Environmental Adaptability: From the Extreme to the Everyday

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abstract

The environment in which we live is always changing. It can change slightly throughout one day, moderately from season to season, or even more intensely in times of severe environmental occurrences. This thesis project will explore an architecture that is able to adapt and respond to this range of variations in the environment. These changing environmental conditions could include (but are not limited to) changes in site, climate, weather, temperature, wind, humidity, and precipitation. Architecture such as this should be able to shelter the inhabitants on a daily basis while at the same time compelling them to become aware of and to appreciate the shift in the environment that is going on around them. In times of severe external conditions, architecture should be able to protect the occupants, yet help them understand and safely experience what is going on around them. The relative level of permanence should also be considered in extreme instances such as these. By thoroughly understanding a site and the different conditions that affect it, designers can work with the changing conditions instead of against them to create an architecture that is more in tune with its surroundings. Being adaptable, flexible, and variable are important in this type of architecture since as the external conditions change the architecture should be able to adjust in kind.

project summary

Architecture is undoubtedly connected to the environment in which it exists, but what happens to architecture when the surrounding environment is shifting, in flux, or uncertain? When the environment becomes unstable, as has recently been the case with many natural disasters throughout the world, buildings and community centers fall apart, in turn ripping individuals, families, and communities apart. This thesis project will explore how to design an adaptable structure for variations in the environment, climate, and other external conditions of a specific site. This type of adaptable architecture should be able to respond to moderate environmental changes such as those experienced on a daily or seasonal basis, while at the same time being able to respond to more intense environmental circumstances such as natural disasters. The question of the relative level of permanence is also an interesting issue brought up here, as sometimes being rooted in an extremely unfavorable environmental condition may not be the best solution. Through the understanding of a site's variable environmental conditions and the impact those conditions have on our structures, designers can use appropriate building techniques, sustainable design approaches, and structural knowledge to work with these conditions instead of against them. The relationship of the architecture to its site is also important since as characteristics of the site change the architecture should also be able to adjust in kind. By investigating the unstable circumstances in which architecture exists, conclusions can be made about how to satisfy the daily needs of people as they adapt to the external environment in which they live. This thesis will examine architecture that nimbly transforms in symbiosis with the natural and environmental conditions in which it exists.

A certain circumstance would foster the development of this thesis better than others. Often times extreme conditions require a collective response. The architectural vehicle of this thesis could be a place where people would come together and form a strong community if something severe or unexpected happened. It could include space for gathering, sleeping, eating, distributing supplies and information, finding others, etc. But since natural disasters of such

intensity happen only occasionally, there is a need for some sort of commonplace activity to occur daily in this space. A church would be an appropriate solution as it would provide a place where the focus of the occupants would be on the daily funtions of the church instead of on the direct relationship between the architecture and the environment. In this everyday condition a church would allow the architecture to adapt and/or respond to its changing conditions while subtly revealing this relationship to the occupants. If the architecture is able to physically adapt and/or respond to the environment on a daily basis, the occupant becomes aware of his or her relationship to the environment.

Even more important to the circumstance of the thesis are considerations of specific site conditions. The territory in question should first be looked at regionally so that it is large enough to provide a variety of specific site conditions, and then narrowed down to focus on a few differing site environments. It is obviously necessary that a site be selected where extreme environmental conditions are possible, yet not the everyday norm. A site with a surrounding population in need of a church, along with a surrounding population in need of a shelter during intense environmental circumstances is necessary. A location that is considered unstable or challenging because of a particular environmental condition could also be an interesting situation for this thesis.

thesis paper

Change is a good thing despite what some people believe. Everything in the world is constantly changing so one's choice is to change with it or get left behind. Especially today, with the world changing rapidly and dramatically because of global warming, environmental conditions can go to extremes very quickly. Architecture that exists within these varying environments should also be able to change with the changing conditions. There are a number of stances one can take concerning architectural design exisiting within these extreme conditions. Along with extreme conditions exist slightly variable conditions such as those that occur on a daily or seasonal, which have an entirely different set of architectural strategies. Whether the environmental change is big or small, however, adaptability is the key to designing with variable environmental conditions in mind.

According to Webster's dictionary, the word adapt implies a "modification according to changing circumstances".[1] This means that as something changes, varies, alters, or transforms another change is made in accordance with the first. This is an easy enough concept to understand, but what happens when something that we generally perceive as permanent is in need of changing? Architecture and the built world are seen as relatively permanent, yet they are undeniably linked to the environment in which they exist. Invisible often times to us is "...a different form of habitation-the dense weave of associations, songs, philosophy that bound as one not only the land but everything on it".[2] Architecture has an intense connection to place. The dilemma that arrives from this situation however, is that if these so called "permanent" structures are so strongly

connected to a constantly changing environment then shouldn't they be able to adapt to this environment as it changes and evolves? Architecture should in fact be able to adapt to the unique changing external conditions of the environment in which it is located.

Each place has its own essence or character; it has a particular set of meanings that are identified with it called its genius loci. [3] This is extremely true for the location of the thesis project, New Orleans, Louisiana. New Orleans is a city unlike any other, with a culture all its own. "The real beauty of New Orleans is in its culture and tradition that make neighborhoods strong and resilient."[4] It is historically Catholic and still holds the flavor of religion throughout. It is home to the biggest Mardi Gras celebration in North America, while also being well known for its historical connection to jazz. It is a tropical Cajun society consisting of a diverse mixture of people who are for the most part very friendly. All this can easily be observed and discovered by a short visit to the Big Easy (as it is fondly referred to).

Although the culture of the area is unique and interesting in itself, there is another aspect of New Orleans that is much more important to the thesis. The environment in which the city exists is certainly also a genius loci in itself. It is located entirely below sea level, kept dry by levees surrounding the city. Louisiana (along with the entire Gulf Coast region) is also a prime target for hurricanes that come in from the Gulf of Mexico and the Atlantic Ocean. Wetlands are located at the outskirts of the Gulf Coast regions and provide some protection from hurricanes and tidal waves. These however seem to be disappearing at a faster rate each year.[5] This environmental condition of New Orleans sets up a perfect example of a changing environment. If a hurricane were to hit, an endless number of possible changes could occur within the city, including anything from slight flooding of the lowest locations to a full blown hurricane wiping out the

area. As an example of an extreme environmental change, if a hurricane could be so strong that the levees would need to be broken to prevent the entire city from being destroyed (as was the case in the summer of 2005 with Hurricane Katrina) then water from the surrounding Lake Pontchartrain and Mississippi River would flow into the city and flood the majority of it. This scenario shows that environments do change over time and that anything connected to the environment should be able to adjust with these changes if the two are indeed truly connected.

It is true that environmental changes that are this extreme do not happen on a daily basis, but minor changes in the environment are occuring all the time. From day to day the weather, temperature, humidity, water level, precipitation, and amount of sunlight in a location (just to name a few conditions) can change quite dramatically. Changes such as these are slight, but make a big impact on individuals at a phenomenological level. These are the changes that we deal with on a regular basis and which impact our daily lives. Architecture can act as a mediator between the interior and exterior world so that these slight changes can be perceived by occupants who perhaps might not notice otherwise. For example, thoughtful design could allow a beautiful sunset to be appreciated where it might otherwise not, allow a cool breeze to be enjoyed on a humid day, or allow the rain to create beautiful sounds as it hits a roof. By designing with the external conditions of a site and environment in mind (along with the understanding of how these conditions change throughout time), these occurrences in nature can be revealed and celebrated. Ultimately, architecture such as this allows humans to see and understand their place in the dynamically changing world that is before them.

Vernacular architecture often uses natural design techniques in their buildings while revealing the true beauty in nature. Korean

architecture, for example, is one type of vernacular design that is well suited for the climate in which it exists. The climate in Korea ranges from hot and humid in the summer to chilly in the winter, although some areas do have deep snow. The houses built there "...allow life to retreat to a heated indoors in the worst conditions, but opening up layer by layer with sliding screens and folding doors until it becomes a well-ventilated space in the summer heat under its parasol roof."[6] An under floor heating system is used to keep the occupants warm. A fire is built low to the ground under the floor and when the heat naturally rises it travels along the underside of the floor up a space in the wall heating up the floor, wall, and anyone touching them.[7] The summer climate also influences the design as the floor plans are wide and the buildings are freestanding to allow for cross ventilation. Screens used generously throughout the design encourage airflow as do the raised platforms which all the buildings sit upon.[8] Korean architecture is designed with one specific climate in mind, but also takes into account all the variations of that environment.

One architect who focuses on designing specifically for both the site and environment is Glenn Murcutt. He designs solely in his home country of Australia, which is said to be a place where all living things have adapted to the difficult nature of that environment.[9] His designs are so strongly connected to the environment that one can smell the rain and sense the changes in the air and light outside. A tent might be a good comparison to the way in which he approaches his designs-there is only a thin edge between inside and out with the ability to add or remove layers depending on the external conditions.[10]

On the other end of the spectrum of changing environmental conditions are those that are extreme. Environmental conditions that could be considered "extreme" might include wind from hurricanes or tornadoes, tidal waves, severe flooding, intense heat, and intense cold

(just to name a few). Conditions such as these tend to occur only rarely (perhaps every 100 years or so), but are known to occur in specific locations based on the fact that they have repeatedly occurred in the same locations throughout history. Many communities are built in locations where these extreme environmental conditions are known to occur, and are in fact sometimes destroyed. This happened to one such community in Valmeyer, Illinois. During the Great Flood of 1993, this town which set alongside the Mississippi River was fully flooded for over two months. There was no way the people could go back after that, and they were forced to relocate the entire town to a nearby parcel of higher land.[11] "In dealing with the relocation the issue is both physical and spiritual: how will the site of the old town be used, and how will the old village and its demise be remembered?"[12] Being able to adjust and adapt with changing environmental conditions such as these could have possibly saved this town.

To date, there are not a great number of cases in which architecture adapts to these extreme environmental changes. There are a number of different attitudes that might be taken toward the idea of changing or extreme environments, however. One attitude is to design architecture with the ability to withstand the extreme environmental condition. This strategy has been used in the past and often achieves a design resembling a bunker or fortress, which is not the desired outcome for many building types. This may also not be the best attitude to take since storms, waves, heat, and cold (or extreme environments in general) are getting more and more intense due to global warming and at some point there needs to be a limit on how far designing for an environmental disaster truly should go. Since there is no such thing as a totally "hurricane proof" design, there needs to be a point up to where the architecture is sure to withstand and past which it should be abandoned.

A second attitude concerning extreme environmental conditions is to just move away from the situation. A new trend in architecture that relates to this idea of adaptability is mobile (or portable) architecture. Many artists and architects are designing units that house a person or two and are often times extremely flexible, mobile, and adaptable. These units are small enough to be stored and transported and then reassembled or put back in place.[13] One emerging young architect specializing in this field is Jennifer Siegal. She has designed many mobile works including iMobile, which provides computer access to locations where it is otherwise unavailable, along with the Portable House, which is a modern mobile home. Flexibility and adaptability play a large role in her work as well as the work of other "mobile" architects. One criticism of this kind of work, however, is that it is never fully rooted in the community in which it exists. Since this type of design is so mobile, there is no strong connection to place or community.

A third attitude that is taken is to accept the fact that there are going to be extreme environmental conditions and to actually design for them. This is the attitude that the Dutch are adopting in relation to the waterlogged situation in which their country exists. Holland is a country full of water and throughout history has relied upon dikes to keep the water out. One Dutch architect has started to look at things from a different point of view, however.[14] Koen Olthius of Waterstudio.NL has designed houses that actually float on water. His theory is to "let water in and even make friends with the water."[15] Each house sits upon hollow concrete cores that allow the house to float while it is docked to solid land[16]. This different way of looking at a problem brings new solutions which allow people to live within the changing environment, without uprooting entire homes and communities.

Another example using a similar attitude but a slightly different

approach is that of the Safe(r) house designed by a group of students from Harvard and MIT. This house was designed for people living on the coast of Sri Lanka whose homes were destroyed by a tidal wave in 2004. These homes consist of centrally located C-shaped cores that allow water to flow between them in case of flooding. The water could pass right though the house, flowing around the cores, although everything inside and the movable partitions put between the cores would wash away.[17] This solution is another where the extreme environmental condition is recognized and designed for.

Although all the above responses to varying environmental conditions are different, they do have one common thread. They all are adaptable in some way to the external conditions. Each of the projects decribed above are successful because they adapt and respond to whatever variable environmental condition is before them. Architecture's ability to be able to adapt allows it the chance to change and evolve with the nature that surrounds it.

Adaptability isn't only about the physical, external moves architecture can make, however, but can also be applied when looking at the building programmatically. A communal building that acts as a church one day could indeed turn into a shelter if there was an extreme environmental disaster. By using spaces that are open, flexible, and able to adapt to the changing conditions internally, a building is created that can wholly respond to its environment. Large spaces within a church such as the narthex (the initial gathering space), the nave (the seating within the sanctuary), or any other large gathering spaces (a parish hall for example) could all serve as large spaces for communal gathering, sleeping, or discussion that is needed in times of extreme environmental disasters. Many of the smaller, more private rooms within a church (such as classrooms and offices) could be used to offer more privacy to those

who are sick, elderly, or in need of assistance. A much more flexible and adaptable architecture can be produced if the idea of changing programs and conditions is kept in mind while designing.

In conclusion, architecture should be able to respond to the changing environmental conditions that surround it. Each place has its own character and own unique environmental conditions that come along with it. By understanding these conditions and how they vary, we can learn to design in accordance with them by using natural and vernacular building techniques that actually celebrate these conditions. When an extreme environmental condition occurs, however, there are a variety of different ways that one might respond. Extreme environmental design could be resilient to nature and try to withstand it. It could also be mobile and merely try to flee the extreme situation. Lastly, it could accept the conditions as they are and work to design for and with them. This last solution creates a type of architecture that is more flexible and adaptable to environmental changes both inside and out.

precedent studies

idea precedents

Snel Waterhouse
Waterstudio.NL

Marika-Alderton House.
Glen Murcutt

Safe(R) House
Design team of Harvard & MIT grads

program precedents

Zion Luthern Church
Pietro Belluschi

short precedents

Ecoville
Jennifer Siegal

Korean Architecture

Jungle House
Dewes & Puente

Disaster Relief Shelters

New Orleans Protoype House Competition Designs

Snel Waterhouse

Waterstudio.NL . 2004. Aalsmeer, The Netherlands

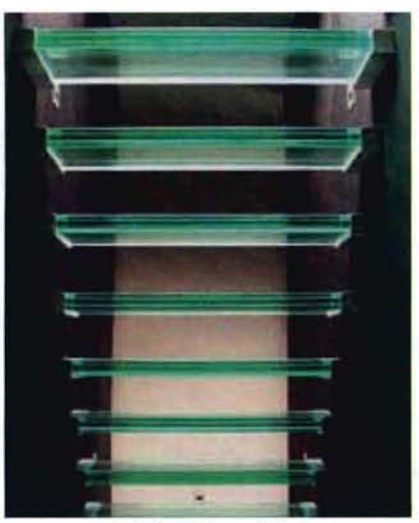
This project is important to the development of the thesis project because it exists in a unique environmental condition (one which has never been studied carefully as a building site) and responds to its environment in an unconventional way. The Netherlands is a country full of water; it consists of towns built up on polders (a tract of low land reclaimed from the sea or other body of water) with water pumped out from between them. For centuries the water has been held back by dikes surrounding these cities. More recently however, the Dutch are developing new ways in which they can learn to live with the water instead of trying to keep it out. This idea is similar to the goals of the thesis in that it too is dealing with uncommon environmental conditions and how to respond to them.[1]

This water-house is designed by a group of architects from Waterstudio.NL, lead by a man named Koen Olthuis. This 10 person Dutch firm barely had any commissions for close to two years, but ever since Hurricane Katrina and the growing awareness of worldwide climate changes the new ideas this firm brings have been attracting attention. A number of these water-houses have been built to date with many more in the works.

The buoyant condition is achieved through the use of hollow concrete foundations. These foundations can weigh up to 500 tons, but still manage to float because of the great volume of the house above. The building is then either attached to land by cables (if the water is stable) or by stilts made of concrete, wood, or steel (if the water is moving). Flexible pipes from the building to the land are used to provide access to utilities.[2]

view alongside the house's exterior

detail of connection between house and floating concrete base[4]



interior view of stairs

This project in particular is one of Waterstudio's first projects. It is a two story, 7,000 square foot house built on Westender Lake in the northern Netherlands. Although the house itself takes up no land, the client owns adjacent property to the house which includes a 10,000 square foot garden. The lower floor is underwater and contains a lounge, movie theater, washroom, and storage space. The first floor is on top of the water and contains a bathroom, kitchen, living room, and two small bedrooms (because the owner didn't like the idea of sleeping underwater).[3]

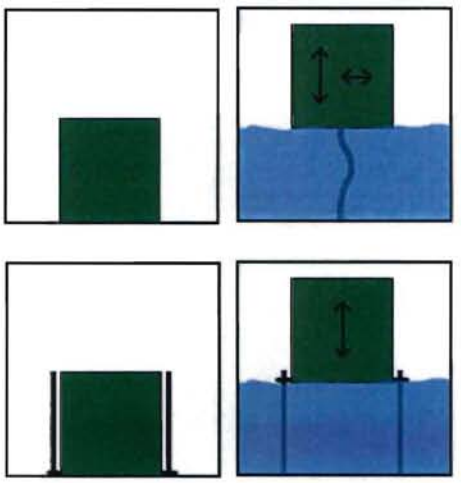
One strong aspect of this project (and actually all of Waterstudio's projects) is this inventive solution designed to work with the obstacles put in front of them. They are one of the first firms to physically deal with building on the water. They needed to come up with a new solution to their housing dilemma in this environment saturated with water. Instead of staying with the old method of continuously pumping out water, they came up with something new. Although it took a long time for their ideas to be accepted, they are finally being taken seriously (in some parts of the world at least).

There are some weaknesses in this project however. It seems that Waterstudio is focusing so much on the idea of being able to design on water that the actual design of the building is not well considered. From there the question is brought up about whether the design of this individual house is anything extraordinary. The conceptual design ideas for the Snel house were never explicitly stated anywhere. The plan actually doesn't seem to be a whole lot different than the plan of a typical houseboat, except that it is larger and is of much higher quality. Ideally this floating technique would be used as the foundation for a building that is designed not as merely a building known to be floating on water, but a building that is applauded for its design that just happens to be built on the water. This project is paving the way for buildings that are well designed to accommodate extreme adaptation.

By looking at the design concept of the project from the point of view of the thesis, the design could have gone farther with its ideas. It deals with the amount of water that is in that environment, but it only deals with one particular aspect of the water-the variation of the level underneath the building. The designers did include humidity-resistant and mold-free treated wood in their design, but that is about the only other way in which they acknowledged water or any other environmental conditions. What about the other

ways in which water conditions. What about the other ways in which water affects the building? Is there a way that they could collect rainwater and use it to power some of the building (or even just to water the adjacent garden)? Some of the house is built underwater, yet there are no views out of the lower level to see what's going on around it. There are also other environmental conditions in the Netherlands such as mild winters and cool summers. They could have incorporated many more aspects that acknowledge and respond to the environment.

While analyzing this project, one main focus was on the relationship between the building and land and how the building responded to the environment in which it was placed. Simple diagrams (at right) were created that show the different ways in which the building could be connected to the earth. In one case the building is attached at the corners of the house by rings around poles (bottom two icons). In that situation the house's only reaction to the environment would be moving up and down in response to rising and lowering water levels. In the other case the building is attached to the land by a cord (top two icons). In that situation the house would be more mobile, able to move not only up and down with the rising water level but also back and forth with a little leeway.



Based on the idea shown in the first two icons (above), I created a model that dealt abstractly with the idea of connection and movement of the house. In both cases the house has a sense of place and the capability to move around within a certain range, but was ultimately limited in where it could go. In the icons the house can move within any range of the cord. In the model the house can move anywhere within the bubble. Both deal with the simultaneous movement and flexibility that is put on the house.

Marika-Alderton House

Glen Murcutt . 1991-1994 . Northern Territory, Australia

This project is important to the development of the thesis because of the way Murcutt considers the natural environment, climate, and inhabitants when designing this building. Murcutt designs with empathy for the surrounding land forms, plant material, and aura of the place. One goal of this thesis is to achieve that kind of overall harmonious relationship to the environment.[5] Also, the site for each of Murcutt's designs is chosen first and the building is then designed for that unique site. That attitude about making decisions based first upon the environment and site conditions is something that the thesis needs to take away from this project.

There are many ideas and underlying themes in Murcutt's work that can be applied to this thesis. Murcutt mimics much of nature when he designs, looking at the vegetation of Australia to inspire his architecture. The vegetation in that area is tough, durable, hardy, yet supremely delicate, and often times his buildings achieve those same qualities. Everything (from plants to architecture to people) is connected to the sunlight and sky. His architecture is also always stripped down to the bare essentials. Overall, his work in has been described as a tent because of the way it is barely separated from nature.[6]

The Marika-Alderton House is made of metal supporting broad, waterproof plywood and hinged slatted tallow-wood shutters with 8 mm gaps. These panels can be adjusted to open up the sides and ends of the house (either

partially or completely) for cross ventilation and/or views out. There are also pivoting venturi tubes that puncture the roof's ridge to allow hot air to be expeled out. There is no glass used at all in the building. The corrugated metal roof is wide enough to keep out both monsoons and sun. No building component is nailed- everything is screwed and bolted together so that it is easy to unscrew and reuse the material. The plan of the house is simple, yet elegant and fitting. It is a narrow, linear platform 83 meters long that is divided into 3 zones. The sitting/cooking /dining area is at the east end, the sleeping areas (divided by vertical plywood separators) are at the west and south ends, while the bathroom and laundry are in the core of the building. The building cores offer not only privacy, but double as protection from cyclones that occur in that area. The structure of the house is designed to resist winds of speeds up to 63 meters per second and also complies with anti-cyclone regulations. The floor height responds to the environmental conditions as it is raised to allow for a flooding of up to .5 meters from a tidal surge coming from the coast.[7]

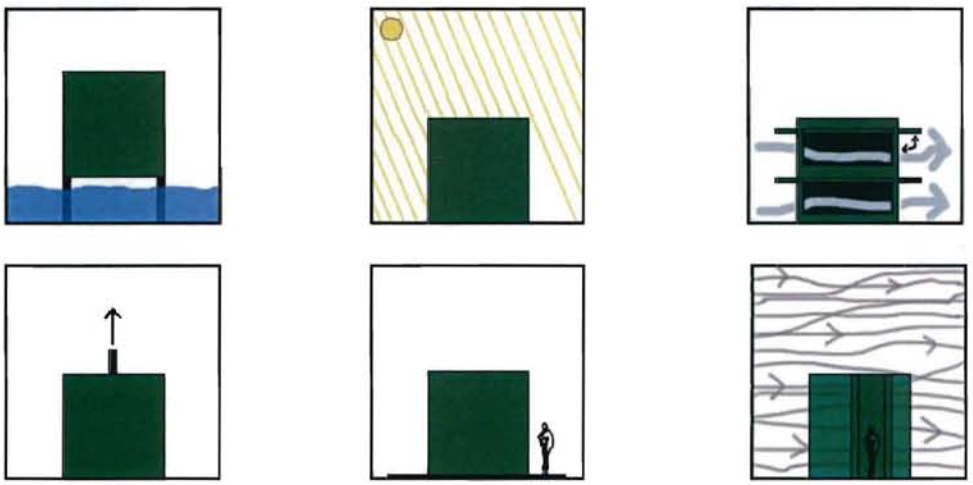
Overall in this project the theme seems to be executed very well throughout. Murcutt set out to design a building that could be a mediator between the inhabitants, the landscape, and the ritual of the passing seasons. Movable panels on the exterior of the building open as awnings to let

the occupants interact with the environment. In each of the photographs, even the interior photos, both outside and inside can always be seen. This blurring between the building and the landscape also includes the exploration of the relationship between interior and exterior.[8] A series of interior and exterior verandas create layers that can be added or subtracted as the surrounding environment changes. The house itself seems light and breezy, perfect for the climate of the area. This building is perceived as almost movable or transient because of the lightness it possesses overall and in its connection to the earth. Even the paint on the plywood panels brings the architecture a sense of belonging to the place; the color is bauxite- a mineral mined in that region that casts dust over everything.

One glaring criticism of the house, however, is regarding privacy and security. For example, there is an opening all along the bottom of the south wall that looks wide enough and close enough to the ground that if someone or something wanted to get inside they might be able to. Openings like this do contribute to the overall goal of relating the inside and out, but is this goal at the expense of other things such as privacy? The culture of an Australian Aboriginal family would be very unfamiliar to people living in urban areas of the U.S., so if one wasn't from that culture, they might not know what amount and type of privacy is needed or desired. One unique aspect of this project, however, is that Murcutt actually lived with this Aboriginal family to learn about their culture and way of life before he designed the house. From the readings he seems to have taken extra care in making sure this design was well suited for the particular family it was designed for, so safety and privacy were surely discussed.

In one of the readings, it was stated that the cores of the house were not only used for privacy, but also as havens from cyclones. The house is compliant with anti-cyclone regulations which prompted the large column diameters and the wide struts that bolted down at the connections of the purlins. The floor is also raised off the ground to allow for water to be able to pass underneath in case of a flood

from occasional nearby tidal waves. All these disaster precautions are occurring here, yet the sense of lightness is still the predominant feeling of this building. Cores acting as cyclone protection bring to mind bulk and stability, while when one looks at the actual building they see a transient, light house raised on pillars instead. These two ideas seem conflicting in the way they would achieve their goals, but both are achieved in this



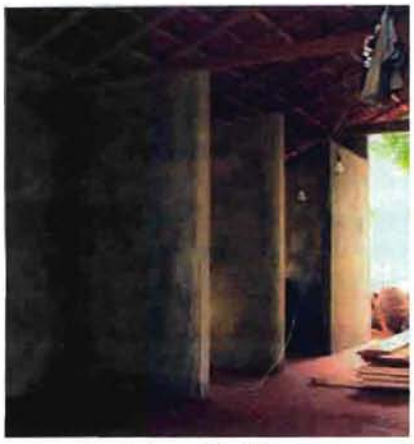
design. This building looks like it would lift right up off the ground if a cyclone hit instead of offering the protection it truly does.
In analyzing this project the focus was again on the house's relationship to environment and site. In this instance there were many factors that created this relationship. One response to site was the raised placement of the building in case of flooding. The large overhanging roof offered protection from the sun and monsoons. A third major aspect of the house responding to the environment were the movable panels that opened into awnings to let air flow through. There are also tubes on the interior that let the hot interior air out. Exterior verandas are created that blended the interior and exterior. Lastly, there were building cores that offered the occupants protection from strong winds. All these design considerations that relate building to environment are shown in the analysis drawings above.

Safe(R) House

Design team of Harvard & MIT grads . 2005 . Sri Lanka

This project is important to the thesis because it is a permanent housing project that is designed directly in response to a natural disaster. In December 2004 a tsunami hit the south coast of Sri Lanka and with it brought massive flooding that destroyed many homes. In January of 2005 the Sri Lanka Public Security Ministry announced new building restrictions that prohibited construction within 100 yards from the sea in the southwest or 200 yards in the northwest. These new building regulations were not welcomed however, because of many economic, cultural, and social reasons that are important to the residents. A group of designers and planners from Harvard and MIT began investigating ways in which families could return while guaranteeing their future safety at an affordable cost.[9] One aspect of this thesis is protection from natural disasters and how to design while understanding the effects of the site and environment on the building. The Safe(r) House is directly focused on these same ideas so it is extremely suitable for this thesis.

The Safe(r) house is made entirely out of local materials so that it would be realistic for residents to build. Four concrete

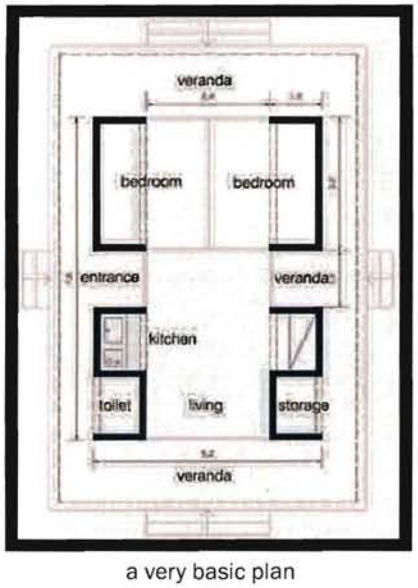


the C-shaped building core

block, C-shaped cores form the support of the building and are arranged in a way which allows water to flow through while providing higher resistance in case of a tsunami. Between these cores are heavy-weight, collapsible, porous partitions which air (or water) can circulate through. Initially the partitions are made of bamboo, but they can also be made of different elements customized for that particular residence.[10] The roof is built using traditional building techniques with simple wooden elements underneath a cover of tile or tin. Initially, the design included a raised floor for water drainage, but the residents didn't approve of the idea so it was taken out during construction.

bamboo partitions

The Safe(r) House compares very well to the traditional Sri Lankan house design. The Safe(r) House is designed to be able resist a wave five times higher than the traditional house design. To figure out its strength the design team used computer modeling to determine the wall deformations that occur from wave pressure on the Safe(r) house compared to those of a traditional house.[11] The total surface of the walls and roof are essentially the same in both designs, so the cost of the Safe(r) house is designed to still be equal or less than that of a traditional house.

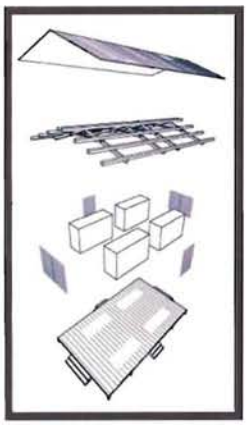


a very basic plan

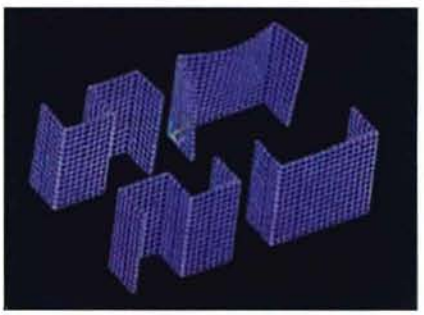
Although the structure and floor plan are fixed there are a number of functional variations that the team offers for the interior. The functions occurring inside the concrete cores vary from being merely structure to being a kitchen, storage, toilet, or a combination of the three areas. The layout is a modular system that can expand to accommodate large households. There are also variations of the building in which it is used as a community center. In the case of the community center, the interior provides flexible spaces for various programmatic needs, while most of the larger group activities could take place outside under a roof.

the front of a Safe(R) house

This project stands out as one of the few that has directly addressed the problems that come along with the reality of building where natural disasters occur. A group of designers and planners faced a problem that affected thousands of people and families, so they started figuring out what they could do to help. By using their knowledge of computer modeling, they devised a solution that is five times stronger than the original design. The fact that their solution is just as economical as a traditional house and uses local materials makes it even more successful. Their creative and resourceful approach toward the design of this house is one that this thesis should ultimately adopt.



Only a few small criticisms can be made about the Safe(r) house from the point of view of this thesis. First of all, if the house is meant to be fully porous then there is little privacy in the house. The open floor plan and layout seem to inherently lead to this lack of overall privacy, although in Sri Lankan culture that degree of privacy may be very acceptable. Next, if there is a large storm the house will still be damaged. The building was designed so that in the event of a large tsunami the foundation and cores of the house would still be standing, but the roof and porous partitions would most likely be swept away with the storm. The house also doesn't allow for total protection of the occupants, and in a severe storm (as is the case in any severe storm) the residents should be advised to leave the area. And lastly, if all the houses were built like this Safe(r) house prototype, then every single house would look the same from the outside. In a row of houses it might be difficult to find a specific house when all of them look the same or nearly the same. Although it is a prototype meant to be copied for efficiency, a little move variation and detailing might be an option.



computer model of pressure of wave on Safe(r) house cores

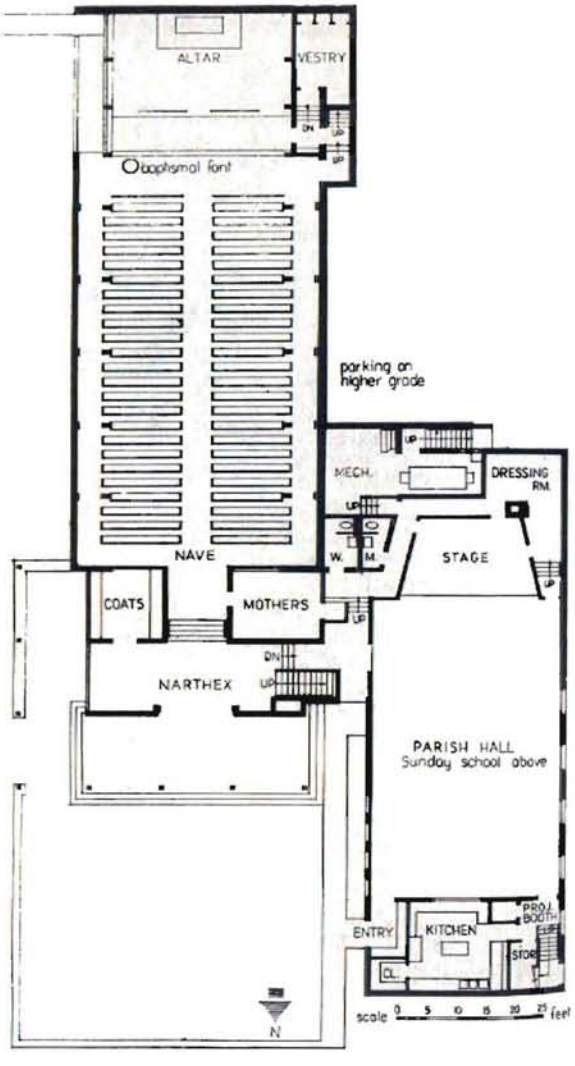
One thing that was never mentioned in any of the articles was the actual strength of the new design. The strength of the two was stated comparatively, but the strength of the traditionally designed house was never given. If the traditional house is extremely weak against a tsunami to begin with, then the Safe(r) house might not be able to withstand an intense storm. If the design of the traditional house was, on the other hand, relatively strong against a storm, then the Safe(r) house might be unbelievably strong against a tsunami. The strength of the house in relationship to storm strength would be helpful information.[12]

Despite these minor criticisms, the overall concepts and goals of this house are very strong throughout. The idea of creating a house that will remain in the event of a tsunami or flood is clearly achieved by the strong central cores. Through the arrangement of the cores and the use of porous partitions, a building is created that water can easily flow through. These are two concepts that the analysis drawing depicts (shown in the icons below). At the same time the house is specifically designed for the region in which it exists by the use of local materials and building techniques. The Safe(r) House is one of the first buildings created in response to a natural disaster and because of that lends many new ideas to this thesis.

Zion Luthern Church

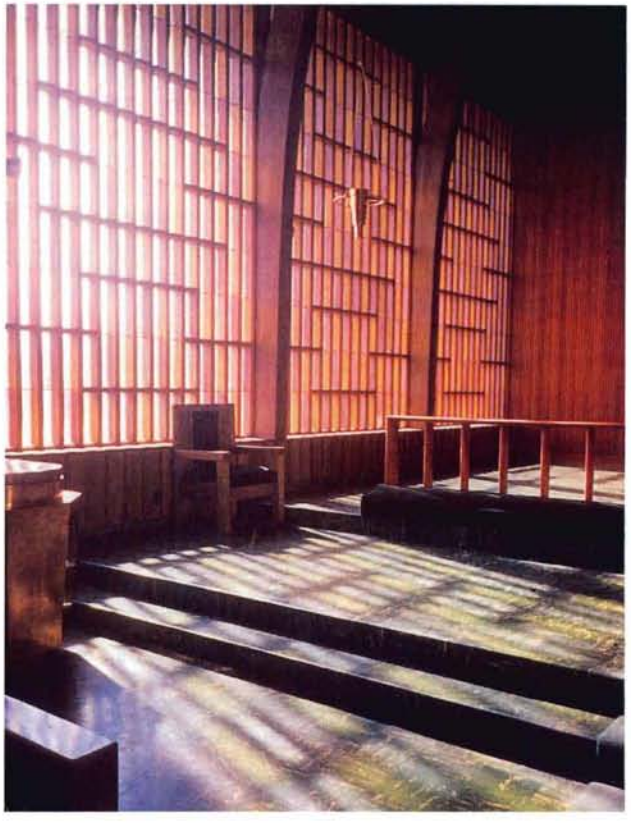
Pietro Belluschi . 1948-1950 . Portland, Oregon

This project is relevant to the thesis as it is a church for about 200 people. The Zion Lutheran Church is also relevant to the ideas of the thesis as this architecture strives to reveal hidden beauty in an understated way (as the thesis strives to reveal the beauty of nature in a subtle way). The church also takes into account its site as the materials and style are suited to the area and community.[13]



Spaces and sizes:

<u>Service Spaces</u>	
Nave	3160 sq. ft.
Altar	810 sq. ft.
Vestry	162 sq. ft.
Mothers	182 sq. ft.
Coat Room	156 sq. ft.
<u>Community Spaces</u>	
Parish Hall	1856 sq. ft.
Stage	300 sq. ft.
Dressing Room	108 sq. ft.
Projection Booth	16 sq. ft.
<u>Entry Spaces</u>	
Narthex	403 sq. ft.
Portico	570 sq. ft.
Covered Exterior Space	2648 sq. ft.
<u>Support Spaces</u>	
Kitchen	252 sq. ft.
Food Closet	36 sq. ft.
Storage	36 sq. ft.
Women's Restroom	45 sq. ft.
Men's Restroom	45 sq. ft.
Mechanical	268 sq. ft.



Overall, the Zion Lutheran Church is reminiscent of a traditional church with lineal organization and tall vaulted roofs while also having a modern touch through the use of new technologies. This combination of old and new characteristics gives it a sense of timelessness. Visually rich materials, exposed structure, and subtle lighting all reveal the natural beauty of the church. Although the interior photographs of the church are beautiful and seem to achieve the goals of the architect, the outside of the church is lacking in revealing that same sense of spirituality. The rest of the building is also a mystery as to whether the other spaces carry out the conceptual ideas of the architect, as the only interior photographs that were available were of the nave and altar. Another critique is about the area where the parish hall, nave, and narthex all meet. Where all these spaces come together the architect has chosen to place the restrooms, mechanical room, and mother's room. The central location of these incidental rooms seems like an odd place for them. The connection between the spaces could be used as a focal point of the entire design, but instead it is overlooked and seems almost like a missed opportunity.

short precedent studies

Ecoville . Jennifer Siegal, OMD

Jennifer Siegal designs with a focus on mobility. Her designs are for those with nomadic, transient, and minimalist lifestyles. The work is movable and adaptable, lending itself helpful to the ideas of the thesis.[14]

Korean Architecture

Korean architecture is very intune with nature and the surrounding environment. It adjusts to the various changes in the environment, while still creating a connection between the interior and exterior. It celebrates nature and reveals this beauty to its occupants.[15]

Jungle House . Dewes & Puente

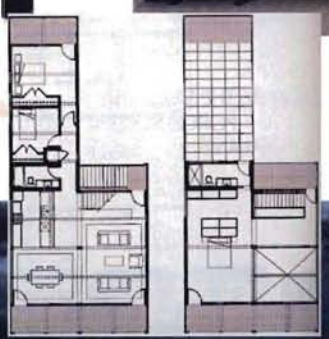
The jungle house is a design that celebrates nature and the surrounding climate. It is built buried in tropical vegetaion and consists of materials that are chosen to erode with the forces of nature. The architecture's celebration of nature is something this thesis applauds.[16]

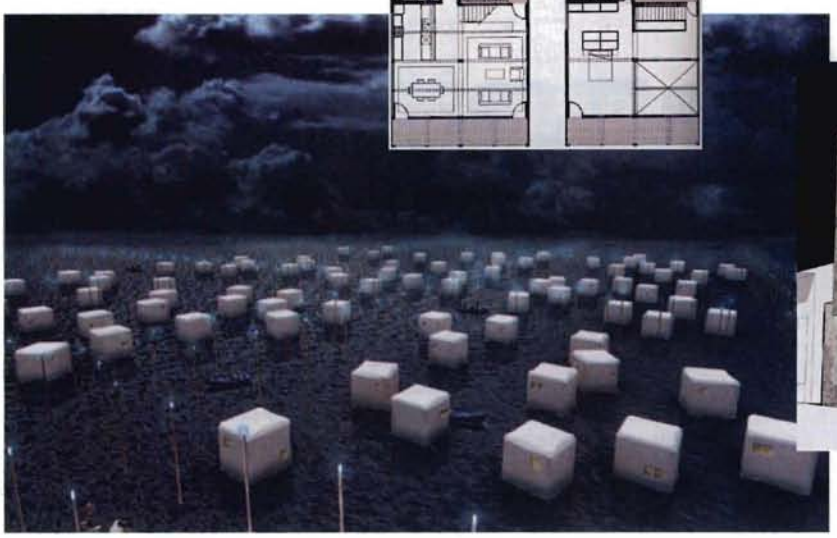
Disaster Relief Shelters

These disaster relief shelters from all over the world show how people deal with architecture in times of crisis. They show what people are truly concerned about when it comes to basic shelter. This idea is connected to the thesis in dealing with architecture in extreme instances.[17]

New Orleans Prototype House Designs

This student competition to design a prototype house in New Orleans brings up many issues relevant to this specific location through some common ideas. The height above the ground plane, outdoor porch areas, development of the shotgun house, and open views with filters are common in many projects. These ideas could help the thesis by showing what aspects are most important to the site.[18]





site studies

The Gulf Coast region in Louisiana is a very complex and interesting territory. This is the location of the Mississippi River Delta where the freshwater of the Mississippi River flows into the saltwater of the Gulf of Mexico. Here the water combines and forms estuaries (semi-enclosed bodies of water which have a free connection with the open sea water that is diluted with fresh water derived from land drainage).[1] The river brings freshwater and sediment down from the midwest and dumps it into the ocean. In most cases the mouth of the river finds its way to the lowest lying land in the coastal region so that the dumping of the sediment restores the low lying land. In fact, rivers change course many times throughout history in search of the lowest lying land (referred to as delta lobe switching).[2] At the mouth of the dynamic Mississippi River, however, there are many issues that don't conform to these generalities and describe this natural system of adaptation.

First of all, the mouth of the Mississippi River is extremely far out into the ocean. This is due mainly to the strict levee system of Louisiana. Levees are man-made banks constructed along the river to keep its path under control. Through the use of the levee system many floods are prevented and the course of the river is at the will of humans. The levee system keeps the floodwaters of the river from spreading across the delta, thus hindering it from building up the land of the Gulf Coast region. The mouth of the Mississippi River is instead out on the edge of the continental shelf which is referred to as a bird's foot delta (shown below).[3] Here the sediment from the river is depositied into such a deep water level that it is just lost

into the ocean. This is also a problem because that lost sediment is full of nutrients which if deposited in the correct locations could be very beneficial to the land. By instead depositing this nutrient-rich sediment out into the ocean, a "dead zone" is produced.[4] This dead zone is a large area of water along the coast that is devoid of dissolved oxygen that creates an environment in which no plants or animals can live.

Secondly, the wetlands and barrier islands along the Gulf Coast Region are disappearing. This loss of both wetlands and barrier islands is very significant as these offer protection from flooding and hurricanes that occur in that area yearly. This problem is again due to the fact

that the Mississippi River cannot flood and replenish these areas. Many plants and animals are losing their home, thus becoming extinct, due to the fact that the wetlands are disappearing.[5] Another cause of the disaperance of the wetlands are the fault lines of that region. Under the Gulf Coast region are thousands of pieces of subsurface faultzones that crisscross the delta from east to west. These fault lines are pulling pieces of the coast away from the mainland and into the sea. This is just one of the many causes of land loss of the Louisiana coast.

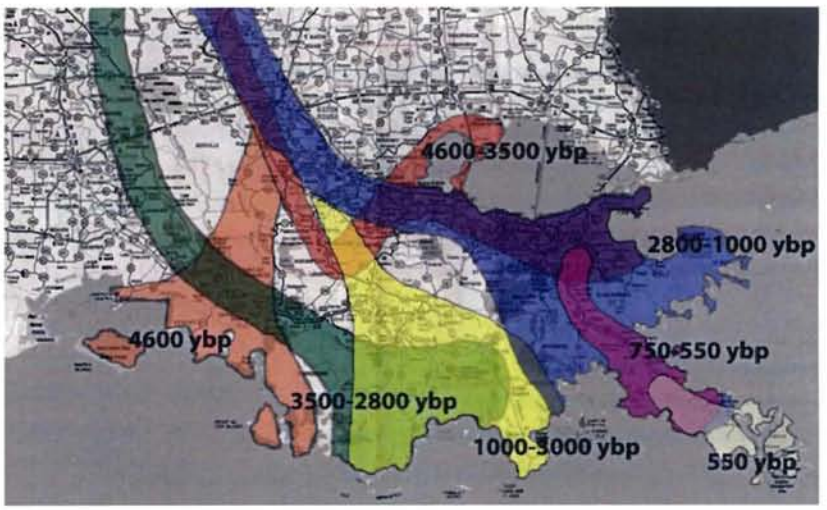
Lastly, navigation channels and canals compose a third problem for the Missississsippi River Delta. These canals are a problem because they introduce brackish water into the dominant freshwater of the region. Manmade waterways offer not only a path for humans, but also a path for salty gulf water to flow far inland. When the saltwater taints the areas of freshwater, many plants and animals are affected. "Brownouts" can occur which are the dying out of the marsh plant life along the canal. Another negative effect canals can have on the environment is from channelization. Channelization refers to the dredging of the river bottom to make passage easier and safer for cargo ships (enviroliteracy.org). This ultimately contributes to the dead-zone because of the increased speed of the river's flow.[6]

site analysis

For this thesis project, it is most important that a site located where there are variable environmental conditions. This requirement includes a possibility of extreme environmental conditions along with the occurrence of slight changes in the environment on a daily basis. Because of these requirements a site located in coastal Louisiana was chosen. This area is prone to hurricanes, tidal, waves, and flooding as it is located at an elevation below sea level. Within this broad area of coastal Louisiana, the search for a site was narrowed down to the cities of Slidell, Morgan City, Venice, and New Orleans. These sites were chosen because of their connection to a sizable community, their relationship to water, their history of changing environmental conditions, and any other unique site characteristics. From there New Orleans was selected as the final site and a broad study of the climate and regional characteristics was completed until a site visit could occur to locate a more specific location for the project.

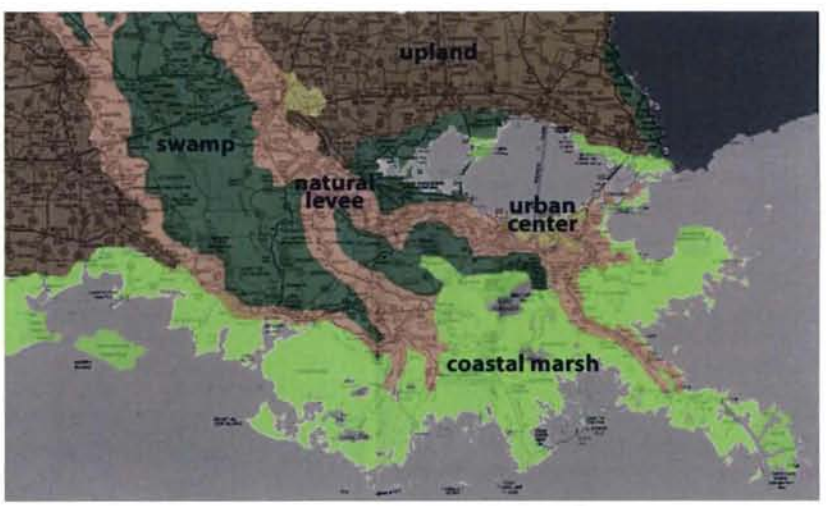
regional analysis

The changing locations of the Mississippi River throughout history are shown in this map. Each color responds to a different location of the river during the indicated number of years before present (ybp).



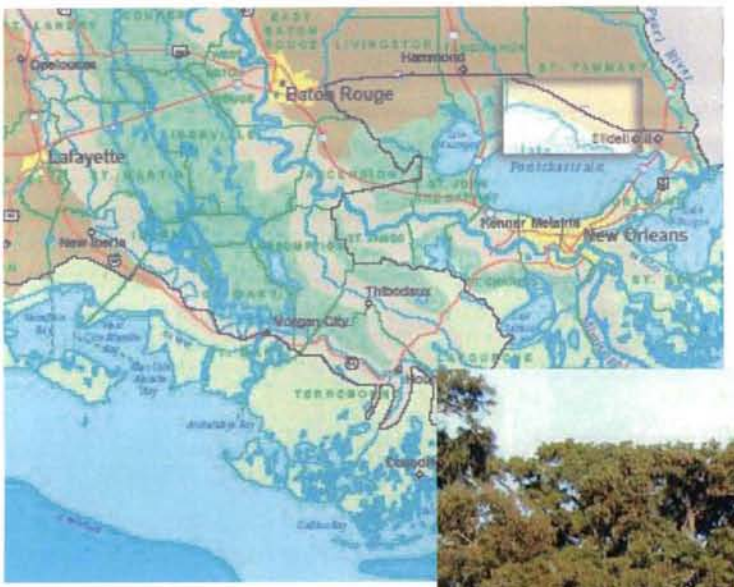
This map shows Louisiana's relationship to different bodies of water. In blue the storm surge heights along the coastal area during Hurricane Katrina are also shown.

Shown here are the range of different land types that occur in coastal Louisiana. Each color shown on the map is labeled and corresponds to a different land type.

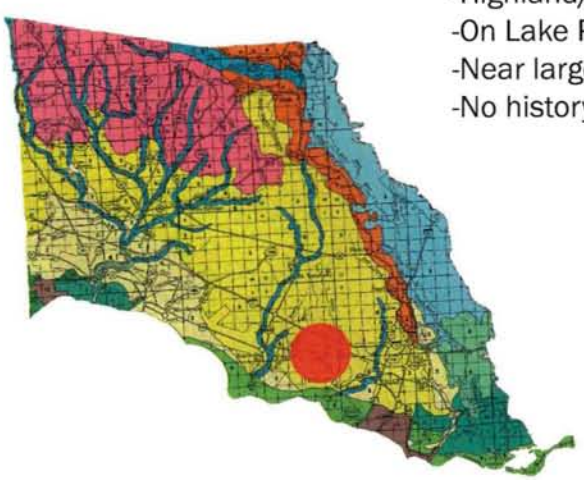


Slidell, Louisiana

site possibility #1

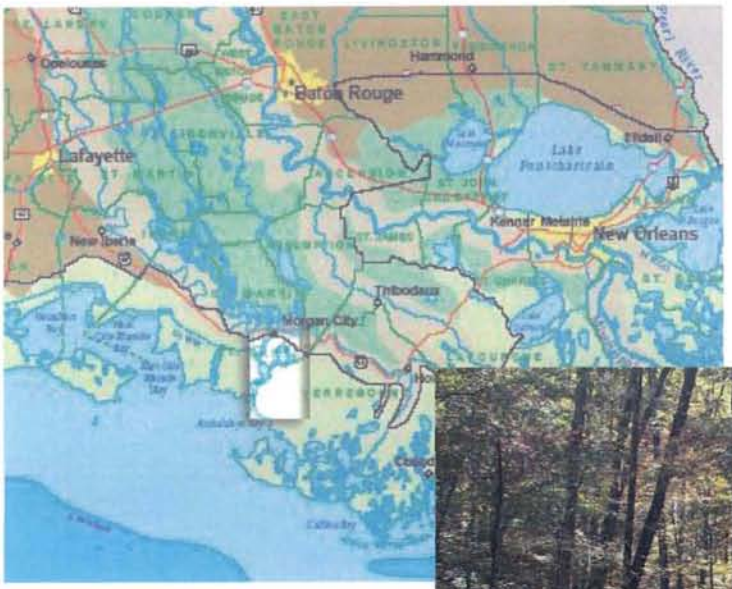


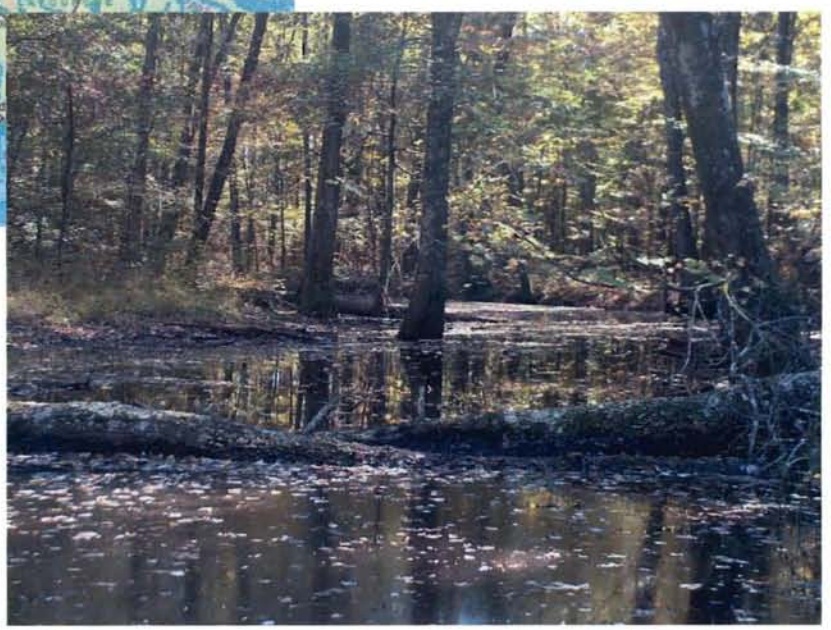
-Highland/Upland
-On Lake Pontcharirain so direct contact with water
-Near large city of Slidell
-No history of delta lobe location



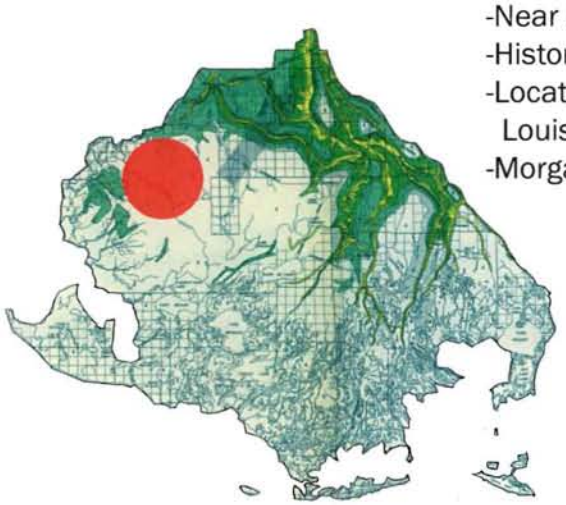
Morgan City, Louisiana

site possibility #2



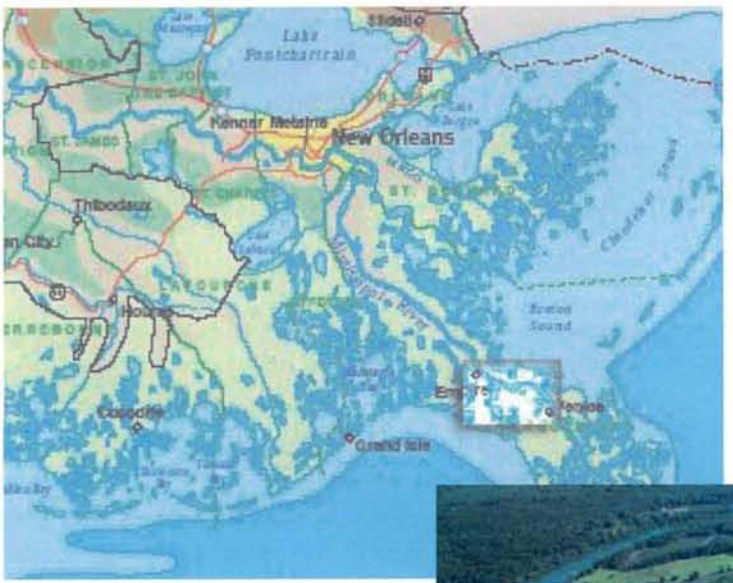


-Swamp/Marsh
-Near Atchafalaya Bay so close connection to water
-History of delta lobe location
-Located near one of the only increasing shores on the Louisiana coast
-Morgan City closest large city



Venice, Louisiana

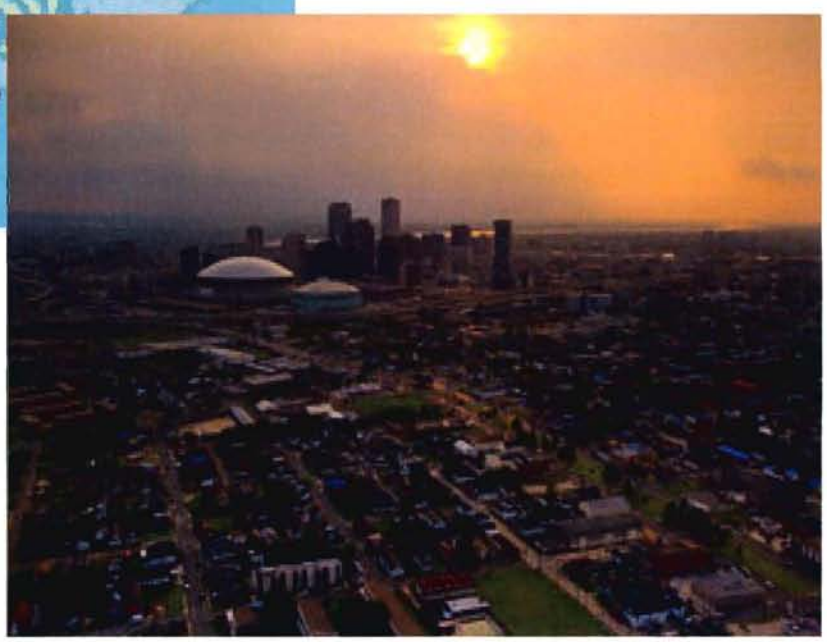
site possibility #3



-Flood Plain/River Delta
-On Mississippi River bed so direct connection with water at certain times of the year
-Located close to end of continental shelf so proximity to "dead zone"
-Near a number of small towns
-History of delta lobe
-Proximity to wetlands

New Orleans, Louisiana

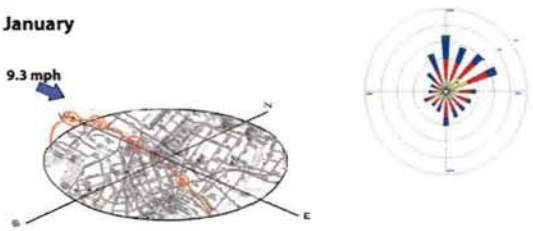
site possibility #4



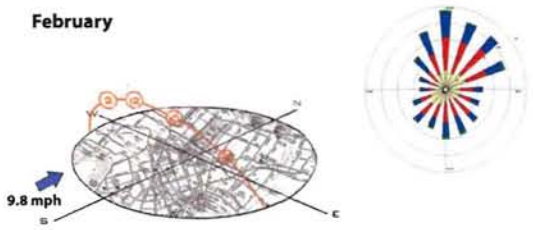
-Urban Center
-Located between Lake Pontchartrain, the Mississippi River, and a number of small canals
-History of delta lobe
-Elevation below sea level
-Includes a number of natural levees

sun and wind analysis

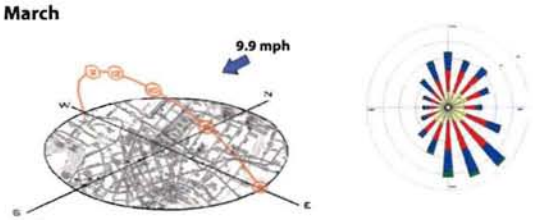
January



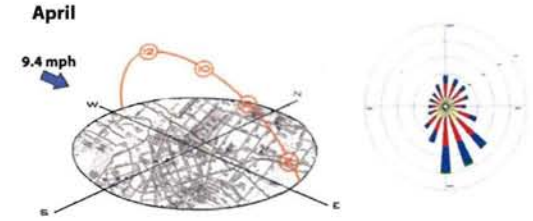
February



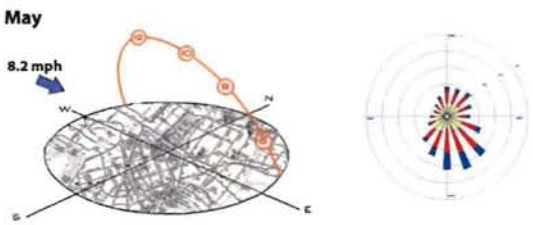
March



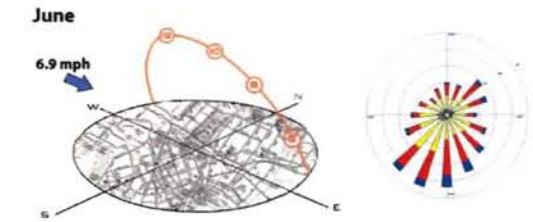
April



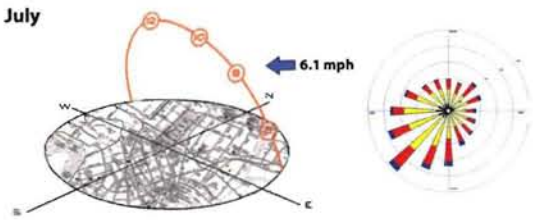
May



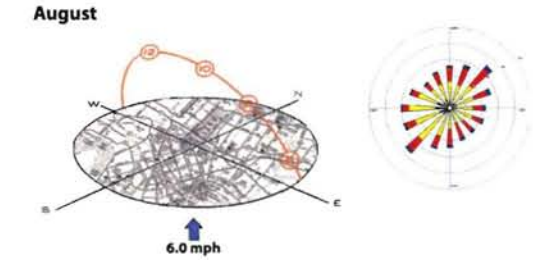
June



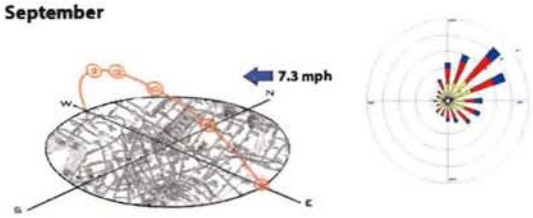
July



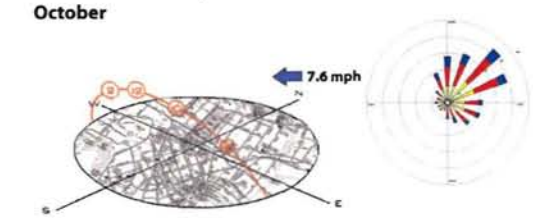
August



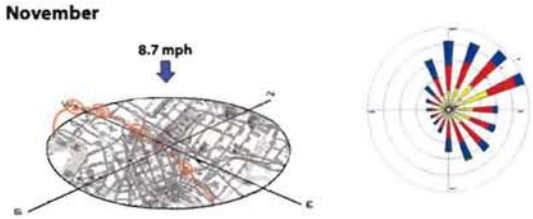
September



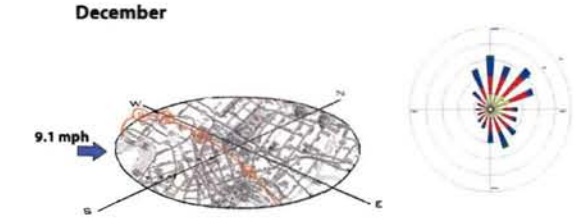
October



November

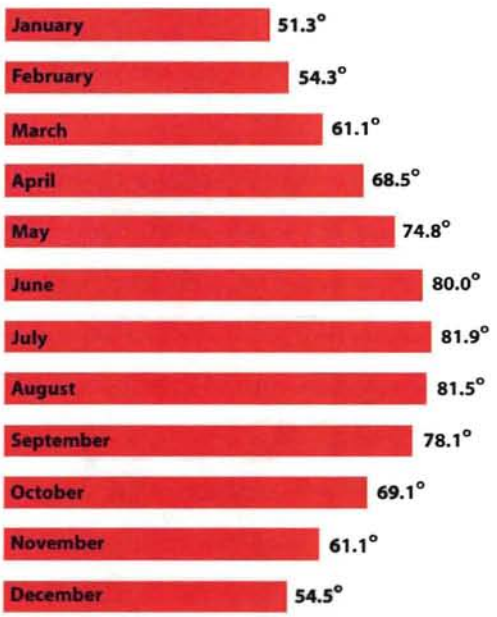


December

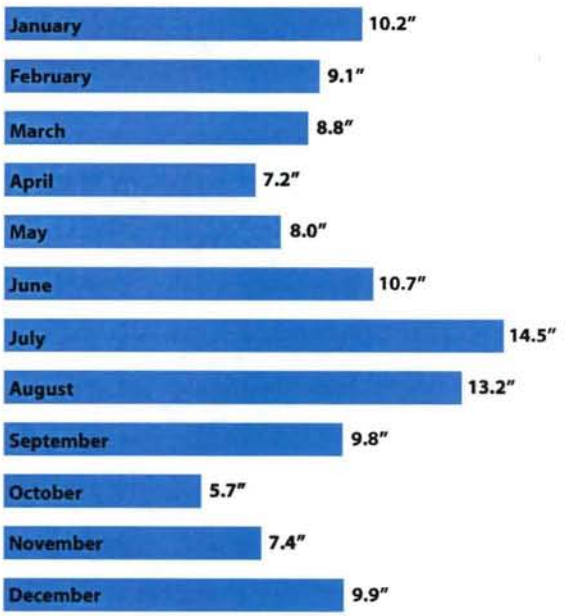


climate analysis

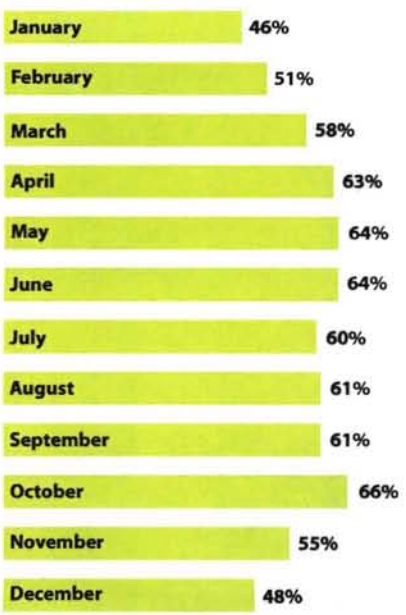
Temperature
Monthly average in degrees Fahrenheit



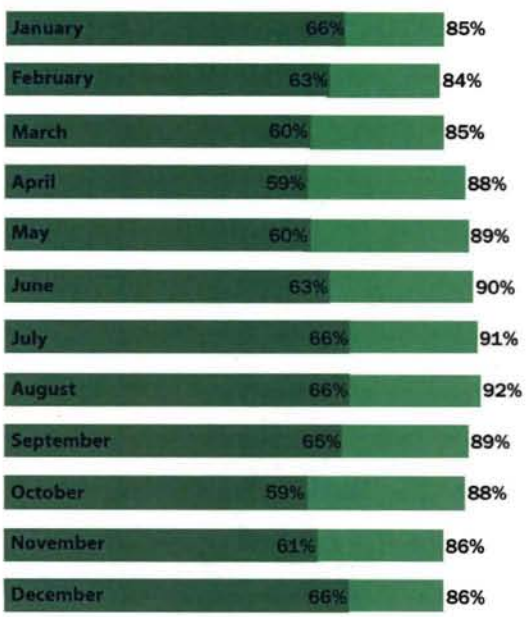
Precipitation
Monthly average in inches



Sunshine
Percentage of days possible in a month

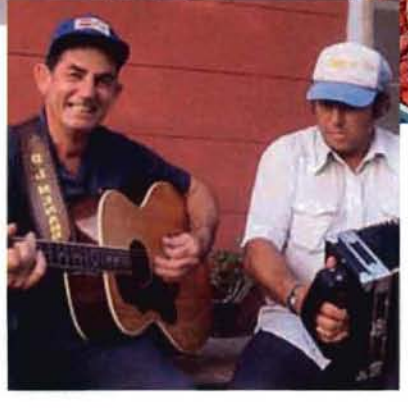


Relative Humidity
Minimum and maximum daily averages in a month



cultural analysis

Louisiana is known not only for its lush environment, but also for having a strong cultural identity. Many coastal areas have a rich Creole culture which attracts tourists from all over the world. Louisiana is predominantly Catholic, despite the fact that it's also home to one of the biggest Mardi Gras festivals in North America. It is one of the birthplaces of jazz and one of the poorest states. Overall there is a tropical, easygoing feeling that dominates the area. It is diverse, culturally rich, and a place unlike any other. These images give only a hint of the vibrant culture thriving in coastal Louisiana.



1200 Mirabeau

After a regional study was complete, a site visit was made which helped determine an exact site location for the thesis project. The final site is located in the northern section of New Orleans, close to Lake Pontchartrain between the Gentilly area and New Orleans' City Park. The site is located on the block surrounded by St. Bernard Avenue, Mirabeau Avenue, Duplessis Street, and Owens Street. It previously was the location of the Provincial House of the Sisters of St. Joseph, but much damage was done from the effects of Hurricane Katrina and so the current building is no longer inhabitable and is structurally unstable. This site is located in an area that is being built back up after the hurricane, demonstrated by the constant flow of work trucks driving down the street and the endless construction noises heard throughout the neighborhood. The site also has a sense of spirituality to it, due to the remnants of a huge religious building on the site which looks like at one time was a place of protection for its users. It also has a unique sense of connection with nature as the site is set in an urban area, yet there is plenty of land surrounding it with the vegetation on the site wild and overgrown. It is located within a mile and a half of Lake Pontchartrain, within a quarter of a mile of the city park, and at an elevation of -.5 ft. below sea level. It is located between the levees of New Orleans, relying on them to stay above the waters of the lake.

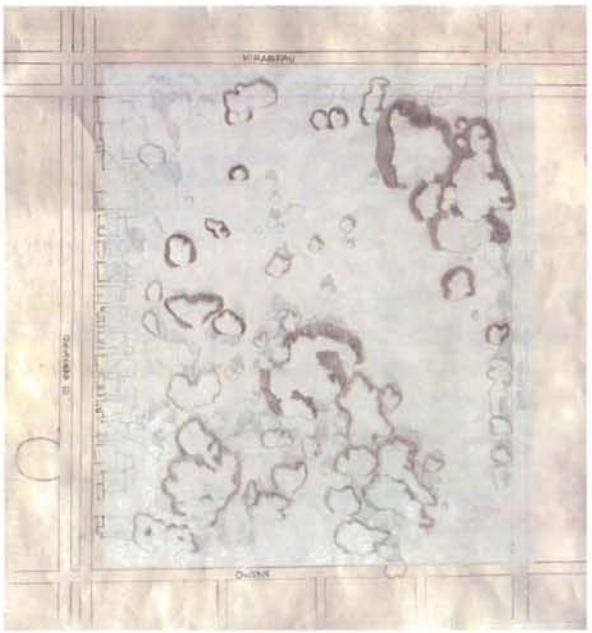
The image to the right represents the essence my the site. It has a strong spiritual sense to it - a feeling of power and security. The overgrown vegetation is also prominent, giving the site a feeling of being untamed and wild.

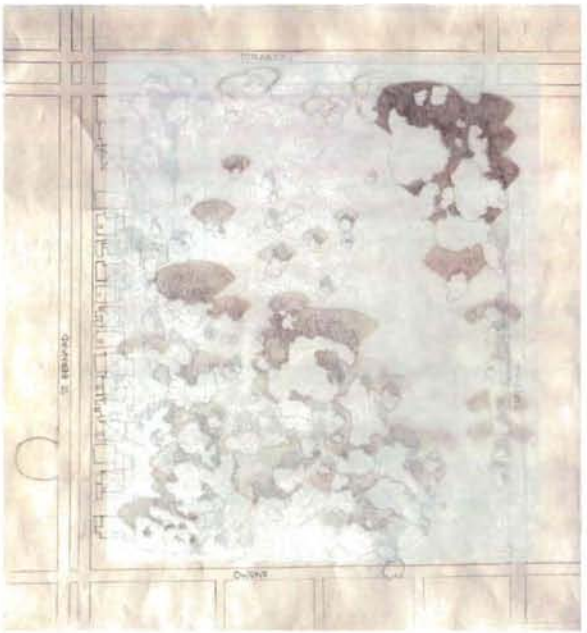
The map to the left shows the location of the site in relationship to Lake Pontchartrain, the Mississippi River, City Park, and the rest of New Orleans. The site is located under the red square to the left.

The map below shows an arial view of the site (with North at the top) plus the residential neighborhood surrounding it. The site is very big compared to the tightly packed surrounding neighborhood houses, has a good amount of open space, and has natural vegetation all over it. Each letter signifies a panorama view on the following pages with the view starting from the letter and extending out in the direction the arrow is pointing.

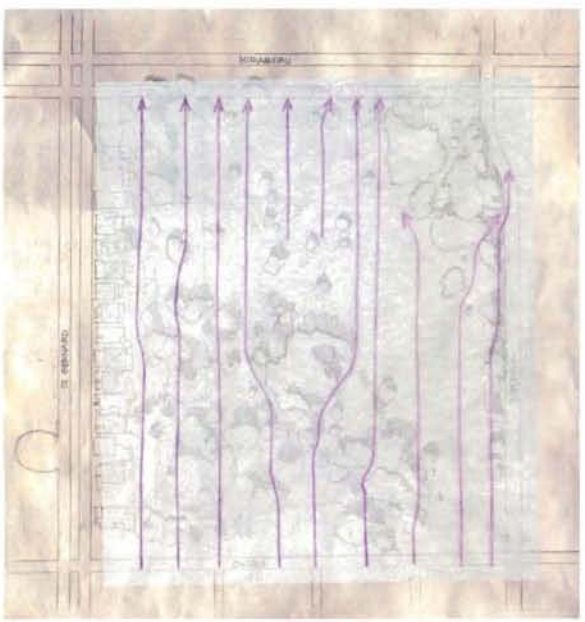
These panoramic photographs show the site starting at the northwest corner of the site, working around to the northeast corner, and then from the east facing north (top to bottom).

This set of panoramic photographs show the site starting at the southeast corner of the site then moving along to view the south, southwest, and west (from top to bottom).

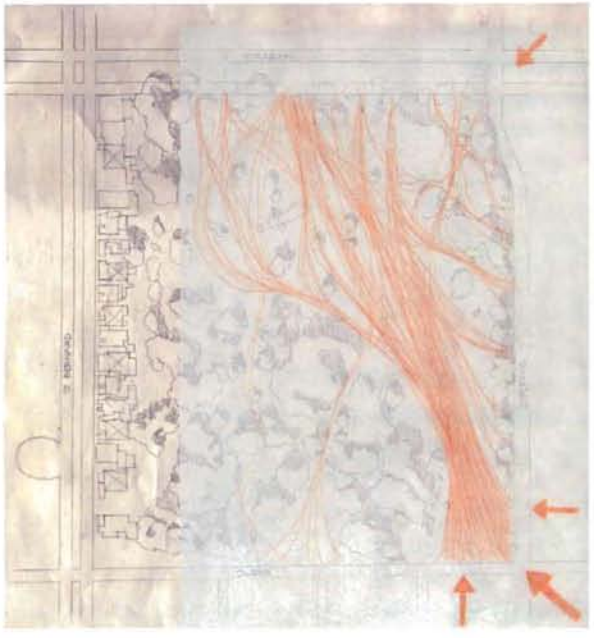




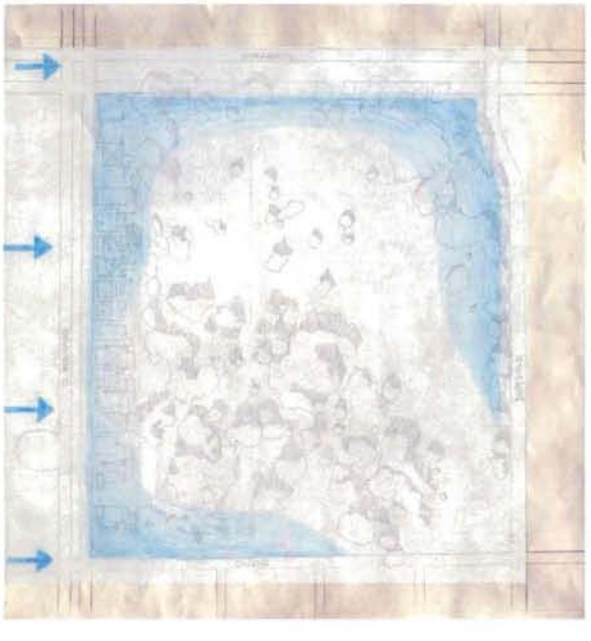
This series of site analyses look at various environmental conditions on the site. These were all drawn on separate sheets over top of an existing site drawing. This first set of drawings (above) looks at the sun conditions on the site during the winter (left) and summer (right).

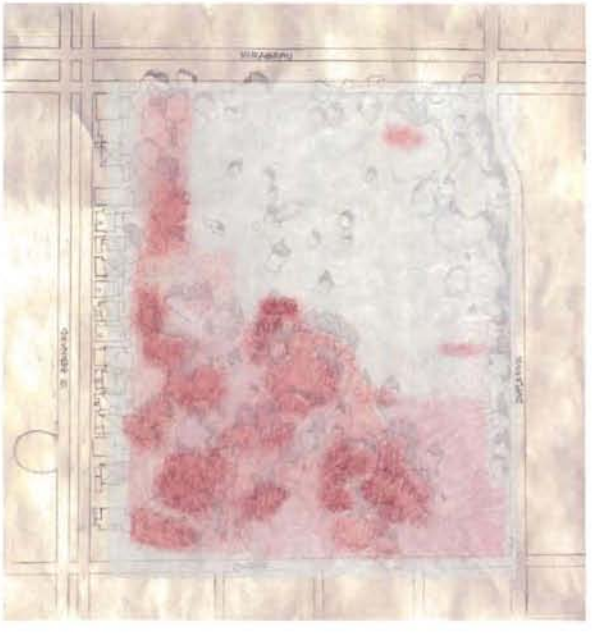


This second set of analysis drawings looks at the wind conditions on the site. The drawing on the left shows the wind coming from the South as it often does in the summer. The drawing on the right shows the wind coming from the Northeast as it often does in the winter. Although both of these directions are the prevailing direction of the season, the winds in this region are especially variable and in most cases there isn't a definitive prevailing wind.

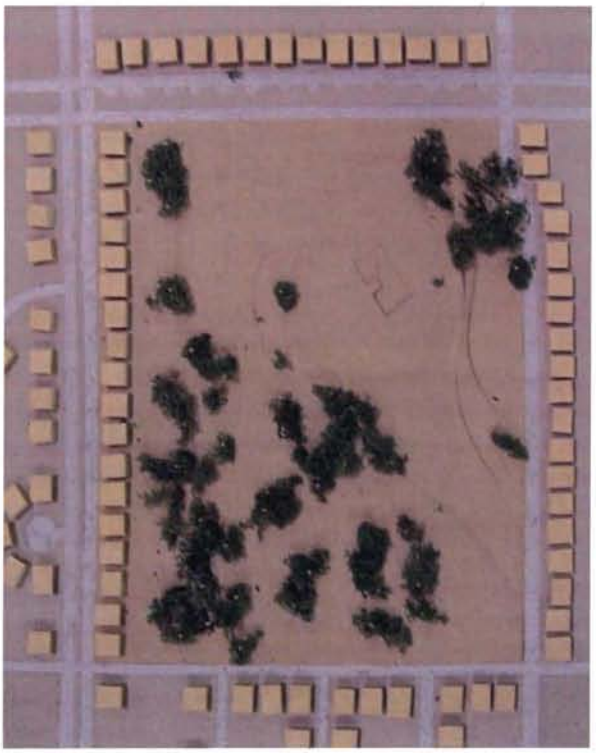


This set of analysis drawings shows the way the site would be traveled to and upon. The drawing on the left shows the paths that pedestrians might travel through the site and what direction they would most likely come from. The drawing on the right shows the major roads around the site and depicts how heavy the vehicular traffic on each would be.





The final set of analysis drawings shows environmental conditions on the site. The drawing on the left shows how the water level would rise on the site and from what direction the water would enter the site if the levees were breached. The drawing on the right shows where the most overgrown areas of the site are located.



This is the model of the site. The top view is shown in the picture above and a perspective view is shown in the bottom photograph.

project program

project identification

A communal program that would be an appropriate vehicle to test the thesis would be a church. In this instance a church that could, in the occurrence of a natural disaster, transform into a shelter would offer an appropriate programmatic solution. A church would provide a place where the focus of the occupants would be on the daily functions of the church instead of on the direct relationship between the architecture and environment. In this everyday condition a church would allow the architecture to adapt and/or respond to its changing conditions while subtly revealing this relationship to the occupants. In an extreme condition the church could transform into a shelter where people could come and find refuge if their dwelling wasn't suitable to withstand the disaster that was occurring. It is hoped that here people could gather together, sleep, eat, distribute information, find others, and ultimately feel some sort of safety. Thus, the thesis program would essentially be one with a dual nature.

major components

There are a number of distinct components that together make up the program of the church. There should be a narthex for initial entry and gathering. There should be a nave and sanctuary for large religious group gatherings and worship. A secondary gathering space would also be needed for assemblies that may not be as religious in nature. There should also be a few private office spaces for the church staff and a few classrooms. Obviously there would be restrooms and storage areas. A kitchen would be needed along with a small area for serving the food. Lastly, there should be a nursery and mother's room, along with other building support spaces. In this program, all these spaces would also serve a dual function in which they would be able to operate in cases of extreme environmental conditions.

enumeration of actions

-joyfully gathering for a service in the diffused morning light

-privately dealing with personal issues while tucked away in the shade of the afternoon

-dutifully gathering for community events in the summer humidity as a breeze passes by overhead

-singing whole-heartedly as the rain falls to its own tune just barely visible outside

-creating and strengthening of faith as the wind forcefully twists and turns amongst the trees

-sharing of lives alongside the existing, but ever changing environment

-devoted studying as the evening air turns pleasantly cool with the day changing to night

-making and renewing relationships with others in the dappled shade of the trees

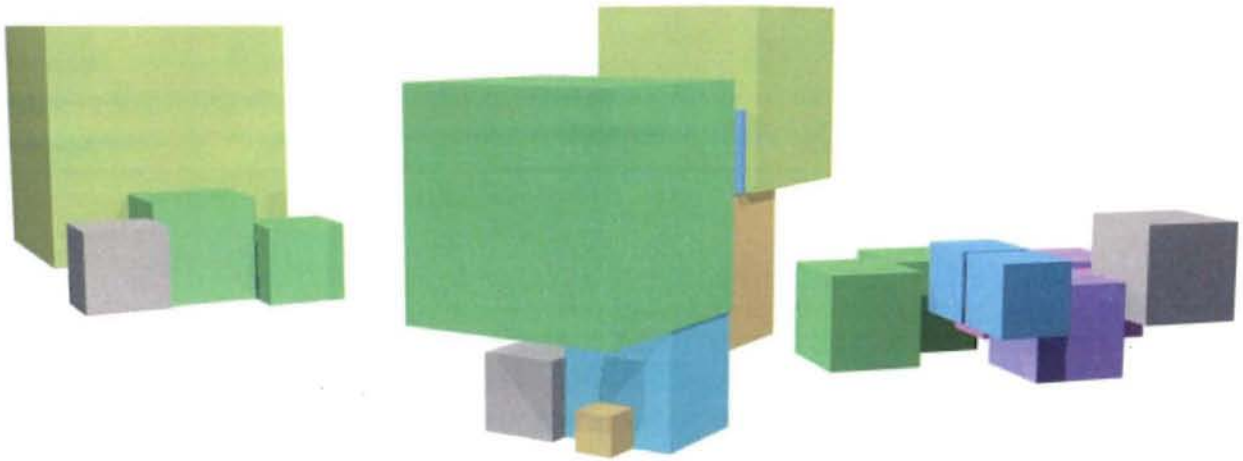
-preparing for services amongst the stickiness of the dense humidity that occurs right before a strong rain

-sitting and watching children play outside as the clouds shift overhead

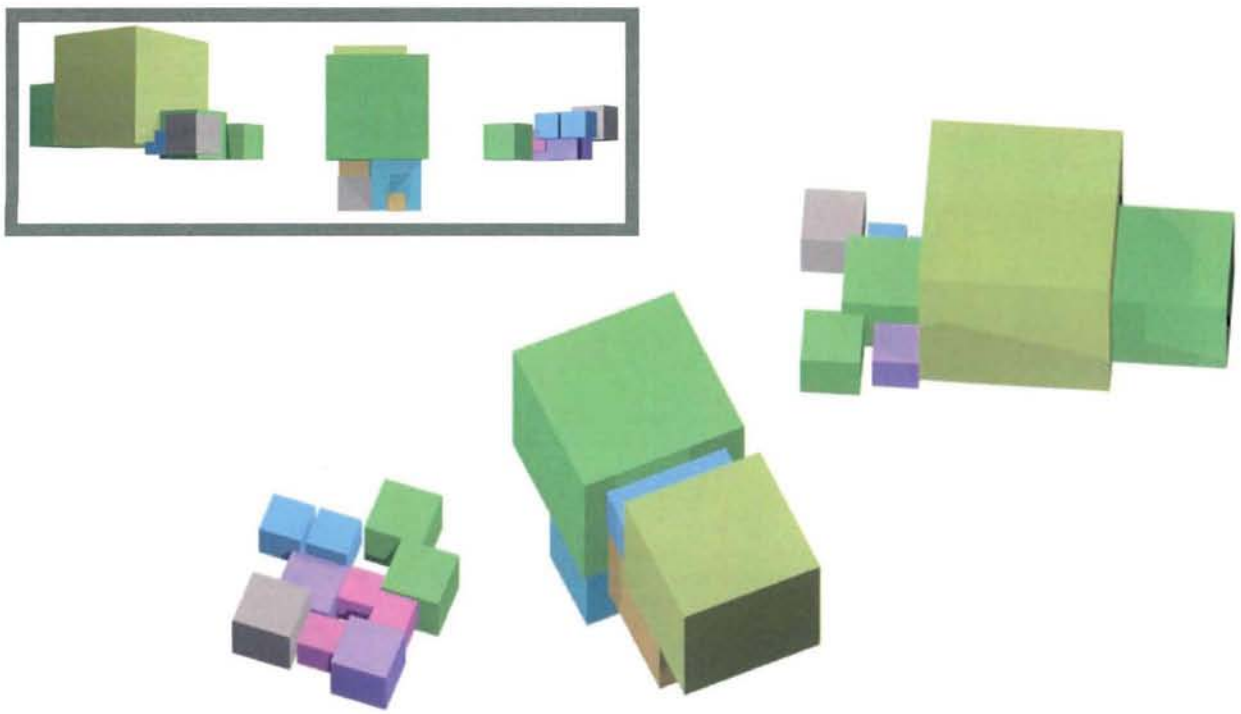
-instructing children, teens, and adults on religion as sprinkles are seen falling on the vegetation outside

-patiently waiting and resting as the fog clears

program diagram



This diagram represents the church program and the various parts that it includes. Different colors correspond to different aspects of the program with purple representing private spaces, gray representing mechanical rooms, blue representing bathrooms and kitchens, tan representing storage, yellow-green representing public spaces that become more private in extreme conditions, and green representing public spaces that remain public in times of extreme conditions.



program quantitative summary

Space Name	Size in sq. ft.	Quantitiy	Total sq. ft.	
Sleeping Area (adapted to the Parish Hall)	2131	1	2131	
Sleeping Area (adapted to the Nave)	3511	1	3511	
Community Space (adapted to the Lobby)	2760	1	2760	
Community Space (adapted to the Narthex)	626	1	626	
Kitchen/Small Dining Area	791	1	791	
Kitchen Storage	115	1	115	
Bathroom (2 women & 2 men)	189/411	4	1200	
Clinic (adapted to the Library)	364	1	364	
Storage	1520	1	1520	
Reception Area (adapted to the Church Office)	361	1	361	
Individual Room (adapted to a Classroom)	332	2	664	
Individual Room (adapted to a Private Office)	150	3	450	
Individual Room (adapted to the Mother's Room)	210	1	210	
Nursery	350	1	350	
Sacristy	147	1	147	
Gathering Space (adapted to Sanctuary include. Baptism Area)	1265	1	1265	
Projection Booth	41	1	41	
Mechanical	364	3	1092	
Total Gross sq. ft.			17598	
Circ. & mech. allowance + 20%			3520	
Total Interior Sq. Ft.				**21,118**
Exterior Spaces				
Parking Lot - 200 cars	60000	1	60000	
Small courtyard	2361	1	2361	
Large courtyard	4576	1	4576	
Interior courtyard	500	1	500	
Grassy outdoor play area	2652	1	2652	
Total Gross sq. ft.			70089	
Circ. & buffer allowance + 20%			14018	
Total Exterior Sq. Ft.				**84,107**
Total Sq. Ft.				**105,225**

Sleeping Area (adapted to Parish Hall)

space detail summary

A. Quantities required
   a. 50 occupants laying down, 130 occupants standing
   b. 1 unit
   c. 2,131 sq. ft. per unit
   d. 2,131 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation this space acts as a place for men and women to sleep separately. Possibly some moveable partitions or separators could be included to give more privacy to the large open space. In this situation the space would be served, public, and collective (with a hint of semi-privacy and individualism with the partitions constructed).

   In the everyday use of the space, it would be used as a hall, a place for community meetings to be held. This space would be public, served, and collective.

C. Activities

   In a disaster situation the main activity in these spaces would be sleeping. It would serve as a little place to rest and think as needed.

   In the everyday situation the hall would be a place to hold meetings, community gatherings, or special events.

D. Spatial Relationships

   This area should be relatively close to the other sleeping area/nave and the community space/narthex. These would also be close to the bathrooms and shower, although not necessarily directly adjacent. Adjacency to the storage area would also be needed. In a disaster situation being close to the information center and registration area might be helpful, but is not essential.

E. Special Considerations

   This space should be bright and able to open and close to the outside depending on the different conditions.

F. Equipment/Furnishings

   Different types of furniture will be used in different situations and stored away when not in use.

   Cot - 50 required, 28"W x 35"H x 7'L

   Chair (folding) - 75 required, 22"W x 24"D x 31"H

   Table (folding) - 15 required, 42" x 72"

G. Behavioral Considerations

   This space must be able to be flexible for very different uses. It must be a space where people can hold meetings and have group gatherings. In a disaster situation the space must be able to contain a large number of people who need to feel a sense of community while at the same time also being able to feel a small sense of privacy and ownership.

H. Structural Systems

   For the space to be adaptable like it is designed to be, it should be open with no supports coming down throughout.

I. Mechanical/Electrical Systems

   Good ventilation is required for this area.

J. Site/Exterior Environment

   In its daily use this space should be relatively open to the environment. In a disaster situation, however, this space should be able to be tightly closed off from the outside conditions. It should be flexible in relating to the outside.

Sleeping Area (adapted to Nave)

space detail summary

A.. Quantities required
   a. 50 occupants laying down, 130 occupants sitting
   b. 1 unit
   c. 3,511 sq. ft. per unit
   d. 3,511 sq. ft. of net area

B. Purposes/Functions

In a disaster situation this space acts as a secondary place for men and women to sleep separately if conditions allow (not if the nave is flooded). Possibly some moveable partitions or separators could be included to give more privacy to the large open space. In this situation the space would be served, public, and collective (with a hint of semi-privacy and individualism with the partitions constructed).

In the everyday use of the space the area would be the nave of the church. These spaces would be public, served, and collective.

C. Activities

In a disaster situation the main activity in these spaces would be sleeping. It would serve as a little place to rest and think as needed.

In the everyday situation the nave would be a place where people would go to worship. It is the seating area that looks upon the sanctuary. People sit there, listen, and participate in whatever is going on in the front.

D. Spatial Relationships

This area should be relatively close to the other sleeping area/hall and adjacent to the community space/narthex. These could also be close to the bathrooms and shower, although this is not necessary. Proximity to the storage area would also be needed. In a disaster situation being close to the information center and registration area might be helpful, but again this is not essential.

E. Special Considerations

The light in this space should be bright enough to see, but diffused to create a sense of peacefulness or holiness.

F. Equipment/Furnishings

Different types of furniture will be used in different situations and stored away when not in use.

Pews (movable) - 22 required, 3'D x 3'H x 15'L

Cots - 50 required, 28"W x 35"H x 7'L

G. Behavioral Considerations

This space must be able to be flexible for very different uses. It must be a space where people can hold meetings and have group gatherings. In a disaster situation the space must be able to contain a large number of people who need to feel a sense of community while at the same time also being able to feel a small sense of privacy and ownership.

H. Structural Systems

For the space to be adaptable like it is designed, it should be open with no supports coming down throughout.

I. Mechanical/Electrical Systems

Good ventilation is required for this area. A sound system is required in this space.

J. Site/Exterior Environment

In its daily use the space should be aware of its environment, but that should not be the main focus of the space. The environment should be affecting the space subtly. In a disaster situation, however, this space should be able to be tightly closed off from the outside conditions altogether.

Community Space (adapted to the Lobby)

space detail summary

A. Quantities required
   a. 25 occupants laying down, 200 occupants standing
   b. 1 unit
   c. 2,760 sq. ft. per unit
   d. 2,760 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation this space acts as a secondary place for families or people needing assistance to sleep in an area that isn't separated by sex when conditions permit (not when the lobby is flooded). This space could also act as a communal area where people could sit and hang around. Possibly a few moveable partitions or separators could be included to give more privacy to the large open space. In this situation the space would be served, public, and collective.

   In the everyday use of the space, the area would be the main lobby and/or initial gathering space of the church. This space would be public, served, and collective.

C. Activities

   In a disaster situation the main activities in this space would be gathering, resting, relaxing, talking, and just being in a group setting. It would also be a place for some people to sleep.

   In the lobby people would gather once first entering, come inside and get prepared for the service, talk and mingle with others.

D. Spatial Relationships

   This area should be adjacent to the sleeping area/parish hall and sleeping area/nave. In a disaster situation these would ideally be close to the information center and registration area. A proximity to a storage area is also necessary. These should also be close to the bathrooms and shower, although not necessarily directly adjacent.

E. Special Considerations

   This space should be bright and able to open and close to the outside depending on the different conditions.

F. Equipment/Furnishings

   Different types of furniture will be used in different situations and stored away when not in use.

   Cots - 25 required, 28"W x 35"H x 7'L

   Chair (folding) - 25 required, 22"W x 24"D x 31"H

   Table (folding) - 2 required, 42" x 72"

G. Behavioral Considerations

   This space needs to allow people to communicate effectively and interact easily.

H. Structural Systems

   For the space to be adaptable like it is designed, it should be open with no supports coming down throughout.

I. Mechanical/Electrical Systems

   Good airflow is required for this area.

J. Site/Exterior Environment

   In its daily use this space should be relatively open to the environment. In a disaster situation, however, this space should be able to be tightly closed off from the outside conditions.

Community Space (adapted to the Narthex)

space detail summary

A. Quantities required
   a. 10 occupants laying down, 200 occupants standing
   b. 1 unit
   c. 626 sq. ft. per unit
   d. 626 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation this space acts as a secondary place for families or people needing assistance to sleep in an area that isn't separated by sex when conditions allow (not when the narthex is flooded). This space could also act as a communal area where people could sit and hang around. In this situation the space would be served, public, and collective.

   In the everyday use of the space this area would be the narthex where people could gather themselves before entering the sanctuary. This space would be public, served, and collective.

C. Activities

   In a disaster situation the main activities in this space would be gathering, resting, relaxing, talking, and just being in a group setting. It would also be a place for some people to sleep.

   In the narthex people would prepare themselves for entering the sanctuary.

D. Spatial Relationships

   This area should be adjacent to the sleeping area/nave. In a disaster situation these would ideally be close to the information center and registration area, although it is not necessary. These should be in close proximity to the bathrooms, shower, and storage area, although not necessarily directly adjacent.

E. Special Considerations

   This space should be bright and able to open and close to the outside depending on the different conditions.

F. Equipment/Furnishings

   Different types of furniture will be used in different situations and stored away when not in use.

   Cots - 10 required, 28"W x 35"H x 7'L

   Chair (folding) - 25 required, 22"W x 24"D x 31"H

   Table (folding) - 2 required, 42" x 72"

G. Behavioral Considerations

   This space needs to allow people to communicate effectively and interact easily.

H. Structural Systems

   For the space to be adaptable like it is designed, it should be open with no supports coming down throughout.

I. Mechanical/Electrical Systems

   Good airflow is required for this area.

J. Site/Exterior Environment

   In its daily use this space should be relatively open to the environment. In a disaster situation, however, this space should be able to be tightly closed off from the outside conditions.

Kitchen/Small Dining Area

space detail summary

A. Quantities required
   a. 20 occupants
   b. 1 unit
   c. 791 sq. ft. per unit
   d. 791 sq. ft. of net area

B. Purposes/Functions
   This space is where food can be prepared and people can be fed. This could be a space where people might naturally form a community in times of a disaster situation. This space would be servant and served, semi-public, and collective.

C. Activities
   In this space people can prepare, store, and eat food. People can talk and bond with each other, while doing something (preparing food) that is needed by the rest of the group.

D. Spatial Relationships
   This area should be directly adjacent to the kitchen storage. It should also be spatially close to the community space so that people can move easily from one area to the other.

E. Special Considerations
   This space should be bright with more direct light over the work areas.

F. Equipment/Furnishings
   Refrigerator - 1 required, 51"W x 31"D x 83"H
   Microwave - 1 required, 22"W x 19"D x 16"H
   Oven - 1 required, 40"W x 34"D x 36"H
   Range - 1 required, 24"W x 30"D x 10"H
   Dishwasher - 1 required, 23"W x 25"D x 34"H
   Sink - 2 required, 21"D x 18"W
   Stool - 15 required, 18"W x 18"D x 33"H
   Table (folding) - 2 required, 42" x 72"

G. Behavioral Considerations
   It would be ideal if somewhere within the space there was at least one large table to work on, to gather around, and to serve food on.

H. Structural Systems

I. Mechanical/Electrical Systems
   Mechanical ventilation is required for this area. A commercial range hood is required for over the ovens. A fire suppresion system is also needed.

J. Site/Exterior Environment
   In this space the exterior atmosphere should be able to be felt, but not seen.

Kitchen Storage

space detail summary

A. Quantities required
    a. 0 occupants
    b. 1 unit
    c. 115 sq. ft. per unit
    d. 115 sq. ft. of net area
B. Purposes/Functions
    This space allows food and drinks to be stored then used in the everyday activities of the church. This space is public (yet out of the way), servant, and collective.
C. Activities
    The only activity that goes on in this space is storage of food and drinks.
D. Spatial Relationships
    This area should be directly adjacent to the kitchen.
E. Special Considerations
    This area must not be susceptible to humidity or dampness as food items stored here need to be kept dry and well preserved.
F. Equipment/Furnishings
    Shelves - 6 required, 10'H x 2'D, ceiling height, 4' walkway
G. Behavioral Considerations
    The entryway must be wide enough to get large items in and out.
H. Structural Systems
I. Mechanical/Electrical Systems
    Good ventilation and airflow is required.
J. Site/Exterior Environment

Bathroom

space detail summary

A. Quantities required
   a. 20 occupants
   b. 4 units
   c. 189 sq. ft. per unit without showers and 411 sq. ft. for units with showers
   d. 1200 sq. ft. of net area

B. Purposes/Functions

   This space serves as a place to get clean, go to the bathroom, and to get refreshed. In this space people can look in the mirror and feel like themselves again after a traumatic event has occurred. In everyday use, this space is functional as purely a bathroom. There are four spaces: two for women, and two for men, with children being allowed to go in either one. This space is private, served, and individual (although it may seem collective when groups of people are in there).

C. Activities

   In this space people can go to the bathroom, wash their hands, clean up their faces and bodies, and take care of any other bodily problems.

D. Spatial Relationships

   This area should be very close to the community space and directly adjacent to the lobby. It should be easily accessible and located. This space should also be somewhat near the lockers. The two bathrooms containing showers should be located in an area that is separate from the other two bathrooms and less likely to be affected by extreme environmental conditions.

E. Special Considerations

   This space should be generally bright.

F. Equipment/Furnishings

   Toilet - 18 required, 24"H x 24"W x 18"D
   Urinal - 4 required, 16"W x 24"H x 6"D
   Sink - 8 required, 14"W x 15"D
   Hand dryer - 5 required, 10"H x 11"W x 5"D
   Paper towel dispenser - 5 required, 11"H x 11"W x 4"D
   Toilet paper holder - 18 required, 11"H x 5"D x 6"D
   Sanitary Napkin Dispenser - 8 required, 11"H x 9"W x 3"D
   Mirror - 3 required, 60"L x 3'H
   Waste Receptacle - 3 required, 63"H x 20"W x 20"D
   Baby Changing Station - 3'W x 1'6"D
   Shower - 2 required, 3'6" x 3'6"

G. Behavioral Considerations

   There must be enough room for people to get in and out while others are waiting in line. It must also be designed with the knowledge that people may have to wait in line, wait for others, and not everyone is going to be going in and out in the same amount of time. There should also be a separate area in both a men and a women's bathroom for a small shower with a changing area.

H. Structural Systems

I. Mechanical/Electrical Systems

   Extremely good ventilation is required.

J. Site/Exterior Environment

   In this space the exterior atmosphere should be able to be felt and understood, but not seen.

Clinic (adapted to the Library)

space detail summary

A. Quantities required
   a. 12 occupants
   b. 1 unit
   c. 364 sq. ft. per unit
   d. 364 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation this space would be used as clinic where people would go if they are hurt or not feeling well. In everyday use this space would be a place where people can look at and check out books. This space is public (although some privacy with partitions put up), served, and collective (although individual needs are being taken care of here).

C. Activities

   In a disaster situation people might be lying down, sitting around, having conversations, getting bandaged up, getting examined, or getting taken care of in general. In an everyday church use this space might consist of people looking through books or having conversations.

D. Spatial Relationships

   It should be close to the storage room and some individual rooms where sick or injured people can stay.

E. Special Considerations

   This space should be warm and bright.

F. Equipment/Furnishings

   Different types of furniture will be used in different situations and stored away when not in use.
   Cots - 10 required, 28"W x 35"H x 7'L
   Chairs (folding) - 9 required, 22"W x 24"D x 31"H
   Examination table - 3 required, 27"W x 76"L x 26"H
   Sink - 2 required, 14"W x 15"D
   Paper towel dispenser- 1 required, 11"H x 11"W x 4"D
   Shelving - 8 required, 10'H x 2'D, ceiling height
   First Aid Equipment

G. Behavioral Considerations

   The space must be laid out so that multiple conversations can be going on without interrupting the others.

H. Structural Systems

I. Mechanical/Electrical Systems

   Mechanical ventilation is required.

J. Site/Exterior Environment

   This space can be connected to the external conditions, but should be able to be closed up tight in an emergency situation.

Storage

space detail summary

A. Quantities required
    a. 0 occupants
    b. 1 unit
    c. 1520 sq. ft. per unit
    d. 1520 sq. ft. of net area
B. Purposes/Functions
    This space allows for the spaces throughout the building to change and become adaptable in times of disaster by providing storage for different sets of furniture and supplies. This space is public (yet out of the way), servant, and collective.
C. Activities
    The only activity that goes on in this space is storing anything that is needed from furniture to supplies, to smaller items.
D. Spatial Relationships
    This space should be directly adjacent to the parish hall and lobby. It should generally be easily accessible and located in the middle of things.
E. Special Considerations
    This area must not be susceptible to humidity or dampness as the items stored in this area should be kept clean and dry.
F. Equipment/Furnishings
    Shelves - 4 required, 10'H x 2'D
G. Behavioral Considerations
    The entryway must be wide enough to get large items in and out.
H. Structural Systems
    This space must be strong enough to support a heavy load and a large amount of items.
I. Mechanical/Electrical Systems
J. Site/Exterior Environment

Reception Area (adapted to Church Office)

space detail summary

A. Quantities required
   a. 10 occupants
   b. 1 unit
   c. 361 sq. ft. per unit
   d. 361 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation there are so many questions that are going to be asked and confusion that is occurring. Some sort of system of organization needs to take place. This space is where the questions can come, where the organization of the building can occur, and where things can get figured out. In an everyday church use of the building this space is for running the church as an organization and doing the day to day business usually done in an office. This space is semi-private, served, and individual.

C. Activities

   In a disaster situation the main activities occurring in this space would be organizing and identifying the people in the building, trying to stay connected to the outside world to know what is going on, and making sure things inside are running as smoothly as possible. In the everyday situation the office would be where people could come to see the clergy, to bring forth any comments or concerns, or to bring any business regarding the church. In both situations there is also an included reception area for people to sit and wait for any business they may need to do there.

D. Spatial Relationships

   This area should be located close to the entry and one of the first things you see when you enter. It should also be located close to the lobby.

E. Special Considerations

   This space should be able to open and close to the outside depending on the different conditions.

F. Equipment/Furnishings

   Chair - 10 required, 24"W x 24"D x 33"H
   File Cabinet - 4 required, 15"W x 50"H x 29"D
   Desk - 5 required, 60"W x 30"D x 26"H
   Table - 2 required, 42" x 72"

G. Behavioral Considerations

   There needs to be area at the front of this space for a small waiting area, along with more individualized spaces further back where people can work with a bit more privacy.

H. Structural Systems

I. Mechanical/Electrical Systems

   A speaker or intercom system that is used from this space would be helpful.

J. Site/Exterior Environment

   In their daily use these spaces could be relatively open to the environment. In a disaster situation, however, these rooms should be able to be tightly closed off from the outside conditions.

Individual Room (adapted to a Classroom)

space detail summary

A. Quantities required
   a. 25 occupants
   b. 2 units
   c. 332 sq. ft. per unit
   d. 664 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation the individual room would give people who need to be secluded on their own (i.e. they are sick, elderly, handicapped, dangerous, or disadvantaged in some other way) a separate area to rest or to be away from others. This space is private, served, and individual.

   In the everyday use of this space it acts as a classroom for learning about the religion or for any other outside organizations that may ask the church's permission to use it. In this usage the space is public, served, and collective.

C. Activities

   In a disaster situation this space could be used for sleeping, having some privacy, having a more private conversation, getting away from the group, or being locked up.

   In the everyday use of this space there could be learning, reading, discussions, singing, and understanding occurring.

D. Spatial Relationships

   This space should be located next to the rest of these individual area/classrooms and the clinic/library. It should also be located close to the reception area/ church office.

E. Special Considerations

   This space should be able to open and close to the outside depending on the different conditions.

F. Equipment/Furnishings

   Different types of furniture will be used in different situations and stored away when not in use.

   Cot - 5 required, 28"W x 35"H x 7'L

   Chair - 16 required, 22"W x 24"D x 31"H

   Table - 6 required, 24" x 48"

G. Behavioral Considerations

   The space should allow for small groups to gather (such as classes),while at the same time being able to exist as a semi-private space where a few people can sleep and stay together.

H. Structural Systems

I. Mechanical/Electrical Systems

   A projector and projection screen are needed for each space. Good ventilation is also required for times when these spaces will be used by people who are sleeping (in times of an emergency situation).

J. Site/Exterior Environment

   In its daily use, this space could be relatively open to the environment. In a disaster situation, however, this room should be able to be tightly closed off from the outside conditions.

Individual Room (adapted to a Private Office)

space detail summary

A. Quantities required
   a. 10 occupants
   b. 3 units
   c. 150 sq. ft. per unit
   d. 450 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation the individual room would give people who need to be secluded on their own (i.e. they are sick, elderly, handicapped, dangerous, or disadvantaged in some other way) a separate area to rest or to be away from others. This space is private, served, and individual.

   In the everyday use of this space it acts as a private office for church employees (such as clergy) that have personal conversations with their parishioners. In this way the space is private, served, and individual.

C. Activities

   In a disaster situation this space could be used for sleeping, having some privacy, having a more private conversation, getting away from the group, or being locked up.

   In the everyday use of this space there could be private conversations, talking, reading, studying, writing, praying, and working.

D. Spatial Relationships

   This space should be located next to the rest of these private offices. It should also be located adjacent to the reception area/church office.

E. Special Considerations

   This space should be able to open and close to the outside depending on the different conditions.

F. Equipment/Furnishings

   Different types of furniture will be used in different situations and stored away when not in use.

   Cot - 2 required, 28"W x 35"H x 7'L
   Chair - 3 required, 22"W x 24"D x 31"H
   Bookshelf - 1 required, 42"W x 13"D x 13"H
   Desk - 1 required, 60"W x 30"D x 26"H

G. Behavioral Considerations
H. Structural Systems
I. Mechanical/Electrical Systems
J. Site/Exterior Environment

   In its daily use this space could be relatively open to the environment. In a disaster situation, however, this room should be able to be tightly closed off from the outside conditions.

Individual Room (adapted to a Mother's Room)

space detail summary

A. Quantities required
   a. 12 occupants
   b. 1 units
   c. 210 sq. ft. per unit
   d. 210 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation this room would give people who need to be secluded on their own or in a smaller group of people (i.e. they are sick, elderly, handicapped, dangerous, or disadvantaged in some other way) a separate area to rest or to be away from others. This space is private, served, and individual.

   In everyday use this space would be used as a place where mothers can take their babies or young children if they are crying or being loud during a service. This space is public (although some privacy with partitions put up), served, and collective (although individual needs are being taken care of here).

C. Activities

   In a disaster situation this space could be used for sleeping, having some privacy, having a more private conversation, getting away from the group, or being locked up.

   In an everyday church use this space might consist of babies crying, mothers soothing their children, babies sleeping, and parents watching over their kids.

D. Spatial Relationships

   This area should be adjacent to the community space/narthex and have direct vision to the sleeping area/nave. It should also be located near the nursery.

E. Special Considerations

   This space should be warm and bright. It should also be insulated from the sound coming in or out.

F. Equipment/Furnishings

   Different types of furniture will be used in different situations and stored away when not in use.

   Cot - 5 required, 28"W x 35"H x 7'L

   Chairs (folding) - 9 required, 22"W x 24"D x 31"H

   Baby Changing Table - 3'W x 1'6"D

   Toys

G. Behavioral Considerations

   This space must also be arranged so that in everyday use one side is visually open to the nave.

H. Structural Systems

I. Mechanical/Electrical Systems

   Ventilation is required. A sound system is also needed in this space for when in everyday church use.

J. Site/Exterior Environment

   This space can be connected to the external environment, but should be able to be closed up tight in an emergency situation.

Nursery

space detail summary

A. Quantities required
   a. 25 occupants
   b. 1 units
   c. 350 sq. ft. per unit
   d. 350 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation the nursery would still be used as a place where children can play and be watched over by their parents and others in charge. This area will allow the children to feel some sense of normality where they otherwise might not. This space is served, public, and collective.

   In everyday use this space would be used as a place where parents can take their younger children to play while they participate in the church service. This spcae could also serve as a place for youth education at other times. This space is public, served, and collective (although individual needs are being taken care of here).

C. Activities

   In a disaster situation this space could be used for a place where children can play and be watched over safely.

   In an everyday church use this space might consist of children playing, adults watching over the children, babies napping, conversations occurring, young children being taught.

D. Spatial Relationships

   This area should be adjacent to the community space/narthex. It should also be located in close proximity to the mothers room and the bathrooms.

E. Special Considerations

   This space should be warm and bright. It should also be insulated from the sound coming in or out. It should also have a relatively open feeling to it so children aren't afraid to stay and can easily be watched over by adults.

F. Equipment/Furnishings

   Table (child-sized) - 4 required, 15" x15" x 15"
   Chair (child-sized) - 16 required, 10"H x 10"D x 15"H
   Shelves - 6 required, 60"L x 24"D x 12"H
   Toys

G. Behavioral Considerations

   This space must be designed so it is open and the children inside are easily observed.

H. Structural Systems

I. Mechanical/Electrical Systems

   Ventilation is required. A sound system is also needed in this space for when in everyday church use.

J. Site/Exterior Environment

   In its daily use this space should be directly adjacent to an exterior play area so that the functions inside could spill outside. In a disaster situation, however, this room should be able to be tightly closed off from the outside conditions.

Sacristy

space detail summary

A. Quantities required
    a. 0 occupants
    b. 1 units
    c. 147 sq. ft. per unit
    d. 147 sq. ft. of net area
B. Purposes/Functions
    In the everyday use of this space it acts as a place to store religious items. This space is private, servant, and individual. This space would serve the same function of storage in a disaster situation.
C. Activities
    In the everyday use of this space there would mainly be storage of vessels, the blessing, and religious dressing. In a disaster situation there would still be items stored in this area, although the range of what is stored could be much vaster.
D. Spatial Relationships
    This space should be located adjacent to the community space/narthex and in close proximity to the sleeping area/nave
E. Special Considerations
    This area must not be susceptible to humidity or dampness as food and other items stored here need to be kept dry.
F. Equipment/Furnishings
    Different types of furniture will be used in different situations and stored away when not in use.
    Shelves - 6 required, 10'H x 2'W, all around room
G. Behavioral Considerations
    The items stored in the room must be able to be stored away so that if this room needs to be used for a different function it can easily be changed.
H. Structural Systems
I. Mechanical/Electrical Systems
    A sound sytem is required.
J. Site/Exterior Environment

Gathering Area (adapted to a Sanctuary)

space detail summary

A. Quantities required
   a. 25 occupants
   b. 1 unit
   c. 1265 sq. ft. per unit
   d. 1265 sq. ft. of net area

B. Purposes/Functions

   In a disaster situation this space could serve as a flexible space for whatever is needed in the situation. It could have many uses depending on what is needed for the situation (including prayer).

   In the everyday use of this space it serves as a central stage for religious activities and worship. In either case, the space is public, served, and collective.

C. Activities

   In a disaster situation this space could be used as an open space for gathering, talking, praying, or just being together. Any number of activities could occur in the space.

   In the everyday situation the space could again be used for a number activities including preaching, baptizing, singing, and worshiping.

D. Spatial Relationships

   This space should be directly adjacent to the sleeping area/nave. It should also be within close proximity to the projection room and sacristy. A relationship to the storage area might also come in handy in an emergency situation.

E. Special Considerations

   The light in this space should be bright enough to see, but diffused to create a sense of peacefulness or holiness.

F. Equipment/Furnishings

   Lectern - 1 required, 3'3"H x 1.5'W x 1'D
   Altar table - 1 required, 8'L x 3'3"H x 3'W
   Chair - 3 required, 32"W x 31"D x 29"H
   Pews (movable) - 6 required, 3'D x 3'H x 15'L
   Baptismal font - 1 required, 2'1"W x 2'1"D x 3'H

G. Behavioral Considerations

   The space should be designed to be acoustically correct.

H. Structural Systems

   The space should be open with no supports coming down through it.

I. Mechanical/Electrical Systems

   A sound system is required in this space. A projection system might also be helpful.

J. Site/Exterior Environment

   In its daily use the space should be aware of its environment, but that should not be the main focus of the space. The environment should be affecting the space subtly. In a disaster situation, however, this space should be able to be tightly closed off from the outside conditions altogether.

Projection Booth

space detail summary

A. Quantities required
    a. 2 occupants
    b. 1 unit
    c. 41 sq. ft. per unit
    d. 41 sq. ft. of net area
B. Purposes/Functions
    The space functions as the location of the sound system and projector, which are both needed for the church services. This space is individual, private, and servant.
C. Activities
    The activities that occur in this space are setting up equipment, checking equipment, running a projection, and running music or videos.
D. Spatial Relationships
    This space should be adjacent to the sleeping area/nave. It should be opposite the sanctuary so the projections will be able to be seen.
E. Special Considerations
    This area should be kept dry and cool so the equipment stored in the room stays in good condition.
F. Equipment/Furnishings
    Chair - 2 required, 22"W x 24"D x 31"H
    Work surface - 1 required, 60"W x 30"D x 26"H
    Shelves - 2 required, 10'H x 2'D
G. Behavioral Considerations
    There must be an opening toward the nave and sanctuary that is high enough for people to not block when walking by so that the projection can be projected.
H. Structural Systems
I. Mechanical/Electrical Systems
    A sound system should be able to be controlled in this space.
J. Site/Exterior Environment

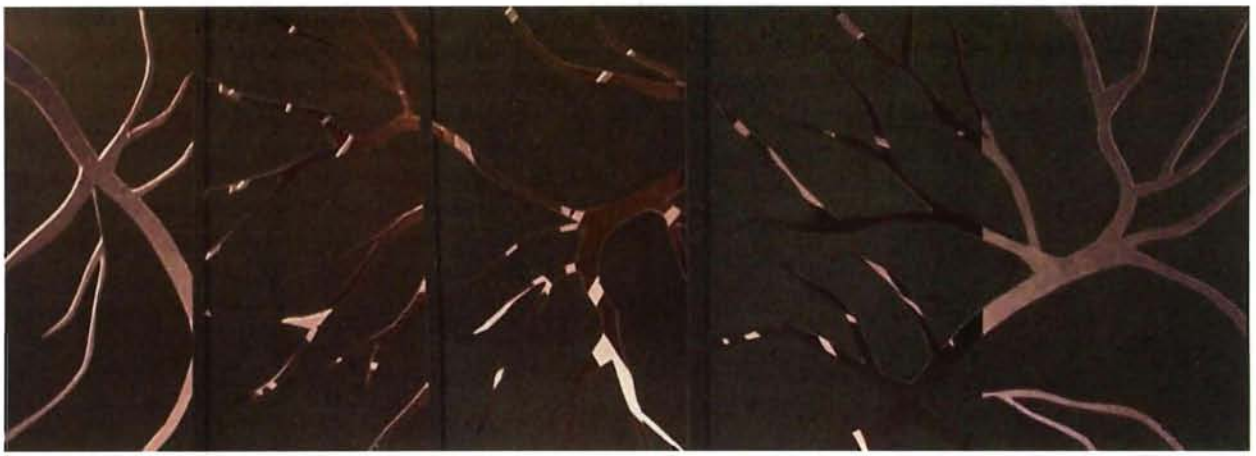
Mechanical Room

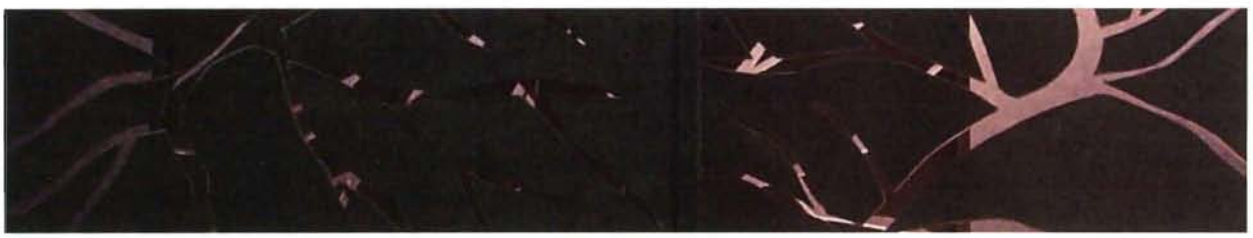
space detail summary

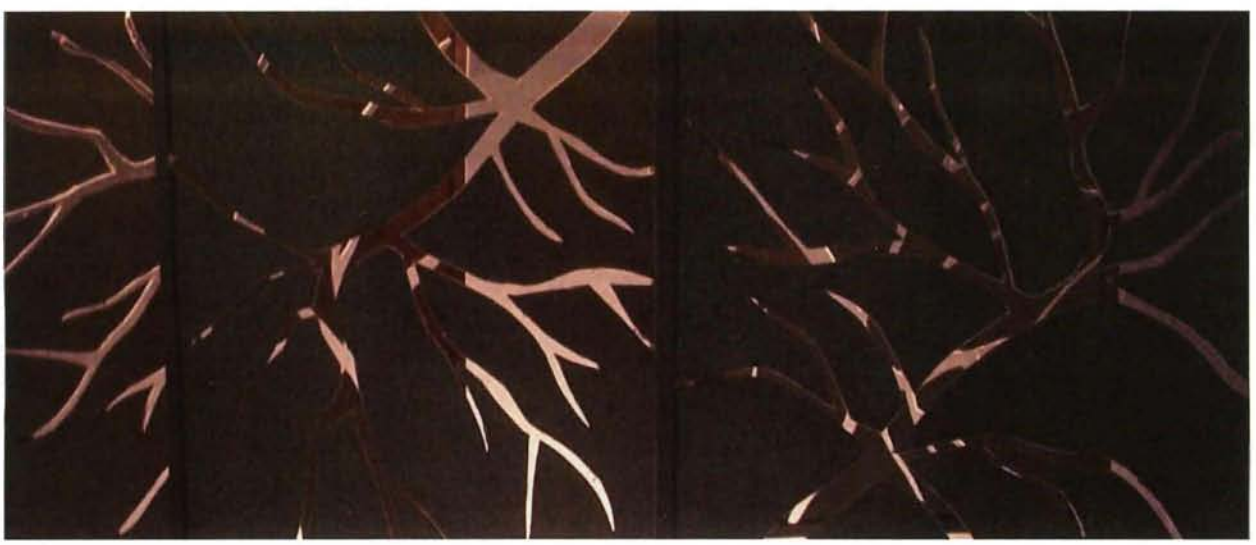
A. Quantities required
    a. 0 occupants
    b. 3 unit
    c. 364 sq. ft. per unit
    d. 1092 sq. ft. of net area
B. Purposes/Functions
    These spaces house all the mechanical units and equipment. They are private, servant, and individual spaces.
C. Activities
    The activities that occur in these spacse all deal with the equipment in them. Fixing equipment, uninstalling old equipment, and installing new equipment all could occur here.
D. Spatial Relationships
    These spaces should be away from a lot of activity that is occurring in the church. One mechancial room should be located in each of the three seperate buildings.
E. Special Considerations
    This area should be kept dry and cool since there is equipment in the space.
F. Equipment/Furnishings
    Air handling unit - 1 required
    Chiller - 1 required
    Boiler - 1 required
    HVAC equipment - 1 required
    Electrical generator - 2 required
    Water Heater - 1 required
G. Behavioral Considerations
    There must be enough room left around the equipment so that if someone needs to fix it or replace it they have enough room to do so.
H. Structural Systems
I. Mechanical/Electrical Systems
J. Site/Exterior Environment

springboard

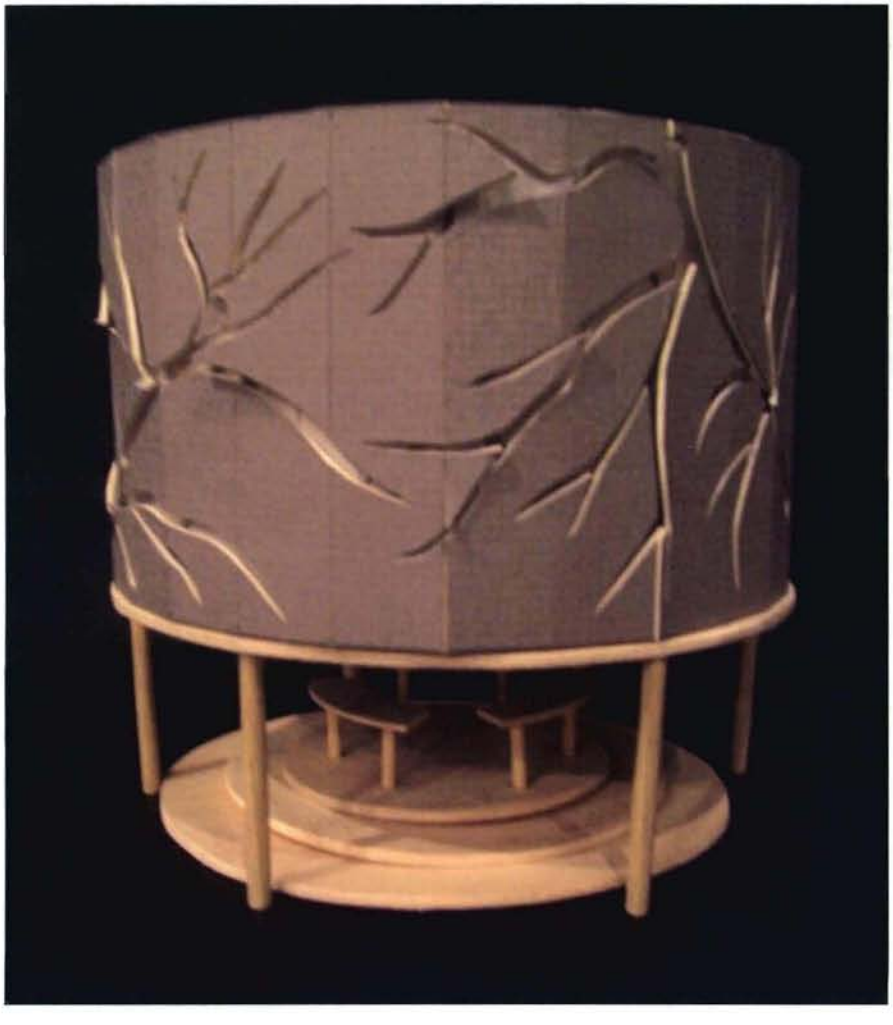
During this stage of development, the ideas in the thesis began to be translated into architectural statements. First a number of studies were done which looked at the individual elements of light, wind, and water and how these elements could be noticed and appreciated by occupants of a space. The results of those studies were photographed and then translated into a design for a series of pavilions. Looking at light, wind, and water, these pavilions created spaces in which the individual environmental condition that was explored in the initial studies could be appreciated by the users. After that set of pavilions, two other pavilions were created that addressed the conditions of wind and water from their most intense circumstance. From there a number of sketches and collages were done looking at how these conditions could be achieved architecturally. Each space within the program was looked at individually to determine what kind of characteristics it should have relating to the outside environment. The relationship to the ground also became important in this step of the process and many sketches were done looking at this connection. From there materiality became important since this was a way through which many of these internal conditions could be achieved and/or affected by the environment. Wall sections were developed that translated some of these external conditions into the desired internal conditions. Sections of the entire building began to be developed combining the required interior characteristics of each area, the required wall section for that condition, and the appropriate relationship of that space to the ground. Created for the final schematic design review were a number of interior perspectives showing various internal conditions, a floor plan showing the interior conditions of each individual space, and sections to help explain the design proposal.

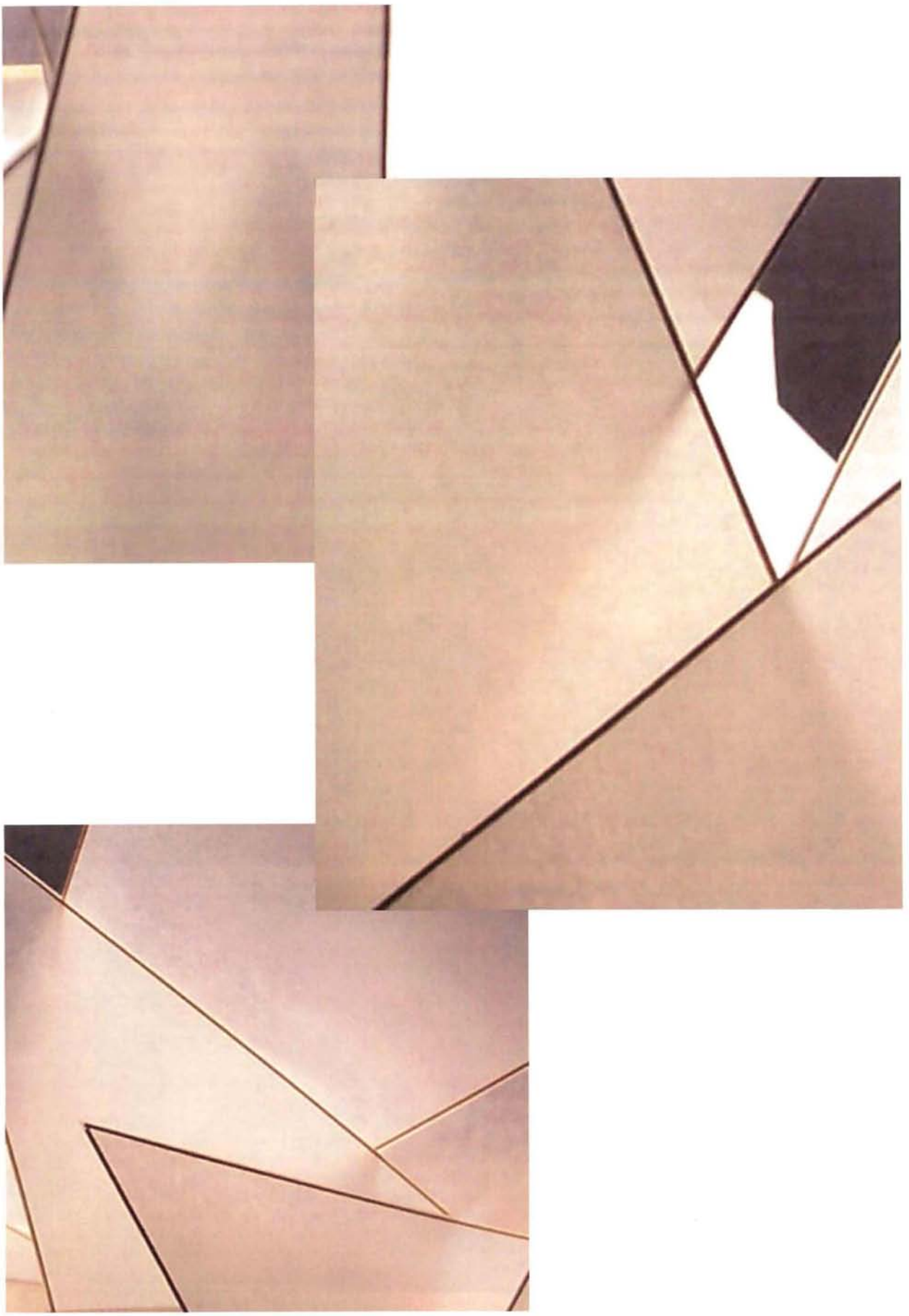


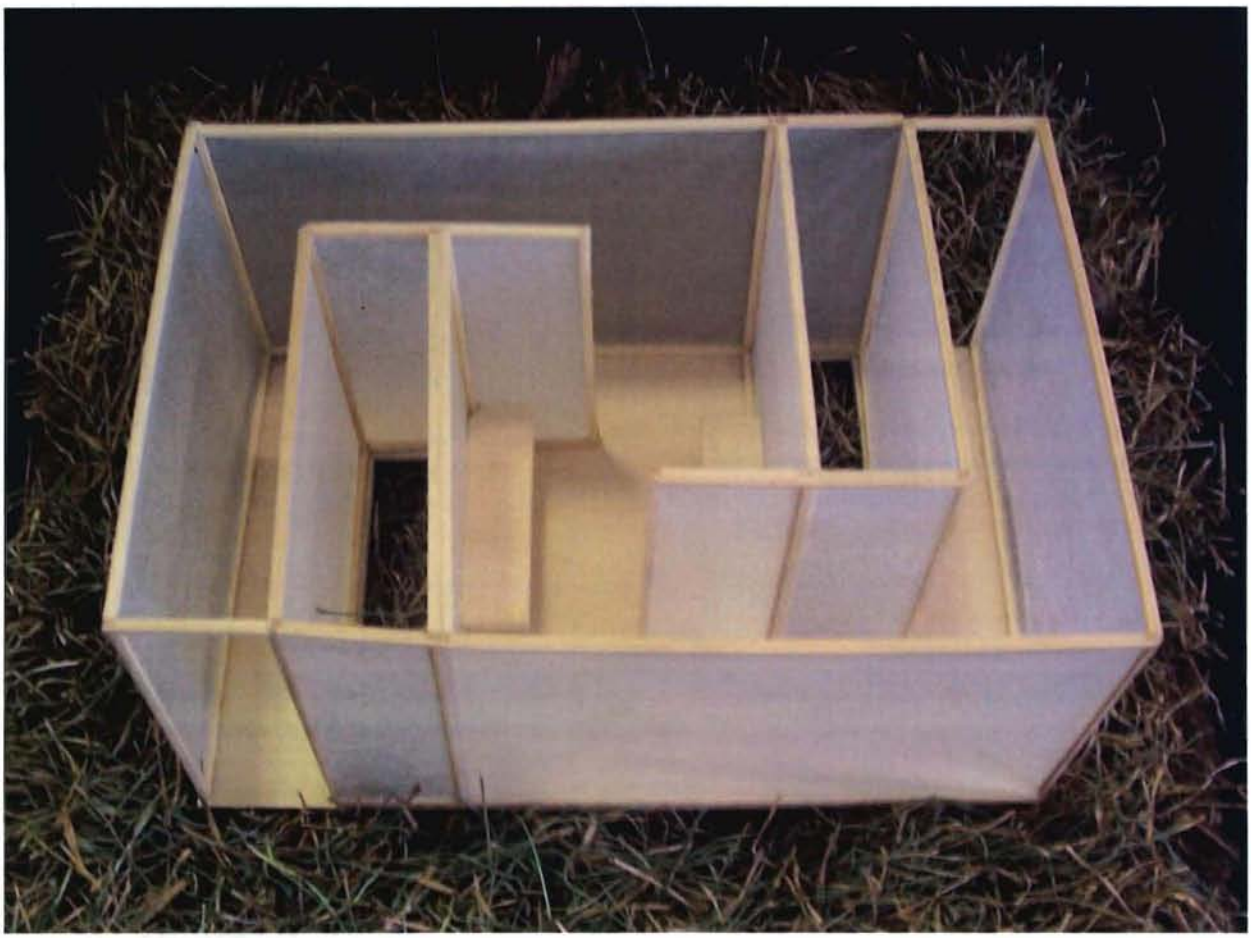


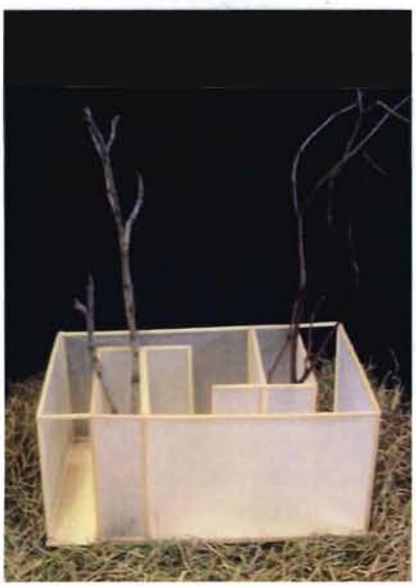


This first study focused on the effect of light filtering through a screen. First I created an object that allowed only a certain amount of light to shine through (shown in the top left photo) and took pictures of the effect it produced (shown on the previous page). Based on those pictures I then created a pavilion that could achieve that desired effect (the first version shown in the right top and bottom and the final version shown to the bottom left).

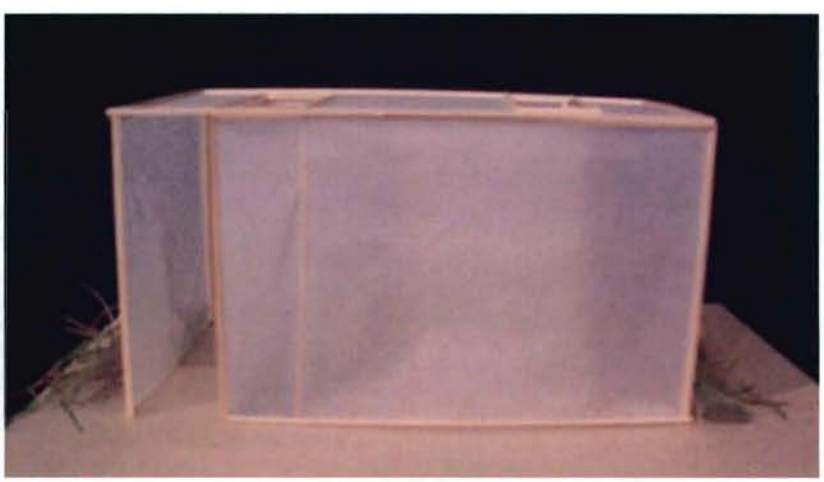


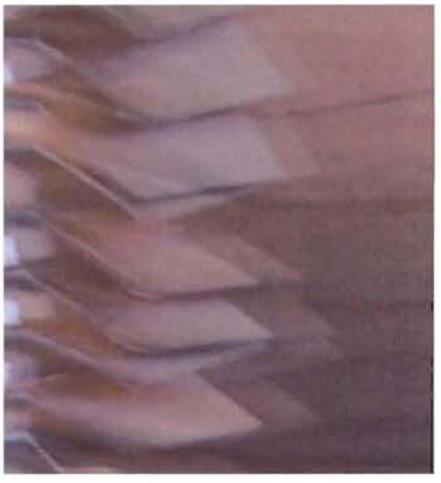


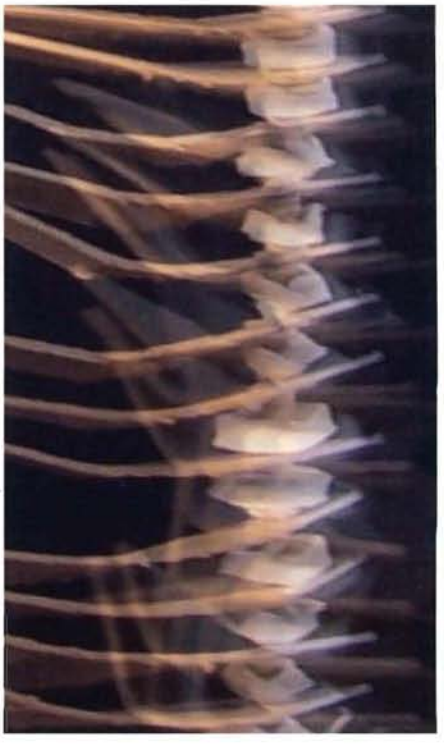


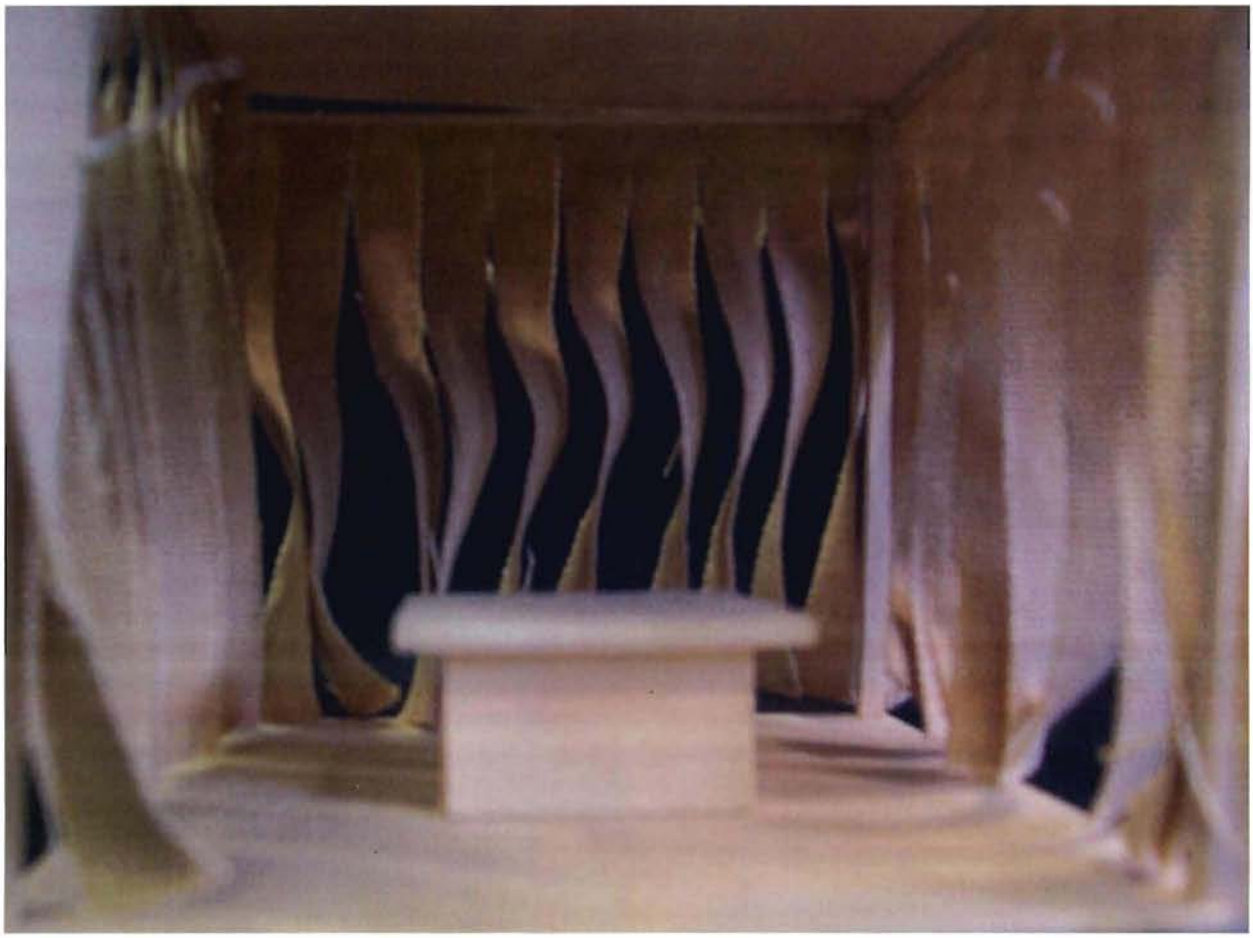


This study was a second light study, this time looking at various transparencies and the effects of light transmitted through translucent materials. Here an object was created (bottom left) through which light was transmitted and pictures of the desired light qualities were taken (shown on the previous page). From those pictures a pavilion was created which contained spaces demonstrating that quality of light (final version shown to the left and above).

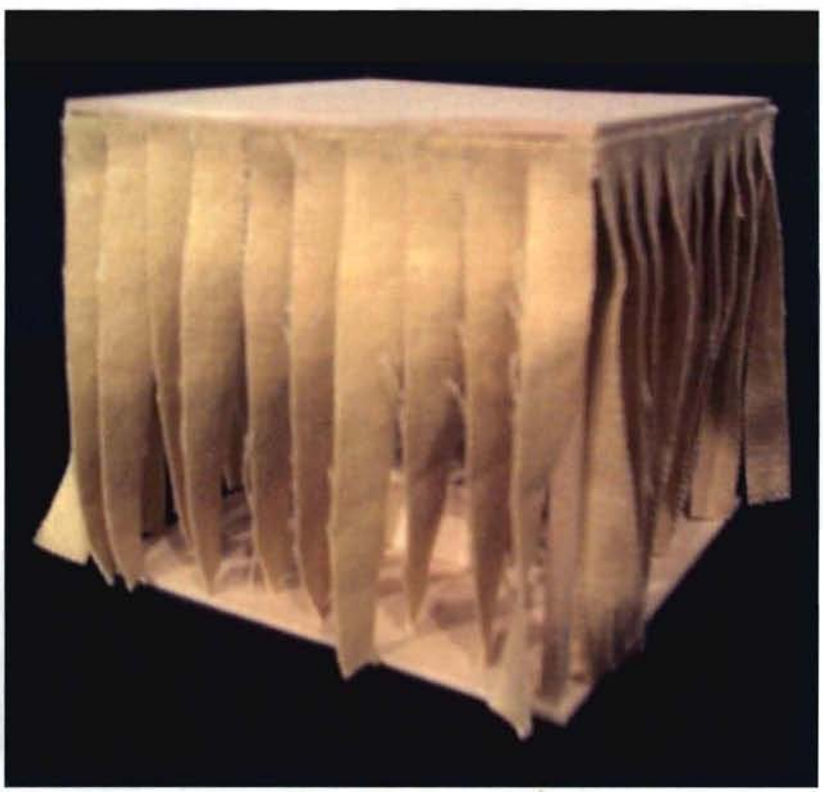


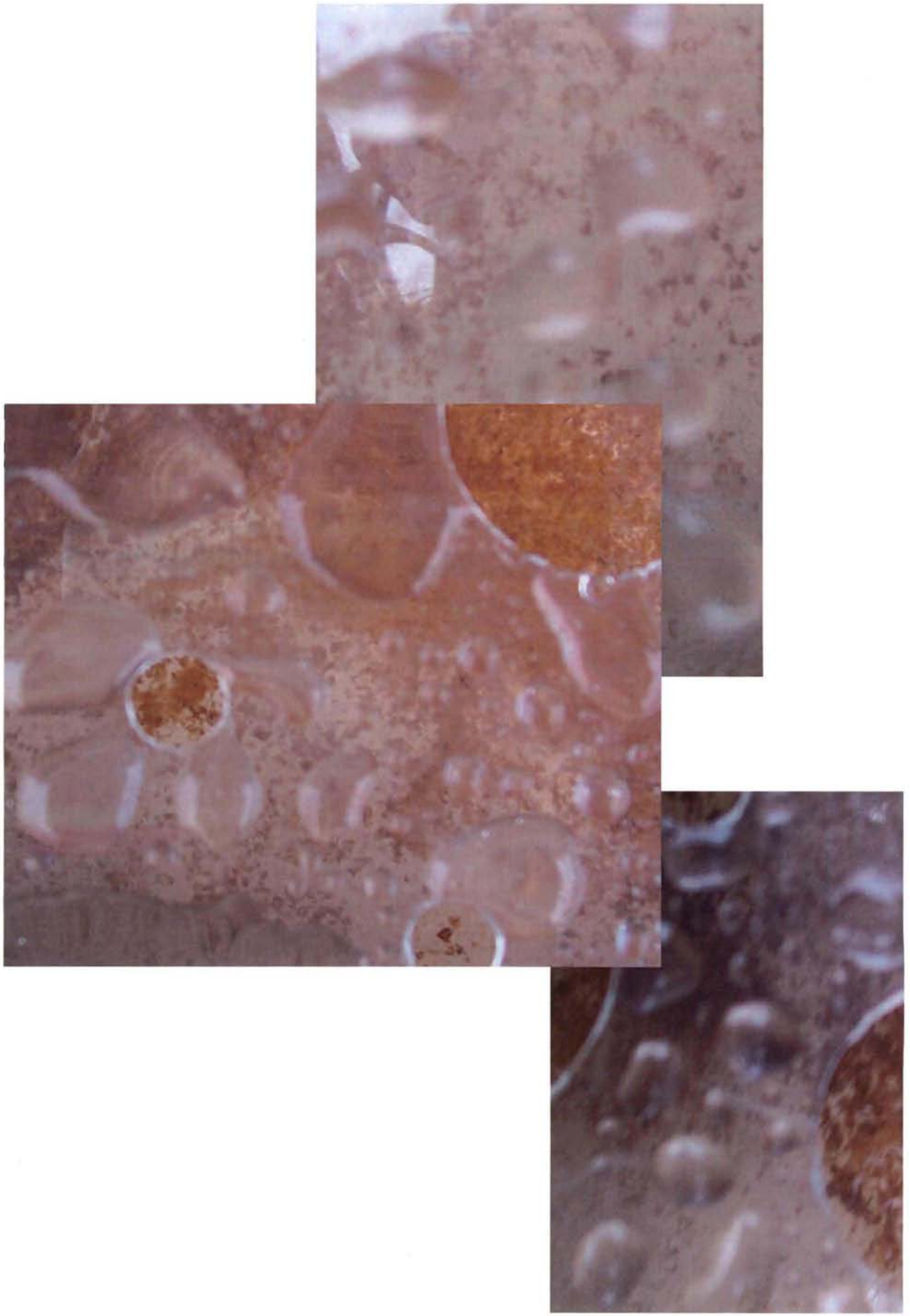


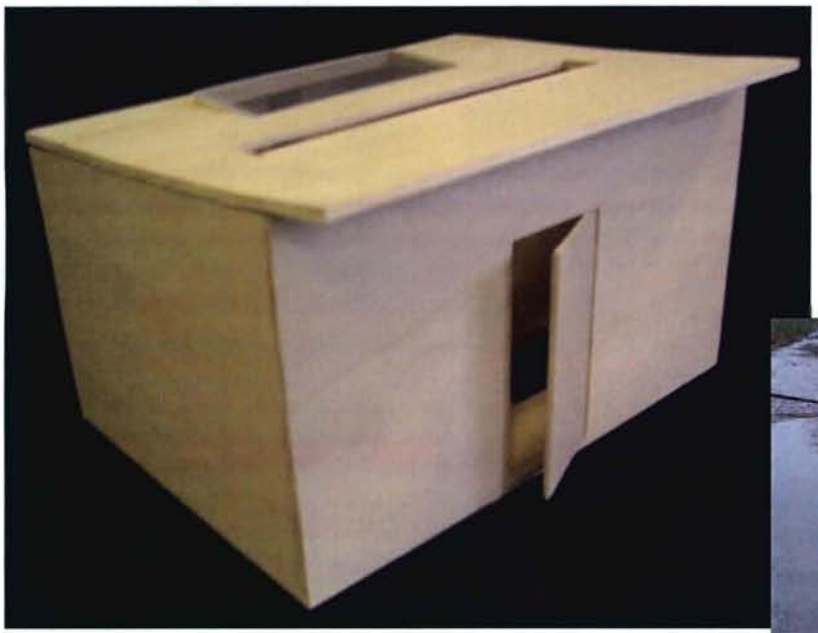




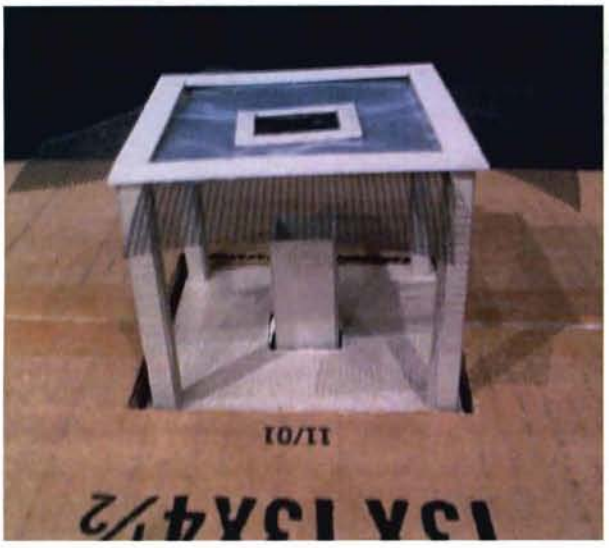
This study investigated the architectural qualities that could be achieved based on the desirable qualities of the wind. An object was created that moved with the wind and was then photographed (shown on the previous page). A pavilion was designed based on those photographs that highlighted the unique characteristics of the wind (the final version shown to the right and above).





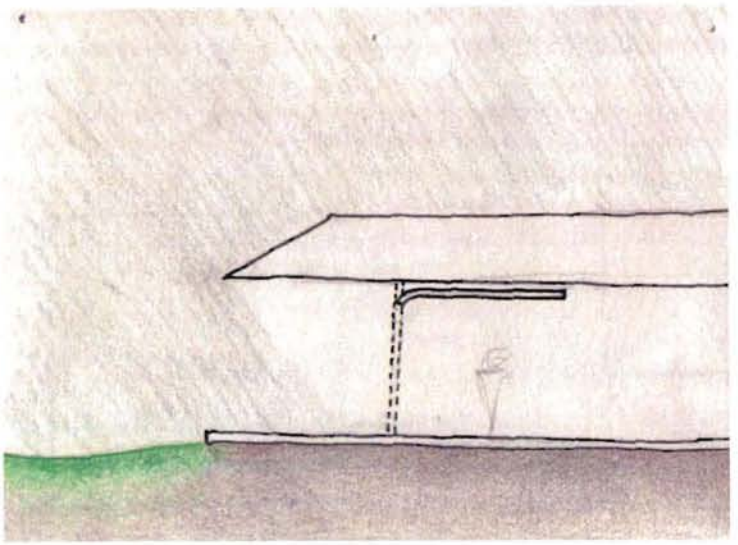


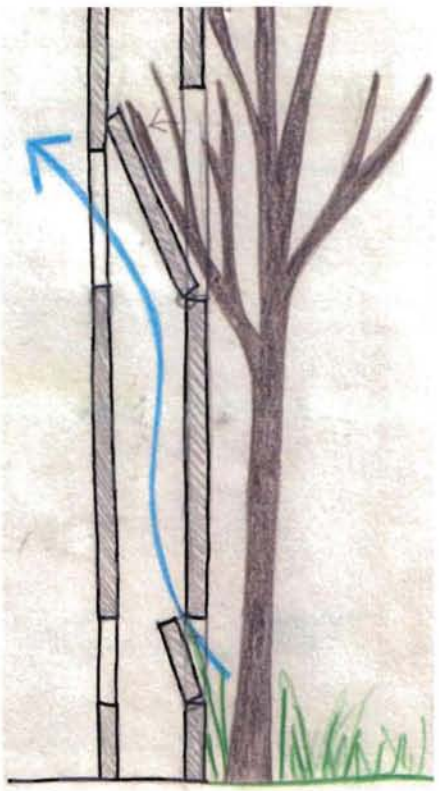
This study looked at the various conditions that could be created by examining the desirable qualities of the rain. An object was created to study the rain (above right) and was photographed as it interacted with the rain (photos on previous page). From there a pavilion was created that highlighted the various ways in which rain and water could be used to enhance the interior environment for an occupant (shown above left and below).



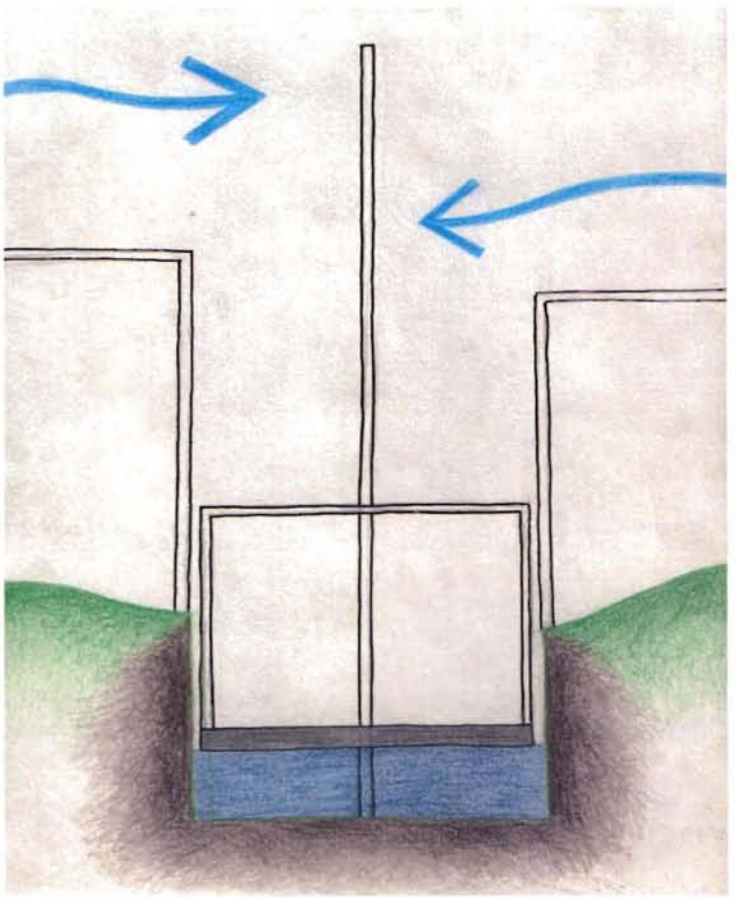
The above model is a pavilion designed for wind, but wind to the extreme degree. In an everyday calm condition of slight wind the pavilion would be above ground and open for people to use (shown in top left photo). At the occurrance of high winds, as would occur in a hurricane or tornado, the pavilion is able to be closed up and pulled below ground so the occupants could be protected (shown in the top right photo).

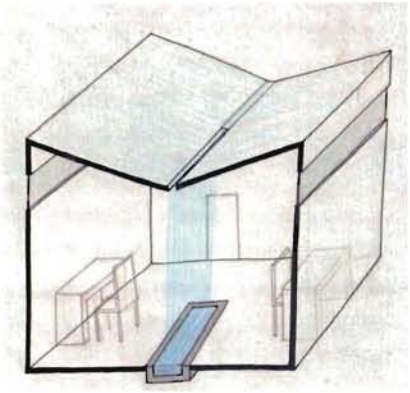
The pictures below show a pavilion that is designed for another extreme set of conditions-flooding and high winds. As the flood waters rise the occupants can climb higher and higher up the platform as they watch the water rise up the ramps. There are movable blinds around the exterior that can be positioned so that the occupants are protected from the wind no matter what direction it is coming from.

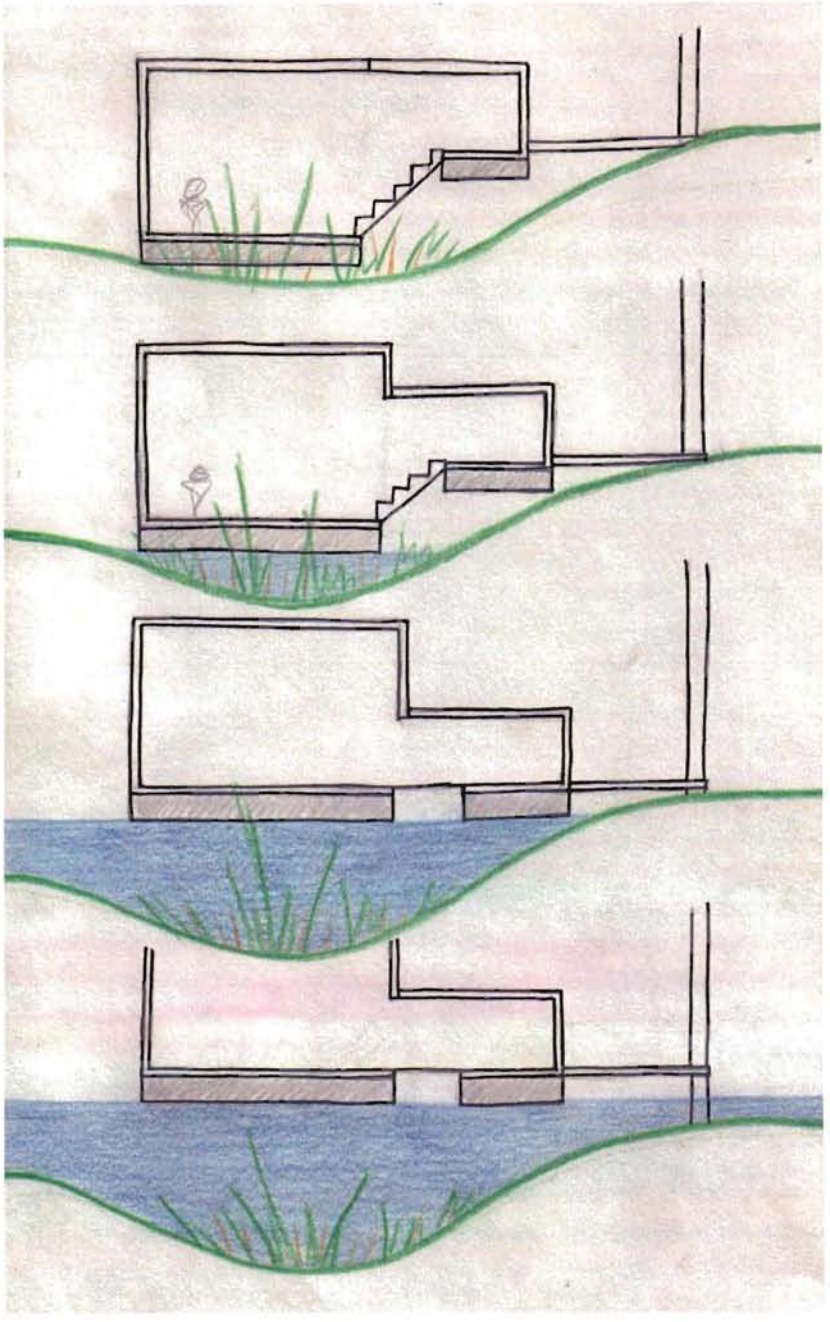


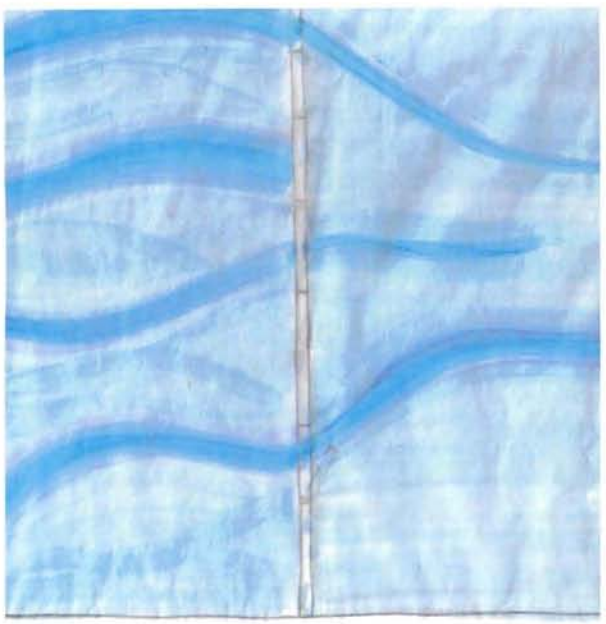


After the pavilion studies a number of small sketches were done that showed ideas about how a larger building could achieve some of those same qualities of space that had been worked with in the pavilions (shown here and on the following page). The focus of these sketches was more on the direct ideas of the thesis, such as adaptability and flexibility.



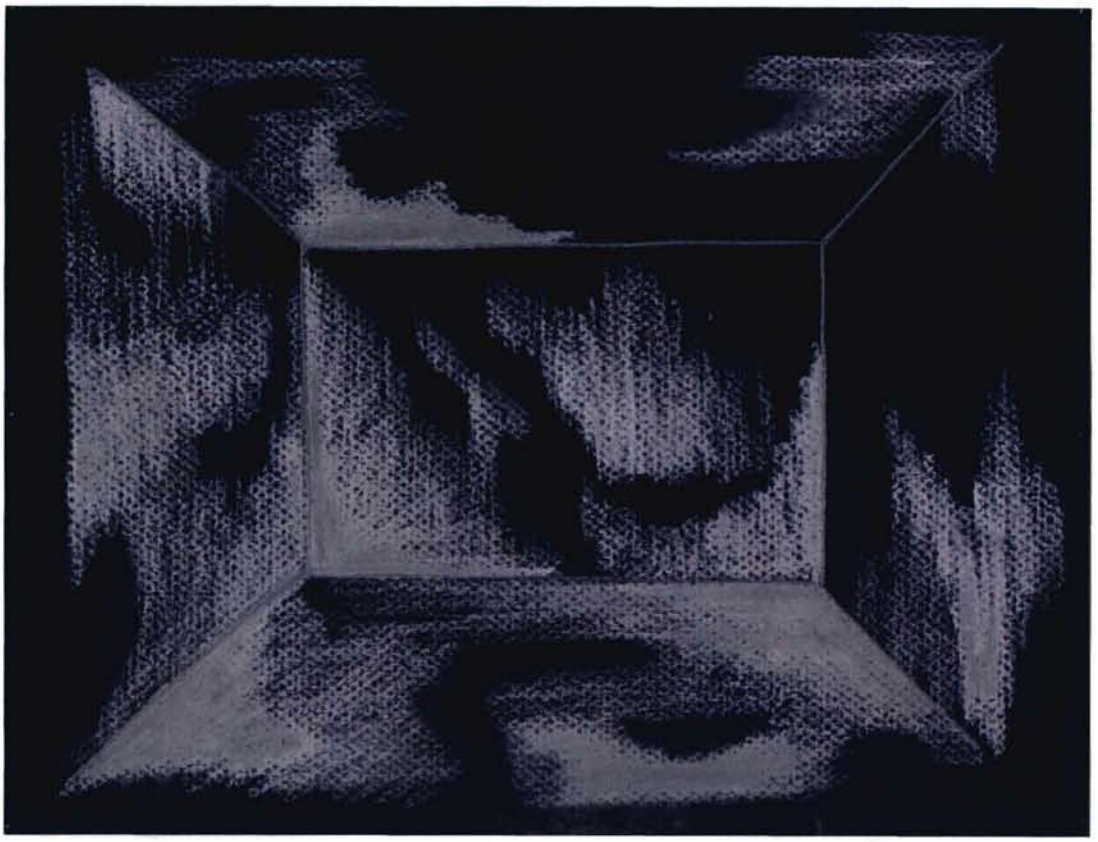




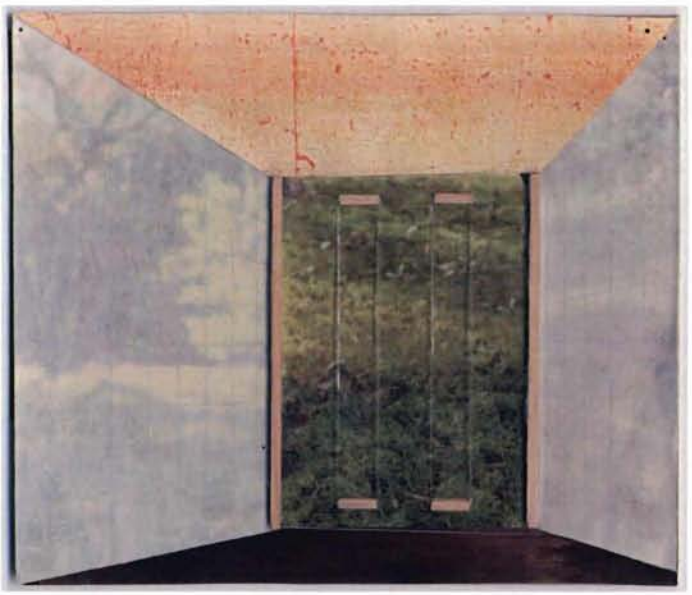


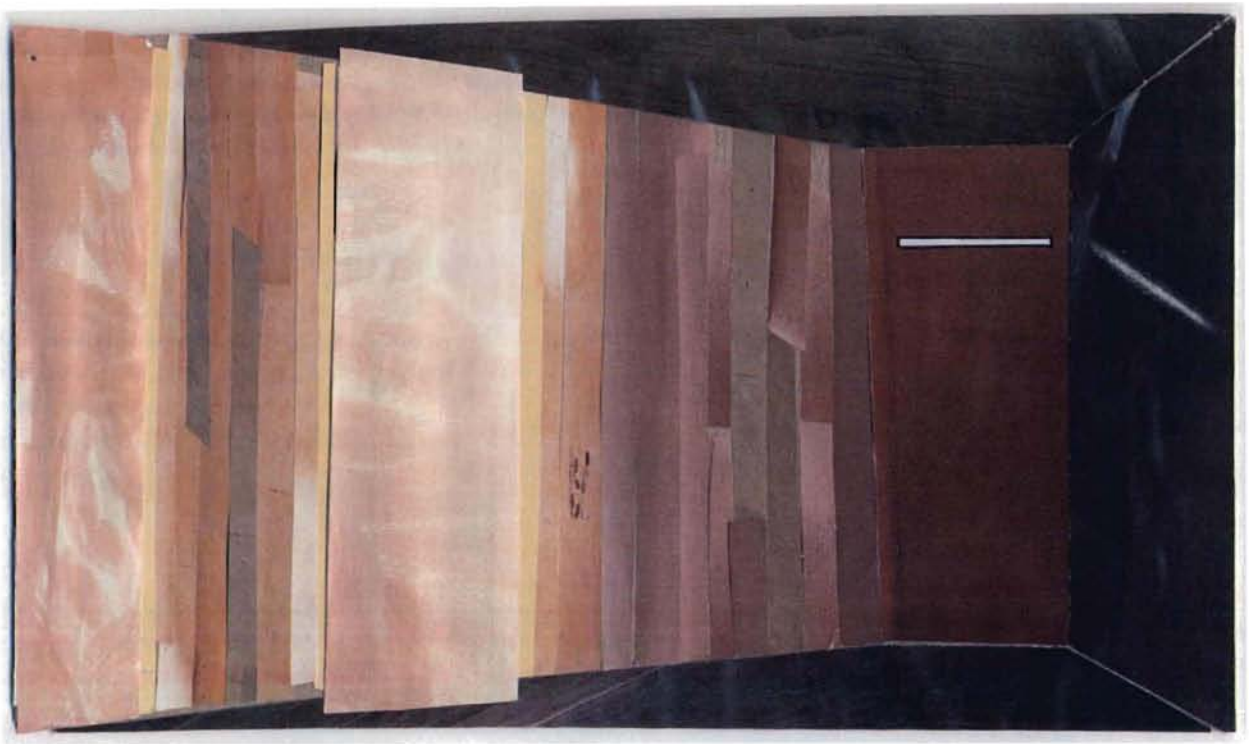
Some marker drawings (shown above) were created looking at the various ways in which wind and sun could pass through a wall (whether it is by filter, direct opening, indirect opening, translucent material, or something else).

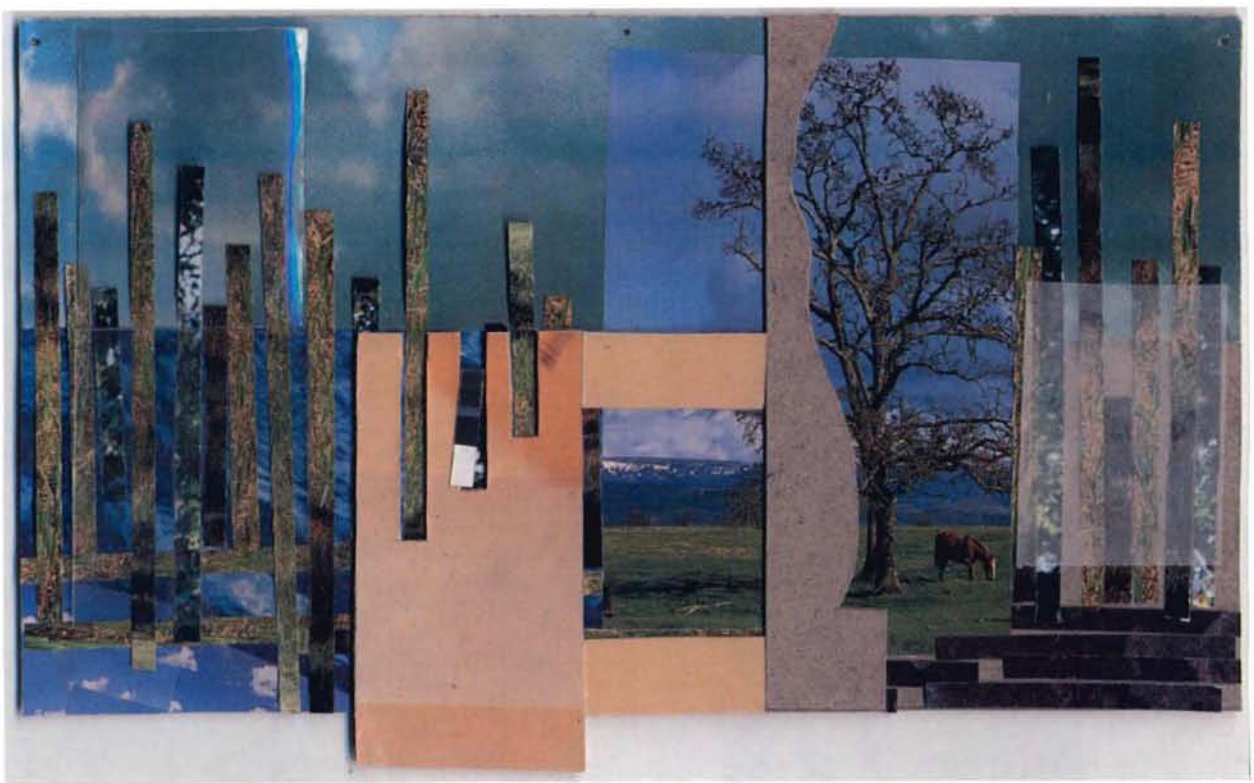
Another drawing (shown below) looked at the area within a space and how within the same area there could be different qualities and degrees of light along with different qualities and degrees of darkness.

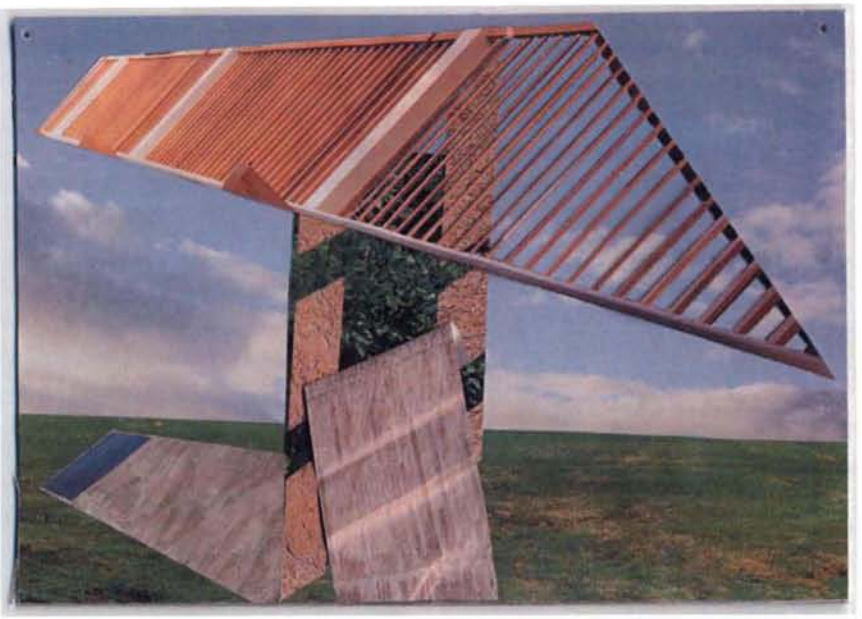


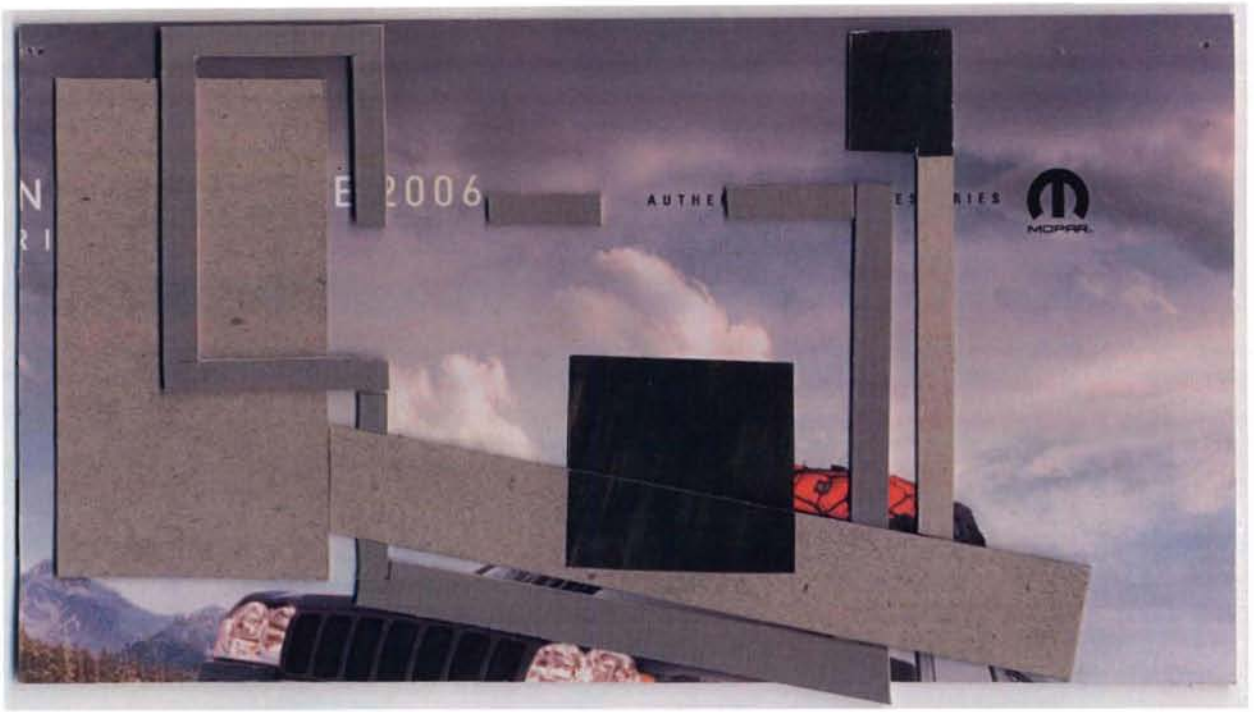
Along with sketches a series of collages (shown here and on the following pages) where created that looked at different ways of relating the external environment to the interior. They showed various ways of having the interior adapt to the changes in the external environment.

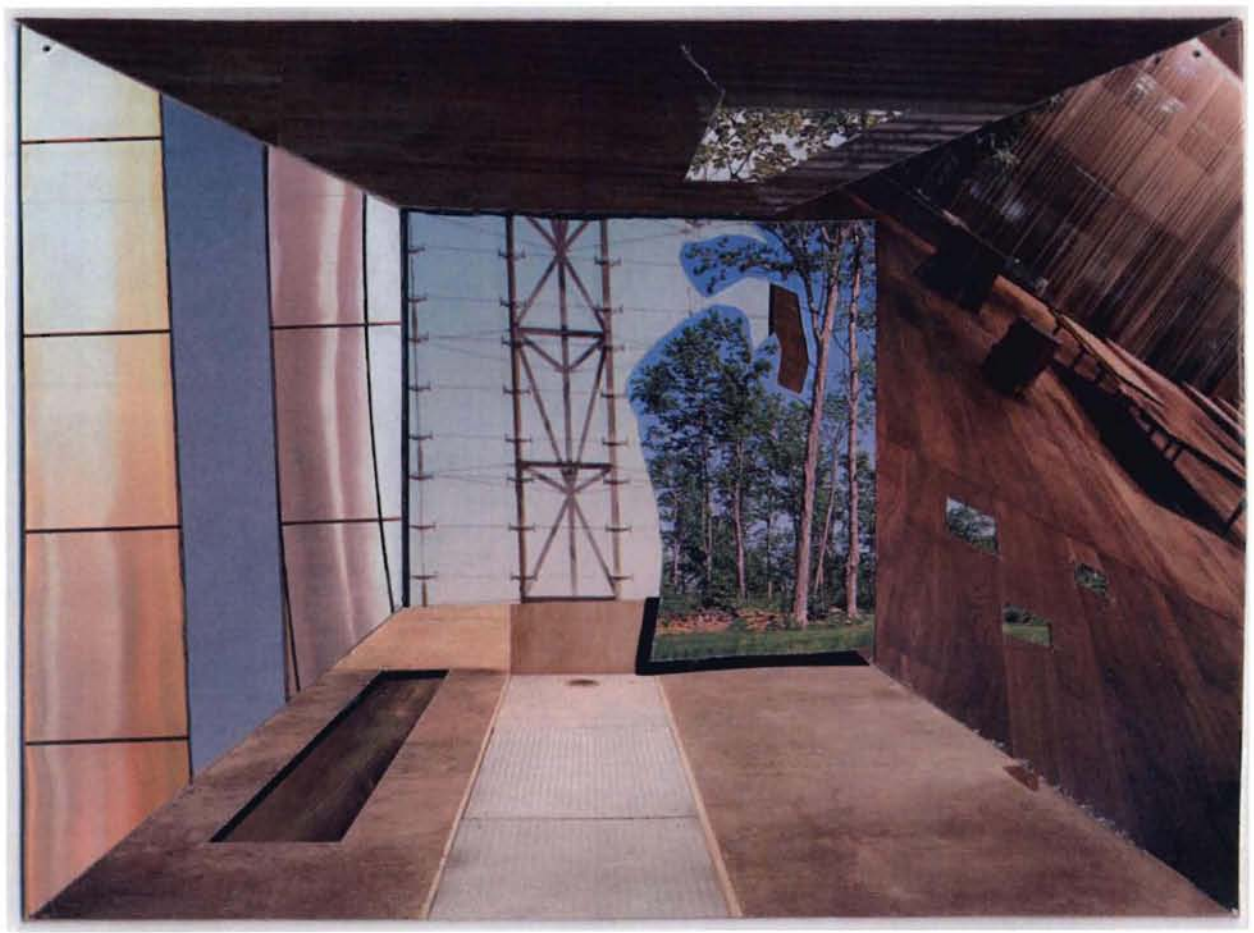


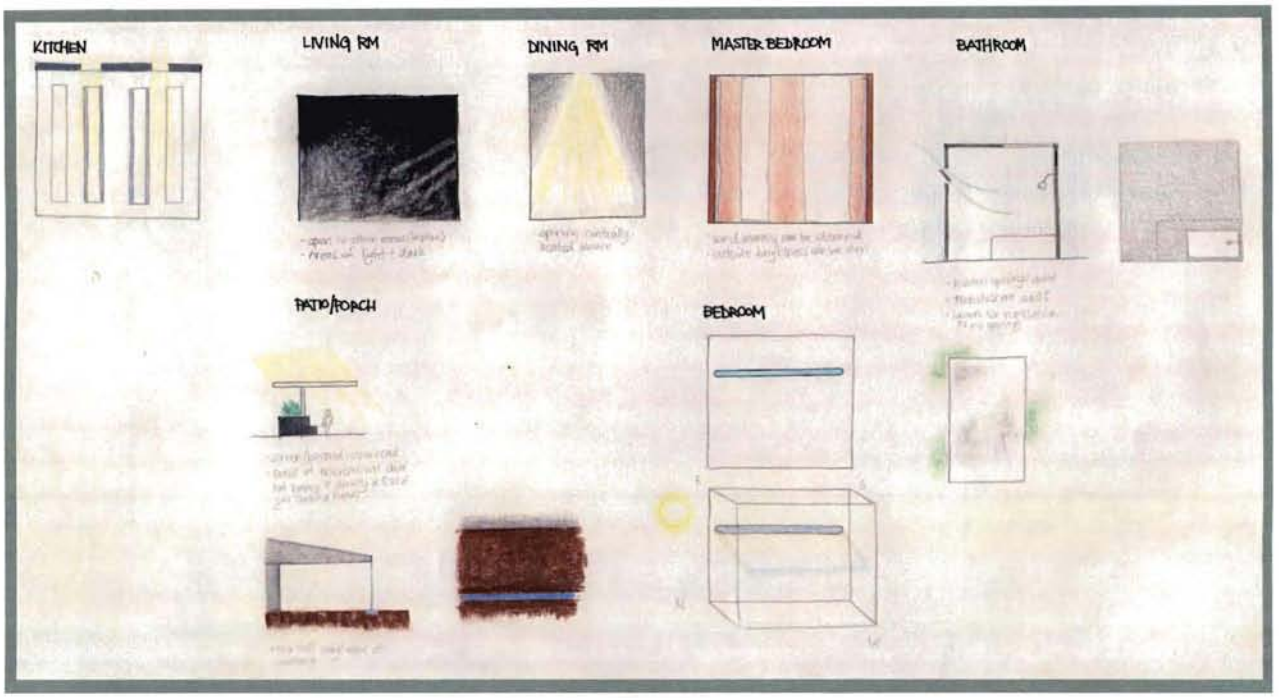




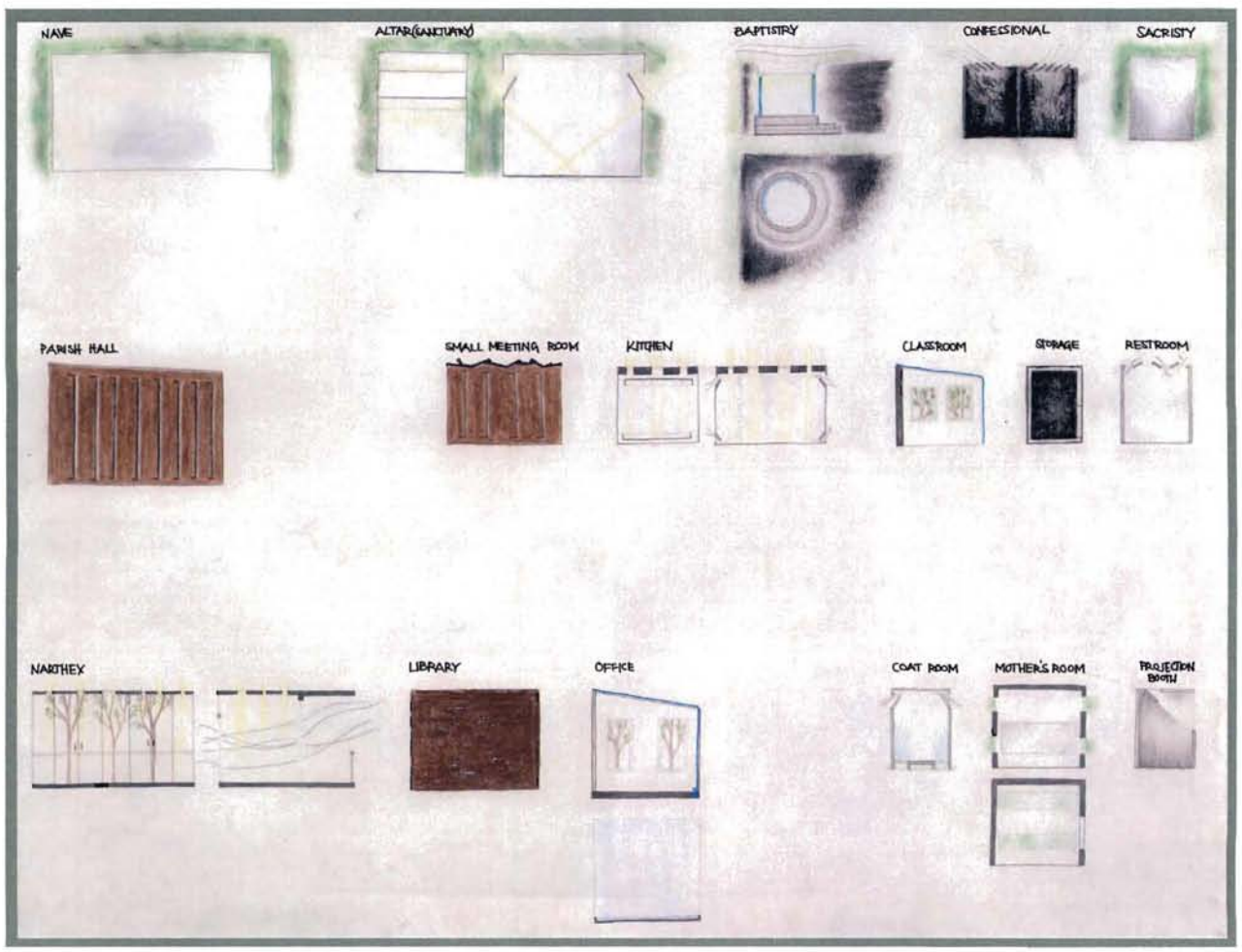


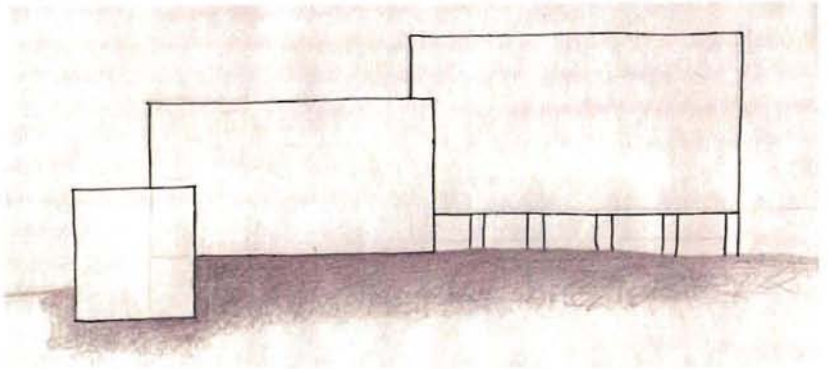

2006
MOPAR

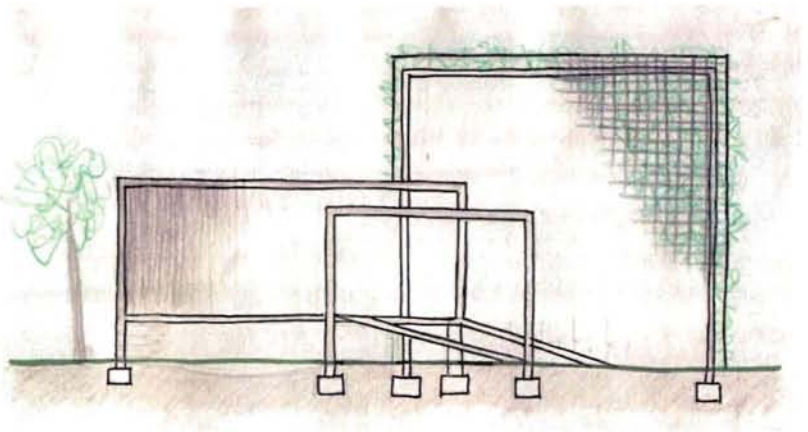




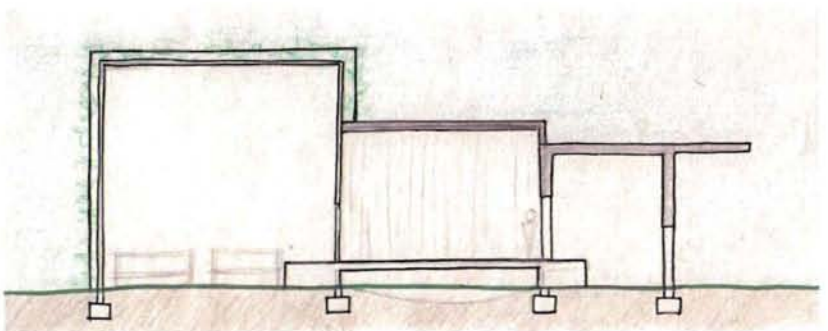
These two sets of small sketches show the development of light, wind, water, and view characteristics of each of the interior spaces. The spaces were looked at individually and based on the requirements of each space its individual interior quality was determined.

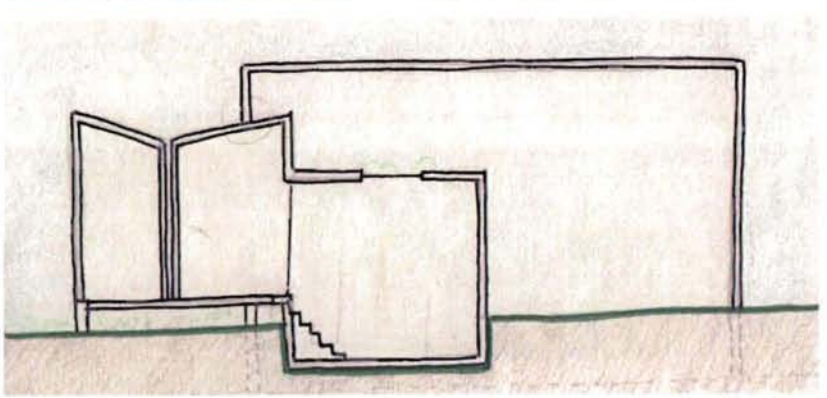


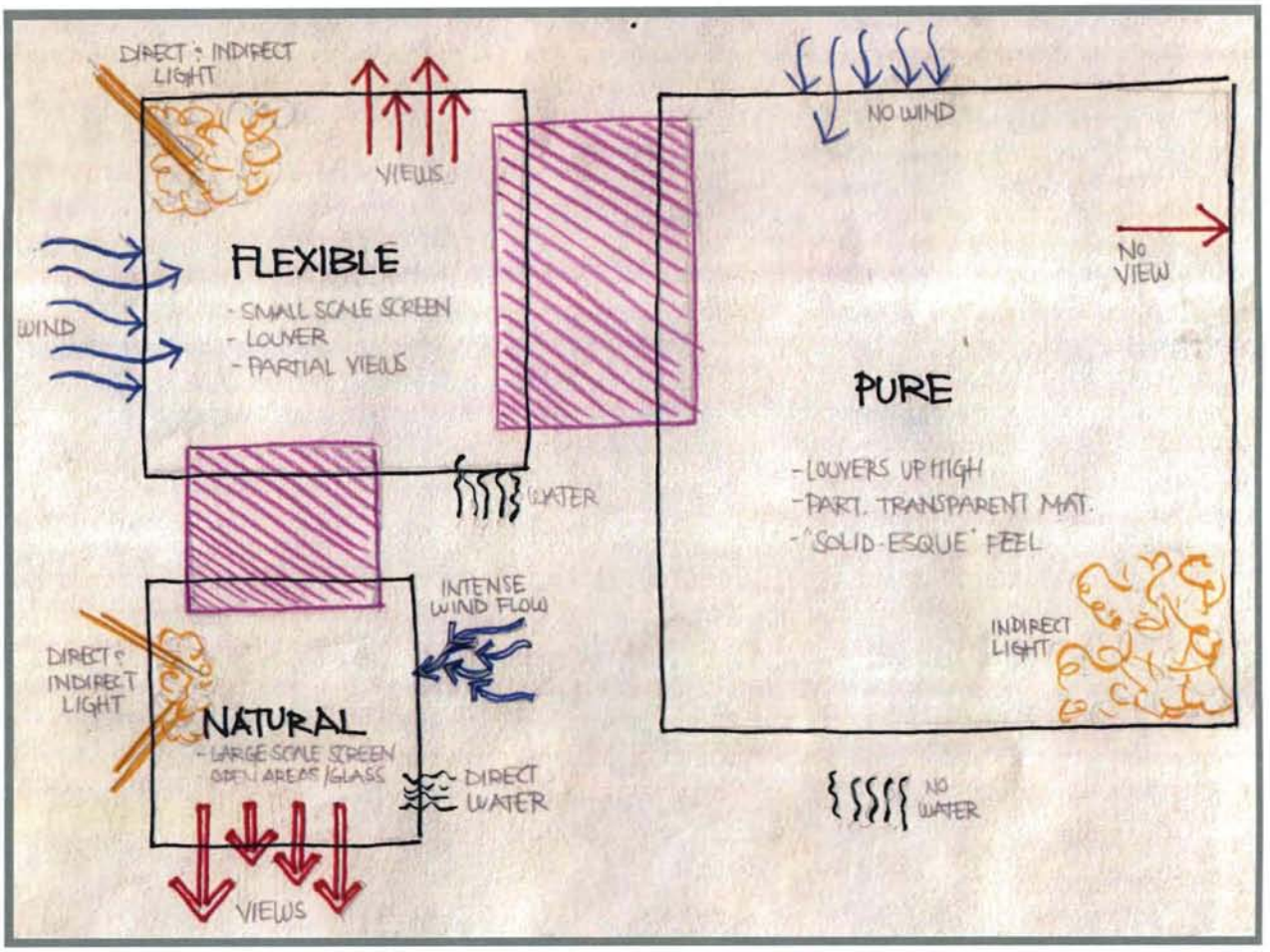


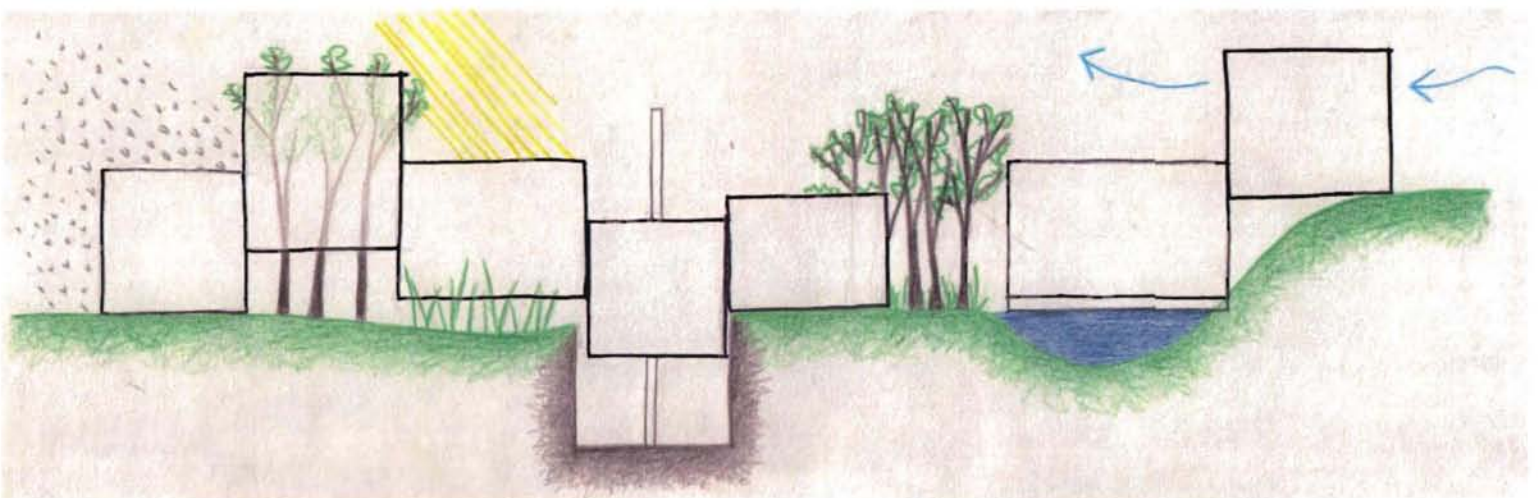


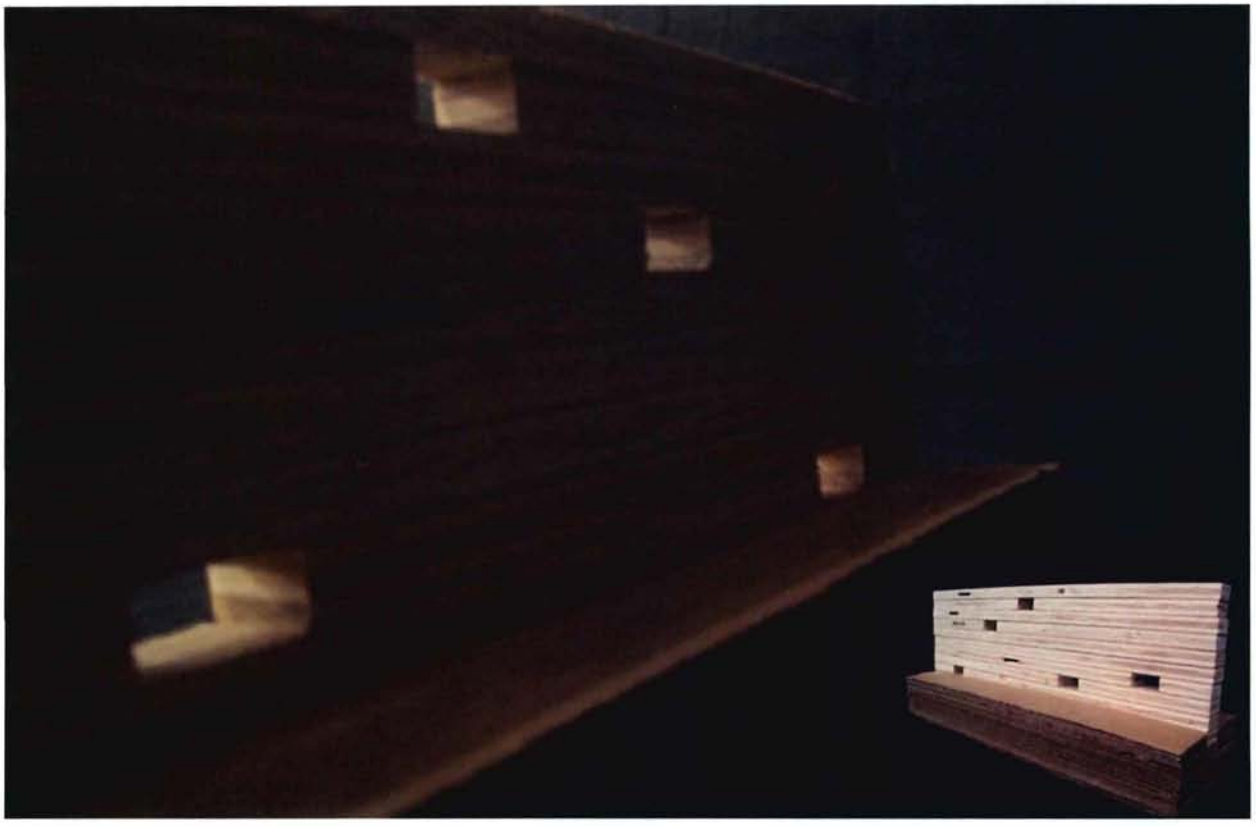
Looking at the building as a whole with the different parts being put together was the next step in this process. Each part's relationship to the ground and to the other parts of the building was studied (shown here and on the next page).



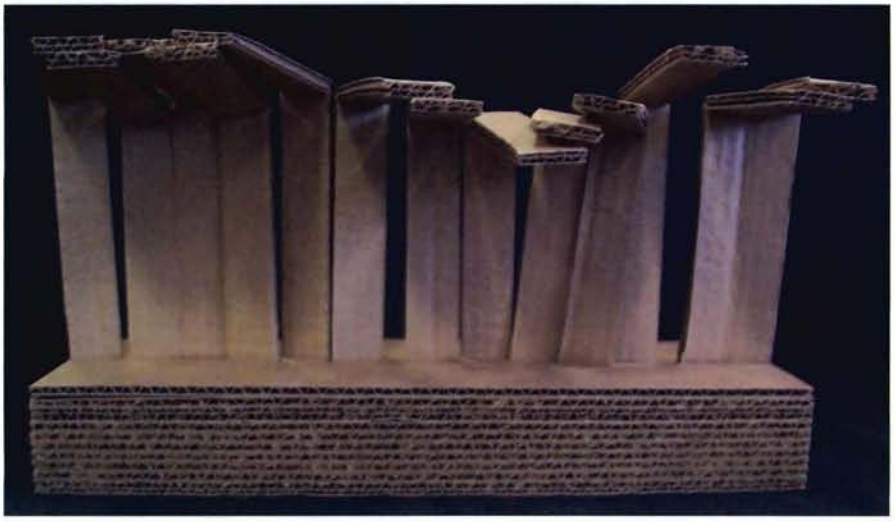


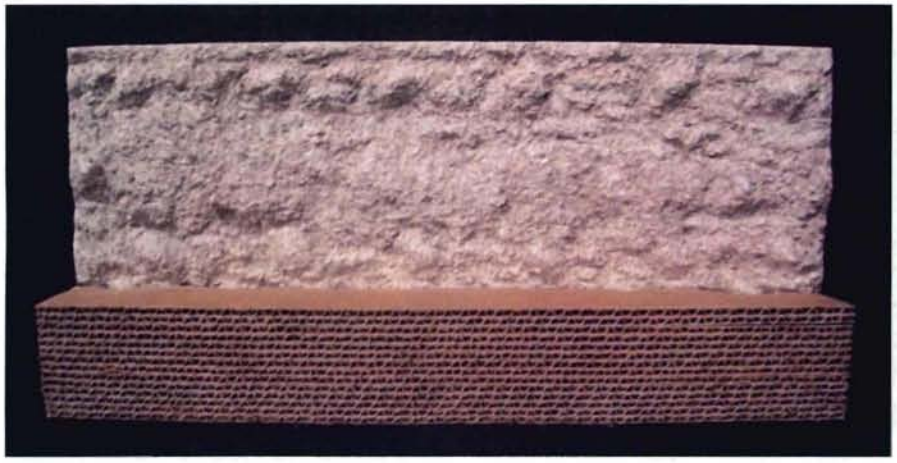

DIRECT + INDIRECT LIGHT
VIEWS
FLEXIBLE
- SMALL SCALE SCREEN
- LOUVER
- PARTIAL VIEWS
WIND
WATER
INTENSE WIND FLOW
DIRECT + INDIRECT LIGHT
NATURAL
- LARGE SCALE SCREEN
OPEN AREAS / GLASS
DIRECT WATER
VIEWS
NO WIND
NO VIEW
PURE
- LOUVERS UP HIGH
- PART. TRANSPARENT MAT.
- "SOLID-ESQUE" FEEL
INDIRECT LIGHT
NO WATER

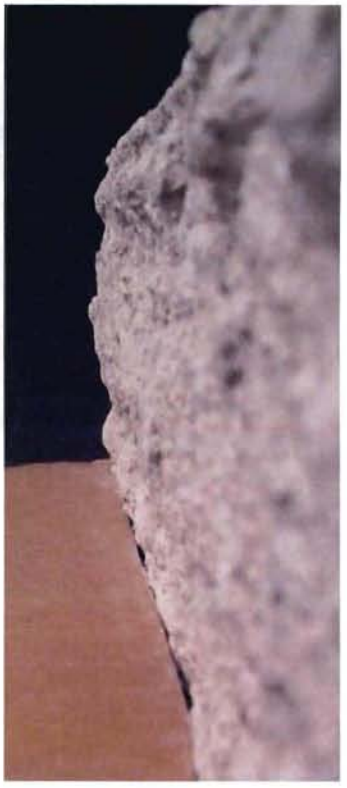




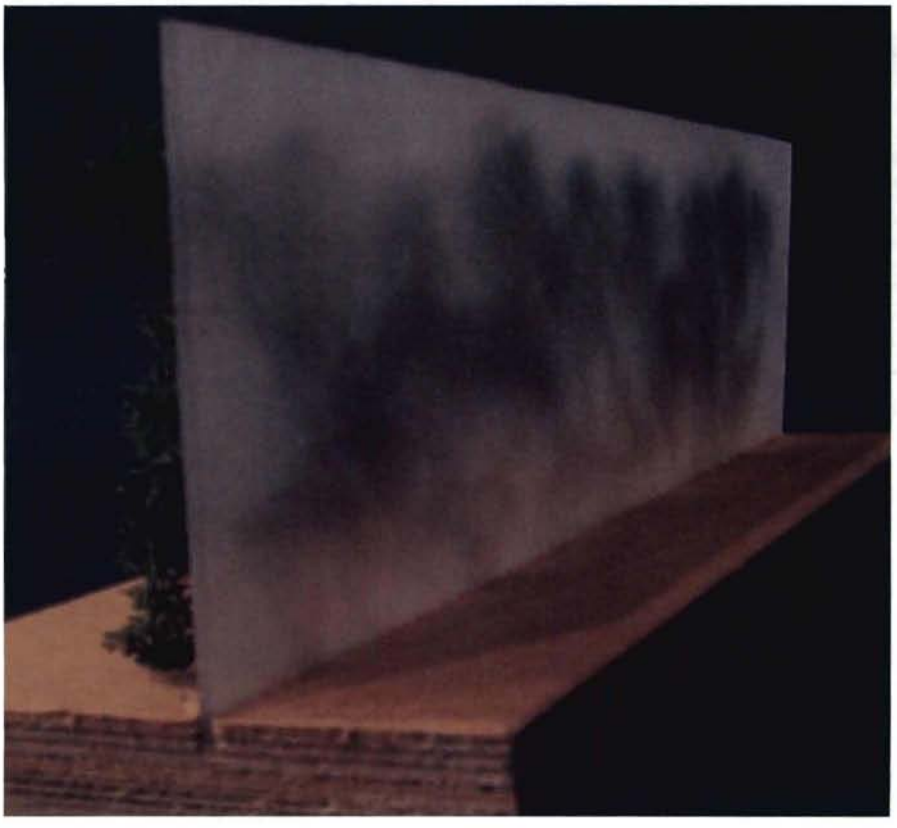
Wall sections became important to the thesis in how the exterior environmental conditions would be translated into the interior spaces. One wall section (shown above) used a stacking effect which created small specific views out that would allow the user to see the slight changes in the external environment throughout time. Another wall section (shown below and on the next page) would allow the user to see out with partial views and would be flexible enough so that the user could change the amount open as desired.

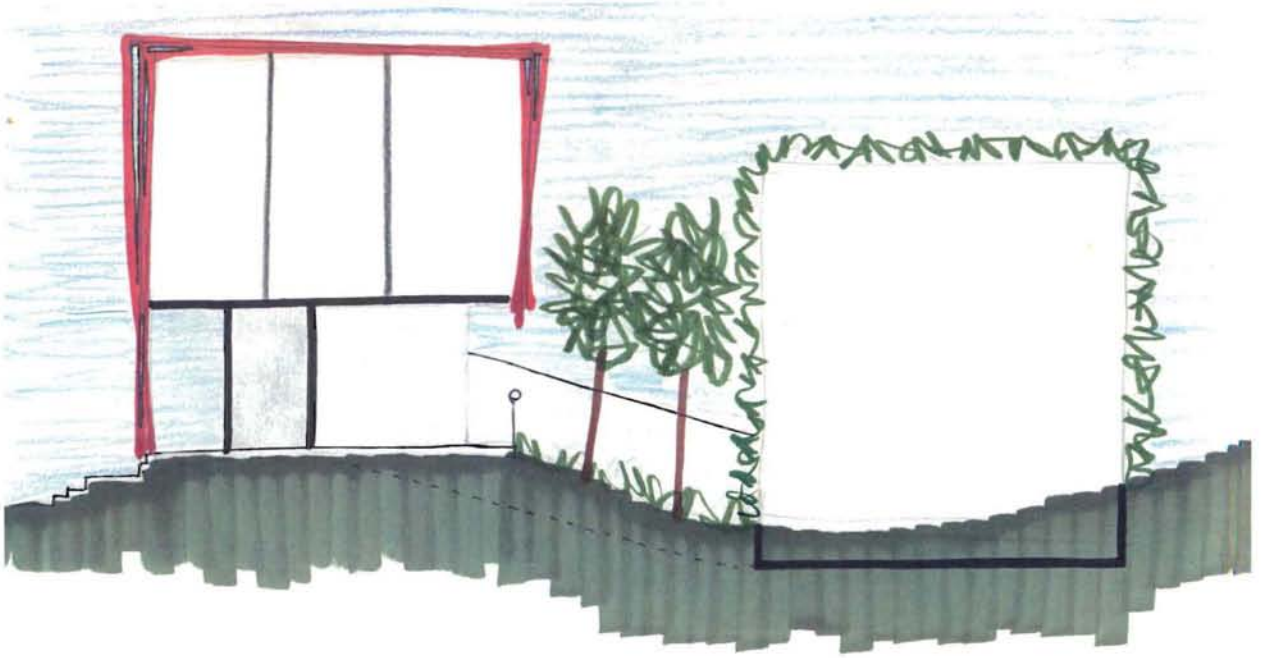


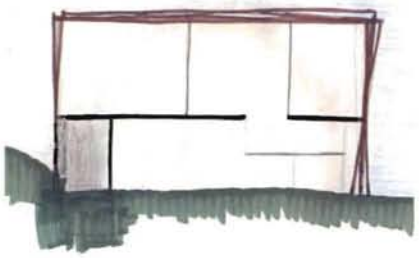




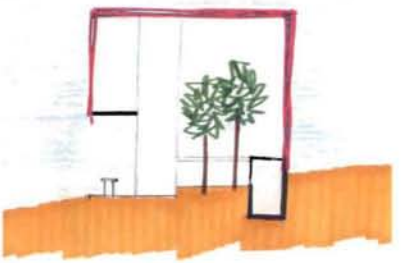
The wall section shown above was created with an irregular surface so that as the sun moved over it throughout the day different shadows would form and change within the irregularities. The wall section shown below consists of a layer of frosted glass with another layer on the exterior made up of screen and vegetation. The idea with this is that the vegetaion could grow and cling to the screen, pushing up in certain places against the glass. From the inside an occupant would be able to see different shades of dark and light, although they wouldn't be able to totally see what is creating the effect.

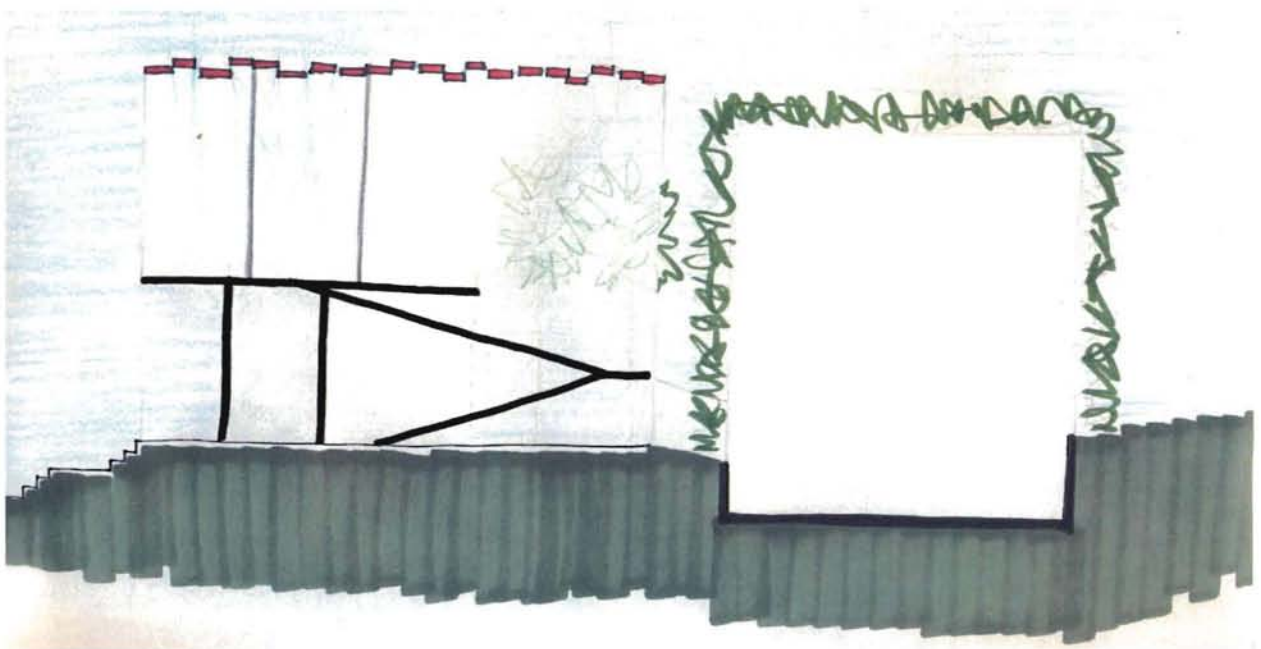


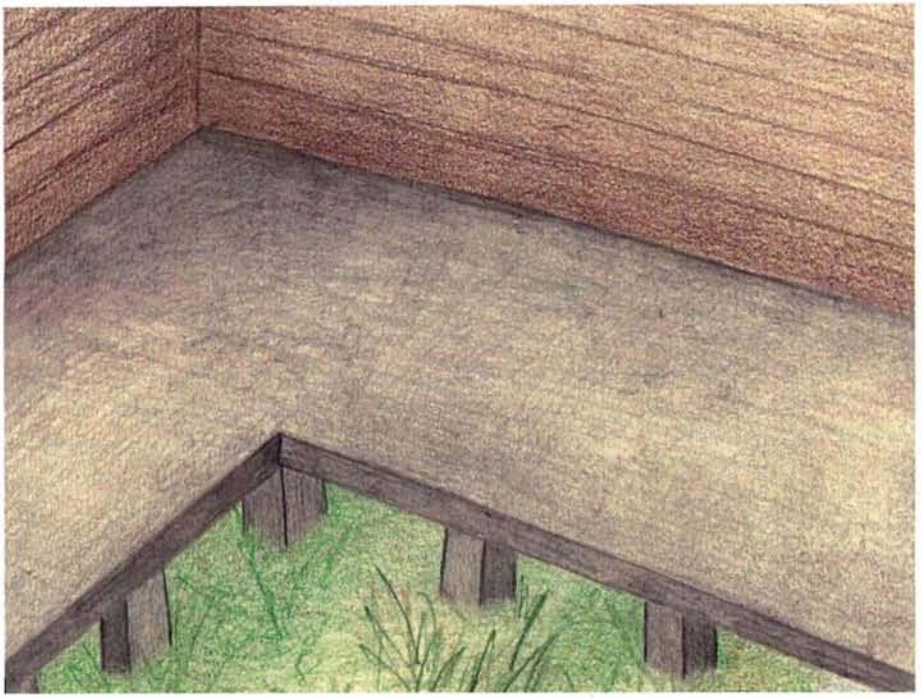




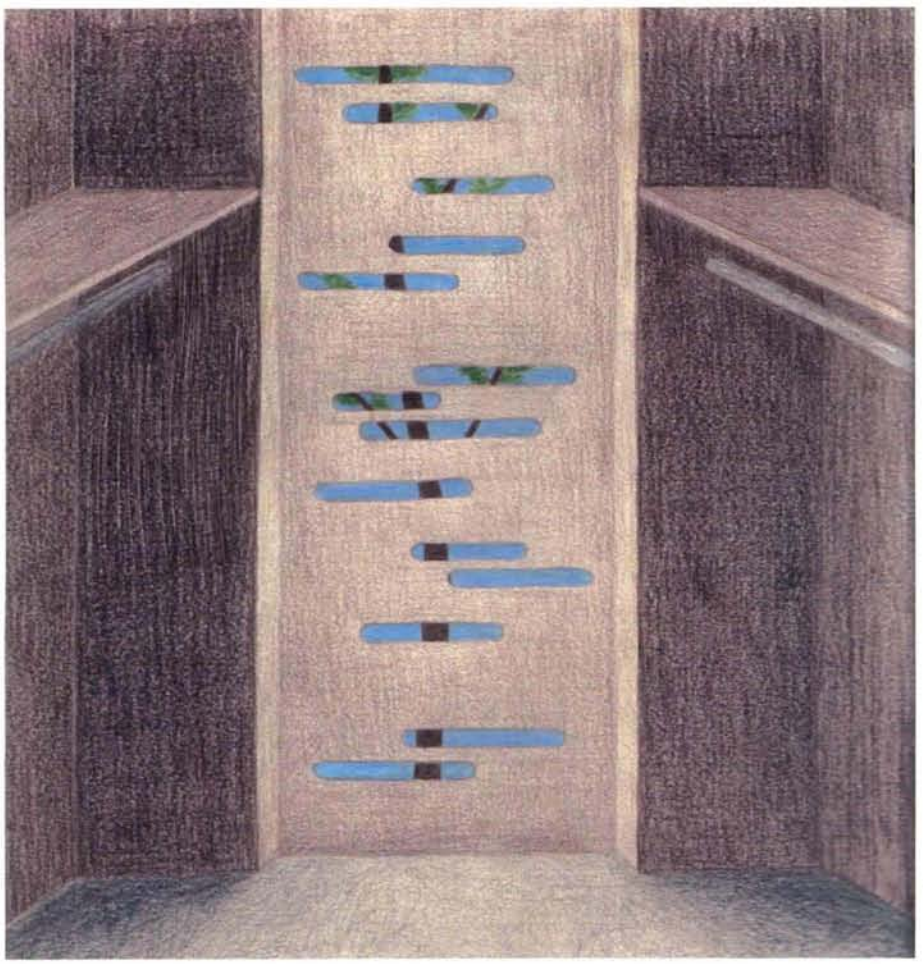
The sections shown on this page are some initial attempts at understanding the relationship to the ground, the connection of the various spaces, and the use of materiality within the project.

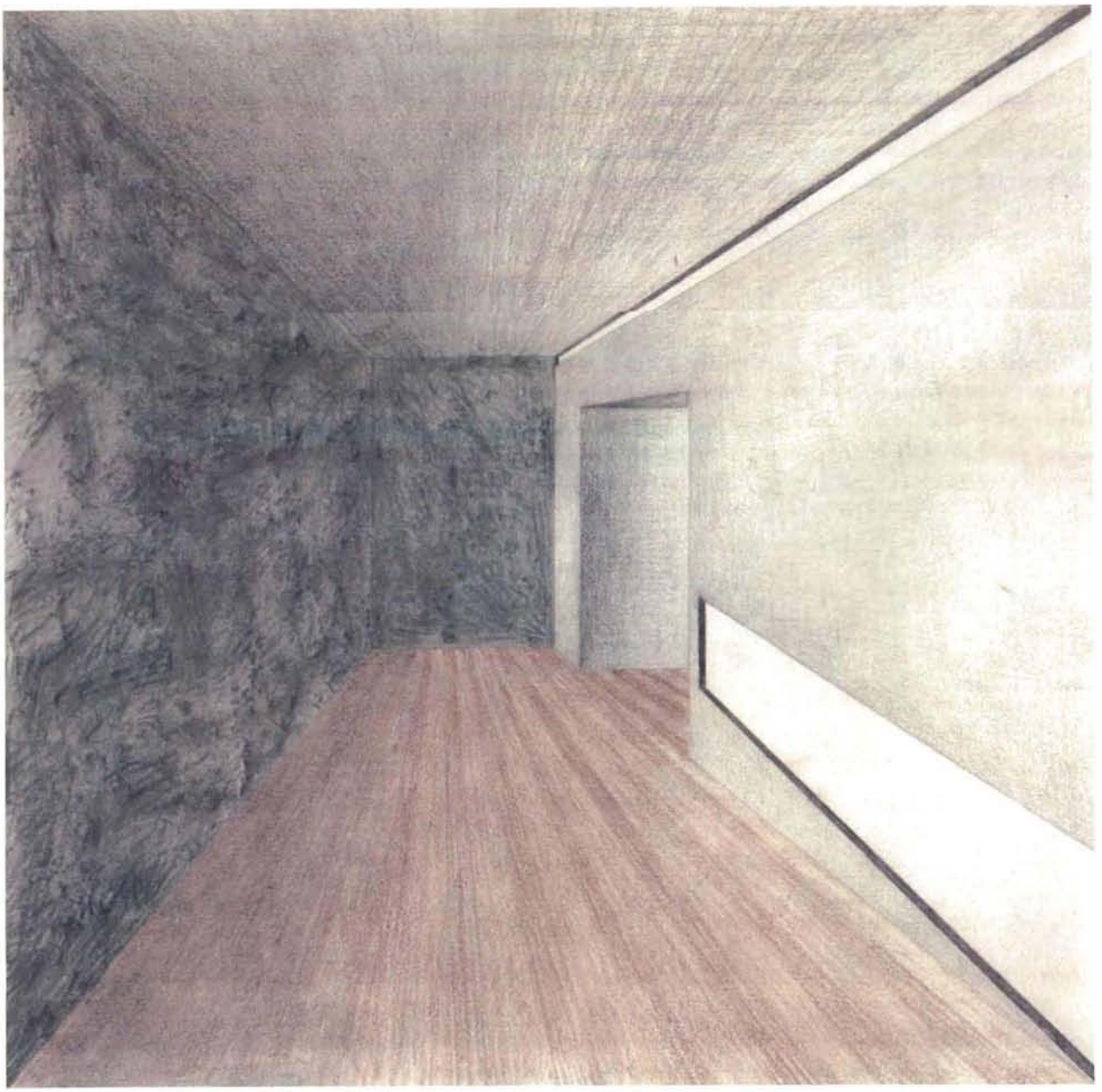


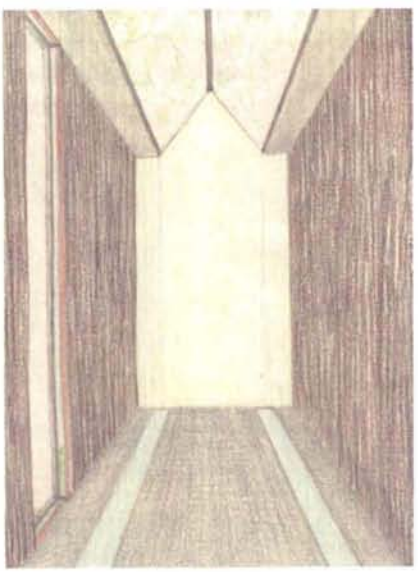


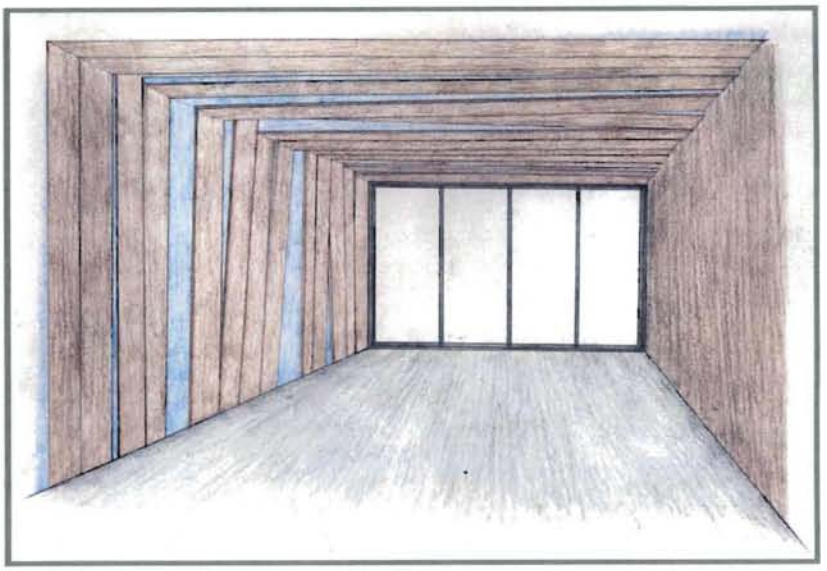


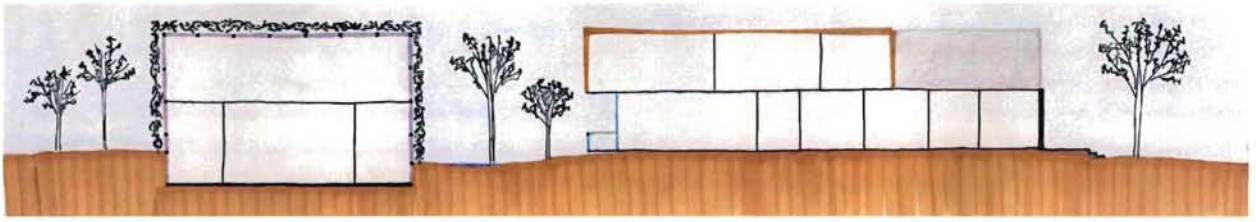
The drawings on this and the following page show moments within the builiding where the occupants interact with the external environment through the architecture in very specific ways.

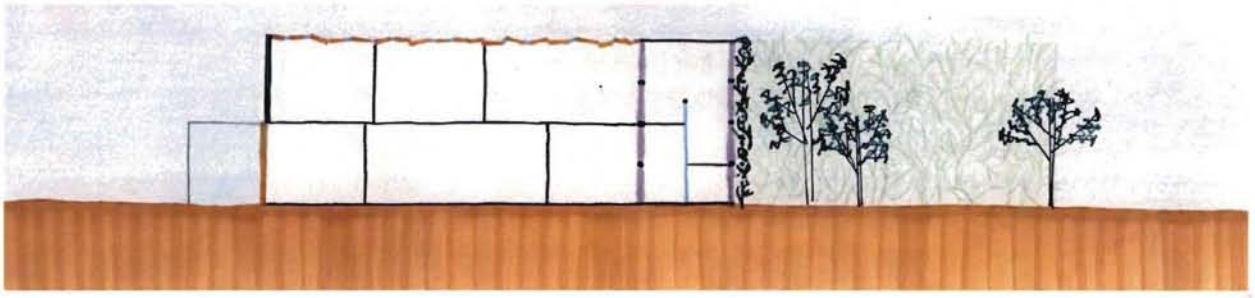




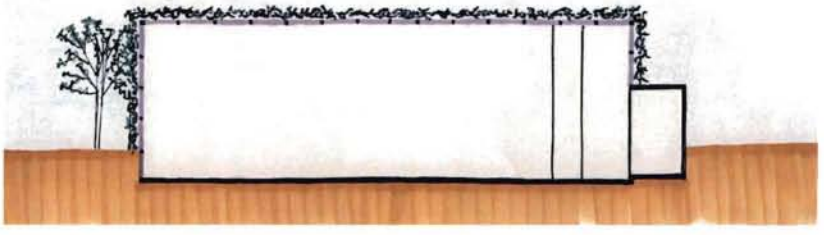


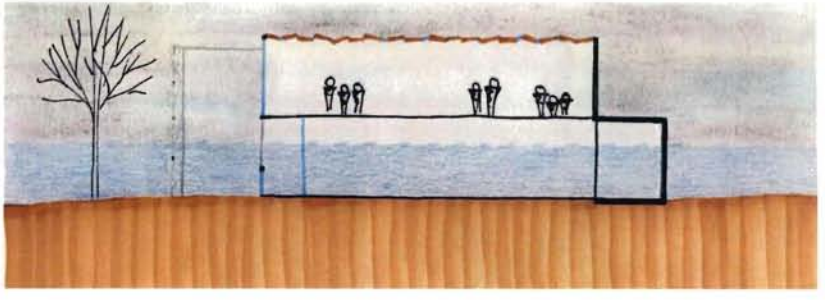


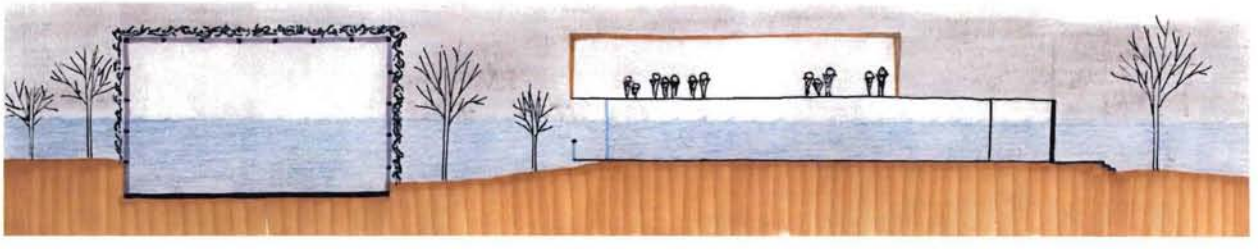


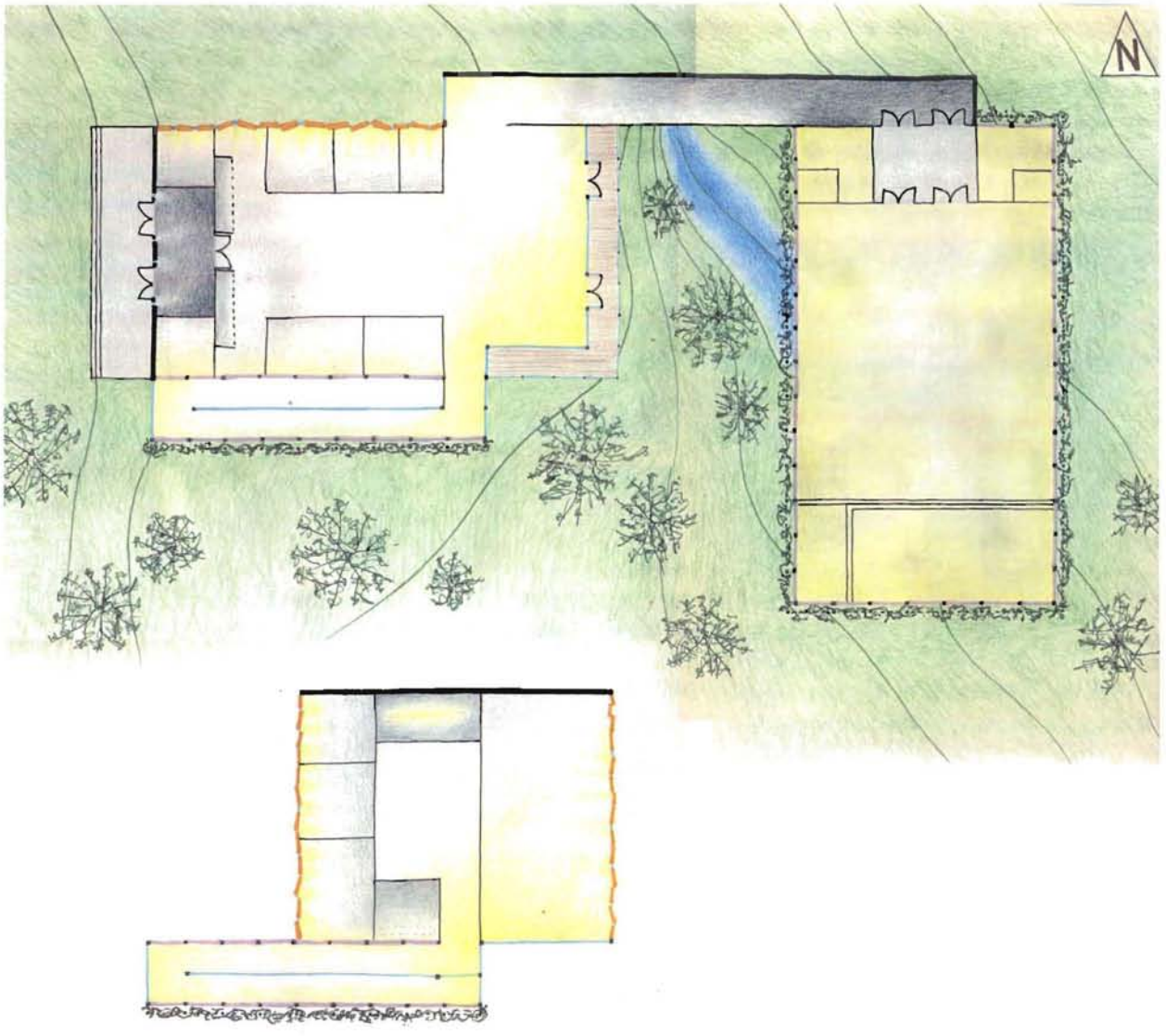


The sections on this page were developed for the final schematic design review. They suggest the materiality that was used throughout the building, along with the relationship between the spaces and the ground. An environmentally extreme condition is also shown in the bottom two sections with a high water level drawn and people occupying the second level.



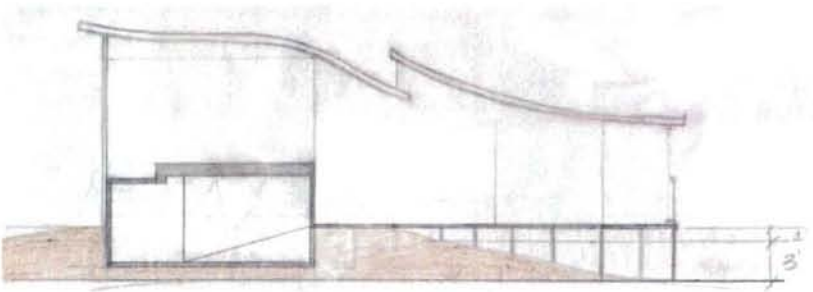




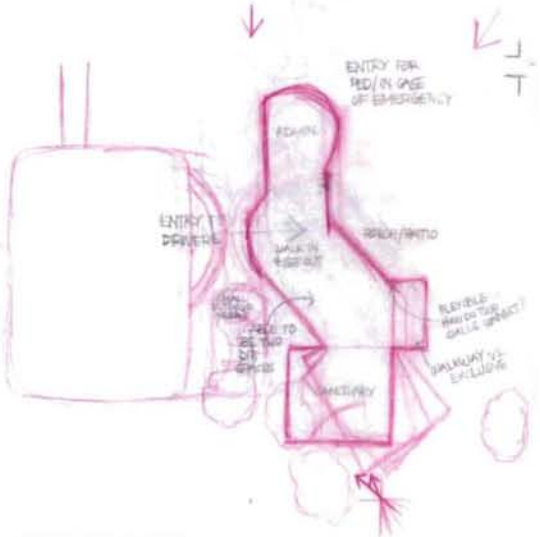


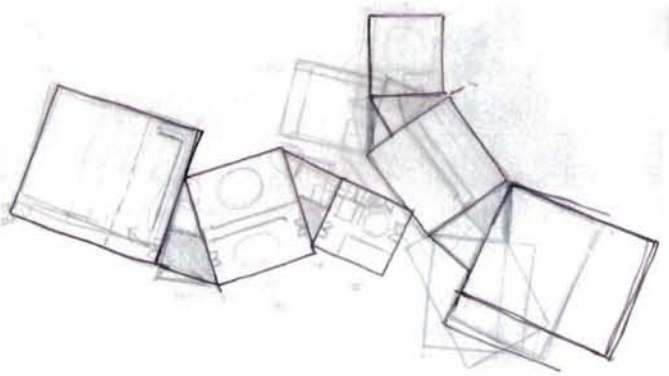
The design (in plan) developed for the final schematic design review is shown on this page. Each area is rendered according to the quality of light that isrequired in that space. The first floor plan is shown above (including the surrounding site) and the second level plan is shown directly below.

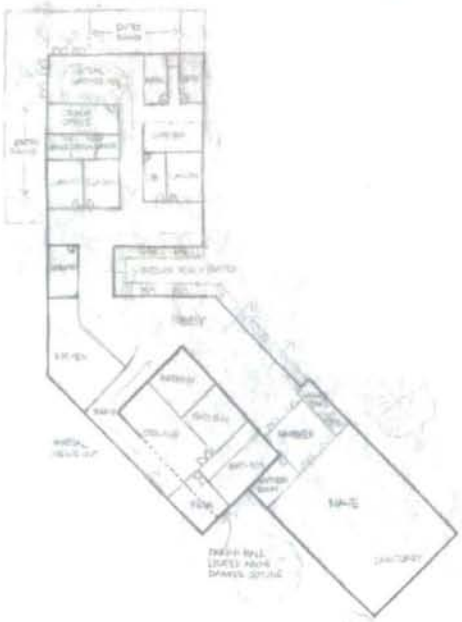
building design



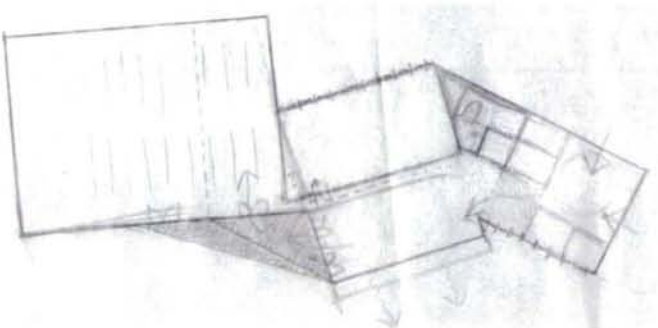
During the building design part of the process, the focus of the project was on developing an initial building design. The first step taken was to look at the site and determine where the building should be located, how it should sit on the site, and what should be done with the rest of the site. Through the use of the site analysis a desirable location for the building was determined. The relationships between the different spaces of the building were looked at along with the transitions between those spaces. The relationship to the ground (the height off of it, on top of it, or the depth in it) was studied along with how these different heights would be achieved. Materiality and wall sections continued to be an important part of the project as the site analysis helped determine where each wall section should be used throughout the building. For an intermediate building design review, a series of sections were created that showed the relationship of the interior to the exterior conditions. A floor plan showed the qualities of each interior space. The rectory, which was being designed in addition to the church as a place for the priest to live, also began to become more developed and included thinking both about extreme conditions and everyday moderate conditions.

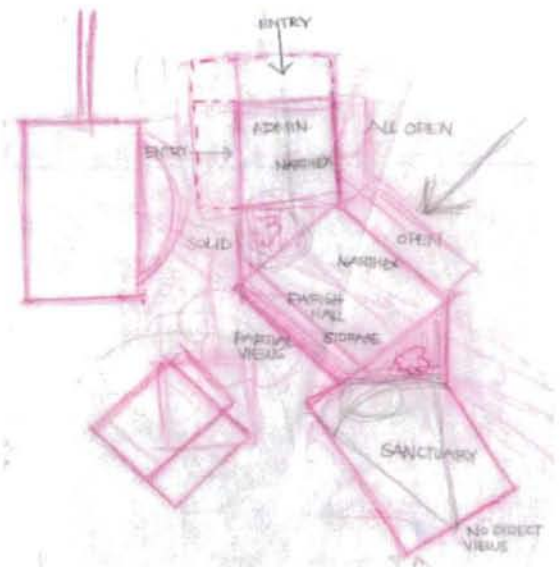


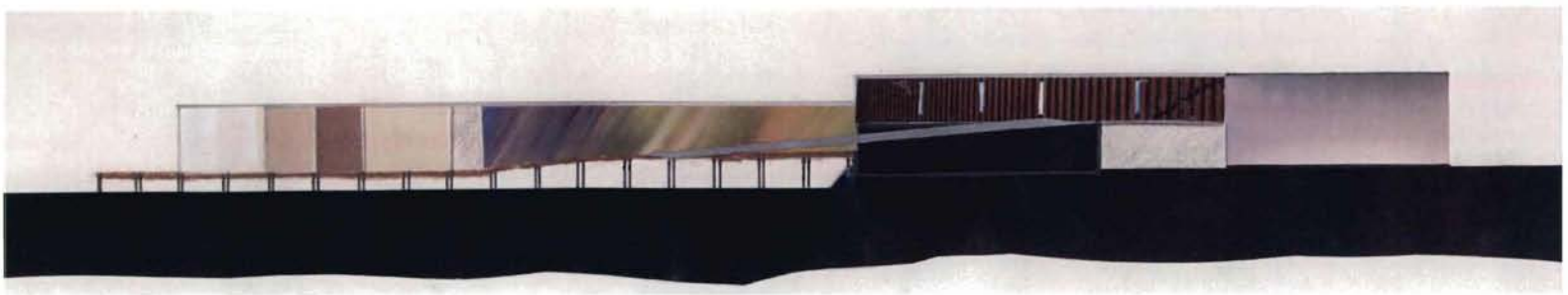


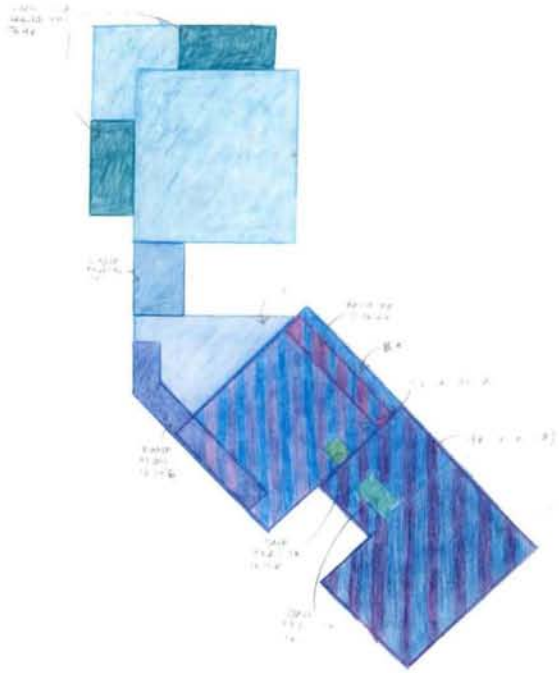


These sketches show the relationship of different parts of the building to the various site conditions. Parts of the building and particular wall sections are located in specific locations as to take advantage of the site. These sketches also show the various spaces of the building and their connection to each other.

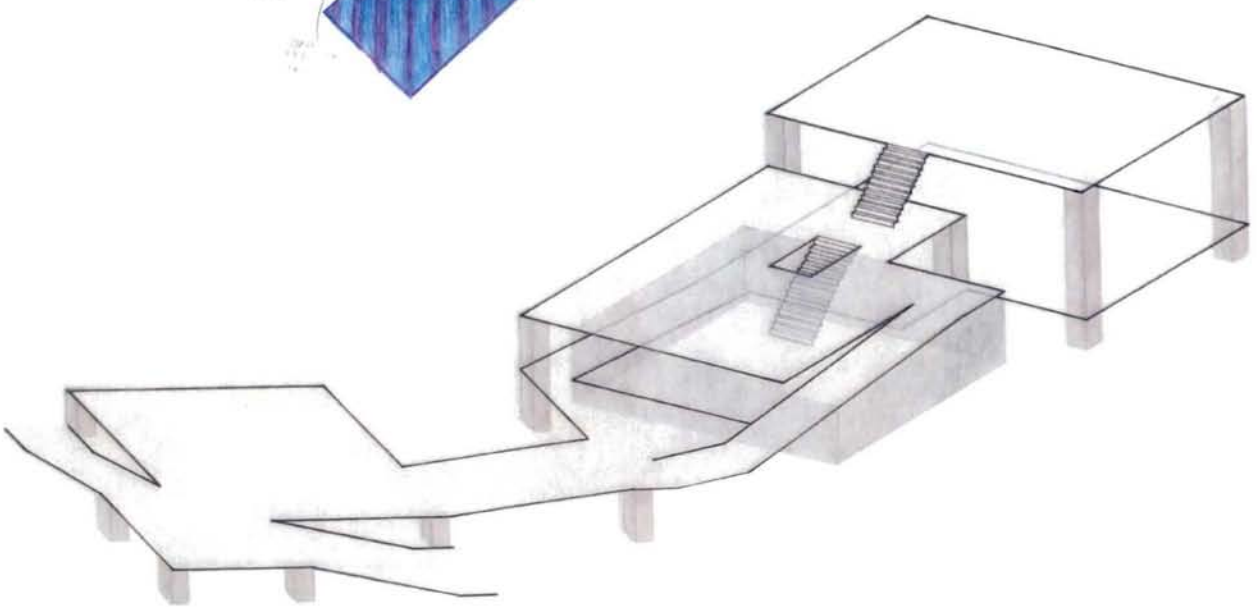


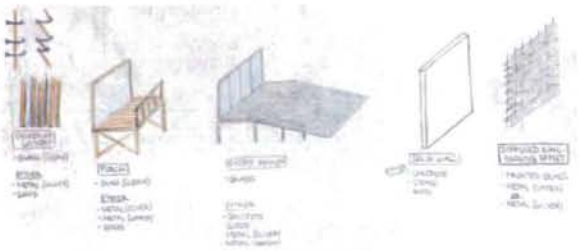




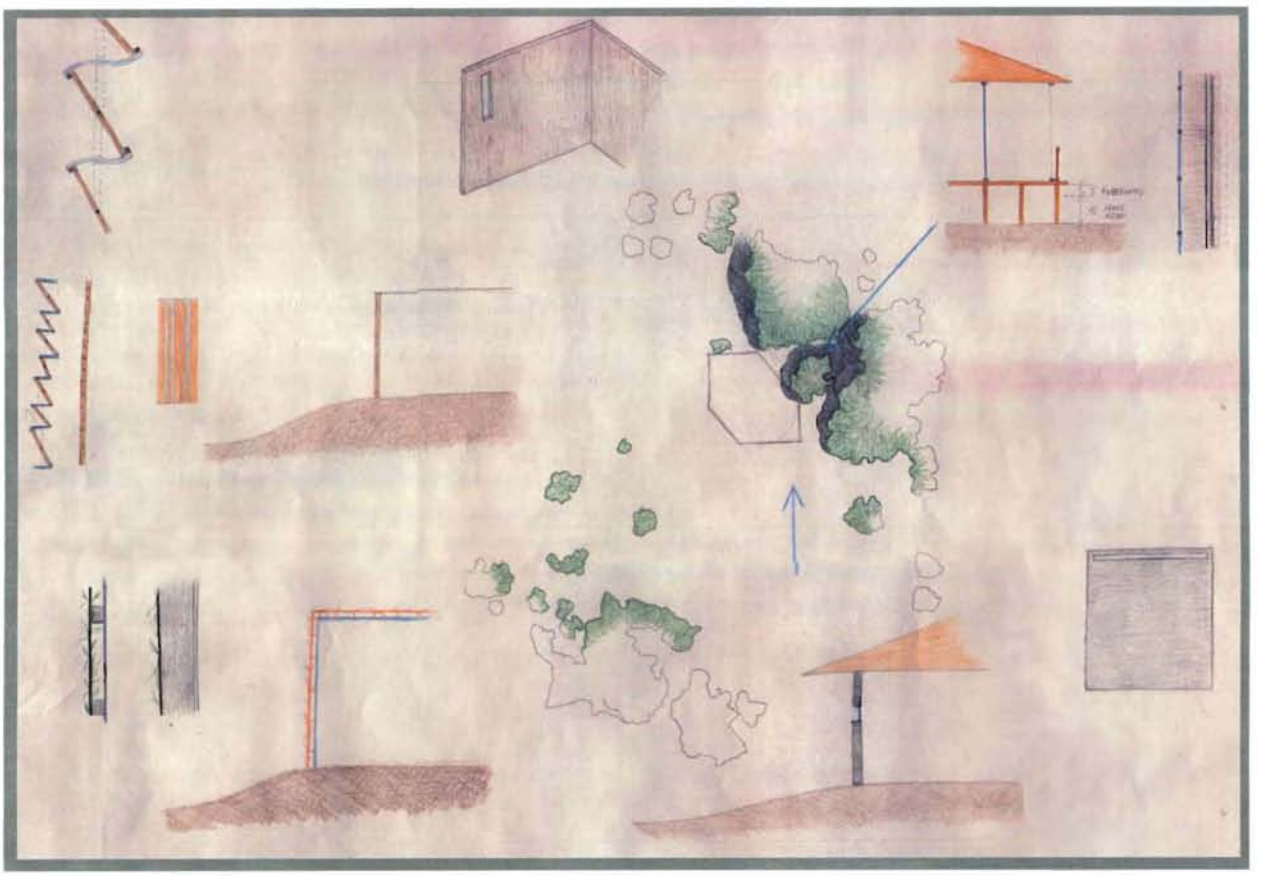


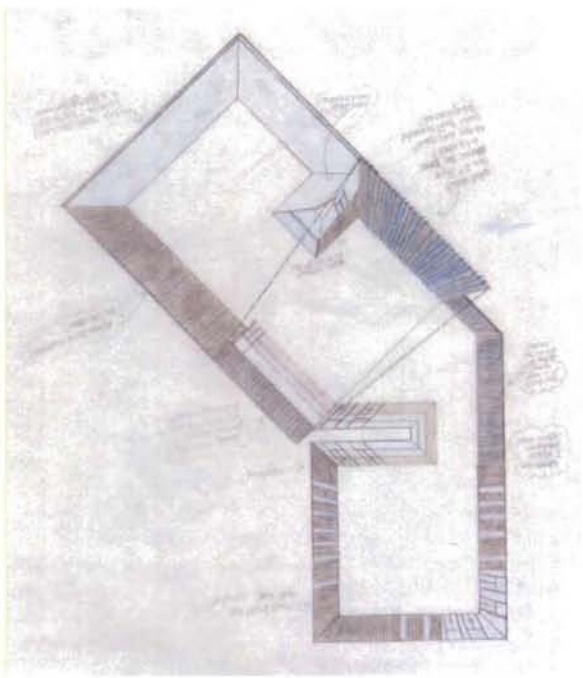
The above section shows the qualities of each space within the building and suggests the materiality within each space. The drawing to the left was a study that looked at the changing heights within the design. The diagram below continues with and clarifies this same idea of changing heights at the transitions between the different spaces.

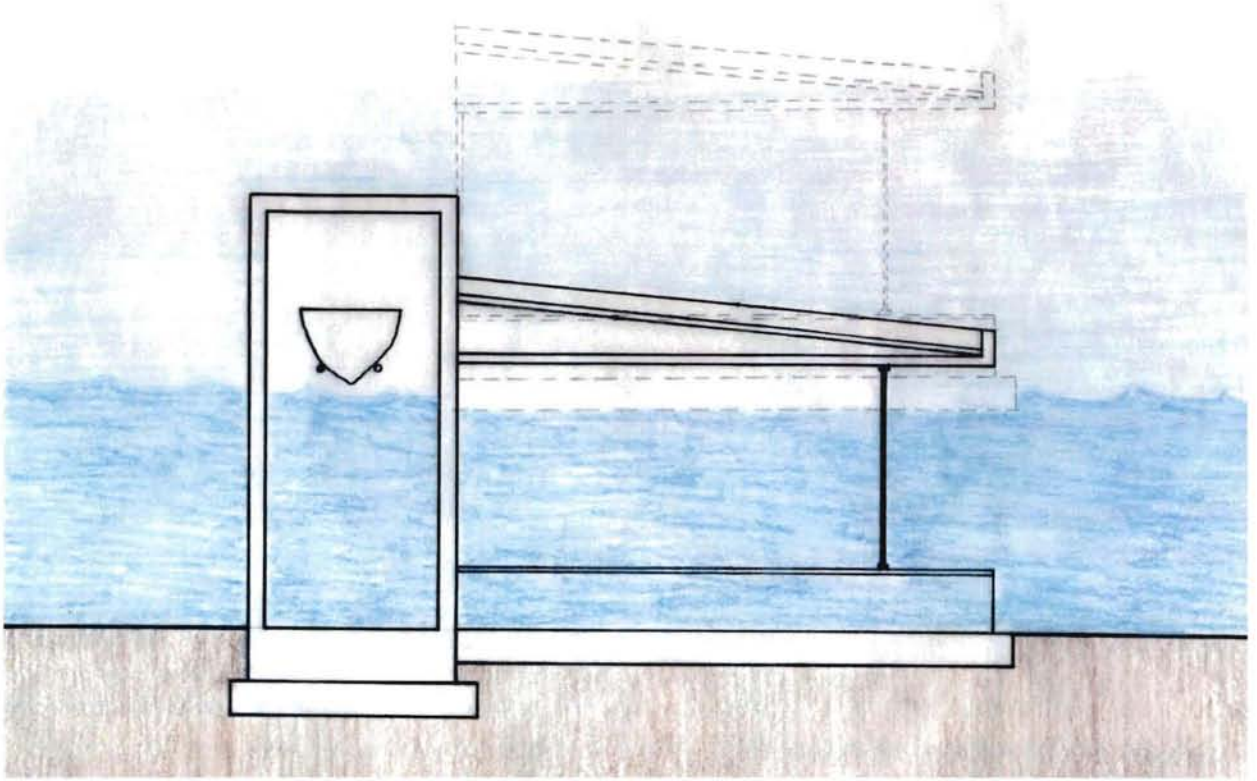




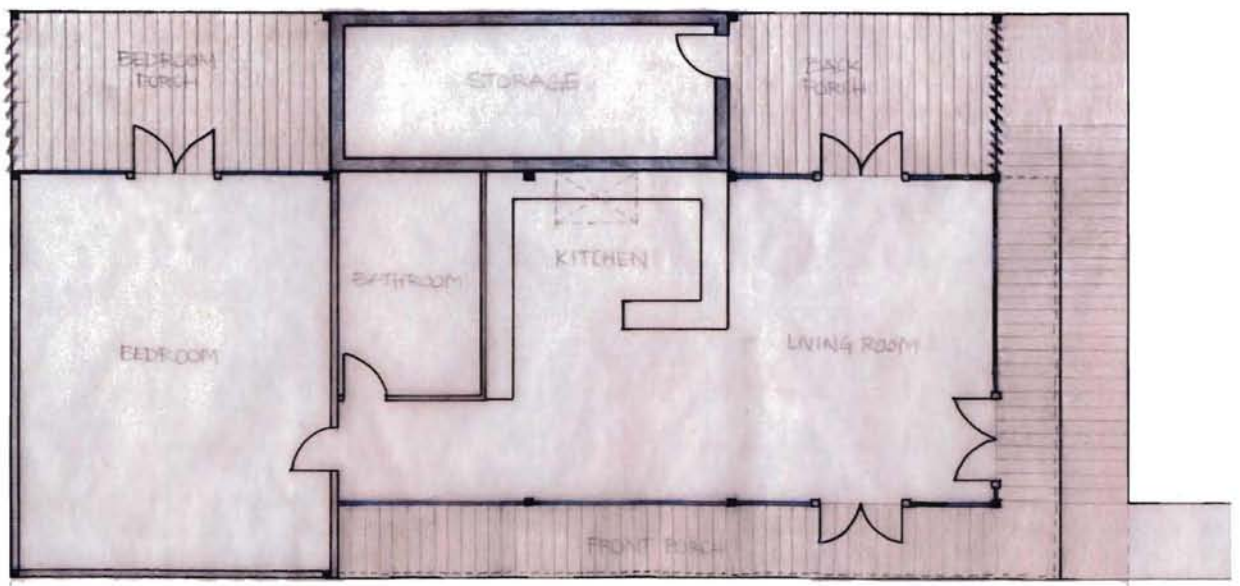
This set of sketches show the ideas about the different types of materials that could be used along with where these materials could be located throughout the building.

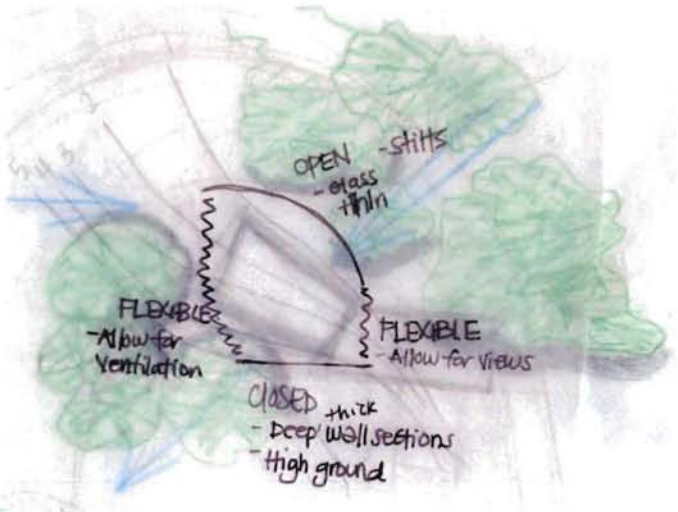


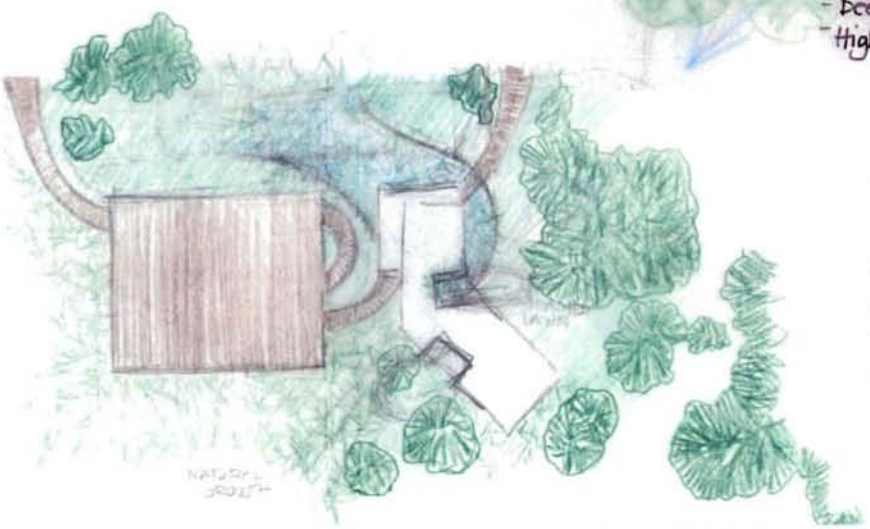




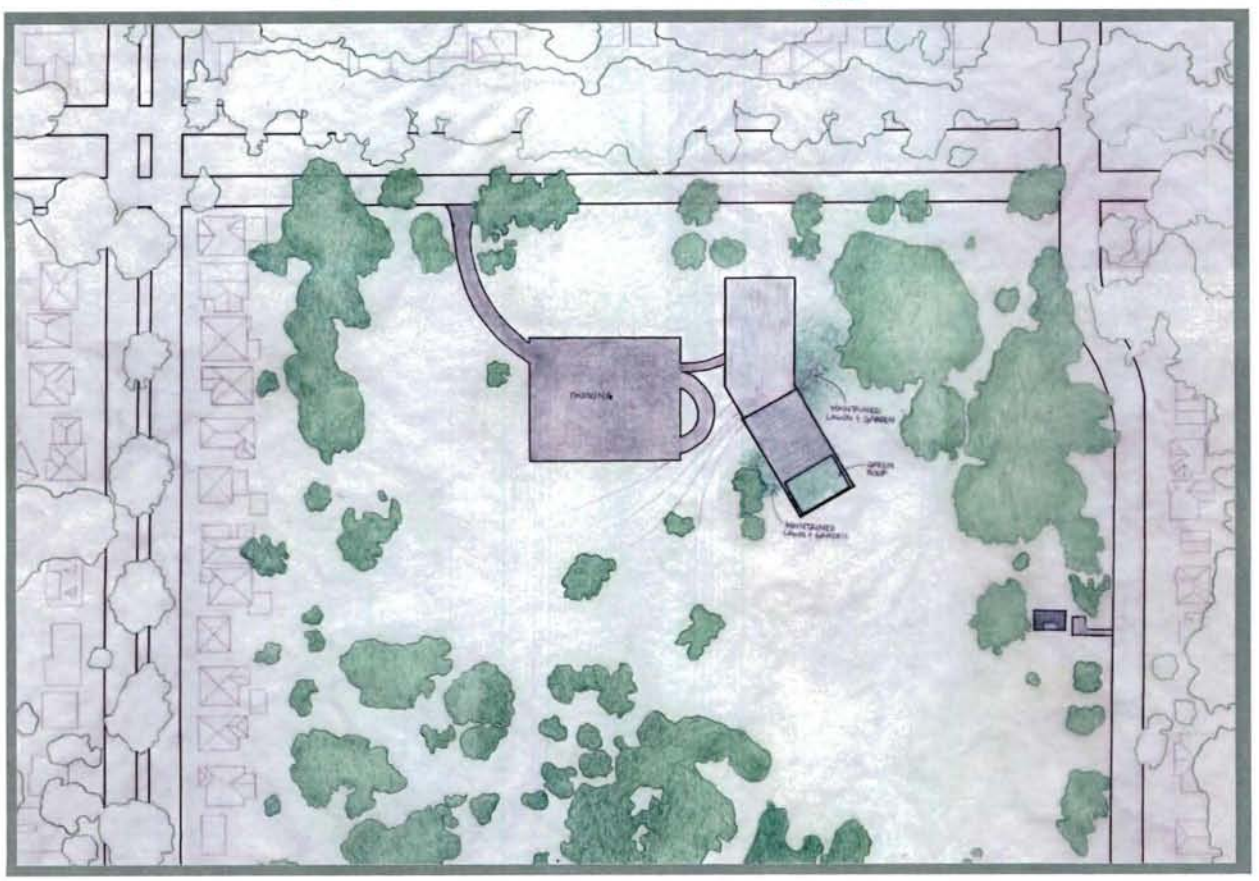
Another portion of the program that began to be developed was the rectory where the priest of the church could live. The drawing above shows a section in which one part of the house is stationary and the other part is on light-weight concrete (which floats) so it is able to rise with the water in the case of a flood. In a situation such as this, the water could eventually rise to a level where it would allow the occupants to get out and to escape the situation in a boat that could be stored in the top of the stationary part of the house. The drawing below is of the plan of the house. By using outdoor areas, lots of glass and exposed areas, and doors to let breezes in, the occupants are able to interact with and experience the environment.

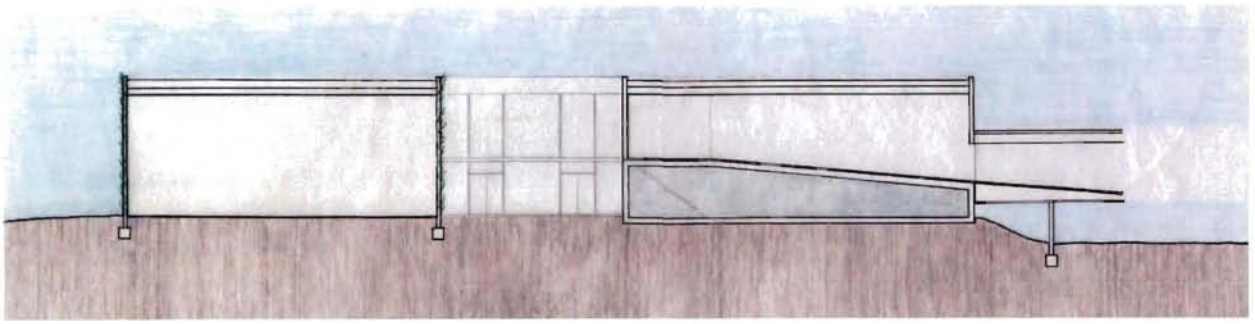


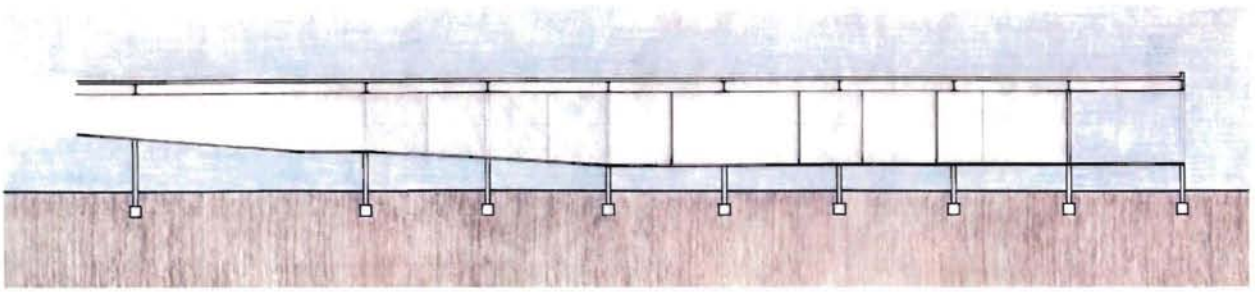




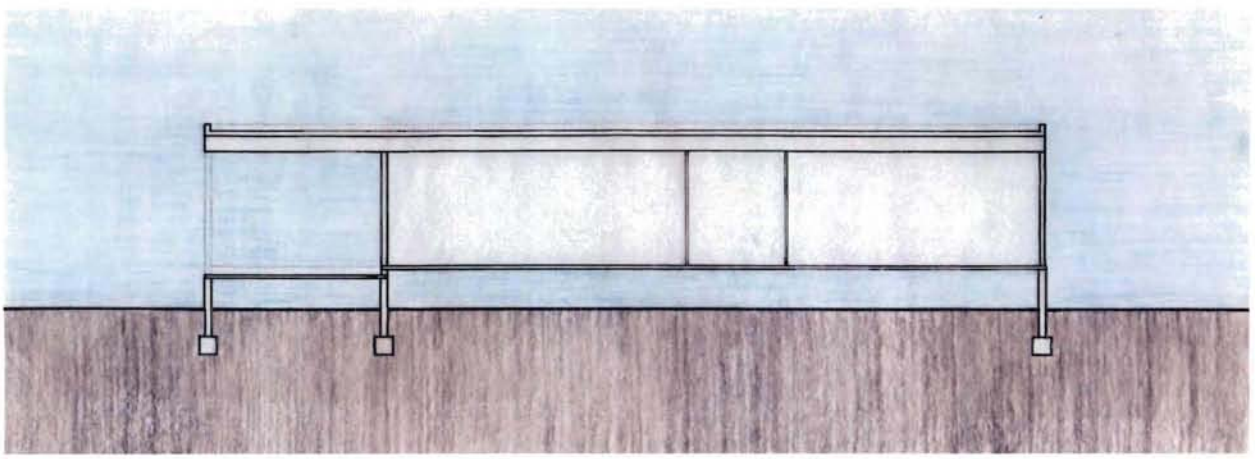
The sketches here began to look at the building on the site, along with the development of the entire site. The drawing below was the final site proposal for the building design review.

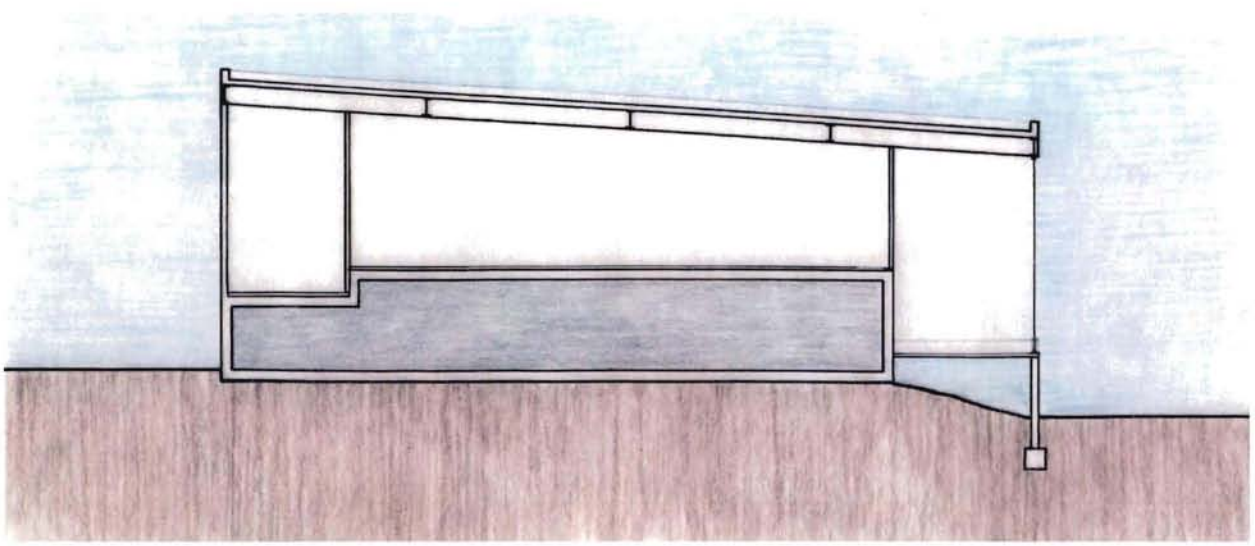


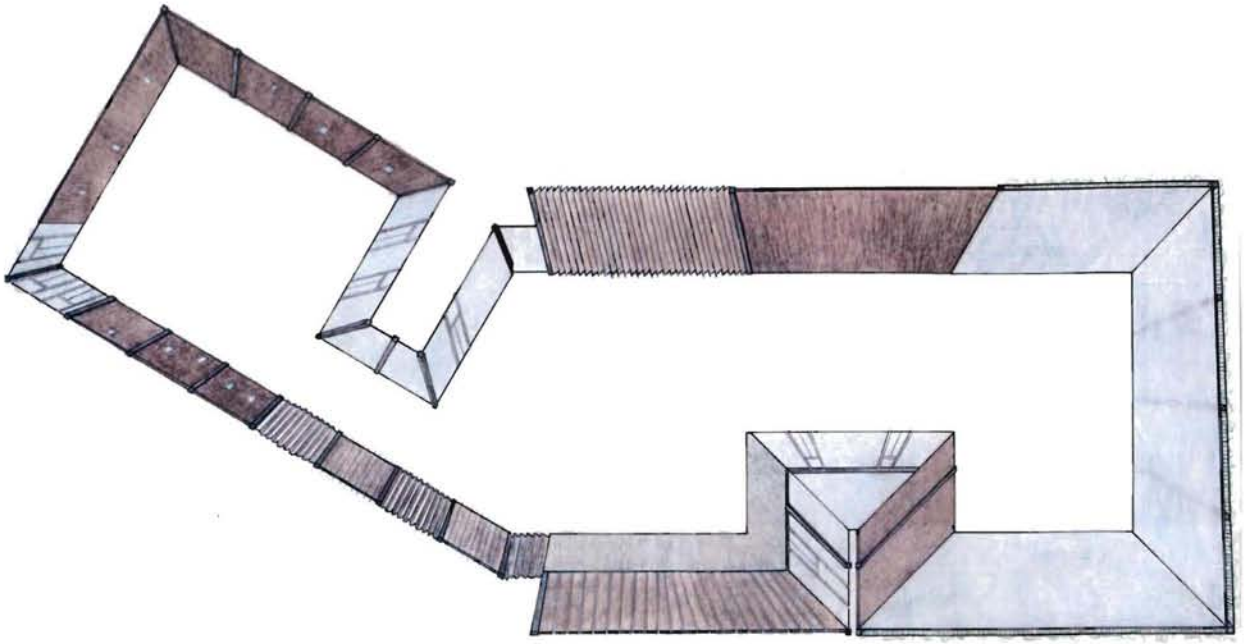




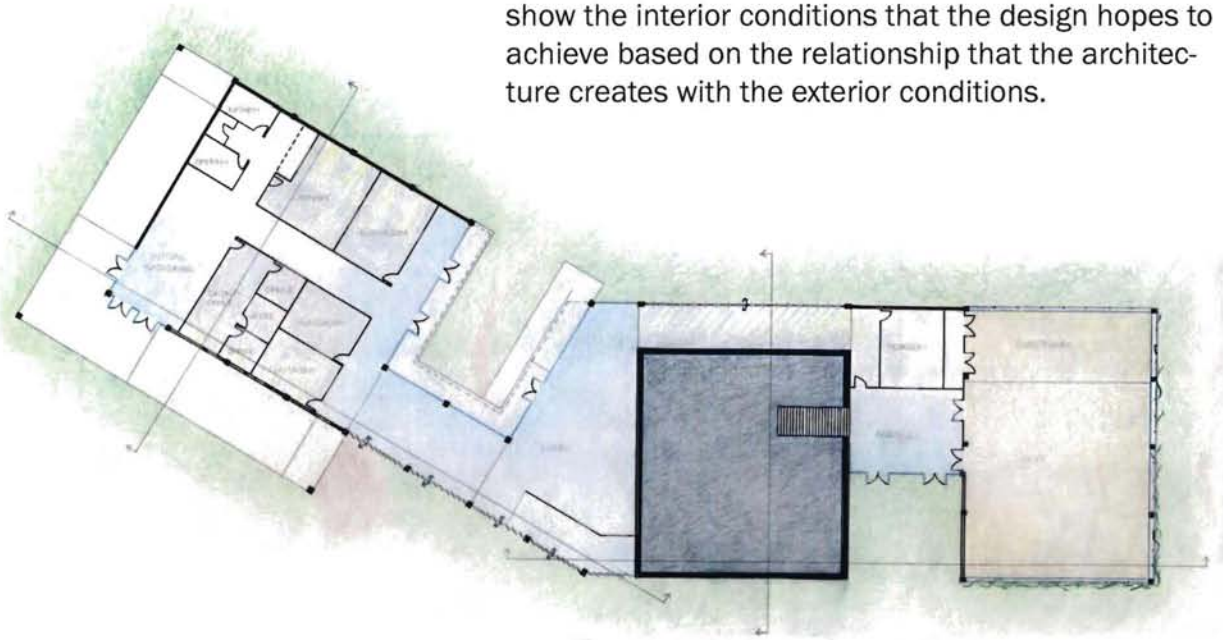
These sections showed the relationship to the ground which is a very important aspect to the thesis. They also show the varying levels and relationships of different spaces.







Above is a plan in perspective that shows from the interior the materials used in each area. Below are plans of the design with the first level above and the second level right below it. These plan drawings show the interior conditions that the design hopes to achieve based on the relationship that the architecture creates with the exterior conditions.

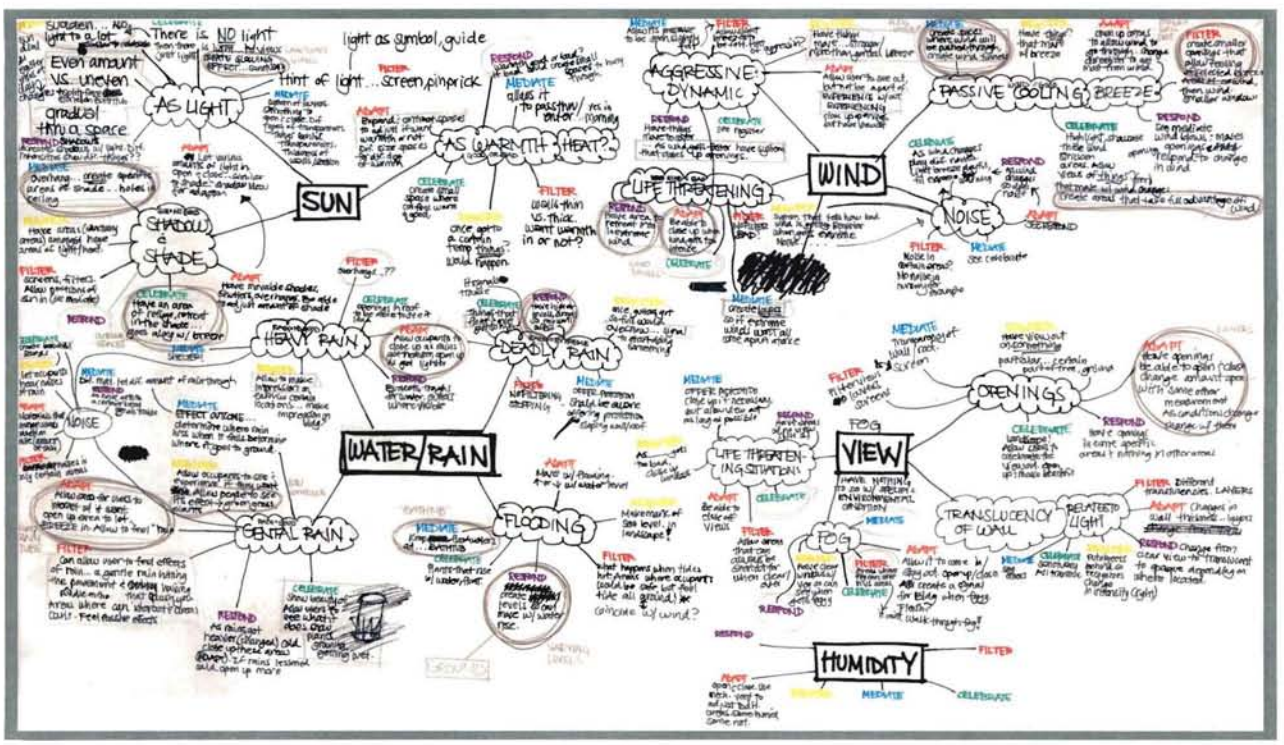


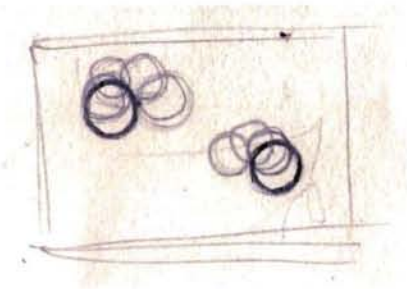
The model above shows how the building massing looks on the site. It also shows the overall scale of the building compared to the entire site and where it is located compared to everything else.

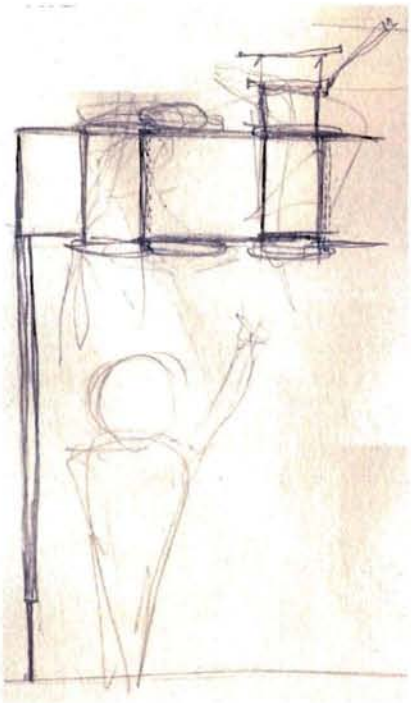
design development

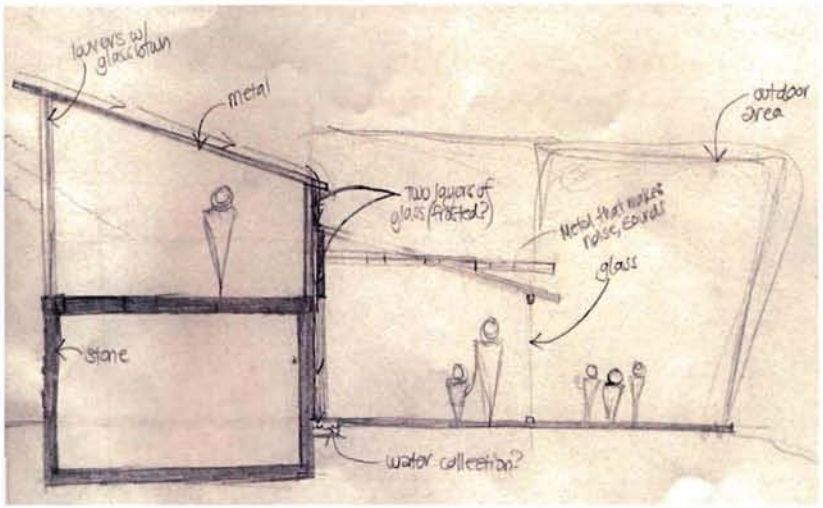
After the building design review the focus of the project turned more specific, making sure the range of conditions that were explored in springboard still found their way into the design. The site was also studied more carefully, and the courtyards, the building form, and the immediate site were developed. At the same time, details were worked out based on the wall sections that were being used in the design. Throughout the whole stage of this process, entire building sections were carefully studied and were continually being revised. During this part of the process the choice was made to forget about the rectory as the church became the main focus of the thesis and the rectory was not getting the attention is deserved.

The first step in this process was to make sure that each condition that was explored during springboard was truly being captured in the design. A map was made of all the environmental conditions that were examined along with the ways in which the design mediated, filtered, registered, adapted, responded, and celebrated each condition (shown below). This helped in thinking about the depth and scope of the conditions addressed and the techniques used throughout the design.

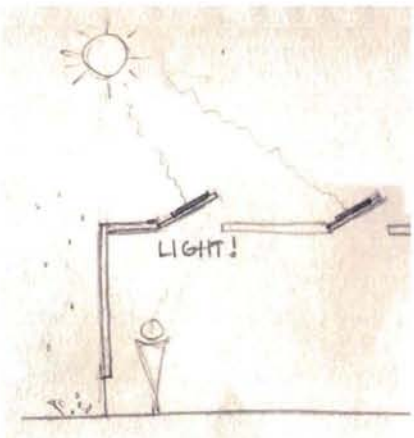


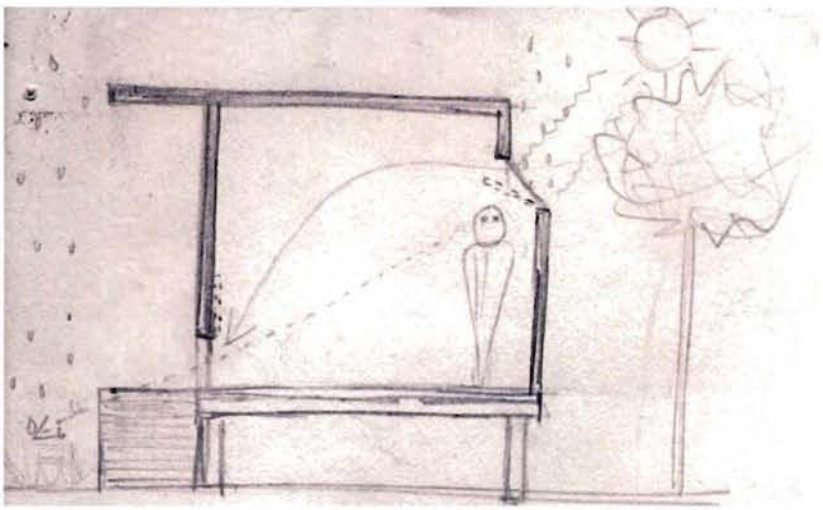


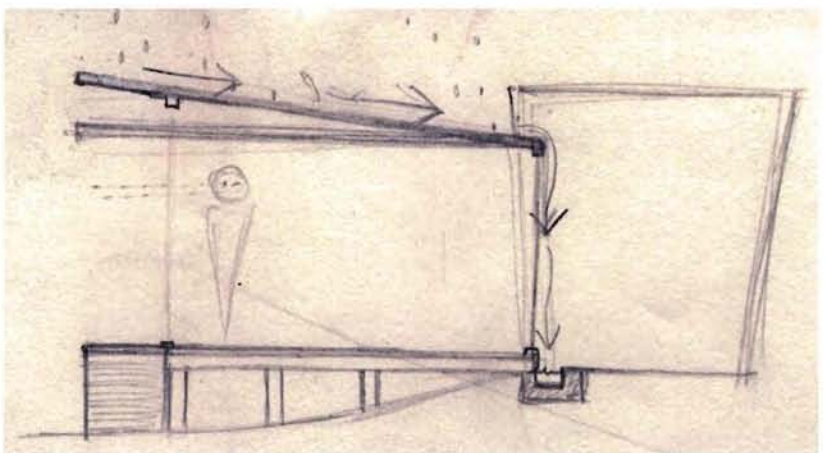


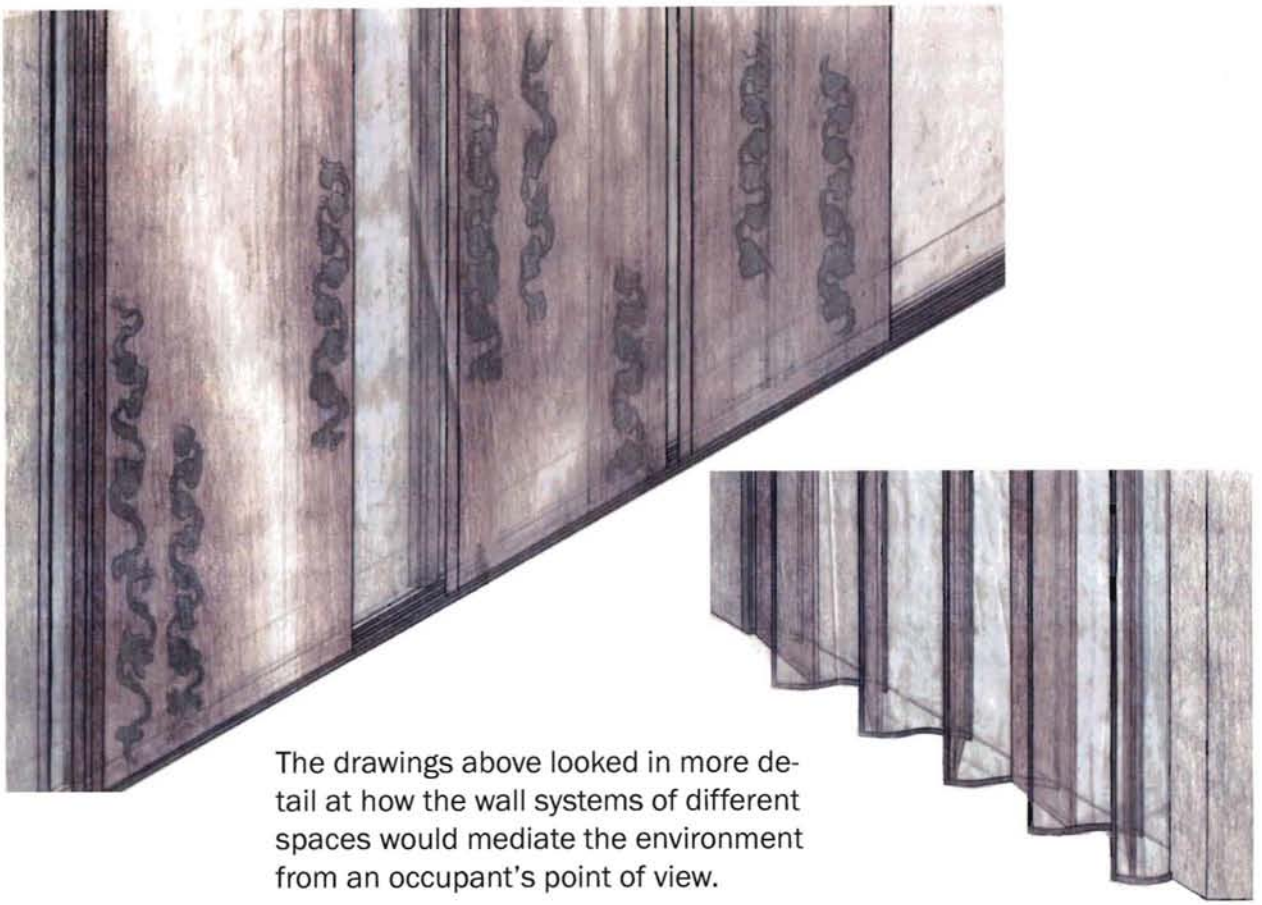


The sketches shown on this page were specific ways in which the building could mediate the exterior environment along with how the occupants of the building might experience the space. These sketches helped to make sure the thesis was looking at a variety of conditions and issues.

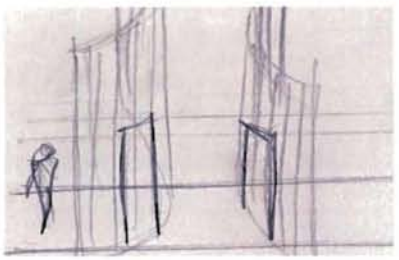


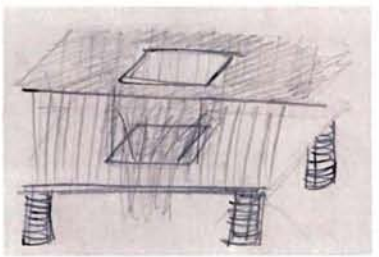


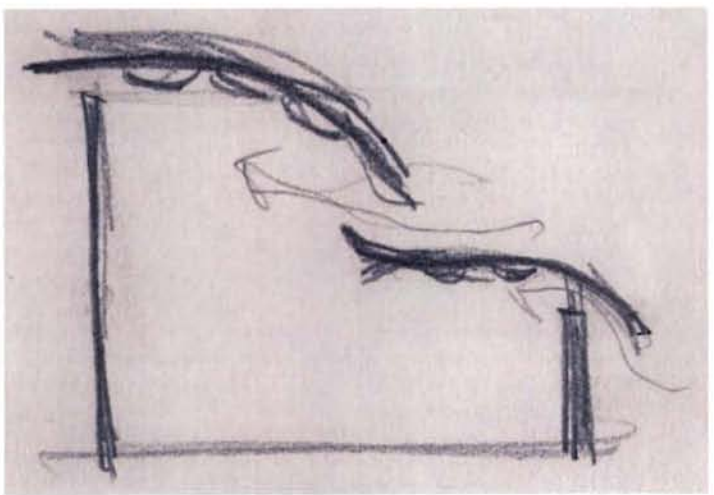




The drawings above looked in more detail at how the wall systems of different spaces would mediate the environment from an occupant's point of view.

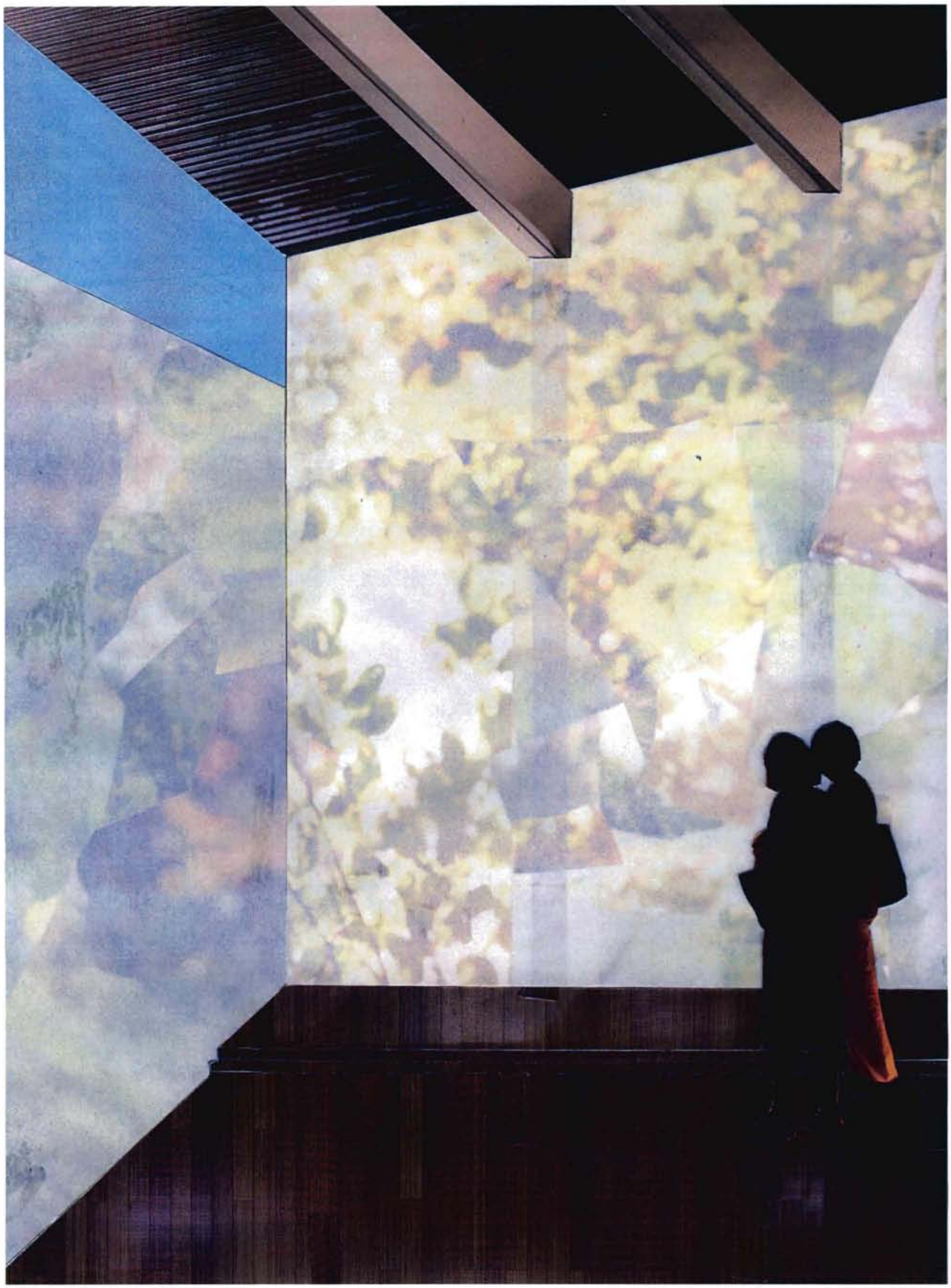




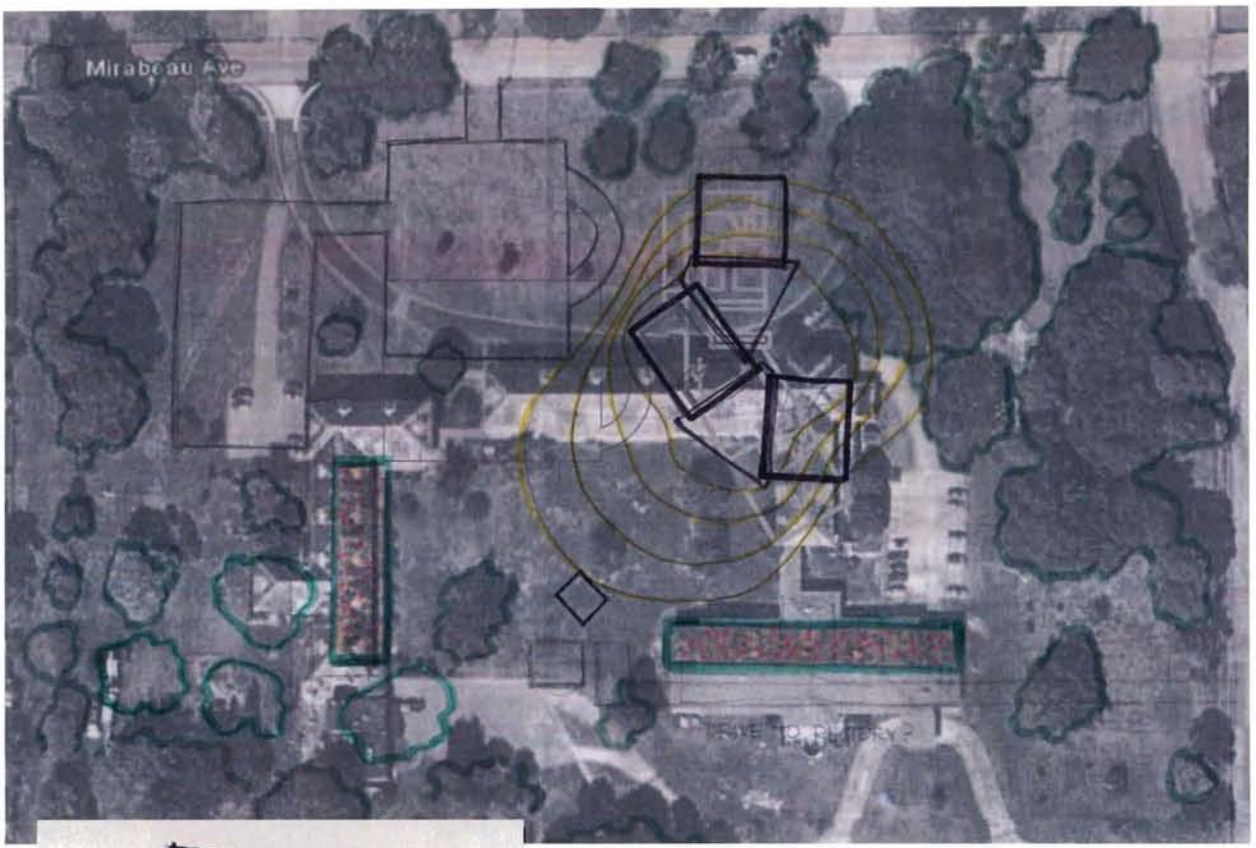


The sketches on the lower half of this sheet were additional techniques that could be used to mediate the external environment. They included ideas that were important, but which had not been significantly included in the design so far.

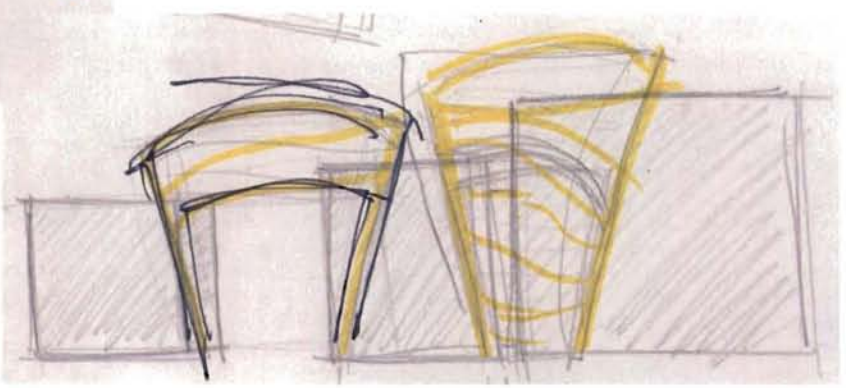
The collages on this and the following page are looking at the interior conditions of the spaces within each of the buildings. The collage shown above is a view inside the parish hall looking out the door and along the wall of louvered windows. The collage shown below is a view of the hallway outside of the offices and classrooms where a tube will let light into a dimly lit space and allow an occupant to experience the changing external conditions while inside.

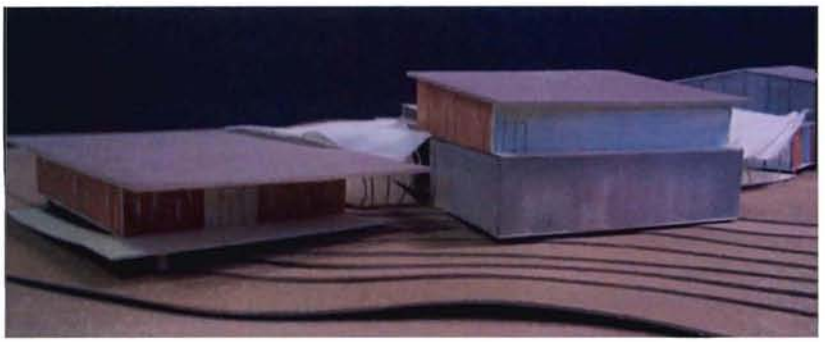


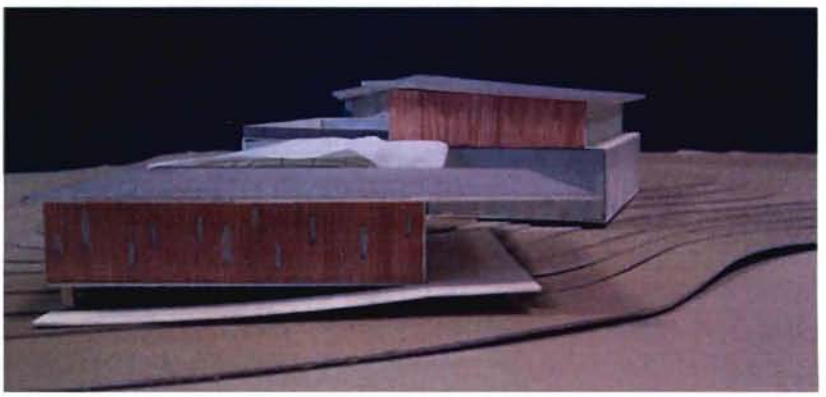
This collage shows the glowing light effect achieved in the sanctuary from the combination of the sun hitting the vegetation growing on the outside of the building and the translucent glass.



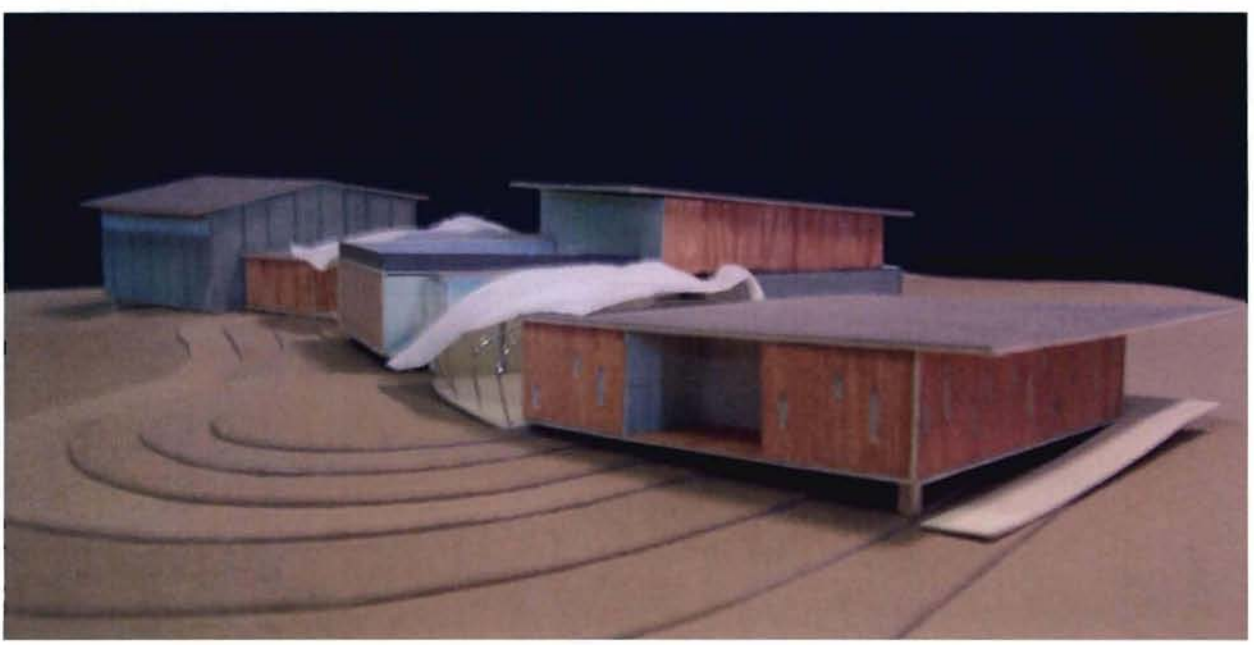
The site plan above shows a general attitude toward the site. The design is attempting to create usable exterior spaces between the buildings, which is one idea that played a major role during this stage of development. The drawing also shows an attitude taken toward the ground with it being built up around the central building and courtyards. The gardens in the footprints of the previous church also show more development of the overall site. The sketch to the left is looking at the flow between the separate buildings and the connection of one side of the proposal to the other. The sketch below starts to examine what these in-between spaces might be like in elevation.

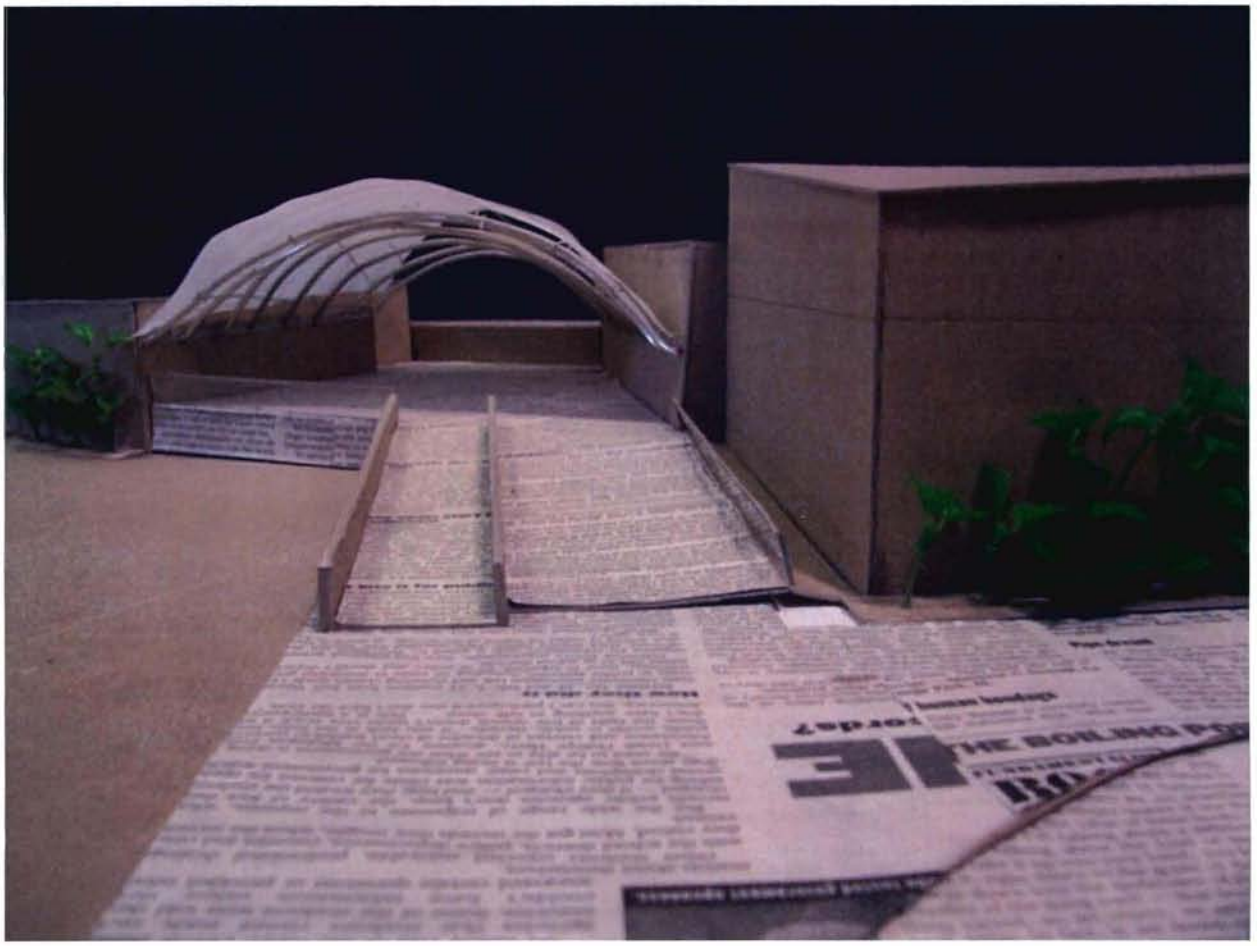


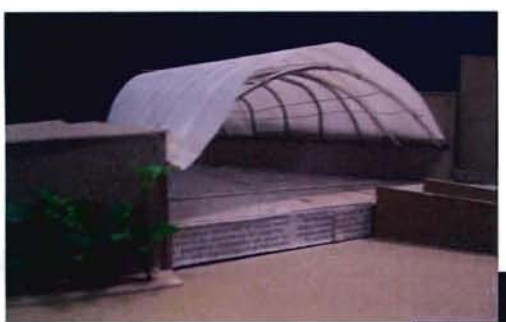




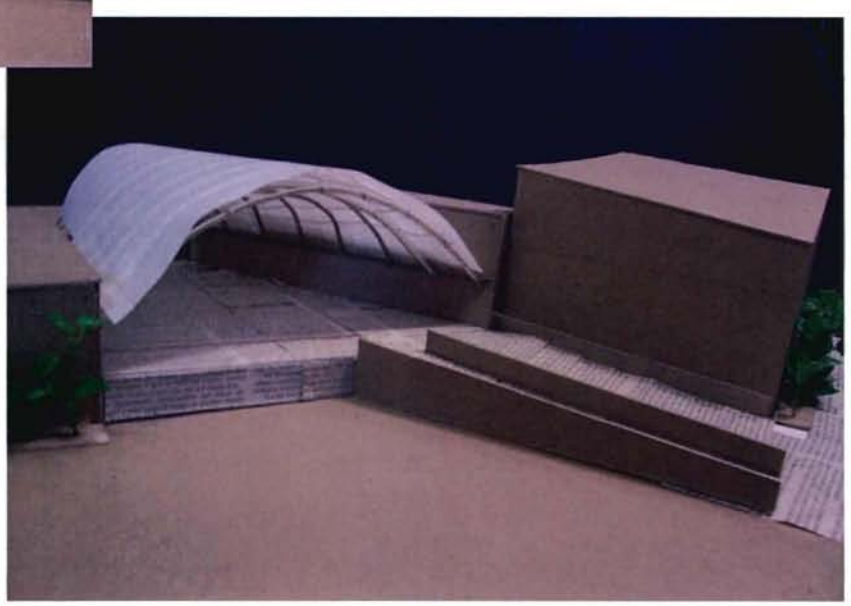
The model shown in this and the following page was the first model of the actual building proposal. It showed the relationship between the three buildings, along with an initial investigation of what was really happening in the spaces between the buildings. This model also attempted a basic look at materiality and elevation, although the model really needed to be a bit bigger to gain a true sense of materiality.



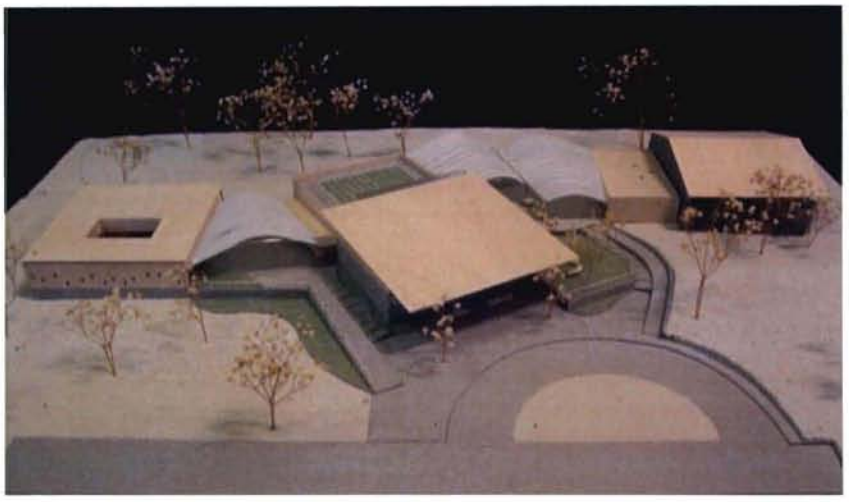




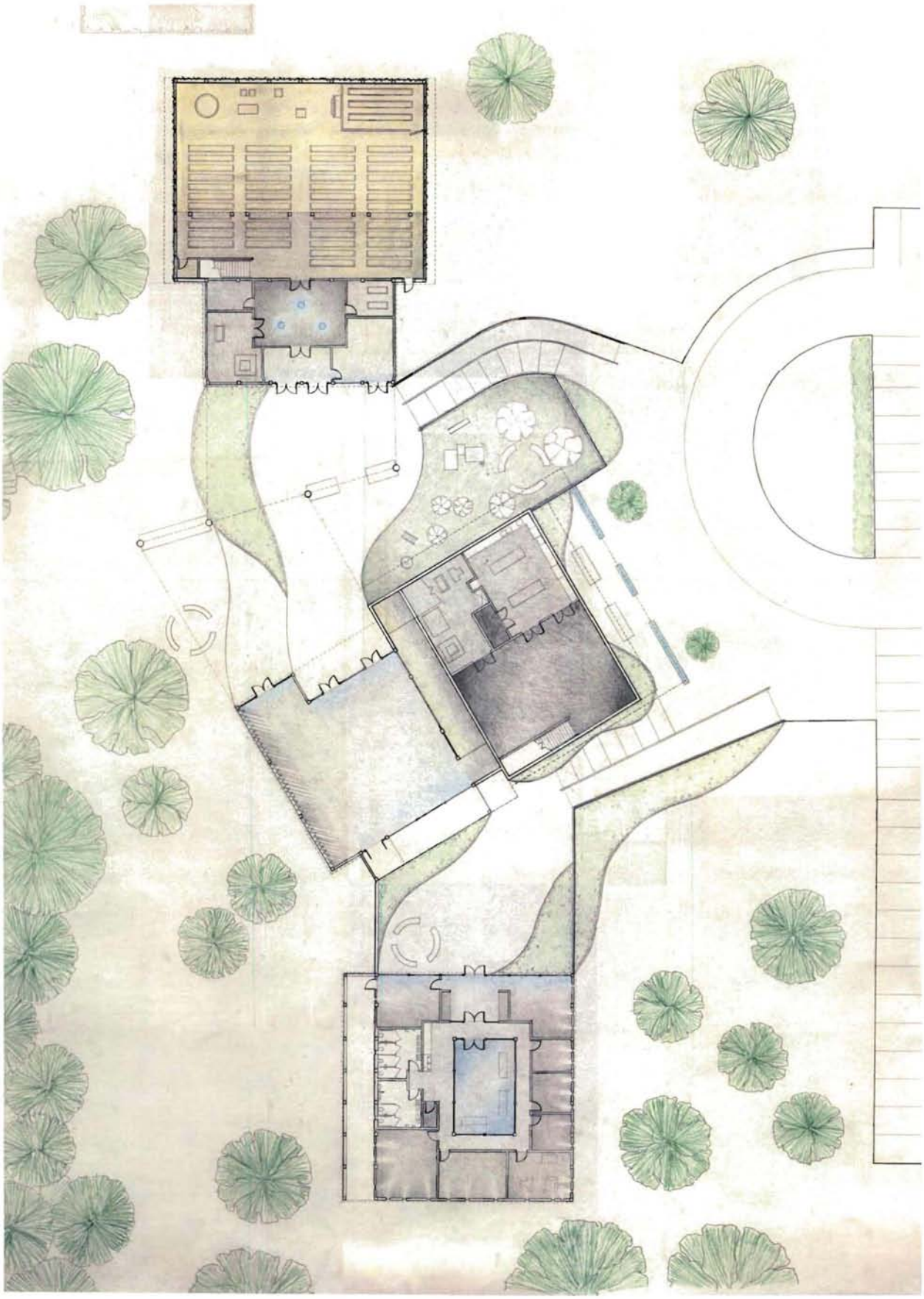
This model was a study of one of the entry courtyards between two of the buildings. This large scale model looked at the physical connection between the canopy structure and the adjacent buildings, the space that was being created under the canopy, and the entry sequence into the building.



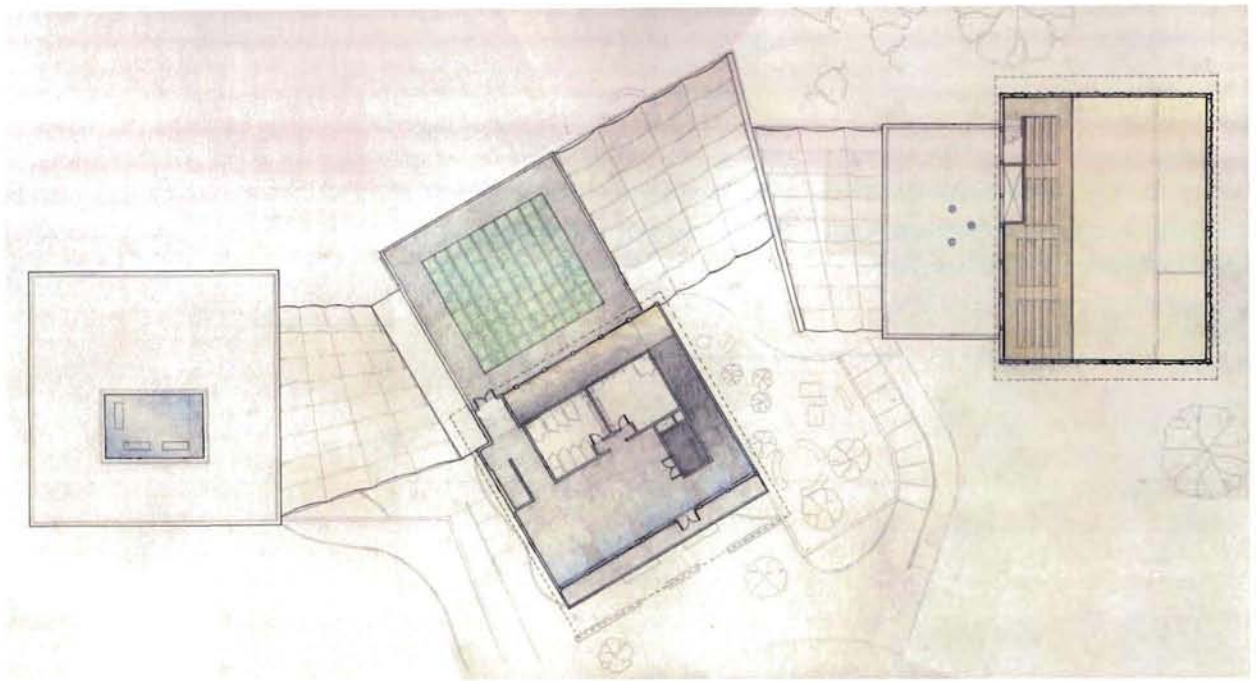
final presentation



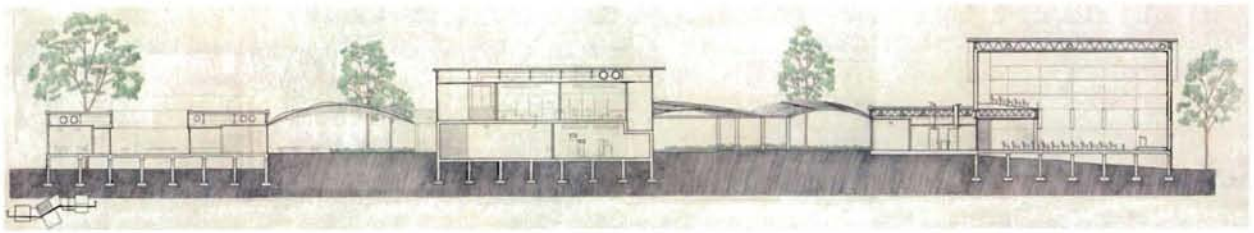
A number of sections, plans, perspectives, and details were created which explained the design proposal for the final presentation. Large scale plans were drawn and rendered to show the interior qualities of each space whether it was partial or specific views out, a brightly lit atmosphere, dark areas, or other specific conditions. Large scale sections were also created, one through each of the three individual buildings and one long section the other way through all of the buildings and courtyards. Perspective drawings of specific interior views were created both by hand and on the computer to show what it really felt like to be in a particular space. Blown up details show the variety of techniques that were used to mediate the conditions between inside and out. A large scale model was also created which helped explain the building's relationship to the ground and the rest of the site.



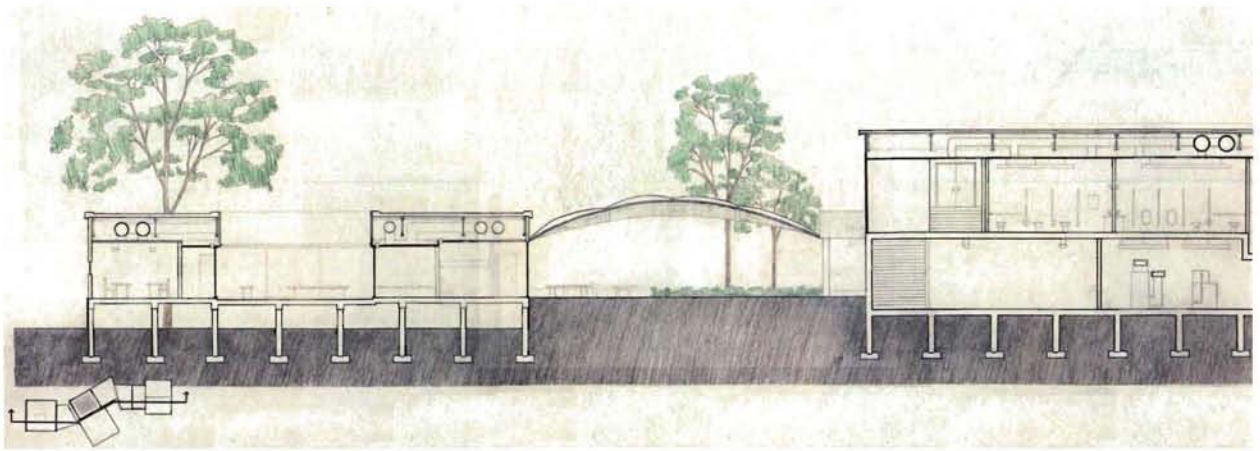
This is the final ground floor plan shown with the surrounding landscape and exterior spaces.

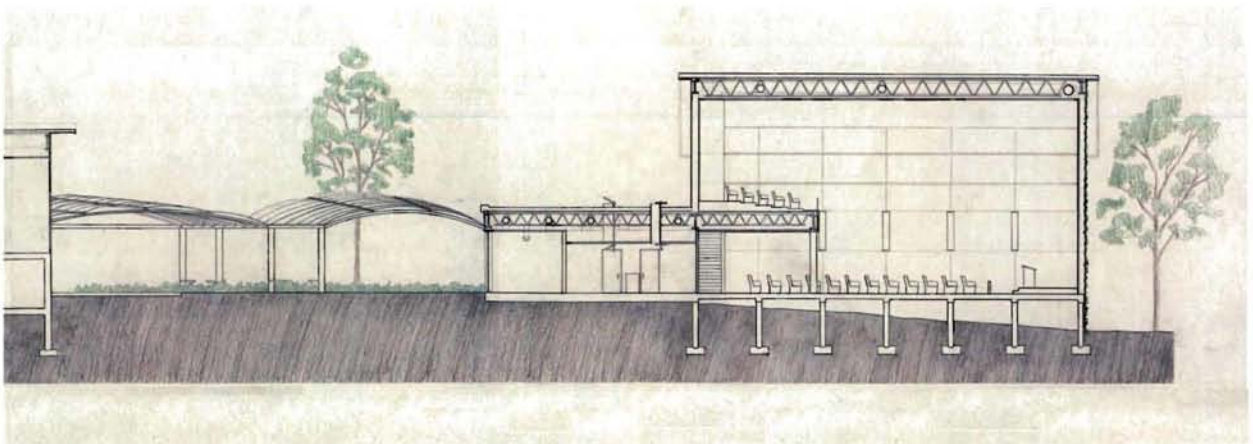


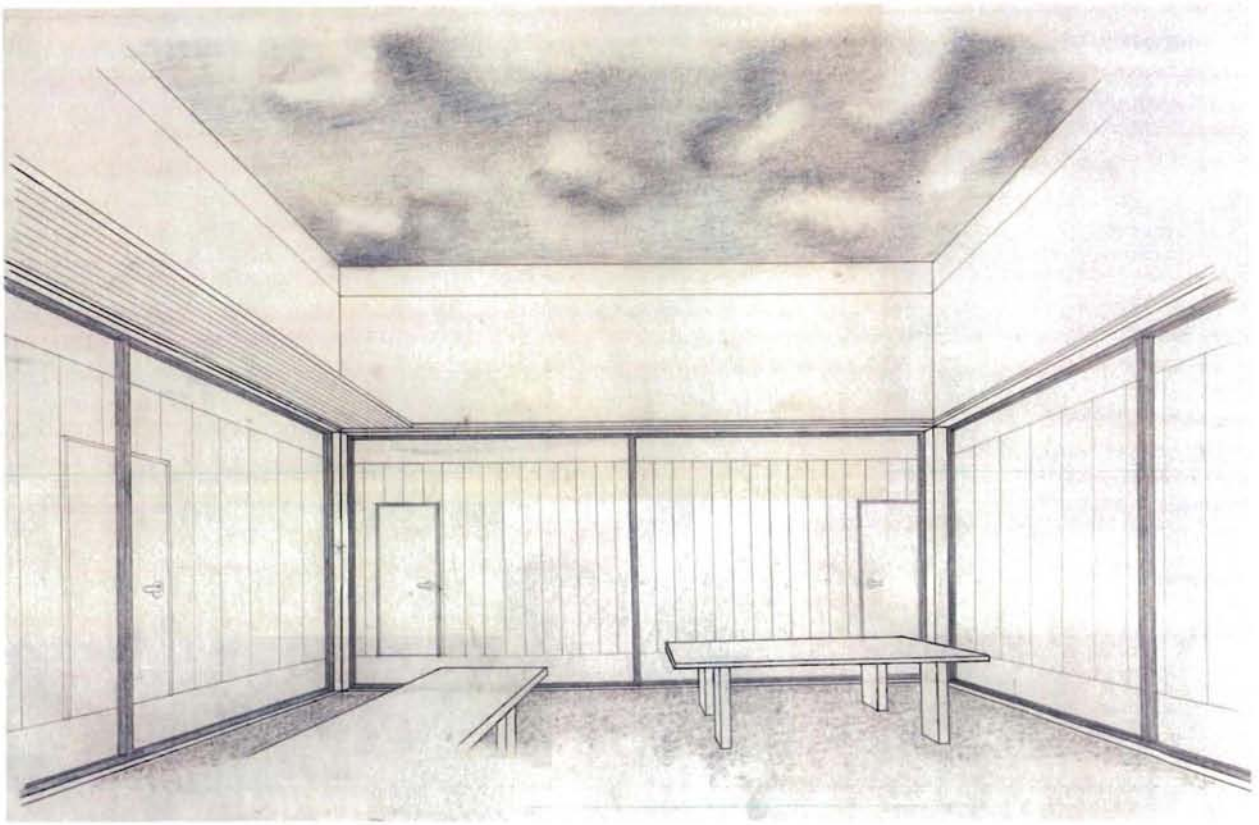
The drawing above is of the upper level floor plan. This plan shows the outdoor green roof, the interior courtyard in the building to the left, and the roof plan of the courtyard canopies. The lower image of the overall site shows the placement of the building in relation to the existing vegetation and roads, the proposed gardens (in purple), other proposed vegetation, the parking lot, and the exterior spaces.



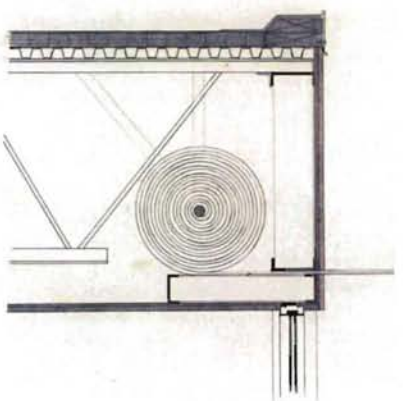
This is the long section that passes through each of the three buildings and both of the courtyards. It shows the overall relationship to the ground and the relationship between the different buildings and spaces. The drawing above is the entire section, and the drawings below are the same sections enlarged to show more detail.

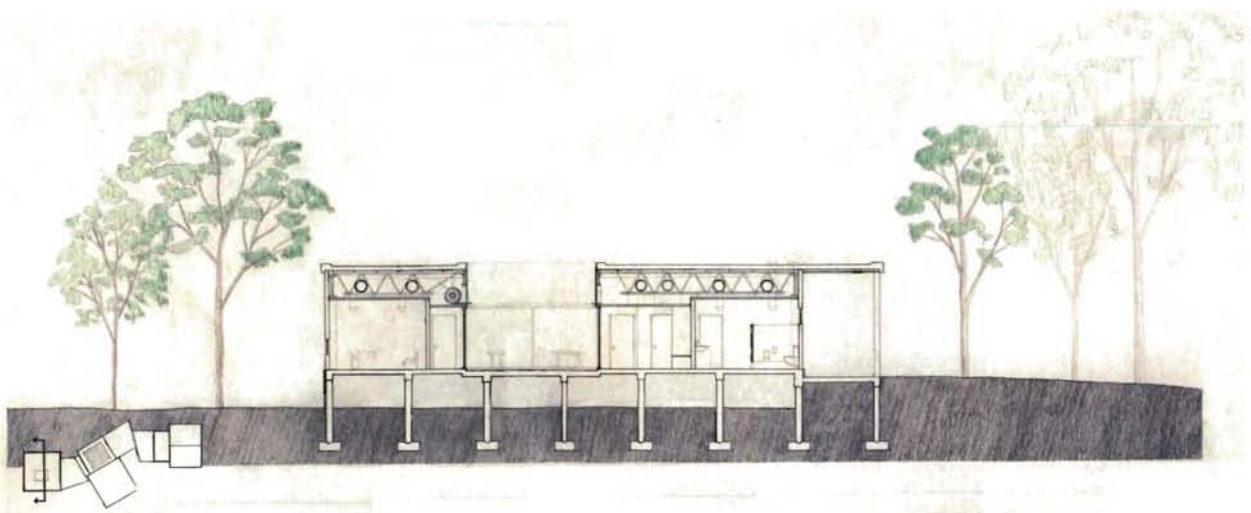


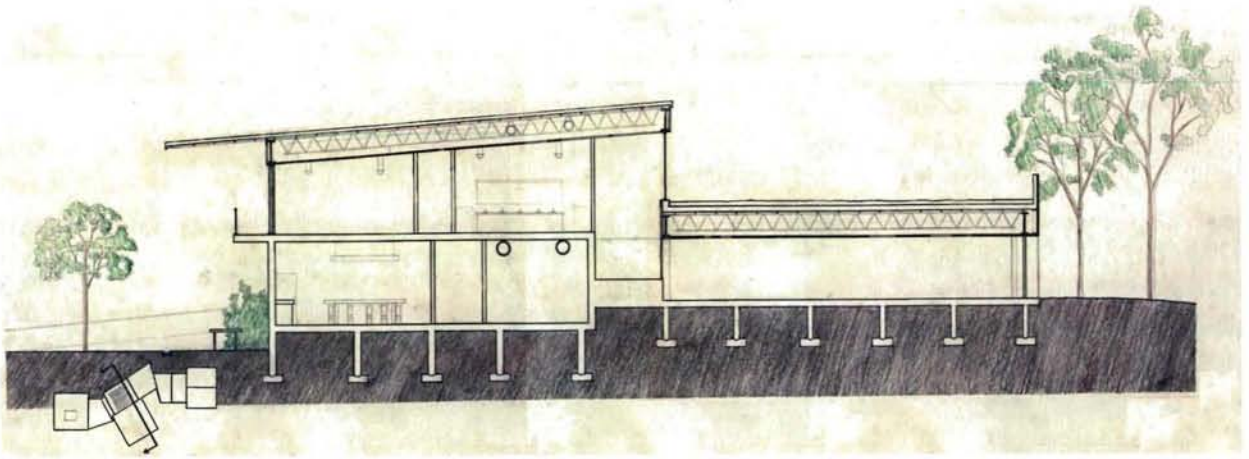


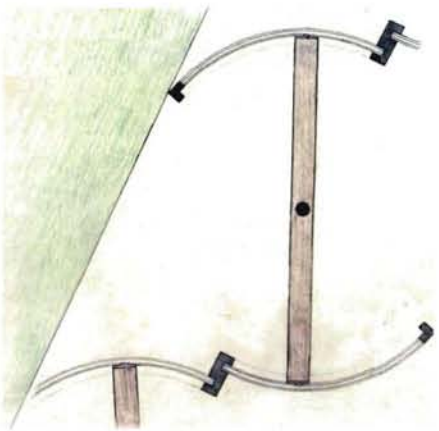


The drawing above shows a view out from the interior courtyard in the first "private spaces" building. The courtyard is open at the top, with a retractable sun shade that pulls out overhead to allow the occupants to adapt the courtyard to changing environmental conditions (a section detail of the retractable sun shade is shown to the right). The drawing below is a section through the entire first building which houses most of the small and more private spaces within the design (thus it is referred to as the "private spaces" building).

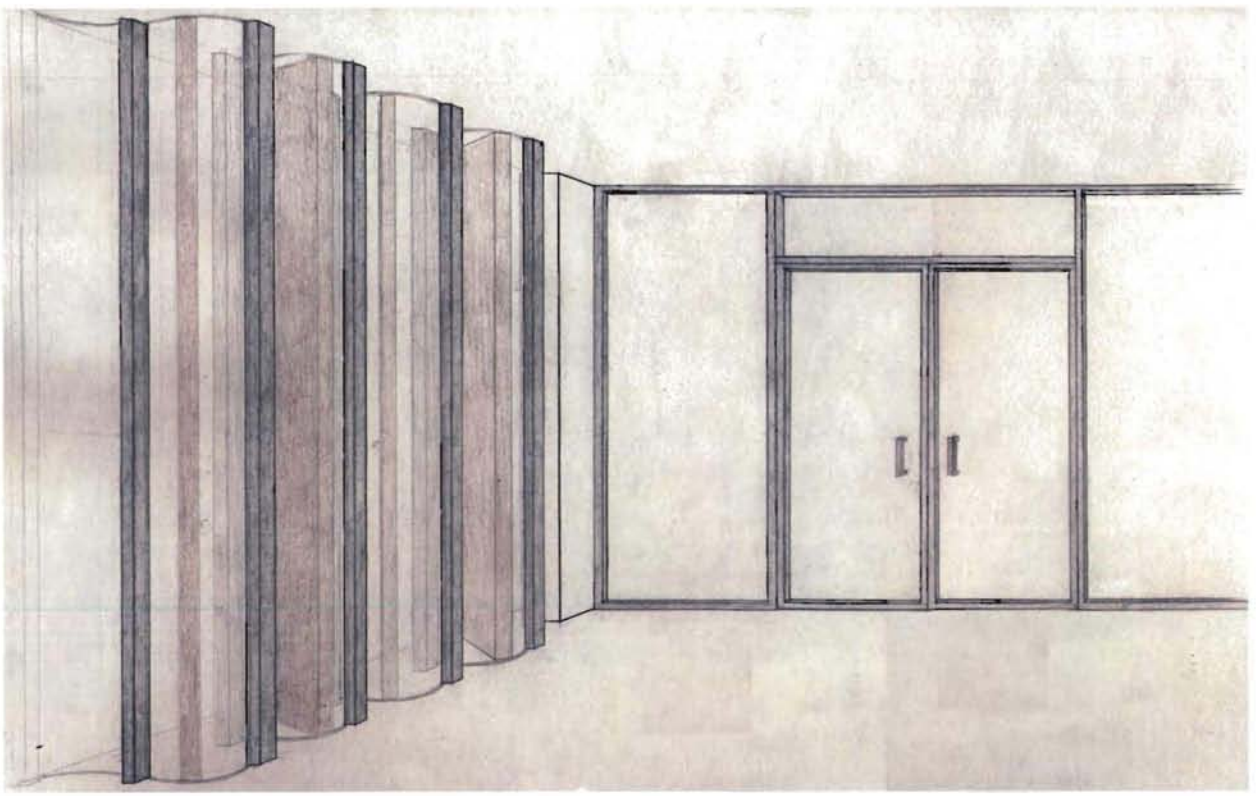


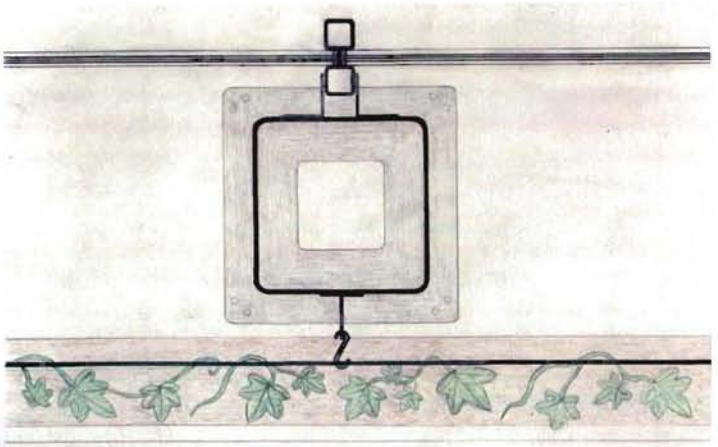




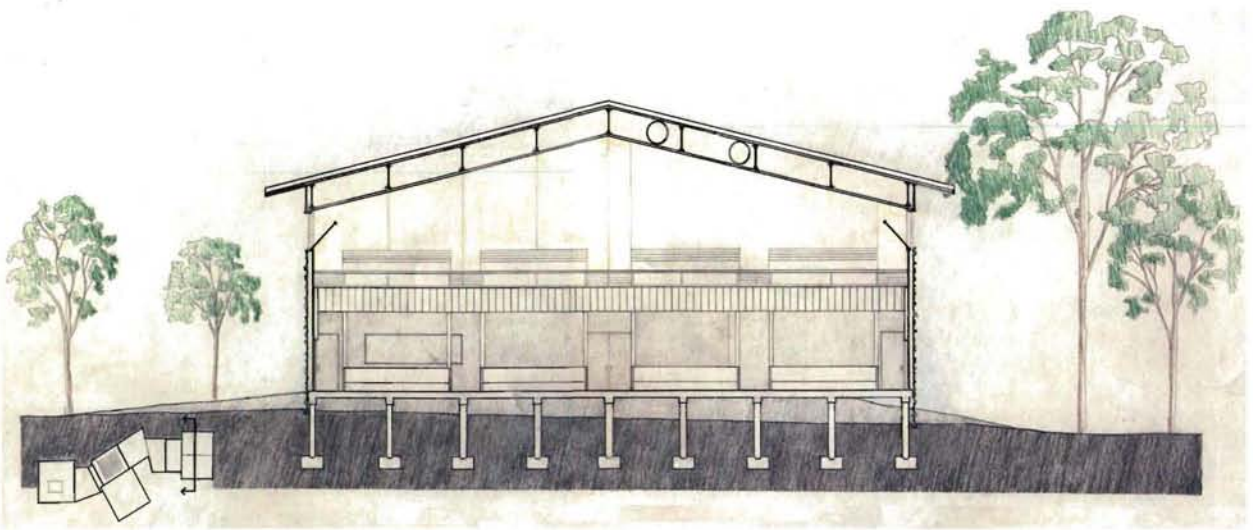


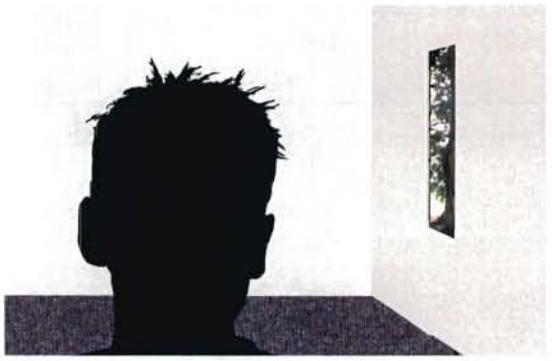
The above drawing is a section through the "communal spaces" building, which is where the community spaces such as the lobby and parish hall are located. The spaces are located at different heights so in the case of a flooding situation where the water keeps rising the occupants can continually move up the building and stay dry. The detail to the left is a plan of the louvered window system that allows the occupants to vary the views out and the amount of light in the space by rotating the wooden panels. The bottom drawing is a perspective view from inside the parish hall looking along the louvered wall and out the door.

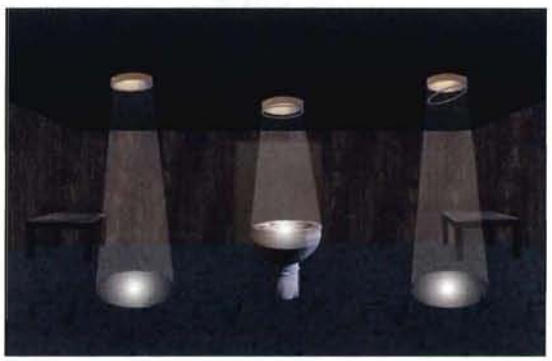




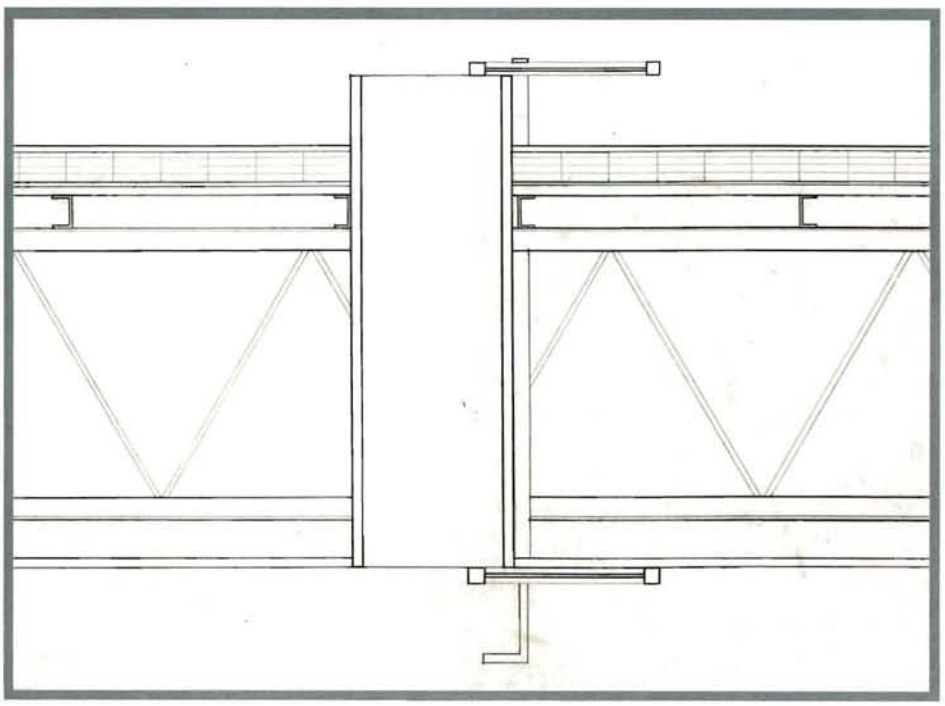
The top detail drawing is a plan view of the wall of the sanctuary. On the inside of the wall a layer of translucent glass (the top dark line in the drawing) is attached to a tube column which is then attached to a screen with vegetation growing on it (the lowest dark line with leaves). The drawing directly below the detail is a perspective view looking along the inside wall of the nave. The walls of that "sacred space" show variations of light and dark creating a sort of dappled light effect. The open windows along the top and the view of the roof edge from a person's point of view are also important to that space. The drawing below is of a section through the "sacred space" showing the entire building.

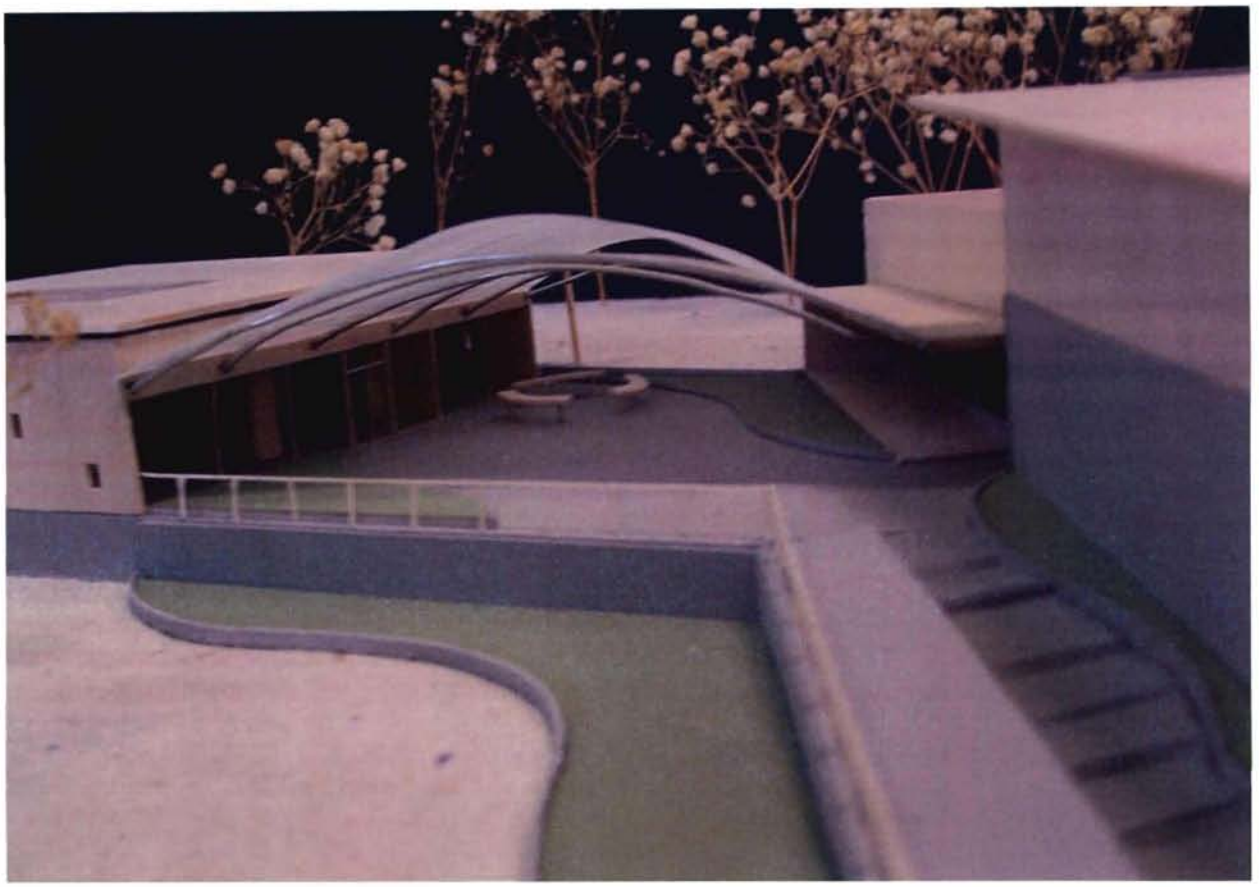




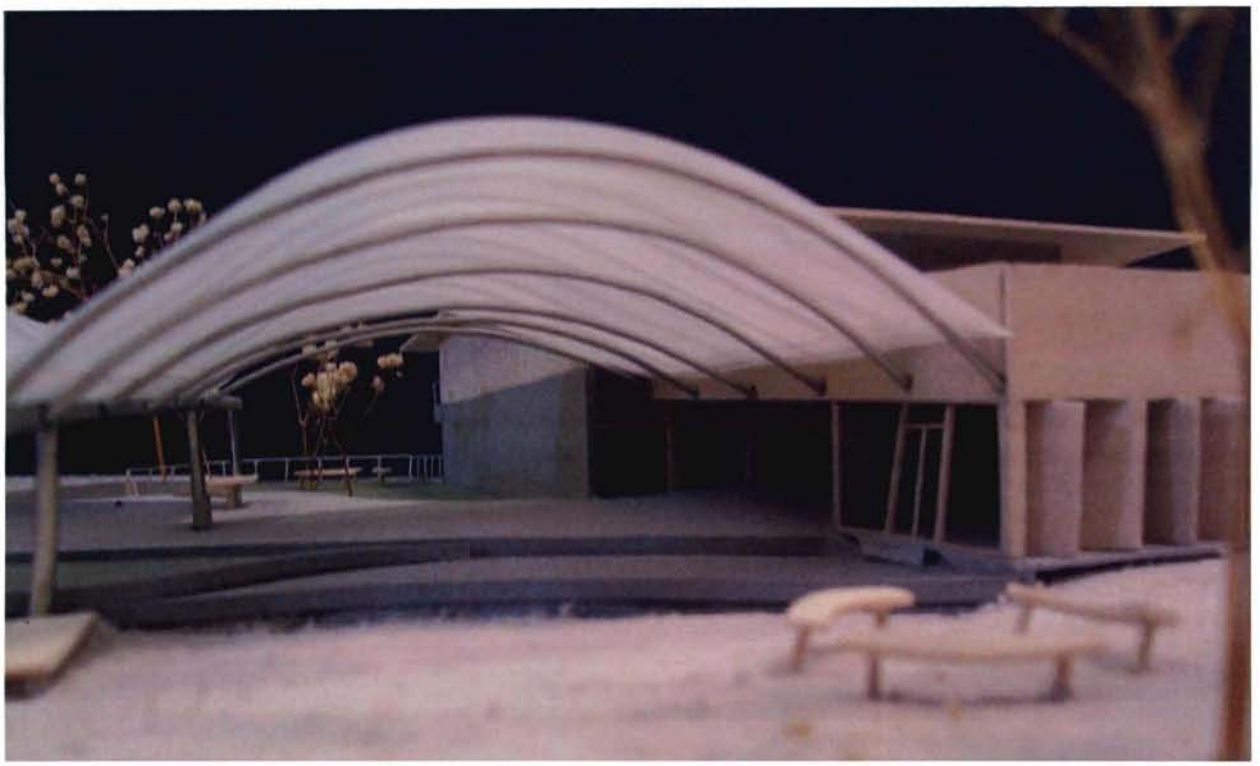


The three images to the left show specific areas, views, and effects within the final design proposal. The top image is a view of the small courtyard looking out to the trees in back. The middle image is a view of one of the offices in the "private spaces" building. This image shows how small openings in the wall let the users see only a specifically framed view of the external environment, which allows them to continually register the changes that occur outside. The third image is a view of the narthex. This space is dimly lit, with three circles in the ceiling that let light in from outside. These light tubes let light in at all times, but users can also let other elements in (such as rain and wind) and adapt to the external environment by moving a handle. The detail drawing of the light tube is shown in the section below.

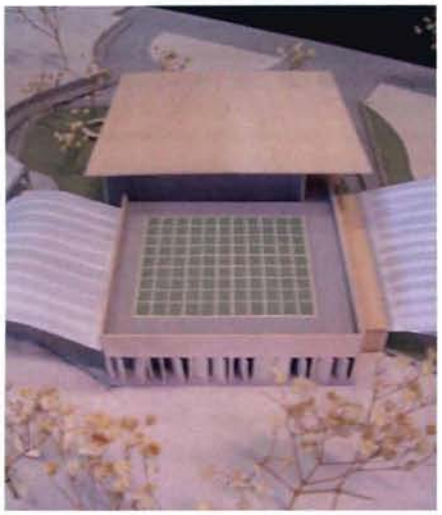




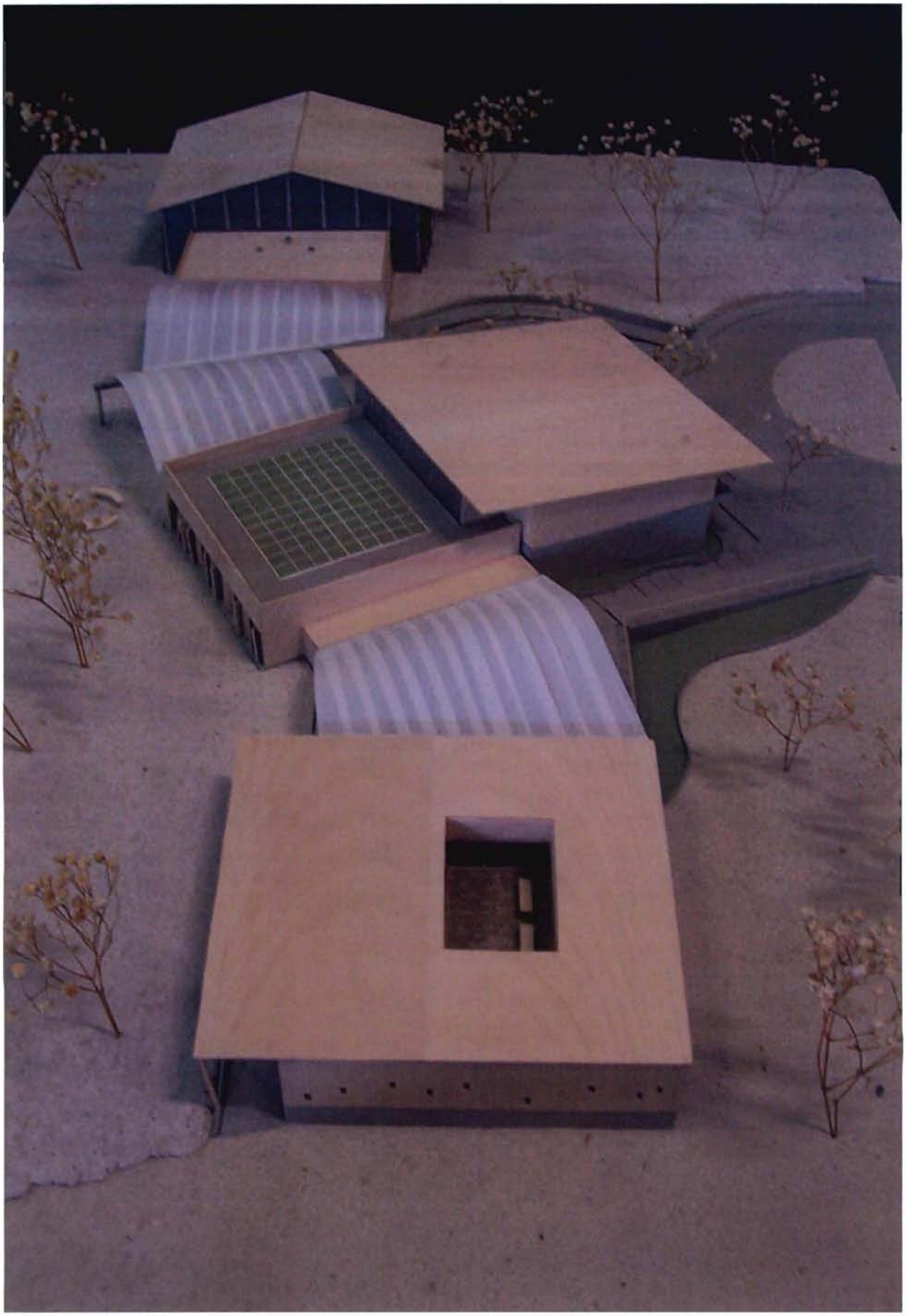
This and the following pages are images of the final model of the building proposal. The above image is of the small entry courtyard. The smaller image to the left is the "private spaces" building, showing the ramp that can be taken if entered from the road and the punched out windows that frame specific views for the occupants. The small image at the bottom is a view of the "private spaces" building with the roof off, showing the interior spaces and the interior courtyard.



The image above is a partial view of the larger courtyard taken from the back (or East) side of the building. The image below is also of the larger courtyard (taken from the West side of the building) showing one of the entries and the grassy outdoor play area (shown in green).



The image to the left is a bird's eye view of the communal spaces building, showing the green roof above the lobby. The smaller image below is of the sanctuary with the wire representing the screen and vegetation that occurs along the outside of the wall. The large image at the bottom gives a view from the back of the building (the East), looking at the louvered window system of the parish hall. The image on the following page is of the entire model and site.



conclusion

As I look back on the entire process I went through this past year, the thesis topic seems to pervade my thinking throughout the entirety. The process took me from one end of the spectrum to the other, focusing on extreme conditions one day while thinking about nuanced conditions the next. Finding that mix between the extreme and the everyday conditions was one of the biggest challenges for me throughout this entire process.

When I first thought about where my thesis project would end up, I would never have guessed it would have gotten to where it did. Looking back, I am glad that the thesis went in this direction. The issues I examined where important and exciting to me, and I enjoyed the work I did throughout the year.

One huge challenge during my process, however, was the fact that I didn't have a physical site until second semester. When everyone else was finding their sites and really getting to understand them I was working on the pavilion studies. Once I did have a physical site, there wasn't time set aside that I could use to analyze it as fully as I wanted or needed. As I was trying to understand my site, many other things were going on and I had a difficult time doing a thorough site analysis.

Looking at the final building proposal, I think the thesis was achieved through the building relatively well. In the end, spaces were created inside and out that aided an occupant in perceiving and realizing the changes in the environment. The building itself acted as a mediator between the inside and out, filtering and adapting to the changing conditions in a number of ways. In retrospect there are still a number of shortcomings in the proposal however, along with aspects that I would definitely do differ-

ently if I could do them over.

One of the biggest problems that stands out to me in the final design proposal is the site. There needed to be more thought about the design of the exterior spaces along with the rest of the site in general. The parking and large gardens were missed opportunities to continue expanding on the thesis proposal and tie the whole site together. There could have been more specific attitudes taken toward outdoor seating, the areas that people could spill out into, and the environmental conditions that could be celebrated and incorporated in the design of each of those areas. The site should have played one of the most important roles in this thesis investigation, and I don't think it really got elevated to the level to which it needed to be.

Another shortcoming of the project is the fact that the conditions which were mediated between the interior and exterior were somewhat limited in scope. I believe this relates to the idea about the conditions analyzed on the site not playing as large of a role as they needed to. Most of the conditions that are mediated in the project deal with light and view. Although there were some techniques that focused on wind and rain, these weren't as obviously expressed and didn't seem to hold as much weight in the final proposal as light and view. These other conditions were thought about during the process, but their importance wasn't demonstrated in the final design as much as they needed to be.

A third weakness in the project is the overall form of the building. This is one step in my process that wasn't so successful, as the site conditions and thesis should have influenced this outcome much more than it did. I am a little disappointed in retrospect, that the formalization of the building didn't go further than it did. This is one area of design that I personally need to work on improving as I move forward in my architectural career.

One aspect of the project that I wish I could have continued to pursue was the design of a rectory for the church priest. The idea of a rectory was initially part of the program that could offer a more personal way for occupants to experience the changing external conditions, along with offering a design solution that could possibly be more mobile in times of extreme environmental conditions. The rectory was dropped near the end of the process, however, since the focus of the thesis was on the church and the rectory wasn't getting the attention it needed and deserved. The issues that the rectory could have developed still remain valid and interesting and are directions that I could see the thesis heading if it continues to be investigated.

end notes

1. http://www.m-w.com/
2. Lelyveld, Amy. "Tenting on Terra Nullius: The Work of Glen Murcutt." Architectural Design March/April 2004: 91.
3. Drew, Philip. Leaves of Iron: Glenn Murcutt: Pioneer of an Australian Architectural Form. Sydney: Angus & Robertson, 1991, 48.
4. Journal of Architectural Education 60(2006): 17.
5. Sackett, Russell. Edge of the Sea. Alexandria, VA: Time-Life Books, 1983.
6. Jones, Peter B. "Living with the Elements: The Korean House." The Architectural Review 09(2004): 84.
7. Ibid., 81.
8. Ibid., 80.
9. Lelyveld, Amy. "Tenting on Terra Nullius: The Work of Glen Murcutt." 92.
10. Ibid., 94.
11. http://freshstart.ncat.org/case/valmeyer.htm
12. Kessler, Helen J., and Nancy Skinner "Valmeyer, Illinois: The Potential for a Sustainable Community." Inland Architect 38(1994): 33-34. (9.5) Echavarria, Pilar M. Portable Architecture-and Unpredictable Surroundings. Barcelona: LINKS International, 2006, 34.
13. Lerner, Kevin. "Jennifer Siegal: The New Nomadism." Architectural Record October 2001: 71-72.
14. Metz, Tracy. "Why the Dutch are Dismantling Their Famous Dikes." Architectural Review 06(2006): 140.

15. http://www.waterstudio.nl/

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1. Metz, Tracy. "Why the Dutch are Dismantling Their Famous Dikes." Architectural Review 06(2006): 140-142.

2. http://www.waterstudio.nl/

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4. "Het nieuwe waterwonen." Vivenda

5. Melhuish, Clare. "Glenn Murcutt: Marika-Alderton House and Kakadu Landscape Interpretation Centre (With Troppo Architects), Northern Territory, Australia." Architectural Digest November/December 1996: 40-45.

6. Lelyveld, Amy. "Tenting on Terra Nullius: The Work of Glen Murcutt." Architectural Design March/April 2004: 90-95.

7. Fromonot, Francoise. Glenn Murcutt: Buildings and Projects. New York: Whitney Library of Design, 1995.

8. Drew, Philip. Leaves of Iron: Glenn Murcutt: Pioneer of an Australian Architectural Form. Sydney: Angus & Robertson, 1991.

9. Ogilvie, Megan. "How to Build a Tsunami-Proof Home." Toronto Star 5 June 2005: 1-3. http://www.prajnopaya.org/found_art060505.htm.

10. http://senseable.mit.edu/tsunami-prajnopaya/

11. http://architectureforhumanity.org/

12. Howe, Peter J. "Safe(r) in Sri Lanka." The Boston Globe 20 November 2005: 1.

13. Clausen, Meredith L. Pietro Belluschi: Modern American Architect. Cambridge: MIT Press, 1994.

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17. Architecture for Humanity, Design Like you Give a Damn. New York: Metropolis Books, 2006.

18. Russell, James S. "Rebuilding After Katrina." Architectural Review 06(2006): 130-138.

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1. Sackett, Russell. Edge of the Sea. Alexandria, VA: Time-Life Books, 1983.

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3. http://www.enviroliteracy.org/article.php/1128.html

4. Haslam, S.M. The River Scene: Ecology and Cultural Heritage. Cambridge, United Kingdom: Cambridge University Press, 1997.

5. Bourne, Joel. "Louisiana's Vanishing Wetlands: Going, Going...." Science 289.548615 Sep 2000 1860-1863. 27 Sep 2006 http://www.sciencemag.org/cgi/content/full/289/5486/1860

6. http://pubs.usgs.gov/fs/la-wetlands/

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books

Asensio, Paco. Stunning Houses. Barcelona, Spain: Loft Publications, 1999.

-This book shows modern houses in detail with sections, plans, and details about the design of each.

Architecture for Humanity, Design Like you Give a Damn. New York: Metropolis Books, 2006.

-This book gives many examples of architects coming up with solutions to very specific problems.

Bahamon, Alejandro. Prefab: Adaptable, Modular, Dismountable, Light Mobile Architecture. New York: Loft Publications S.L. and HBI, 2002.

-This book discusses many projects that are portable/movable, which is an aspect this project may also include.

Brayer, Marie-Ange, and Beatrice Simonot. Archilab's Futurehouse: Radical Experiments in Living Space. New York: Thames & Hudson Inc., 2002.

-This book contained an interesting project that was directly affected by the weather and seasons.

Changnon, Stanley. The Great Flood of 1993: Causes Impacts, and Disasters. Boulder, CO: Westview Press, Inc., 1996.

-This book is about the Mississippi Flood of 1993 and how it affected the surrounding land, environment, and ecology.

Clausen, Meredith L. Pietro Belluschi: Modern American Architect. Cambridge: MIT Press, 1994.

-This book discussed the program precedent.

Daguerre, Mercedes. 20 Houses by Twenty Architects. Milan: Phaidon Press, 2003.

-This book gives detailed explanations and photos of houses from all around the world.

Drew, Philip. Leaves of Iron: Glenn Murcutt: Pioneer of an Australian Architectural Form. Sydney: Angus & Robertson, 1991.

-This book is about the work of Glenn Murcutt, whose work is discussed in one precedent.

Echavarria, Pilar M. Portable Architecture-and Unpredictable Surroundings. Barcelona: LINKS International, 2006.

-This book gave examples of portable architecture, especially floatable ones which could possibly pertain to this project.

Friedman, Avi. The Adaptable House. New York: McGraw-Hill, 2002.

-This book discusses strategies for programmatic adaptation of a house.

Fromonot, Francoise. Glenn Murcutt: Buildings and Projects. New York: Whitney Library of Design, 1995.

-This book is about the work of Glen Murcutt, whose work is discussed in one precedent.

Haslam, S.M. The River Scene: Ecology and Cultural Heritage. Cambridge, United Kingdom: Cambridge University Press, 1997.

-This book gave a large amount of information about rivers and their connection to the rest of the environment.

Hyde, Richard. Climate Responsive Design. New York: E & FN Spon, 2000.

-This book discusses strategies used in designing for tropical climates.

Journal of Architectural Education 60(2006): 3-74.

-This journal has many different articles containing a wide variety of insights about the effects of Hurricane Katrina, one close to home natural disaster.

Pearson, David. The Natural House: Creating a healthy, harmonious, and ecologically-sound home environment. New York: Simon and Schuster, Fireside, 1989.

-This book discusses strategies used in ecological design.

Sackett, Russell. Edge of the Sea. Alexandria, VA: Time-Life Books, 1983.

-This book contained basic information about the relationship between the land and water and the various environments that are created there.

Smith, Courtenay and Sean Topham. Xtreme Houses. New York: Prestel Publishing, 2002.

-This book looks at a variety of houses using out of the ordinary houses.

Sternberg, Eugene and Barbara Sternberg. Community Centers and Student Unions. New York: Van Nostrand Reinhold Company, 1971.

-This book looks at different types of community centers and student unions.

Richardson, Phyllis. New Spiritual Architecture. New York: Abbeville Preee Publshers, 2004.

-This book shows recent religious work from all around the world.

Tiner, Ralph. Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification, and Mapping. Boca Raton, FL: Lewis Publishers, 1999.

-This book discusses wetlands and the different kinds of plants and wildlife that live in different kinds of wetlands.

articles

Anderton, Frances J. "Jungle House." The Architectural Review 06(1991): 42-47.

-This article gives an example of a home that respects the environment and surrounding nature.

Bourne, Joel. "Louisiana's Vanishing Wetlands: Going, Going...." Science 289.548615 Sep 2000 1860-1863. 27 Sep 2006 http://www.sciencemag.org/cgi/content/full/289/5486/1860

-This article was very informative about what was happening to Louisiana's coast and what is being done to fix the problem.

Carlson, Victoria. "Talk of the Town: Dialogue and Design at the Valmeyer
Charette." Inland Architect 38(1994): 30-32.

-This article discussed the flooded town of Valmeyer and how it dealt with the moving and redesigning process.

Carlson, Victoria. "Their Town: The Remaking of Valmeyer." Inland Architect 38(1994): 25-29.

-This article discussed the flooded town of Valmeyer and how it dealt with the moving and redesigning process.

Chang, Chaya. "Building strength: updated design trends and products lead to stronger, safer structures.(Coastal Building)." Qualified Remodeler 31.4 (April 2005): 36(4). InfoTrac OneFile. Thomson Gale. University of Detroit Mercy. 6 Oct. 2006 <http://find.galegroup.com/itx/infomark.do?&contentSet=IAC-Documents&type=retrieve&tabID=T003&prodId=ITOF&docId=A132181984&source=gale&userGroupName=lom_udetmercy&version=1.0>.

-This article gave general guidelines that are being followed concerning design for hurricane weather.

"Het nieuwe waterwonen." Vivenda

-This foreign article contains detailed photographs of the interior of one precedent.

Howe, Peter J. "Safe(r) in Sri Lanka." The Boston Globe 20 November 2005: 1.

-This article discusses some negative aspects of one precedent.

Jager, Erik. "Hightech Watervilla in Aalsmeer." Eigen Huis & Interieur June 2005: 144-153.

-This article contains plans and photographs of one precedent.

Jones, Peter B. "Living with the Elements: The Korean House." The Architectural Review 09(2004): 80-85.

-This article illustrates ways in which Korean architecture respects nature and exists in harmony with it.

Kessler, Helen J., and Nancy Skinner "Valmeyer, Illinois: The Potential for a Sustainable Community." Inland Architect 38(1994): 33-34.

-This article discussed the flooded town of Valmeyer and how it dealt with the moving and redesigning process.

Lelyveld, Amy. "Tenting on Terra Nullius: The Work of Glen Murcutt." Architectural Design March/April 2004: 90-95.

-This article discusses the theory behind much of Glenn Murcutt's work.

Lerner, Kevin. "Jennifer Siegal: The New Nomadism." Architectural Record October 2001: 71-72.

-This article introduces Jennifer Siegal and some of her mobile architecture.

McClure, Michael, and Ursula Emery McClure. "Hybrid Tectonic Nature: Terra Viscus." The Art of Architecture/The Science of Architecture (2005): 583-588.

-This article discusses the relationship between natural waterways and humans. It discusses how we try to live near and control our waterways, while at the same questioning whether that is the best response.

Melhuish, Clare. "Glenn Murcutt: Marika-Alderton House and Kakadu Landscape Interpretation Centre (With Troppo Architects), Northern Territory, Australia." Architectural Digest November/December 1996: 40-45.

-This article gives very specific information about one precedent.

Metz, Tracy. "Why the Dutch are Dismantling Their Famous Dikes." Architectural Review 06(2006): 140-142.

-This article gives an example of a society that has lived with water it's entire existence and how it has dealt with it. In this article also was an brief introduction to one precedent.

Metz, Tracy. "Float On." Surface: 44-45.

-This article gives detailed information regarding one precedent.

Ogilvie, Megan. "How to Build a Tsunami-Proof Home." Toronto Star 5 June 2005: 1-3. http://www.prajnopaya.org/found_art060505.htm.

-This article contains information about one precedent.

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-This article was a short description of a project that was designed with the climate of the area in mind.

Penland, Shea. "Taming the River to Let in the Sea." Natural History Magazine Feb 2005 28 Sept 2006 <http://www.naturalhistorymag.com/0205/0205_feature2.html>.

-This article gave more in depth explanations about what was happening in Louisiana along with the history of that area.

Russell, James S. "Building a Better Gulf South." Architectural Review 06(2006): 112-129.

-This article gave me insight into the effects that Katrina had on the community as a whole, as well as the various ideas about rebuilding.

Russell, James S. "Rebuilding After Katrina." Architectural Review 06(2006):
130-138.

-In this article are the winning designs of a competition held for a new housing complex and house prototype in New Orleans.

websites

http://architectureforhumanity.org/

-This is the homepage for Architecture for Humanity and shows many of their projects (including both new projects and competitions).

http://earthasart.gsfc.nasa.gov/mississippi.html

-This website gave a bird's eye view photograph of the Mississippi River delta.

http://freshstart.ncat.org/case/valmeyer.htm

-This article briefly discussed the town of Valmeyer

http://pubs.usgs.gov/fs/la-wetlands/

-This page discussed Louisiana's wetlands and their resources.

http://senseable.mit.edu/tsunami-prajnopaya/

-This packet outlines the basic concepts and goals of one precedent.

http://soils.usda.gov/survey/online_surveys/louisiana/index.html

-This webpage gave links to soil surveys for the parishes of Louisiana.

http://www.blueplanetbiomes.org/climate.htm
-This website showed where different climates existed around the world and more in dept information about what those labels really meant.

http://www.enviroliteracy.org/article.php/1128.html
-This discussed hypoxia (the dead zone) in the Gulf of Mexico.

http://www.nemw.org/louisiana.htm
-This was the website for the Northeast Midwest Institute which discussed the ecology of Louisiana and gave a very useful map.

http://www.m-w.com/
-This website is for Merriam-Webster's Online dictionary and thesaurus that I used throughout the thesis book.

http://www.pbs.org/now/science/neworleans.html
-This webpage generally discussed various aspects of the Mississippi River.

http://www.waterstudio.nl/
-This is the homepage for Waterstudio.NL, a firm that works with building on water.