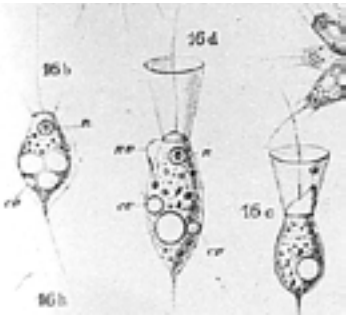
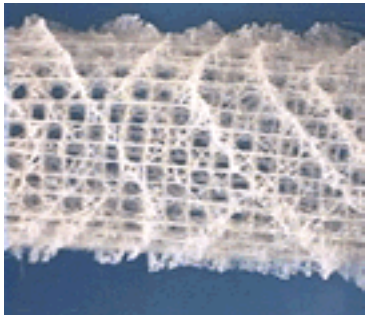
ALLUVIAL SPONGE COMB : 6.28.06





Design Concept

Design Concept

The Alluvial Sponge Comb is the waterfront landscape element of our design proposal for New Orleans, mediating between the natural ebb and flow forces of water and the inhabitation of the site. The central design criteria for our building and landscape design focuses on adapting the human construction to harmonize with the cyclical flows and extremes of the natural site, absorbing and beneficially harnessing nature's impact rather than resisting it. We feel that it is very important for the American Pavilion in Venice to not dwell on the disaster as an unfortunate freak occurrence of nature, but instead to focus on the opportunity to engage in design for alleviating a worldwide infrastructure concern, by proposing new modes of waterfront development that accommodate and celebrate natural extremes, avoiding human and ecological destruction with multi-functional systems that contribute to the quality of life each day rather than investing in single-purpose bulwarks that serve once in a lifetime yet stand as ungainly, inflexible and expensive barriers always in place. New Orleans and Venice are both remarkable works of unnatural environmental construction that have developed intriguingly similar cultures of black humor artifice and cyclical festival that experientially mediates the difficult, dangerous, and uncertain environments that both sustain and threaten them. For the courtyard of the American pavilion at the Venice Biennale, we will install a sample portion of the alluvial sponge comb as outlined in the following pages, proposing a constructed waterfront landscape that can be rich, accommodating and absorptive, and affirming of the hopeful logic of life in the nature and culture of unique waterfront cities like New Orleans and Venice.

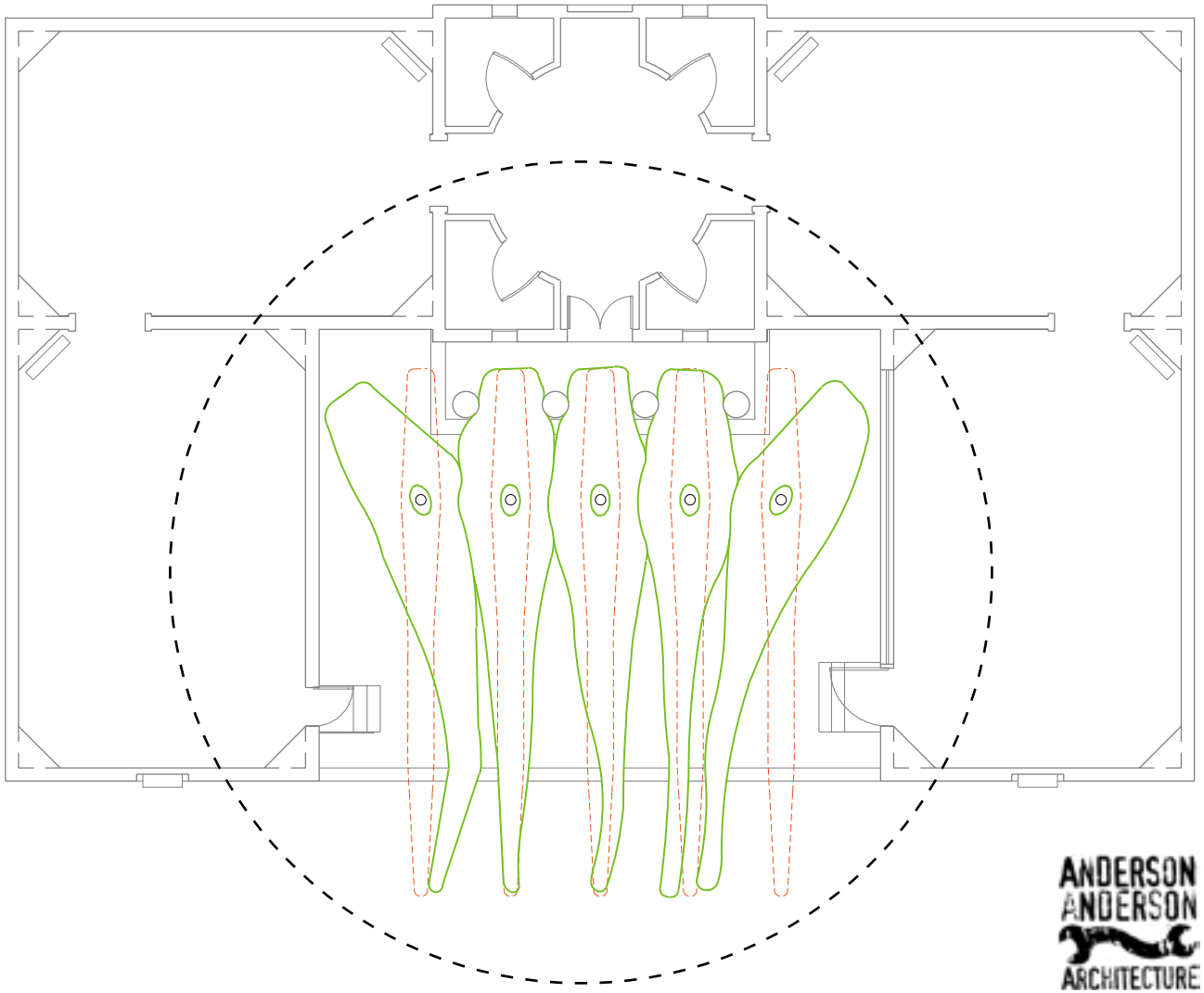
In its proposed implementation at the edge of the Mississippi river, the Alluvial Sponge Comb performs several functions, including flood and erosion control, the slowing of water flow along the river bank in order to capture silt to aid in the build-up of the shoreline, and the sustenance of land and water life—human, plant and animal—by affording both habitat and unencumbered passage through the latent barrier system. In times of unusually high water levels, portions of the comb are designed to swell as they absorb the rising water, becoming a temporary levee to protect the land and buildings beyond it. When the flood waters subside, the swelling in the comb also diminishes and returns the structure to its original fingered form, allowing a high degree of porosity in the landscape. The ideas for this structure are based on considerable research and past prototyping of related systems. There are large industrial firms engaged in related product manufacture. Chemical companies such as BASF, DuPont, and Dow all produce superabsorbent products that swell to absorb water and then slowly respirate vapor back into the environment as they dry and return to their original composition. 95% of the superabsorbent market is for new throw-away diaper products. However, all of these firms are also engaged in construction products and environmental control products, and all are positioning themselves as leaders in innovative technology that can be in harmony with the environment. It is likely that there will be one or more companies that would be interested in sponsoring this project with expertise, materials and financial support, and we have prepared background research and strategies for approaching them. The stand-alone siting of the comb in the courtyard will allow a significantly market-related image for these companies that may help generate their enthusiasm for supporting the pavilion overall.

ANDERSON ANDERSON ARCHITECTURE

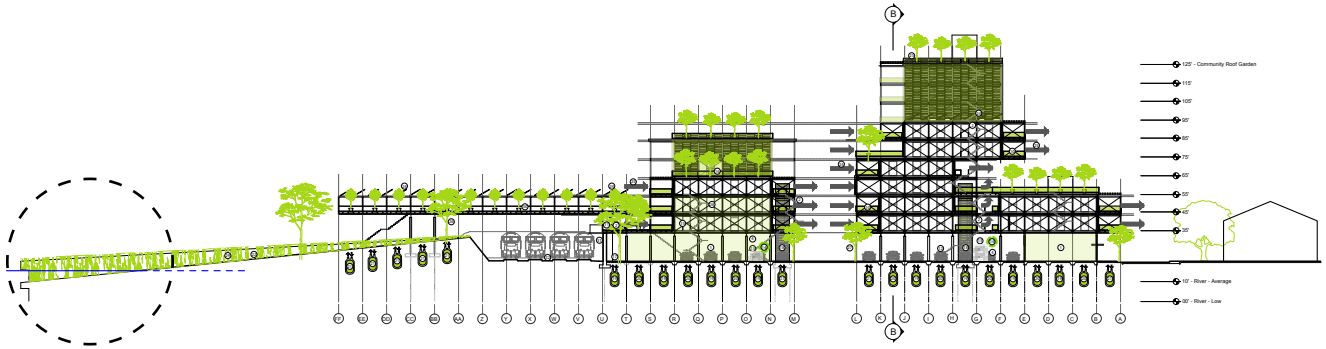
The proposed installation for the courtyard of the American Pavilion at the Venice Biennale is a full scale model of a section of the proposed Alluvial Sponge Comb from Anderson Anderson Architecture's New Orleans Housing Competition entry.

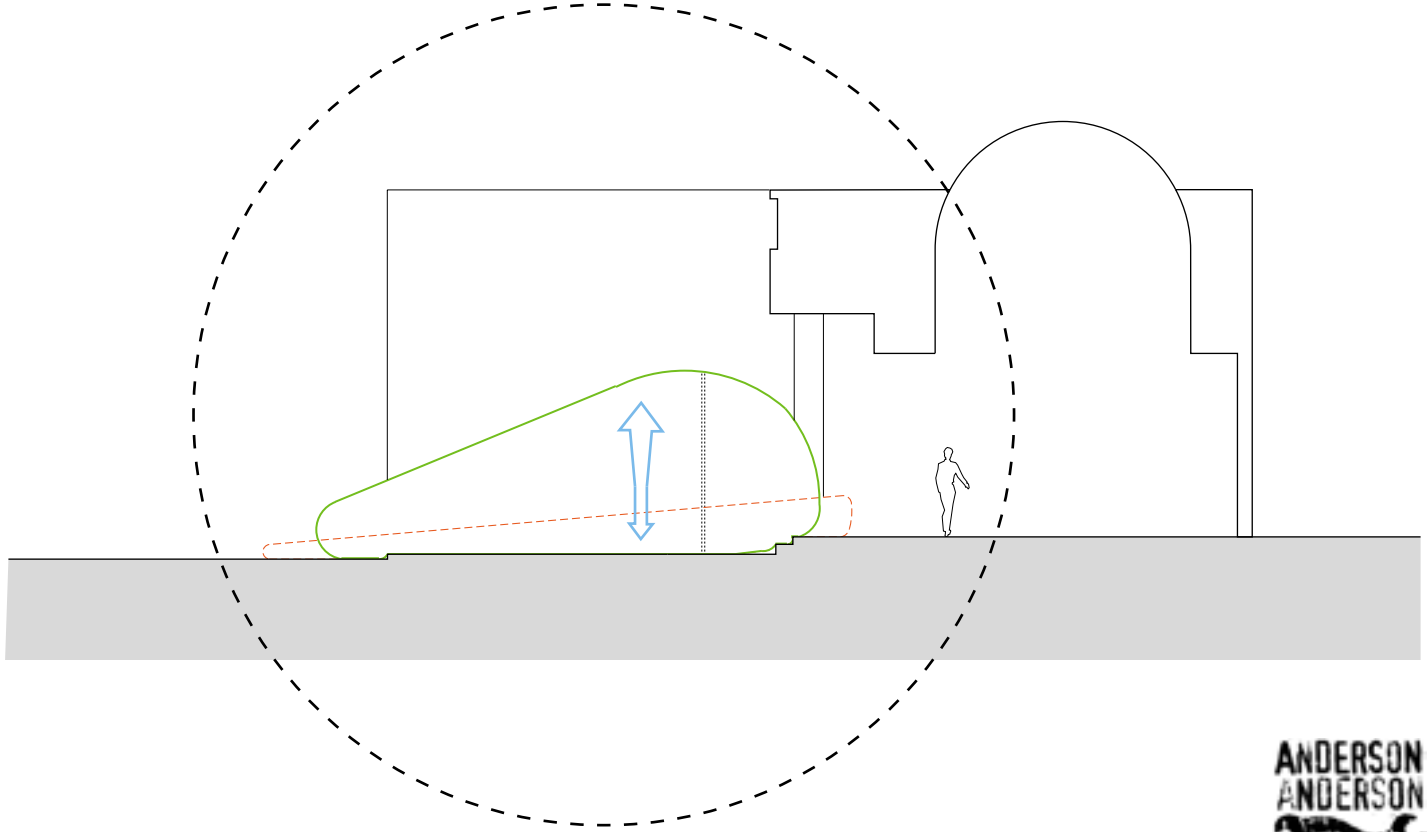
"The site itself reaches out through the park to create an alluvial delta comb recapturing passing river sediment to slowly replenish and build the high ground and its natural waterfront life, much as the natural delta, bayous and barrier islands originally functioned. These sponge-like delta fingers then reach back and up to form the housing blocks themselves, which in turn also function as absorptive, living tissue in the larger landscape."

[from: Anderson Anderson Architecture New Orleans Competition Entry]



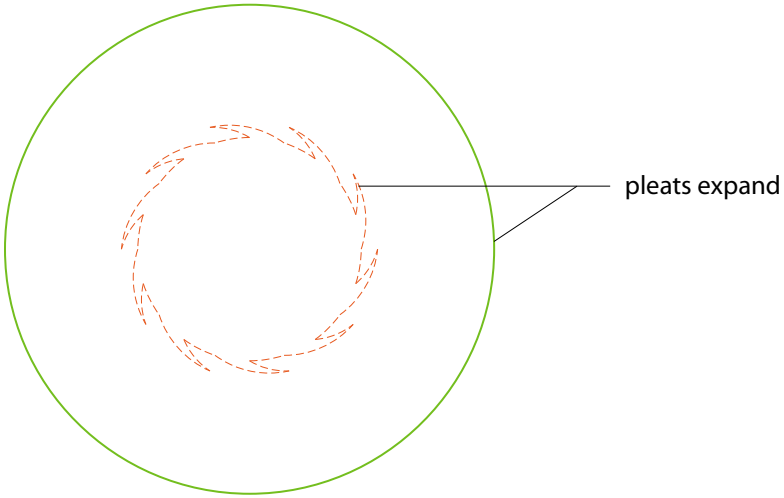
ANDERSON ANDERSON ARCHITECTURE





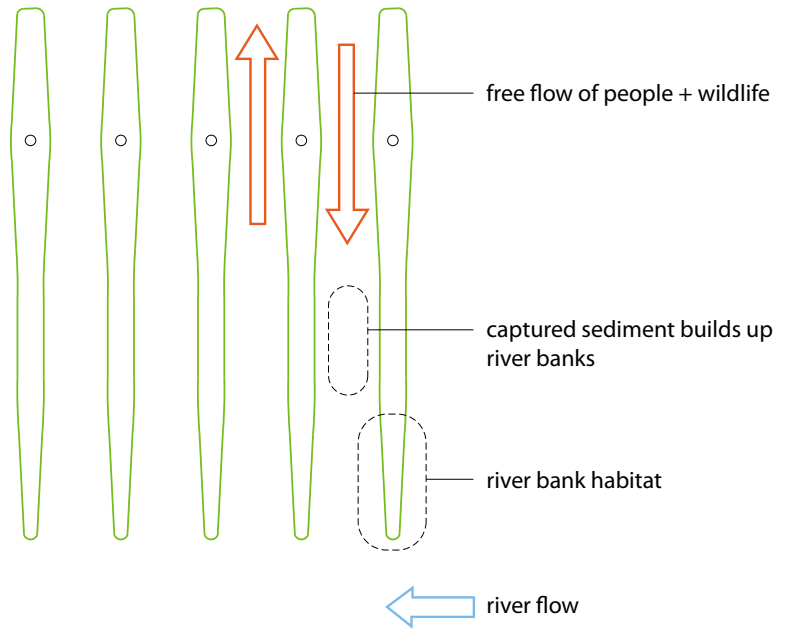
ANDERSON ANDERSON ARCHITECTURE

Alluvial Sponge Comb

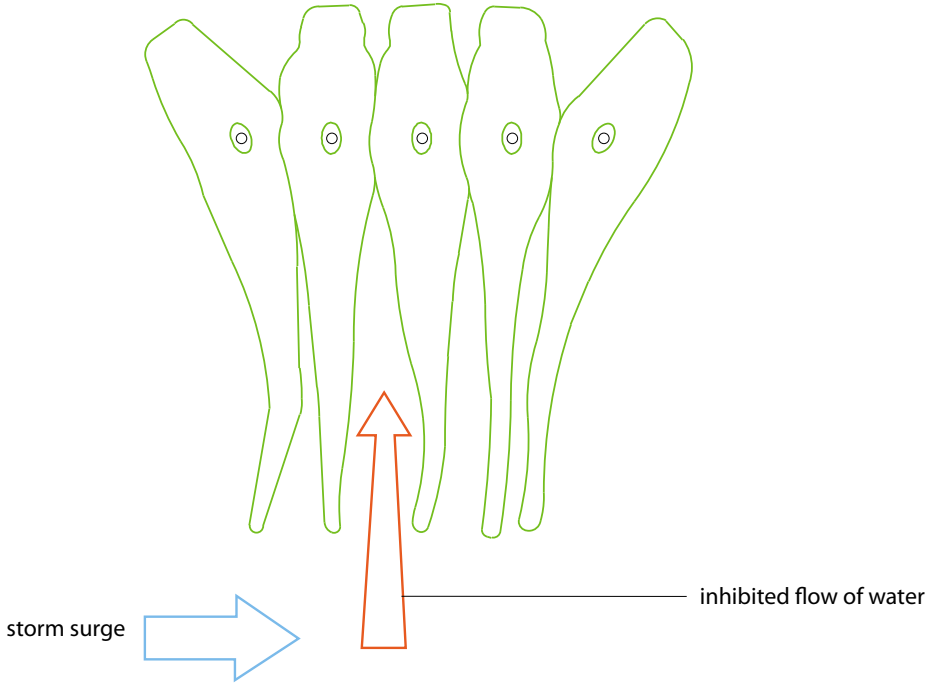


folds in the exterior membrane unfurl to allow the superabsorbents within to expand.

TYPICAL PREPAREDNESS MODE



FLOOD BARRIER MODE



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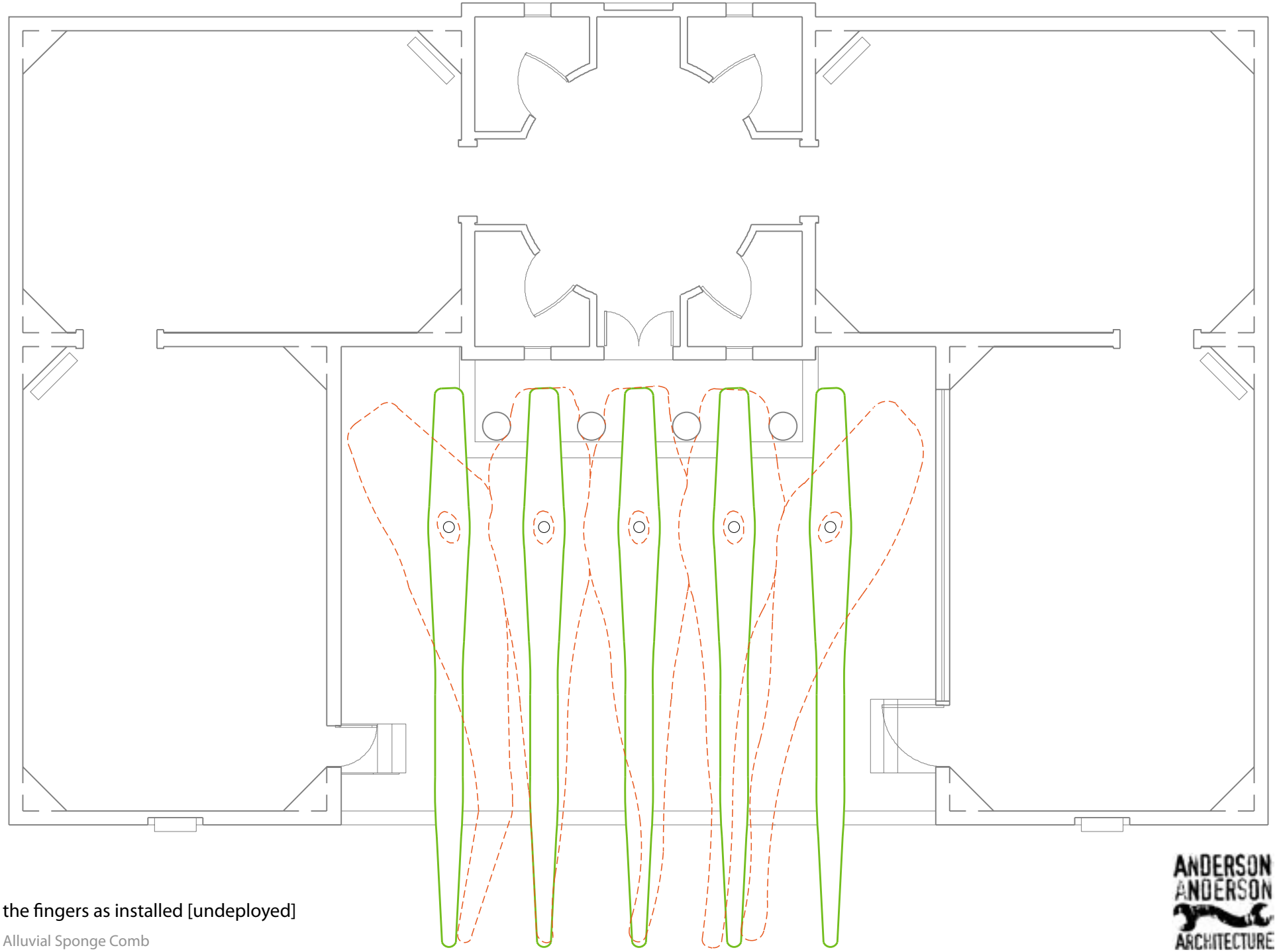
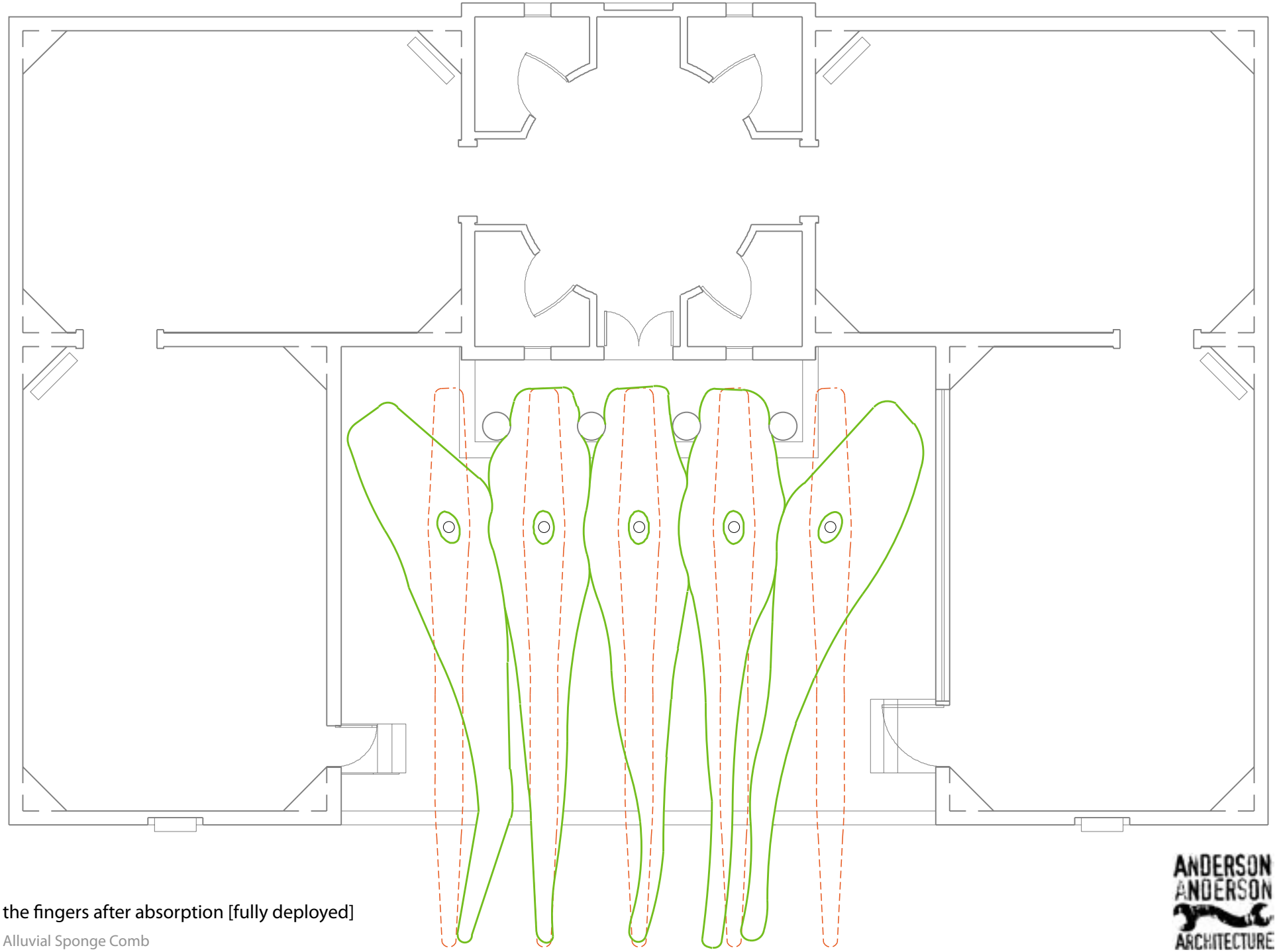


the fingers as installed [undeployed]

Alluvial Sponge Comb

ANDERSON ANDERSON ARCHITECTURE



the fingers after absorption [fully deployed]

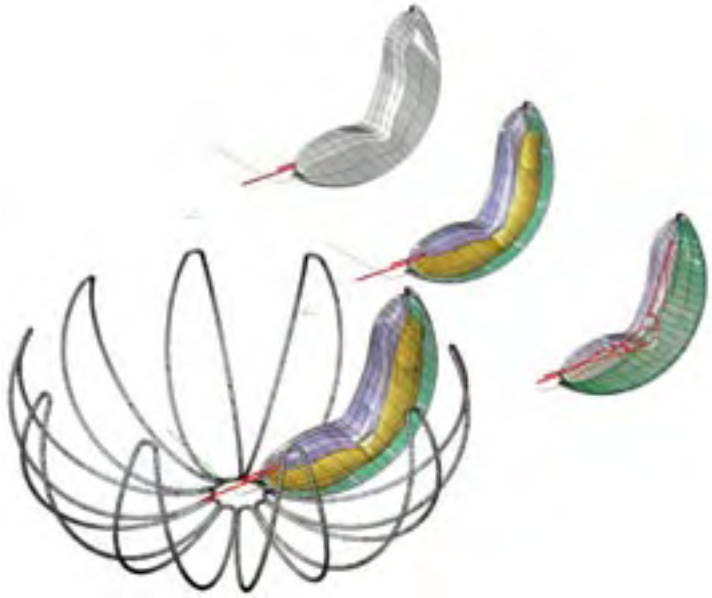
Alluvial Sponge Comb

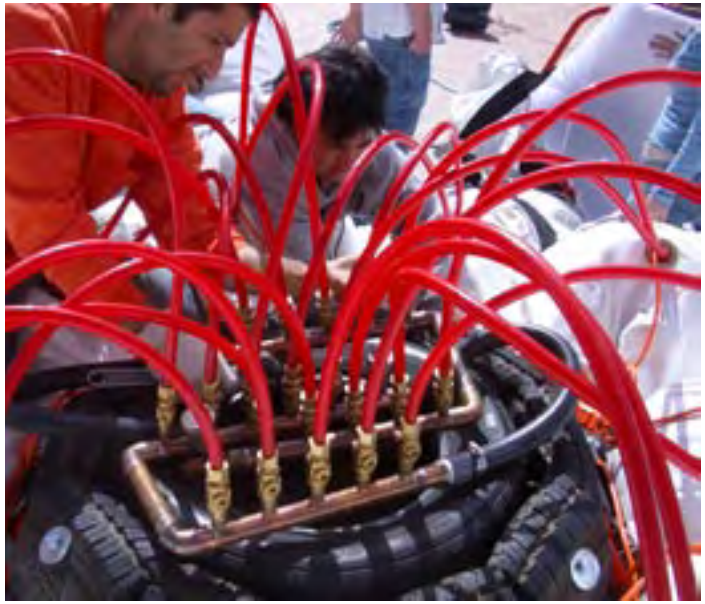
ANDERSON ANDERSON ARCHITECTURE

Related Prototype Projects: the life bean 2006

Alluvial Sponge Comb

ANDERSON ANDERSON ARCHITECTURE





Related Prototype Projects: hot white orange 2005

Alluvial Sponge Comb

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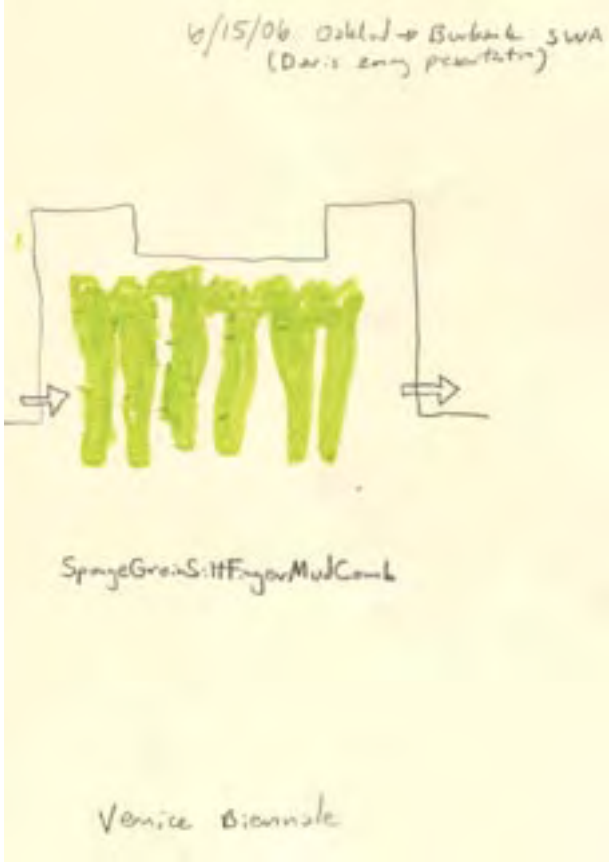

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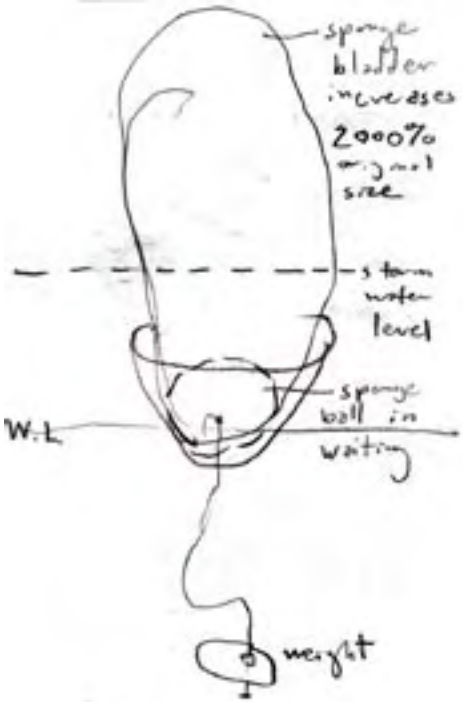

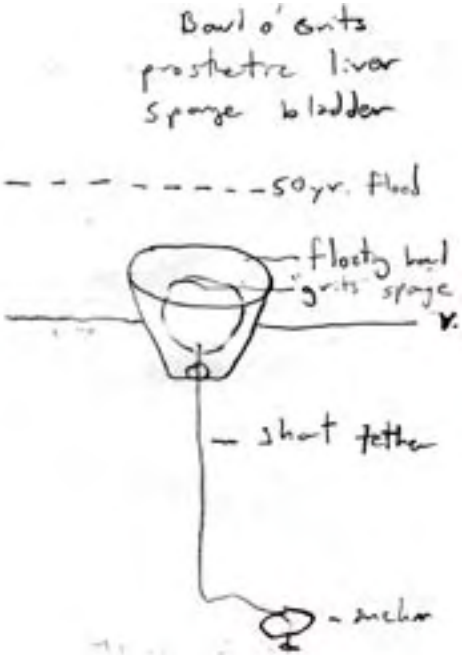

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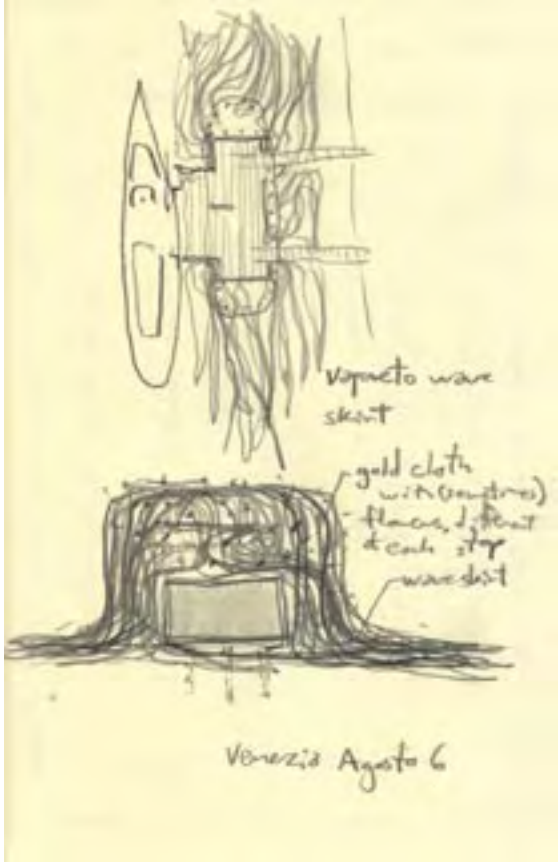


ANDERSON
ANDERSON
ARCHITECTURE

Superabsorbents for Flood Control

Title: Flood water containment bag

Document: United States Patent 4650368

Abstract:

A flood water containment bag constructed of lightweight, inexpensive porous material with a quantity of water absorbent material therein which increases substantially in volume and weight when it absorbs water entering into the interior of the bag. The bag can be easily and quickly transported to a point of use and arranged in a plurality of superimposed courses when in a flattened lightweight condition and ***will expand to form a water barrier or wall***. Fastener strips are attached to top and bottom surfaces of the horizontally arranged bags to enable them to be interconnected to stabilize the formed barrier.

www.floodcontrolam.com

www.basf.com

Alluvial Sponge Comb

ANDERSON ANDERSON ARCHITECTURE

Erosion Conrol, Levees, Dykes, and Dams

RELATED, BUT ON POLYURETHANES (from BASF);

Flexible covering protects imperiled dikes

The elastic composite of crushed stones and BASF's polyurethane Elastocoast® withstands even harsh storms

The Story

About 800 kilometers of dike systems protect the German North Sea Coast against the onslaught of the forces of nature. The North Sea coastal states Schleswig-Holstein and Lower Saxony already invest almost €100 million every year in coastal protection measures for flood disaster prevention. And these efforts will have to be increased even further in future: during the coming century, scientists predict that global warming will cause a rise in the sea level of up to 70 centimeters. The regions at greatest risk are therefore already raising the height of many of their dike systems to as much as 9 meters.

More than ever before, innovative solutions are needed to provide effective and stable coastal protection. One of them is a specially developed elastomer polyurethane system from BASF's subsidiary Elastogran: under the name Elastocoast®, the company is offering a novel plastic for reinforcing stone ballast revetments for dikes. These coverings represent the first line of defense in the fight against the sea, protect the dike by absorbing the force of the breaking waves and slow down the water masses. "Elastomer revetments utilize the property of polyurethanes of creating permanent and elastic bonds with stone surfaces", explains Professor Erik Pasche of the Institute of Hydraulic Engineering of Hamburg-Harburg University of Technology, Elastogran's partner in developing Elastocoast®, the adhesive for stabilizing sea defenses. "This creates sturdy, ***porous but at the same time very resistant*** revetments."

Elastic and porous – these two properties are the secret of Elastocoast®: the ability to yield slightly protects the revetment against the brute force of the water masses crashing down upon them; the interconnecting cavities between the stones absorb their energy. Rigid and solid revetments made from the conventional "adhesives" concrete or asphalt, on the other hand, are often broken down by the pounding force of the waves: starting from an initial, tiny defect, the breakers gradually make deeper and deeper inroads into the revetment.

The philosophy of yielding slightly to these thundering masses of water in order to contain them has paid off. The same principle is applied in the construction of modern dike systems which rise with a very gradual incline on the side facing the sea. ***This allows the breakers to gradually expend their force without causing damage***, instead of explosively releasing their pent-up force on immediate impact. But the dikes also need a protective layer against the insidious erosion which is reaching dramatic proportions along exposed sections of coastline, as for example in Sylt, and is even threatening the integrity of whole islands. Preventing this from happening is the job of Elastocoast®.

It could hardly be easier to use: the liquid two-component special plastic polyurethane is stirred on site and then mixed – for example in a concrete mixer – with the crushed stone which it envelops like a thin, transparent film. With relatively little effort, the finished mix of materials, which remains ready to use for about 20 minutes, can be applied in covering layers about 15 to 30 centimeters thick. The mixture even hardens underwater. Alternatively, the environmentally friendly Elastocoast® can also be sprayed onto a loose layer of stone ballast using a high-pressure technique.

Following its successful use in the redevelopment of a jetty on the bank of the river Elbe in Hamburg, Elastocoast® is now facing its biggest challenge on the island of Sylt. Especially in winter, the North Sea gnaws away at the island: last year, flashing eroded coastline sections with sand cost at least € 3.5 million. In September 2005, a revetment made of Elastocoast® has

protecting part of the particularly exposed northern part of the island. A similar pilot project has also been completed on Hamburger Hallig to the north of Husum. Dr. Marcus Leberfinger, project manager for maritime applications at Elastogran, is very satisfied with the results achieved in the first winter: "Even in the breaker zone of the open coast of Sylt, the revetment reliably withstood the high dynamic stresses caused by wave impact, salt water and the effects of frost."

The research results speak for themselves, but is coastal protection with Elastocoast® affordable as well? "Cost control was given high priority from the outset in developing the product", says Leberfinger. "Elastocoast® is easy to apply, and because of the reduced thickness of the revetment and the lower cost of the smaller-sized ballast stones, at the end of the day the costs are even somewhat less than those for conventional structures."

Elastocoast® with its ecological properties also provides benefits for nature: ***flora and fauna could find new habitats in the porous structure of the cover layers*** – and so shore crabs, limpets and beach grass would also stand to gain from this innovation.

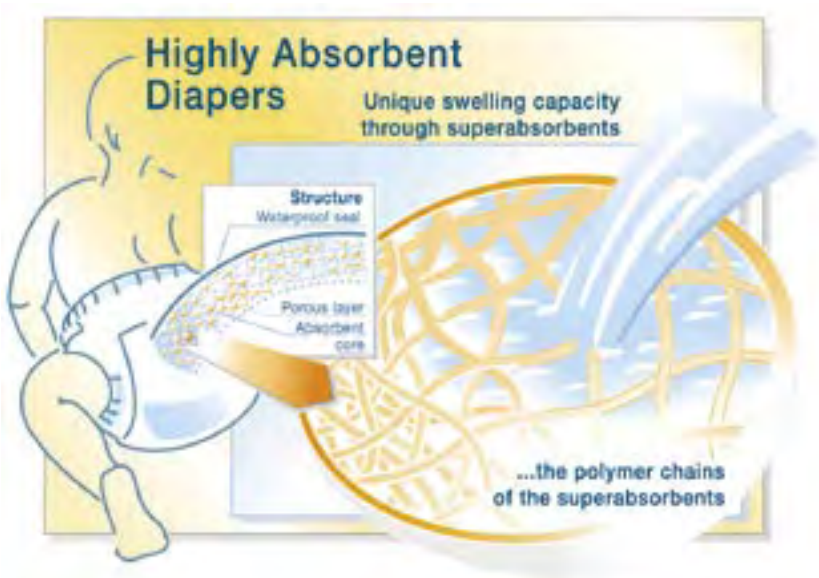
From Chemical & Engineering News, 83 (11), pp.14-15 (3/14/2005):

Degussa boosts superabsorbents

Degussa is expanding capacity for acrylic acid-based superabsorbent polymers (SAPs) in Germany and the U.S. In Germany, the firm says it will spend more than $50 million to raise SAP capacity in Krefeld by 2007 as well as acrylic acid capacity in Marl. The acrylic acid plant is a joint venture with Rohm and Haas. In the U.S., the company is adding 40,000 metric tons per year of SAP capacity in Greensboro, N.C., by restarting a plant that was mothballed four years ago. The company's SAP business had sales of about $560 million last year, up 2% over 2003.

Superabsorbent polymers (SAPs)

Superabsorbent polymers (SAPs) are materials that have the ability to absorb and retain large volumes of water and aqueous solutions. This makes them ideal for use in water absorbing applications such as baby nappies and adults incontinence pads to absorbent medical dressings and controlled release medium. Early superabsorbents were made from chemically modified starch and cellulose and other polymers like poly(vinyl alcohol) PVA, poly(ethylene oxide) PEO all of which are hydrophilic and have a high affinity for water. When lightly cross-linked, chemically or physically, these polymers became water-swellable but not water-soluble. Today's superabsorbent polymers are made from partially neutralised, lightly cross-linked poly(acrylic acid), which has been proven to give the best performance versus cost ratio. The polymers are manufactured at low solids levels for both quality and economic reasons, and are dried and milled in to granular white solids. In water they swell to a rubbery gel that in some cases can be up to 99wt% water.



Why don't SAPs dissolve in water?

Cross-links between polymer chains form a three-dimensional network and prevent the polymer swelling to infinity i.e. dissolving. This is due to the elastic retraction forces of the network, and is accompanied by a decrease in entropy of the chains, as they become stiffer from their originally coiled state (figure 4).

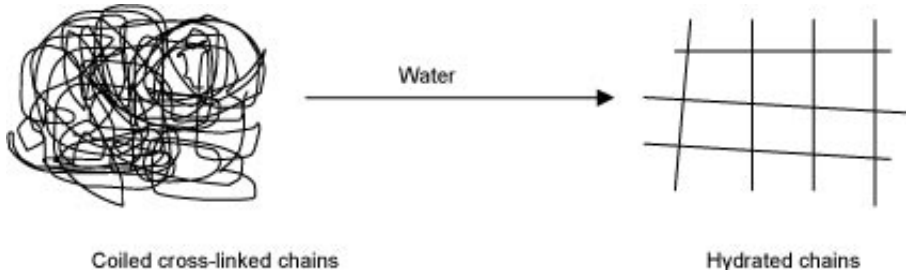


Figure 4

Water Coiled cross-linked chains Hydrated chains There is a balance now between the forces of retraction and the tendency for the chains to swell to infinite dilution. The degree of cross-linking has a direct effect on the level of swelling of the polymer and the strength of the network...