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A Concrete Solution to America's Flooding Problem

Impulsive and indiscriminate, floods take an average of 100 lives each year and cause more than [\\$1 billion in repairs and reconstruction](#). Yet wrecked houses rushing downstream, streets, parks and neighborhoods engulfed in flash floods, and cities pounded by angry sea foam rarely deter Americans from living in harm's way. Even though most homeowners' insurance policies do not cover floodwater damage, the beauty of living on the water's edge appears to be worth the risk.

While there's no fooling Mother Nature, there are ways to live more safely with her. Construction technology, including methods and materials, continues to improve, as does our knowledge of floodwaters and its effects on buildings. The clincher to achieving safer living may be a more nimble approach in the pursuit of solutions.

RSMC, President Diane Richardson knows how to track down solutions that tend to be elusive because they are so obvious. She has proposed one for those living in flood-prone areas - floating concrete used to make emergency platforms and shelters and amphibious homes.

"It's a simple technology that was patented many years ago, but the patent has expired and is now available for anyone to use," Richardson said. "It's currently being used by companies around the world to build marinas, ferry docks and bridges. For those who live in flood-prone areas, it has the potential to save money and lives."

Floating concrete consists of very large blocks of polystyrene (closed-cell, brittle Styrofoam material commonly found in cheap ice coolers) encased in wiremesh and lightweight concrete. When lashed together, the foam and concrete modules create floating platforms that can move with floodwaters up and down held in place by steel piles driven into the ground.

The platforms are capable of supporting considerable weight. In addition to homes, businesses and emergency roadways, Richardson suggests using the floating concrete to provide emergency platforms for those trying to escape or find safe ground in a flood.

"These structures are very stable, unlike pontoons and wood docks," Richardson said.

Floating an untested idea

Arun Bhalaiik, a Seattle engineer specializing in marine structures, is somewhat of a floating concrete evangelist. "It's an existing technology that can save taxpayers a bundle," Bhalaiik wrote in a 1990 Seattle Times op-ed urging residents to consider building a floating bridge using the improved polystyrene materials to connect Seattle to growing Eastside communities. Today, Seattle is home to the first and longest floating bridges in the world.

Fifteen years later, Bhalaiik believes that using the floating concrete technology in flood-prone areas is a viable solution to persistent destruction and danger. He says the polystyrene-concrete structures range in cost from \$80 to \$200 per square foot of deck surface - far less than the cost of repairing, rebuilding, and relocating entire communities.

Having designed hundreds of floating concrete structures, Bhalaiik has seen the technology work in a range of conditions and settings, including guidewalls for ships moving through locks, bridges, marinas, docks, and offshore drilling units. He says homes and emergency platforms

should be quite simple compared to the much more complex structures that have been built successfully around the globe.

"There is an LPG (liquefied petroleum gas) facility on top of floating concrete structure in Indonesia. It was built in Tacoma, Washington, and they moved it all the way to Indonesia. There are floating saw mills on the Amazon, and the Norwegian oil field rigs are all building on floating concrete. It's an understood technology. We know how to build these things."

The sturdy floats can be made anywhere polystyrene is available, including directly on site, eliminating the need for transportation. And because concrete is inherently resistant to corrosion and protects the steel reinforcement embedded in it from rusting, the structures last and upkeep is minimal.

While these benefits are compelling, the idea is hard to wrap one's mind around. Most people are used to seeing polystyrene used for egg cartons and packing, not homes, and concrete hardly conjures up an image of domestic beauty. What would houses look like? How can foundations not anchored to the earth be secure?

High and dry with a stunning view

Consider this example from the Netherlands, where two-thirds of the Dutch live below sea level, constantly under threat from rising waters. For centuries, residents have built dikes to protect themselves from the sea, but faced with rainfall predictions that would raise the sea level by four feet, engineers turned to floating concrete to counter the rising tides.

A village southeast of Amsterdam, built on the "wrong side" of a dike in a beautiful flood plain, has been transformed into a community of amphibious homes. Each hollowed-out home foundation rests on the ground, fastened to mooring posts with sliding rings that allow the house to float upward with rising flood waters. All the electrical cables, water and sewage flow through flexible pipes inside the mooring piles.

Attractive, modern and boasting spectacular views from the bedroom and living room balconies, the houses have been so popular that a waiting list of 5,000 continues to grow. Developers have plans for an entire floating town of 12,000 homes near Amsterdam's Schiphol airport. Construction is expected to begin in 2010 and will include floating schools, hospitals and shops. Concrete bunkers below the buildings will store water for reuse.

While floodwaters persistently damage large sections of the United States every year, such communities have yet to be built or even planned. Richardson says the Army Corps of Engineers has turned down offers to promote this technology and make it available for the construction of homes and safety platforms, because they don't want to encourage people to live in flood plains.

"So the technology in general goes wasted when it could save lives and help so many people. History has shown that people will continue to live in flood-prone areas, no matter what the risks. If we have a simple, inexpensive solution, it's worth making available so [people can help themselves if they want to](#)," Richardson said.

Ready, set, pour

If shifts in the market and improvements in construction technology of above-ground concrete shell dwellings -- essentially an inside out and upside down form of Richardson's better living solution -- are any indication, acceptance could be close at hand. The popularity of homes with concrete wall construction is at an all-time high, and a new construction method, using polystyrene forms for the cement that are then covered with another layer of concrete - Insulating Concrete Forms (ICF), is spurring even more growth.

This market expansion could pave the way for homes with concrete top to bottom and capable of rising above floodwaters. Advances in concrete mixes create very lightweight cement that still maintains its strength, making it possible to use for the foundation and walls. Weighing in at 45 pounds per cubic foot without the polystyrene, it easily floats above water, which weighs 62 pounds per cubic foot.

"It's the way of the 21st century," said Dave Sethre, executive director of the [North Dakota Ready Mix & Concrete Products Association](#). "It's totally cool stuff."

Sethre's enthusiasm stems from the structure's many benefits over woodframe homes. He says concrete structures are strong enough to withstand forces of nature that would destroy houses built using traditional construction materials - unaffected by mold, moisture, intense sun and strong winds. They're also much more energy efficient, cutting heating and air conditioning costs in half - quite a boon in North Dakota and Minnesota where Sethre does most of his building.

Joseph Lyman, president of the [Insulating Concrete Form Association](#) (ICFA) said the growth trend line of the ICF construction has been like a hockey stick - relatively flat to start then spiking over the last decade. "We're at the critical bend in the hockey stick right now, almost doubling the number of homes built each year."

In the last few years, Lyman says the U.S. Department of Housing and Urban Development has provided welcome encouragement. "HUD has broadened ideas, and perspectives of how we perceive buildings. They realize that two-by-four construction is not sustainable. We can't continue to cut down trees for lumber. Concrete is a stable, durable, and sustainable building material."

Other benefits of cement over traditional "stick frame" homes built with wood studs include virtually soundproof walls and air completely filtered of allergens and dust. "There are no voids where air can enter a home. It's the perfect controlled climate," Sethre said.

Sethre said there are several attractive colors and designs that can be applied, including a faux brick appearance, varied textures, rounded corners and other decorative features. Sethre hosts several seminars for builders to learn the trade and is excited about the opportunity it presents for young people.

"Contractors are so busy doing stick frame systems, they don't take the time to learn. It allows a young person who wants to build a better home for the consumer and the environment to get started in something big with minimum investment and a premium product," Sethre said. "With these systems, we're building to last like the European structures. They will last forever. There's nothing here to rot."

Based on his own experience in the industry, Lyman expects homes with floating concrete foundations will be greeted with initial skepticism and reticence, but "if people want a floating house to protect them from floodwaters, markets can be created by themselves. Consumers drive the market and the popularity of concrete homes in market share in the past decade could create more acceptance."

Architects of a floating world

Don Innes, chairman of the board of [Float, Inc.](#) knows a thing or two about getting the public and markets to try new things. Innes isn't so much concerned about flood prevention, but sees the waters' surface as a new real estate frontier. He has patented and tested large floating platforms, designed for off-shore oil refineries, airports and military bases. The technology uses cylinders of trapped air to support platforms that rest on the ocean's surface. Unlike

floating concrete using polystyrene, the pneumatically stabilized platforms remain perfectly stable as weight is added and waves break on its sides, providing a level surface to base any operation. In addition, the shock absorber air cells are capable of capturing wave energy, which can be used to generate electricity.

"Everybody seems to be very excited about it and thinks we have the future in our hands, but no one wants to pay for the risk of building on the first platform," Innes said. "Edison must be rolling over in his grave. Nothing would be here if we didn't try things that hadn't been done before." The first taker - a Louisiana military base - is not interested in building on the platform, but will use it to test detonations and explosions. "It will be an empty platform where they can conduct tests, blowing things up."

Innes insists that eventually the demand will be so great, that offshore real estate will be inevitable: "The population of the world will expand past the one-third of the world that is habitable by man and start taking advantage of the other two-thirds surface of the earth."

Innes says the idea of using floating concrete for housing in flood-prone areas is so simple by comparison, "It's hard to believe it hasn't been put into practice before." He urges Richardson to be patient and build a cadre of engineers and architects who can attest to its viability.

Better living made easier

Floating concrete as a flood protection tactic is just one of a steady stream of products, concepts and ideas that Richardson's company will introduce to making living more safe and a little easier.

Flooding facts

Floods account for more than 90 percent of disaster-related property damage and more than 75 percent of all Presidential disaster declarations.

Water weighs 62.4 lbs. per cubic foot and typically flows downstream at 6 to 12 miles an hour. Given this force and the buoyancy created by displaced water, two feet of water will carry away most automobiles.

People who live in a flood plain have a 26 percent chance of being flooded during the life of a 30-year mortgage, compared to only a 4 percent chance of fire.

National Flood Insurance Program insurance loss records show that more than 30,000 houses have been flooded more than once in a six-year period.

The National Weather Service and U.S. Geological Survey are using new technologies to create flood maps that provide more detailed predictions of where water will go during a flood. These maps can provide an early alert system for those in harm's way to protect themselves.

*National Weather Service, Federal Emergency Management Administration, and U.S. Geological Survey

RSMC™ Solutions

With a company slogan, "Helping to Understand Our World and Committed to Finding Better Ways to Live in It," the mission of RSMC is to create useful products that meet common needs and to provide information in engaging ways so that people in need of a solution can help themselves.

RSMC™ has patent pending an inexpensive and convenient application to protect consumers from the damages caused by identity theft known as Safety-Zones® and is finishing an online finance program to help the average person to control debt and better manage money known as Budget-Master.com. Another RSMC™ solution includes an "e-mail guardian" - a product that will stop spam. "It's the ubiquitous problems that tend to be most neglected," said company president Diane Richardson. "It's just a matter of looking for solutions in the right places."

Richardson points to a Sufi story about philosopher-fool Nasrudin, who was on his knees looking for his house keys under a street light. A neighbor happened by and joined in the search. After some time with no success, the neighbor asked Nasrudin, "Exactly where did you lose your keys?" Nasrudin replied, "Inside my house." "Then why on earth are we looking for them out here?" asked the neighbor. "Because," Nasrudin said, "there is more light here."

This story reveals a common predisposition to look where we want to instead of where the solution exists. "RSMC is founded on a belief that in our multidimensional world, knowledge, determination, curiosity, open-mindedness and serendipity lead to discoveries. With a healthy concern for ourselves, and the welfare of others, we look for and create value within ours," said Richardson.

Additional Help for Flooding

Federal Emergency Management Administration (FEMA)
Help at all stages of flooding: preparation, management, and clean up -
<http://www.fema.gov/hazards/floods/floodf.shtml>

"Homeowners Guide to Retrofitting" - Six Ways to Protect Your House from Flooding
<http://www.fema.gov/hazards/hurricanes/rfit.shtml>

Small Business Administration <http://www.sba.gov/disaster/getready.html>
The SBA provides low-interest disaster assistance loans for both businesses and private residences to pay for rebuilding damaged structures, including the cost of bringing the building into compliance with local ordinances and laws.

Department of Housing and Urban Development
<http://www.hud.gov>
HUD may provide additional, or allow Community Development Block Grants to be used for retrofitting substantially damaged houses or substandard housing (including elevating floodprone houses and acquiring badly damaged floodprone houses).

US Army Corps of Engineers
<http://www.usace.army.mil/public.html> The Corps has statutory authority to participate in flood protection projects that may include residential retrofitting (including elevating floodprone houses and acquiring badly damaged floodprone houses).

US Department of Agriculture's Natural Resources Conservation Service
<http://www.nrcs.usda.gov>
The NRCS has the statutory authority to participate in small watershed flood protection projects that may include residential retrofitting. Contact your local Conservationist listed in the government pages of your telephone directory or at www.nrcs.usda.gov for further information.

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