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The Collapsible House

by

Carlos E. Fighetti

A Thesis Submitted
in Partial Fulfillment of the
Requirements for the Degree

Master of Architecture

Approved, Thesis Committee:

[Signatures and names of committee members]

Houston, Texas
April, 1999
ABSTRACT

"The Collapsible House"

by

Carlos E. Fighetti

The scales of change that affect suburban houses differ according to numerous variables. The goal of this thesis is to design a house that can adapt not only to different external scales of change—for example, climate—but also the internal pressures that reflect the owner's spatial needs and desires. By focusing on the demands of nature and the internal demands of the family, this re-conceptualization of the suburban home proposes to satisfy the above mentioned criteria in addition to the traditional expectation of a suburban home.

Following a detailed study of the suburban environment, it became quite obvious that the typical house simultaneously negotiates different scales of change that have little to do with each other. We expect our houses to adapt to both the climatic environment that envelopes it as well as the changing physical and emotional needs of its owner. Yet when one takes away the option of a costly renovation, few, if any, homes meet both these inner and outer wants.

My design accounts for these past failings and proposes to function as a filter that negotiates that outside world with the chaos of life. Though natural disasters and personal change are completely different in origin, they both disrupt our lifestyles in a similar fashion. By using the house as a mediator between the two, I find a middle ground that bridges the two seemingly antithetic contexts.
ACKNOWLEDGMENTS

I would like to express gratitude to my thesis committee for their guidance, especially Doug Oliver, whose professional demeanor and excitement provided the inspiration that kept me pushing the project forward.

I would like to thank Mother Nature for the catastrophes that she sent to Texas and the Caribbean. Her numerous examples of extreme weather conditions convinced me that my project was a worthy endeavor.

I would also like to thank all those who provided help and support at crucial times: Scott Gac, Ash Roake, Juanita Jaramillo, Ivan Tkachenko, Brian Heiss, Alex Knapp, Kindra Welch, Kent Fitzsimons, and Joshua Roberts.
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Chapter 1
Research background
Urbanization and the justified fear of natural disasters.
The ecological perspective begins with a view of the whole, and understanding of how the various parts of nature interact in patterns that tend toward balance and persist over time. But this perspective cannot treat the earth as something separate from human civilization. We are part of the whole too, and looking at it ultimately means looking at ourselves. And if we do not see that the human part of nature has an increasingly powerful influence over the whole of nature, that we are, in effect, a natural force just like the winds and the tides—then we will not be able to see how dangerously we are threatening to push the earth out of balance.

Al Gore, 1993
Modern American society is out of sync with its environment. We are ambivalent to the natural context that we live within because technology has given us the ability to coerce nature to fit our needs. Our culture has become so accustomed to environmental control that half the time we are not even aware of it. This is due to the fact that environmental control systems extend all the way from the large urban scale, a situation in which most of the population is unaware of the harnessing of nature, to the small scale of individual interaction with his or her environs. For example, a system of dams and flood control devices is the only thing that is preventing the Mississippi river from changing course and destroying New Orleans. The populace of that city are reminded of this circumstance only when a major flood threatens the city, as in the Great Flood of 1994. On a day to day level, most of us keep the temperature of our apartments set at 72° Fahrenheit. The level of control that we surround ourselves is so thorough that it has allowed us to conveniently ignore the natural context that we live within, and consequently overlook the unpredictable character of nature.

Lately one is hearing more and more of natural disasters attacking our way of life. One reason for this is that we live in an environmentally conscious society with superb communications systems. Floods, hurricanes, earthquakes, tornadoes, etc. are promptly reported by both local and global news agencies for both safety and informational reasons. Another reason is that earth's

The Illinois River Flood Plain, September 1993. Normal river channel is to the far left of the image.

Natural Disasters: A Global Context:

Section I: A look at Flooding
"I think in the US, today there is essentially a general lack of will to confront our contemporary problems and to confront them squarely and clearly. Although the relationship of architecture to its immediate context, its political and economical context is illusive and complicated. I think we have no choice but to frame it within the realities of our world.

-Thom Mayne"

expanding population creates situations that are vulnerable to geologic processes. The most obvious examples are communities expanding into areas that have a history of flooding and/or storm surge. Satellite cities of New Orleans, Saint Louis, and Charleston have a history of doing exactly that. The first section of background research for my thesis project consisted of an attempt to understand why there is a direct relationship between increasing urbanization and the threat of natural disasters. Why the more urban our built environment becomes the more aware we must be of its geographic location and the threat of natural disasters. For the sake of simplicity, floods and hurricanes are the only natural disasters addressed by this thesis, and they played a major role in understanding the natural context of the project.

Grafton, Illinois town center during the 1993 Flood

Floods have become a much greater threat to life and limb than the San Andreas earthquake fault. The number of rivers, streams, and other water sources in this country is uncountable, and dominate the landscape. The Mississippi is the most important river in the country. Fed by over twenty major overflowing tributaries, including the Ohio, the
Arkansas, and the Yazoo, it is impossible for a growing urban society to avoid river valleys, not only because of the sheer number of them, but also because of the immense benefits a city receives from being adjacent to a river. In addition to fertile land, river valleys are flat and water transportation is readily available. Through out history the river valleys have always been the most heavily developed regions.

The problem is that surplus water from our countries’ river basins are no longer draining away via earth’s natural channels. Since the turn of the century enormous ecological and geographical changes have been wrought to the skin of the land. For example, extensive systems of flood control devices have been built on the Mississippi to stop flooding and prevent the river from changing its course. Man has forced small rivers and streams to change direction through obstructions to both prevent flooding and provide water to cities and communities. Homes, public utilities, factories, highways, and parking lots now occupy the floodplains. The flat hard surfaces of urban communities are ideal water transporters. Holt and Longbein, in their 1950 seminal study of American floods, wrote: “These conditions are evidence of a growing and prosperous nation. A nation not fully aware that there is no absolute assurance that future floods will not exceed the capabilities of our most comprehensive control measures. As a result the people who occupy the Flood Plains will do so at considerable risk.”

The simple fact is that urbanization promotes flooding. Our modification of stream channels and urbanization of valley floors has increased the frequency and severity of many floods. If an area is fully vegetated, a soaking rain increases stream discharge slowly, and the peak discharge will occur well after the rain begins. This is important because it takes time for the rain to saturate soil and then create significant run off. Also, once the run off begins, the vegetation further slows down the rate at which water flows, containing the size of the flood. During urbanization vegetation is removed, surfaces are paved, and stream channels are modified. It is common for developers to extend
the floodplains by adding fill to the land that borders streams. Both paving and fill prevents water from sinking into the ground, so it drains faster over the surface into streams, sewers, and man-made canals. This means that a substantially greater volume of water runs off faster, increasing the peak discharge, causing local flooding where none has ever happened before. Thus urbanization is one of the major contributing factors to the nationwide increase of floods. A problem that only worsens as now, some 14 million people are said to be living in floodplains.

This was evidenced throughout Texas this past fall, 1998. Over 850 homes were evacuated, and as much as 22 people died in Victoria, a town adjacent to Guadalupe River Basin. It was the worst flood ever recorded for the town whose flood history only reaches back sixty years. In the Houston area, the San Jacinto river and Cypress Creek caused thousands of dollars worth of damage. Areas such as the Norchester Subdivision, and Cypress

All newspaper clippings taken from the Houston Chronicle, month of October, exact issues unknown.
Estates Subdivision of North West Harris County have seen floods only twice, both times in the past four years. One resident of the Cyprus Estate subdivision remarked to me, "I have lived here in this house for the past twenty three years, flooding was never an issue, then all of a sudden, in the past seven or eight years houses and parking lots were built in the all the areas just north of here. In fact some of my neighbor's houses are only ten years old. All of a sudden we are getting flooded." By the end of the year, flooding was reported in over one quarter of the Texas' counties. Areas expected to withstand 100-year and 500-year storms are being swept away.

According to James Cornell in his *International Disaster Book*, river flooding is the most wide spread geophysical hazard in the United States, accounting for more annual property damage then any other type of disaster, natural or unnatural. The population living on lands borrowed from rivers and the ocean is over twice that of the national average population density. River flooding affects at least 7% of the total U.S. land area, and are of major consequence to approximately ten million people. There are more then 50 million acres of land in the U.S. known to be below flooding levels. Though this represents less then three percent of the total, the land is the most fertile, the most densely occupied, and the most economically active.

Flooding is not an isolated circumstance that only happens in Louisiana or Texas, but is a common occurrence throughout the United States. Over fifty major metropolitan areas are located in the
flood basin, and of those the majority of them experience floods on a fairly regular basis due to their location. This is explicit in the two maps that are provided. The lower map is the regional variation of the Flash Flood Index of the United States. As is evident in the map the eastern and Western seaboard is free from danger. Areas of Southern California, New Mexico, Arizona, and Texas are effected by a high probability Flash Flood Zone. The map on the following page clearly demonstrates the number of American cities and metropolitan areas located in the flood plains. All major metropolitan areas are demarcated in red, and the flood basin is
Catalogue of major metropolitan areas located within Mississippi River Basin.
Section II: A Look at the Coasts

Over 50 percent of the entire population of the planet lives and works within 200 kilometers of a coast. Nothing more dramatically illustrates that fact than a satellite photograph taken at night. The market forces of the developed world account mostly for the explosion of coastal towns and cities. Millions of middle-class families now have significantly more disposable income and more leisure time to enjoy the fruits of their labor. Seacoasts, with their boundless economic opportunity and high quality of life are increasingly viewed as the preferred place to work, live, play, and retire. Who wouldn't want to have a beach house?

Coast lines provide some of the most attractive land known to man. In the United States, 55-60 percent of Americans (around 156 million) now live in 772 counties adjacent to the Atlantic and Pacific oceans, Gulf of Mexico, and the Great Lakes. In 1990, the most crowded coast lines, the eastern seaboard stretching from Boston to Baltimore housed over 2,500 people per square kilometer. The five states that have the greatest rise in population are all coastal: California, Texas, Florida, Georgia, Virginia.

Coastal development increases the loss of life and property damage from storms. Warning systems and
hazards along the Gulf and Atlantic coasts. Unfortunately it is almost impossible to protect our coasts from these phenomena. The myriad of technologies that we have, seawalls, jetties, groins, etc. protect us from everything but the strongest of storms.

Coastal urbanization in the United States has increased markedly since 1970, a time during which the frequency of hurricanes was far less than in the previous twenty years. The image below depicts hurricane tracking charts from 1986 to 1996. By studying such charts the U.S. weather service and other researchers are able to statistically project which areas of the country are most likely to have a difficult hurricane season. The second chart is a compilation of class 4 and class 5 storms (See Sathr-Simpson scale provided in notes and references). It is easy to determine which geographic area is most likely to be hit by a

Below: Hurricane Tracking Charts, 1986-1996
Below: Superimposition of class 4 and class 5 storm tracks from Hurricane Tracking Charts 1986-1996
hurricane. Florida, Texas, the Caribbean, etc. The difficulty lies in determining when a hurricane is going to hit.

Recent research and statistical compilation suggests that the ten to twenty year period following 1994 will have a far more frequent storm probability. Analysis of storm frequency along the U.S. Atlantic coast by Dolan Davis reveals fewer of these storms during the 1980's. However the frequency of major storms (classes 4 and 5) has increased in recent years. In the period from 1987 to 1993 at least one class 4 or class 5 storm has occurred each year, a situation duplicated only once in the past 50 years. Of the eight storms in class 5 during the period studied, seven (88%) have occurred since 1960. ¹¹

The U.S. weather service was in its infancy at the time of the 1900 Galveston hurricane, the largest natural disaster of U.S history. The service bureau did not have the economic or technological resources to offer adequate warning and prevent the loss of life. Modern High technology weather monitoring equipment allows for adequate warning to be broadcast to the populous, but evacuation is far more difficult then it was ever before

"We admire one kind of place... but we consistently build something very different... the sprawl of modern suburbia."

Alex Krieger

Homes in Garden City, South Carolina destroyed by Hurricane Hugo, 1989. Photo by Coch. ¹²
because the density of beachfront properties is steadily increasing. Coastal cities and towns are no less attractive than they were ever before. The destructiveness of past hurricanes offers lessons that we do not seem to learn; we keep repeating the same mistakes over and over again. The truth is that disasters fade from people’s memories after five to ten years. After one generation, memories of the event become stories heard from older people that sound like “Remember that storm... well it was a long time ago, there is no need to worry anymore...” Unfortunately, History has proven this short-term thinking false. Regardless of what technological safeguards we erect to protect our investment, a storm comes along to prove us wrong.
Notes and References:

1. *Earth in the Balance*, pp. 2
2. Hinders, Kevin J. *After the Flood*, pp. 101
3. Mayne
4. Hutchings, Bruce L. *After the Flood*, pp. 107
5. Ibid.
6. Waldo Jobler
7. Hinrichson, pp. 7
8. Coch, pp. 394
9. Coch, pp. 428
10. Krieger, pp. 9
11. Coch. pp. 426
12. Coch. pp. 448
The Sathr-Simpson Scale of Hurricane Intensity

Category Wind Velocity, Storm Surge Height, and Damage

1 Winds 119-153 kilometers per hour (74-95 miles/hr), or storm surge 1.2-1.5 meters (4-5 Feet) above normal. No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal road flooding and minor pier damage.

2 Winds 154-177 kilometers per hour (96-110 miles/hr), or storm surge 1.8-2.4 meters (6-8 feet) above normal. Some damage to roofing material, and door and window damage to buildings. Considerable damage to vegetation, mobile homes, and piers. Coastal and low-lying escape routes flood 2 to 4 hours before arrival of hurricane eye. Small craft in unprotected anchorage break moorings.

3 Winds 178-209 kilometers per hour (111-130 miles/hr), or storm surge 2.7-3.6 meters (9-12 feet) above normal. Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain continuously lower than 1.5 meters (5 feet) above sea level may be flooded inland as far as 9.6 kilometers (6 miles).

4 Winds 210-249 kilometers per hour (131-155 miles/hr), or storm surge 3.9-5.5 meters (13-18 feet) above normal. More extensive curtainwall failures with erosion of beach areas. Major damage to lower floors of structures near the shore. Terrain continuously below 3 meters (10 feet) above sea level may be flooded, requiring massive evacuation of residential areas inland as far as 9.6 kilometers (6 miles).

5 Winds greater than 249 kilometers (155 miles/hr), or storm surge greater than 5.5 meters (18 feet) above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures, with small utility buildings blown over or away. Major damage to lower floors of all structures located less than 4.5 meters (15 feet) above sea level and within 457 meters (500 yards) of the shoreline. Massive evacuation of low areas on low ground within 8-16 kilometers (510 miles) of the shoreline may be required.

*NOAA table, 1990 version.
*Actual storm surge values vary considerably, depending on coastal configuration and other factors.

Comparative destructive level of hurricanes by Saffir-Simpson category:

<table>
<thead>
<tr>
<th>Category</th>
<th>Relative Hurricane Destruction Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 (reference level)</td>
</tr>
<tr>
<td>2</td>
<td>4 times the damage of a Category 1 hurricane</td>
</tr>
<tr>
<td>3</td>
<td>40 times the damage</td>
</tr>
<tr>
<td>4</td>
<td>120 times the damage</td>
</tr>
<tr>
<td>5</td>
<td>240 times the damage</td>
</tr>
</tbody>
</table>
Chapter 2
Research background
The changing connection between House, Home, and its Owner.
The second part of the background research for my thesis project consisted of an attempt to better understand the relationship between the house and the person who calls it home. One of the driving forces of my thesis was to understand how the house interacted with natural forces and also begin to establish a psychological/social context to investigate how a house can adapt to a person's changing needs over time.

Home-as-haven may become home-as-trap as a person's self-image changes over time but the dwelling remains the same.¹

The House as a Manifestation of 'Self':
A connection between House and Home.

In contemporary American society the house is seen as sacred. It is the place where we store and safeguard our belongings; the place where we eat, sleep, and relax; it is the place that protects us and our families. All of these descriptions imply that the house is more then just an object. Though house and home are one in the same, there is a vast difference between the two. The question that I asked myself time and time again throughout this process is what makes the home more then just a house. One of the objectives of my thesis was to better understand
the spiritual bond between the house, and the person who calls it home. The primary idea of this chapter originated from theoretician Clare Cooper Marcus. Her understanding of how the home and ‘self’ are intertwined led to the evolution of the final design.

The French Philosopher Gaston Bachelard has suggested that in the same way that the house and the non-house are the basic division of geographic space, the self and the non-self represent the basic division of psychic space. The ‘self’ is the part of our psyche that is unique, our innermost being. Unfortunately it is that very uniqueness that makes the ‘self’ so illusive to both understand and describe. According to Clare Cooper, man grasps at physical forms and symbols which are close and meaningful to him in order to better define what the ‘self’ is. Objects have a physical form, and as a result, they are visible and easily defined. The most conscious representation of the ‘self’ is the body, because it consists of an outward representation, and inward representation. Our exterior form is easily depicted through the senses of sight and touch, whereas the interior of our body remains a mystery due to its inaccessibility. On a less conscious level, man selects his house as a symbol of the self. Like a set of clothes, or better yet, like our bodies, the house is a basic protector of an internal environment. The house both encloses space and excludes space, encloses what is familiar and excludes what is foreign. The house consists of two very different, but crucial components, the interior and the facade. If the house is an extension of the body, the facade would symbolize the persona that we demonstrate to outside world, and the interior would reflect the ‘self’, or the part of ourselves that we only invite others to see.

The house style and interior design seem often to be selected so that they reflect how a person views himself both as an individual, and as a member of society. In a recent study of how contemporary California suburbanites choose their homes, Berkeley sociologists agree that many people bought houses to bolster their image of ‘self’*. In one large suburban development near San Francisco, self-made businessmen tended to choose somewhat pretentious, mock-colonial display homes, while people in the helping professions, whose goals revolved around personal satisfaction rather than financial success, tended to opt for quieter,
Mock-colonial display home.
Photo taken by author

Quieter, inward looking home.
Photo taken by author
California study suggests that people with little control in their outer lives tend to create highly controlled gardens.

Those with more freedom of choice in their outer lives create more wild or rambling gardens.

inward looking architect-designed styles of accepted good-design.

Clara Cooper has stated that the interior decoration of the urban commune also abides by the idea that the house is a symbol-of-'self'. In a number of urban communes of the Berkeley-Oakland it is very noticeable that the bedrooms, the only private spaces of residents, were decorated in an attractive and highly personal way symbolic of the person who resides in it. The living rooms, communal space for six, eight, ten, twelve, people, were only sparsely decorated, a result of conflicting personalities. Clara Cooper also contends that the normal house displays the opposite arrangement. The bedrooms are sparsely decorated whereas the living rooms, where guests are entertained and the owners spend the most time, contain the best furniture, family heirlooms, decorations, etc. The only exception is the teenagers' room, highly personalized reflecting his/her desire to gain both a separate personality from the parents and an individual identity.

The contrasting views which people of different socioeconomic classes in the U.S. have of their houses again reflects the house as a symbol-of-'self' in a 'self'-world relationship. For example, the greater the peoples' feelings of living in a dangerous and hostile world, the greater the likelihood that they will regard their houses as a protective shell, a fortress into which to retreat. The sociologist Lee Rainwater has shown that this image of the 'self', and of the house, is true for low-income blacks
(particularly women) in the ghettos and housing projects of this country. For many in the middle income bracket, the house is an expression of 'self' rather than a defender of 'self'. Increasing economic and psychic stability will enable a person to think of his house as an attractive, individual expression of 'self' and family with picture windows so that neighbors can admire the inside. The 'self' and environment are seen in a state of mutual regard, instead of a state of combat.

The fact that the decoration of the interior of the house often symbolizes the inhabitant's feelings about 'self' is one that has been long recognized. It has even been suggested that the rise in popularity of the profession of interior decoration is in some way related to the people's inability to make these decisions for themselves since they are not really sure what their 'self' really is. Many times this is due to the simple fact that one changes. People's emotional needs mature, grow, and change, as the years go by. Self identity is not immutable. It is not uncommon that as soon as one thinks that they have figured themselves out, they realize that in fact what they figured out no longer applies since
they are now a different person. The ‘self’ is not isolated from external stimuli and the environment. The events and occurrences that occur around us often provide the fuel that changes one’s character and emotional needs. The phenomenon of people, particularly women, rearranging the furniture in their house during times of psychic turmoil or change in ‘self’, is a strong suggestion of not only of how the house is very intimately entwined with the psyche, but also of how one’s relationship to their house changes. This is evident in a series of interviews that Cooper recorded in order to illustrate how one’s psychological state can manifest itself in his/her feelings towards their home. Two examples are provided below.

“I remember the day she (her girlfriend) left. My body at that point was like a board. I sat down on a couch and heard the door close, and I felt all of this tension just draining out of my body. And I immediately began to fix up my room as my own. I bought other pieces of furniture and I shampooed all the rugs. I washed the hearth down and all the floors. I had never been noted for cleaning the place. That was what I did. I spent three days cleaning; I didn’t even go to work. It was like a ritual. I felt I was becoming a woman and I was washing away the past.”

“Worst of all was how I felt at night, a carryover of nighttime tears from my wartime childhood that came back in spades when Stephen left. I was terrified that someone would break in and kill me or try to kill my children. It didn’t make any sense; it wasn’t Stephen I feared. It was some kind of unknown ‘other’ who would creep in at night. I tried to talk myself out of it; that didn’t help. Every night, two or three, sometimes five or six times I’d go around checking every door and window to see that it was locked. I’d go to bed, knowing that everything was locked, then I’d have to go downstairs again to check. In the middle of the night, I’d wake and swear I’d heard movements downstairs, and go down, my heart pounding. There never was anyone there; the doors
and windows were always secure. But still it went on, I was a wreck. I don’t think I slept through the night for two years.”

Another example of how the house as a symbol-of-‘self’ changes over time is in the psychological and physiological transformation that accompanies pregnancy. The pregnant woman is especially attuned to her surroundings, and this is evident in how she occupies the space that resides in:

Sudden compulsive urge to do thorough house cleaning is common among pregnant women. They are, on one level, practical attempts to prepare for the coming baby; but when the house is already amply clean and delivery is impending, there may be a second, more significant level. The woman may be acting out her unconscious identification of the house with her own body. She may feel that if she cleans out the house and puts everything in order, she is in some way doing something about that other living space, the “house” of her unborn child. For her it is an object rather than a word, which has taken secret meanings.

The personal need for self-expression in the environment is different for everyone. Some need more, some need less. We are all unique beings on paths of different psychological and emotional growth. It is no wonder how couples, at one time living harmoniously with each other, sharing common goals and desires, suddenly find themselves in different places, or moving in diverging directions. How we occupy space, and how are material and spatial needs change over time indicate how we ourselves change as a person. Home is where the ‘self’ is. If we can learn how to read the clues imprinted on our home living environment, not only can we gain insight to the ‘self’, we can potentially learn how, and when, to make changes to our home environment that will lead to a
happier spirit.

References:

1. Marcus, pp. 156
2. Bachelard, pp. N/A
3. Cooper, pp. 130
4. Werthman, pp. N/A
7. Cooper, pp. 135
8. Rainwater, pp. 23-31
9. Marcus, pp. 56-57
10. Marcus, pp. 224
11. Colman, pp. N/A
Chapter 3
The House as an Extension to the Body
The house likened to a set of clothes
The Tree and the Reed

“Well, little one,” said a Tree to a Reed that was growing at its foot, “why do you not plant your feet deeply in the ground, and raise your head boldly in the air as I do?”

“I am contented with my lot,” said the Reed. “I may not be so grand, but I think I am safer.”

“Safe!” sneered the Tree. “Who shall pluck me up by the roots or bow my head to the ground?” But it soon had to repent of its boasting, for a hurricane arose which tore it up from its roots, and cast it a useless log on the ground, while the little Reed, bending to the force of the wind, soon stood upright again when the storm had passed over.

-Aesop
The House as an Extension to the Body:
Using the House to Mediate The outside Environment with Urban Change

The thesis began as an investigation of two different ideas that at first seemed completely unrelated. The first idea that propelled the project is the climatic context. The house needed to respond in some way to the geographic environment that enveloped it. Not only did the house have to provide a comfortable living environment throughout the year, taking advantage of good weather for ventilation and light, but it also had to provide security and safety during extreme weather. The house is sighted in Tichi Island, the last subdivision approached by I45 before entering Galveston Island. Due to the house's location on Galveston Bay, it has to take into account the risk of flooding and storm surge that accompanies severe storms. The second idea that drove the project is the psychological context best described as the relationship between house and owner. The house needed to respond in some way to the changing physical and emotional needs of its resident. Due to the nature of modern lifestyles, one must take into account that the house will eventually be inhabited in ways other than it was originally intended. As a result, the house must have programmed within it a degree of flexibility that can accommodate a lifetime of strange twists and turns.

The traditionally, these two propositions have been seen as destructive. The typical response of residential construction and ideology to severe weather conditions is an unfashionable concrete bunker. Make the house as strong as possible so that wind and water cannot push it over. I came across an individual from Ohio who rebuilt his house six times over a span of 25 years because of flood damage. Each time he rebuilt his house the property value doubled. This was not only because land value increased, but also because each time he rebuilt his house more expensive materials were used.

On the simplest and most basic level, living in a private
house represents stability and ownership of a house is thought of as the ideal permanent home; the symbol of our values and goals. Consequently, the loss of one's house also represents the loss of everything it symbolizes. Due to this association, we desire our houses to be immutable so that our values and goals may be equally incorruptible. The ideal permanent house is the most eloquent symbol of ourselves. In the same way our house perseveres in the face of danger and survives the ravishes of time, we imagine ourselves surviving as well. Consequently, the very idea of making a house that cannot protect one from severe weather goes against the very grain of how we think of our homes, and ourselves. The house must provide security and shelter no matter what the cost.

Unfortunately the permanence and security that we expect out of our homes goes against most modern lifestyles because it does not provide sufficient flexibility. For many of us job security exists in the three to five year category. We spend a good portion of our day traveling somewhere. We surf the net, talk on the phone, get married and divorced and married and divorced and married and divorced. Meanwhile, our children go to summer camp, boarding school, college, and then when they cannot find a job, move back into the house.

Logically, if one considers architecture a manifestation of society, our houses would be a kind of tent that can be transformed or exchanged for another. We would need a temporary house to match our temporary life circumstances. Unfortunately, in addition to being unrealistic, the symbolic significance that we attach to our houses does not support this proposition. Alison and Peter Smithson once said: "The ideal house is that which one can make one's own without altering anything. Make one's own within the usual way, within the limits of the fashion of the time."  

The typical response to changing circumstances is to move to a new residence or renovate the structure. Most of us want to feel stable even though our lifestyles are not, so we surround ourselves with the illusion of stability. Houses with Greek columns and Roman pedestals. But this does not negate the fact that when a house no longer fulfill its desired function, we expect to make either a costly renovation or move. It is true that in many situations
there is no choice but to move, for example when one gets a job in another city. Yet, it is not uncommon for some to move only because their previous house could not provide a home work space, or through unforeseen circumstances the mother-in-law has to move in permanently and there is no extra bedroom.

Our expectations of permanence do not allow the flexibility our lifestyles demand from a house. Modern suburban houses are for the most part completely programmed. One is buying a house with three bedroom, two bathrooms, kitchen, dining room, living room. These rooms can only be used for those purposes, and cannot be reprogrammed without an immense cost. The nature of modern society and the rigidity of most homes is the cause for the constant moving within urban society. "Urban historians have demonstrated that in fact residence at the same address for ten years is unusual." 2 Modern society calls for a temporary house that we refuse to conceive, one that is flexible and adapts easily to the needs of its residents. A house that is permanent, but still able to accommodate the unpredictability of our lifestyles.

After careful deliberation, I realized that the two contexts that I was studying are not as antagonistic as I thought. If one were to consider the house as an extension to the body, it can function as a filter that negotiates that outside world with the chaos of urban life. The two elements that the contexts have in common is: First, the house, and Second, the periodic disruption of one’s everyday routine. Though natural disasters and sudden urban change are completely different in origin, they both disrupt our lifestyles in a similar fashion. By using the house as a mediator of the disruption within our life, one is finding the middle-ground that bridges these two seemingly antithetic contexts. Note the diagram on the opposite page.
The House as an Extension to the Body

Understanding how disruption effects our place of inhabitation.

The House acts as a filter that mediates the two forms of disruption. A response to one is potentially a response to the other.
With rising water sloshing around the wheels, a worried Elanor Bowman peeks over the side of a pickup truck. "It's going to be a long time," she says. "Before people around here don't panic every time it starts to rain hard."

"This is the sixth big flood we've had in twenty years," Gratton's mayor Gerald Nunn said. "We keep losing our sewers, houses, and businesses, and this time we almost lost our water plant. I bet we lost $40,000 in sales this year."

The upper quadrant of the axis is a graphic representation of the disruptions caused by storm surge. The black markings plot out a fictitious time line of floods and storm surge over a span of fifty years. Notice the cyclic appearance of the black markings. Storms and other severe weather phenomenon are periodic in nature, though they cannot be predicted accurately, they can be anticipated. One never knows exactly when a storm is going to hit, only that it will happen. For example, the significance of a fifty year storm is that a storm of a certain magnitude has a high probability of occurring once every fifty years. However, this does not mean that a fifty year storm will ONLY occur once every fifty years. This year in Texas, two fifty year storms occurred during a span of three years.

A severe storm will completely break apart the day to day routine that one follows throughout his or her life. The greater the damage, the greater the disruption. It is not uncommon to find oneself unable to go to work after a storm because the roads are flooded, or cancel a vacation because the money had to be put into repairs. Also, each major storm carries with it the fear that it will be the 'big' one and that the home owner will lose everything. When a class 4 or 5 storm approaches the coast, business shut down and small seaside communities are often evacuated in preparation. Statistically one can assume that a severe storm will hit at least once every five to ten years.

The lower quadrant of the axis is a scenario that describes the changes that took place in a family from the time they bought a house to the time they sold it; approximately thirty years. The red markings are a graphic representation of the life changes that disrupted the continuity of the family over time. Mrs. Smith took a pregnancy leave preceding the birth of her oldest son. Mr. Smith took a second job during that time to ensure that the family would have sufficient money to make preparations for the addition to the family. When Mr. Smith walked out on the family, Mrs. Smith entered a state of acute depression, her mother moved into the house and helped with John.
Immediately after Mrs. Smith got married, the house was completely rearranged to make allowance for a new personality.

If one were to define disruption as a violent dissolution of continuity; a severance of the normal course of unity or the day to day routine, the effects from flood and storm surge can be equated with the great upheaval. One can see from the diagram that both forms of disruption have a cyclic pattern that allow them to be anticipated. It is here that the house has the opportunity to act as the filter that mediates both forms of change. A response to one form of disruption is potentially a response to the other. The house becomes an extension to the body, acting like a set of clothes, both filtering the outside environment of danger and fulfilling the need for adaptation.
References:

1 Smithson, pp. 126
2 Jackson, pp. 50
Chapter 4
The Strategy for Design
A Strategy for Design:
The guidelines that led to the final project.

The house is sighted in Tichi Island, on a plot of land facing Galveston Bay. Due to the geometry and depth of the Bay, the bay would act as a funnel, strengthening any storm that crosses it from the direction of Galveston Island. Consequently, I designed the house with the expectation that a certain amount of damage will result from periodic severe storms in addition to normal wear and tear.

The basic design concept consists of two envelopes, a small one inside a large one. The small envelope represents the part of the house that is to be protected at all cost. It is a symbolic representation of the core, the foundation, and the idea of permanence all wrapped into one. The inner envelope or core is the part of the house that is responsible for making its owner feel safe and secure. The metaphorical anchor in the turbulent sea off urban life.

The outer envelope represents the mechanisms that allow the house to adapt to changing circumstances. In the event of a storm, this layer is designed to shield the house from severe winds and storm surge. One of the guiding principles of design is the fact that damage cannot be prevented, only minimized. The elements that protect the house will be the ones that receive the most damage. Thus they are temporary and expected to be replaced when damaged. The outer envelope is also conceptualized as a buffer to urban disruptions. Through a system of flexible wall partitions and few fixed elements, the zone is able to reconfigure itself, expand, and contract, in order to accommodate whatever life throws at you.
The first step that had to be undertaken in order to make the transition from concept to building was to understand not only the significance of the ideas permanent, and temporary, but also the relationship between the two. Due to the basic design concept that the house consist of two parts: a permanent core and a temporary outer protective shell, it was necessary to distinguish between the elements of the house, both physically and ideologically, that are temporary, permanent, or both. These distinctions are illustrated in the diagram on the following page.

**Permanent** as defined by this thesis is: **continuing or designed to continue indefinitely without change, that which is fixed.**

**Temporary** as defined by this thesis is: **lasting for a limited time, not permanent, made to supply a passing need.**
The permanent sections of the house consists of four basic classifications: 1. *The ideas that provide protection and security*, 2. *The Core utilities and Infrastructure*, 3. *The enclosures that protect your things*, 4. *Appliances that are impractical to move*. The ideas behind the house are extremely important because of their symbolic nature. The house is the representation of ideal permanence and subsequently acts as a counterpoint to the fluctuations of society. The core utilities and infrastructure consists of the kitchen, the bathrooms, the stairwell, and other elements tied into the infrastructure. These elements cannot be moved for obvious reasons. The enclosures that protect one's belongings are treated as permanent because our things often have more value than the house itself. Items such as photo albums, clothes, gifts etc. need to be protected because of their emotional and monetary value. As a result the closets, cabinets, etc. that protect these items are considered as fixed. The refrigerator, stove, clothes washer, and other appliances are considered permanent because they are impractical to move.

The temporary parts of the house consist of three classifications: 1. *The elements that deal with the reality of suburban life*, 2. *The spaces that reflect day to day living*, 3. *The elements that mediate the catastrophe*. Suburban life is always in flux. A system of swinging partitions was created for the house so that it can adapt to changing needs over time. For example, the house can easily accommodate a larger living/dining room, a third bedroom, an office, a child's play room, by changing it's configuration. As a result, the spaces that are programmed into the house have an anonymous nature. Rooms can be used as a bedroom, or an office with equal ease. The paradigm of the two bedroom, two bathroom house is not fixed. The elements that mediate the catastrophe consists of a system of storm shutters and protective devices that would protect the house from storm surge, wind, and flying debris. These items are designed to be easily repaired and/or replaced if damaged.

The key idea to the diagram is the gray area that establishes the relationship between the permanent and the temporary. This area consists of both the act of living and the objects of living; the events that occur within the house, and the objects that are kept
inside the house. There is a mutually dependent relationship between the two. Most likely one will relax wherever the TV is, will gossip wherever the couch is, will place a coffee table where one likes to read magazines. As one can tell from the diagram, the house is not a true dichotomy, though it is conceptualized as temporary and permanent, the objects and acts of living are thought of as a third zone that simultaneously occupy both the temporary and the permanent.
Chapter 5
Site documentation
Tichi Island
Artificial subdivision for those who want a suburban house on the water.

Aerial photo, photographer unknown.
Lot Size: 68'-0" x 89'-0"
Chapter 6
A catalogue of process models
A Catalogue of Process Models

The following pages contains an inventory of the process models that were built and studied in the realization of the final design. The process consisted of studying both the individual detail and the entire building simultaneously. The models are given in chronological order.
Early concept models.
A study of the interior partitions.
A study of the hinge.
Chapter 7
The Collapsible House
Plans
Sections
Elevations
Details
Model Photographs
Computer Generated Images
Program

Master Bedroom
1 or 2 additional Bedroom
2 Bathrooms
Kitchen
Living and/or Dining Room
Optional Office Space
Optional Play Room
Optional Nursery
Optional Library
Extended Porch
Boat Landing
Observation Deck
Protected Parking

Ground Floor: Not Included
First Floor: 1725 sq. ft.
First Floor Deck: 1295 sq. ft.
Second Floor: 1725 sq. ft.
Second Floor Deck: 755 sq. ft.
Utility Room: 200 sq. ft.
Observation Deck: 200 sq. ft.

Gross Square Feet: 5900 sq. ft.
Permutations
Chapter 8
Miscellaneous drawings
Detail study of the concrete/timber connection.
Study of the hinge connection used in the storm water pump folding mechanisms.
The core will have an "invisible" beam spaced in order to withstand segment load in both weight and wind load.

- Each beam will have two 2" conduits with 3/4" post tensioning cable tensioned with hydraulic jack to 58 kips.
- Top of post tensioning cable conduit will be placed 4" from top of slab (1/2" tolerance).
- #10 rebar 6" O.C. continuous with 3" cover.

- Each beam section will have the 2" conduit with 3/4" post tensioning cable tensioned with hydraulic jack to 64 kips.
- As above.
- #8 rebar 8" O.C. continuous with 3" cover.

Connection of the slab to the core will need rebar as shown.

2 #10 1/2" rebar tied together on 6" O.C. both sides of bearing wall of the core.

4 #9 right angle rebar 12" O.C. 6' of embedment into core and slab.
piles will be friction pile (sufficient due to side friction) due to the fact that the piles will be in uniform dense sand material.

Datum

Cover outside of piling with cast tar then cover with 1/4" neoprene.

(marine grade) 12'6" timber piles
Bibliography:


Krieger, Alex. "Town and town Making Principles."


Waldo Jobler, Ewe Deichman, etc., *Global Demography Project*. National Center for Geographic Information and Analysis, Department of Geography, University of California, Santa Barbara, 1995.

