the buildings and contents flooded,
- ❑ must the vessel be removed immediately; if so, to what location (same for building contents).

Be Aware!!!

Insurance companies will have surveyors and adjusters in the area to assist and work with their policyholders. In locations designated as disaster areas, there will be insurance teams and claims offices established. While surveyors, adjusters, company representatives, and many repair facilities will try to work with you, only you have the right and authority to determine what is to be done to or on your property. There will be many marinas and boat owners with damages and repair businesses will be very busy. You will have to do the necessary preliminary work quickly to get your property repaired.

As unscrupulous as it may sound, some people take advantage of the misfortune of a hurricane, often times in the form of price-gouging. Watch out for "fly-by-night" operators who promise to do great work, take your money up front and then never return to do this great work. Call the Better Business Bureau if in doubt. Price-gouging is also punishable by law. Businesses may also be required to pay restitution and damages to consumers. If you feel you have been victimized by price-gougers, call your state's Attorney General's office.

Sources: Adaptations of information from Boats/US, Metro-Dade Office of Emergency Management, Houston Yacht Club Hurricane Preparedness Plan, and Beam, Cooper, Gainey and Associates - Marine Insurance Division.



Small recreational fishing are stored on racks at the San Juan Bay Marina - San Juan, Puerto Rico.

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

SECTION VII Appendix A

EXAMPLE - MARINA HURRICANE PREPAREDNESS KIT INVENTORY SHEET

[Note: This list is typical and may be used as a guideline for preparing a list for a specific marina site and operation. The list is by no means complete or exhaustive – determine what else you will need. It is unlikely the “kit “ contents will be in one location, so it is suggested that the list be organized according to location. Also, some items, such as rope, nails will be needed in varying sizes, and the inventory lists must be broken down accordingly.]

Inventory Date: _____

Inventoried By: _____

Reviewed By Management (signature/date): _____

ITEM	QUANTITY TO STOCK	QUANTITY ON HAND	DATE REPLENISHED	ITEM CONDITION OK/COMMENTS
SAFETY & FIRST AID:				
First Aid Kits				
Stretchers				
Blankets				
Flares				
Medicine				
Barricades				
Warning Signs				
DC Powered Radios				
Sanitation Supplies				
Fire Extinguishers				
Potable Water Containers				
PERSONNEL GEAR				
Foul Weather Suits				
Foul Weather Boots				
Hard Hats				
Life Jackets				
Safety Harnesses				
VHF Handheld Radios				
Flash Lights & Batteries				

TOOLS AND EQUIPMENT				
Dock Bolt Wrench Set				
Small Tool Set				
Gasoline Powered Pump				
Hand Pump				
“Come-a-long”				
Generator w/ Fuel				
Extension Cords				
Sledge Hammer				
Hammers				
Shovel				
Pry Bar				
Ax				
Oil Spill Response Kit				
Mops, Brooms, Buckets				
Ice Chests				
Lanterns and Fuel				
Emergency Lights (DC)				
Emergency Lights (AC)				
Chain Saw				
SECURING MATERIALS				
Plywood, Bulk				
Plywood, Cut to Fit Windows				
Lumber (2”X4”X16’)				
Rope				
Lashing Cord				
Wire Ties				
Chain				
Anchors				
Cable w/ Clamps				
Nails – Asst. Sizes				
Spikes				
Screws				
Lag Bolts				
Masking Tape				
Duct tape				
Sandbags				
Fenders and Fendering Material				
Chafing Gear				
HDuty Trash Bags (Asst. Sizes)				

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

Appendix B BOAT OWNER'S HURRICANE READINESS QUESTIONNAIRE

Use this as a worksheet to describe your boat's state of hurricane readiness and your preparation plans. Return a copy to the marina office and provide a copy to your alternates (an alternate must be named for the event of your absence).

Boat name: _____ Length: _____ Model: _____ Power _____ Sail _____

Owner's name: _____ Address: _____

City: _____ State: _____ Zip: _____ Day phone: _____

Night Phone: _____ Other Phones: _____

Captain's name: _____ Address: _____

City: _____ State: _____ Zip: _____ Day phone: _____

Night Phone: _____ Other Phones: _____

Has boat keys? _____ Access to hurricane equipment? _____

Alternate #1's name: _____ Address: _____

City: _____ State: _____ Zip: _____ Day phone: _____

Night Phone: _____ Other Phones: _____

Has boat keys? _____ Access to hurricane equipment? _____

Alternate #2's name: _____ Address: _____

City: _____ State: _____ Zip: _____ Day phone: _____

Night Phone: _____ Other Phones: _____

Has boat keys? _____ Access to hurricane equipment? _____

Boat's current location: _____ Planned location during a hurricane: _____

If at a dock: Slip # _____

Additional lines no.: _____ Length: _____ Size: _____ Chafing gear: _____ Fenders: _____

If at a hurricane hole:

Travel time by water from present location: _____ Are there bridges? _____ If yes, will they open prior to hurricane? _____

Has owner of surrounding land been contacted? _____ How will skipper and crew get ashore? _____

Type of bottom: _____ Depth: _____ Number/types of anchors needed: _____

Lines needed: _____ Number: _____ Length: _____ Size: _____

Chain needed: _____ Number: _____ Length: _____ Size: _____

Chafing gear: _____ Swivels: _____ Shackles: _____

If stored ashore, is boat already ashore and where? _____ If no, what arrangements have been made for hauling? _____

Contact name (marina/property owner): _____ Phone number: _____

List all equipment needed to prepare boat:

List equipment to be stripped from boat:

Equipment	Current location	Equipment	Storage location
<input type="checkbox"/> Extra lines		<input type="checkbox"/> Electronics	
<input type="checkbox"/> Chafing gear		<input type="checkbox"/> Dinghy	
<input type="checkbox"/> Fenders		<input type="checkbox"/> Outboard fuel	
<input type="checkbox"/> Anchors + Ropes		<input type="checkbox"/> Sails	
<input type="checkbox"/> Swivels + Shackles		<input type="checkbox"/> Bimini	
<input type="checkbox"/> Wire ties		<input type="checkbox"/> Galley fuel	
<input type="checkbox"/> Duct tape		<input type="checkbox"/> Ship's papers	
<input type="checkbox"/> Exhaust Port Plugs		<input type="checkbox"/> Insurance Policy	
<input type="checkbox"/> Tool Kit		<input type="checkbox"/> Boat inventory/Photos	
Diagram of proposed hurricane docking or anchoring arrangement:		Hurricane plan final checklist:	
		<input type="checkbox"/> Arrange dock/anchor lines	<input type="checkbox"/> Remove bimini, sails, life rafts, etc.
		<input type="checkbox"/> Add chafe protection	<input type="checkbox"/> Disconnect shore power
		<input type="checkbox"/> Place extra fenders/fenderboards	<input type="checkbox"/> Close fuel valves
		<input type="checkbox"/> Duct tape windows/hatches	<input type="checkbox"/> Close all but cockpit seacocks
		<input type="checkbox"/> Plugs in engine ports	<input type="checkbox"/> Lock boat
			<input type="checkbox"/> Notify marina manager

Adapted from *Seaworthy*, a periodical of BOAT/U.S.

Date this Boat Hurricane readiness plan was tested _____ Signed _____

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

Appendix C EMERGENCY RESPONSE AGENCY PHONE NUMBERS

EMERGENCY	911
<u>County Agencies</u>	
Emergency Management Agency	
Fire Department	
Sheriff Department	
Police Department	
Emergency Medical Service	
Medical Care Center	
Hospital	
County Public Health	
County Public Works	
<u>State Agencies</u>	
Emergency Management Agency	
Emergency Preparedness Division	
Environmental Protection Division	
Department of Natural Resources	
State Patrol	
Department of Transportation	
Attorney General	
<u>Federal Agencies</u>	
Federal Emergency Management Agency (FEMA)	(770) 220-5430
Hurricane Program Manager: William G. Massey	(770) 220-5461 fax
U. S. Environmental Protection Agency	(800) 241-1754 (404) 562-9900
National Response Center	(800) 424-8802
U.S. Coast Guard – Marine Safety Office	
Chemical Transportation Emergency Center (CHEMTREC)	(800) 424-9300
<u>Local EMA Phone Numbers and Contacts</u>	

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

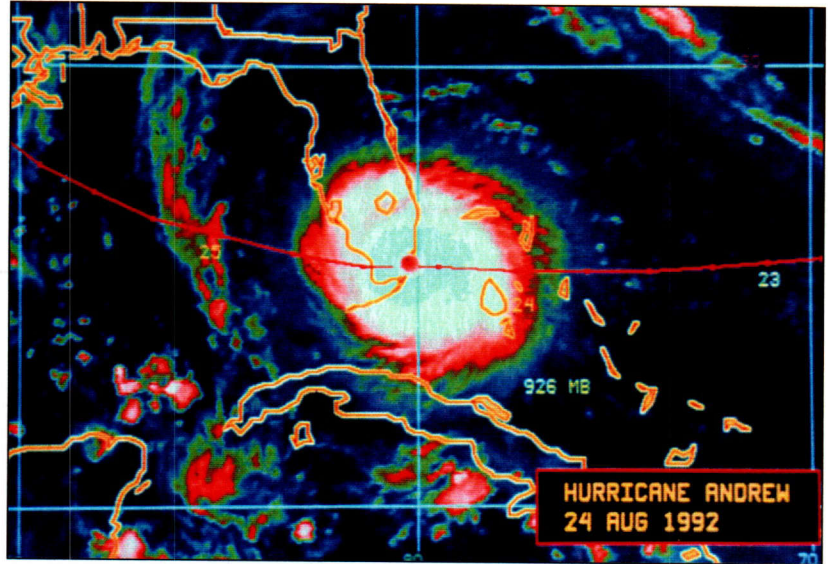
Appendix D Hurricane Preparedness Instructions for Boat Owners

[Note: This is an example of information to provide boat owners, along with the new or annual update for the "Boat Owner's Hurricane Readiness Questionnaire." This is typical information for presentation in boat owner hurricane awareness clinics.]

The key to protecting your boat from hurricanes or any threatening severe weather is planning, preparation, and timely action. A boat owner/operator may be held responsible for damages caused by his vessel during a natural disaster. Normally the National Weather Service will issue 48 and 24-hour warnings; however, in some instances only a 12-hour warning will be given. The marina will evaluate the storm threat and recommend evacuation accordingly.

Upon receiving first storm notice, the boat owner/operator should immediately take precautionary measures to see that his boat is properly secured.

Each boat owner needs a plan unique to the type of boat, the local boating environment, the severe weather conditions, and the characteristics of safe havens and/or plans for protection. The following preparation and precautionary suggestions are issued as guidelines to be used by the marine community. The following precautions and checklists are meant as guides only. It is stressed, however, that following these guidelines does not necessarily exempt the owner/operator from being held responsible should his boat cause damage to another's property; nor will acquisition of required safety equipment and following the suggested safety procedures necessarily assure that no damage will occur to the boat.



Hurricane Andrew - infrared image taken by GOES 7. Andrew is crossing the Florida coast and making landfall August 24, 1992, at Dade County, Florida.

GENERAL PRECAUTIONS

- ❑ Prior to the hurricane season, develop a detailed plan of action to secure your vessel in the marina, if permitted, or remove your boat from the threatened area, or take your boat to a previously identified hurricane refuge. Specifically identify and assemble needed equipment and supplies.
- ❑ Hurricane moorings should be located in advance. Permission should be obtained from appropriate persons. For keelboats, make certain there is enough water at low tide.
- ❑ A practice run should be made to check accessibility, depth of water, bridges, location of aids and/or obstructions to navigation and locations to secure lines or drop anchors. Drawbridges will not open for boats during evacuation procedures.

- ❑ Before a hurricane threatens, plan how you will remove valuable equipment from the boat. Determine how long it will take so you will have an accurate estimate of the time and work involved.
- ❑ After you have made anchoring or mooring provisions, remove all movable equipment such as canvas, sails, dinghies, radios, cushions, biminis and roller furling sails.
- ❑ Lash down everything you cannot remove, such as tillers, wheels, booms, etc. Seal all openings (use air conditioning duct tape) to make the boat as watertight as possible.
- ❑ Make sure the electrical system is off unless you plan to leave the boat in the water. If the boat is not to remain in the water, remove the battery to eliminate the risk of fire or other damage.
- ❑ Arrange for a reliable person to learn and carry out your hurricane plan if you are out of town during a hurricane or severe storm.
- ❑ Check your lease or rental agreement with the marina or storage area. Know your responsibilities and liabilities as well as those of the marina or storage area.
- ❑ Consolidate all documents including insurance policies, a recent photograph or video tape of your vessel, boat registration, equipment inventory, lease agreement with the marina or storage area, and telephone numbers of appropriate authorities, i.e., harbor master, Coast Guard, insurance agent, National Weather Service, etc. Keep the documents in your possession in a locked water-proof box. They may be needed when you return to check on your boat after the hurricane.
- ❑ Maintain an inventory list of both the items removed and those left on board. Items of value should be marked so that they can be readily identified.

Trailerable Boats

- ❑ Determine the requirement to load and haul your boat to a safer area. Be sure your tow vehicle is capable of properly moving the boat. Check the condition of your trailer; tires, bearings and axle. Too often a flat tire, frozen bearings, or broken axle prevents an owner from moving a boat.
- ❑ Do not evacuate your boat with your family evacuation. Hauling your boat as residents evacuate will only compound the traffic problems of the evacuation effort.
- ❑ Once at a safe place, lash your boat to the trailer and place blocks between the frame members and the axle inside each wheel. Owners of lightweight boats may wish to consider letting out about half the air in the tires, then filling 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.) Consult with the manufacturer for the appropriate procedure for your lightweight boat.
- ❑ Secure your boat with heavy lines to fixed objects. Because hurricane winds rotate and change direction, try to pick a location that allows you to secure the boat from four directions. It can be tied down to screw anchors secured in the ground.

Non-trailerable Boats in Dry Storage

- ❑ Determine the safest, obtainable haven for your boat and arrange to move your boat there. When selecting a safe location, be sure to consider whether storm surge could rise into the area. Wherever you choose to locate your boat for the duration of the hurricane, lash the boat to its cradle with heavy lines. Based on the weight of the boat, consider adding water to the bilge to help hold it down.
- ❑ Never leave a boat in davits or on a hydro-lift.

Non-trailerable boats in wet storage

The owner of a large boat, usually one moored in a berth, has three options. Each action requires a separate strategy. Another alternative, running from the storm, is not encouraged except for large commercial vessels.

- ❑ Secure the boat in the marina berth.
- ❑ Moor the boat in a previously identified safe area.
- ❑ Haul the boat.

Boats Remaining in Marina Berth

- ❑ 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, rubber hoses, etc. Install fenders to protect the boat from rubbing against the pier, pilings and other boats.
- ❑ Assess the attachment of primary cleats, winches, and chocks. These should have substantial back plates and adequate stainless steel bolt sizes.
- ❑ 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. Turn off all other devices consuming electricity.
- ❑ Do not stay aboard. First and foremost, safeguard human life. Winds during any hurricane can exceed 100 mph, and tornadoes are often associated with these storms. In addition, when winds and seas warrant, marine agencies remove their boats from service and will not be able to rescue foolish boaters.

Mooring Heads

- ❑ If your vessel is moored at a dock on a river, or in a marina near the ocean, it is possible that with an additional 5 to 10 foot or greater storm surge, the vessel could take a beating against the dock or even impale itself on the pilings.
- ❑ The best offshore mooring location for a vessel to ride out a storm is in the center of a canal or narrow river where at least doubled mooring lines can be secured to both shore, port and starboard, fore and aft.
- ❑ Do not raft vessels together at moorings or docks, especially if larger and smaller vessels are involved. The probability of damage to the vessels is greater than if they are moored separately.
- ❑ If the vessel must remain dockside at a private dock or marina, heavy duty fender boards (2" x 6") should be installed on a bare wood center piling to prevent damage. Lines should be doubled and even tripled where necessary to hold a vessel in the center of a berth or off seawall or dock pilings. Preventers should be installed at the top of the pilings so lines cannot slip off the top. Note that nylon line will stretch five to ten percent of its length.

Don't go down with your boat! Do not stay aboard. Winds during any hurricane can exceed 100 mph and tornadoes often are associated with these storms. First and foremost, safeguard human life.

Source: Fact Sheet DH 12 (1993), Florida Cooperative Extension Service, University of Florida, Gainesville, FL 32611.
<http://128.227.103.58/txt/fairs/23970>

HURRICANE PREPAREDNESS GUIDELINES FOR MARINAS

Section VIII Selected References

Abel, Ed. Hurricane Preparedness for Boat and Marina Owners. Brunswick, GA: Brunswick-Glynn County Emergency Management Agency, 1996.

Amaral, M. & V. Lee. Hazard Mitigation for Rhode Island: Recreational Harbor Communities. Narragansett, RI: University of Rhode Island, March 1995.

Antonini, G.A., et al. Location and Assessment of Hurricane Andrew Damaged Vessels on Biscayne Bay and Adjoining Shore Areas, TP-70A. Gainesville, Fl: Florida Sea Grant College Publication, June 1993.

Arruza, T. "Hugo: The Caribbean." Big Game Fishing & Tournament Digest, 7(3). January/February 1990: 87-89.

Beam, Cooper, Gainey & Associates & NXS. Hurricane/Disaster Preparedness Procedures. Morehead City, NC., 1998.

Boat Owners Association of the United States. Hurricane Warning: A Guide to Preparing Boats and Marinas for Hurricanes. Silver Spring, MD: BOAT/U.S. Marine Insurance Damage Avoidance Program, 1995.

The Boating Research Center. Marina Hurricane Evacuation Study: Dade County, Florida. Miami, Florida: University of Miami, Rosenstiel School of Marine and Atmospheric Science, 1990.

Braatz, E.F. (Ed.). Hurricane Preparation Worksheet. Alexandria, VA: Seaworthy, BOAT/U.S. Marine Insurance Damage Avoidance Program, June 1993.

Briggs, R. E., & D. W. Pybas. Boat Owners' Hurricane Protection Guide [Brochure]. Miami, FL: Dade County Marine Advisory Program, 1980.

Catastrophe: A Natural Catastrophe Planning and Management Guide. New York, NY: American Re-Insurance Co., 1991.

Coastal Technology, Inc. Maryland Guidebook for Marina Owners and Operators on Hurricane and Severe Weather Preparedness. Virginia Beach, VA: Maryland Department of Natural Resources, January 1992.

Coastal Technology, Inc. Commonwealth of Virginia Handbook for Marina Owners and Operators for Hurricane and Severe Weather Preparedness. Virginia Beach, VA: Commonwealth of Virginia Department of Emergency Services, June 1993.

Crosby, T. Hurricane Precautions for the Yachting Community. Ft. Lauderdale, FL: Cigna Loss Control Services, 1987.

Dickinson, E. "Court bars hurricane evictions." BOAT/U.S. Magazine., January 1999.

Evans, Mark. Hurricane! Texas Sea Grant College Program, TAMU-SG-00-503, June 2000.

Fact Sheet: Hurricanes. Available at www.fema.gov/hu98/hurinfo.html

Florida Sea Grant Program. Hurricane and Severe Weather Checklist for Boaters [Brochure]. Gainesville, FL: Marine Advisory Program, 1980.

Florida Cooperative Extension Service. Fact Sheet DH 12. Gainesville, FL: University of Florida, Institute of Food and Agricultural Sciences, 1993.

Gannon, T. "Marina hurricane law update." International Marina Institute: Dock Lines, VI(16), August 1994:1-3.

Glenn, Paul. Hurricane Preparedness Guidelines for Georgia Marinas. Brunswick, GA: Georgia Department of Natural Resources, Coastal Resources Division, June 1999.

Glenn, Paul. Hurricane Preparation Procedures. Unpublished manuscript, 1993.

Glenn, Paul. Surviving Storms & Fires: How Marinas & Boats Can Prepare For & Survive Hurricanes. Unpublished manuscript, 1992.

Glenn, Paul. The Landings Marina's Hurricane Preparation Procedures. Unpublished manuscript, 1990.

Goodlander, F. How to Prepare Your Vessel to Survive a Hurricane in the U.S. Virgin Islands. The Virgin Islands Territorial Emergency Management Agency, 1998.

Halusky, J.G., & L. T. Johnson. Severe weather and hurricane planning guide for marina/boatyard operators. Gainesville, FL: A Florida Sea Grant Marine Advisory Program Publication (Grant # NA80AA-D-00038), 1982.

Hamann, R. G. & B. Malouf. Marina Dockage Agreements: Sample provisions, RN-78. Gainesville, FL: Florida Sea Grant College Program, August 1985.

Hamann, R. & J. Wade. Mitigation of hurricane losses: Federal, state and local programs, SGR-100. Gainesville, FL: Florida Sea Grant College Program, July 1990.

Hogan, J. Hogans' Marina – Hurricane Plan. Unpublished manuscript, 1998.

Hollin, D., & K. Pagans. Protecting Your Boat Against Severe Weather. Bryan: Texas A&M University, Sea Grant College Program (Grant # NA85AA-D-SG-128), 1987.

Hurricane Awareness CESAD Plan 500-1-13. U.S. Army Corps of Engineers: Savannah District, June 1995.

Hurricane Preparedness Plan. Houston, TX.: Houston Yacht Club, 1980.

Hurricane Hugo: A Diary of Destruction. Sun City West, AZ: C.F. Boone Publishers, September 1989.

Hurricane Manual for Marine Interests. Miami, FL: Metro-Dade County Office of Emergency Management, 1993.

Jackson, Don. Panic Preventer File, SGEB-45. Gainesville, FL: Florida Sea Grant Program, November 2000.

Macchio, W. (Ed.). Hurricane Hugo: Storm of the Century. Mount Pleasant, SC: BD Publishing, September 1989.

Marina/boatyard hurricane preparations. Wilmington, NC: NC Marine Trades Services, 1997.

Metro Media Associates, Inc. Michigan Harbors Guide. Lansing, MI: Michigan Department of Natural Resources, 2001.

National Oceanic and Atmospheric Administration & National Weather Service. Storm Surge and Hurricane Safety with North Atlantic Tracking Chart (NOAA/PA 78019). Washington, DC: U.S. Government Printing Office, 1982..

Pybas, D. W. & M.L.Villanueva (Eds.). Recommendations for Hurricane Preparations and Responses for Boating Communities and Industries, TP-75. Gainesville, FL: Florida Sea Grant College Program, June 1994.

Riley, J. P. Hurricane Preparedness Plan for Marinas. Fort Myers, FL: W. Dexter Bender & Associates.

Smith, F.J. Practical Planning. International Marina Institute: Dock Lines, VI (16), August 12, 1994: 1.

Thomas, J.H. Hurricane Evacuation Law for Marinas in Florida. Paper presented at the Florida Marina and Boating Issues Conference, June 1995.

Welch, S. "Hugo: South Carolina." Big Game Fishing & Tournament Digest, 7(3), January/February 1990: 86-91.

WEB SITES

FEMA Emergency response and Recovery: <http://www.fema.gov>

FEMA Tropical Storm Watch: <http://www.fema.gov/fema/trop.htm>

The Weather Channel – Tropical Weather: http://www.weather.com/breaking_weather/trop_update

NOAA COASTAL SERVICES CTR LIBRARY



3 6668 14117429 4

