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Will your marina weather the storm?

An interview with Marina Design Engineer William J. Huffman, Jr. PE

by Robert Wilkes

Bill Huffman's remarkable 37-year career as a marine structural engineer encompasses some of the best-known and most elite marinas in the Northeast, Southeast, Gulf Coast and Caribbean. His years of experience in the field give him a broad perspective from which to advise marina owners about the storm worthiness of their marinas. Huffman is the president of Structural Systems Analysis (SSA) based in Savannah, Georgia.

At the last International Marina and Boatyard Conference (IMBC), Huffman presented a talk titled "Determining Anchor Pile Type and Size for Marinas," in which he described engineering marinas to weather severe storms. Afterward, owners and operators approached him with questions. "How do I know my marina will survive a major storm?" "What is the largest boat I should allow to tie to my docks if a storm is approaching?" To learn the answers to these and other questions, Robert Wilkes interviewed Huffman.

Robert Wilkes: For readers who missed your talk at IMBC, what was the "take away" there?

William Huffman: My talk was about how we design for storm resistance and how that has evolved over the last thirty years and how owners can understand their own vulnerabilities.

RW: You had a lot of questions from people after your talk. What happened?

WH: For many of them, the subject was a bit disturbing. No owner wants his marina destroyed in a storm. But in my view a majority of the owners in the industry are complacent, hoping it doesn't happen to them, but without much knowledge about their own marinas. As long as things are going well, they don't think about it. I made them think about it. Many have marinas

built before epic hurricanes changed our industry and forced us to look at storm resistance in a new way. It has caused the design of marinas to become more comprehensive and site specific.

RW: If you get a call from an operator who wants to know if his marina will survive a storm, how do you respond?

WH: First question is, "When was it built?" Then, we look at the details of the site and construction. We look at winds, waves and currents, and expected storm patterns. What kind of docks do they have? How are they connected? How many piling, of what length, diameter and materials? How far are they spaced and how deep are they driven? What's the consistency, nature and strength of the underlying soils? What size boats? It's reverse engineering to find out how it was built. But when an assessment has been made the owner knows what he has.

RW: How old is an "old" marina? What is the cut off?

WH: If the marina was built from the mid-90s on and it has stamped or sealed

professional engineering drawings, it should be fine. The mid-90s are when the industry starting changing. Prior to that it was fairly common for an owner to say, "I need a marina with 50 slips." The dock manufacturer would calculate the square feet of docks and the number of fingers. Then he'd figure out how many piling to put in based on accepted norms or rules of thumb. Finally, he'd ask the buyer if he wanted a standard or heavy duty marina and deliver an "off the shelf" product. That was it.

RW: If an owner thinks his marina is at risk, what can he do?

WH: If he has a marina from the late 80s or early 90s, he has gotten 25 or 30 years of service out of the facility. He should consider rebuilding before a storm makes up his mind for him and takes the marina and everything in it. We're seeing a lot of rebuilds of marinas that age.

RW: What if he just wants to harden up what he has, address some weaknesses? What kinds of options does he have?

WH: There are many steps he can take short of a total rebuild. If he has an exposed T-head he can add more piling or use wood dolphins to create additional secure mooring points, or figure out the most exposed part of the marina and rebuild that. Another way owners can reduce exposure to storms is by adding a floating wave attenuator



Instead of rebuilding the entire facility to be more storm ready, St. Augustine added a floating wave attenuator where the marina was exposed.



Superstorm Sandy in 2012 surprised many around the Northeast, as there had never been a storm that far north and that late in the year. Marinas across the region were destroyed and it changed attitudes about storm preparation in the area.

where the marina is exposed, as they did recently in St. Augustine. That has the added benefit of providing more visitor moorage. That may be enough. At a minimum the owner should know what his options are. An engineer can assess the marina and tell him the wind and wave his marina is rated for and the size of boats that are safe to moor.

RW: Have you ever seen a marina condemned because the docks are not up to code?

WH: Not yet. There are a number of facilities that appear to be held together with bailing wire and duct tape but it often takes a storm to convince the owner the marina is not working anymore.

RW: What if a storm is coming and the owner of a large boat wants to tie at your marina? Do you have to take him in?

WH: On the East Coast each state has slightly different laws. If he's not already a customer and you are uncertain of the overall design capacity, you probably don't have to take him in. If he's already a customer you normally can't tell him to leave. When the owner of a boat you suspect is too big for your marina comes to you and asks for a six-month lease, you should consider that very carefully.

RW: As you tour the region, what is the storm worthiness of the marinas in general?

WH: Sixty to 70 percent of marinas are vulnerable to severe storms. Some marinas have been upgraded or replaced, but owners usually think, "If it ain't broke don't fix it." Many are in Florida, though marinas in North Carolina are worse. I'd say 80 percent of marinas in North Carolina are underbuilt and need upgrading.

RW: Why so many?

WH: We had a problem common to the Southeast. If a manufacturer advised a customer to build a more robust marina, the customer might say, "No thanks, it'll work. If it doesn't, I've got insurance." No more. Most people can't get insurance now. Insurers were hit hard with claims and now premiums are extremely high. It is not uncommon for many marina owners to just put money aside and self-insure.

RW: Wouldn't insurance companies prefer to insure a well-built marina?

WH: It really should be taken into consideration. Unfortunately, it usually is not. All they want to know is how much it cost to build. A well-built marina should get a lower premium.

RW: The concrete floating-dock marina has been around almost 60 years. Why did it take so long for the industry to adopt new methods?

WH: It's not so long if you look at the

big picture. Floating-dock marinas had to be tested in 50-year or 100-year storms. That has happened and we learned how to deal with it. We learned how marinas survive and fail and we have better meteorological and hydrological data. We also have more rigorous and realistic building codes.

RW: How did Hurricane Andrew get everyone's attention?

WH: Before Andrew, Hurricane Hugo hit Charleston in 1989. It floated marinas off their piling and down the river. Engineers noticed, of course, but the industry and the building code authorities only started making major changes after Andrew.

RW: How did Sandy in 2012 again change perspectives?

WH: We never had a storm that far north and that late in the year. Sandy rewrote the surge tables for New York City, New Jersey and around the Northeast. Docks overtopped piling and stuck on top like shish-kabob. They don't want that again. Northeast operators thought they were safe. Not anymore.

RW: How do you design a storm-resistant marina?

WH: We start by determining historical local winds, NOAA storm surge and tidal ranges, current, and wave forces based on meteorological data, hydrographic details, geotechnical conditions and wind and wave hindcast studies, which analyze past weather data for the purpose of estimating extreme weather. Marina design has become very specific for each site, the site's exposure, wave protection and many other factors.

RW: It must be a challenge to be a marina engineer in the Southeast and Caribbean.

WH: That's very true as it is probably the worst place for hurricanes and historically where the majority of storm damage has occurred over the last 50 years. However, it is also one of the most beautiful areas to work in and the place I grew up in and call home. ⚓

Robert Wilkes writes about the marina industry from Bellevue, Washington.