Concrete Floating Structures & Floating Home Foundations

The concrete floating foundation is now the standard by which all other marine structures for marinas, docks, floating pontoons, and large commercial floating structures are measured by. It can be designed to any shape and size, customizable to each owner's request and has the longevity that is expected to outlast the building structure above it.

Archimedes Principal

Archimedes the great Greek mathematician and inventor determined that “the law that a body immersed in a fluid is buoyed up by a force (buoyant force) equal to the weight of the fluid displaced by the body”. This is the basic principal that allows all ships to float and all floating structures along with floating homes to stay floating.

Mathias Tobias
Senior Project Manager, IMFS International Marine Floatation Systems Inc.

Some history of living on the water

Living on the water is not new; we have always migrated to the water’s edge. In the 1920’s in North America many of the logging camps where built on the water because prior to logging there was no place to live except on the water’s edge. Fig. 1 shows a historic picture of how some of these floating logging camps looked. Many of these floating logging communities had remained as part of the waterfront scene for many years. In cities like Vancouver and Seattle the original floating homes where all built on cedar & spruce logs that where abundant all along the shores of the rivers or lakes. In the early days anyone who was handy with their tools could build a house with just the construction materials that they could find around, and without having to clear a land site. A floating home seemed to be the quickest way to build yourself a house. Building floating homes with logs was a cultural technique that has remained around even today; there are still many floating homes that are built on logs, but these logs floats are now saturated with water, to keep these homes floating they have all added extra floatation under the logs using plastic barrels & foam billets. The log float construction looks like a “V” shaped structure with logs, barrels and foam making up the wide top part of the float and the water saturated logs going down to one single log several feet below the surface.

The floating home communities that have remained part of the waterfront landscape in the Pacific North West, have struggled through the years with the municipalities to keep their access to the water. Even the definition of the floating home compared to what often it is called as a “houseboat” has been a discussion with municipal leaders, lawmakers and float home owners. A houseboat really is a “boat”, it has a motor, it is meant to move from place to place, generally having a raked bow or stern. It is only in the last 30 years that the definition of a “float home” has meant that this floating structure is moored in place, piled or anchored, does not have a motor; the owner of the home pays taxes, and is a legitimate dwelling that is part of the municipal grid. In the floating home community this differentiation between float home & houseboat, has often been the difference in showing that the floating home community is a viable, insurable, mortgage able, unique part of the city.

Waterfront real-estate has always been in high demand and as real-estate becomes more expensive, many of the industrial
Floating Home living is just a unique form of real-estate

The world is quickly realizing that the surface of the water is another form of real-estate. It should not be surprising to us now that with the concerns of world climate changes and higher sea levels being predicted, many of our coast urban areas are now being assessed for future flooding. The densification of urban areas and the premium being paid for living by the water, floating structures start to become a real solution. The floating home way of life has become increasingly popular with the baby boomers, most of our clients are couples that have decided now that the kids are out of the house, they want to simplify their lives, “no more lawns to cut”, and many want the ability of having their pleasure boat moored beside the house. Many economists speak of the baby boomers as the demographic that is driving the world economies, and this is exactly the group, which is now in a transitional stage many choosing to be closer to nature and within communities that will support each other and watch over their homes while they travel.

In 1980 Dan Wittenberg President of (IMFS) International Marine Floatation Systems, Inc. of Vancouver, British Columbia conceives of permanent floating concrete foundation for float homes. He determined that a floating foundation had to have the following characteristics; it must be engineered, unsinkable, fireproof, maintenance-free, one piece construction, have mass/weight, durable, rigid, environmentally safe and insurable. The engineered structural reinforced concrete float built with 100% polystyrene (EPS) foam has revolutionized the floating structures industry. Fig 2 shows the community of Canoe Pass Village in Ladner, B.C. it is the development that Dan envisioned & created to suit his floating foundation characteristics. This development today is fully occupied with 50 floating homes with all types of architectural designs; every home has moorage space for one boat. The houses are like any other land based home, connected to electrical, water, sewer and gas. The development was the first of its kind to be a floating stratified home development, where each owner purchased 1 square foot of land on shore which gives them the riparian rights to the use of the water. The water is not owned, but leased from the government which is paid through a monthly strata fee. The Fig. 3 shows Dan’s original floating home within the community which had a foundation 30ft (9.14m) x 40ft (12.19m), with a home approximately 1800 square feet (167 sq.m) of living space, and wrap around outside decks to enjoy. This development is now 33 years old, and Dan often says, “I’ve never had a call back, about the concrete floating foundation”! These foundations will outlast the building that is on them, which gives the owners a great sense of security & comfort.

Floating Home Community Living

This floating lifestyle creates a very unique sense of community, which is not seen in standard land base neighbourhoods. The people that live in these floating neighbourhoods have an incredible sense of stewardship towards the natural surroundings and environment that they are in. There is a respect for the water that keeps them afloat and in general for “Mother Nature”. The community is bound together by a type of “good neighbour” code which is always looking after each other, a built in “block watch”, which gives help-thy-neighbour a whole new meaning. How many communities have a newsletter or write books about the way of life within the community? How many communities have neighbours that in any weather or storm watch out for each other? There is no doubt that the closer you live with nature the more you tend to respect it, and these floating home communities are a testament to that.

There is a wonderful book that was created by a floating home community resident, the book is called “Facing the Water” which is a great example of floating home community within the Pacific North West. http://www.blurb.ca/b/4372843-facing-the-water

The Concrete Floating Foundation

The Douglas Fir, Spruce and Cedar logs have now been replaced by the concrete floating foundations. The engineered structural concrete floating foundation (CFF) is now the standard for building floating structures. IMFS concrete system has over 30 years of experience with no evidence of breakdown on any of the concrete floating projects that we have done. We take great care with having appropriate concrete coverage on the re-
inforcing “black steel” for all our structural walls & slabs, along with proper concrete consolidation. Our specified concrete mix is a 35Mpa (5,000 psi), using 14mm aggregate and flyash. We have manufactured most of our projects with black reinforcing steel because we feel that the uncoated bar adheres much better to the concrete and provide a stronger section overall. The polystyrene (EPS) used is a Type 1 foam with 10% regrind material allowing for 6% water absorption, the dimensional stability and compressive strength of this foam is necessary to withstand normal engineered loads.

There is no limit to designing CFF. As it has already been proven, concrete has been the material of choice for many engineers, architects who are designing structures including high-rises, bridges, airport landing strips, hydro dams and almost anything that requires strength and longevity. The CFF can be designed to be one piece foundation like many floating homes, or if the foundation needs to be larger, it can be designed to be modular with pieces that are match cast together to make one large piece. These individual pieces can then be post tensioned together with common industry PT techniques to make up one large floating foundation. Fig 6. Shows 27,000 square foot (2508 sq.m) CFF, a project IMFS designed and engineered in 2004 which was built in Arizona, for Lake Powell house boating facility. This CFF was made up of 14 individual large floats Fig. 7 showing one of the floats being launched down the very narrow ramp into the water. These individual floats where then floated together, post tensioned to make up the 27,000 SF foundation. After the foundation was complete the local builder started building the restaurant, general store and washroom facilities that made up the building.

The limitation of design of a CFF is often the ability to put or launch the foundation in the water. It is critical to design the CFF to what the local or site specific lifting and launching equip-
ment which is available. When designing structures that are 50/100/400 Tons, many construction details need to be considered, everything from the capacity of your lifting equipment to the integrity of your work yard ground condition, proximity to water, tidal fluctuations, launching water depths, distance to the ultimate location and site specific considerations.

The Future of Concrete Floating Foundations (CFF)

Every major city that is surrounded or close to seas, lakes and rivers, are now talking about the effects of climate change and possibility of devastation because of water level is rising. The impact of urban areas by flooding as we have seen in many parts of the world is very real. The reality to engineers and architects is that if they are going to design buildings and cities that are by the water, they should consider them to be floating structures. Fig. 7 below shows IMFS concept drawing of a waterfront floating community that has access to land, but is completely self-sufficient. The perimeter large breakwater or wave attenuator has the capacity to hold major roadway, and all the retail and common community requirements above the roadway. The houses and the density shown is just concept, as architects and engineers can make this whatever style or layout they deem suitable. It is quite evident in today’s news articles of industry magazines as this one; that these types of communities are being designed and considered already viable options and in time will become part of our urban landscape.

Author’s Bio

Mathias Tobias is Senior Project Manager at (IMFS) International Marine Floatation Systems, Inc. in Vancouver, B.C., Canada (Established in 1981). IMFS is a global leader in the design/engineering and manufacturing of concrete floating structures, such as Marinas, Wave Attenuators, floating homes, Yacht enclosures, Specialty Floats and Floating Commercial Structures.

www.FloatingStructures.com