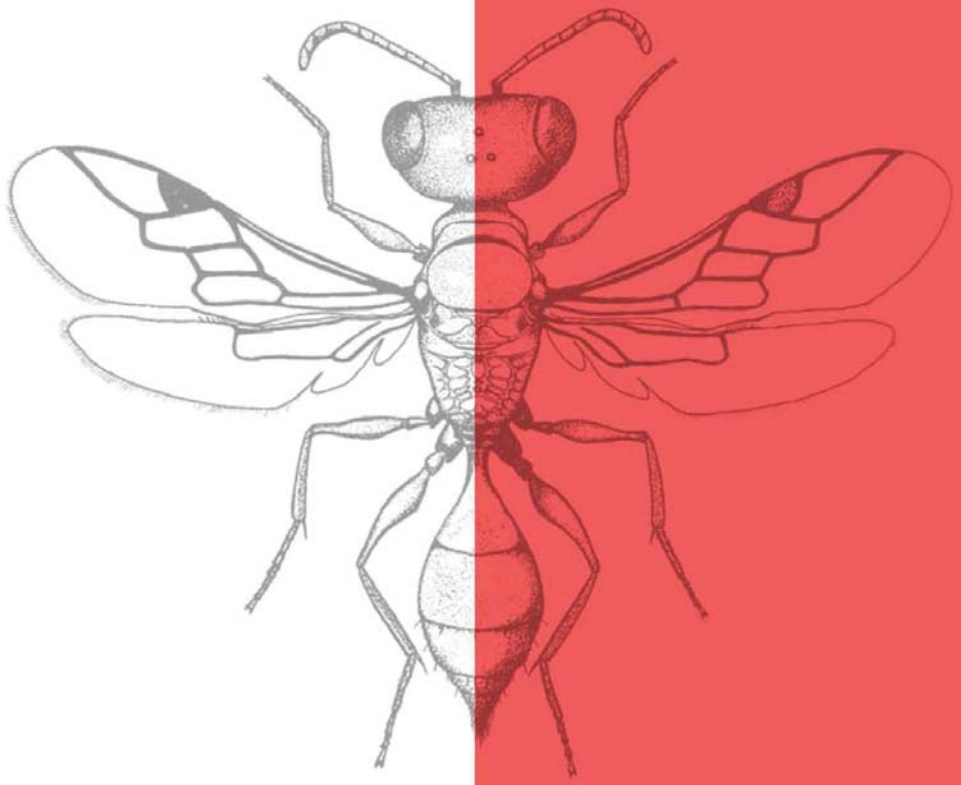
architecture
insectness



BRIAN CURTIS

THESIS

IS IT POSSIBLE TO ACHIEVE ECOLOGICAL STAINABILITY THROUGH WHILE OPTIMIZING MATERIAL USAGE COMBINED WITH THE INTEGRATION OF THE BUILDINGS SYSTEMS?

BASED ON THE IDEOLOGY OF INSECTS, INTEGRATING ARCHITECTURAL MATERIALS WITH THE BUILDING SYSTEM COMPONENTS, ECOLOGICAL EFFICIENCY CAN BE ACHIEVED IN THE ARIZONA DESERT.

ARCHITECTURE AS AN INSECT.... A VISUAL APPROACH TO VIEWING ARCHITECTURE

THEORY

What is our foundation for viewing architecture as form and form as architecture? Establishing a set of guidelines is important to evaluating architectural character and efficiencies. For the purpose of

discussion for this thesis, the principles of insects will be applied to building characteristics. Environment, ecology, tectonics, materials, and sustainability will become the theoretical framework as buildings become insects. The design objective for the study is to create a cohesive marriage between building materials and the climatic issues of the Arizona Sonoran Desert. Viewing, the building systems of the project as living organism proposes that buildings live within their environment. This exploration leads us to ask.... Can buildings function self sufficiently within their environment just as insects do?

As a metaphoric design tool, focuses on the native insects of the Arizona Desert have been limited to the Harvester Ant, Wasp, and Bee. Insects are considered one of the most economical forms in nature. There is virtually no wasted material in the insect makeup. Every component of the insect has a role in order to survive. The efficiency of the insect's structure and skin can be applied to architecture forms as well. This economic principle focuses on the architectural use of materials combines with the buildings systems and structure. Optimizing the components of the building maximizes the efficiencies of the projects.

Explanation of the "Architectural Insect" is not a tangible figure that one continually sees in a natural environment. Rather it is an architecture for or understanding of architecture that portrays insect characteristics. The architecture has an Insectness quality. Viewing architecture as an insect requires a general

understanding of insects. The word insect tends to reflect a certain bug or form in our mind which we are familiar with. Maybe it was a bug we held as a child or were bitten by. The insectness of architecture is not literal where one is looking for specific elements of an insect such as the head, thorax, and antenna. Although components like this do exist in some structures it is the ideology of the insect we seek.

Frank Gehry's Fish Restaurant in Kobe is a literal representation of a fish, maybe a carp of some sort. The representation of this structure doesn't allow for must interpretation of the structure other than what it is.....

a fish. Looking closer at the form, the action of the object provides an interesting point for discussion. If we view the building as a frozen moment in time or snap shot, what is the gesture of the fish representing. Is it theoretically attached to a line as it comes out of the water? Has the fish just penetrated the surface of the water capturing an insect? Is the fish swimming beneath the water surface? A less literal approach is Gehery's Golf Fish sculpture at the Villa Olympia in Barcelona. This structure is a figurative representation of a fish…. or is it an airplane, blimp, or balloon; allowing the viewer to introduce their own imaginative thought process.

The way and season of the year can aid in dictating the way a structure appears within the context of the landscape. Differences between day and night, clear and overcast days can change the perception of the architectural characteristics. For example, a structure with expansive wings or grand gestures that is situated the Arizona desert may be viewed as compressed or hunkered down to escape the heat of the sun during the summer months. Insects will often burry into the ground to gain the cooling properties of the earth. During the spring, this same structure may appear to be emerging from its winter home, ready to take flight. The impact of the environmental elements influences how we perceive structures in their habitat.
Insectual properties of structures often dictate the behavior in which architecture is viewed as either prey or predicator. Based on the social interaction of insects, aggressive and passive characteristics are prevalent among the different species. Architecture forms have similar characteristics as they relate to the surrounding context. The design, shape, size, and materials often portray a subtle elegance or aggressive form creating dominance within the surrounding context.
Contextually guided, the habitat of the structure is a determinant factor when viewing the architecture form based on the subtleness or aggressiveness of its surrounding context. Habitat context can range from

an urban setting to gently rolling hills, mountains to the rigid desert landscape. Additionally, the climatic conditions of the habitat have an impact on the micro

and macro appearance of the structure and are largely attributed the scale of the surrounding context.

Our abilities to experiment with different materials, portraying them in ways they are not typically used,

combined with contextual relationships provides for an excellent design opportunity. Understanding the limits of the materials one can experiment with structure and form, accomplishing economical form.

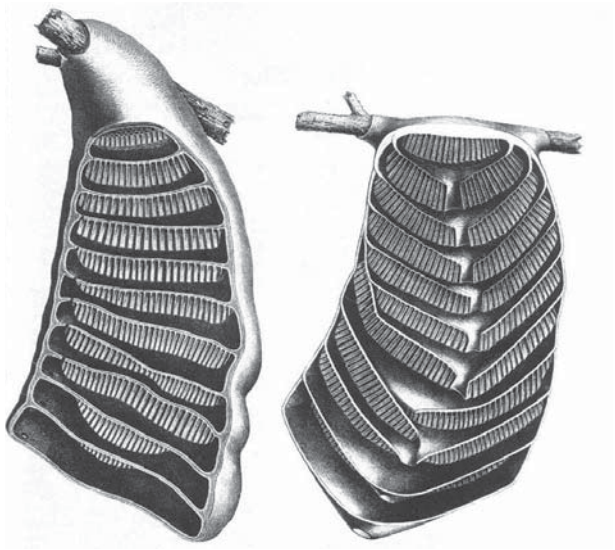
Physical architecture becomes the device for evaluating the built environment through the ideology of the insect. How can the economics of insects be dissected to into architecture form?

The insect as an economical form provides architecture with a foundation for understanding the perception of form, space, and materials of the built environ ment.

ENVIRONMENT

How the building is becomes an object in the landscape is important to the theory of Insectness. Buildings often inherit the characteristics of their natural environments just as insects. A structure crouched in the landscape takes on an idealistic appearance as an insect integrated into the landscape. This conceptual idea of insect in the landscape as a form of structure and space provides more than a single approach to visual architecture. The introduction of materials to the structure defines the spaces, thresholds of space and the experience. With the incorporation of the modern materials, the immediate context of the dictates the architecture identity and characteristic qualities as the form takes place. . The life span and longevity of a building relies on the environment in which they are built. Extremes of hot or cold, dry or wet conditions are important factors in determining the components for buildings within the respected environment. Just as insects are climate dependent, so are materials, mean/ methods, and systems.

Architecture with respect to the environment is dependent on the immediate context of the landscape



form and vegetation as well. How does the building interact with ground? Is the building nestled into the ground as if it were hunting its prey, ready to pounce, or is the building the prey itself, coward down until it is safe to forage. How well does the building camouflage itself with the surrounds or is it meant to brightly stand out. Does the building have expansive elements similar to the wings of flying insects or is the building compact, confined to the ground. The “Glass

House" by Phillip Johnson exemplifies camouflage as a Insectness quality. The structure seemingly disappears as it blends with the natural surroundings of the site. Buildings inherit Insectness qualities with based the interaction of the building with the site context. Position, orientation, and placement of the building within the context of the site sets the ground work for evaluating the integration of structure and context. This interconnected system of building and landscape now becomes the habitat.

TECTONICS

Tectonics is the expression of form and structure through materials; creating space and form as a built environment. One of the simplest natural representations of tectonics is the spider web. Spider's webs

are general constant of the same material yet ever web spun is different providing endless possibilities of form, space, and tectonic moments. How does the dynamic of the web change when a leaf or insect become attached? Does the tectonics of the structure inherit different properties? Does the debris attached to the web now become the material skin for the structure?

Viewing the tectonic moments as a singular architecture element is similar to finding the same shapes in the clouds as those standing around you. Tectonics exists within the eye of the individual. The viewer of the form decides the role of the tectonics in the structures clarity and inderstanding.

The expression of the tectonics of the project is the most influential aspect of the project. The details of the project begin as a micro level providing an intricate person to building relationship. Additionally, the tectonic exploration of the project is an understanding of the detail elements. Efficiency and clarity within the connections of structural and material components exposes the story of the projects process.

It is important to not confuse tectonics with details. Details are the actual representations of the connec tions of the systems. Detail becomes the node for the tectonic expressions.

MATERIAL

With a vast amount of options for building materials, the skin of the project is critical to the survival of the building. Not only are the materials themselves important, but the means and methods in which they are applied to the structure are vital and often climate dependent. Visually approaching architecture, the materiality of the project combined context of the habitat provides endless opportunities for expression. Boundaries of interior and exterior may become blurred as the object reached to camouflage itself with the surrounding environment, absorbing the surround. Materials change colors with the changing of the sun as the seasonal vegetation bloom. While possessing its own identity, the building becomes more integrated into the surrounding habitat as it absorbs the colors of the surrounding materials & vegetation.

Textures of individual materials relate the scale of the project to the human. Details in the material provide a micro level of connection and honesty of the material. For instance, in board form concrete, the concrete, during the curing process, absorbs the characteristics of the wood grain in the form. An honest process, yet the dynamic of the material is contains a texture that is not its own. Visually understanding the individual components or segments of the project as whole can help to identify Insectness characteristics in the overall form.

Construction materials of concrete, steel, and glass will be the primary focus of the thesis.
Instead, the eye focuses on the characteristics of how materials come together efficiently creating space and form.

INSECTS

One of the most amazing elements of the insect is an economical and diverse representation of form and structure. Of over the 750,000 species of insects, the general principle foundations are the same from species to species. The similar principles are what classify and insect. Insects consist of the least amount of material needed to survive, maximizing efficiency as movable forms. Every component of the insect plays a critical role in its survival; rather for protection to foraging. The consistency of the insect is architecture in itself. There is a structure, skin, and system that all allow the insect to function.

Buildings built in the shape of insects are not being proposed. However, the quest within our architecture is to accomplish the economic principles of the insect's structure and form. Throughout this thesis, the principles of ants, bees, and wasp will be evaluated into architecture.

ANT

Throughout the world, there are some 9,500 species of ant reordered. Ants are social insects with their taxonomy being based on the worker class. Ants rank among the principal granivores in the southwest United States with little variation in abundance between rainy and dry seasons. Ants, as individuals, are small with a dry weight of less than a gram. Their small sizes allow then to inhabit microclimates. Ants are part of a colony, which relies on limited resources to exist and exploits the majority of the earth's organisms. Structural efficiencies allow the common ant to carry up to 60 times its body weight, maximizing the economics of its form. The small size of the ant has a cost. Typically, ants heat up and dry out more quickly

than larger animals. Ants, as ectotherms, must remain within their "temperature envelope". When foraging, the temperature of an ant is greater than 10 degress C and must halt foraging when their temperatures reach 40 degreesC. Ants have an average temperature of 30 degrees C when foraging. In Desert environments, ants teed to be soils dwellers and aid in shaping the ecosystem as soin movers. Ants greatly affect the structure of their environments as "ecological engineers" rearranging the environment in ways that affect other organisms. In cool desert

locations, ants typically nest under stones, which retain warmth longer than soil. They also rely on these stones to heat their as environmental hot spots to heat their bodies.

Nest site availability exerts an important influence on ant productivity and community structure. The types

very in structural complexity of the habitat and dictate the types of ants that inhabit the area. Structurally simple habitats and soil types, influence any productivity and community structure.

Ants, unlike bees and wasps are unable to ventilate the nest do to the lack of wings and are unable to employ droplet evaporation techniques. They mainly rely on the location and construction of the nest to achieve automatic microclimate regulation. Colonies that nest directly in the soil directly benefit from the thermal properties or the ground at depths a few centimeters below grade. At these depths, both temperature and humidity are subjst to minimal fluctuation throughout the year.

HONEYBEE

Thermoregulation within honeybees is controlled in one of two wast. First, through the nest structure; designed to achieve long term control over a variety of environmental changes. Secondly, thermoregulation is controlled through short term behavioral responses of individual colony members to particular environmental perturbations. Unlike the elaborately constructed nests of ants, which are design to automatically regulate temperature and humidity, however, thermoregulation is the best controlled system for bees. Worker bees are able to generate a respectable amount of heat as a by-product of metabolism. Mechanisms for heat in cold weather are the fortion of clusters. The adjustment of cluster tightness is achieved as exterior temperatures drop. The central bees rapidly shake their abdomens to generate the majority of the heat where the outer bees serve as

an insulating shell. Workers bees cool the hives by fanning their wings circulating air over the combs at the nest entrance. Additional bees fan their wings to drive moist air away from the cells and out of the nest. Bees often place their bodies and beat their wings drawing air through the tiny channels of the batumen plates and driving it out through the nest

entrance. In the event the temperature of the nest continues to rise, adult females distribute collected water in droplets over the nest surface.

PROJECT

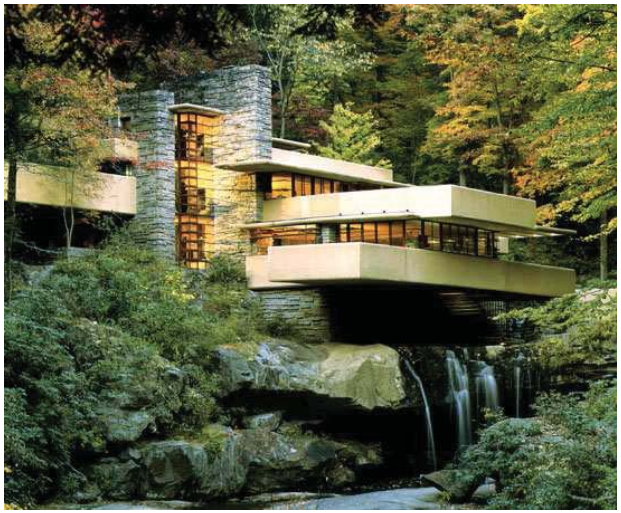
Strategies for solving the sustainable objective of the thesis are explored at a site located in the raw desert outside of Phoenix, Arizona. Introducing the programmatic problem of a Turf Research Facility will be the typology for Insectness architecture.

VISUAL APPROACH

The experience of the structure crouched in the landscape took on the idealistic integration or appearance of an insect about to attack its smaller prey. The conceptual idea of an insect in the desert landscape as a form of structure and space can

provide more than one approach to a visual form of architecture with immense architectural interpretation possibilities. As materials are introduced into the project, the different elements of the insect start to become more evident as spaces, thresholds, and experiences. The introduction of urban materials to the desert environment reflects modern forms and new possibilities of desert architecture. In looking at how different materials are used and how they come together to form spaces, experiences, and forms, the immediate context of the architecture dictates the structures identity and characteristic qualities. As these elements mesh together, the architecture portrays an insect ness.

The definition of urban materials is not set to a specific criteria. The combinations of different materials and the use of materials in a way they are not typically experienced starts to set the foundation



for the limitations and representation of the material. The definition of the material is what one feels portrays an urban feeling. The materials that are of a primary focus are concrete, steel, and glass. Through the exploration of these materials and the combination possibilities the desert can be brought into the building in a modern way that expresses the fusion of cold materials to desert rich environment. The boundary of interior and exterior becomes blurred almost as if the structure is attempting to some way camouflage itself with the environment. The difference in the materials is accented as they radiate color from the desert sun sets. The colors of the materials themselves change as do the colors

of the desert as the cacti bloom with other desert vegetation. The building starts to become one with its desert environment, while at the same time holding its own identity.

The textures of the different materials give the structures a human scale of detail. The form patterns on the different slabs of concrete and how the concrete was pored tells the story or portrays the honesty of how the project was built. These types of elements allow the viewer to understand the individual characteristics and identities of the building. This amount of detail in the material can be compared to a magnified photo of an insect's leg. Understanding the tectonic elements of the project, exposes the structures story and gives a clear understanding of the building.

The Arizona desert is nothing short of a home for endless architectural possibilities. The experience of raw, untouched desert is purely magical. How does one express the desert in words? The closest description of the vast character of the Sonoran

Desert comes from the introduction of Rick Joy's book Desert Works by author Juhani Pallasmaa:

The Sonoran Desert of the American Southwest is a landscape of hidden drama. Its scares an cracked soil is scorched by the merciless desert sun and eroded *by attacks of desert rain. Its plants exhibit spectacular strategies for collecting and preserving water and even more striking means of defending the acquired stock of this basic substance of life. The life forms adapted to the conditions of the Sonoran Desert project intriguing combination of aggression and beauty; the devices of defense and strategies of procreation turn into dazzling fireworks of color and form.*

Later, the landscape is described as radiant, desert beauty that extends towards tones and coloration of the air and sky. The atmosphere of the sunset

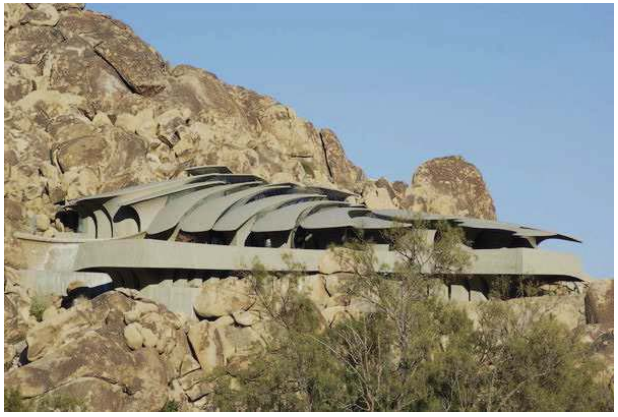
appears to reflect the colored air of the day. Out in the desert, it is almost as if nature slows down. The combination of the materials and the desert proposes a problem of how to use the desert to represent itself as architecture. The materials of the project hold the views of the desert from the inside out, while the exterior of the structure absorbs the desert habitation. Where the materials meet the desert, is when the urban environment is superimposed into the desert landscape in an attempt provide a single, yet complex project, containing a clash of natural and man made environments.

One of the most amazing elements of the insect is

how economical of a structure it is. The insect is made out of the least amount of material possible in order to survive. Every part of the insect (antenna, hair, feelers, etc.) plays a critical role in its survival; rather, it be needed for protection against larger predators or to capture food. In looking at architecture as an insect form, one can start to see

how the tectonics of the project expresses a great amount of an understanding of the building. The ant for instance, can carry up to 60 times its body's weight. In architecture most people have a general understanding of the strength of the material. It is probably the strongest material we as builders have today. In the near future, we may have the possibility of building with carbon-fiber material. Even though carbon-fiber is five time stronger than steel, in comparison to the ant it is not so impressive. This is not a proposition for building structures out of expensive materials that take on the form of an ant; rather, this is an attempt in providing a foundation of understanding in what possibilities form and materials are capable of possessing. It is almost a quest, to accomplish in our architecture what the insect accomplishes in its form, and structure.

The explanation of the architecture insect is not a tangible figure that one can see in the natural environment; rather, it is an architectural form that portrays insect qualities and or characteristics. The architecture has an insect ness quality to the form. The idea of viewing architecture as an insect must be approached through a creative thought and imaginative process. The word insect tends to bring a certain form to mind that one has probably held in their hand at some point and time in their life. The viewer of the architectural piece has to not look for specific insect elements such as antenna, thorax, head, etc..; rather, the eye should find the characteristics of how the materials come together to create form and space with imaginative insect qualities. Because the architecture is



not a direct example of an insect, like Frank Ghery's fish project. The form may not be viewed the same by ever person. Here the ability to think creatively and freely allows the viewer the opportunity to express the built form into words and expressions.

The way the structure is viewed can also dictate the way the form appears. It is almost like looking into the summer sky and finding certain shapes in the clouds. As the clouds coast across the sky, hey

change in form and appear different to every viewer. I am not suggesting that the architecture changes in form, but how the architecture is viewed at different times of the year, day to night, and clearness of the day can change its qualities and characteristics. If the building is visited during the heat of the Arizona summer, the structure appears to hug the ground as it drudges over a desert covered hill on its way to the lake below. The heat from the sun

above appears to almost push the building closer to t the ground. If the building is seen during the early spring months, it appears to be emerging from its winter home. The way and when the project is viewed in its environment influence the type and strength of the insect.

The integration of the building with immediate environment and surrounding area is a key element to how the building is viewed and perceived as its insectual properties dictate the aggressiveness of the architecture. The immediate and distant plays an important role in aggressive and nonageessive architecture as a representation in the form of insects as predators or prey. The forms ability to portray predator or prey insectual characteristics depends on the buildings adaptation to the area. The buildings interaction with the immediate context constitutes a relationship between form and environment. The rules for cauterizing the structure as a predator or prey apply for both the urban and desert insect.

If the surrounding context is aggressive or monumental, the architecture form tends to take on less aggressive structural elements catorizing the form as the prey. The context of the desert is fairly aggressive in itself. The aggressive context in the desert would be rugged cliffs, deep, gouged ravines or washes as a few examples. The building can be one of the most chaotic designs, but if it is placed at the base of large cliffs it does not appear to be as aggressive as it actually is. Here, the building would be the prey because the immediate context absorbs the predator characteristic elements of the site. In an urban setting, the large elements can be anything from tall buildings, freeways, to inner city mountains.

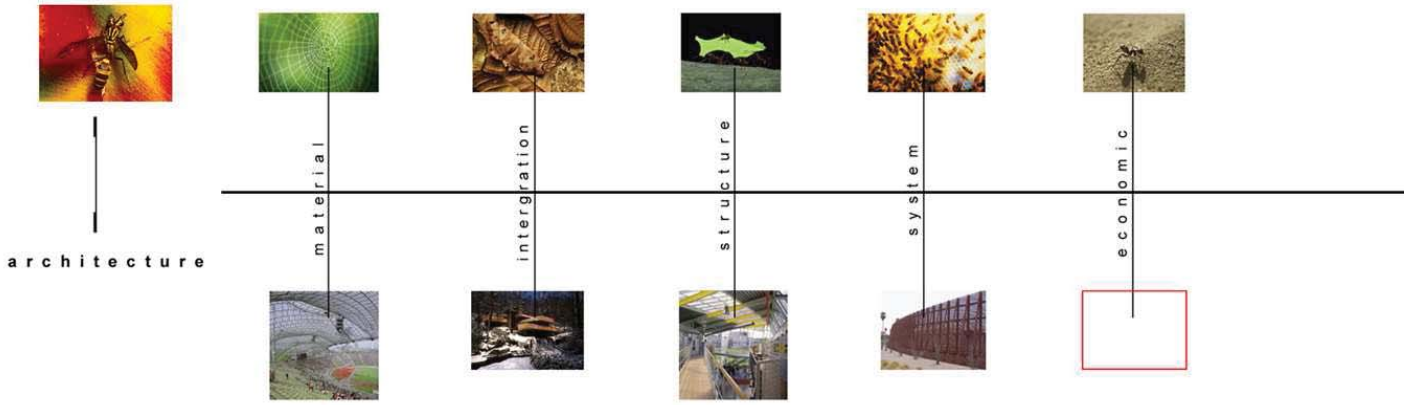
The ability to experience different materials in ways they are not traditionally presented combined with the intense desert environment provides an extraordinary design opportunity. Understanding the limits of the materials and their properties, one can start to experiment with structure and form. How can the architect express the maximum use of the material in both a structural and aesthetic honesty; yet still accomplish an economical form? The physical architecture starts to become purely a device for explaining the idea of the architecture or the ideology of the insect.

DESIGN OBJECTIVE

The design objective for the project is to explore materials in conjunction with the climatically issues of the Arizona Sornoran Desert. Exploring the materials and structural capabilities of the project, the opportunity to express the tectonic elements allows for an optimization of the architectural design. In addition to the materials study, the climatic exploration of the desert is vital to the survival of the project. Essentially, I am proposing a building that can function itself to achieve sustainability, just as the insect functions as an individual and as a singular part of the colony. As a design tool for the project I focused on the native insects of the desert, more in-depth the ant, wasp, and bee. The insect itself is probably the most economical form. There is virtually no wasted material on the insect and they need every element of their component make-up in order to survive. Architecturally, I am applying this principle of the insect to the material usage of the project. By optimizing the use of the materials in the project and by giving each more than one function, the building becomes more efficient from a functionality aspect of each individual material element. I have also applied the functions of the insect societies or colonies to the project as a means for organizing the project and program. One of the more influential aspects of the project is the expression of the tectonics. I intend for the project to be easily understood from a construction or structural view. Also, exploring the tectonics, the details of the project at a micro level begins to allow for an intricate understanding and add a sense of scale from building to person. In addition to the tectonic exploration of the project I am proposing how the visual appearance of the building interacts with the context of the site. How the building becomes an object in the landscape is important to the theory of this insect foraging through the desert floor in search of survival means; rather it is as a predator or prey. Also, the how the project reads by zooming in from a macro level to a micro level of visual impact. Aiding in the visual appearance will depend on the aggressiveness of the structure in how it is positioned on the site. Addressing the position of the building on site, I feel that it is important to explore the desert and the interaction of the structure as a single design opportunity or an interconnected system of landscape and structure. These strategies and objectives are explored on a raw desert site outside of Phoenix while exploring the programmatic issues of a Research Facility for the United States Golf Association or USGA.

THE PROJECT

FRAMEWORK



Insect- any of numerous small invertebrate animals that are more or less obviously segmented: any of a class of arthropods with well defined head, thorax, abdomen, only three pairs of legs and typically one or two pairs of wings

Insectile- resembling or being an insect

Insectness- of or having insect qualities

Economic- of, relating to, or based on production: having practical or industrial significance or uses

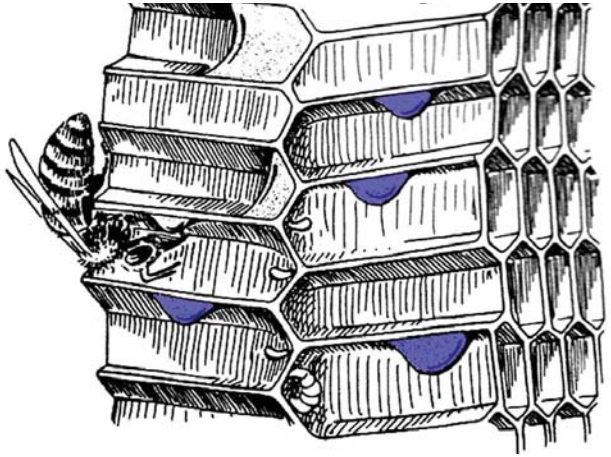
Program- a plan of procedure resulting in the elements contained as function in architecture

Form- the shape and structure of something as distinguished from its material

Space- a limited extent in one, two, or three dimension:

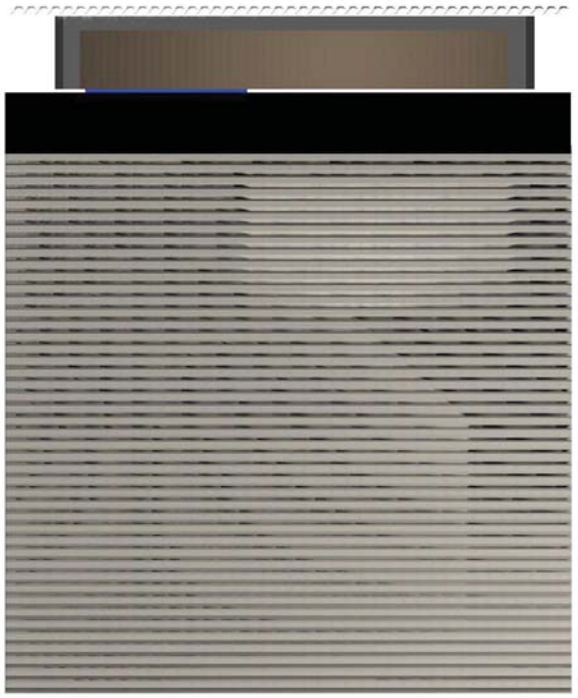
Texture- identifying quality

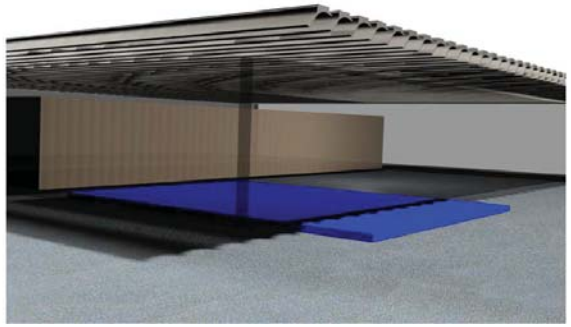
Material- having real importance or great consequence: the elements or substance or the parts of which something is composed or can be made

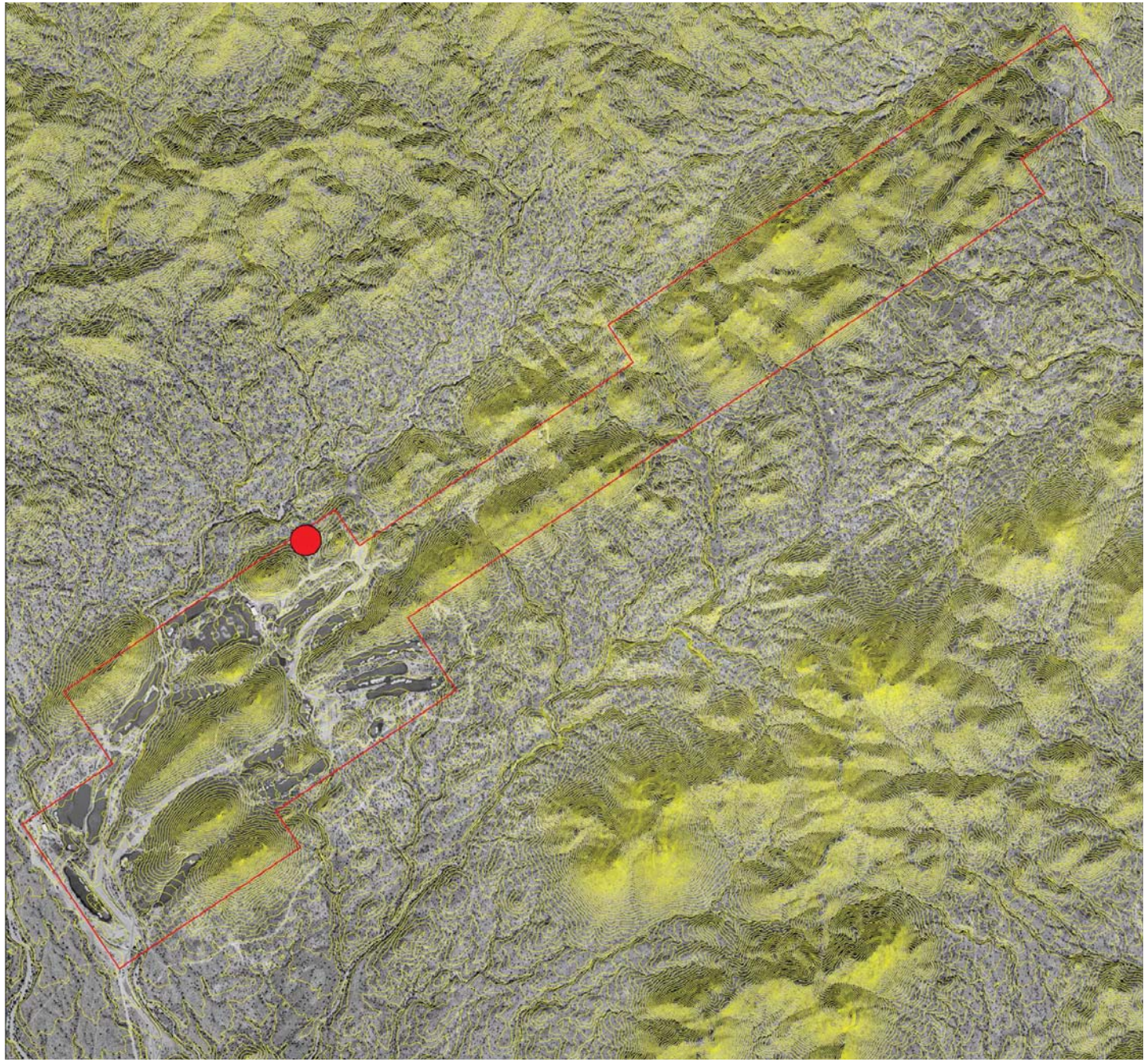


One of the more interesting aspects of the wasp community or colony is the way they cool the nest. The worker wasps forage out to find water and transport it back to the hive in their mouth. Once the water is brought in to the hive a system of wasps fanning their wings creates a cool air current through the hive cooling the colony in a matter of seconds.

Architecturally, the diagrams represent an explored idea of passive cooling by bringing air into the project over water elements and exiting through the roof system. The openness of the roof also allows for natural light to enter the space adding multiple functions to the system.







SITE ANALYSIS

The site location of the project is situated in the saddle between two smaller protective hills. the raised topography on both sides of the proposed sitte provide protection for the structure as well as allow for opportunity to direct wind flow from the prevailing directions.

The site for this thesis is the Quintero Golf and Country Club. Quintero is located 30 minutes west of Scottsdale, Arizona just west of the intersection of Interstate-17 and Carefree Highway tucked back in the Hieroglyphic Mountains. In addition to the spectacular, lush desert mountainous views the main destination purpose is for the two unique desert golf courses one designed by Rees Jones (the Founders Course) and the other by Greg Norman (the Charter Course), which is not yet completed. The multiple elevation changes and the limit of restriction for the golf holes has created dramatic views and allowed for the smallest details to receive full attention. Even though both courses are on the same 820 acre tract of land each is unique in offering challenge, drama, and beauty. The project itself is surrounded by over 20,000 acres of natural Sonoran Desert which is preserved by the federal government. The untouched desert of the relatively young project provides an extraordinary opportunity to provide and explore architecture in the desert. Also, I was drawn to the illusiveness of the project and that it is not surrounded by 20 other golf courses and the urban ciaos which is encompassed with the daily grind of the Phoenix Metropolitan area. The property seems like an excellent opportunity to make a statement both from as a recreation and architectural optimization. In addition to the architectural opportunities, the surrounding environment allows for bio-climatical study and design integrated systems to all for a sustainable building. The raw beauty of the desert landscape surrounding the site for the thesis program, a research facility for the USGA, provides a unique opportunity for the exploration of material in contrast the natural elements of the landscapey. The site of the project is located in a saddle between two desert covered mounds. The opportunity of the site adds an element of protection from the various desert conditions that may exist during all seasons of the year. The opportunity to explore form and program as a built structure is allowed because of the freedom of the site. The mounds providing the protection for the building are located on the north-west and south-east side of the site. The large scale of the project or property boundary angles towards the north-east. The south-west portion of the property is wider and tapers to a longer, narrower dimension. The entry to the property is at the southern end of the project which is accessed from the Carefree Highway. From the Highway, a meandering lane aims north towards the location of the project. . Also, the opportunity to design in the presence of both the raw desert and an introduced man made natural environment allows for an even more overall spectacular architectural experience with an emince visual impact of contrast between built structure and natural environment.

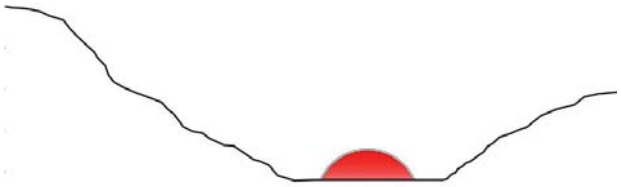
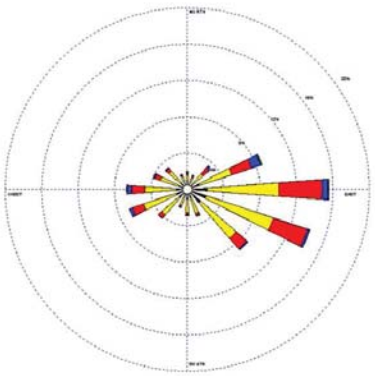
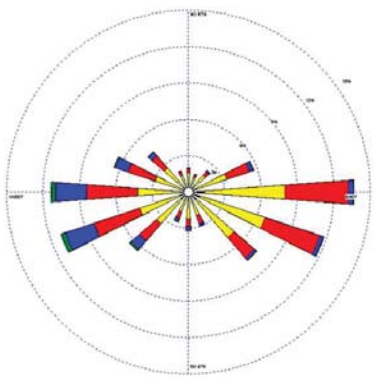
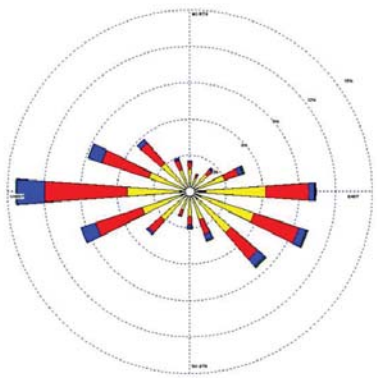
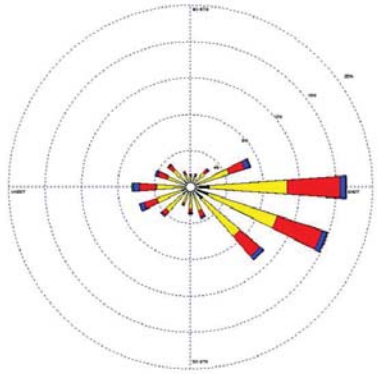
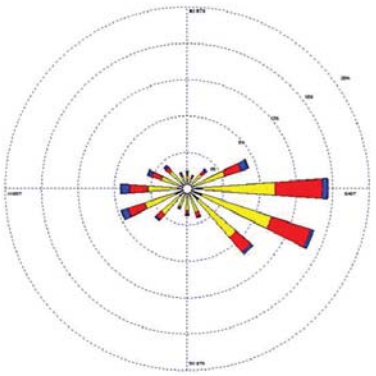
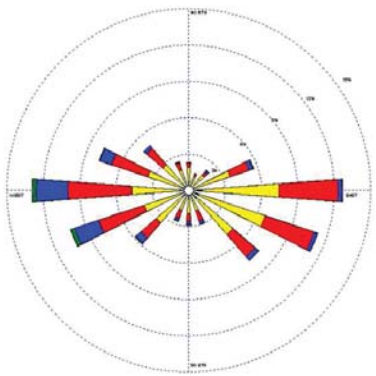
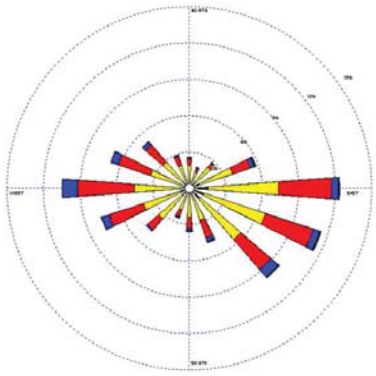
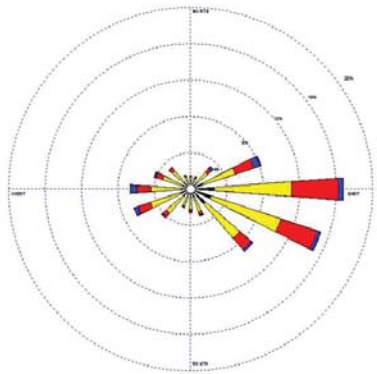
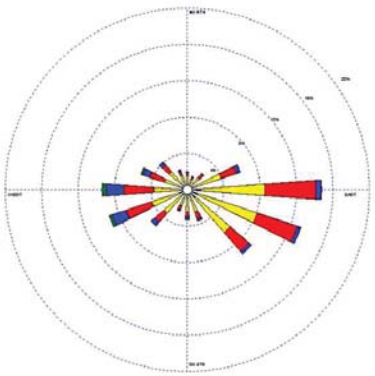
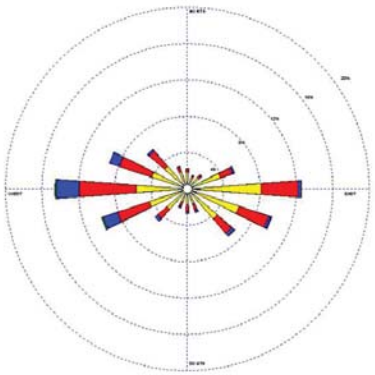
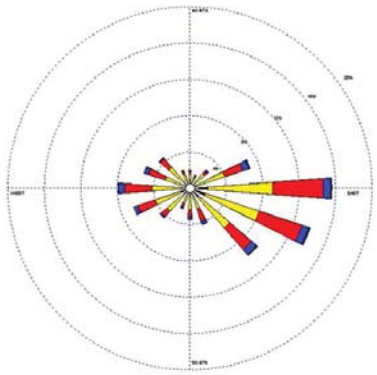
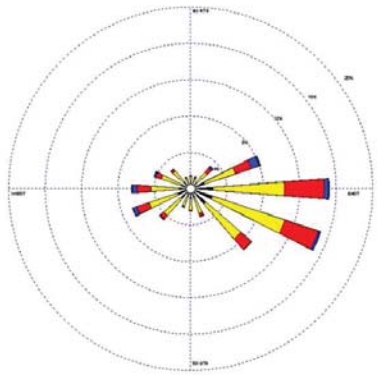
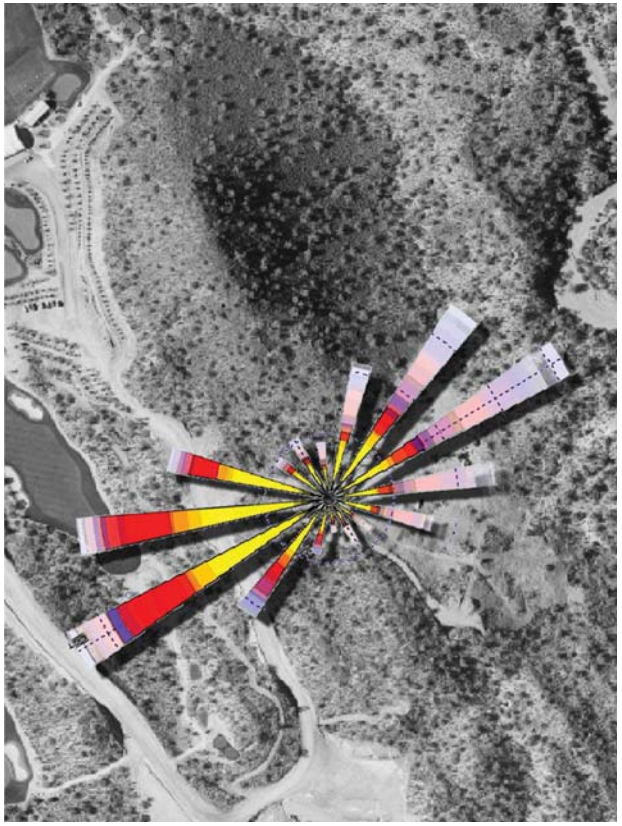


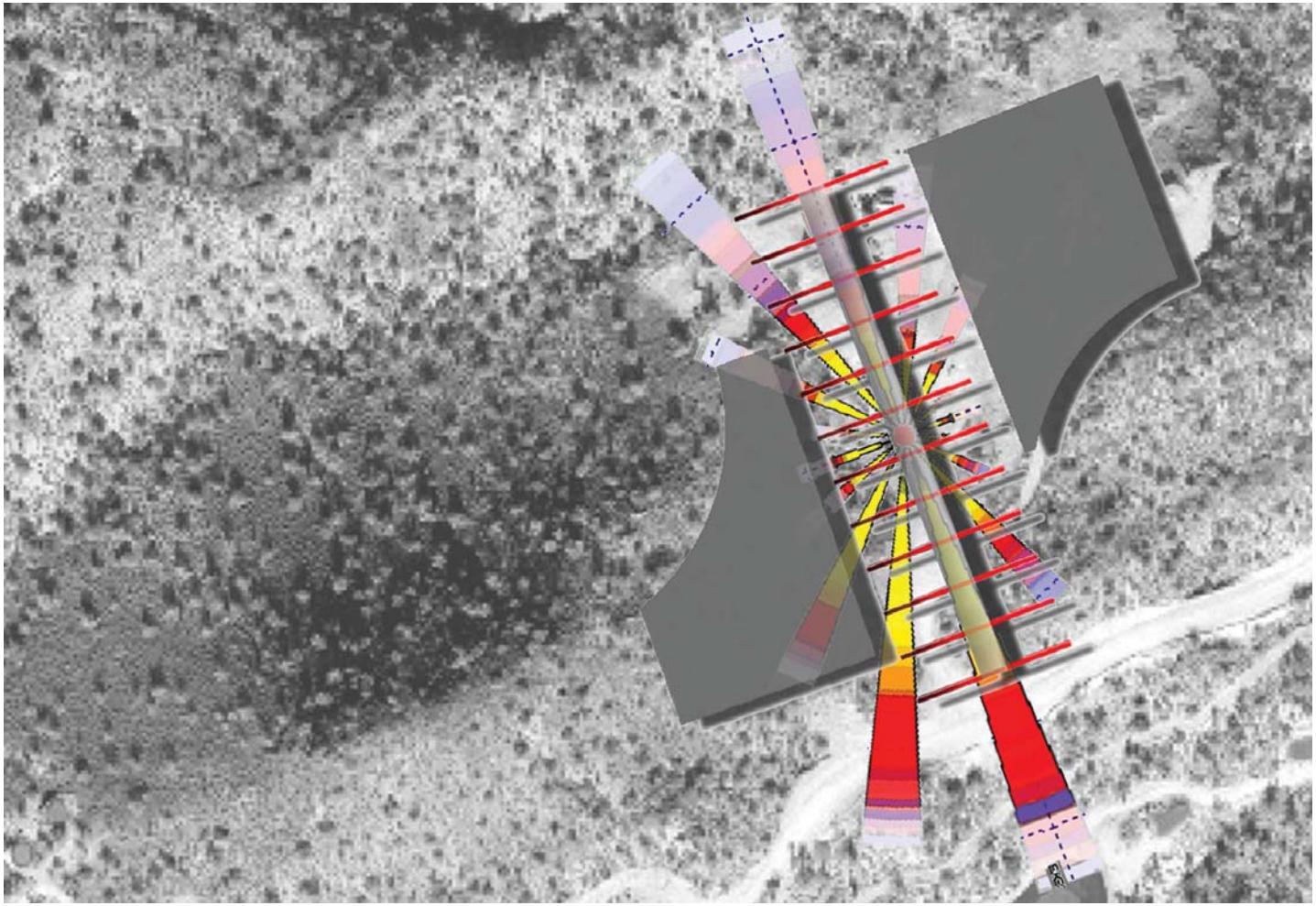
Diagram showing site scale



These diagrams are representations of the wind pattern direction for the site or immediate area for each of the twelve months. The prevailing wind direction is evident by the larger patterns for the particular month. The wind direction is important to the design of the building because passive cooling and natural air ventilation are key elements in the building functioning at a sustainable level.

The understanding of the structural components of the project allow for an opportunity to explore the tectonics of the building. Tectonics, a term that is not confined to a single definition allows for interpretation of the subject to ones vision of the project.



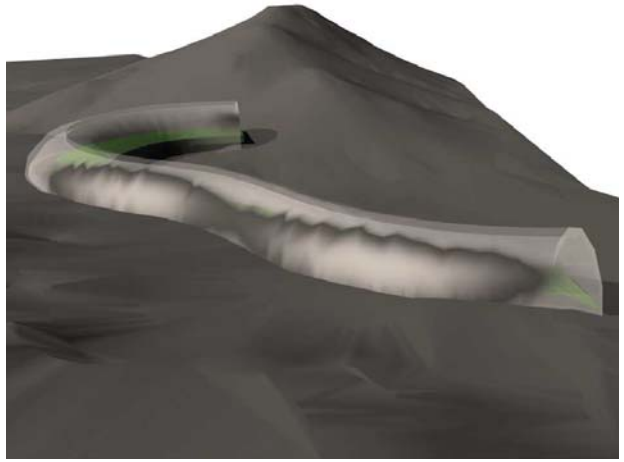
The diagram is a representation of the fusing together the two programmatic forms by an open air element. The programmatic types adopt different sections of the two separate forms, which follow the natural elements of the site. The program becomes divided into sections or quadrants with relation of interior program to exterior program. Essentially, the project becomes a transparent field containing a landscape makeup of natural elements and a virtual foundation.

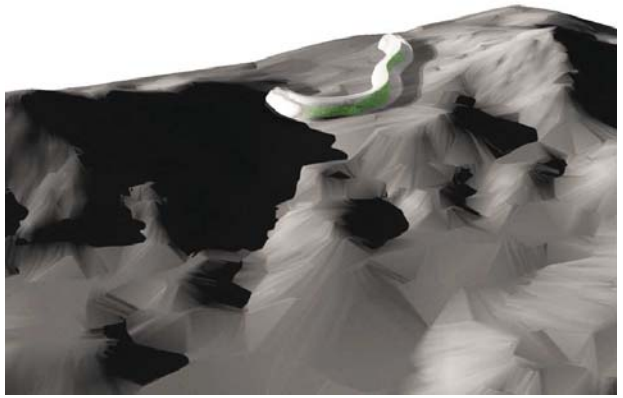
Representating the conceptual structural layout of the project. The optimization of the prevailing wind sets the foundation for the system. The structural organization pattern is based off the wind direction by overlaying the foraging distance of ants dividing the space into sections. The structure of the project on this axis allows for optimal views as well as optimal conditions for natural air ventilation or circulation.

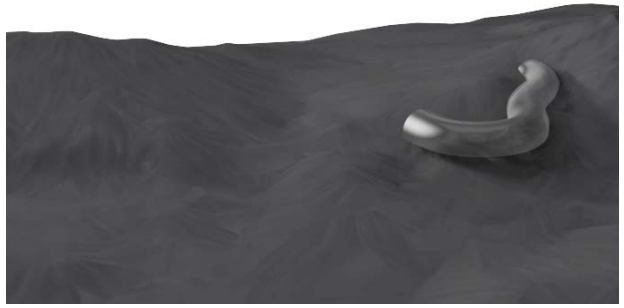
Conceptual Site Plan with topo and project location

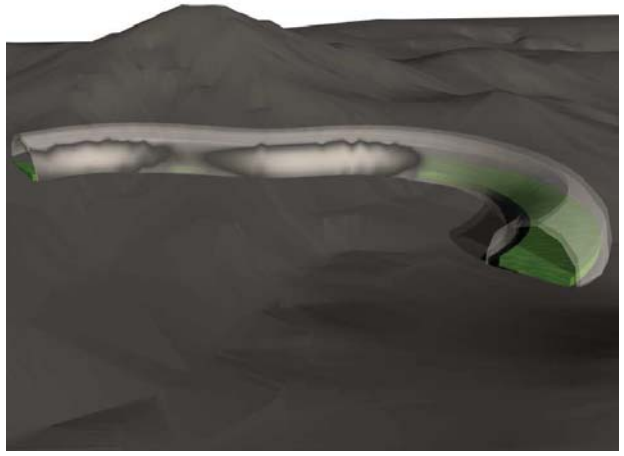
The concept for the project location was to intergrade the building form with the natural topography. The natural characteristics of the selected site Dictated the form for the building project. Working with the natural landscape provided a sustainable foundation for the design.

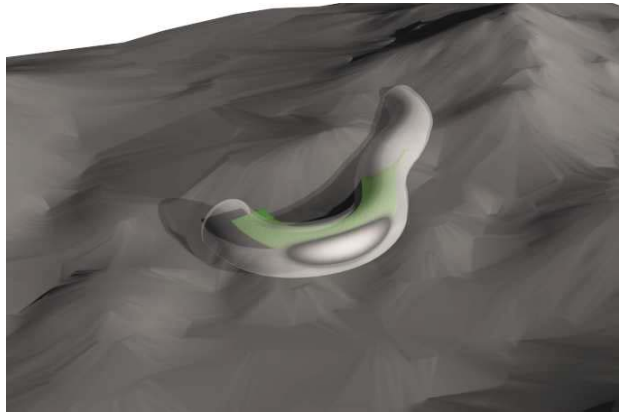
Located between two small hills, the free flowing design concept seamlessly appears to move throughout the landscape. Similar to the characteristics of insects, the form becomes one with its environment.

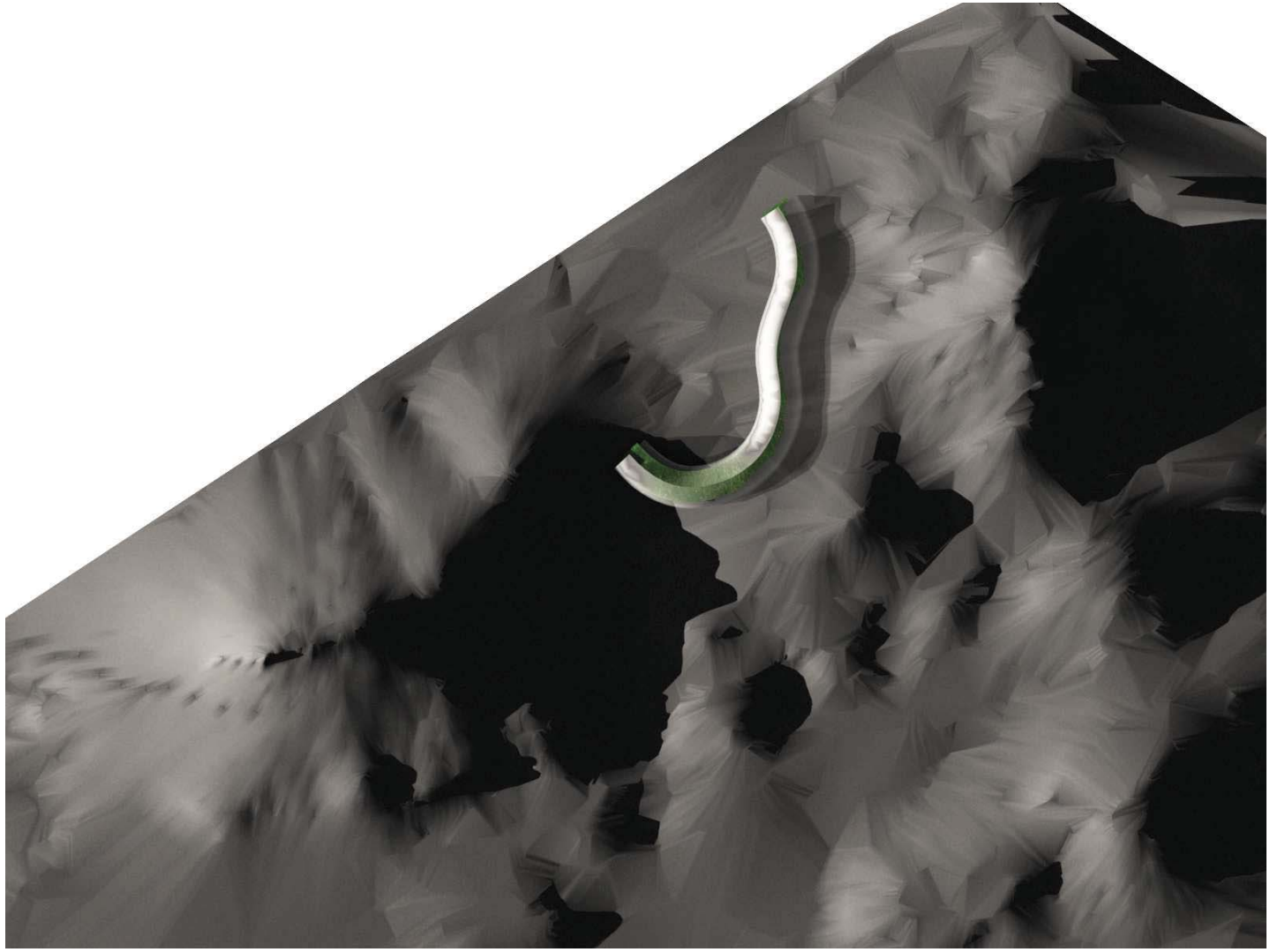












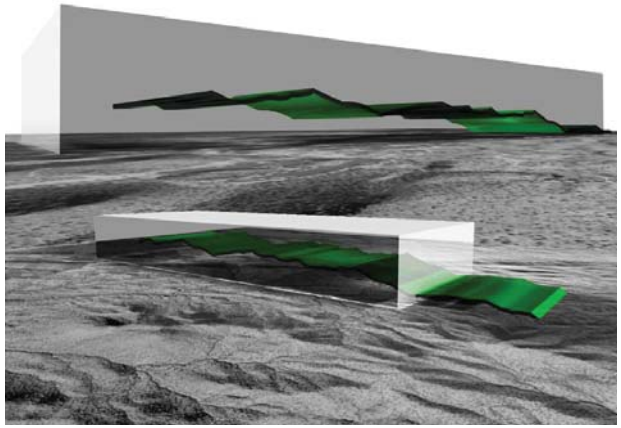
Contextual site studies of form and topography

PROGRAM

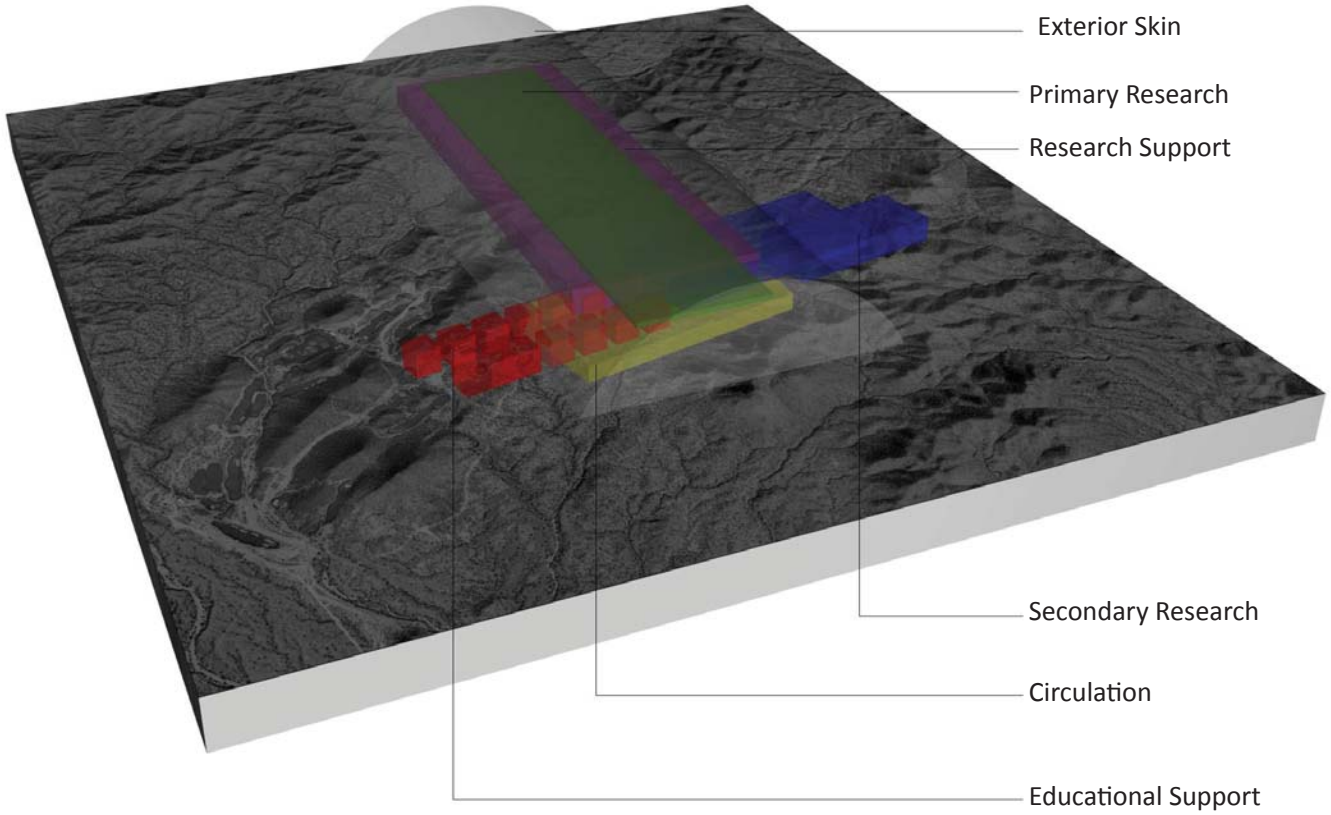
The diagram above is a representation of the ant section, showing the protective skin and the interior voids. Focusing on the skin of the insect and how the interior elements are protected. The second image is an exploration of the program make-up in relation to the primary circulation element. The interior is a make of solid and void space that is continuously connected by the circulation core. The bottom two diagrams are exploring the impact of the structure in relationship to the ground plane. How the structure is positioned in relation to the ground; rather it appears to be submerged partially into the ground or if it is perched on top of the ground regulates the aggressiveness of the structure and adopts the role of predator or prey in the natural environment. The diagrams are also exploring the relationship between programmatic elements and skin relationships.

TURF RESEARCH FACILITY- Program

- Desert Controlled Climate Bay
- Polar Controlled Climate Bay
- Tropical Controlled Climate Bay
- Moderate Dry Controlled Climate Bay
- Moderate Wet Controlled Climate Bay
- Chemical Laboratories
- Water Study Facility
- Training Room
- Classroom
- Administration
- Cafe
- Design Center
- Soil Study Laboratory
- Maintenance Facility
- Conference Room
- Research Center
- Locker Rooms
- Mechanical Rooms
- Sleeping Quarters
- Energy Storage

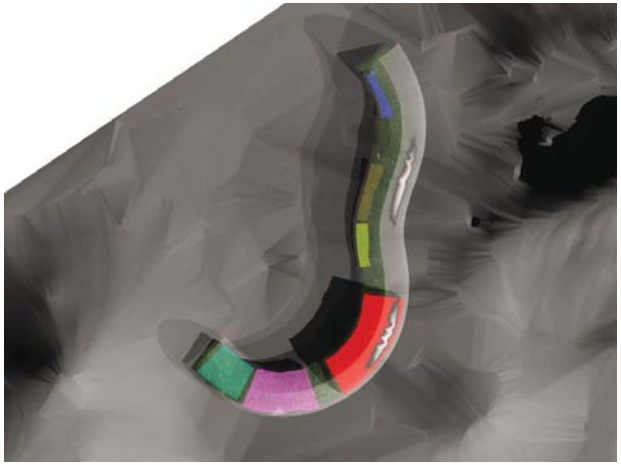


Concept diagram showing turf contained within the glass structure



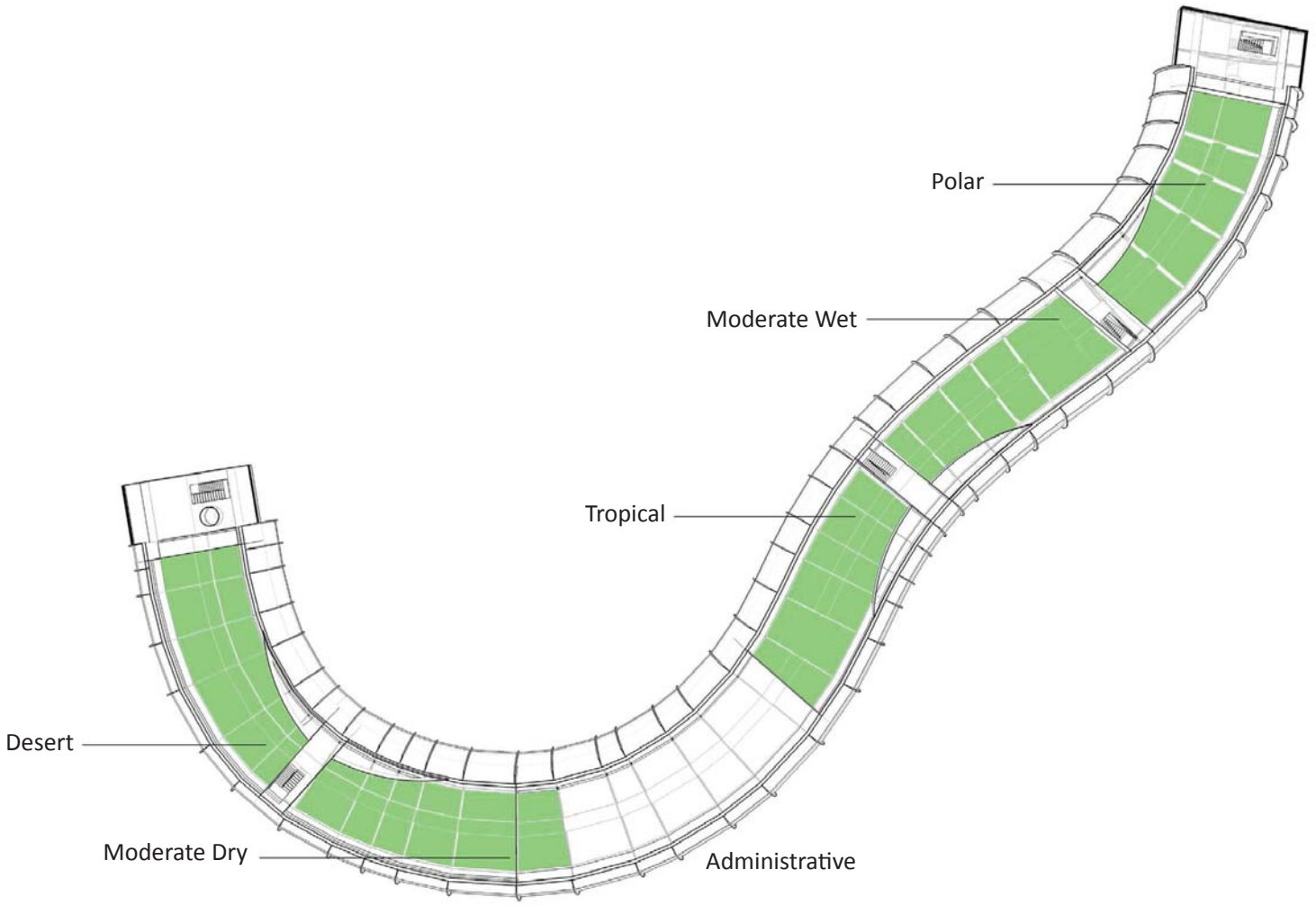
The architecture or building provides an accelerated environment for the turf research facilities, while acting as its own independent element of study in the desert climate. The building responds to the natural conditions of the site and environment as a study of materials, tectonics, and sustainability, while the program of the project responds to the accelerated environment imposed by the building. Programmatically, the thesis is an exploration and study of turf in the desert climate for the United States Golf Association (USGA). The research facility houses the components needed to conduct the turf research. Essentially, the project is an environment for turf study and the building itself is an element of study for the environment, thus addressing both the macroclimate and microclimate issues of the project and surrounding environment. In addition to the programmatic functions of the project, the expression of the tectonics in the project is an important focal design aspect of the project.

The site for this thesis is the Quintero Golf and Country Club. Quintero is located 30 minutes west of Scottsdale, Arizona just west of the intersection of Interstate-17 and Carefree Highway tucked back in the Hieroglyphic Mountains. The multiple elevation changes and the limit of restriction for the golf holes has created dramatic views and allowed for the smallest details to receive full attention. Even though both courses are on the same 820 acre tract of land each is unique in offering challenge, drama, and beauty. The project itself is surrounded by over 20,000 acres of natural Sonoran Desert which is preserved by the federal government. The untouched desert of the relatively young project provides an extraordinary opportunity to provide and explore architecture in the desert. Also, I was drawn to the illusiveness of the project and that it is not surrounded by 20 other golf courses and the urban ciaos which is encompassed with the daily grind of the Phoenix Metropolitan area. The property seems like an excellent opportunity to make a statement both from as a recreation and architectural optimization. In addition to the architectural opportunities, the surrounding environment allows for bio-climatical study and design integrated systems to all for a sustainable building. The raw beauty of the desert landscape surrounding the site for the thesis program, a research facility for the USGA, provides a unique opportunity for the exploration of material in contrast the natural elements of the landscapey. The site of the project is located in a saddle between two desert covered mounds. The opportunity of the site adds an element of protection from the various desert conditions that may exist during all seasons of the year. The opportunity to explore form and program as a built structure is allowed because of the freedom of the site. The mounds providing the protection for the building are located on the north-west and south-east side of the site. The large scale of the project or property boundary angles towards the north-east.



3D programmatic relationship study

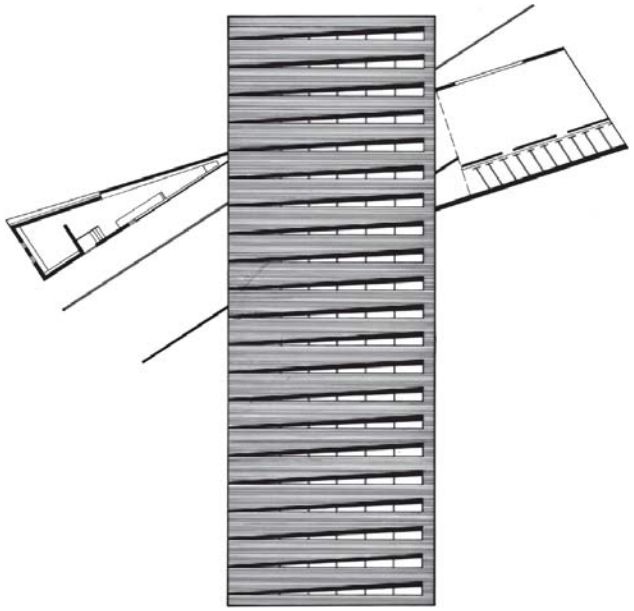
The south-west portion of the property is wider and tapers to a longer, narrower dimension. The entry to the property is at the southern end of the project which is accessed from the Carefree Highway. From the Highway, a meandering lane aims north towards the location of the project. . Also, the opportunity to design in the presence of both the raw desert and an introduced man made natural environment allows for an even more overall spectacular architectural experience with an emince visual impact of contrast between built structure and natural environment.

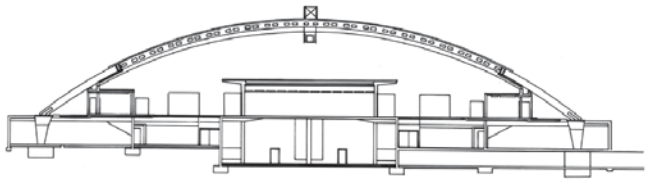


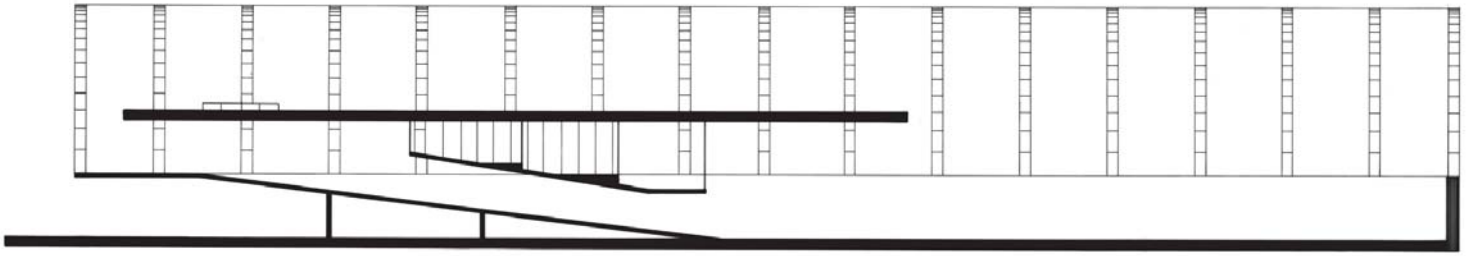
Turf climate location plan

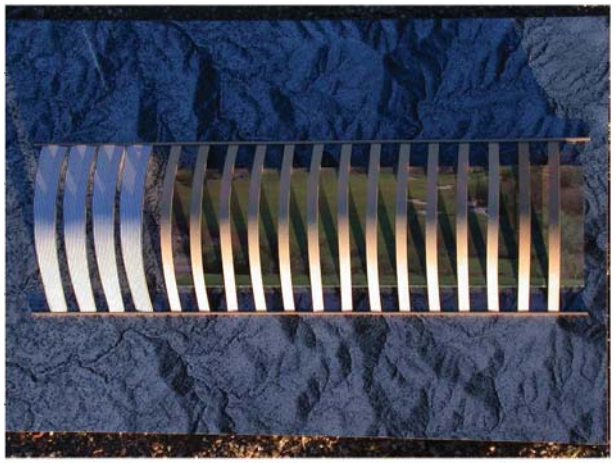
STRUCTURE

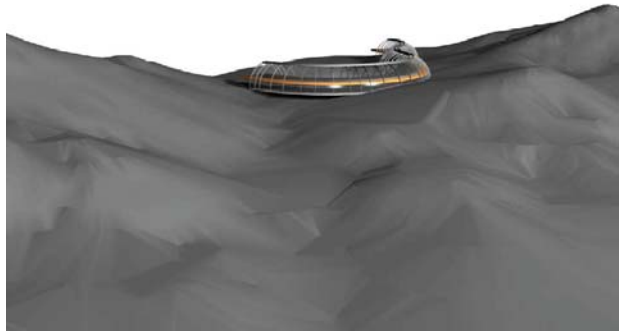
Similiar to the exoskeleton of the insect, the exposed structure of the project maximizes efficiency and structural integraty. The structural system provides an art like quality and honest expression to the form of the design.

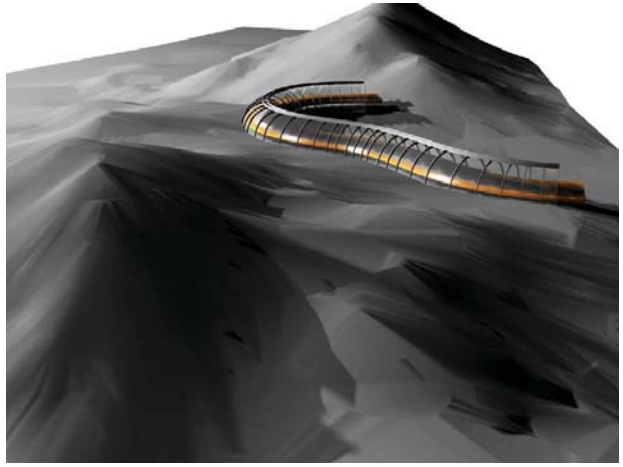


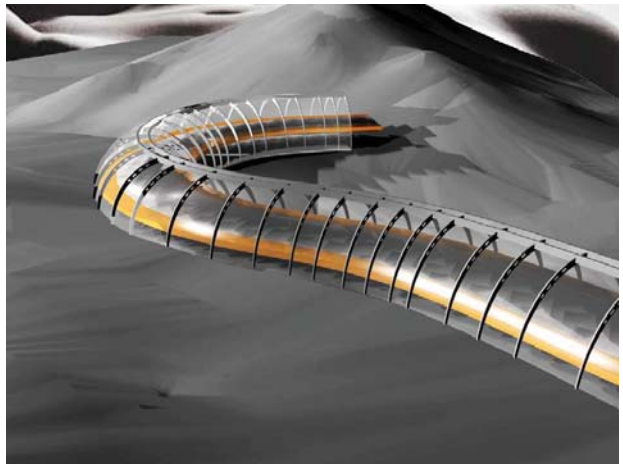


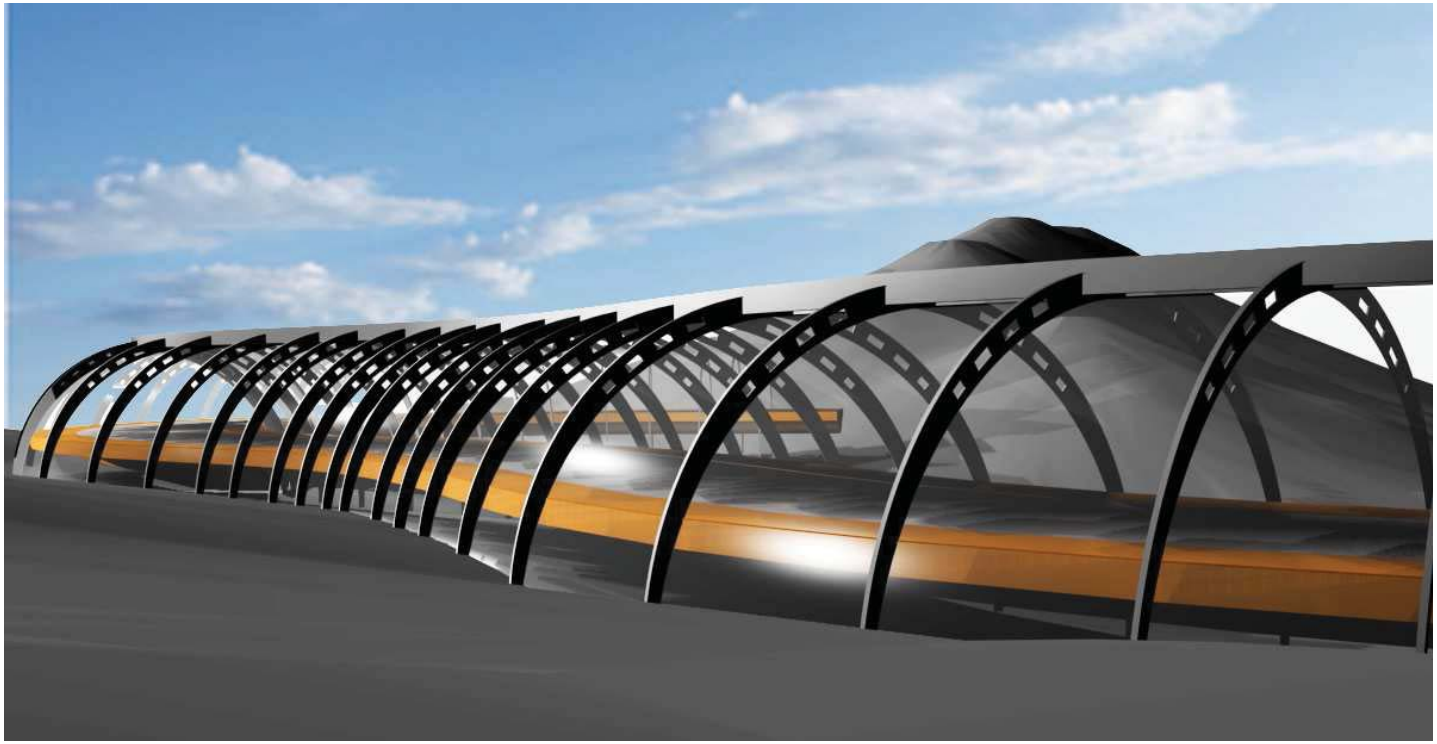


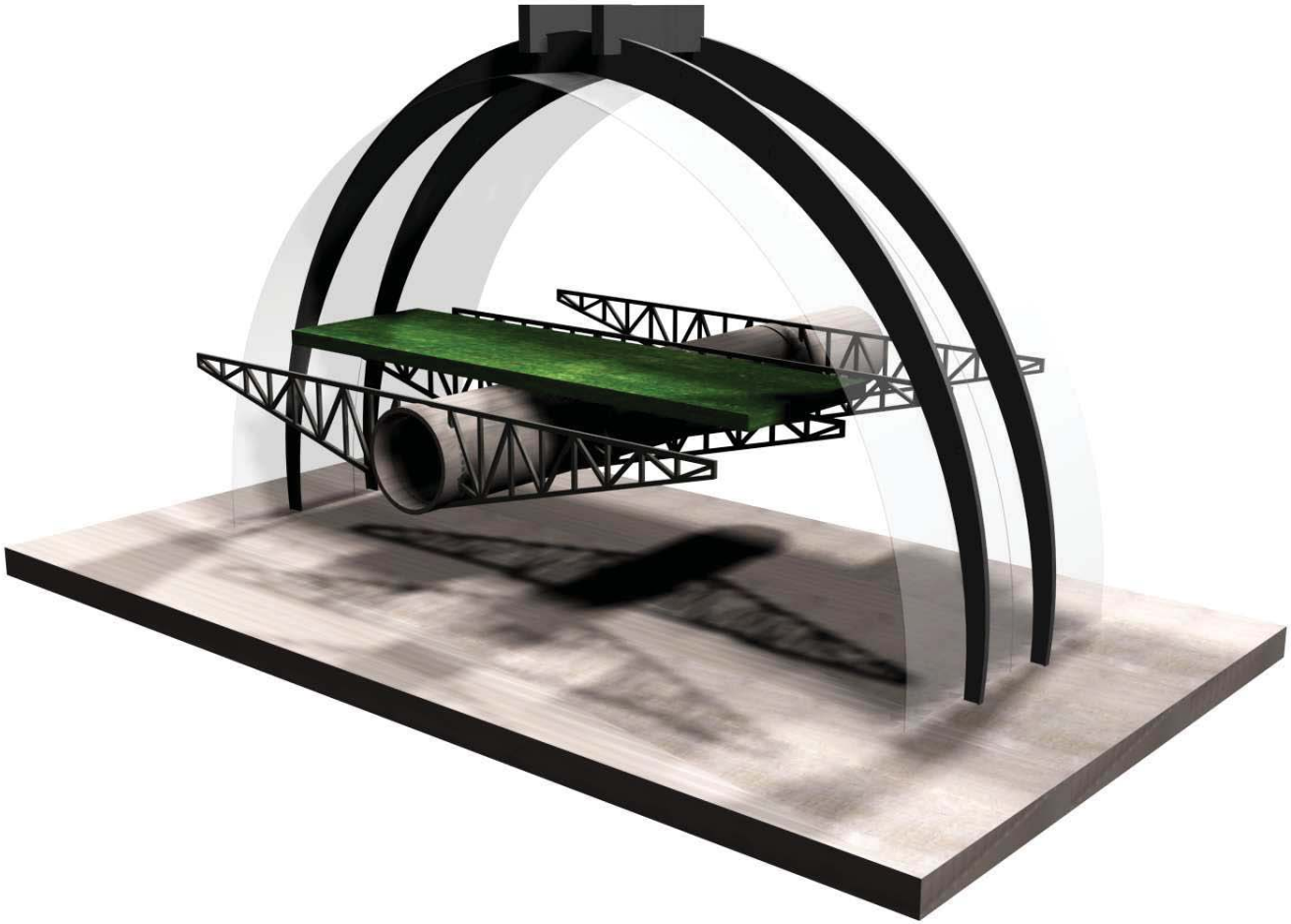


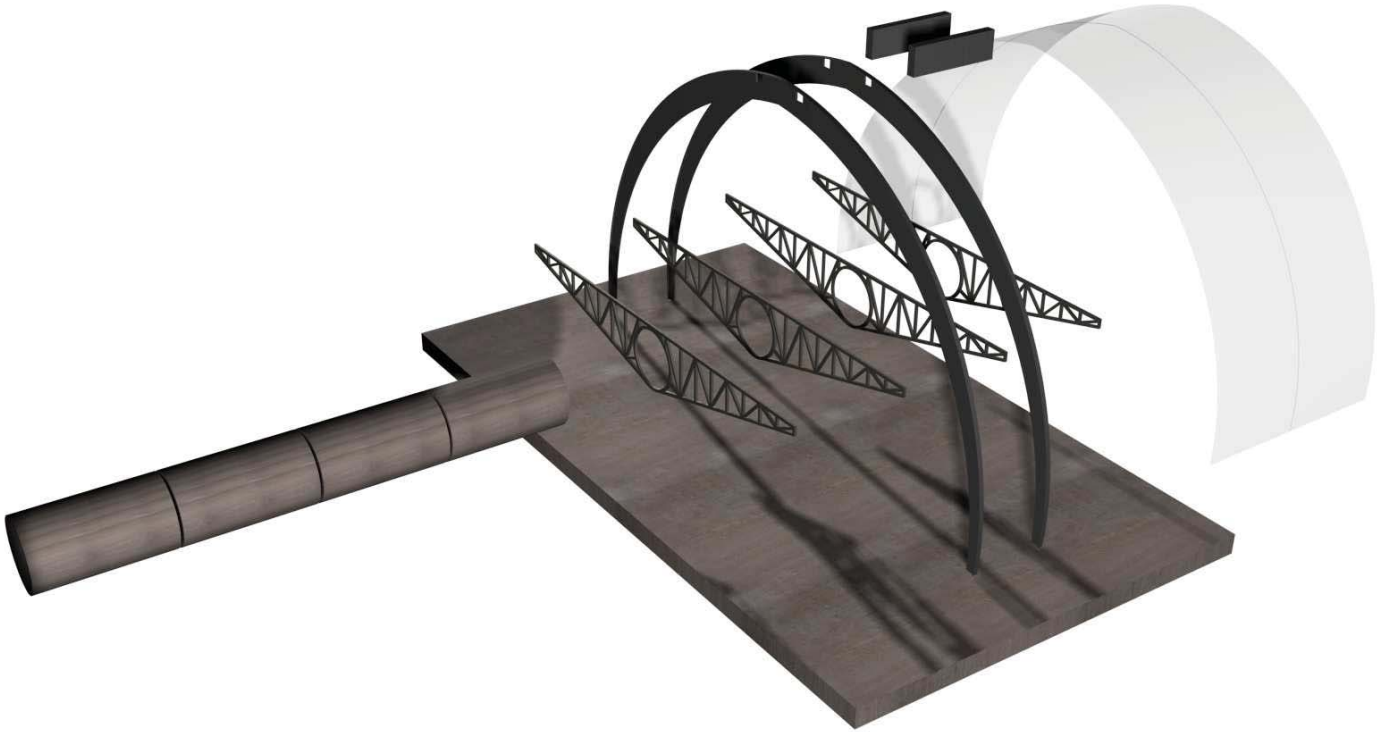


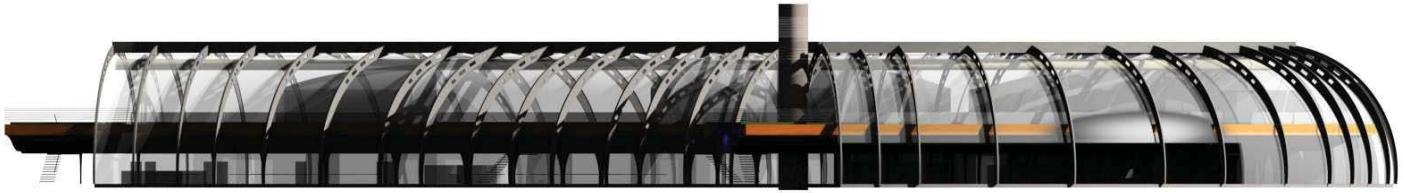


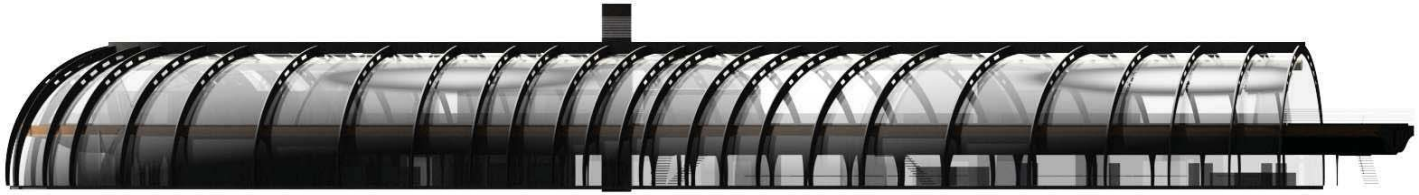




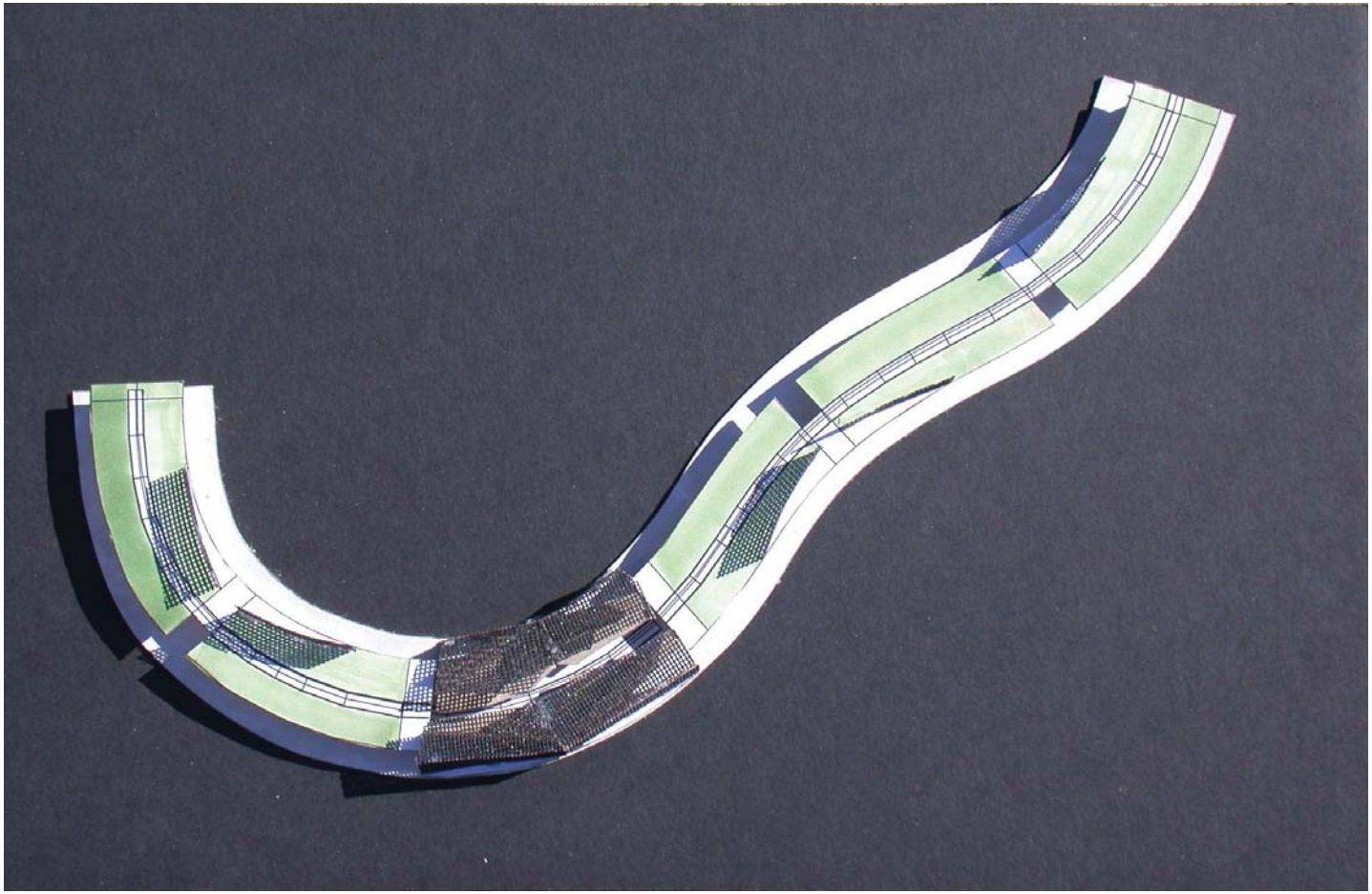


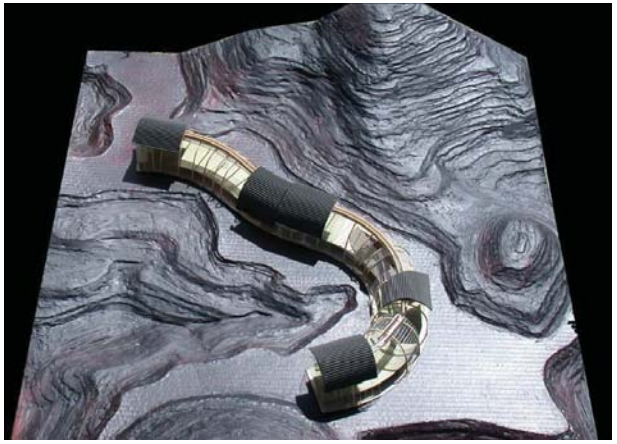


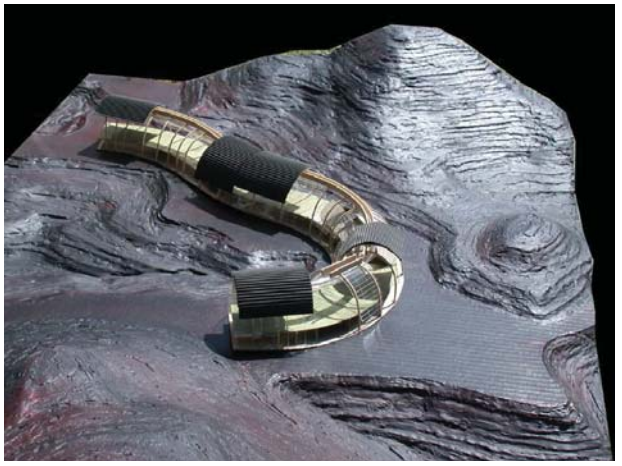


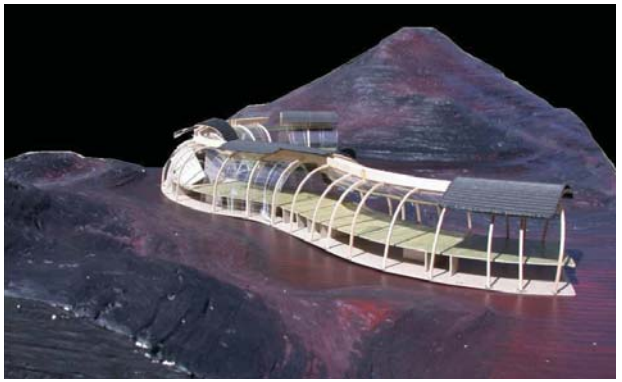


STUDY MODELS









MODEL PROCESS







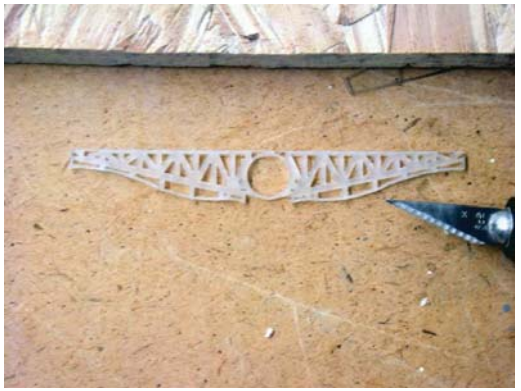
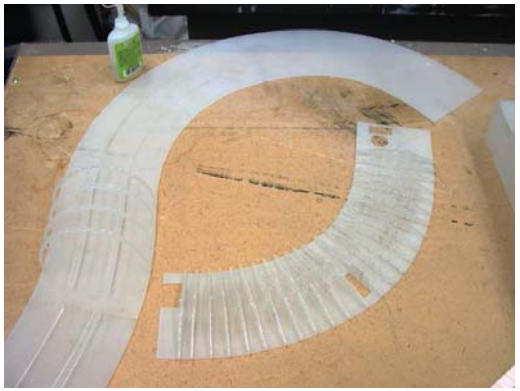


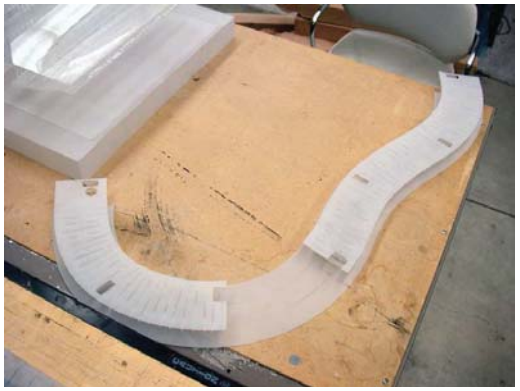


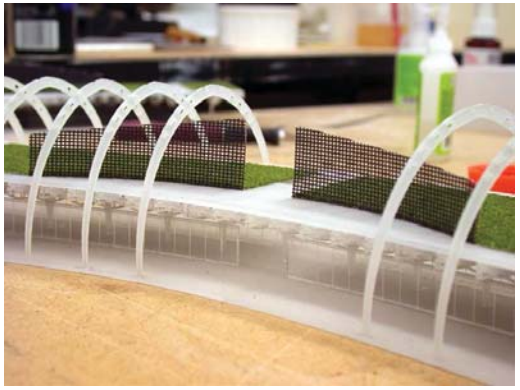


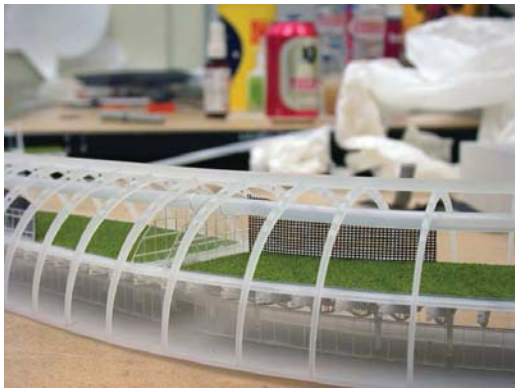
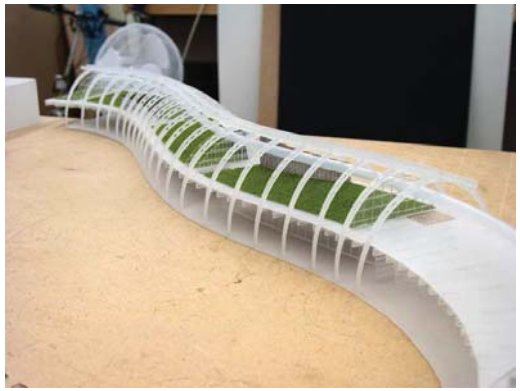
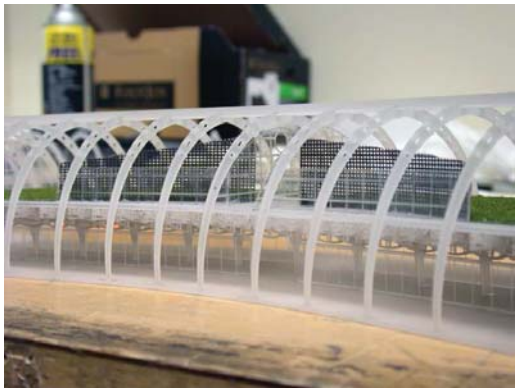


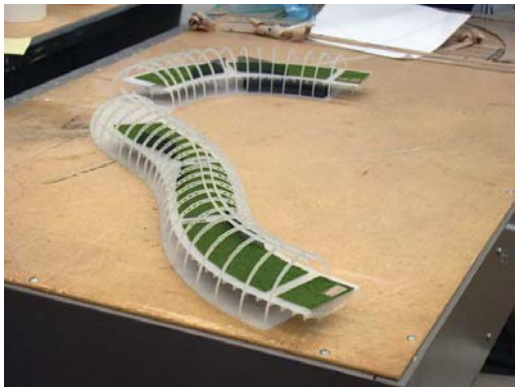
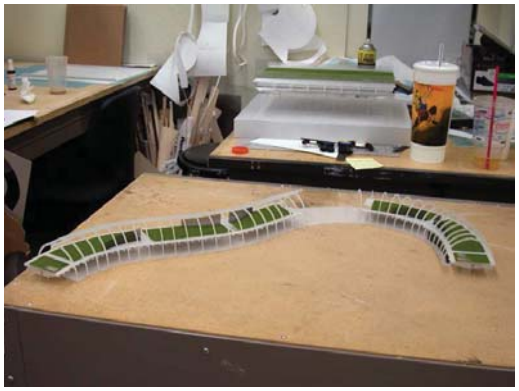


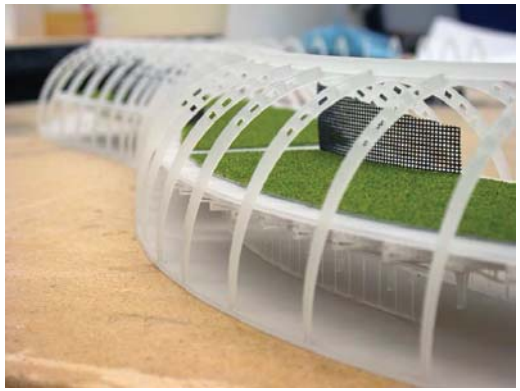
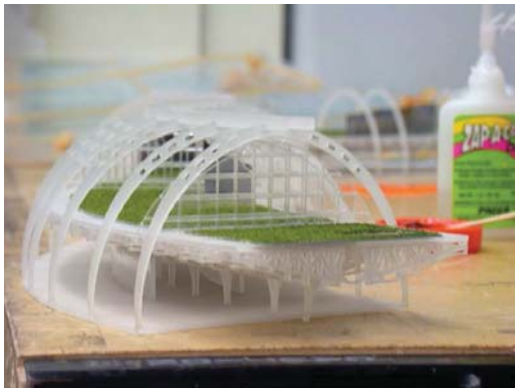




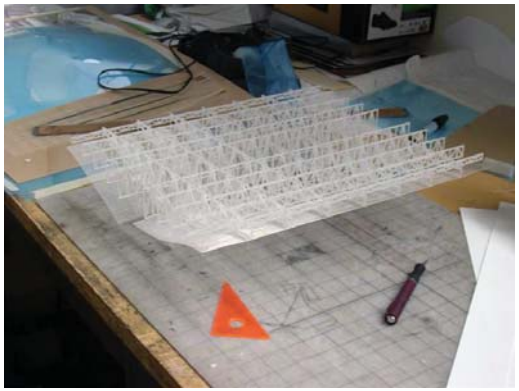
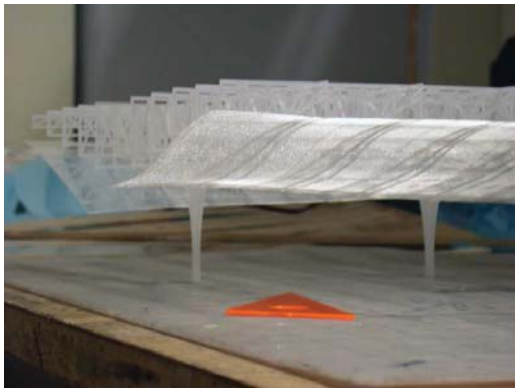
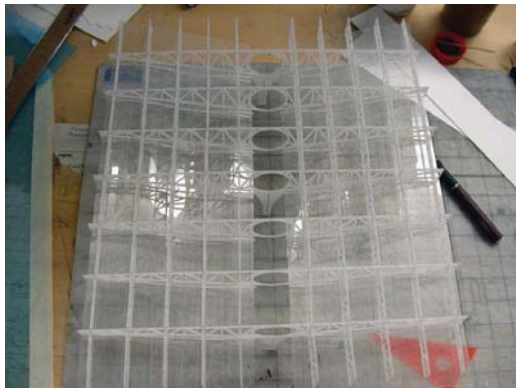
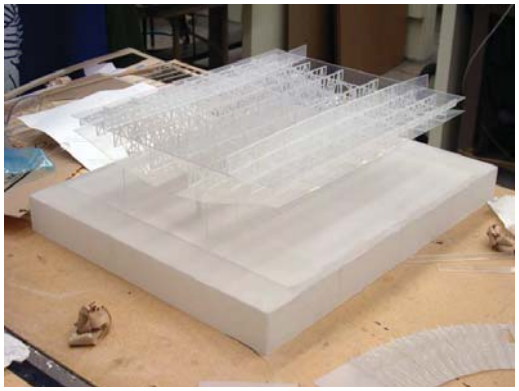
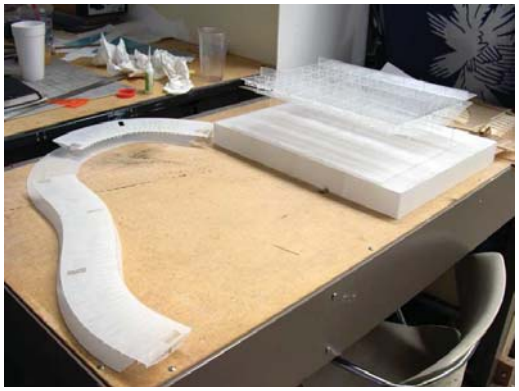
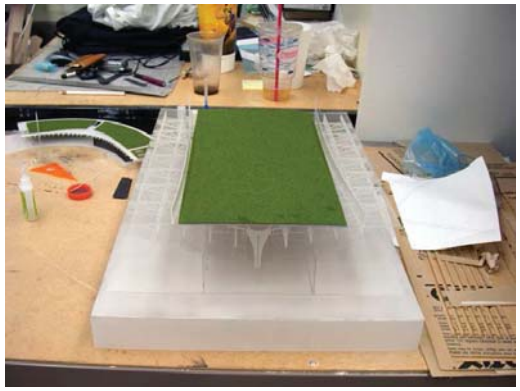
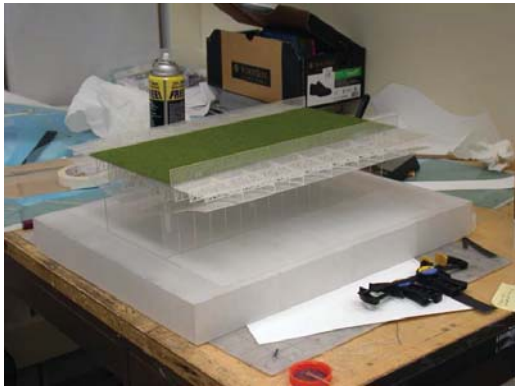
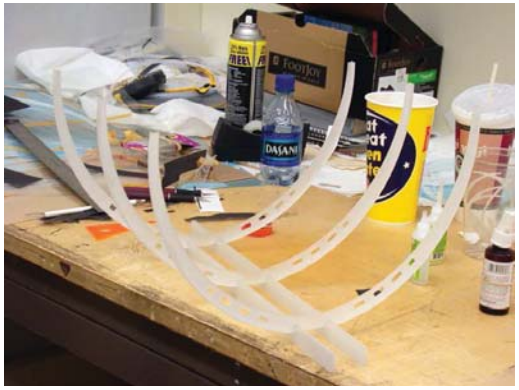

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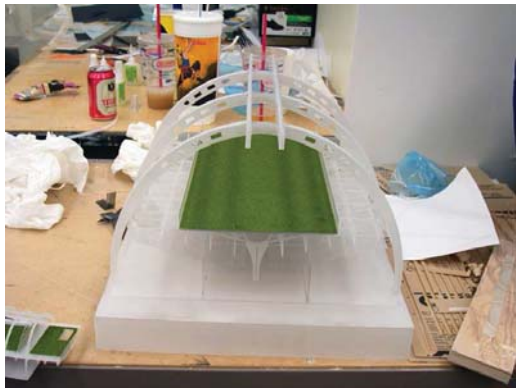
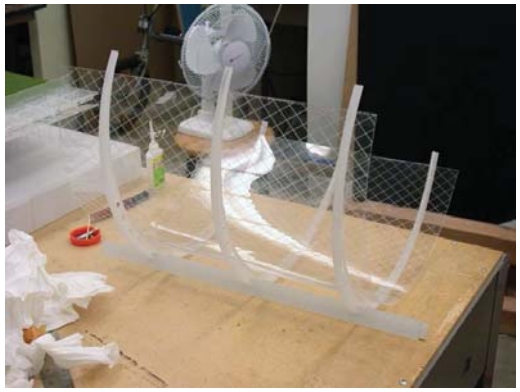
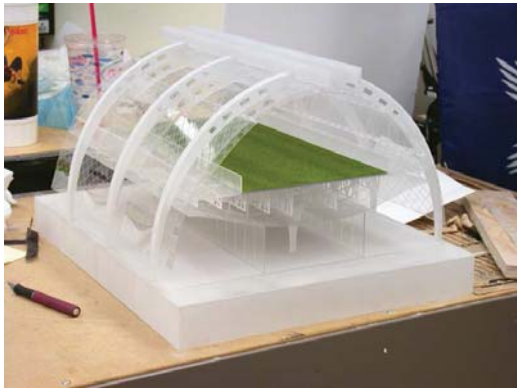
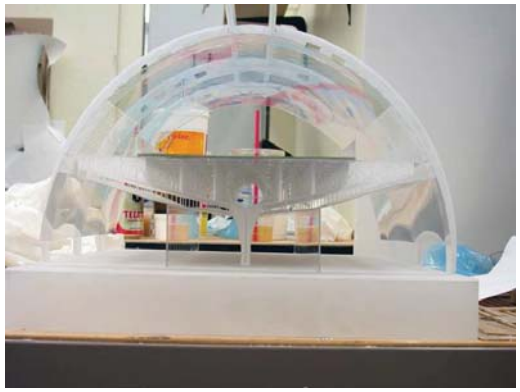
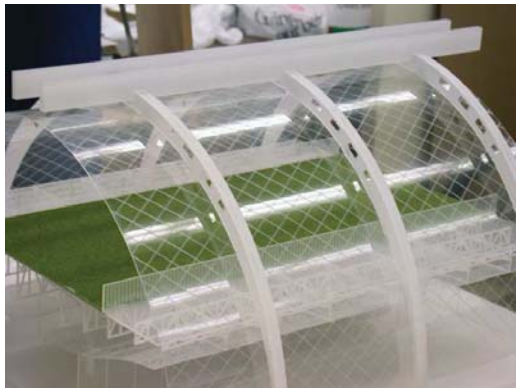
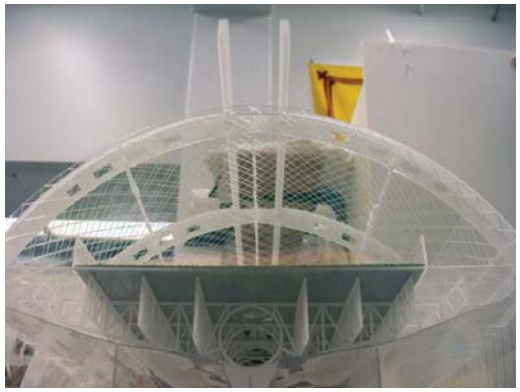
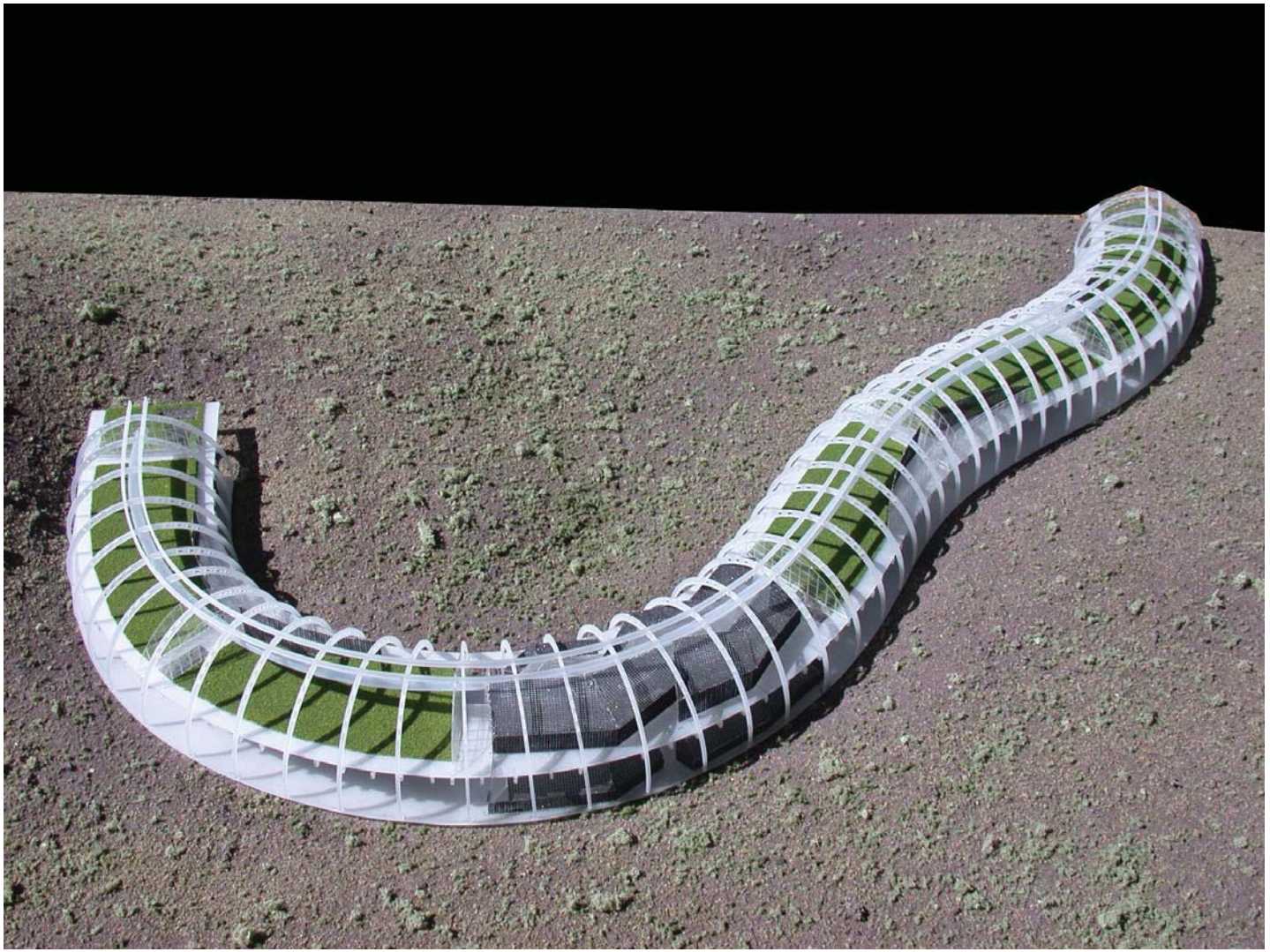
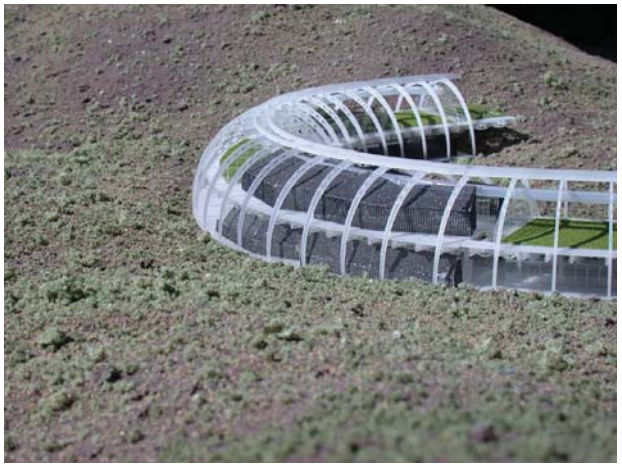
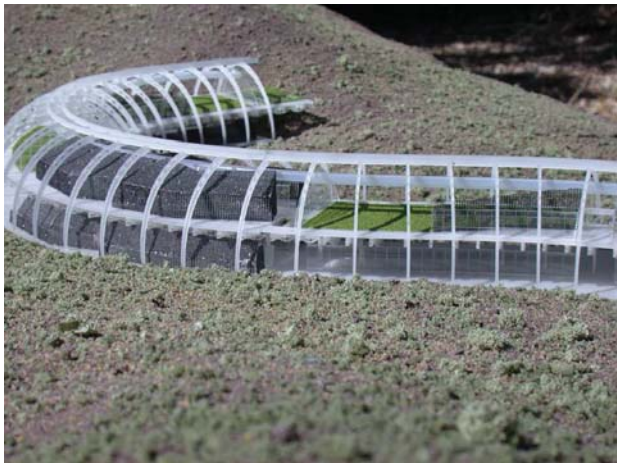






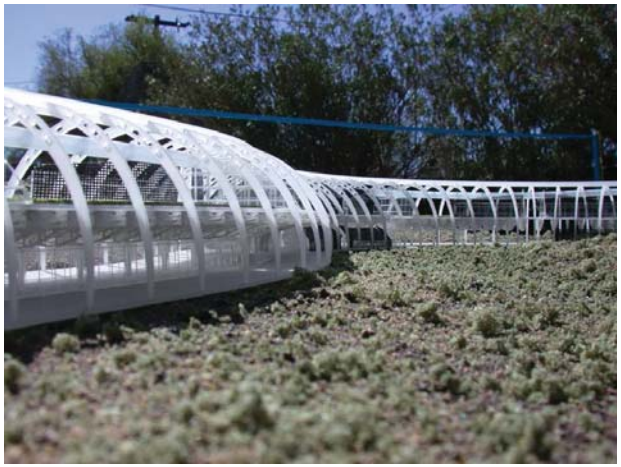


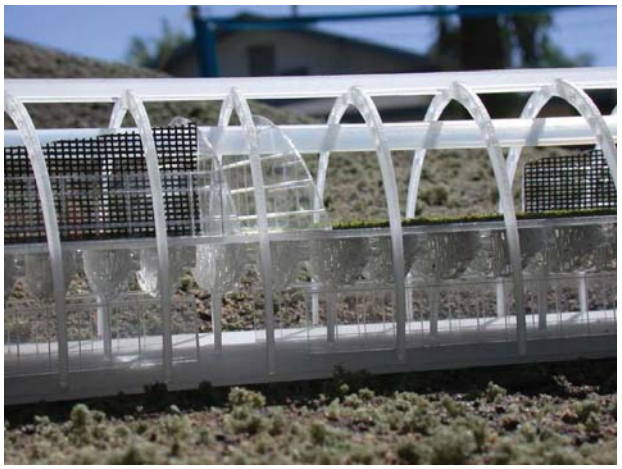
FINAL MODEL

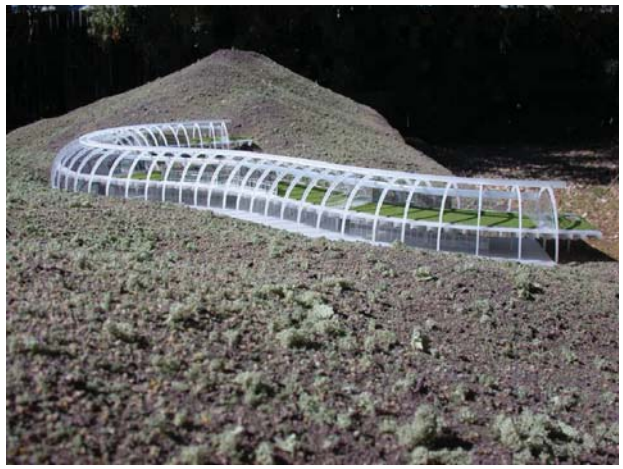


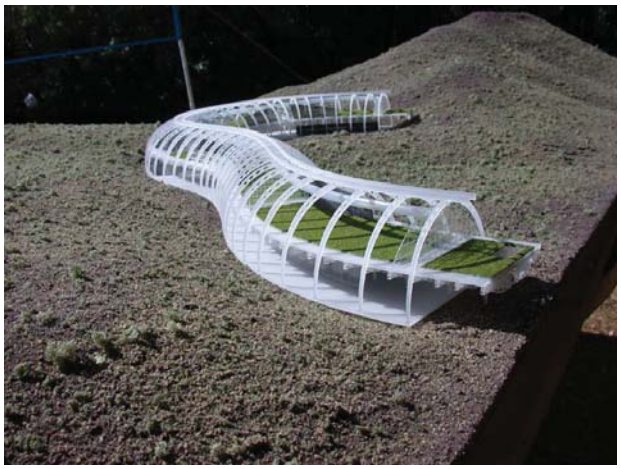


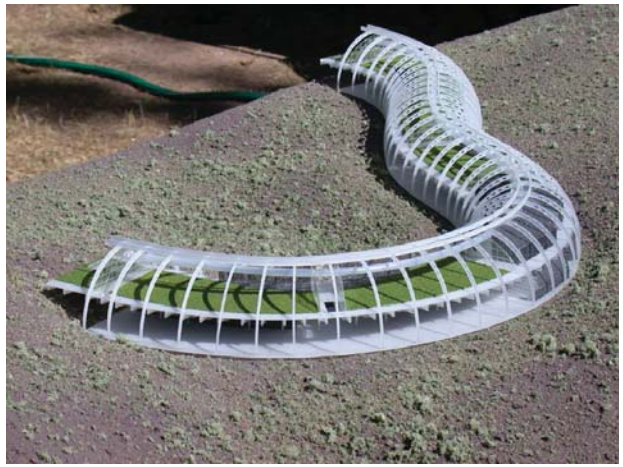


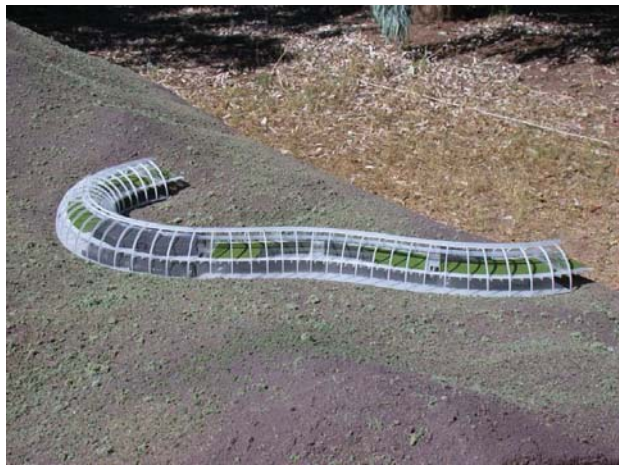


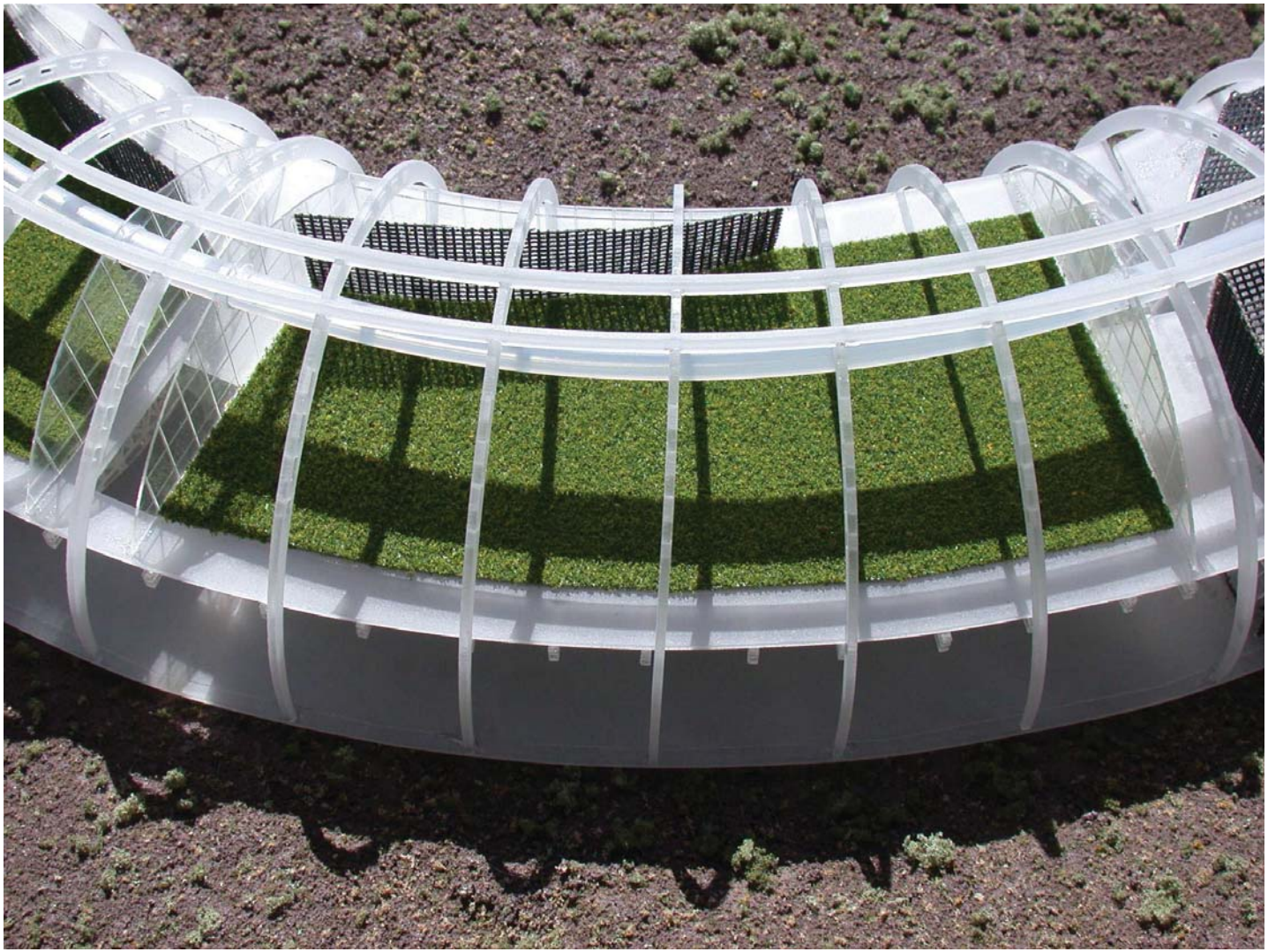


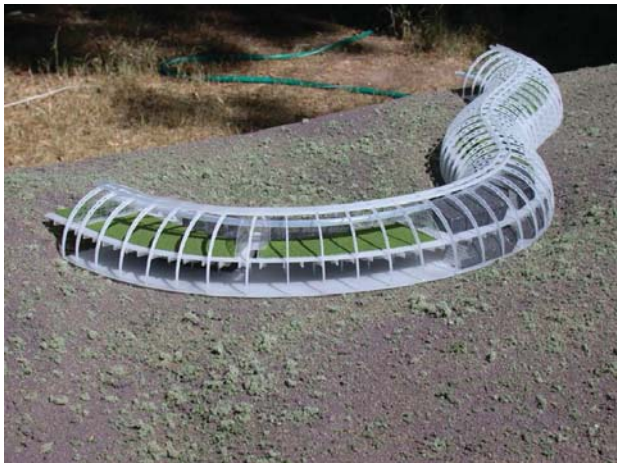


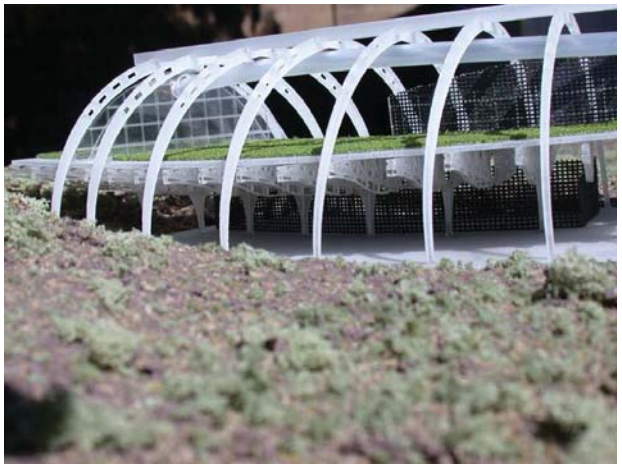


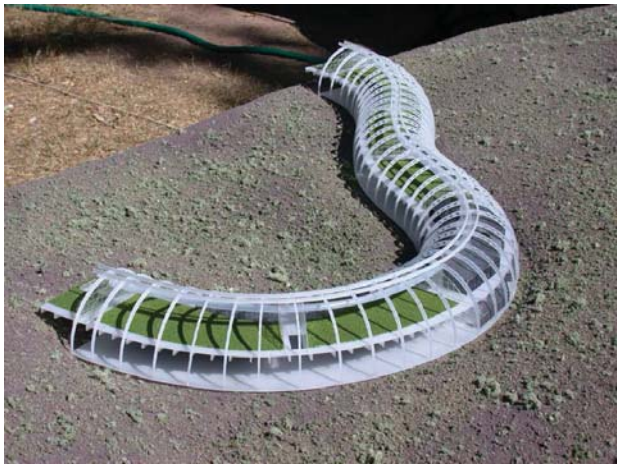


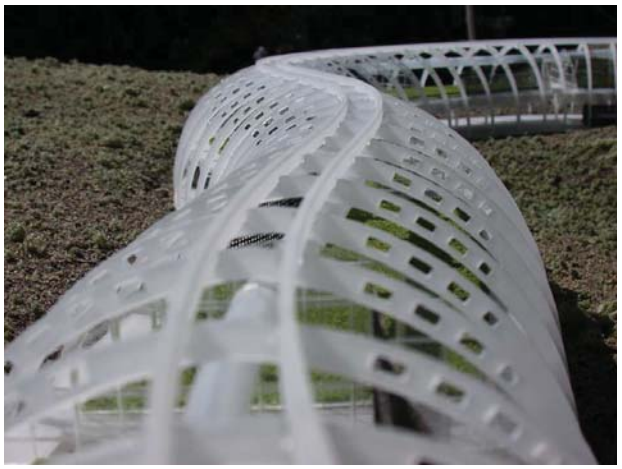


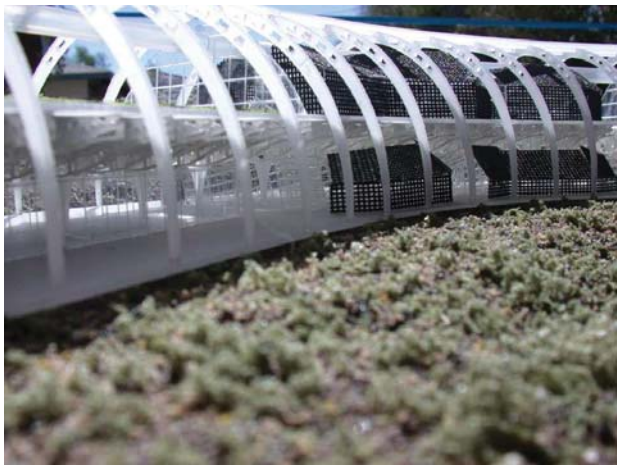


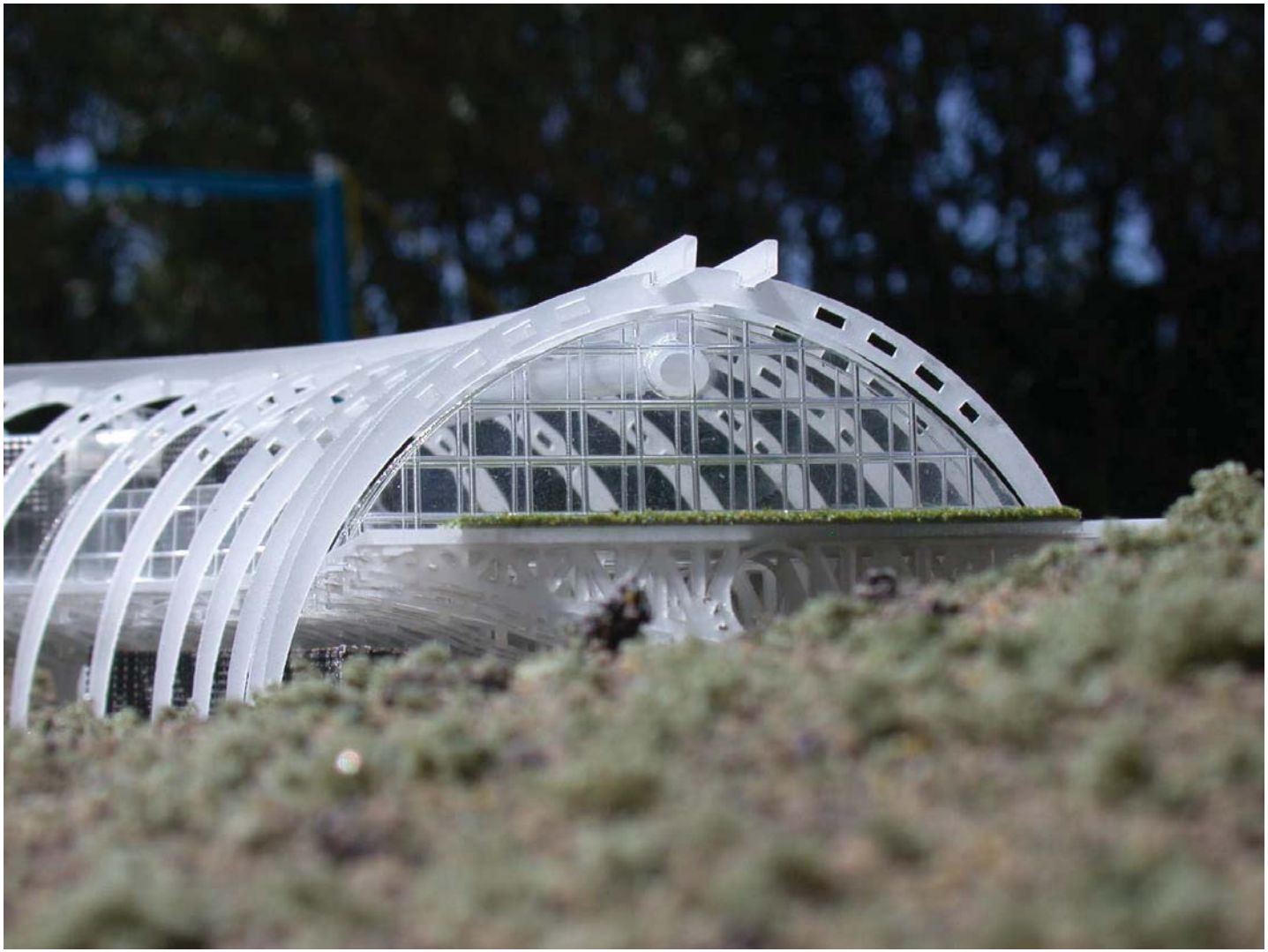


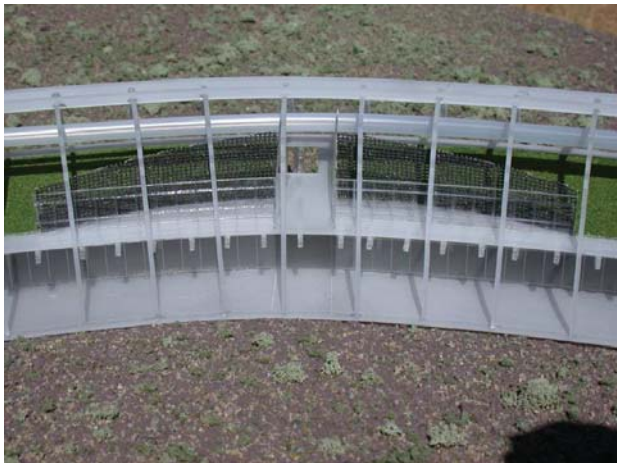


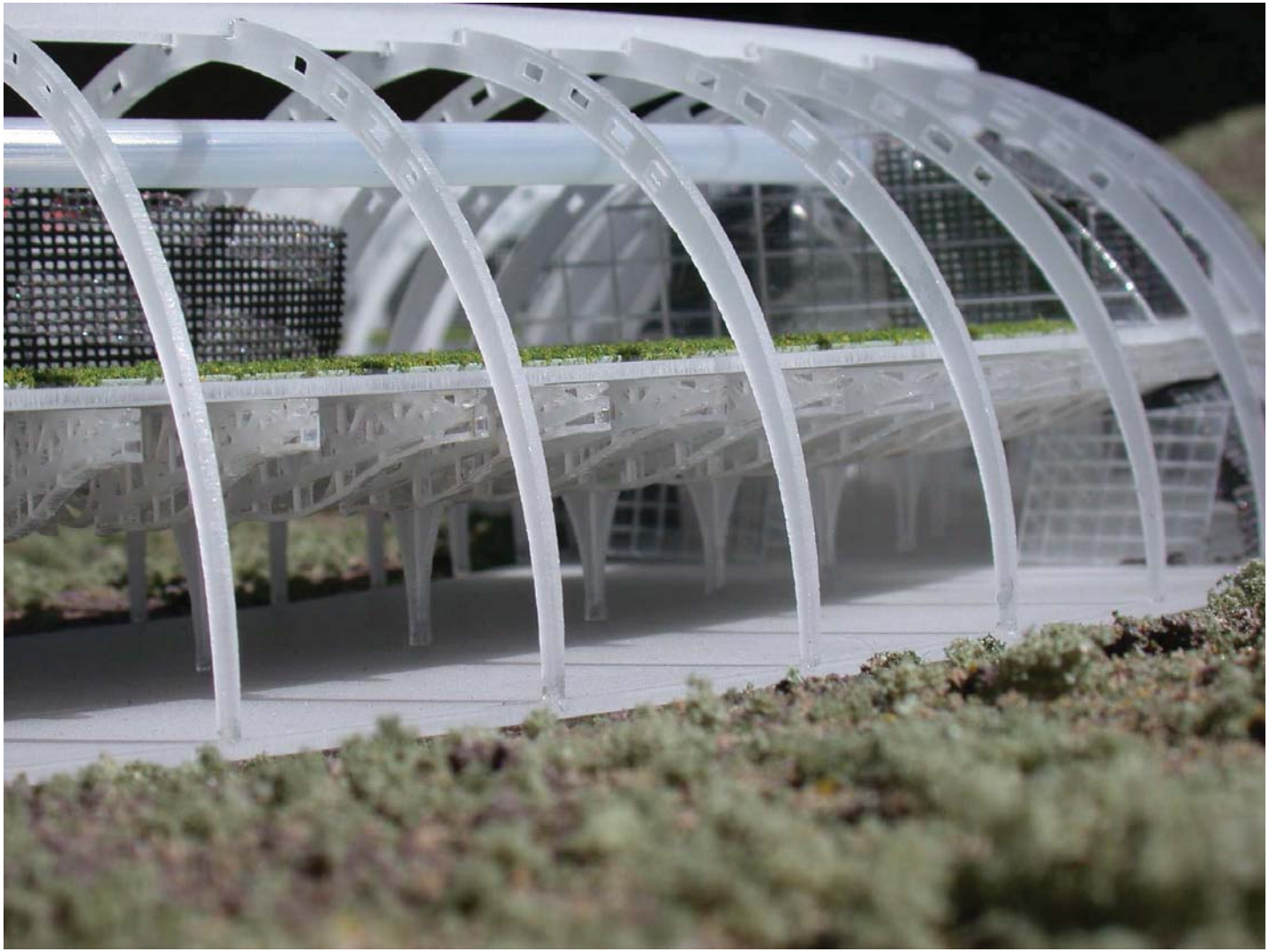


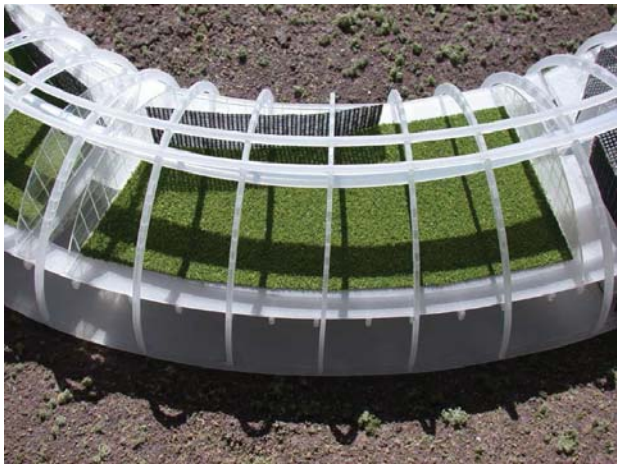


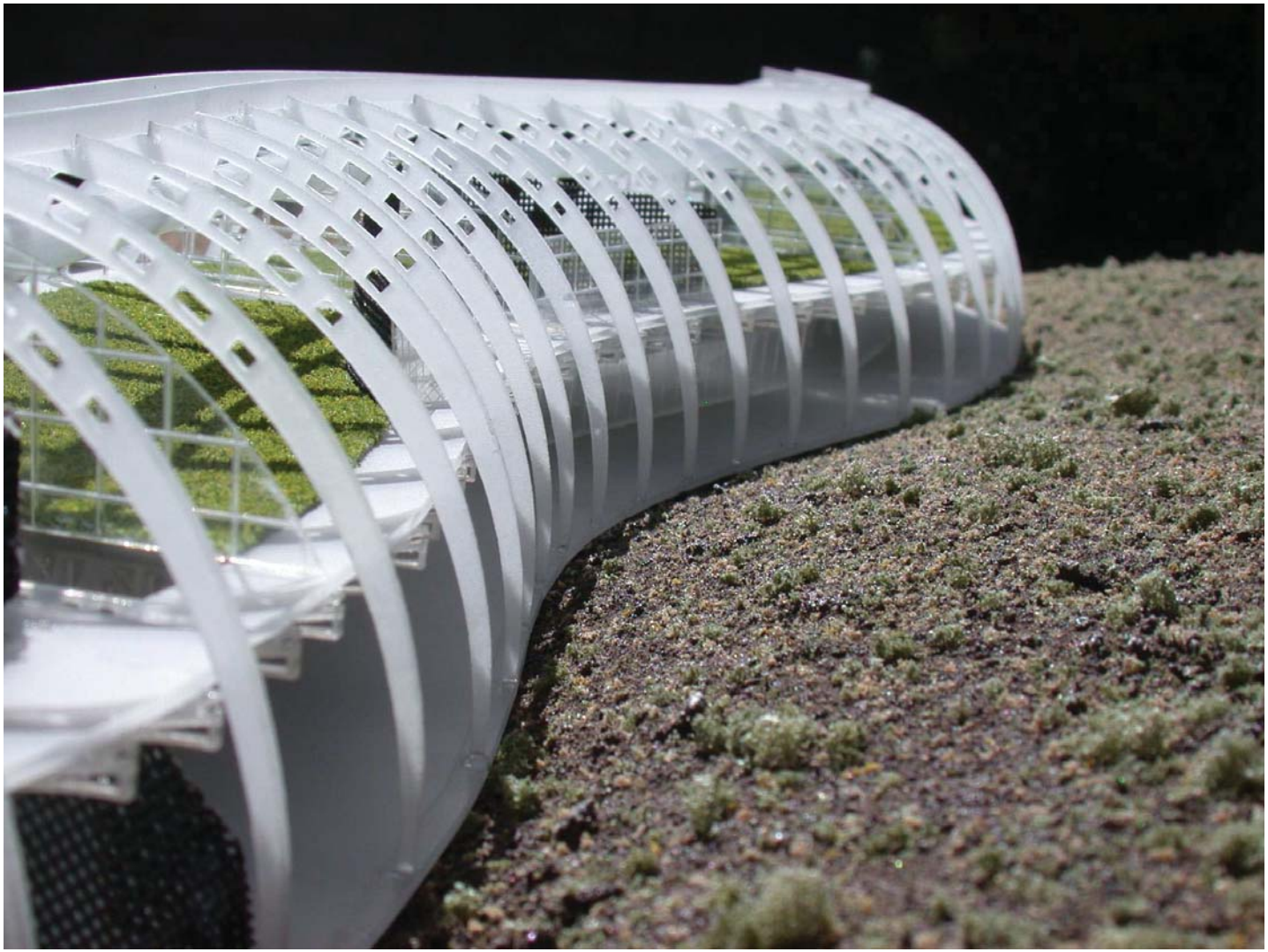


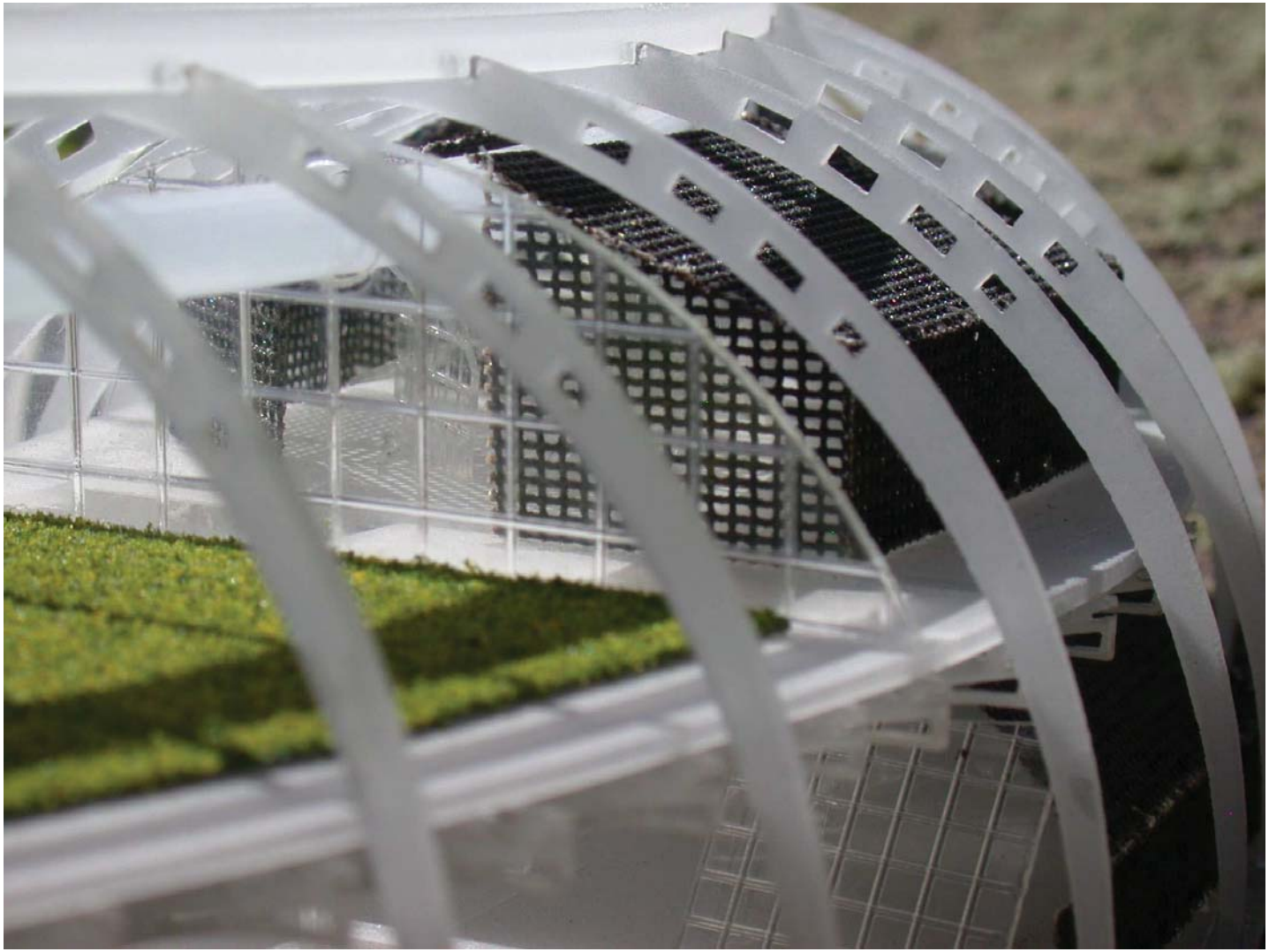


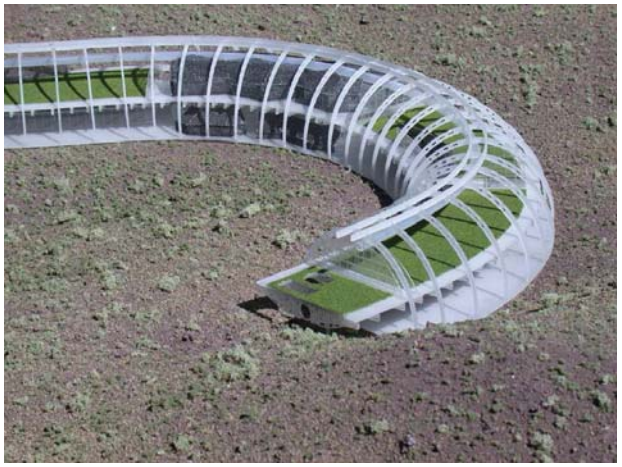


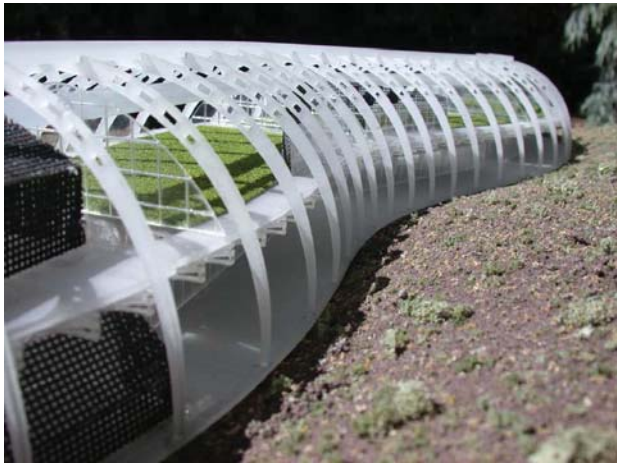


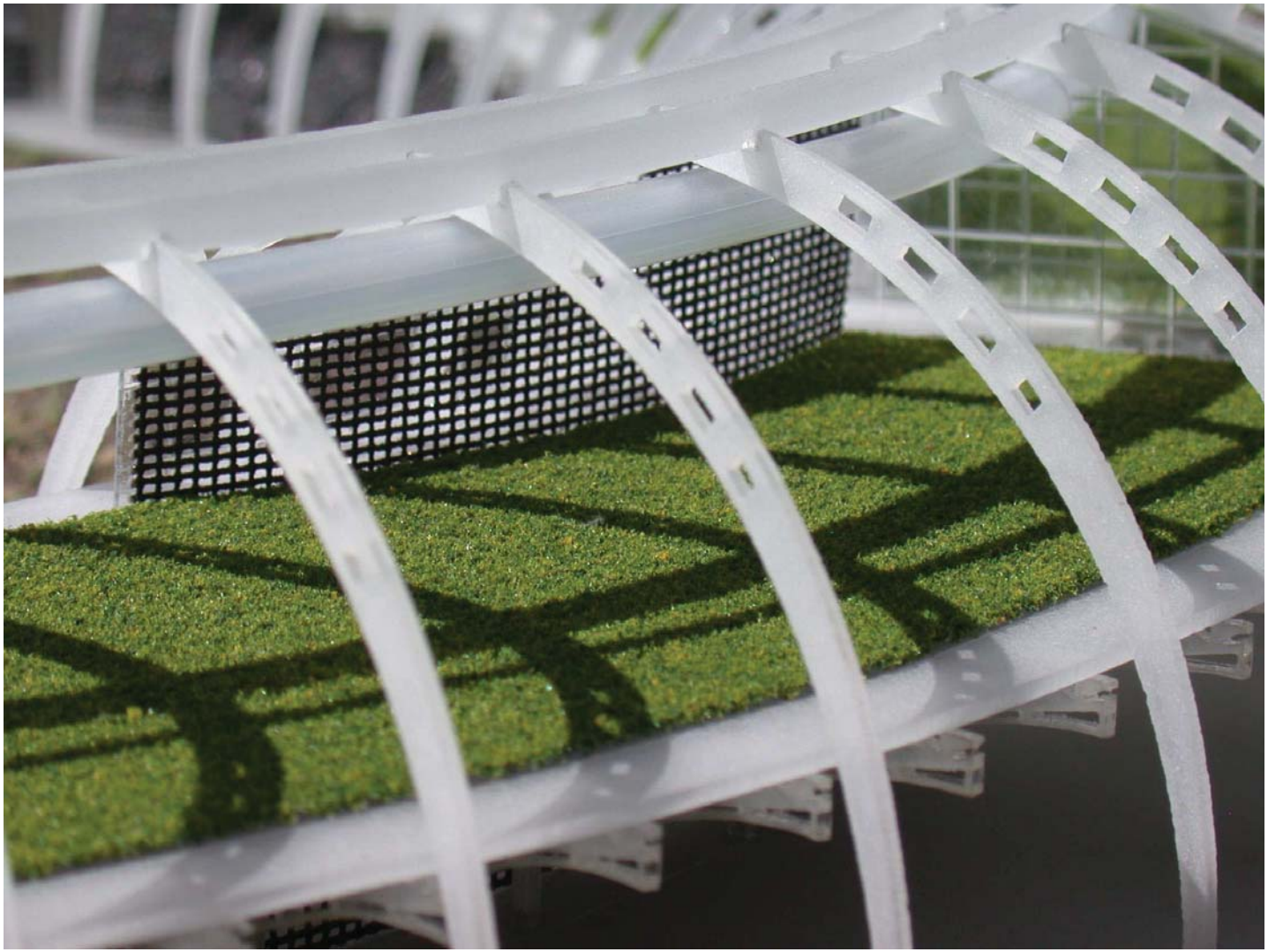


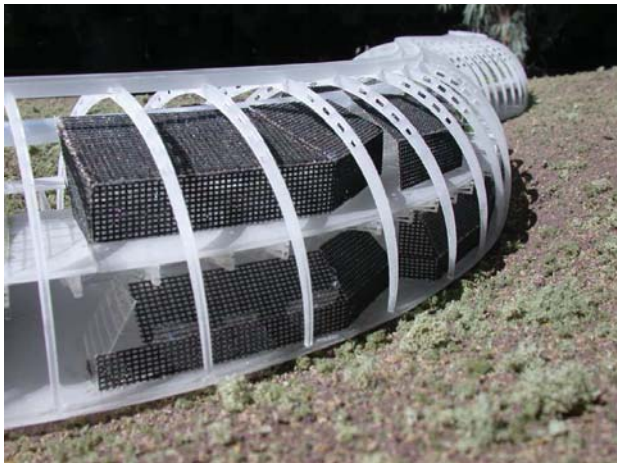


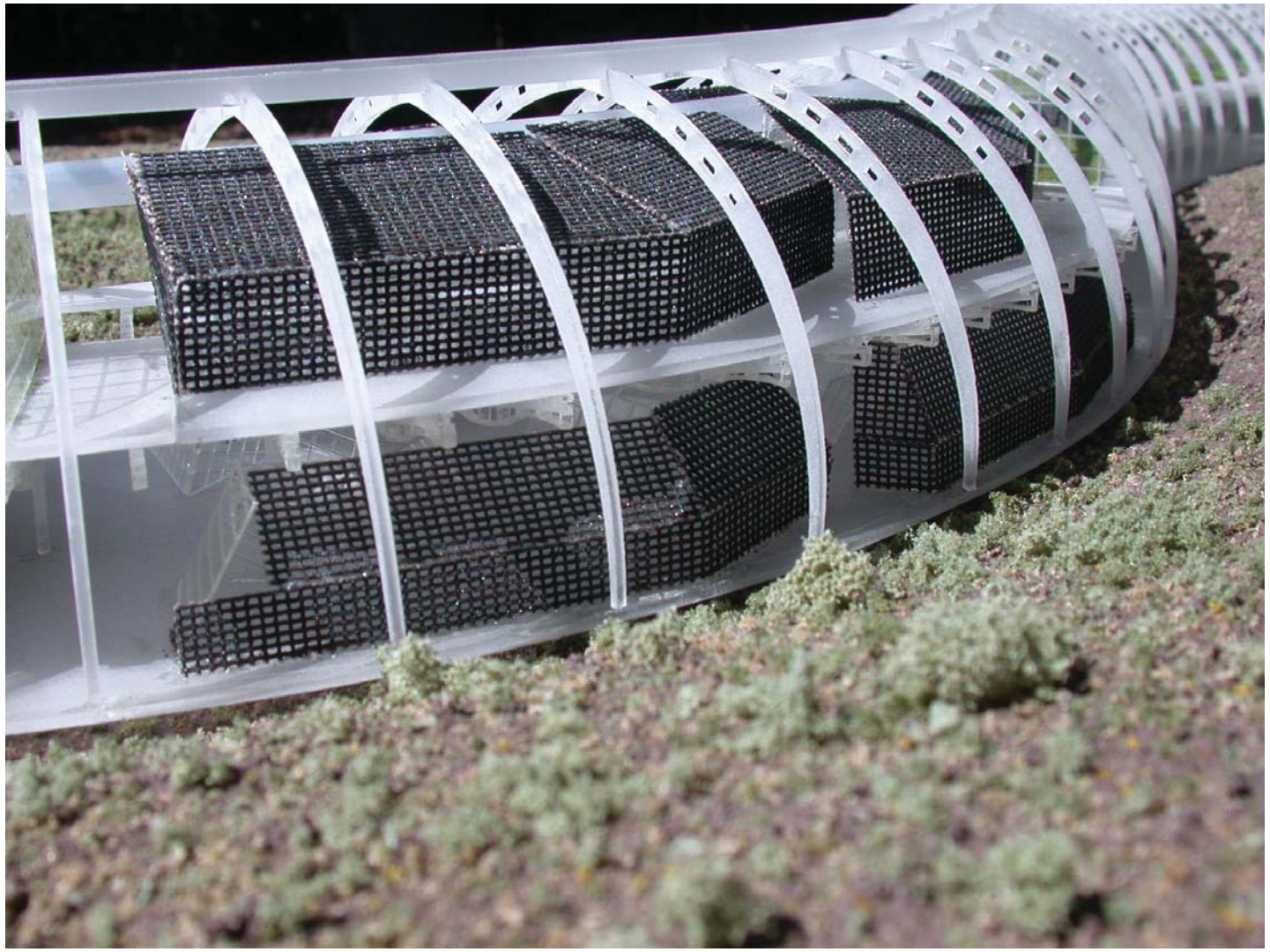


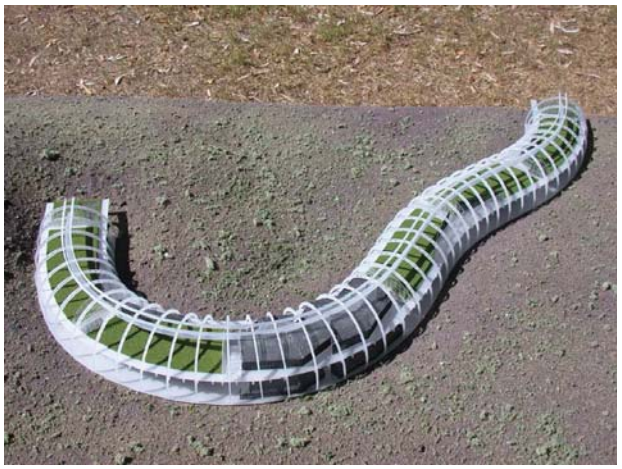


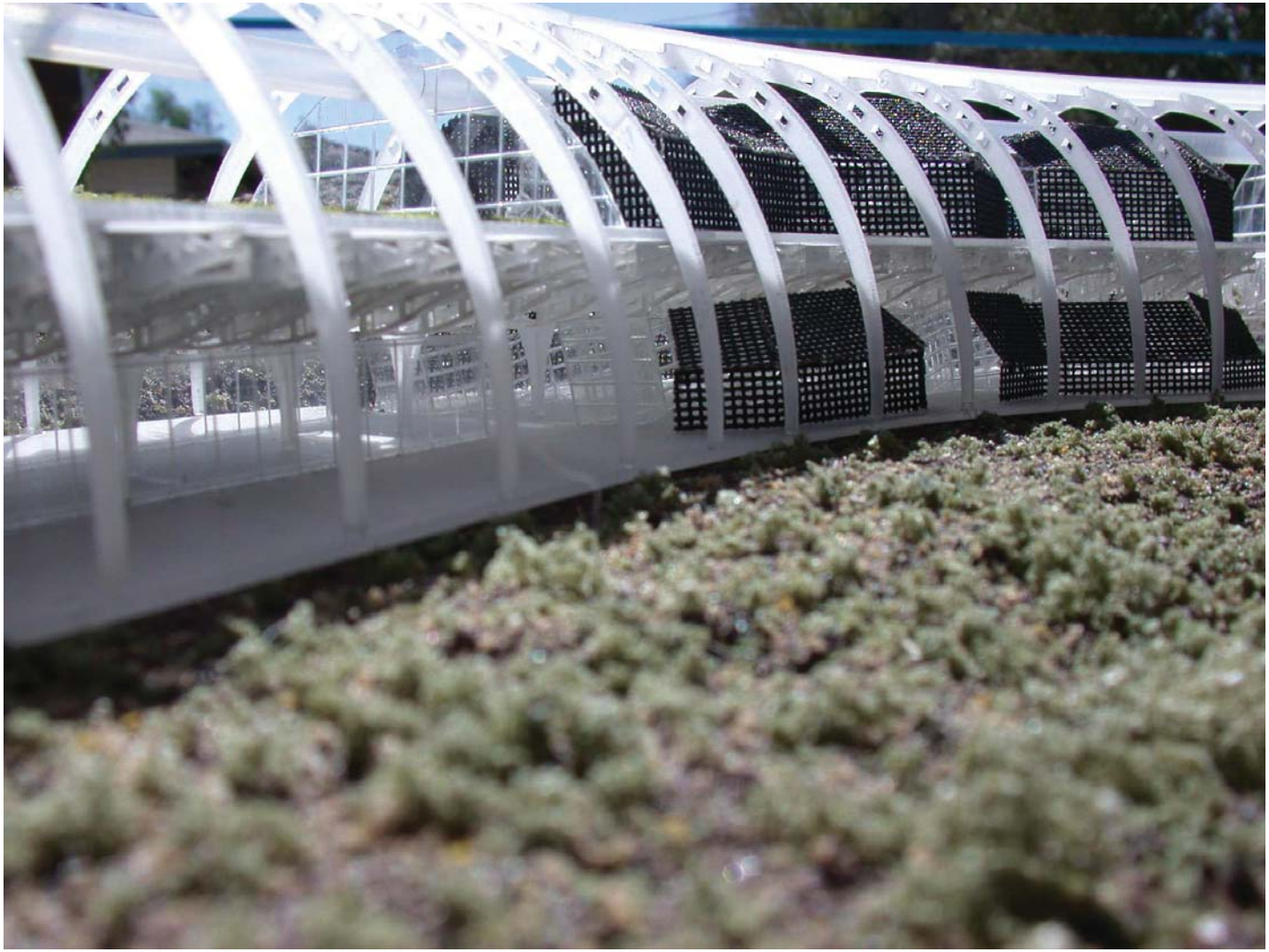


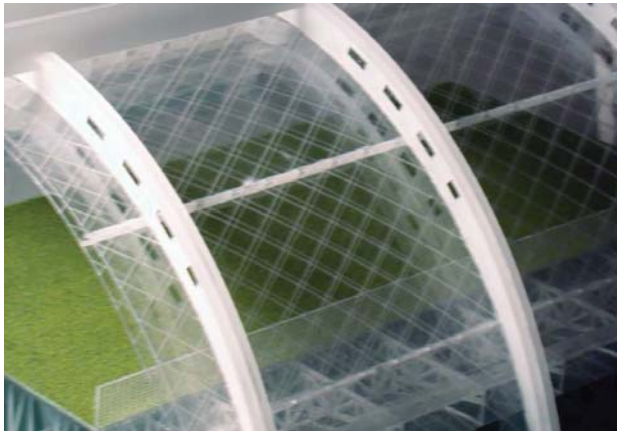


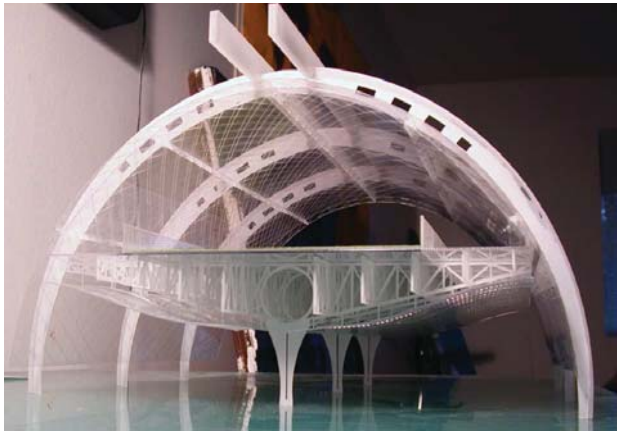


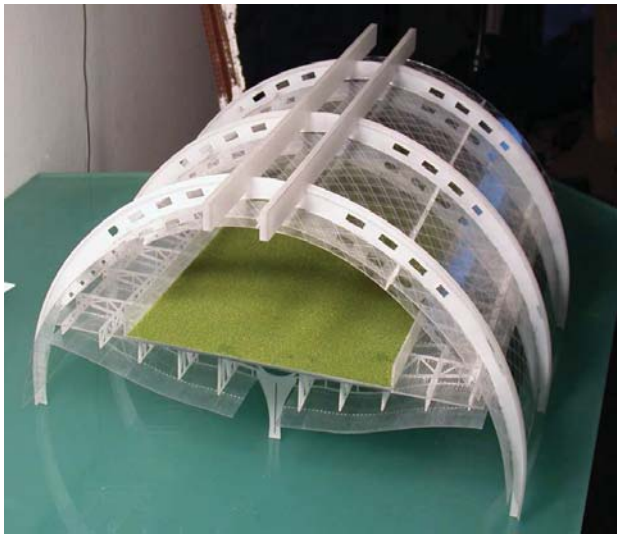


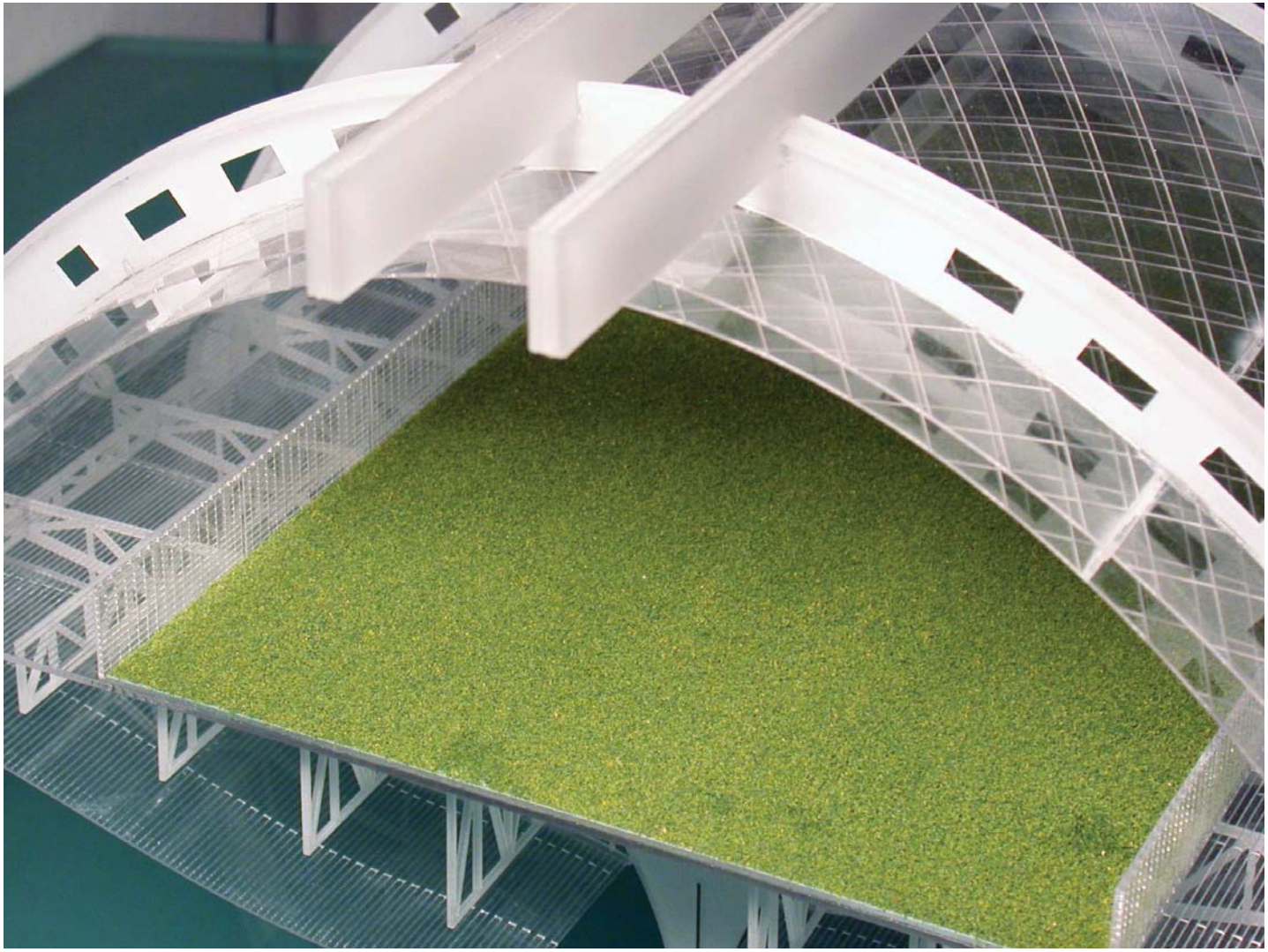


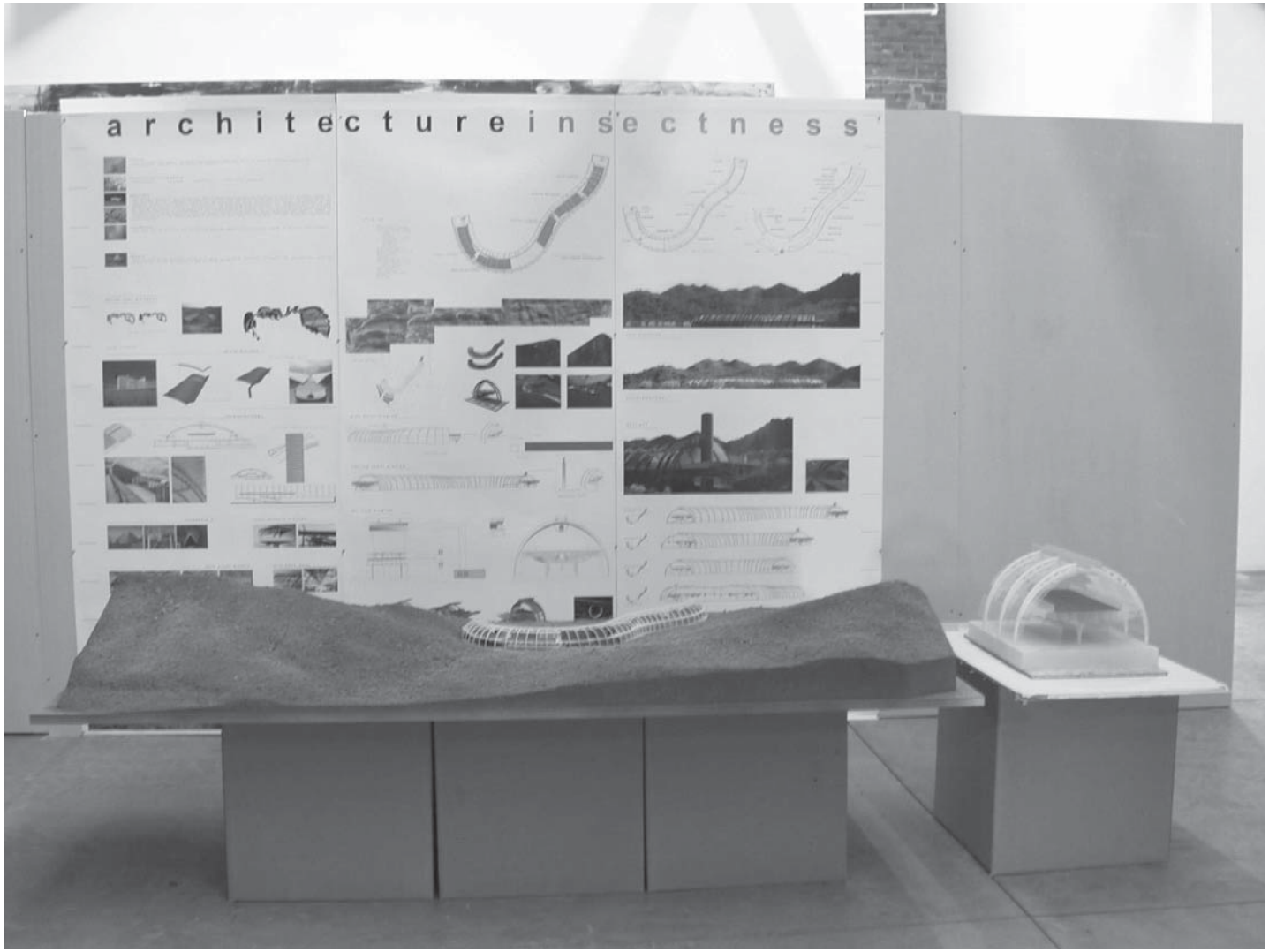











architectureinsectness

MASTERS 2002-2004
CASE STUDIES

CASE STUDY 1
YMCA

Transparency of form and mass

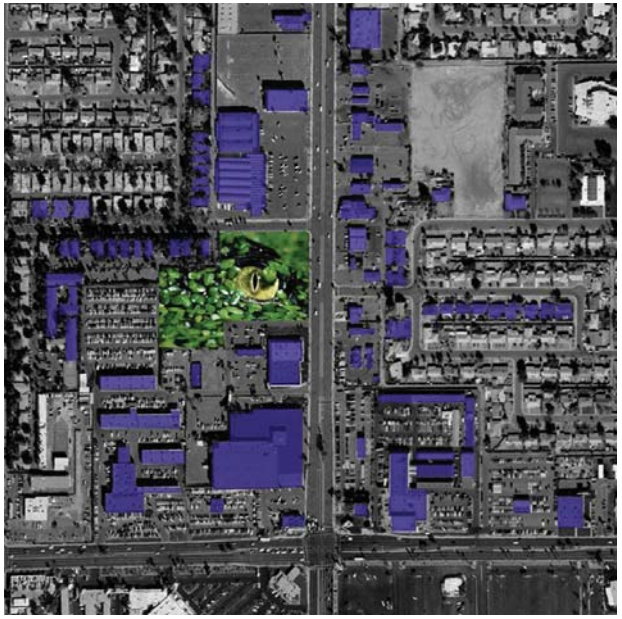
The conceptual idea behind the project was to provide an urban mass or icon for the surrounding area, while at the same time introducing the neighborhood to a new use in materials. I also wanted the project to be as transparent as possible and not to dominate the neighbor area. The project is essentially in the shape of a “U” with an open central corridor for the active programs of the YMCA. The structure of the project is a column and truss system on the interior and a space frame skin on the exterior. Both of the systems structurally support the floating floors at each end. The programmatic elements of the project inhabit the space in the structural wall. The façades of the YMCA are made up of 4’ x 8’ glass panels and covered by a suspended skin made up of metal grate. The parking for the YMCA is a gesture for bringing the ground plane into the building while attributing to its own identity. The relationship to the surrounding area is addressed by the thickness of the interior floors and the floating skin on the exterior facades.

The objective of the project was to provide an interaction with the structure and expose the structural ele

The identity of form and space changes from day to night. The silhouette becomes detail.

ments as a skeleton. The building is a 240' x 320' glass box which is wrapped in a galvanized metal grate. The program inside the box takes on a "U" shape or provides an inhabital wall, which allows for an open central core for active programs. The project is to be as transparent as possible exposing the different structural components, while at the same time obtaining adequate thermal properties. The main structure is made up of a series of 3' x 3'columns spaced 32' on center. Selected columns house the mechanical components inside the hollow cores. Between the columns, over the central core spans a 110' truss with 10' x 10' bays and supports the roof system. The individual members of the truss are all 12" steel members. The inhabital wall is a series of hollow concrete floors which hide the mechanical components as they enter the individual rooms. The diagrams represent the different aspect of the project. The collage of pictures adds a visual depth to the structural elements of the project. The spider is a representation of the spider connections on the glass facades. The frog represents the different structural layers and opacity of the skin as well an idea of different structural elements acting as a single form. The architectural diagram is a representation of the scale of the project in relation to the surrounding in environment.

The structure of the project is essentially a spine with ribs and a skin. The horizontal beams with the concrete floors in the project relate to the heights of the adjacent buildings. The thickness of the floor varies depending on the relationship to the buildings heights as they penetrate the site. The structure starts to form the interior spaces or modules along with a noli plan of the immediate area. Because the structure is a frame structure with a hanging skin the



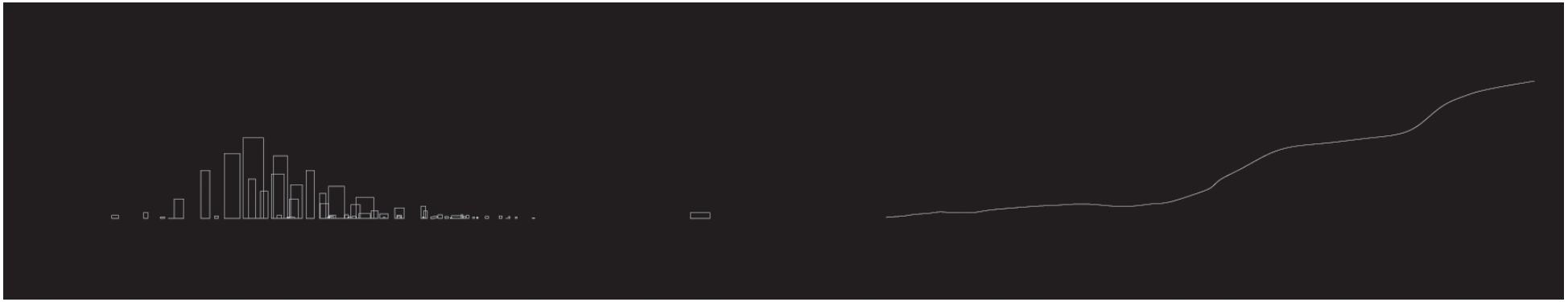
opportunity for voids inside the building are possible. The penetration of the building heights also worked in conjunction with the structural elements in defining programmatic placements.

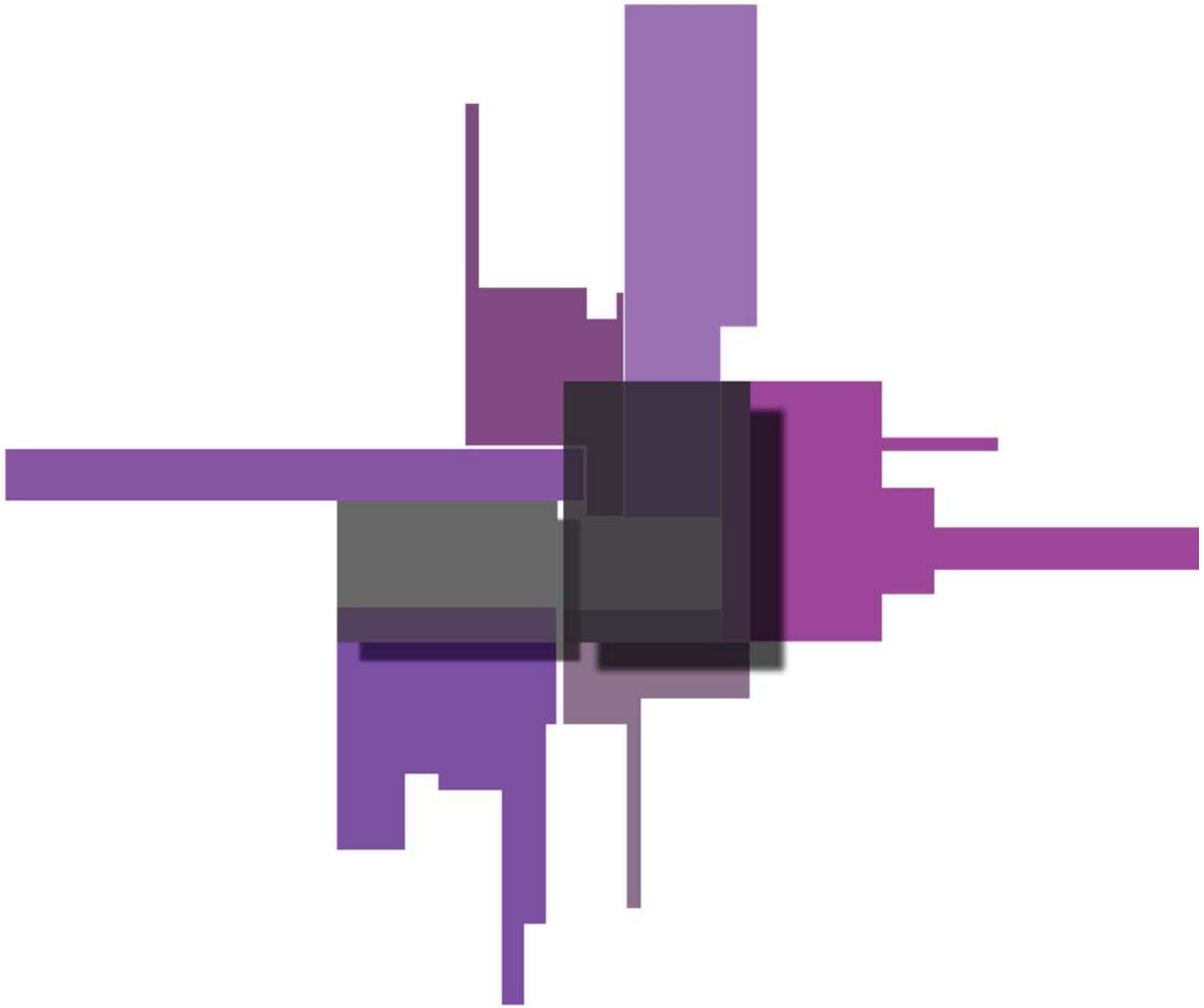
The most impressive element of the project is the space frame which wraps the entire project. The frame anchors the project and keeps it stable. The 4ft. thick skin holds the metal grate as well as 4ft. x 8ft. glass panels on the façade. The skin is made up of 3inch x 3inch steel members. The steel floor beams attach to the skin as well as the columns making the skin a structural façade. The steel floor beam is connected to the frame skin by a fin plate. The plate cups the web of the beam and is welded to the frame at a node point (where four individual members come together). The beam to plate connection is a pinned condition. The load from the floor beam is transferred through the members of the skin down to the small columns anchored to the ground. The 4ft. x 8ft. bay members of the skin also act as a mullion system for the 4ft. 8ft. glass panels and acoustic panels on the roof. The roof of the skin tapers back fro 7ft. at the north end to 12 inches. By sloping the roof, the roof is shaded in the summer and allows for direct sun

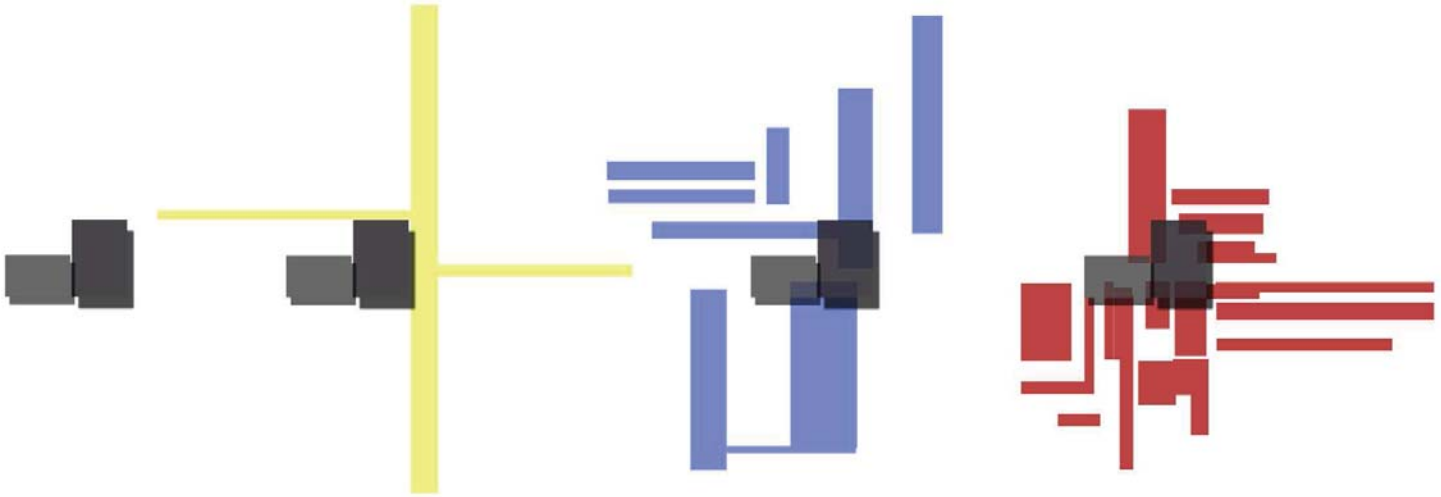
exposure in the winter.

The sections of the project provide a series of horizontal bands, which are the end result of the structure and floor beam system. The thickness of the hollow concrete floors varies depending on the exterior relation. The hollow concrete floors are areas for mechanical and electrical components. The floors, in some places, are supported by an interior truss system for stability. The idea for using the hollow floors, in addition to the mechanical and electrical elements, is to provide a compressing feeling or a feeling of mass while minimizing the amount of weight on the light weight skin frame and interior columns. The flexibility of the structural system allows for multi-height spaces on the interior and a transparent or light weight feeling of the massive building.

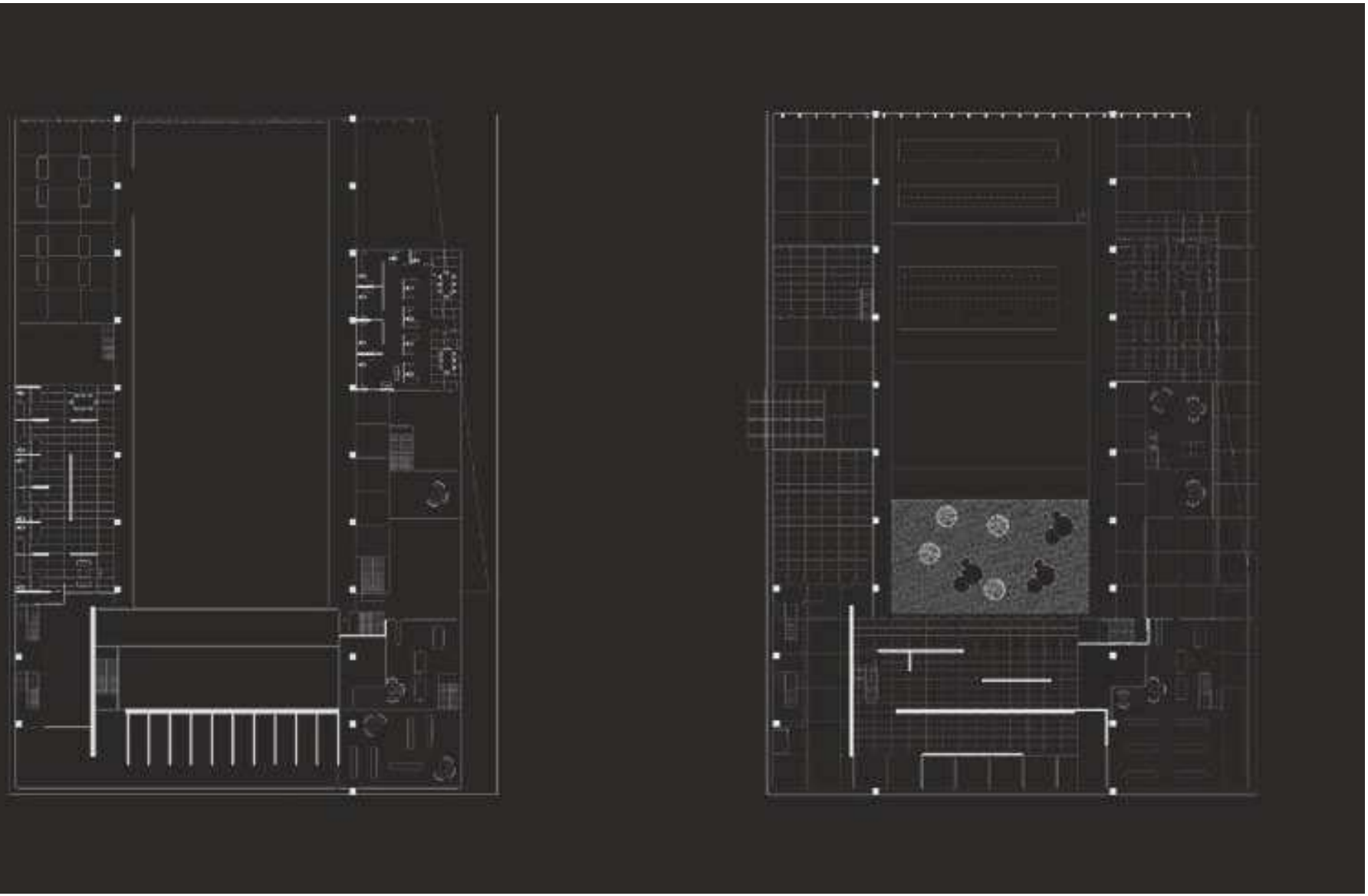
One of the main objectives in the project was to minimize the amount of custom details. The project as well as the structure itself is straight forward and consistent throughout the building. The exposed details and structural elements together add another dement ion to the project, which is sometimes disregarded or overlooked in most architecture. Structurally, the building was designed to give more than one function to every structural element through a means of tectonic exploration.

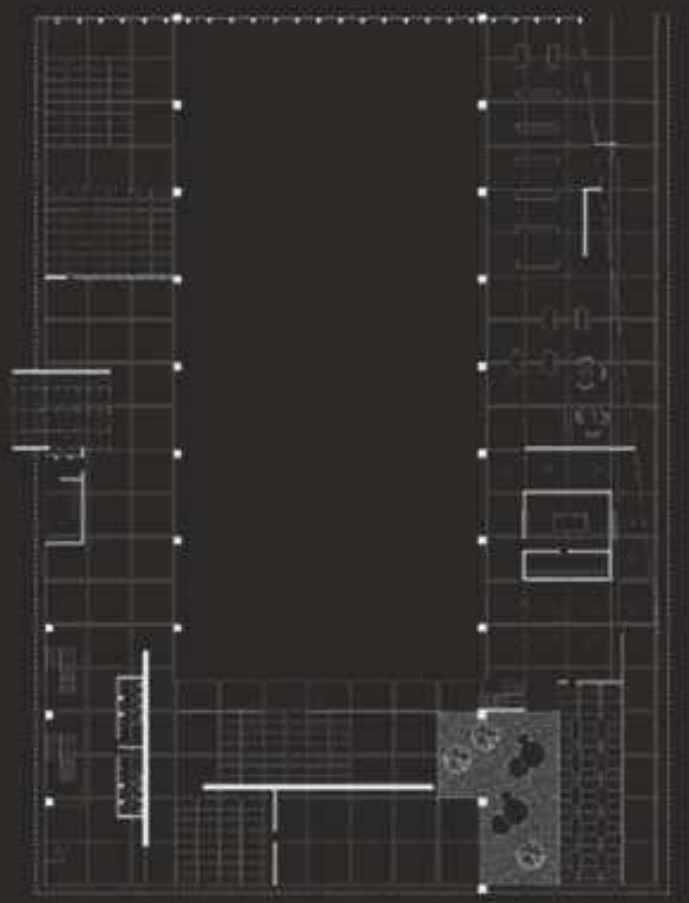


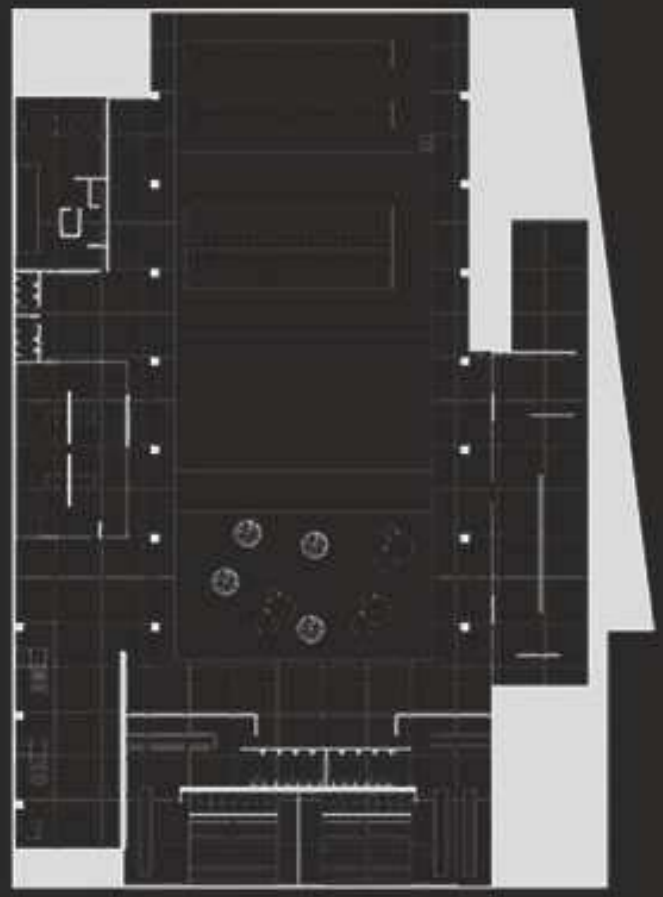


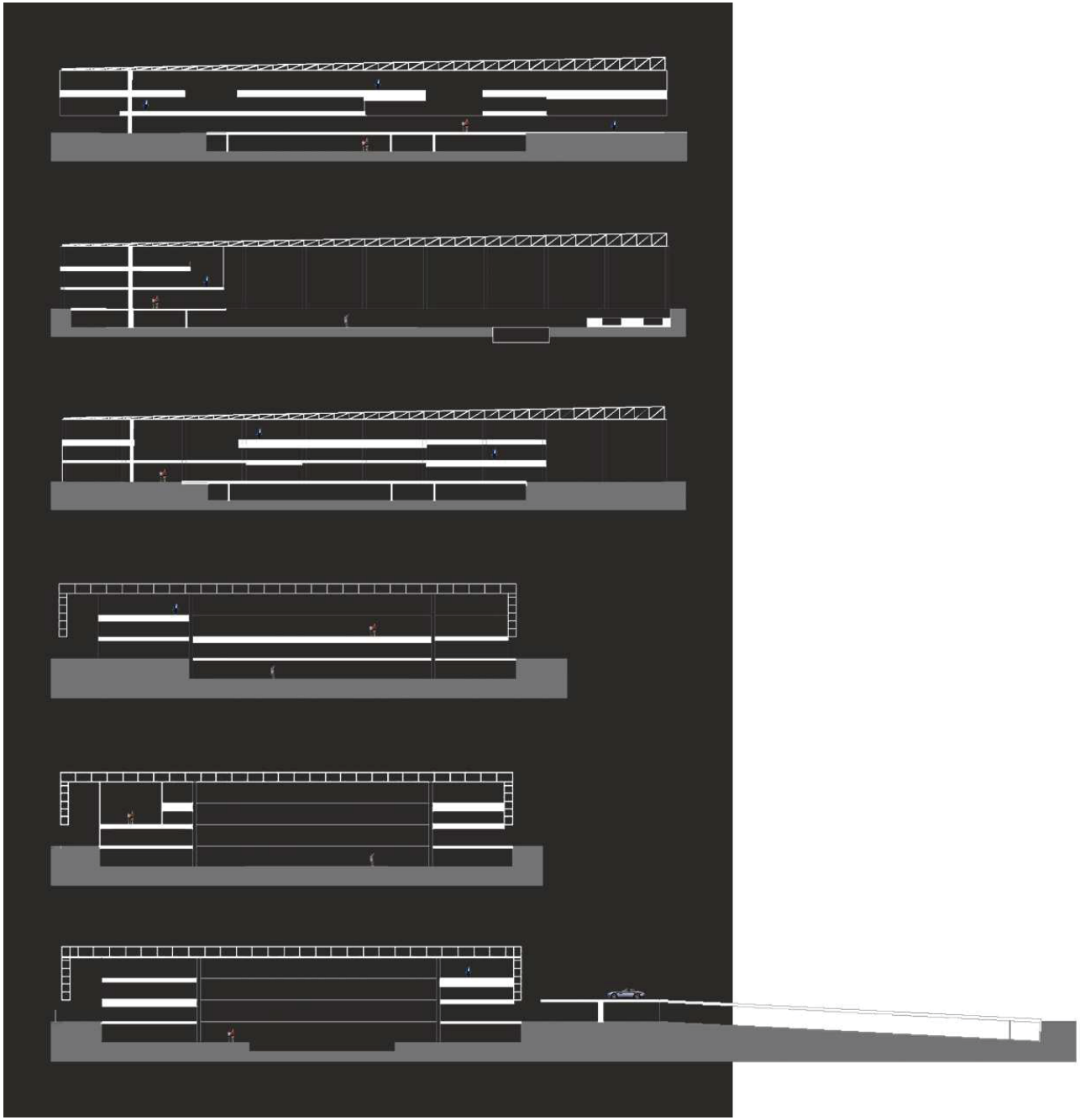


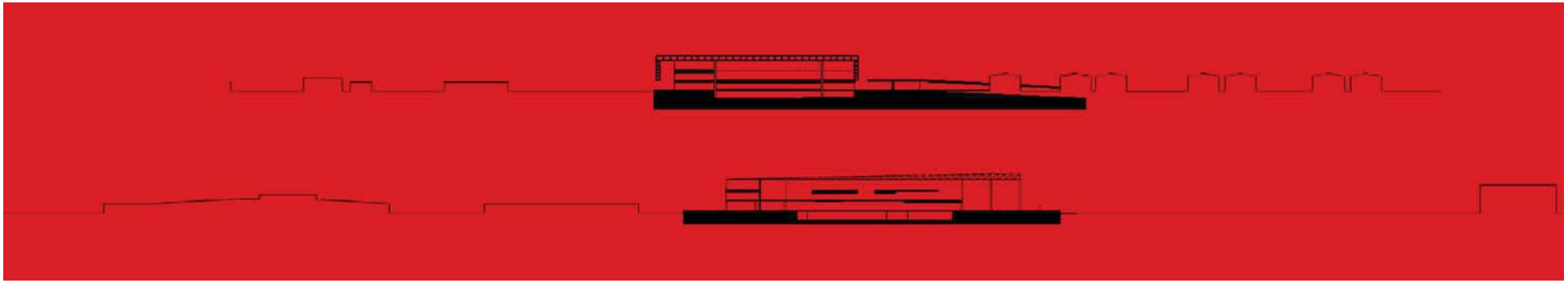
Noli Plan









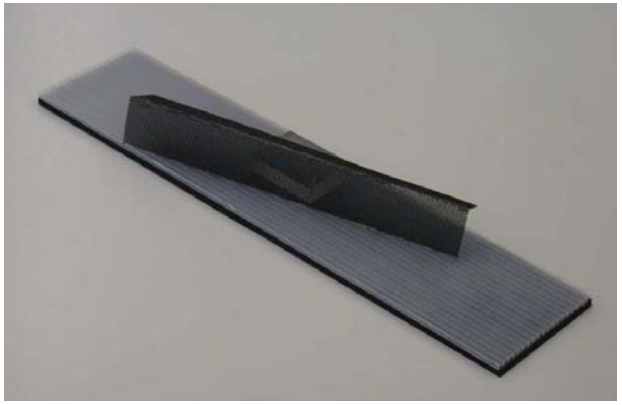


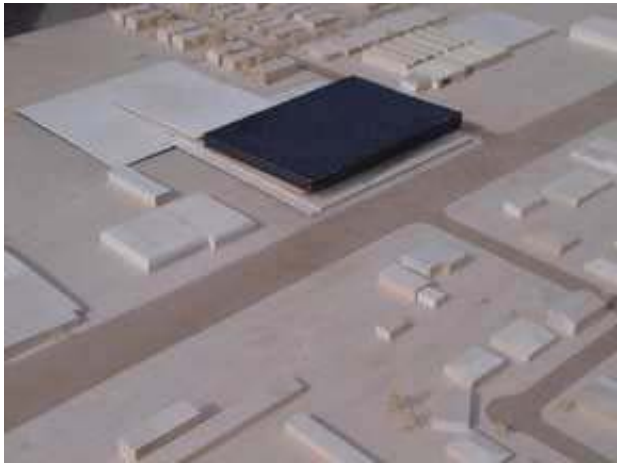
Main structure: 3 foot x 3 foot structural columns
Long span: 10 ft x 10 ft. bays over 110ft. span with 12 inch members
Connection: pinned

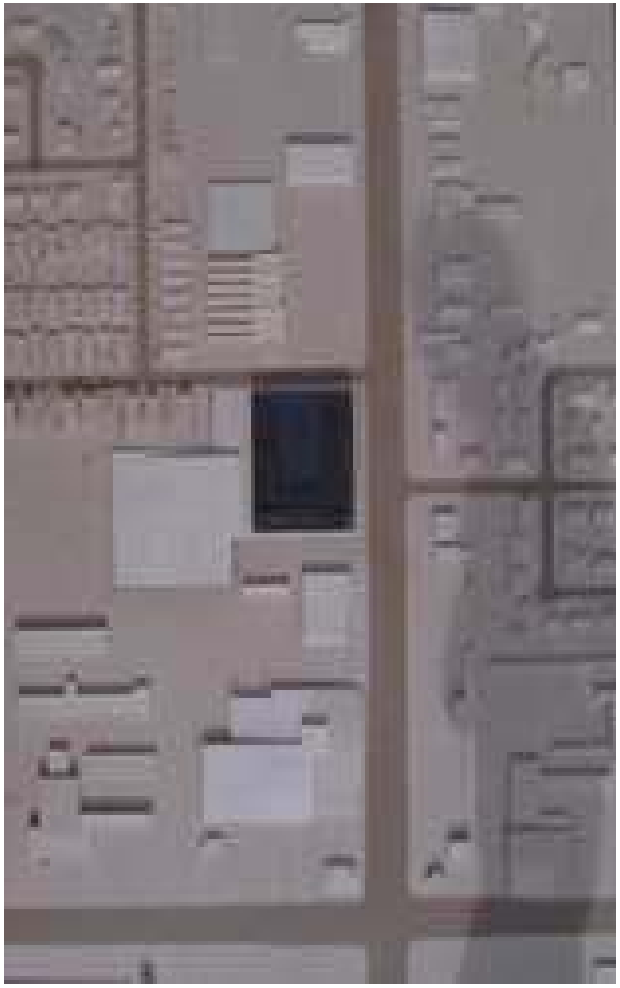
Space frame: 3 inch x 3 inch steel members welded together
Spacing: 8 feet on center per individual truss with cross members for support
Cross Members: hold glass and roof panes as well as metal grate skin

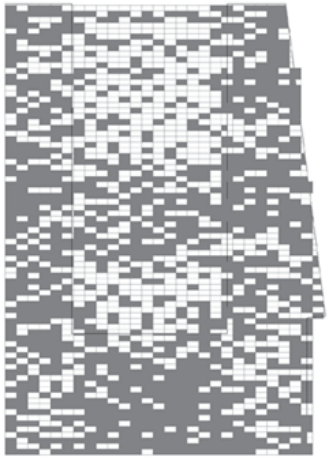
Glass: 4 foot x 8 foot sheets (dimension for 4 x 8 plywood sheets during construction and temporary replacement, mullion system based on 4 foot cntr. spacing of structural skin
Metal Grate: 8 foot x 16 foot sheets (McNicols metals)

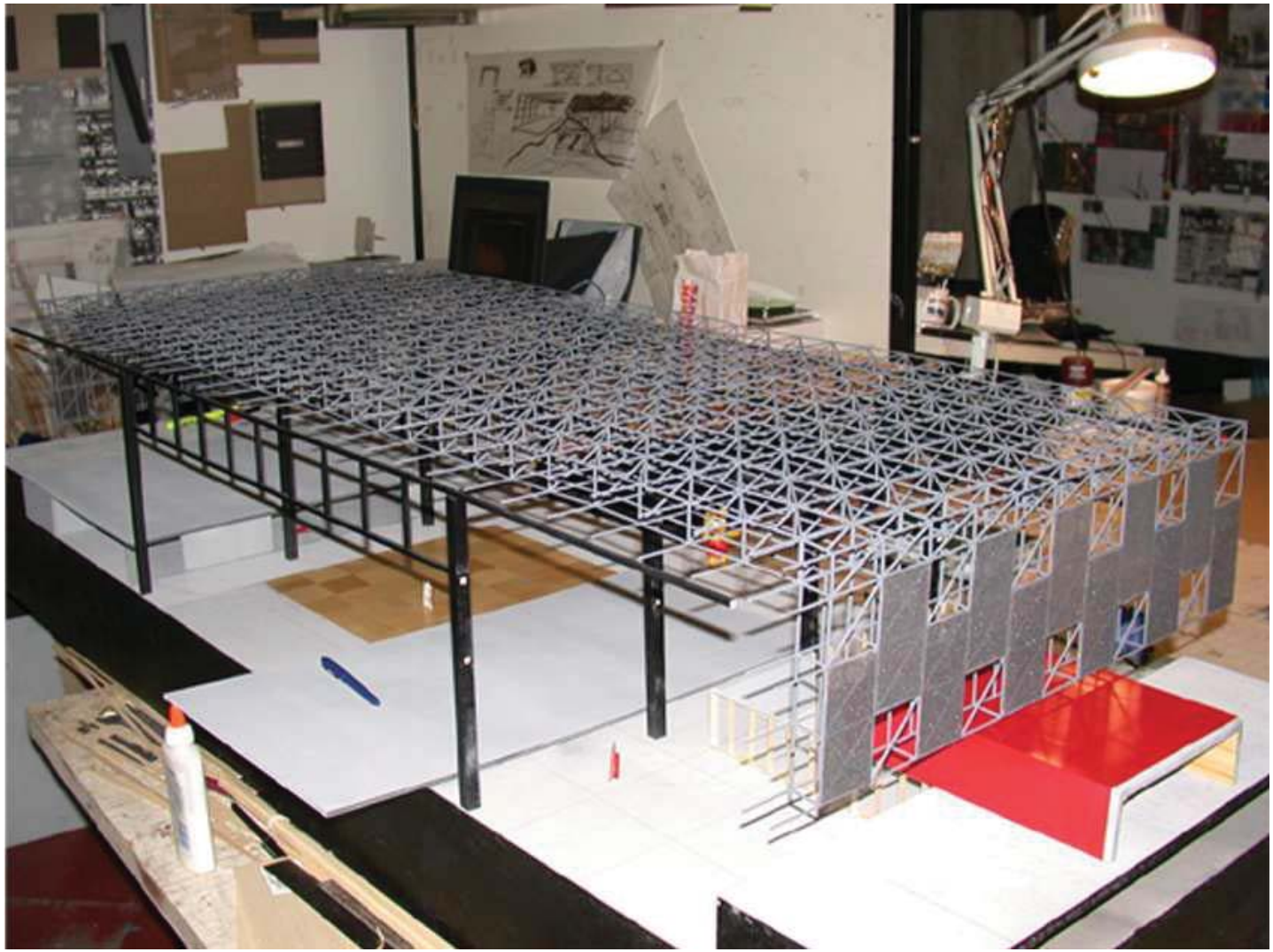
Floor: 24 inch deep steel members over 50 feet (span / 20), hollow concrete floors with interior structural system depending of floor depth.
Connection: fin plate pinned to steel floor beam and welded to interior column and structural skin explanation analysis





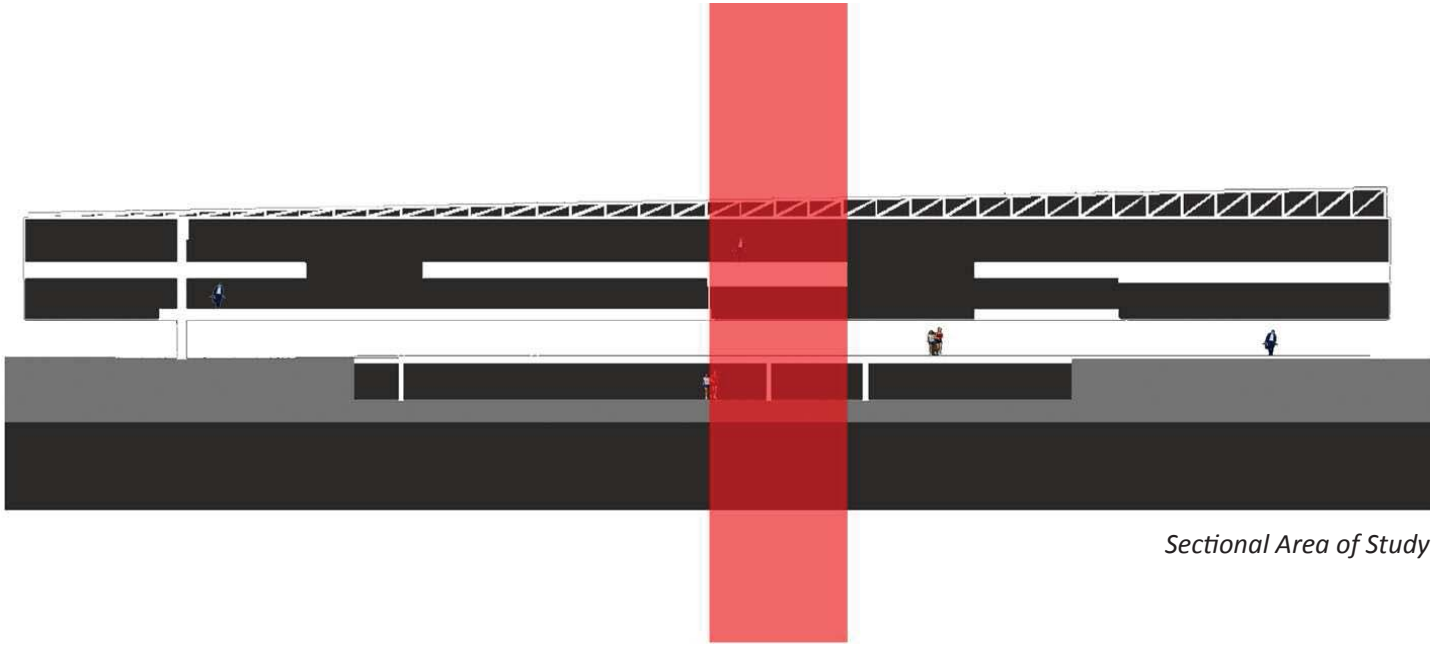




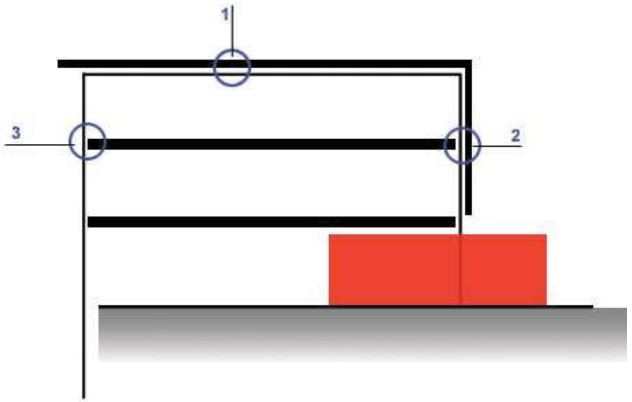


DETAIL STUDY

Why are people intimidated by the simplicity of the box? Afraid of the box and why is it that the box in architecture appears to be frowned on as a design strategy of example of architecture. Could it be that those who do not understand the elegant simplicity of the form are those who do not really know how a technical understanding. i seems that in order to be an architect one whould need to have ant least a general understang of the technical side of architecture as opposed to only focusing on the theoritical aspects. there is an overwelming sence of elegance when one is in the presence of thinly , clad, transparent rectulangulr volumes or forms. forms. after all, does a particially clothed women not have more sex appeal interest that a women who is fully nude. there is opportunity for interpretation and understanding of why the architectural moves were relevant. if we as architects design buildings that are :to put it politelly, irregular in form jsut because we are able, yet at the same time have no understanding of the technical aspects of the arcdhitecture or there is soley no reason to alter the form. there has to obvisously be an extrordarny reason to drive the cost of the construction driven market through the roof. the only example known is the unreality of the architect with the archal world of architecture. this architect wis only familiar with the realities of the architecture that can be modeled in 3D or sketched out on paper.



Sectional Area of Study

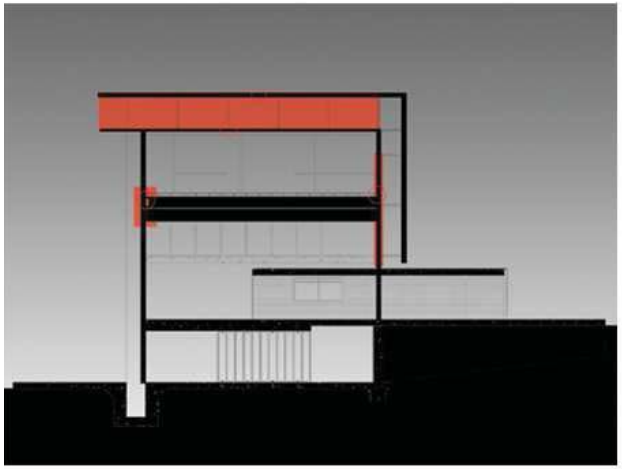


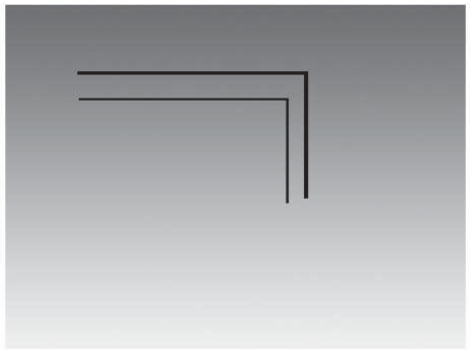
The intent of the project is to reduce the amount of different details and to provide more of a standard solutions for the connections. Further exploration of the systems provides opportunity for prefabricated components or kit-of-parts.

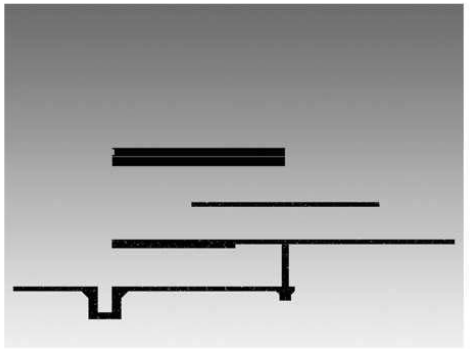
1- This section of the project explores the metal grate to the structural skin connections, while incorporateing the translucent and transparent ceiling panels. The metal grate of the roof system is suspened ove teth insulated roofing element. This allows the roof to be shaded during the summer months. the angle of the roof is such that it maximizes the thermal properties of te sun during the winter months.

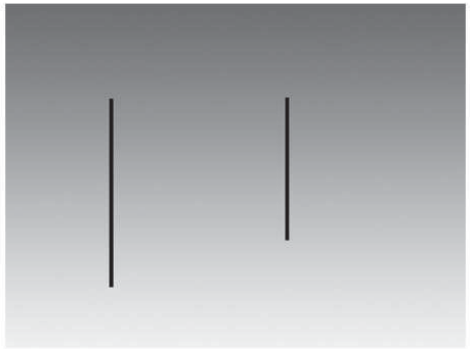
2- The outer skin connection explose the unity of the structural skin with the glass facade. additionally, the techtonics and structural integrity of the systems provide a unique opportunity for expressive architecture. the skin o fht eproject appears to hover over the ground and surrounds the glas box, as a protective skin. the conmnection of the two systems is important as they will need to move indepente of one another as well as a single system.

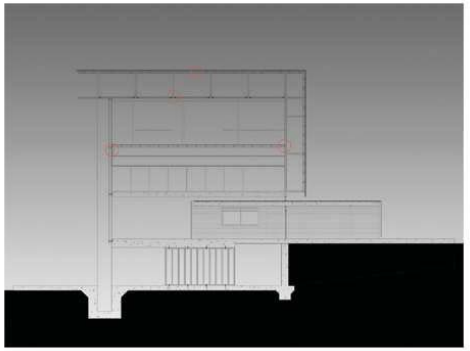
3- The interior structural section exploration is the most important. The super structure of the project consists of large steel columns holding up the steel trusses, supporting the roof system. The interior edge conditions, at the floor systems, is pulled back from the columns providing a floating effect.



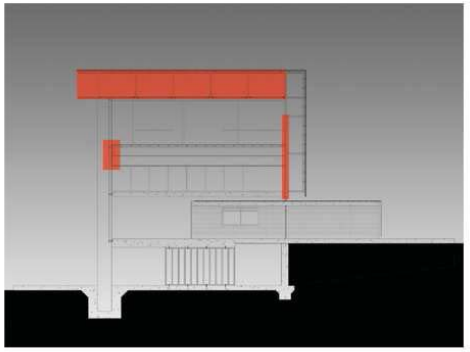


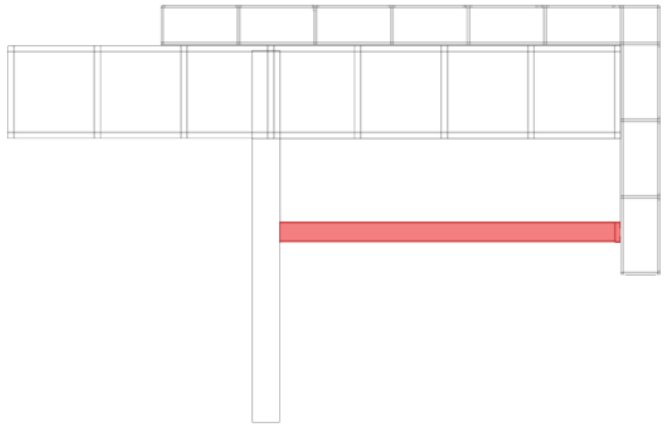


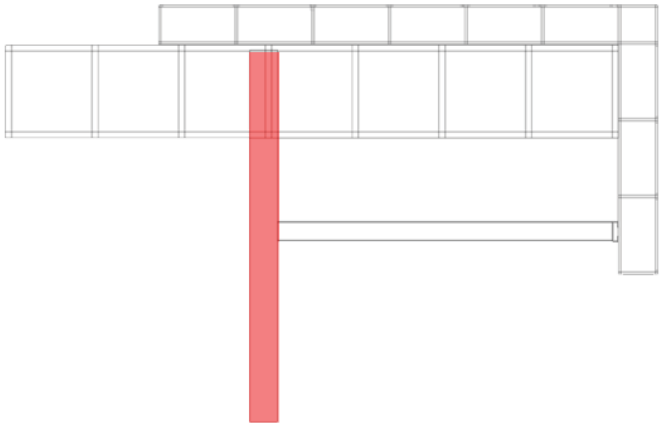


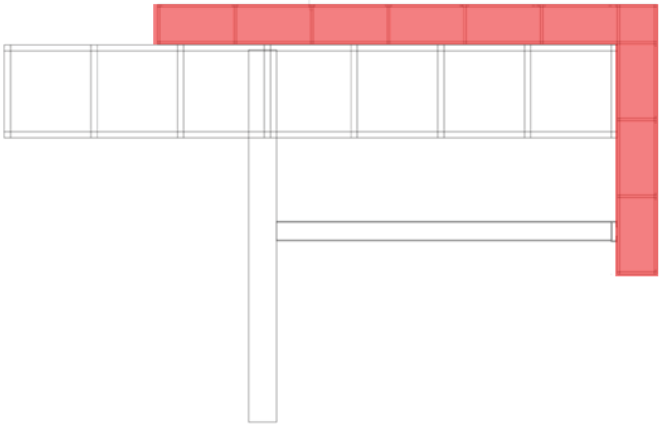


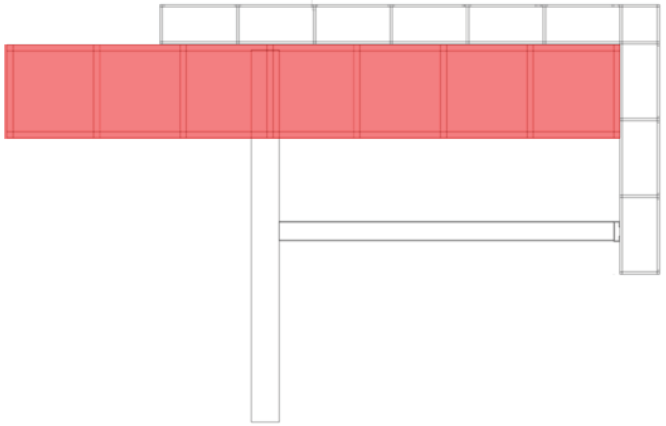
The systems of the project can be broken down into 3 separate elements. These are the structural skin, roof structure, and glass curtain wall. The connections of these components are explored in depth and as a complete system. The expanded study of these elements provides a further understanding of the project as a whole.

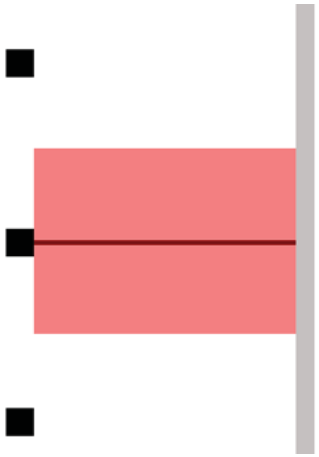


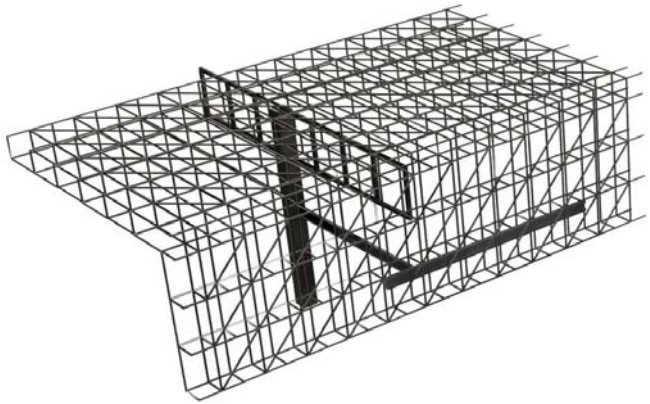


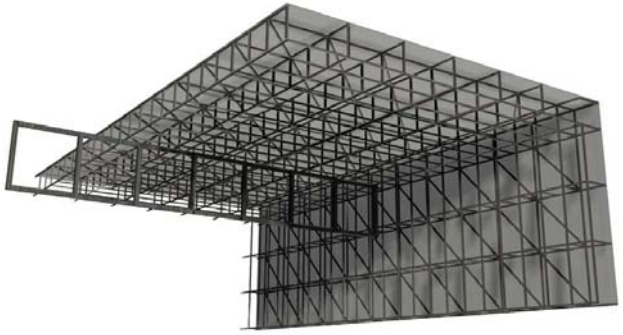


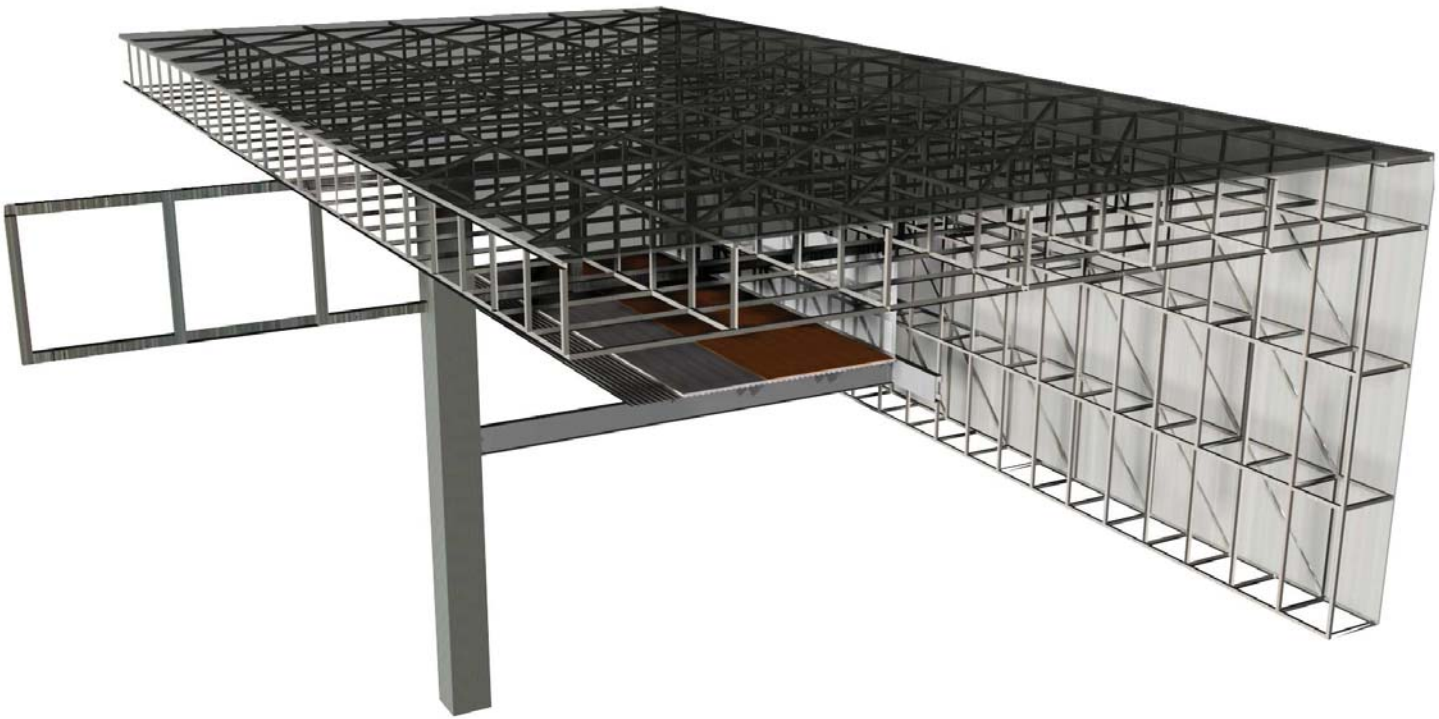


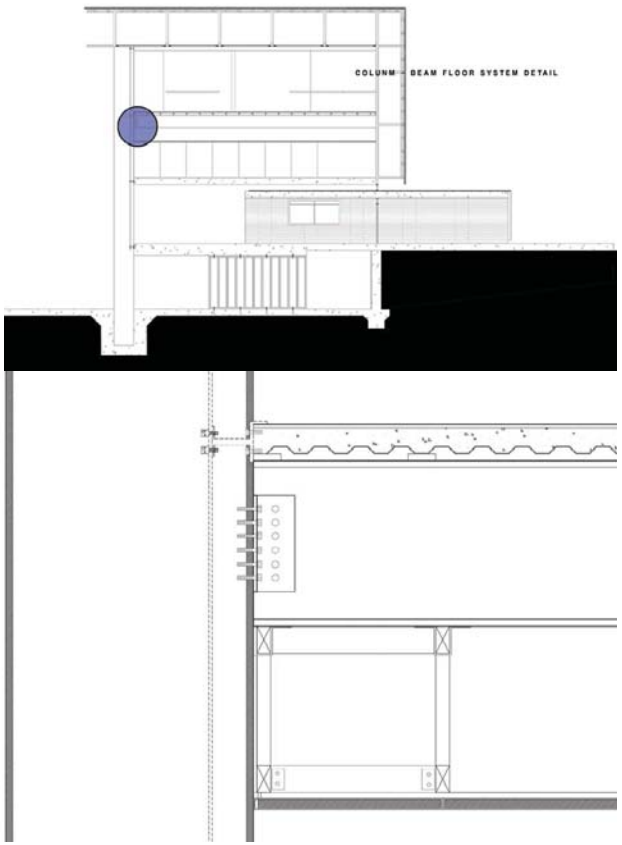


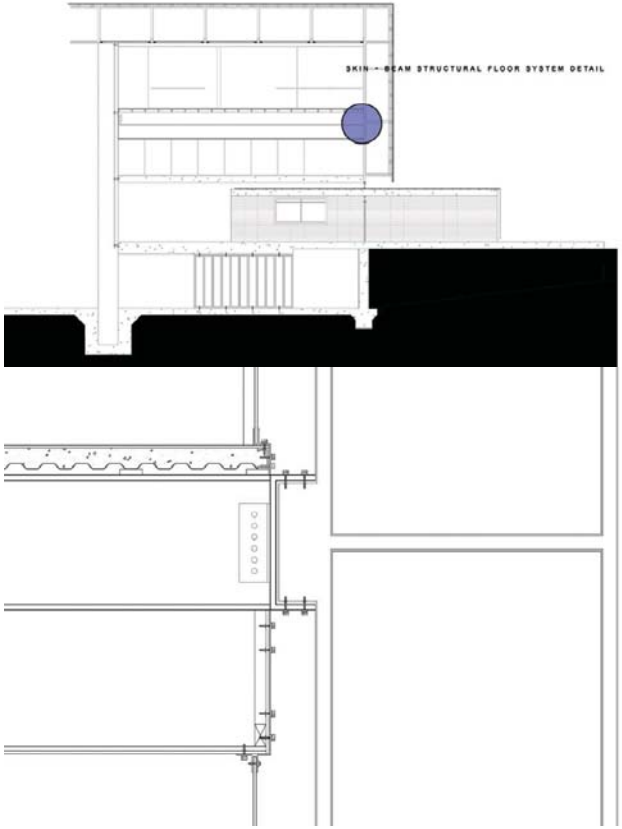


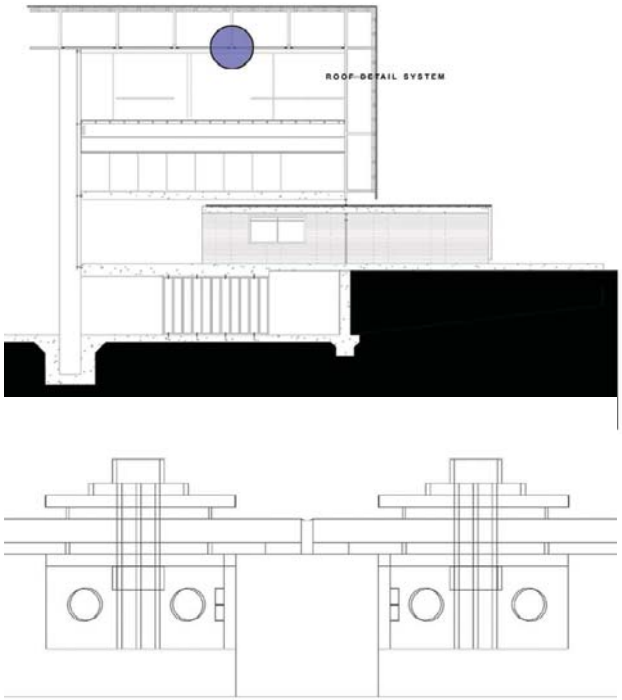


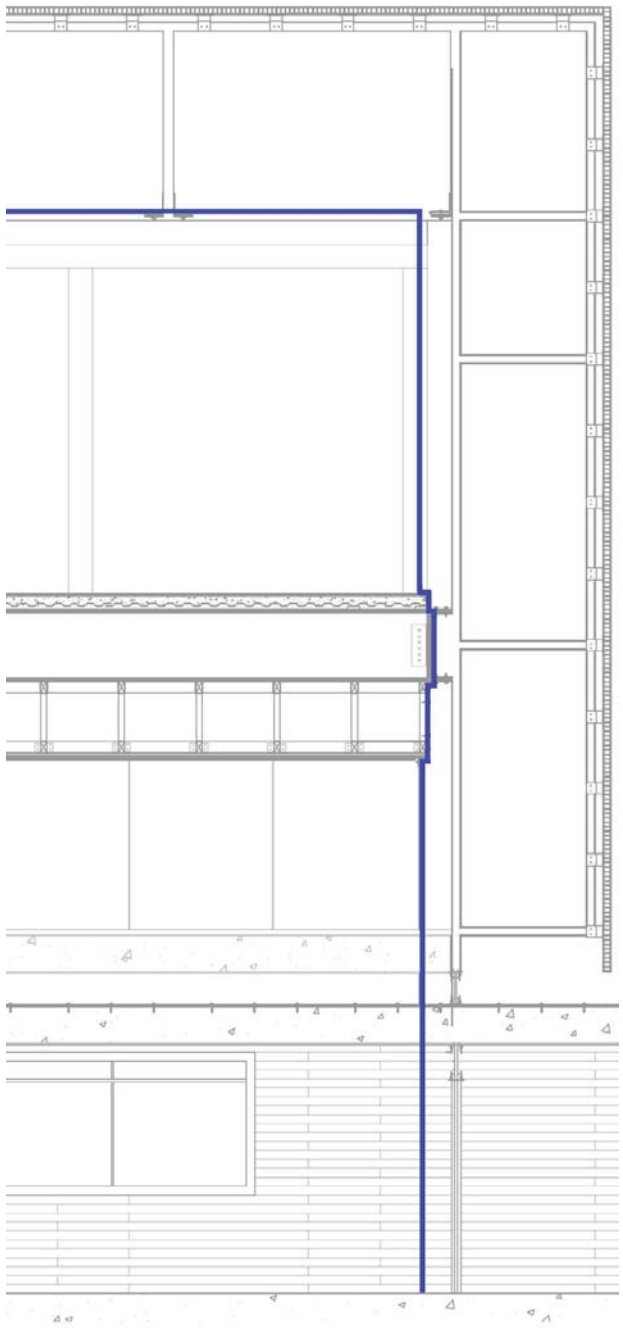




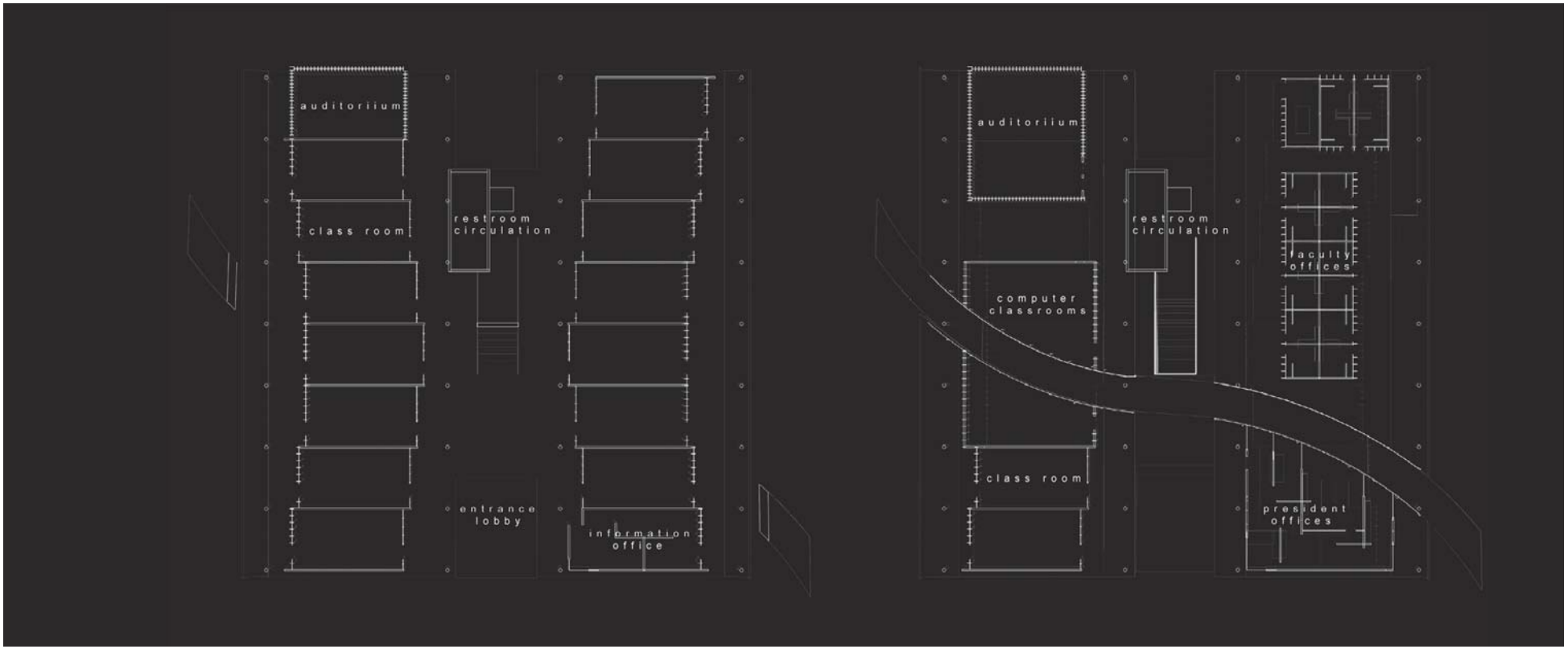

COLUMN – BEAM FLOOR SYSTEM DETAIL


SKIN – BEAM STRUCTURAL FLOOR SYSTEM DETAIL

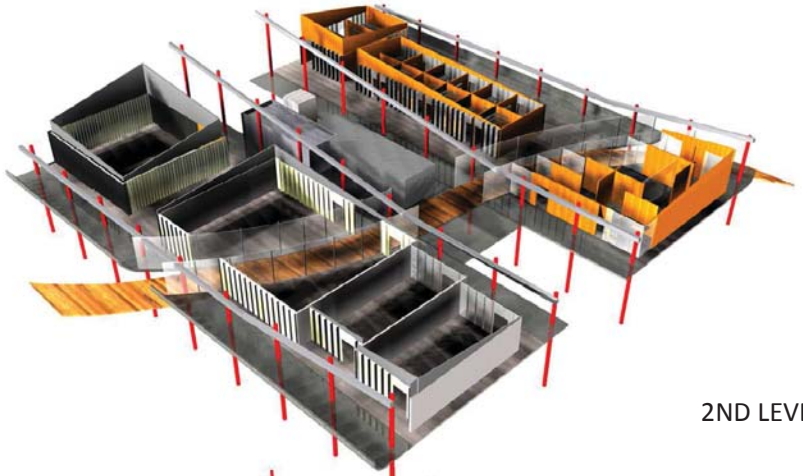

ROOF DETAIL SYSTEM



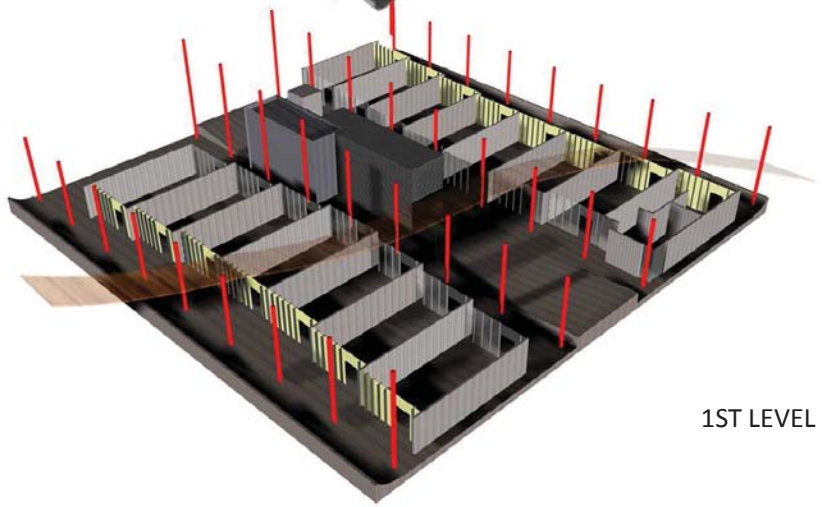
CASE STUDY 2
CLASSROOM FACILITY



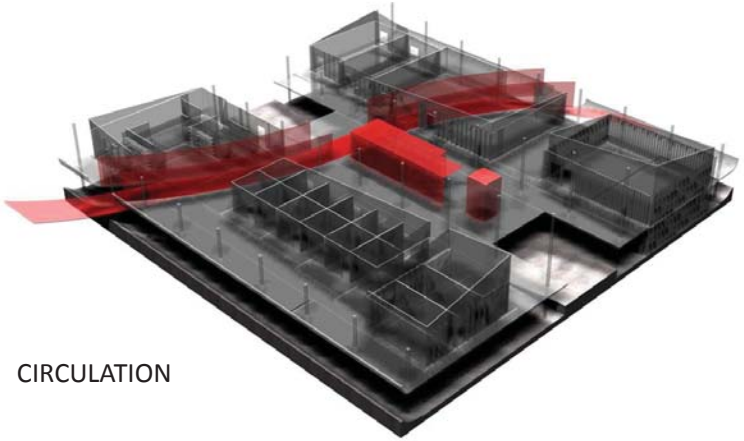
ROOF



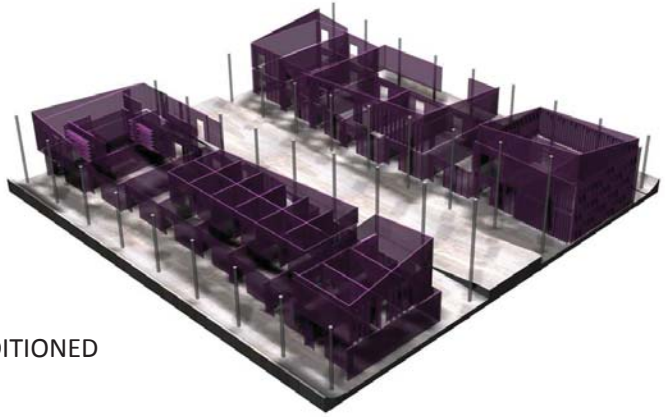
2ND LEVEL



1ST LEVEL



CIRCULATION



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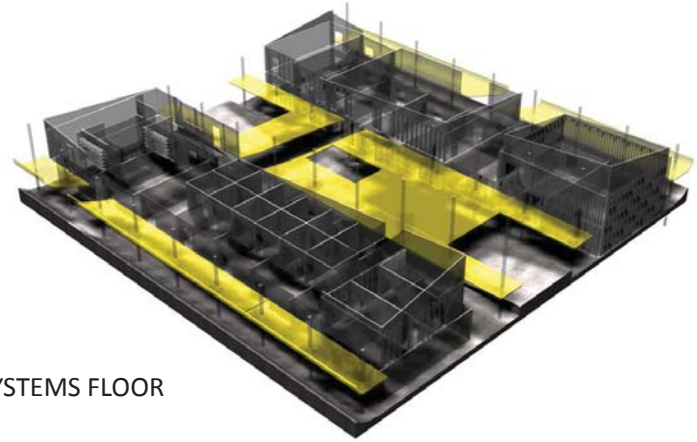
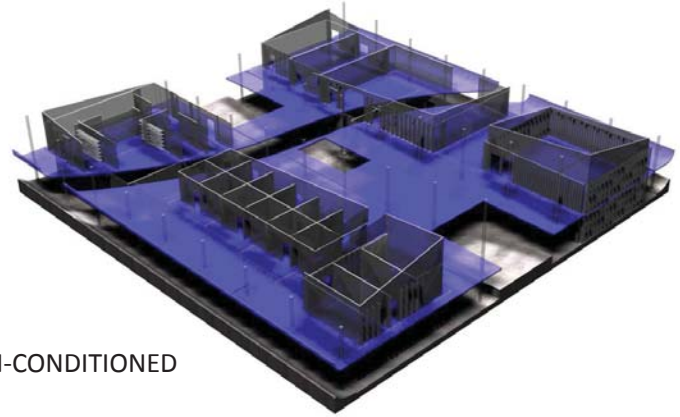


SYSTEMS FLOOR



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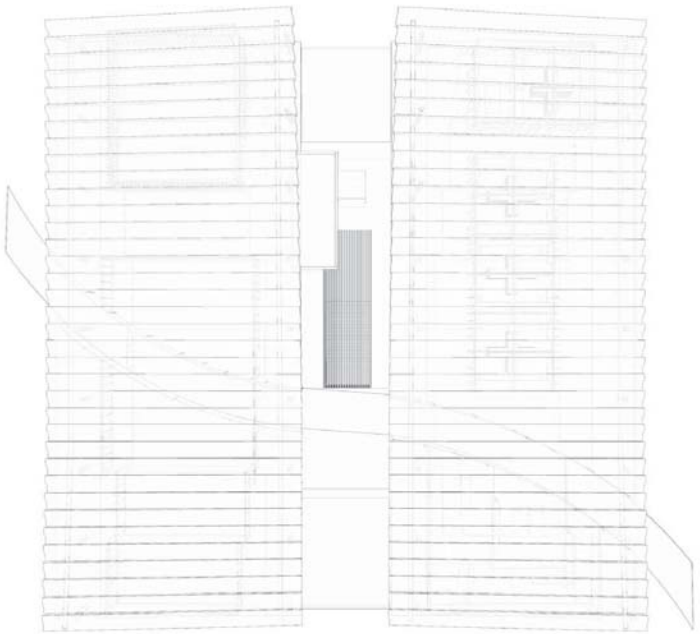
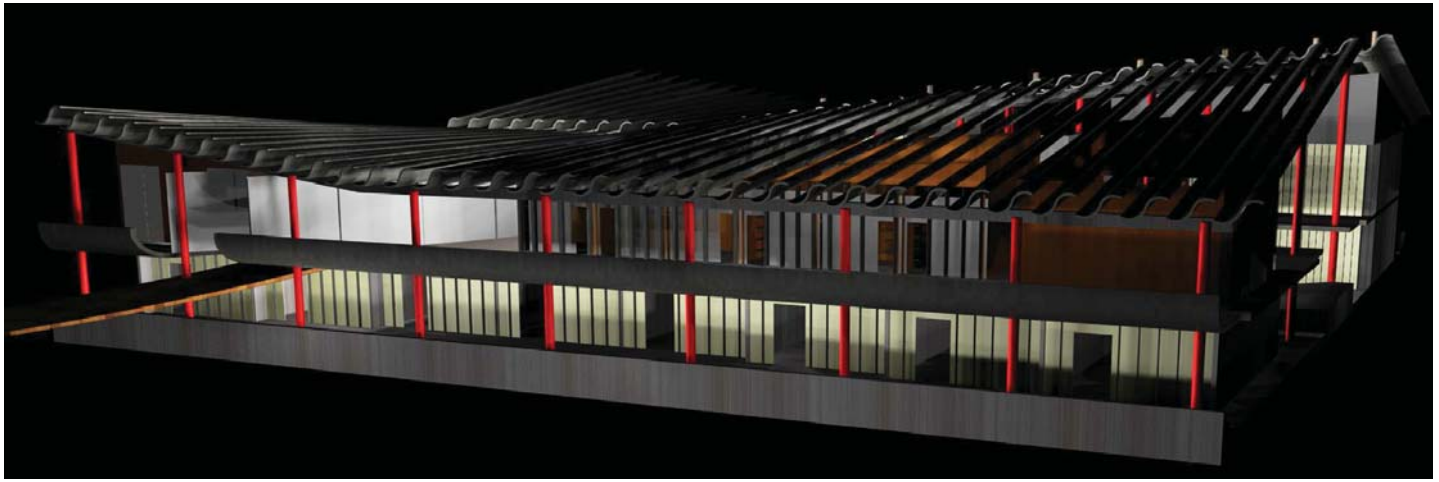
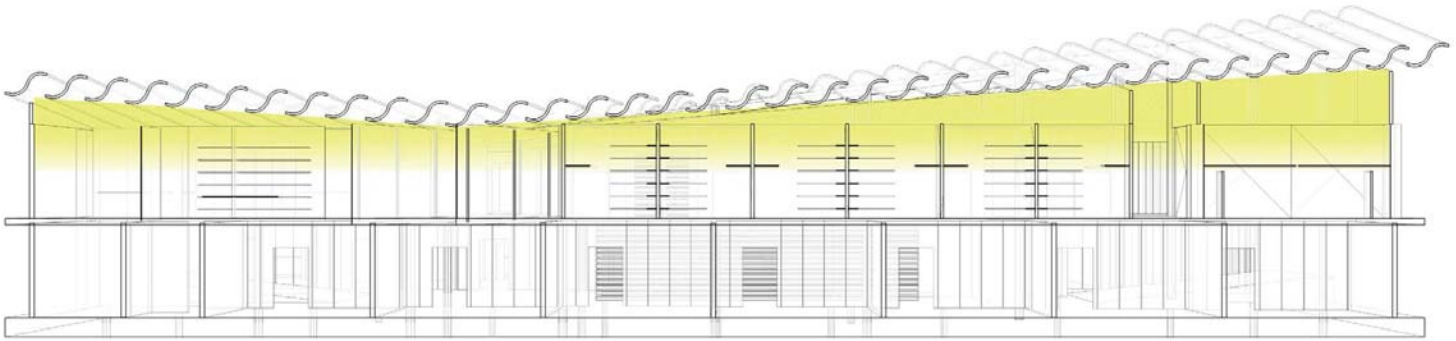
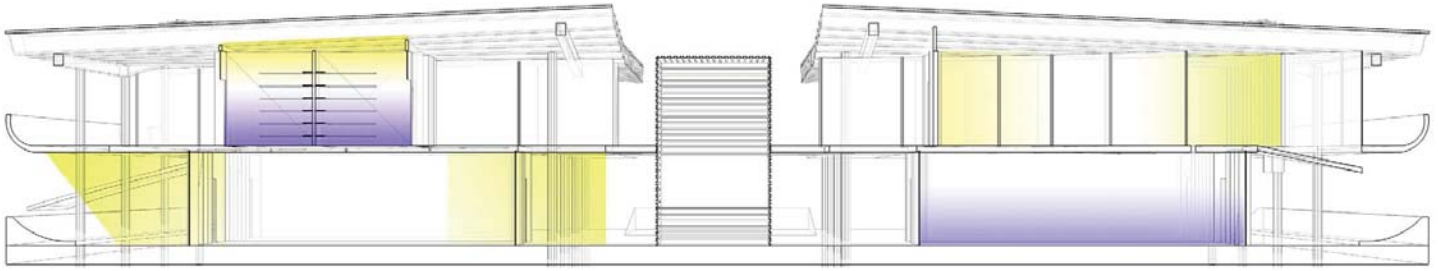
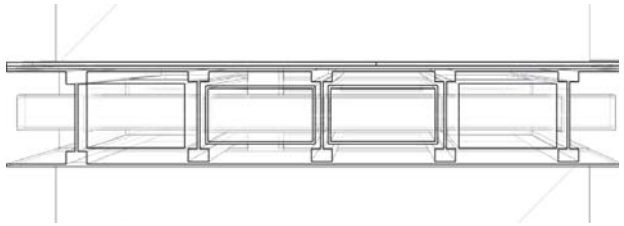
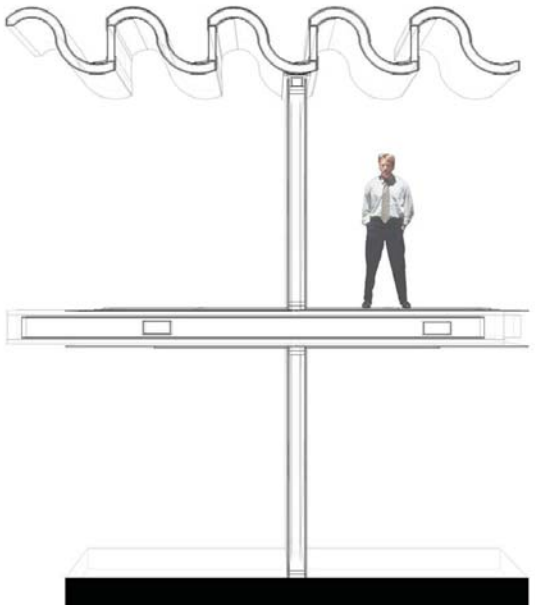


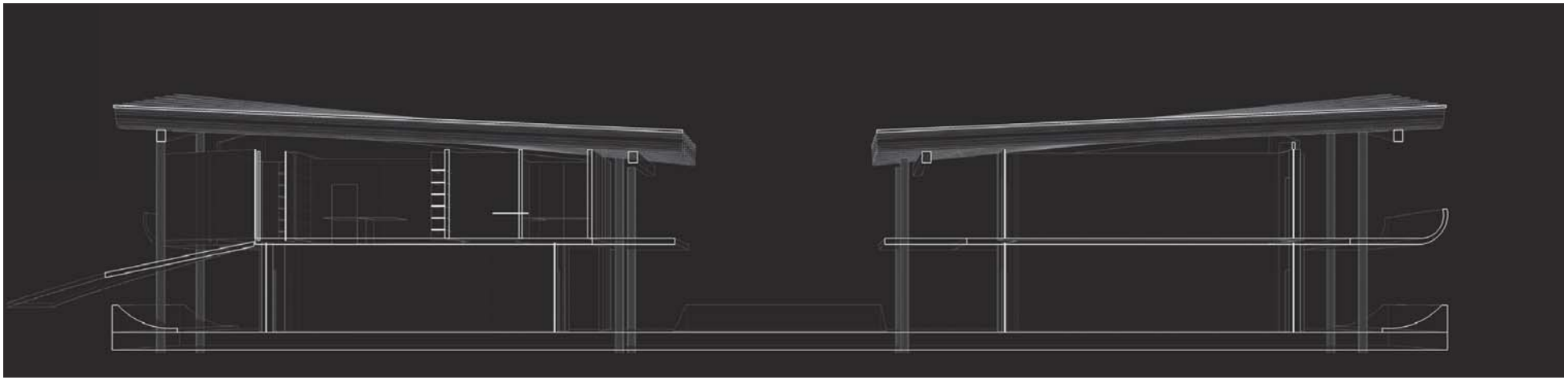


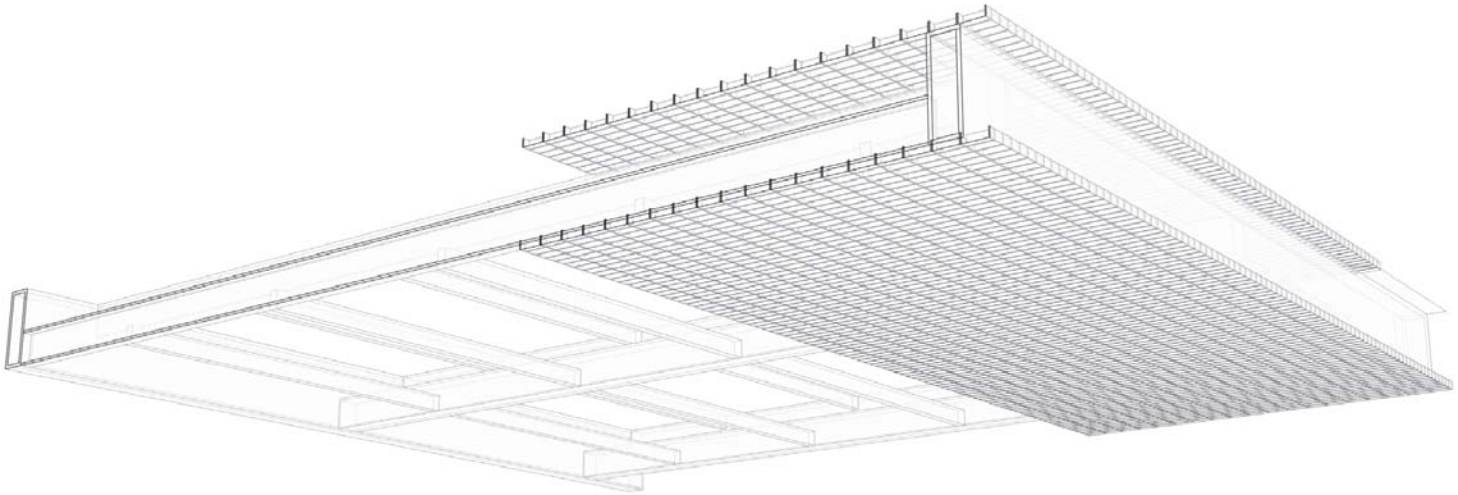


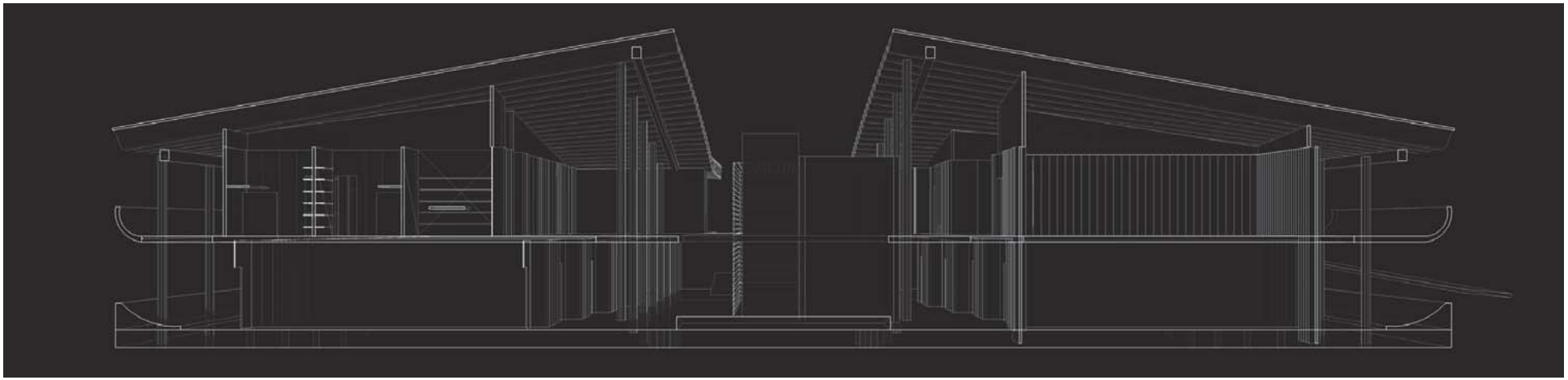


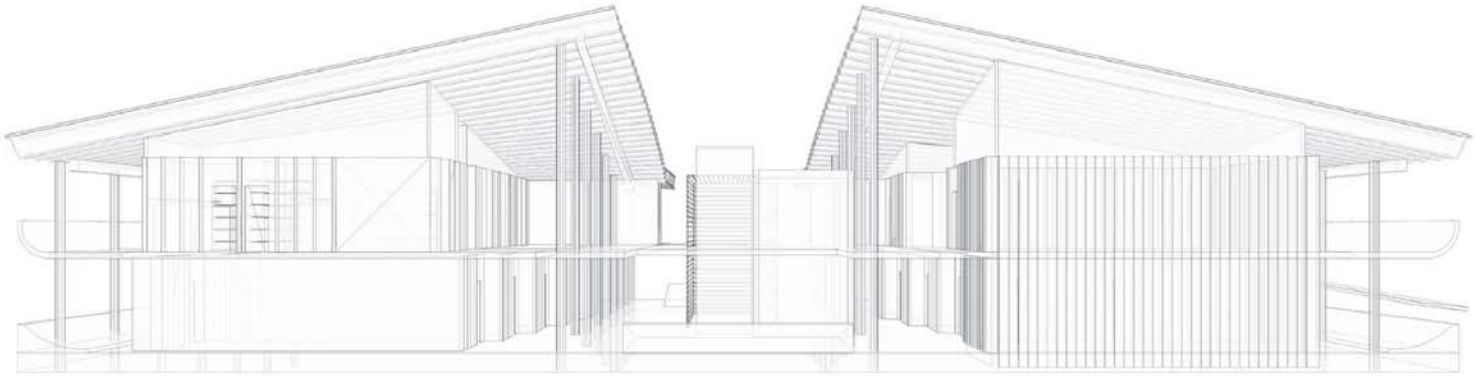


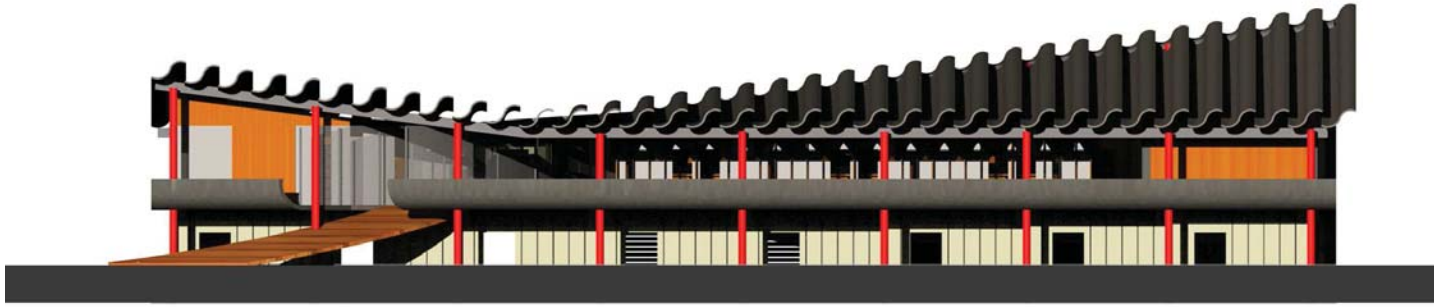


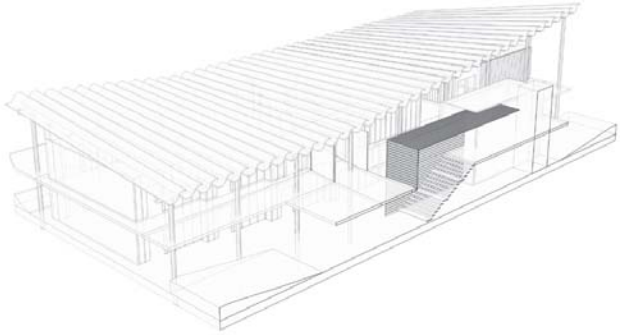




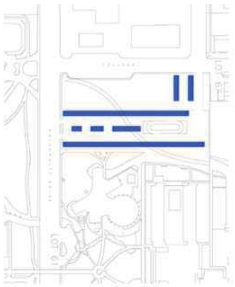


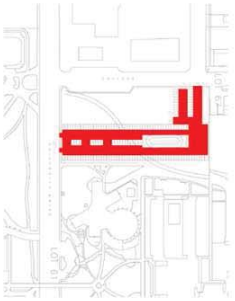


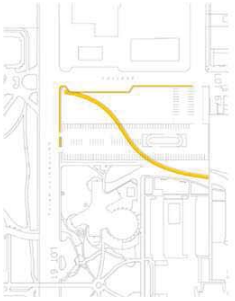


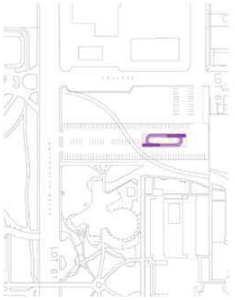


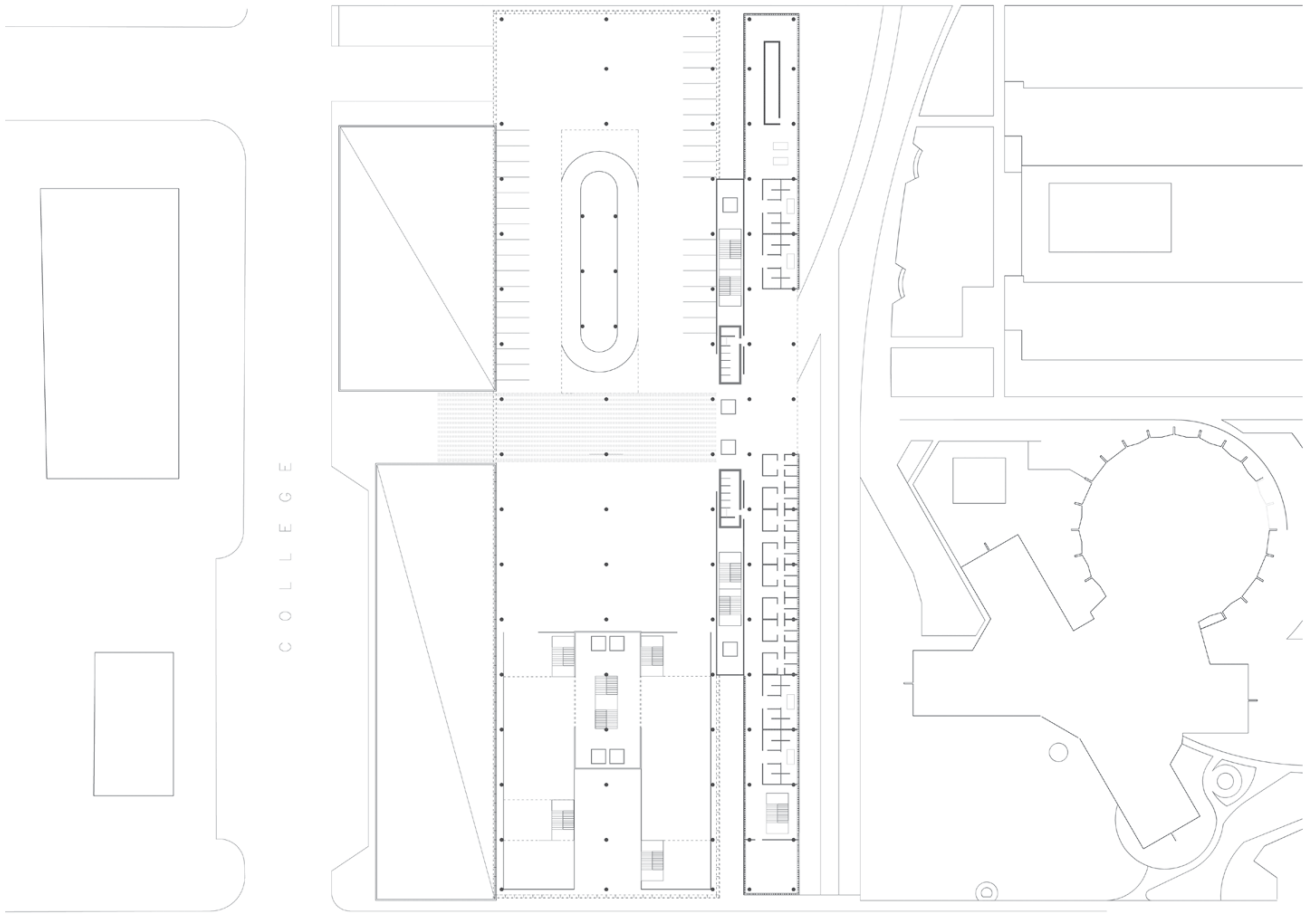
CASE STUDY 3
ASU PARKING GARAGE

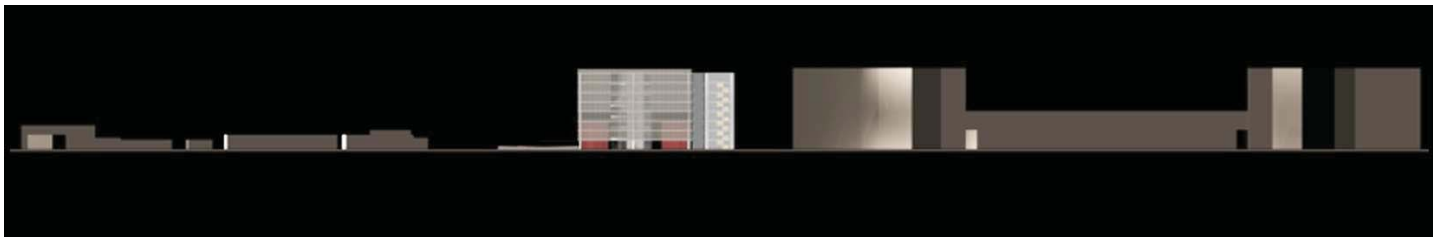


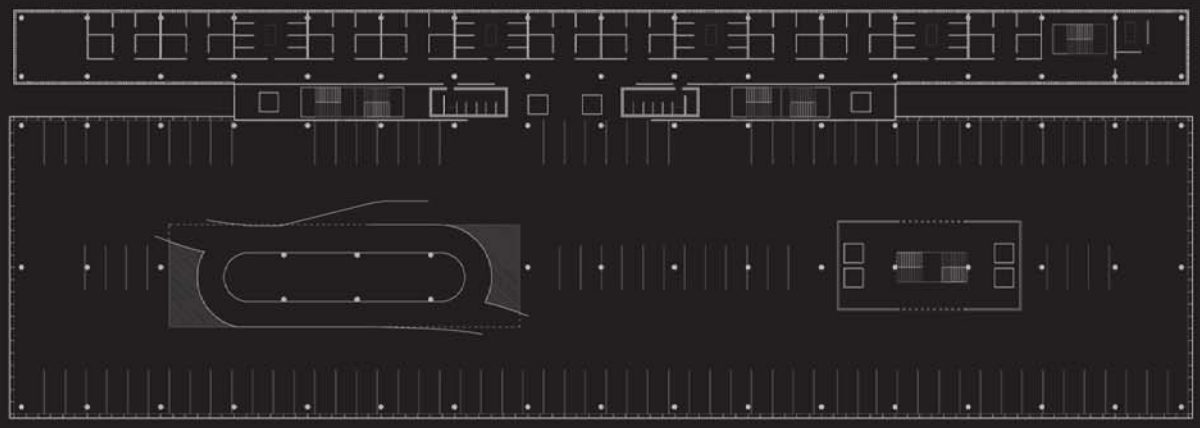


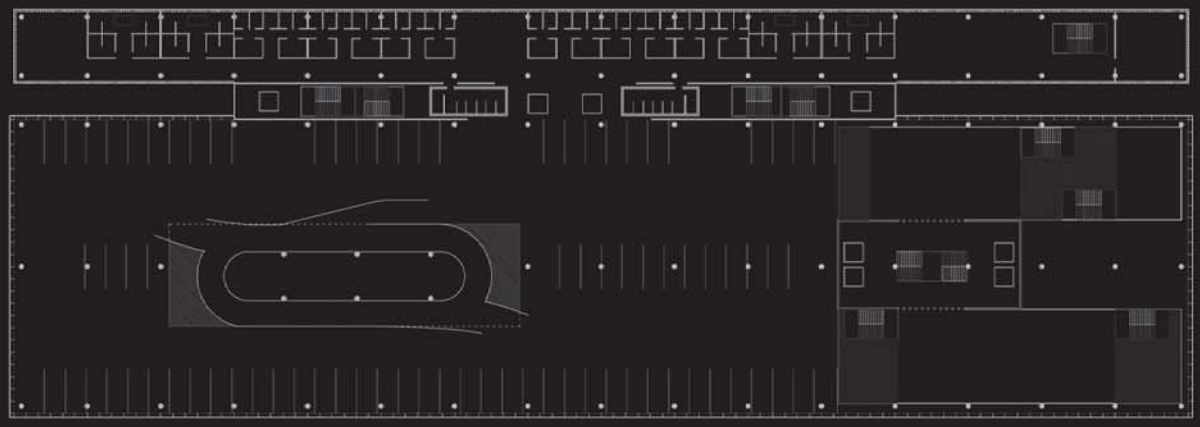


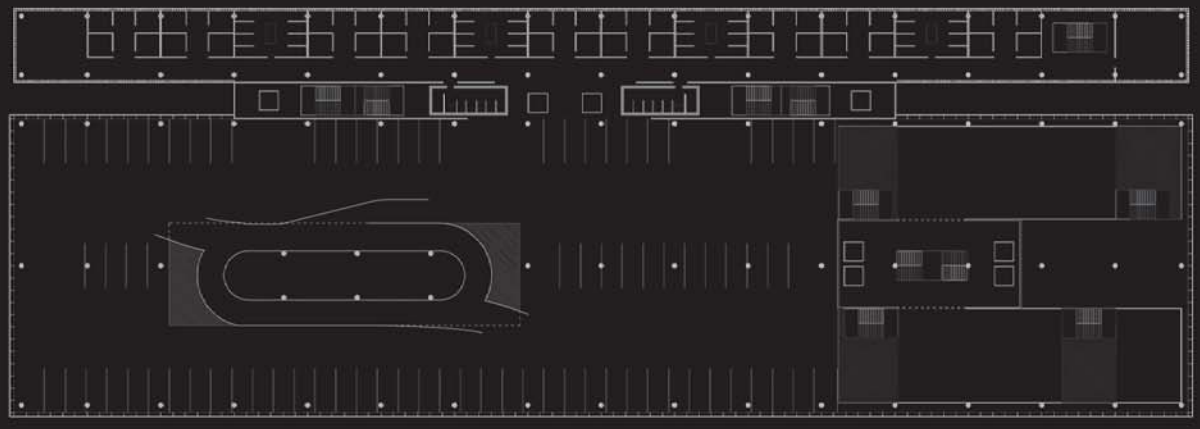


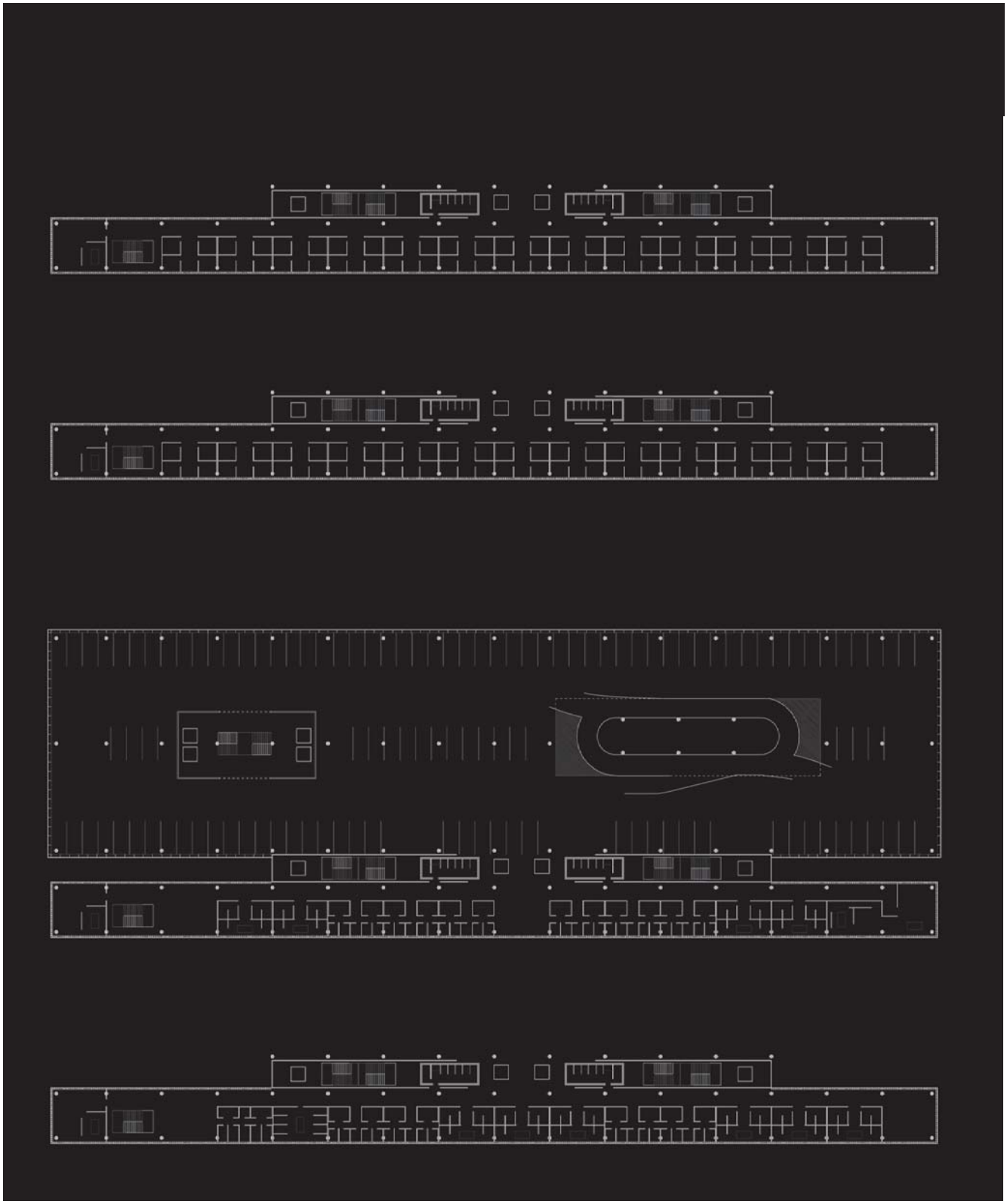

COLLEGE

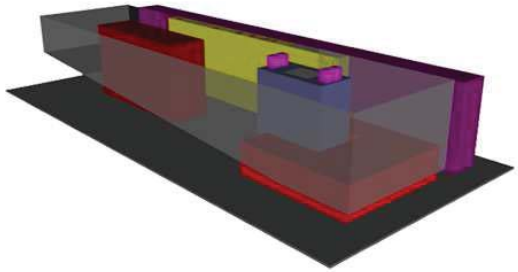


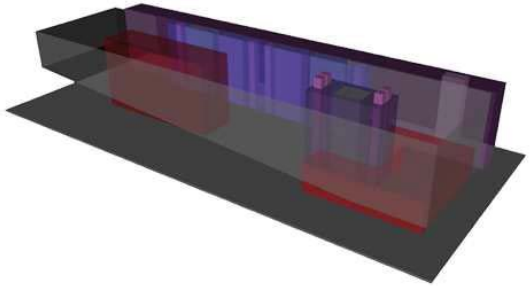


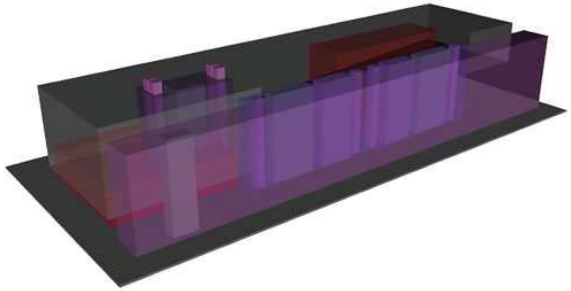


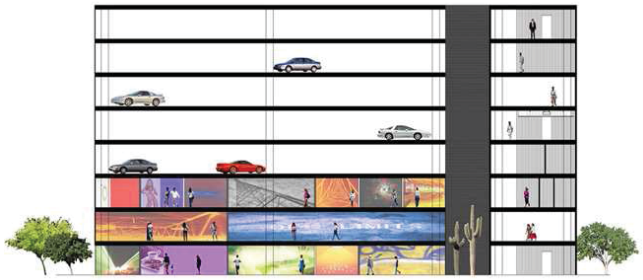


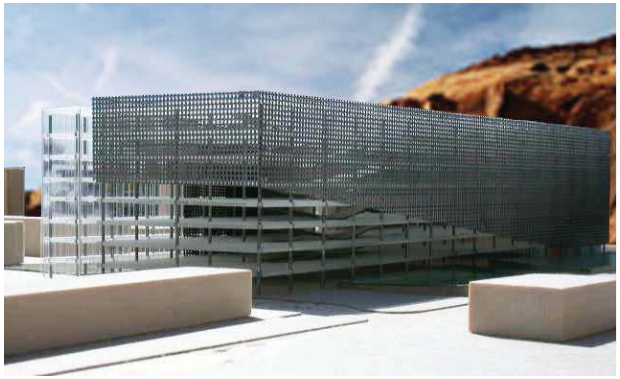


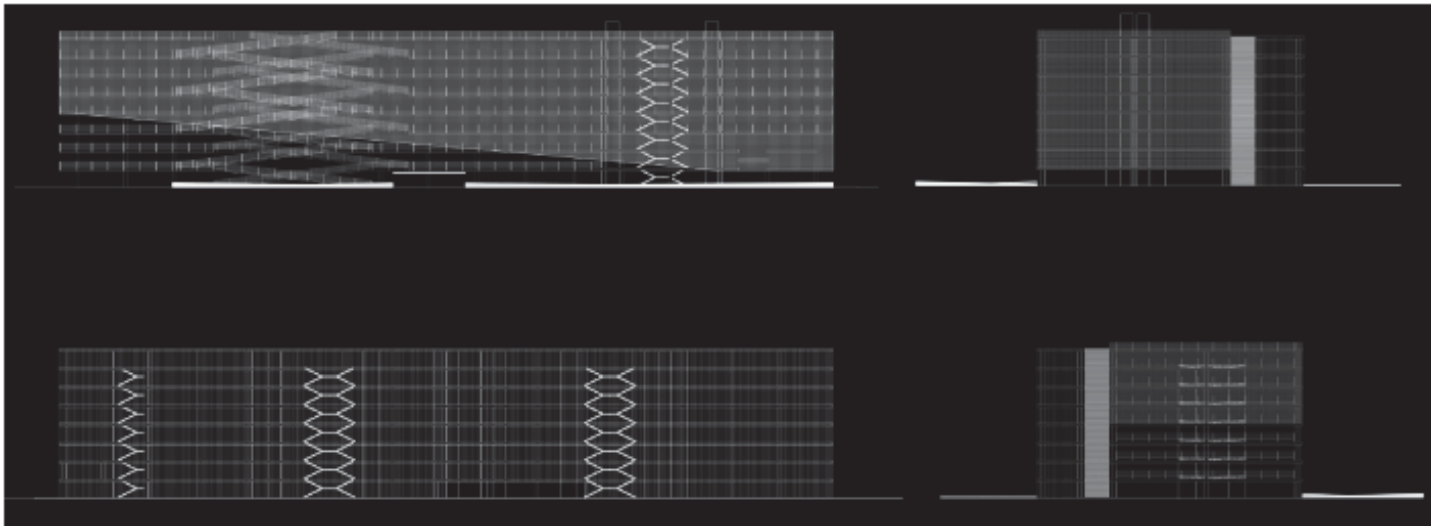


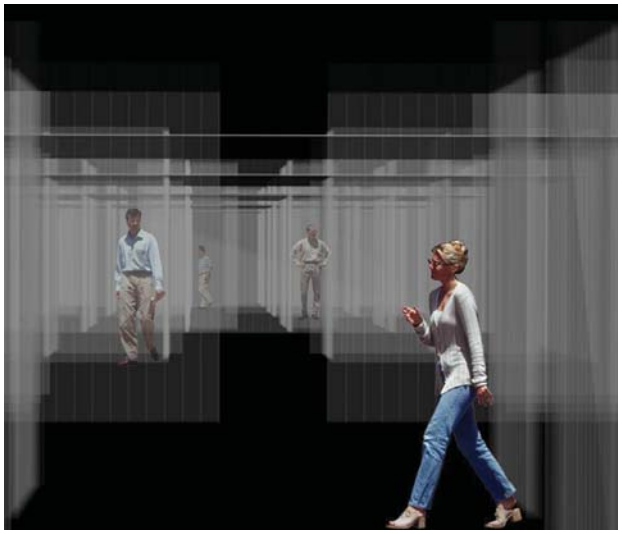


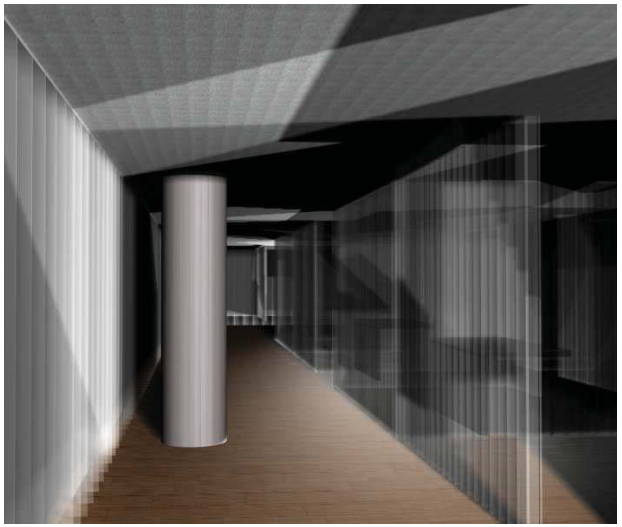


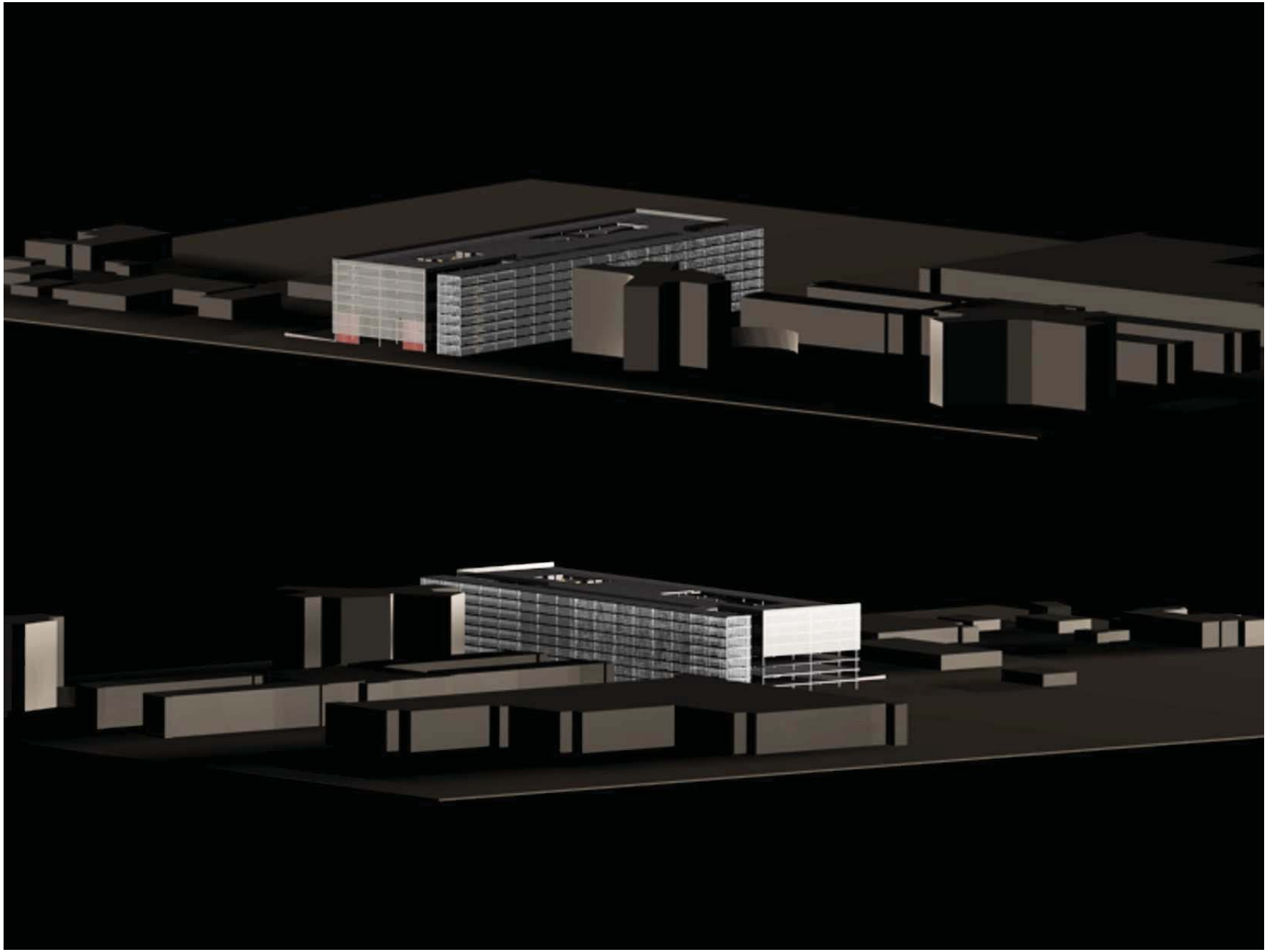


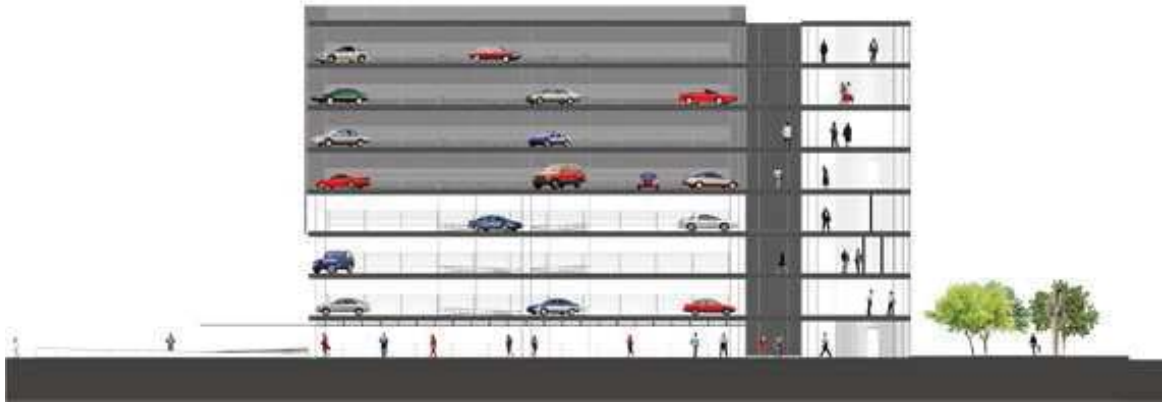


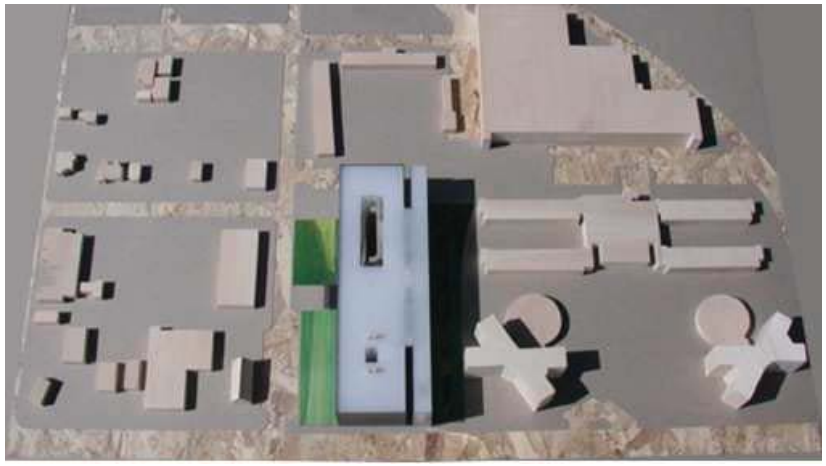


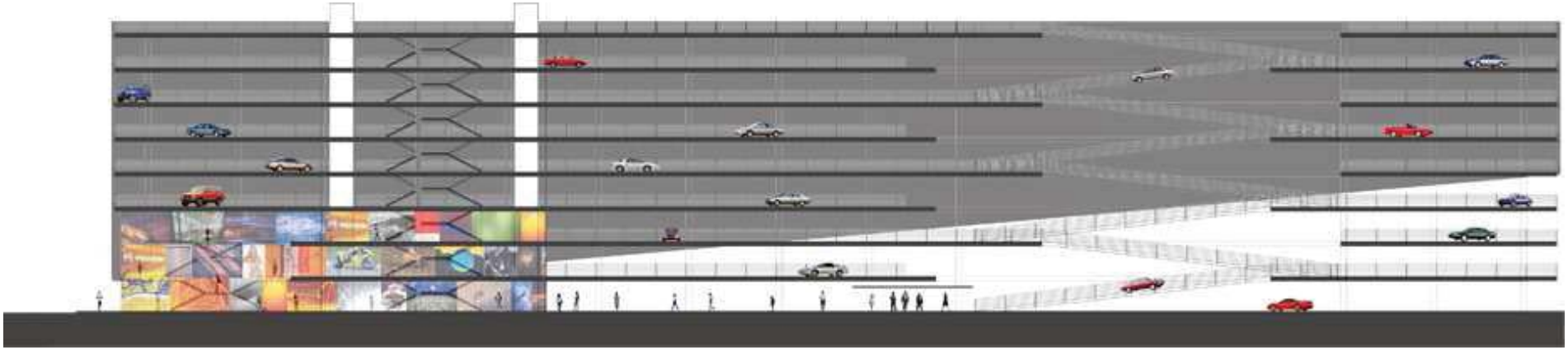


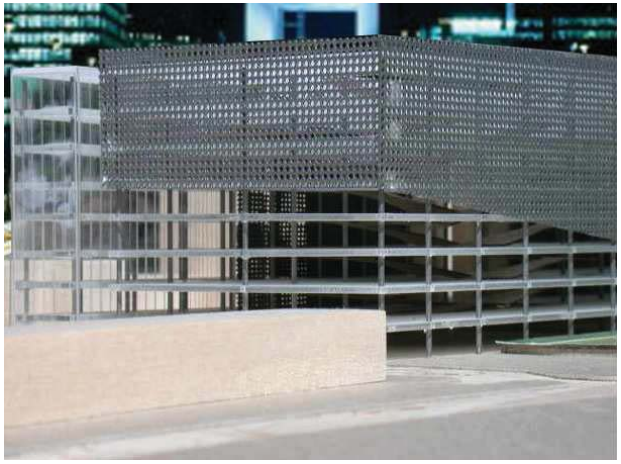


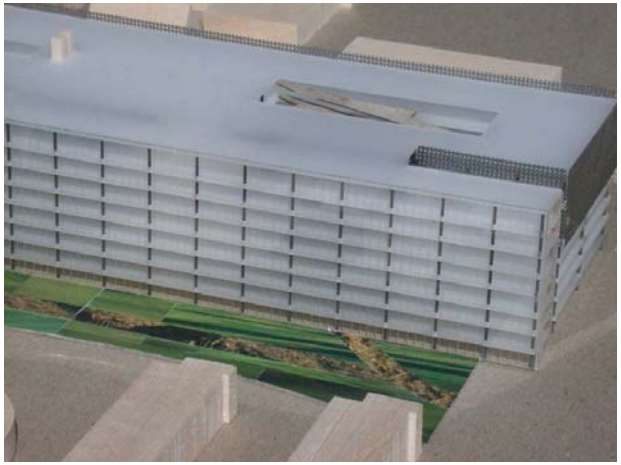












UNDERGRADUATE 1998-2002

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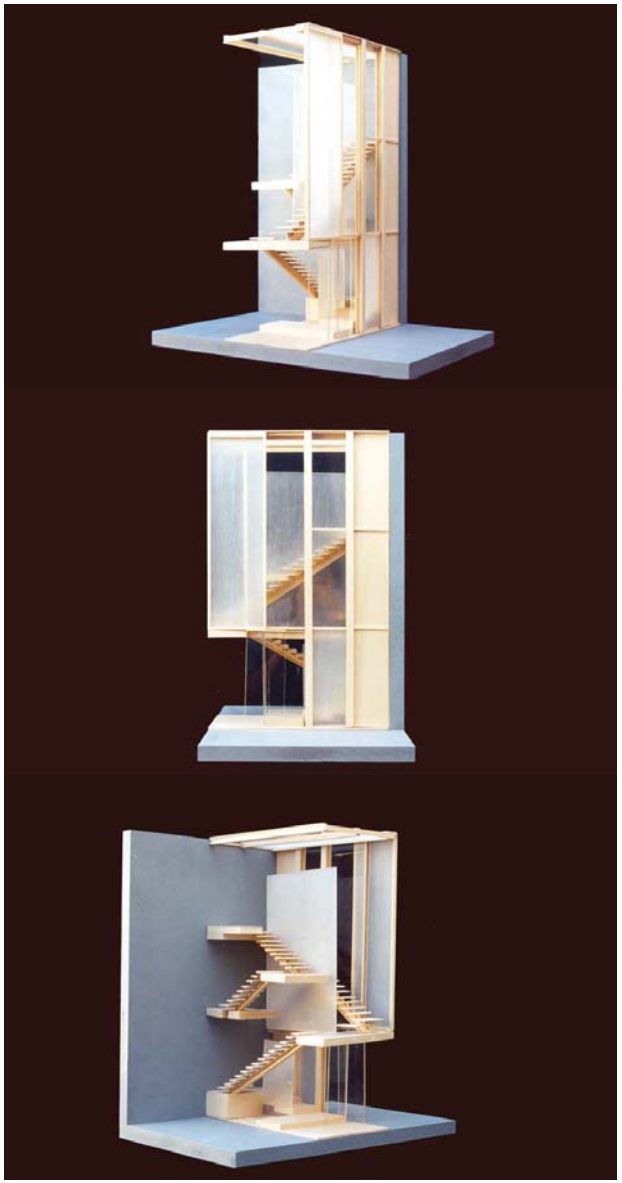

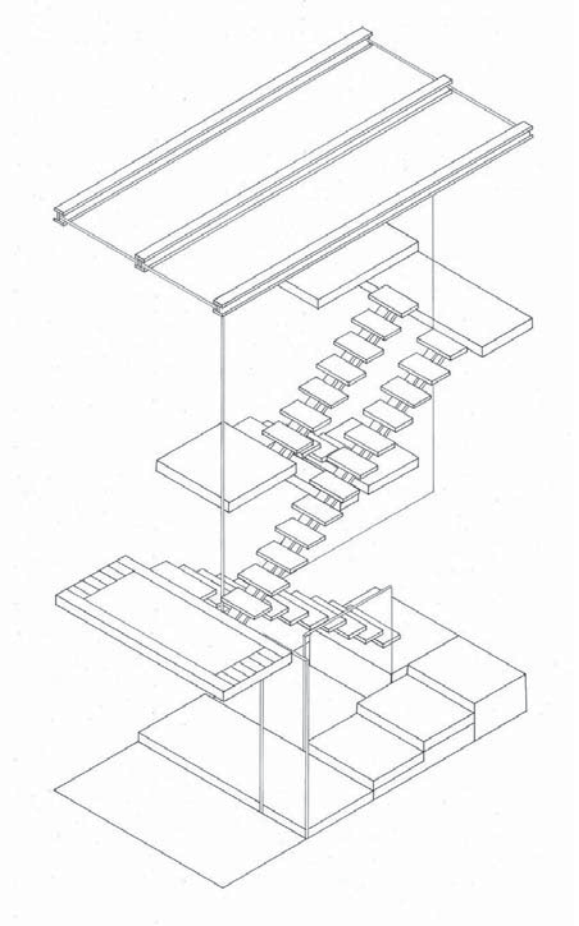

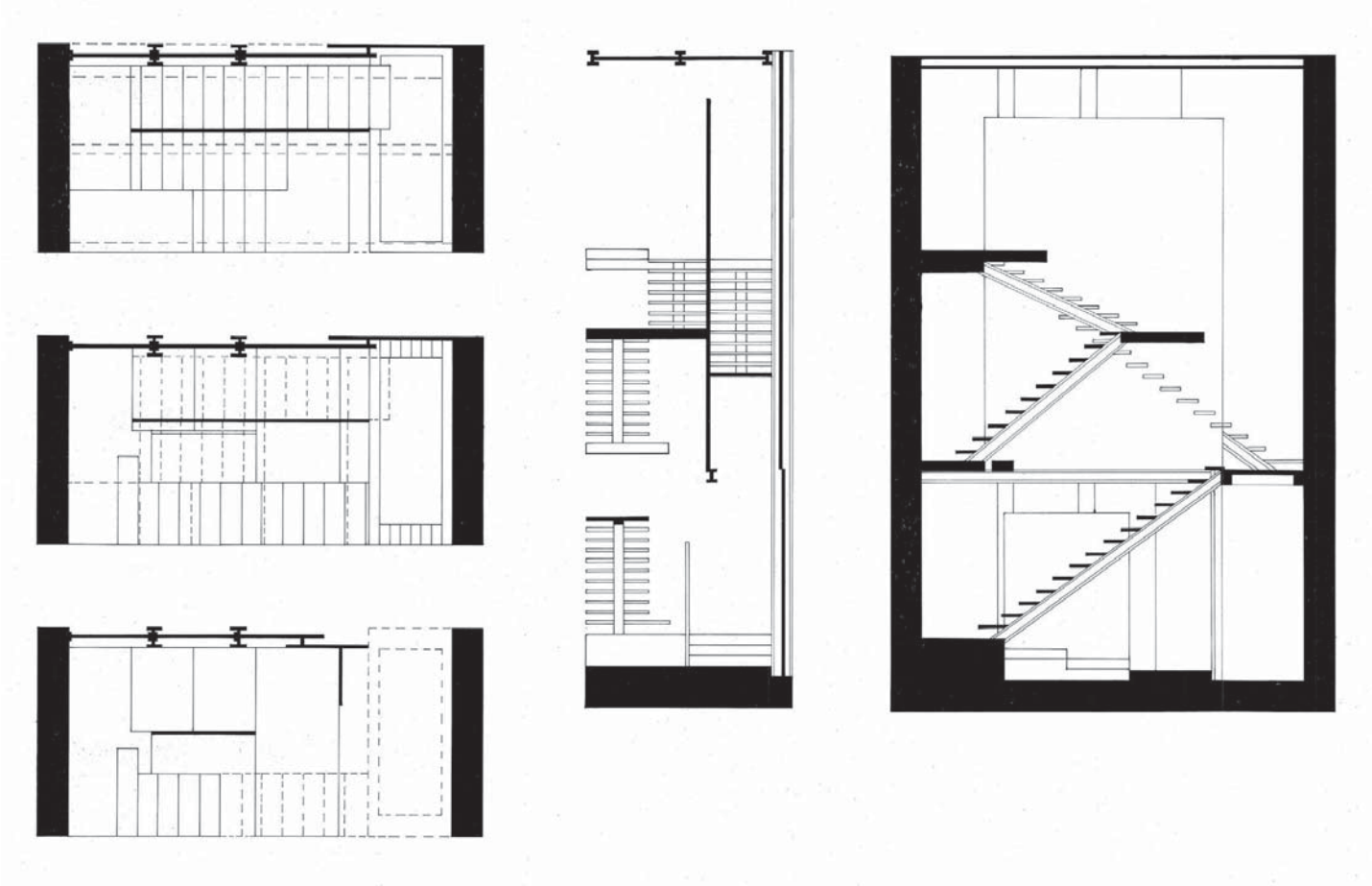

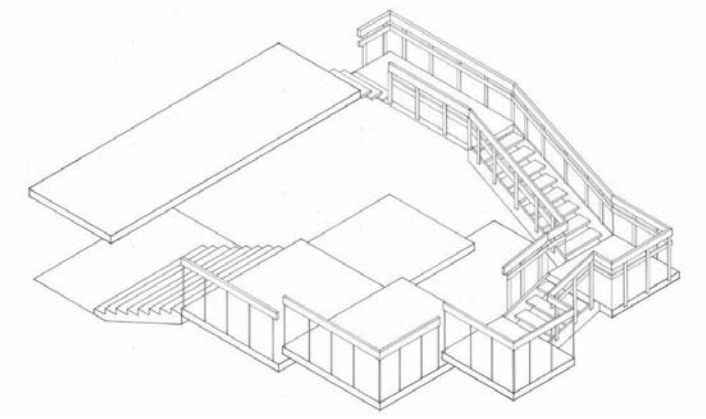

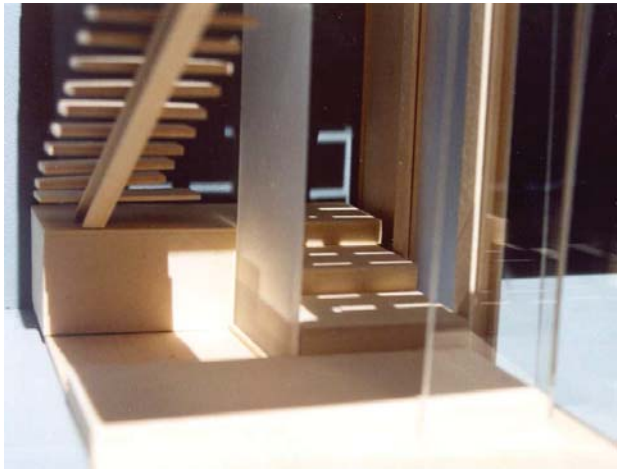

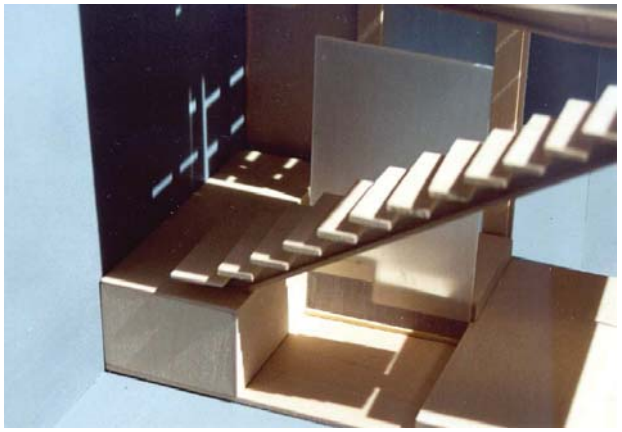

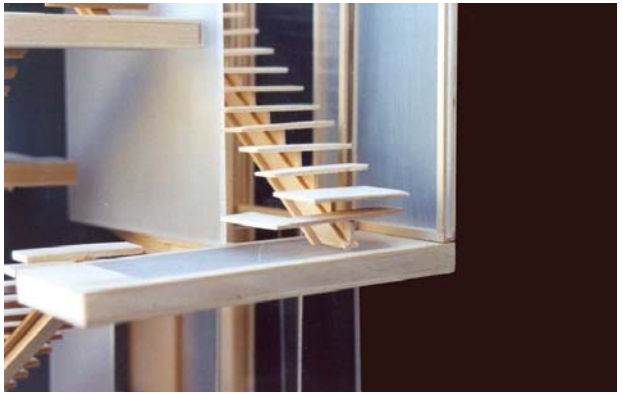

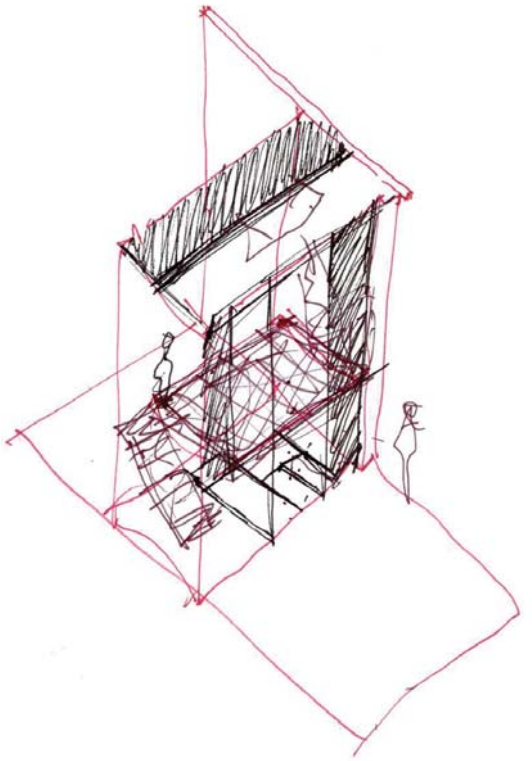

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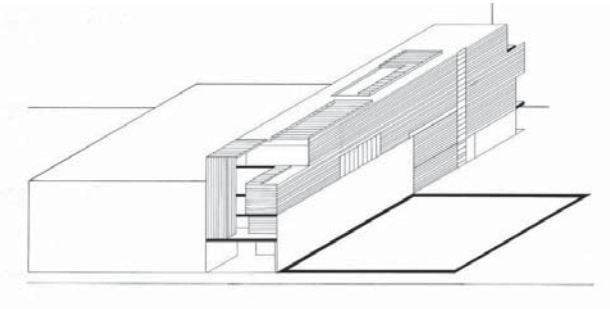

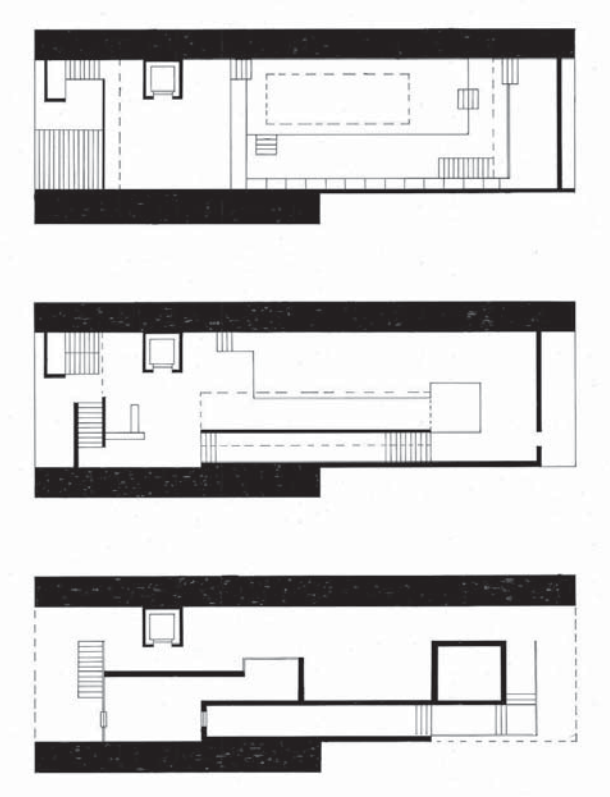

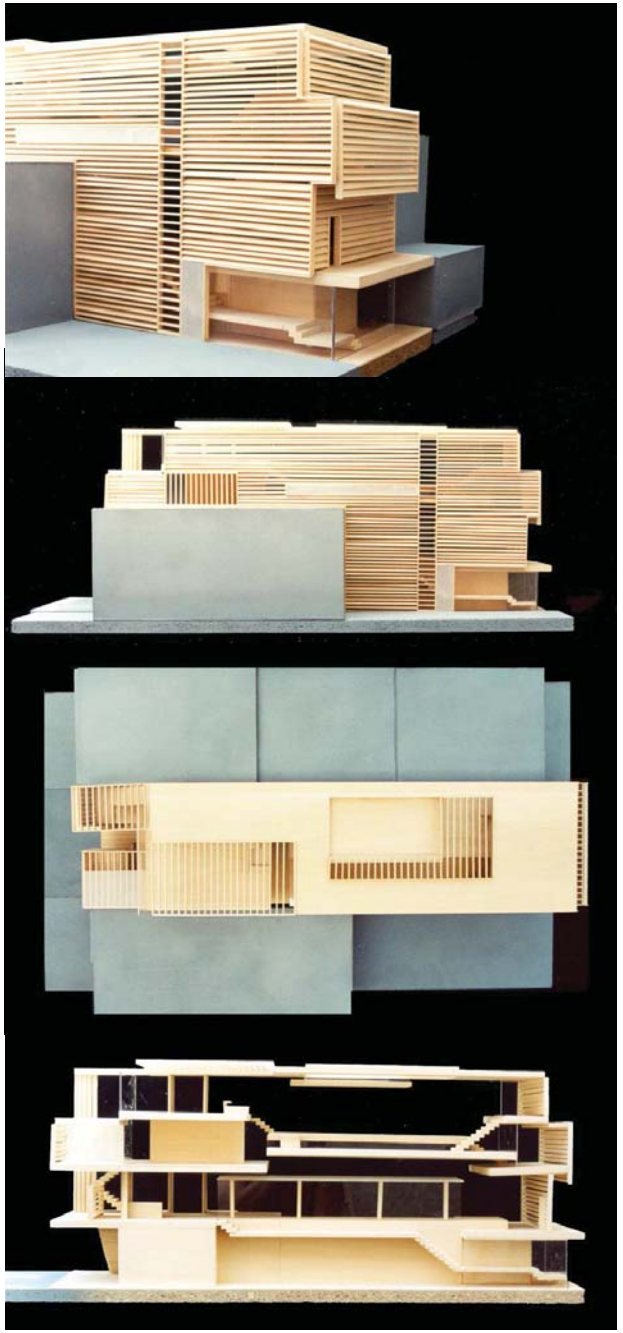

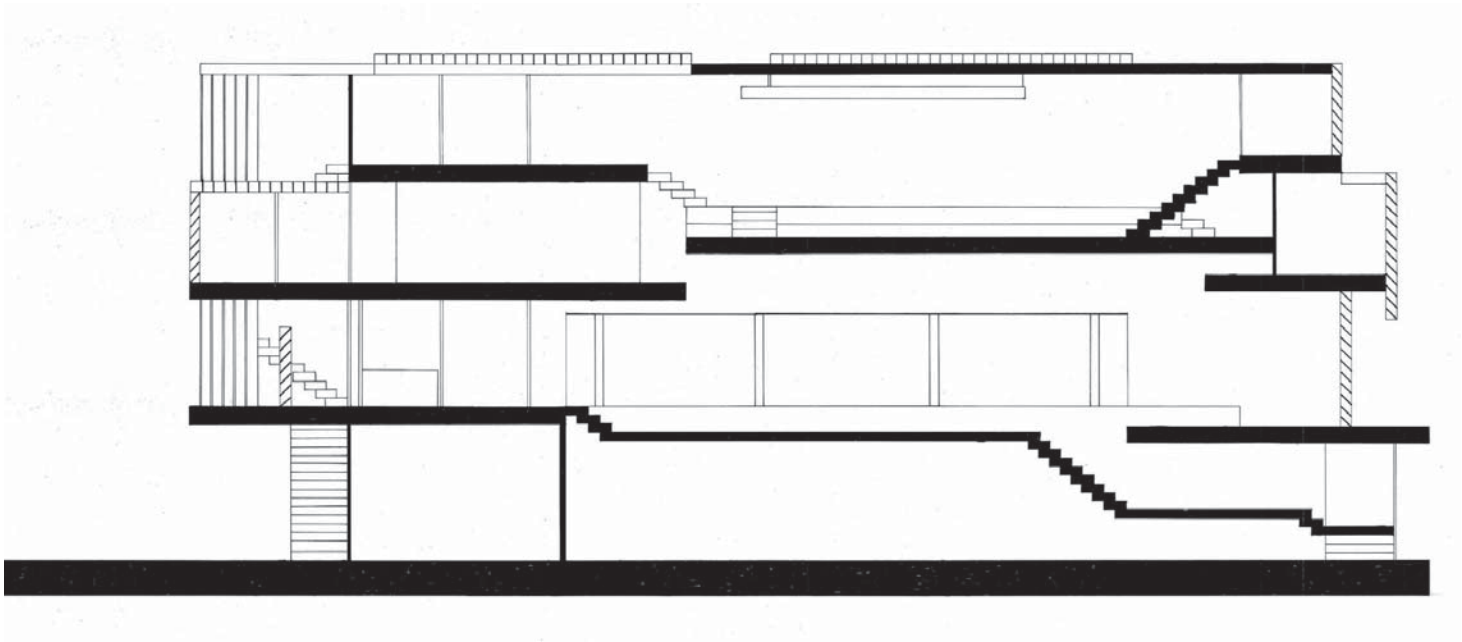

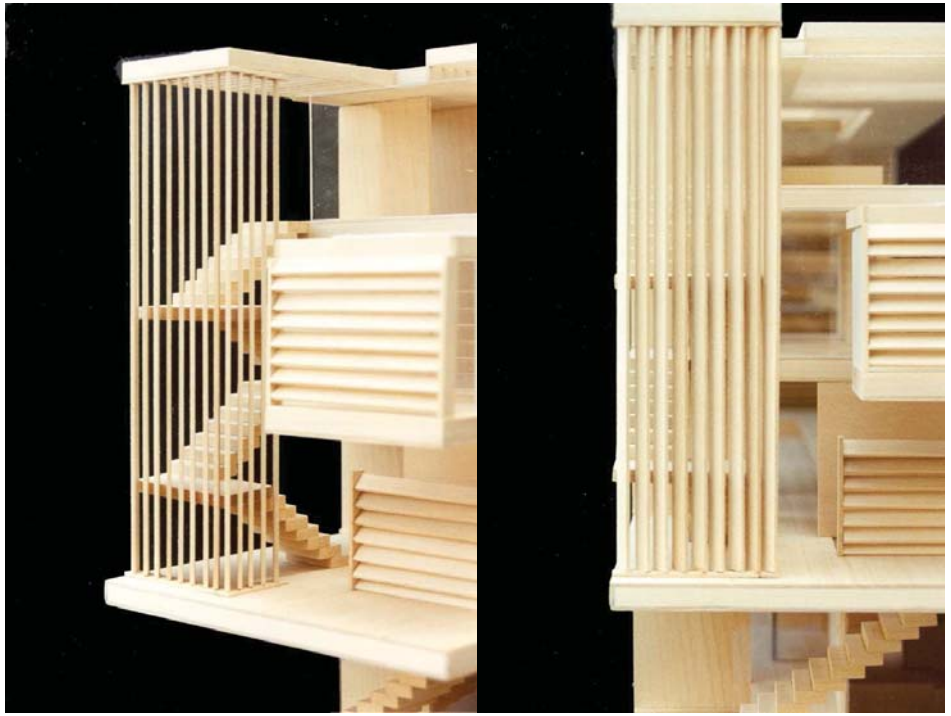

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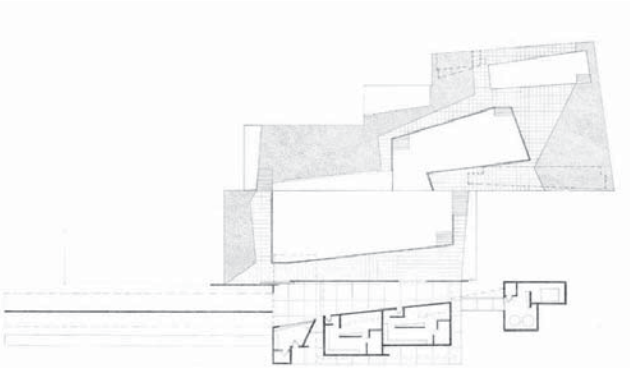

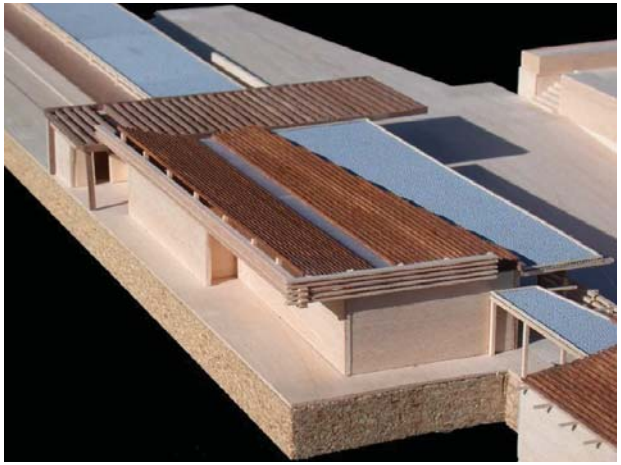

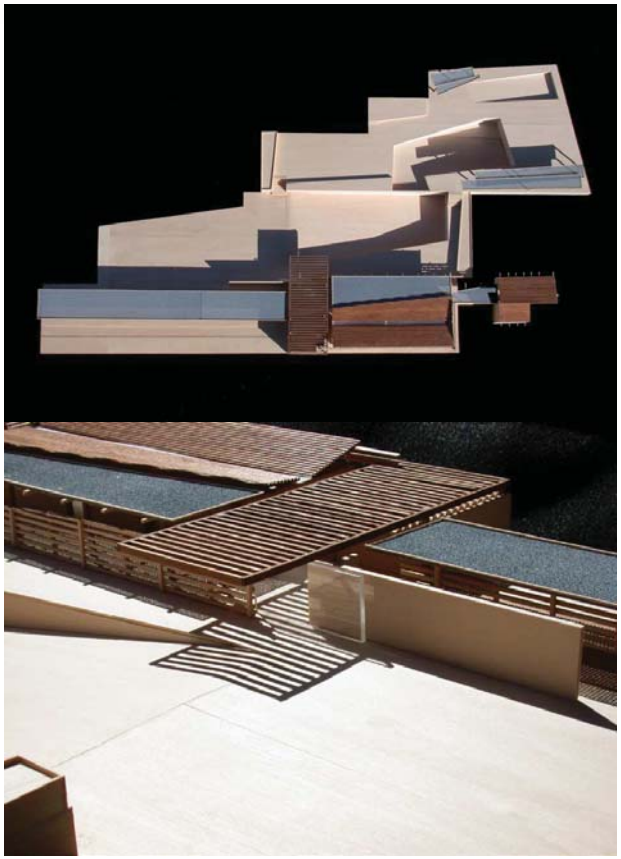

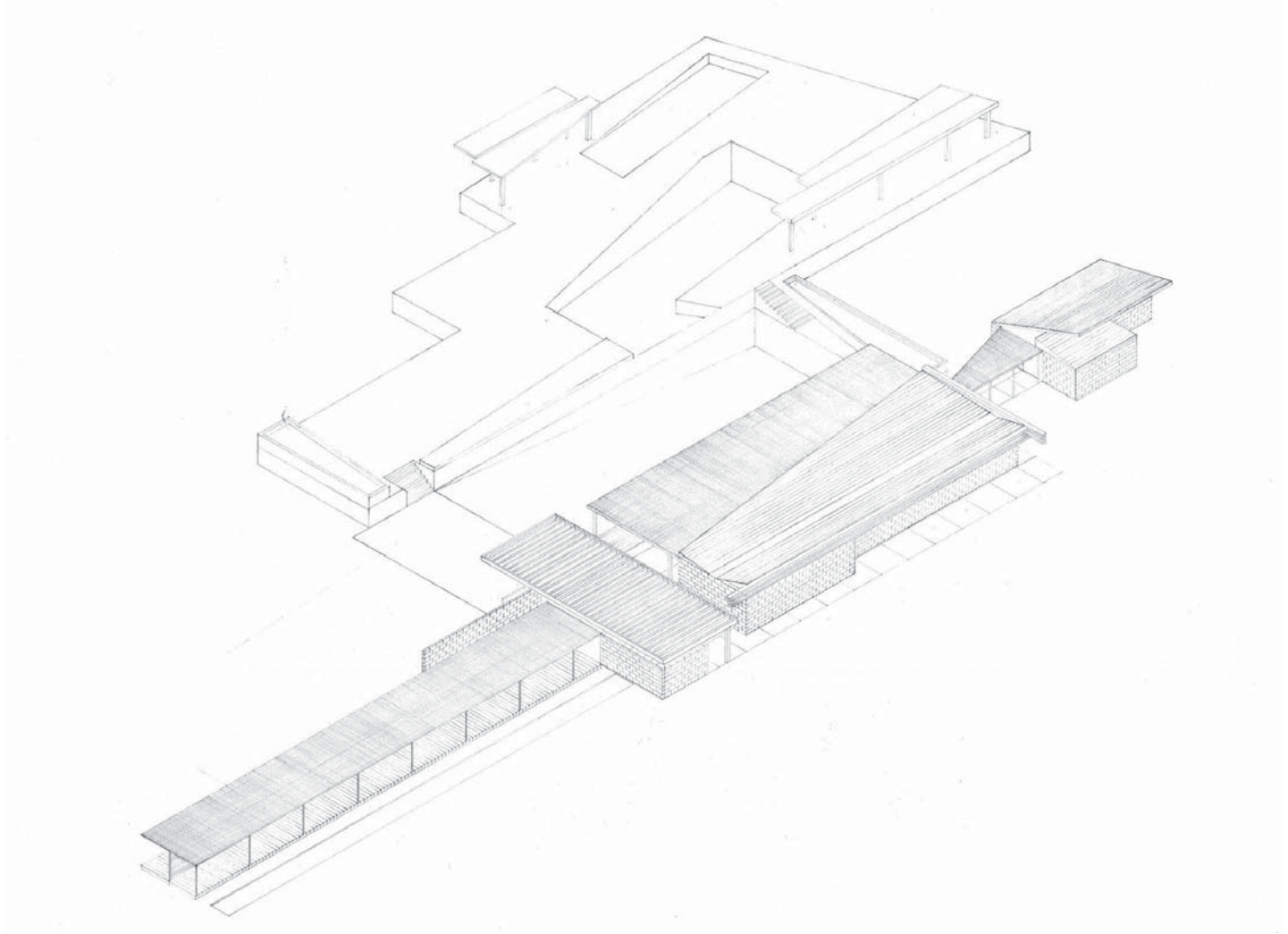

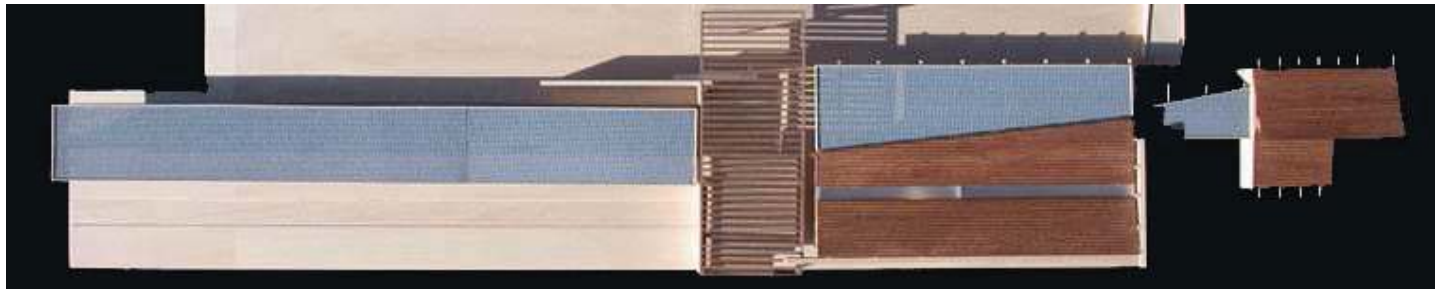

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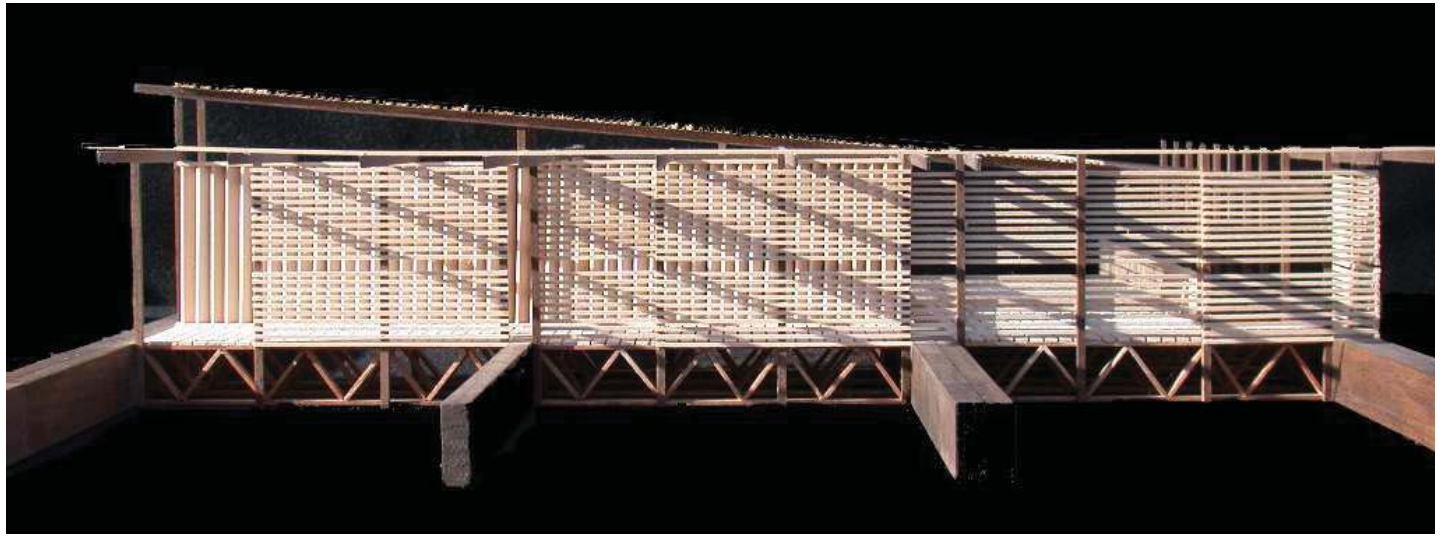

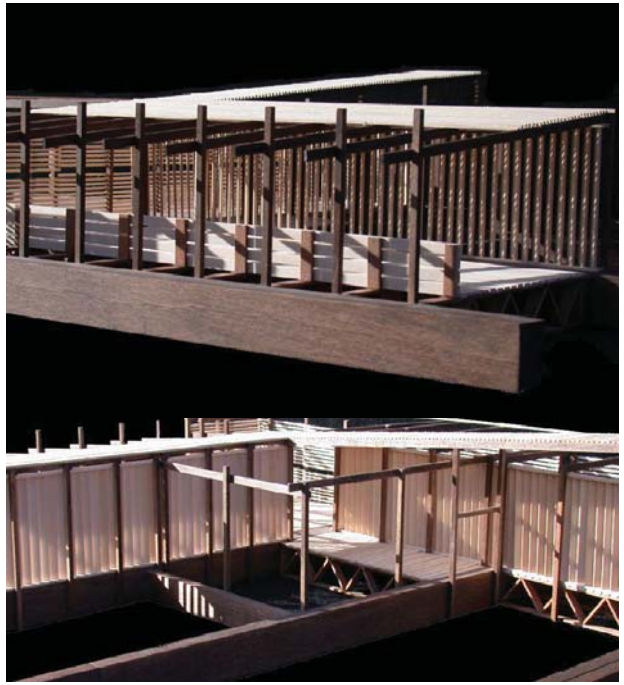

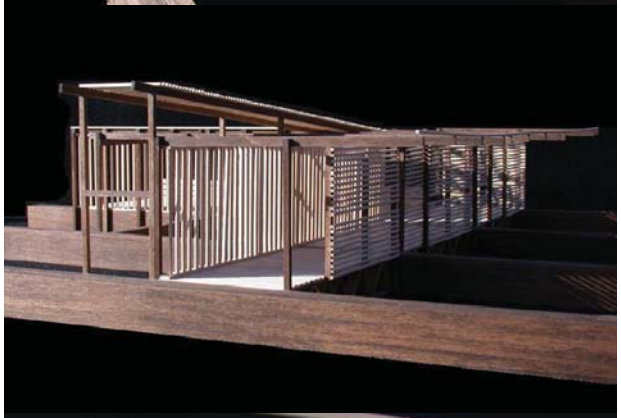

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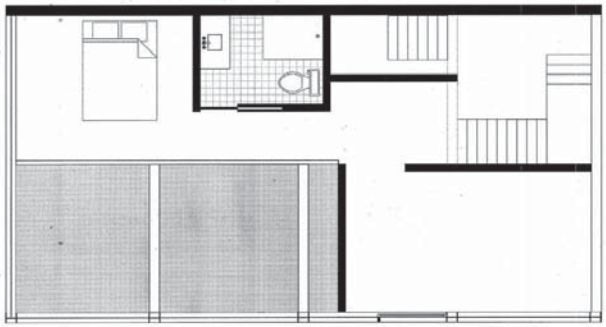

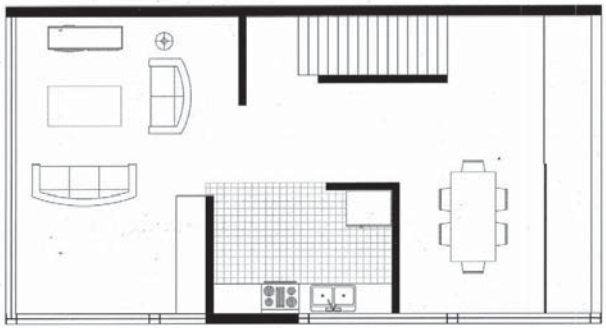

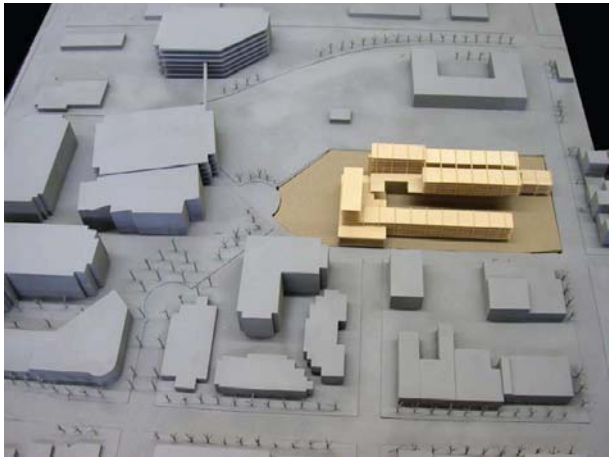

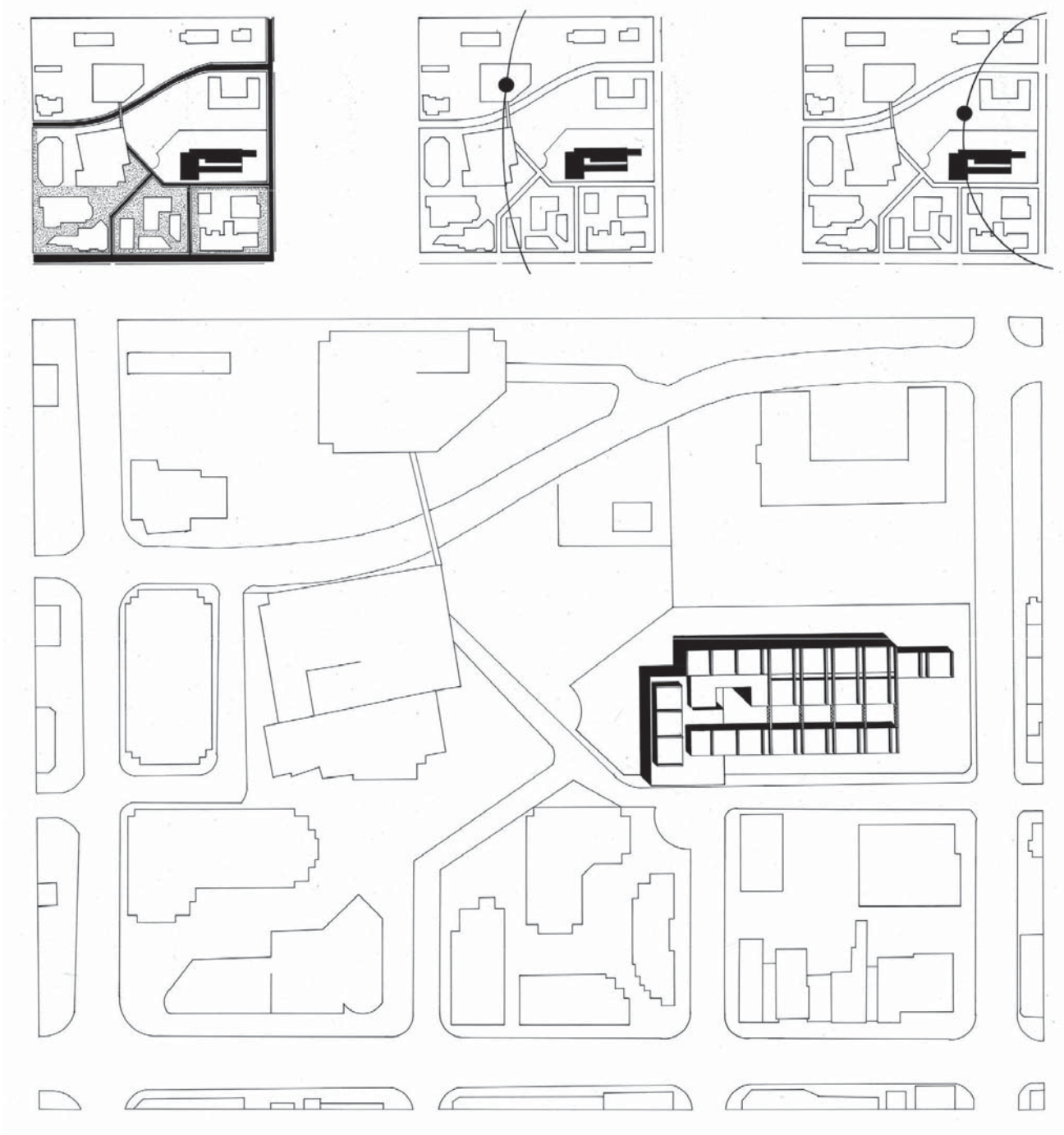

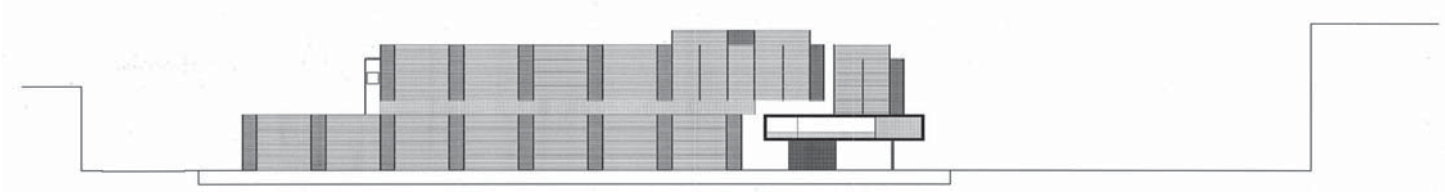

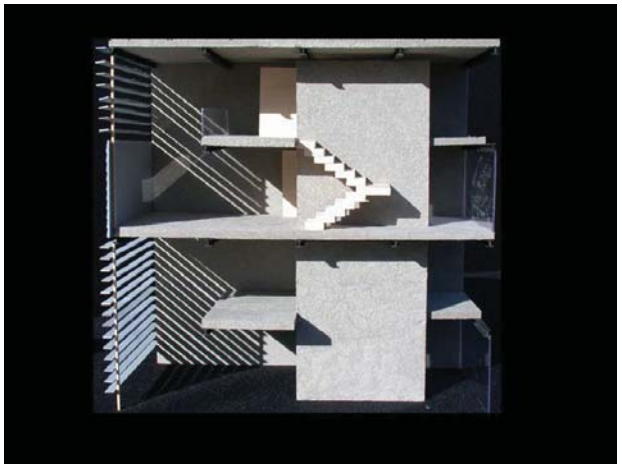

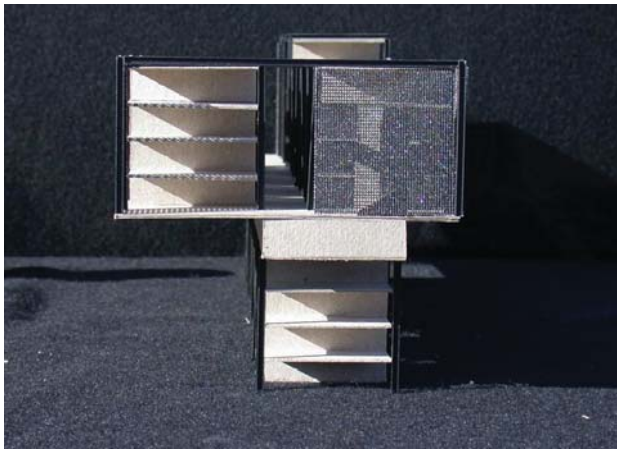

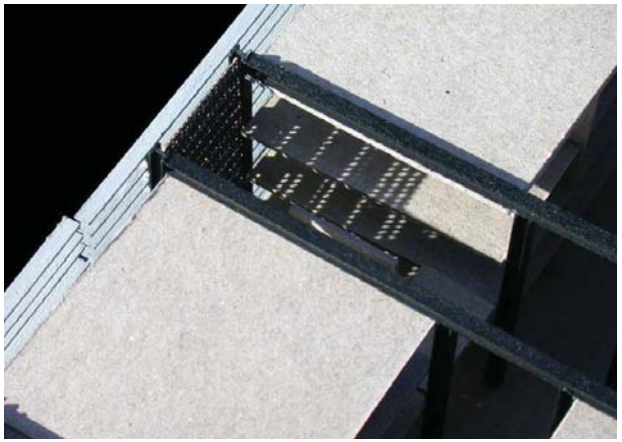

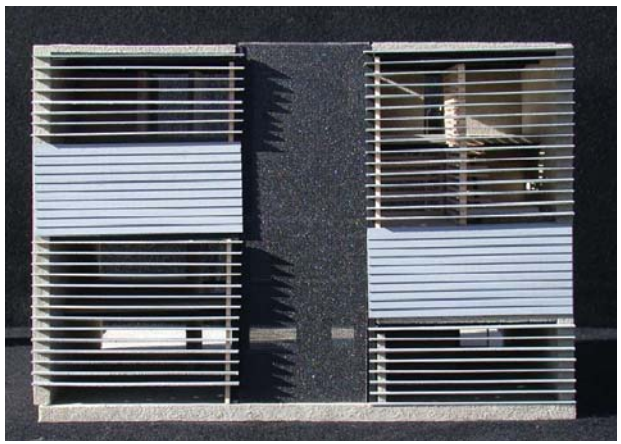

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