Space identity

MIN LIU

Space Identity

FRANKLIN COUNTY
ENVIRONMENTAL LEARNING CENTER

BY MIN LIU

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of Master of Architecture in School of Architecture + Design .

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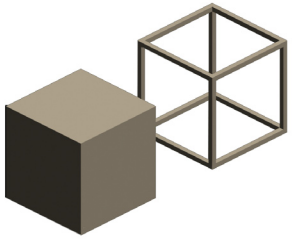
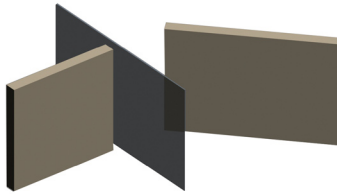
ABSTRACT

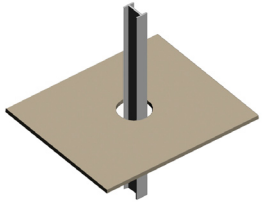
As an architectural language, what elements and systems constitute a work of architecture? They are the structural system, enclosure system, circulation system, functional requirements, context, light, views, proportion, scale, forms, cultural characteristics, color and many others. In this thesis, I focus on the structural system, the spatial organization and quality of light with a view to how they contribute to the identity of spaces. the vehicle of my study is an Environmental Learning Center, for Franklin County, Virginia. The building design enploys two different structural systems in two parts of the building, arranging dissimilar spatial organizations in building sections. Various enclosure materials are used to exhibit distinct light qualities. Design is not only to satisfy functional needs, but to architecturally determine spatial differentiation,which accordingly generates the identity of spaces.



Study of elements to make identical volumes of different appearance



Study of what makes a glass wall primary as the concrete wall becomes secondary



Study of how a steel column of a primary volume meets the slab of a secondary volume

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To my classmates and friends, for sharing two years' architectural studies at Virginia Tech. Thank you for all the constructive suggestions and help you gave me.

To my thesis committee, for their criticism and insightful questions. They have helped me develop my architectural sensibilities and convictions. Thank you for guidance and support. Thank you for educating me as an architect.

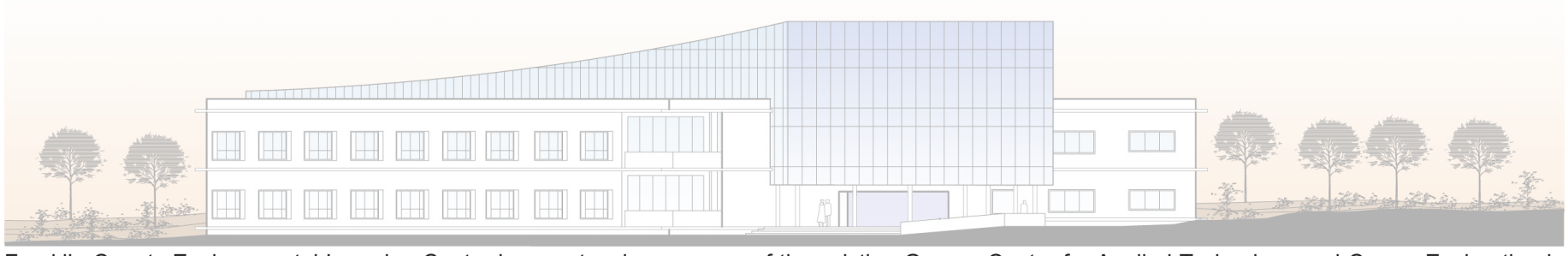
CONTENTS

PREFACE

An architecture thesis is a process of exploring an idea and probing its potential. The thesis project is a platform for expressing my understanding of architecture. It is essential that a designer understand the fundamental nature and structure of the concept. A strong and clear idea grounds a good design. The ability to develop an idea is also important for a good designer.

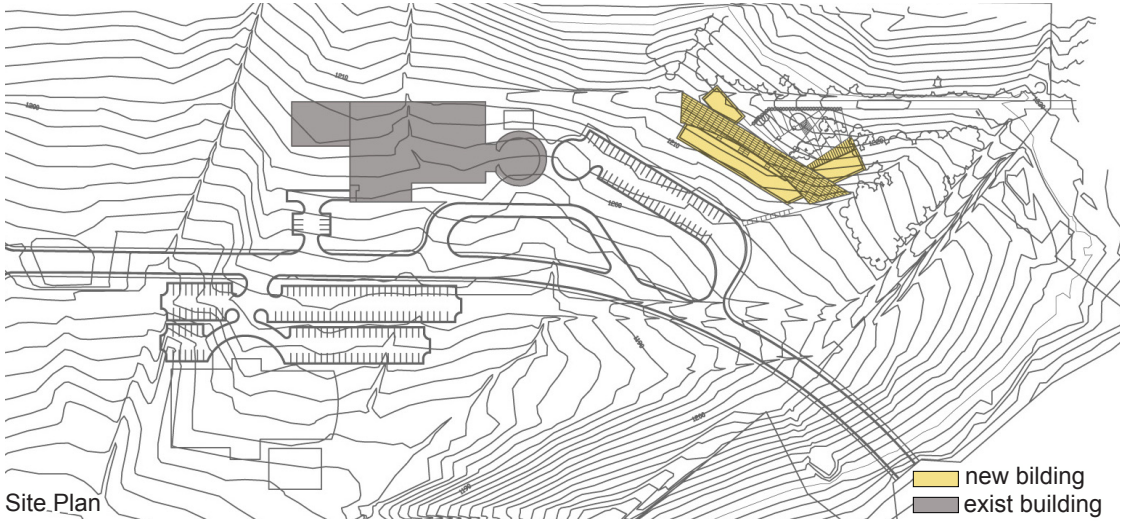
The best part of the whole process of my thesis is to be supported by my committee members: Bill Galloway, Jim Jones and Heiner Schnoedt. Because of their guidance, I realized that I was not just working on a project, but I was clarifying my thoughts on architecture, which help me form a more positive attitude of being an architect.

One year's working experience in an architecture firm tests out what my professors told me during the thesis year is true in practice and it is significant to a beginner like me. The most important thing in practice is the ability of developing an idea whether the idea is yours or from the seniors in the office. So the meaning of thesis is more than designing a project, but learning to be an architect. When you know how to find a path then you will find yourself.



Franklin County Environmental Learning Center is an extension program of the existing Gereau Center for Applied Technology and Career Exploration in Rocky Mount, Virginia. The new center will serve to help students to prepare skills necessary to enter careers in Environmental and Natural Resource fields. It is designed to support the infusion of technology into learning, which offers students an applied, hands-on opportunity via field studies, laboratory experiments and greenhouse activities to experience new information-based technologies that are not widely represented among the area's industry base. Also, it provides a place for the involvement of parents, communities and industries in early career education.

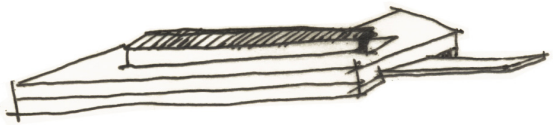
SITE

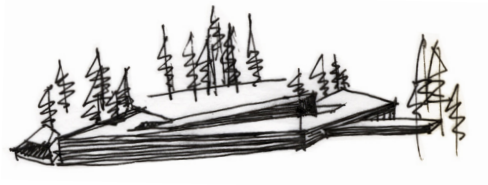


Site Plan

The site is set in an open field at the root of forested hills, the western Blue Ridge Mountains, in Rocky Mount, Virginia. The existing Gereau Center for Applied Technology and Career Exploration is located at the west side of the site. Rolling outlines of the hills, layers of plants from the top of the hills to the ground, the silhouette of the existing building and edge of the site share a strong character: horizontal orders. A dense growth of trees stands along the northern edge of the site, becoming a natural safety barrier for outdoor activities. They also provide a natural edge for an existing weedy path connecting to the highway, which will become a service driveway for the new building. A triangular area with trees on the east side of the site screens views and noise from the highway traffic. Taking advantage of the natural wood edges on the north side and the east side on the site, a terraced landscape playground for outdoor activities is shaped in between the building and the woods.


Site image





Two intersected horizontal volumes constitute the new center. One is a two story stacked pre-cast concrete jagged form, which houses the classrooms and library. North-south oriented regular openings sitting in between the column bays help introduc better natural ventilation and daylight. The other is a linear glass volume with rich sectional varieties, which contains public spaces and indoor circulation of the building. A roof sloping from the east to the west defines a wedge form of the multi-floor height glass volume, which is higher and longer in massing than the concrete building. It could be seen as a glowing background volume of the other one on the way to the site at night. Compatible with the building volumes, different learning settings are created in the building. One is the classroom-based lectures and laboratory experiences; the other is for the outside classroom activities and special events from industries and communities. As a result, architectural space layers become educational environment layers. Meanwhile, the learning based setting values the building spaces.

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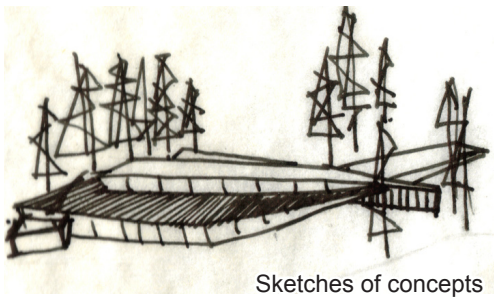
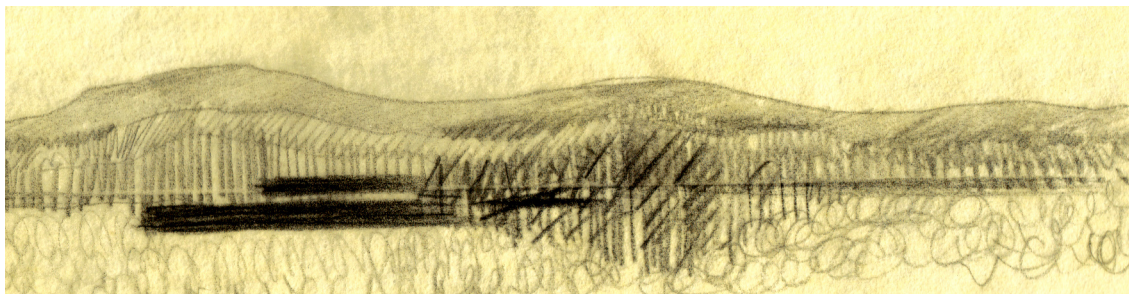
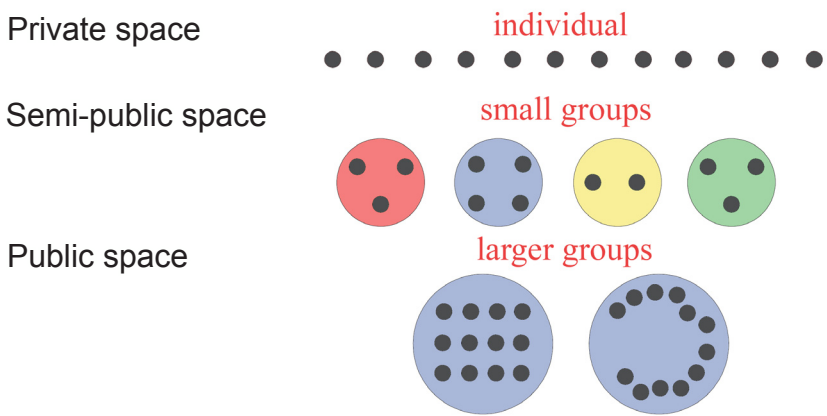


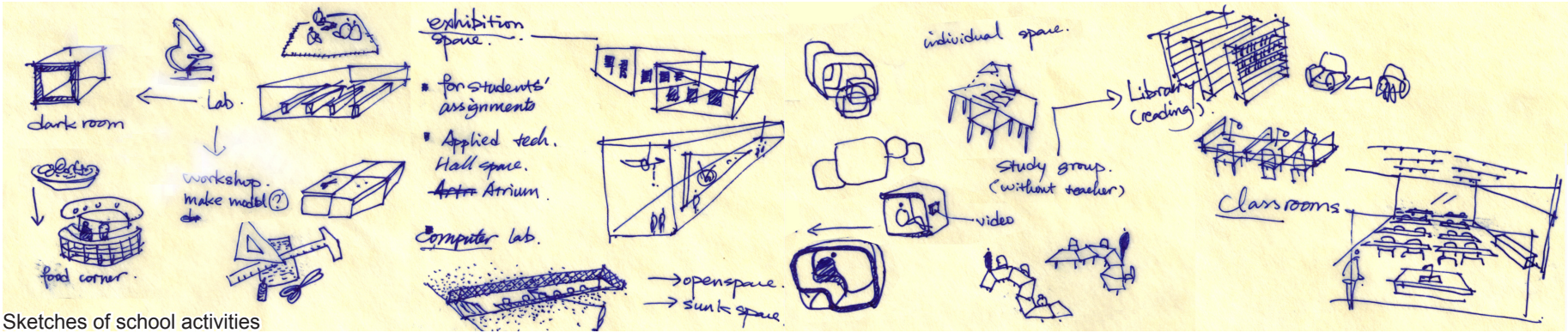
Sketches of concepts



EDUCATIONAL ENVIRONMENTS

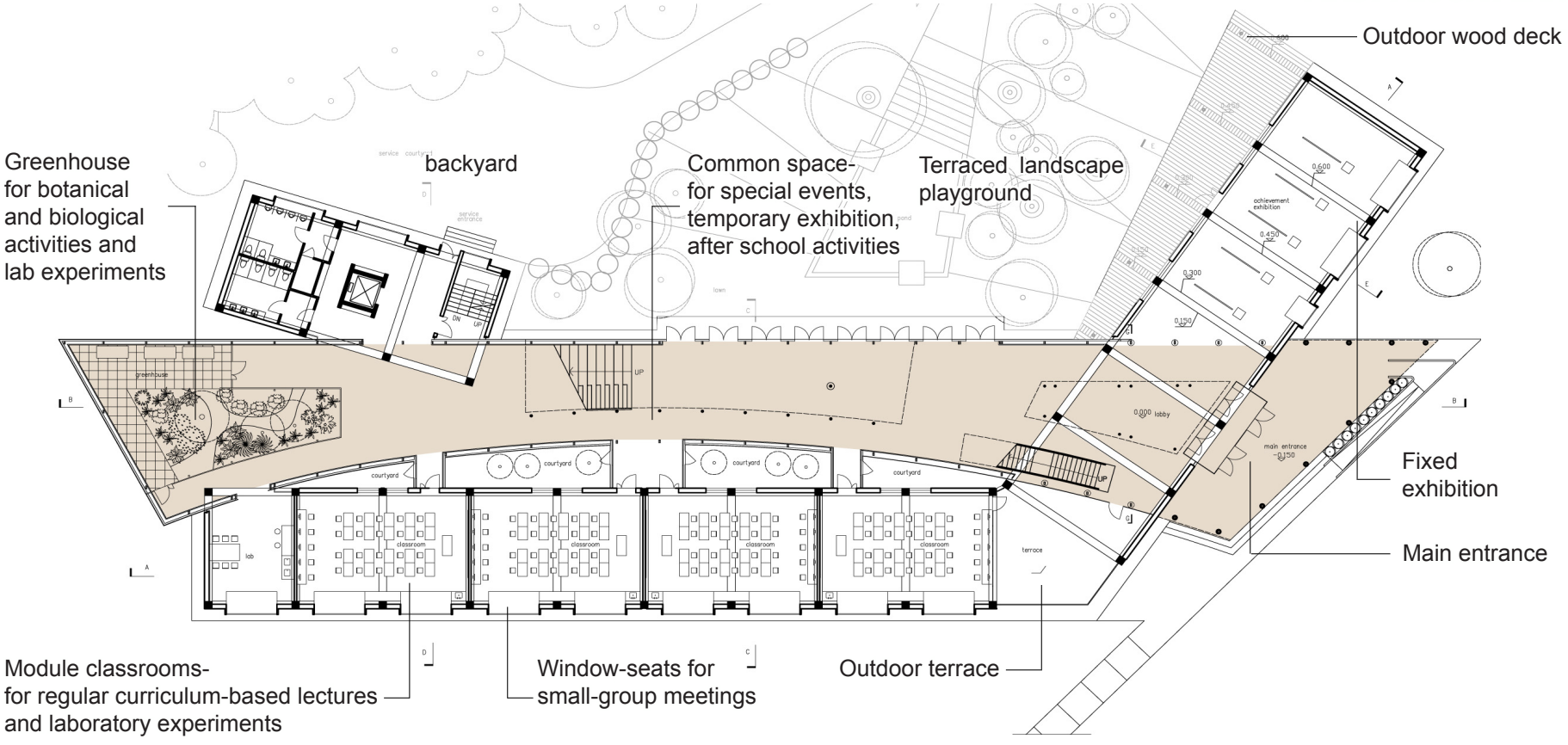


In an educational building, the value of architecture is not only providing material enclosures to deal with external conditions, but also creating spaces in which students can experience a great diversity of learning process. A microscope in a lab is for someone to focus on research independently; a library-reading lamp creates a space for absorbing knowledge from books into one's mind; a classroom is a space gathering teachers and students into a lecture; a table can bring people together to discuss questions. A multi-story height common space is intended for staging school and community events, such as students' performances and new technology exhibitions by local industries. According to this functional analysis, the new center has two volumes which have different spatial arrangements accommating various school activities. A transparent open volume meets the flexibility of spaces group activities desire. meanwhile, an opaque pre-devived volume provides spaces programed activities need.

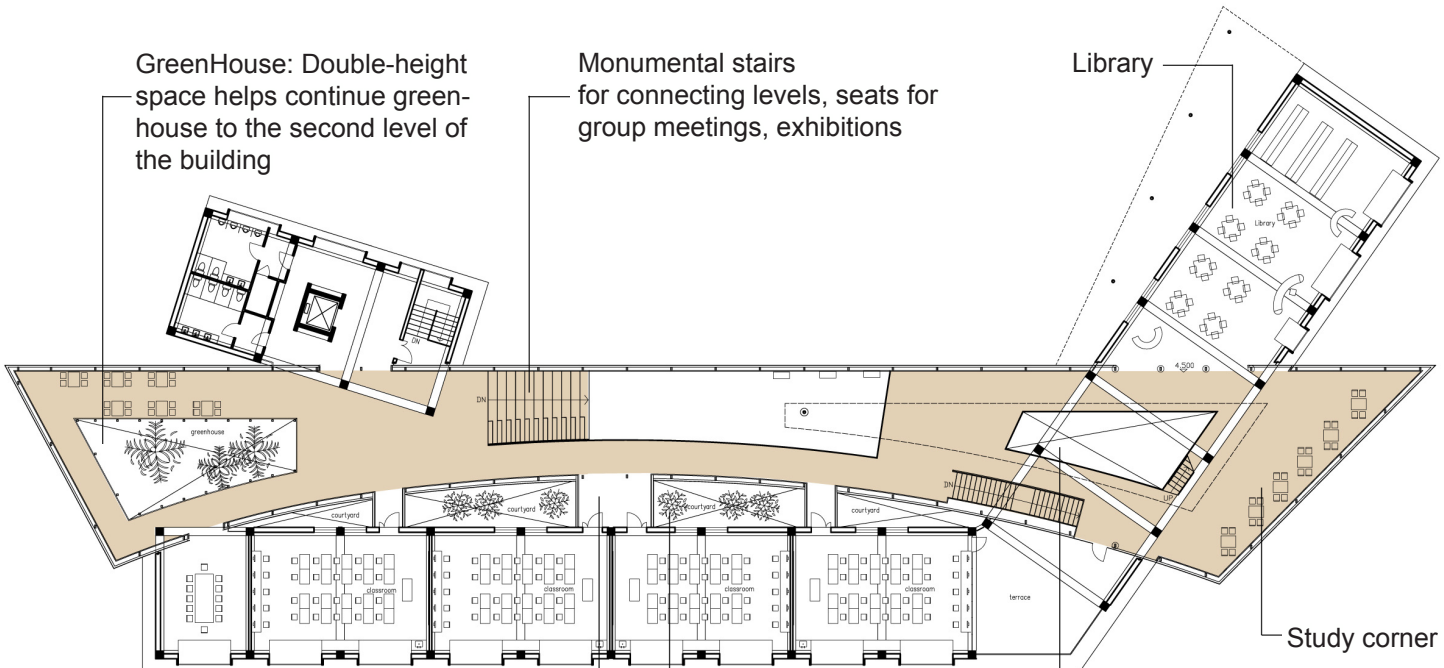


Sketches of school activities

FIRST FLOOR PLAN



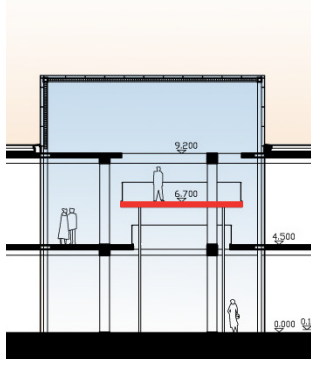
SECOND FLOOR PLAN



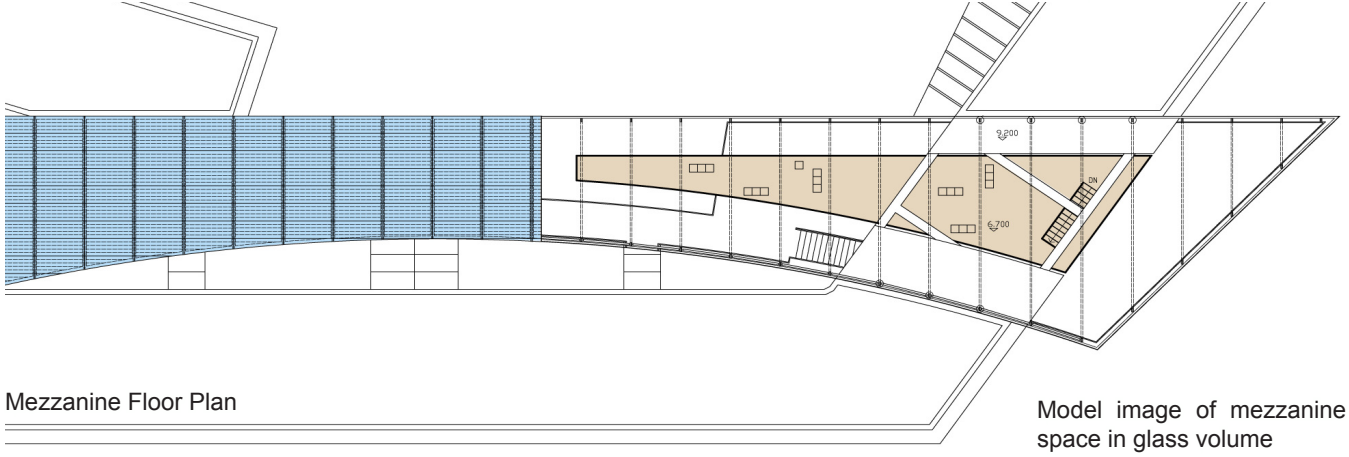
Model image of common area, the glass volume

MEZZANINE FLOOR PLAN

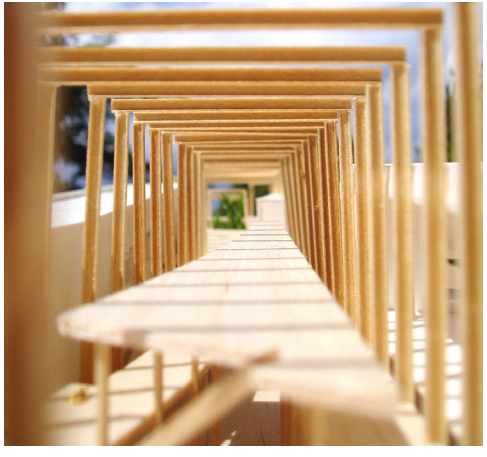
The trapezoid-shaped mezzanine is between the second floor and the roof , which is above the entrance atrium and flowing in-between the structural frame of the concrete volume. As the highest floor in the space, it is supported by the atrium columns on the wider end and by a single column on the narrower end. No steel structure is above the floor slab, giving a panorama for the structural elements of the concrete volume. It is a special “floating” island within the glass volume, creating a singular zone of space for group activities.



Section at mezzanine floor above entrance atrium

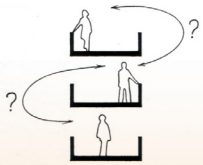


Mezzanine Floor Plan

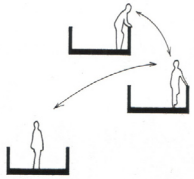


Model image of mezzanine space in glass volume

SECTIONS

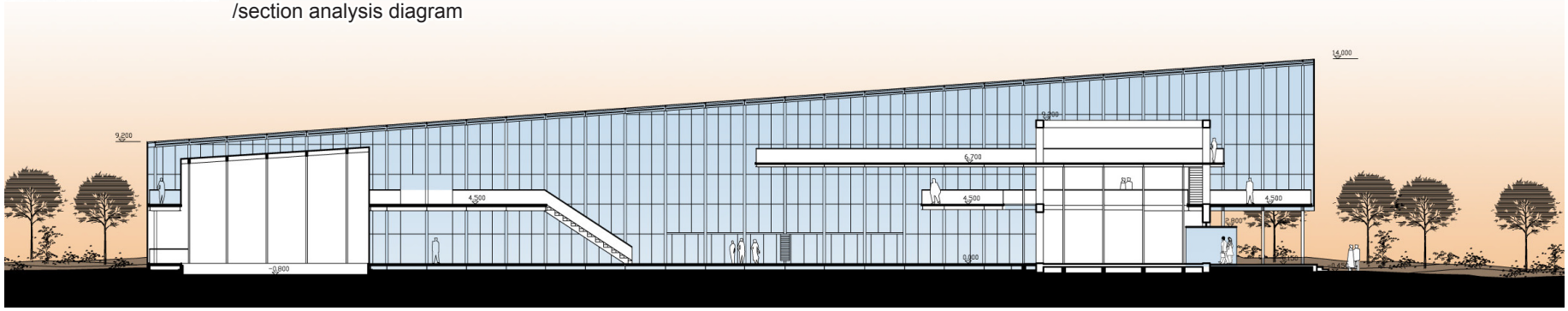


section at concrete volume
/section analysis diagram

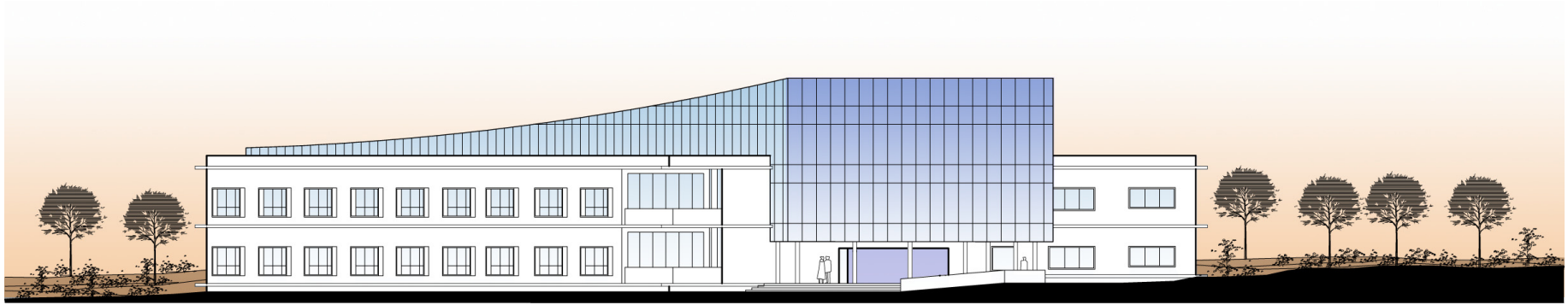


The two volumes differ in the sections. The concrete volume has a unit-stacked section because of the homogeneous space of the classrooms. No direct communication happens between levels. The glass volume has a more dramatic section. Entrance, lobby, atrium, stairs, corridor, greenhouse and mezzanine are different levels without any visual separation, which maintains spatial continuity. Activities on each level can be seen from any other level.

section at glass volume
/section analysis diagram

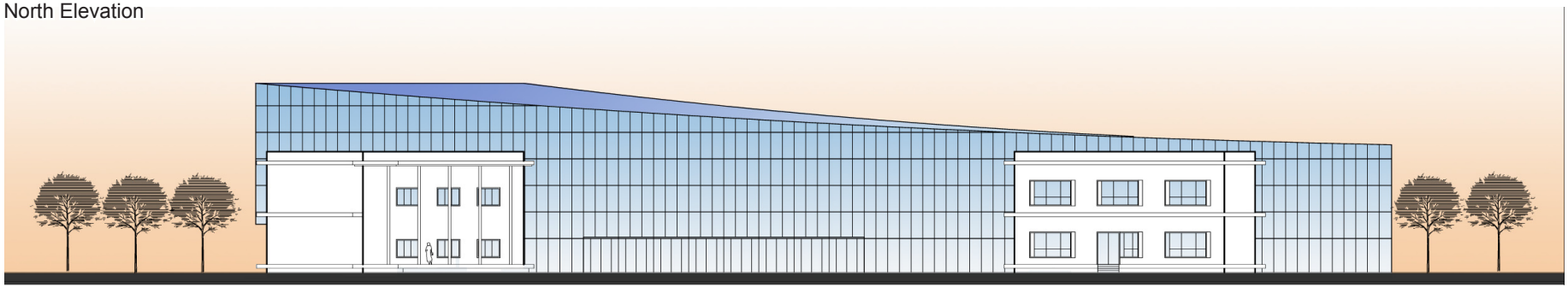


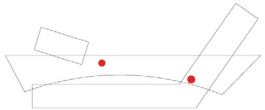
South Elevation



The two volumes have different skins respectively. One is a transparent glass enclosure; the other is an opaque concrete enclosure. The glass volume is elevated above the exterior finish grade on piloti, introducing the main entrance to the building. Different materials give the volume very distinct appearances, which imply the differentiation of spaces inside the building.

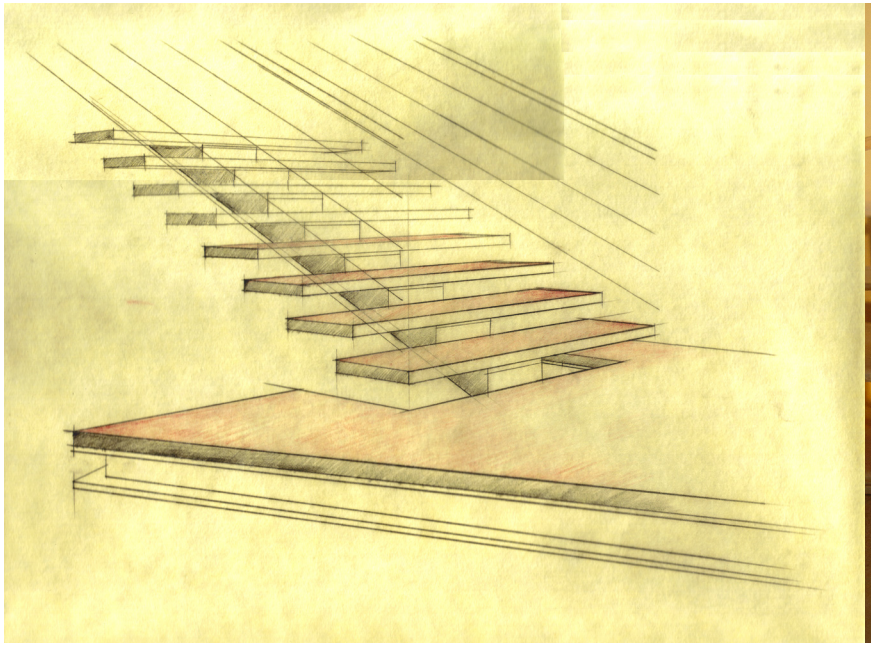
North Elevation





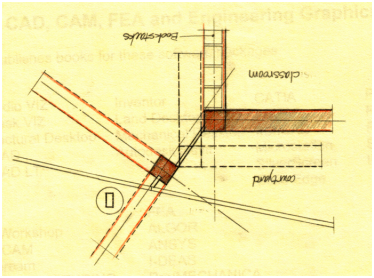
STAIRS

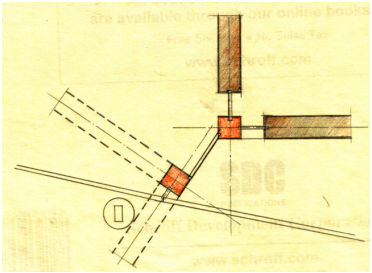
There are two main stairs in the glass volume connecting levels. Near the main entrance a light open-riser stair allows light to pass from above, and visually allows space around the stair to flow through the treads. The first tread on the ground floor is much wider than the rest of the treads of the stair. It forms a transition to introduce the change of level. The second stair in the common area is located at the center of the double height space. It has double height and double depth risers for the full width of the stair, creating a seating area for events and a stage for exhibition. An extra height riser stair gives people an interesting physical experience in the space. Meanwhile, on one-third of the width of the stairs, normal height risers are designed to meet the circulation need.

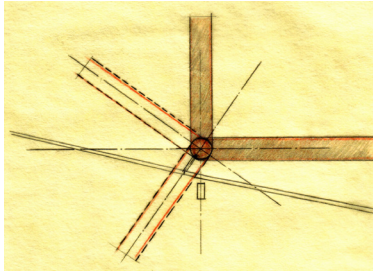


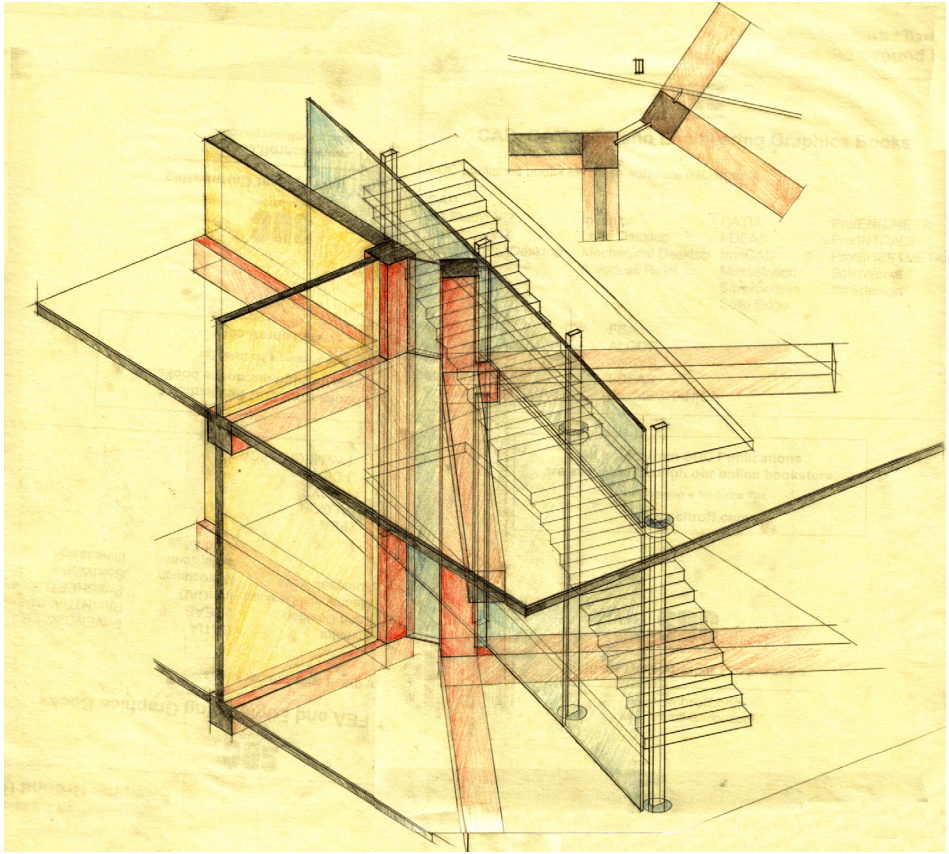
Sketch of open-riser stair

Model image of “exhibition” stair



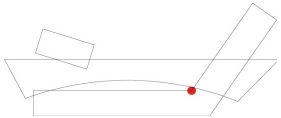






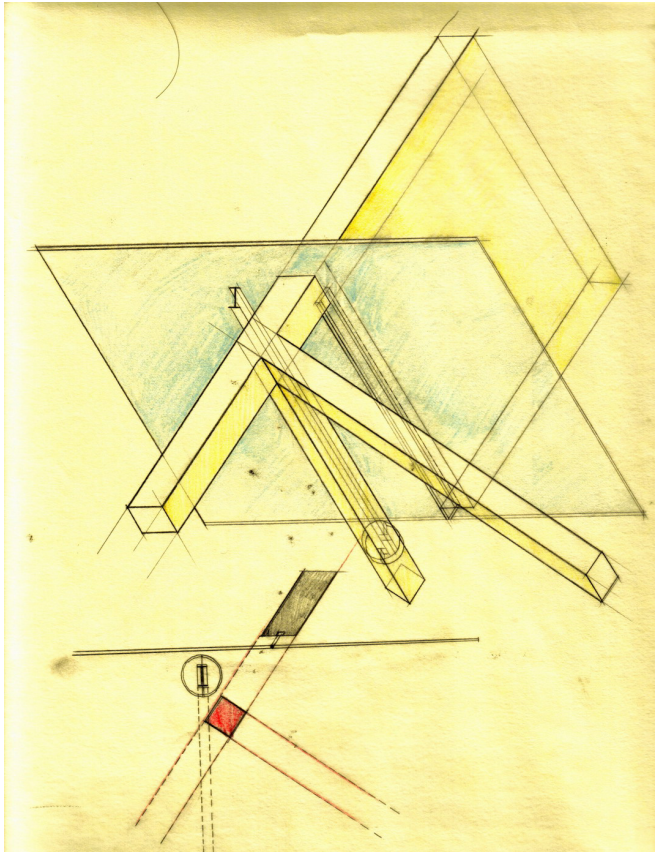
CORNER CONDITION STUDIES

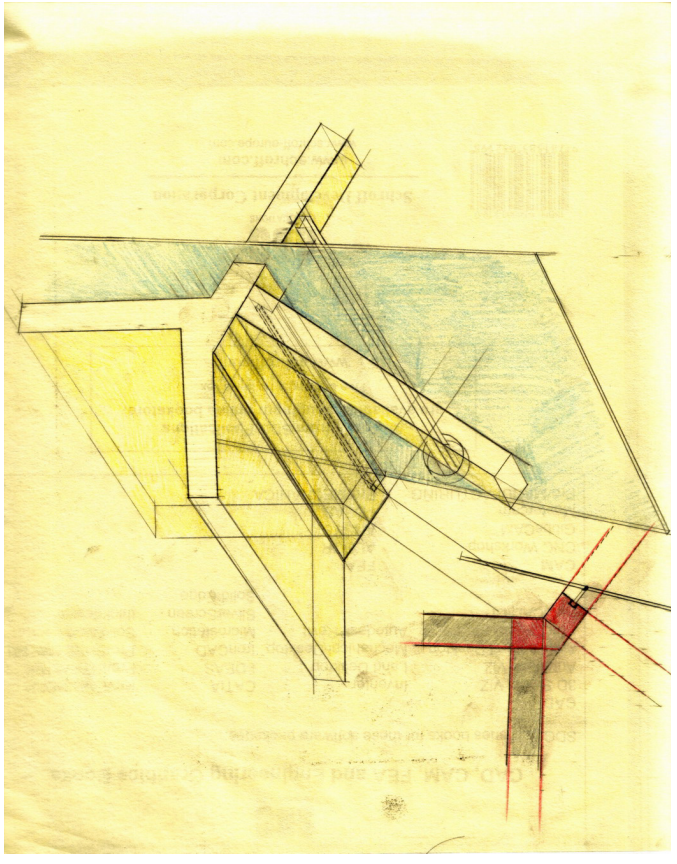
A corner column defines the rotated space. One column as a pivot articulates the continuum of space. The two-column corner emphasizes the rotated neighboring surfaces, introducing a third space connecting two exist spaces. In this case, it is an outdoor terrace. A gap between two columns is wide enough for someone to reach his head out, which makes the changing of space possible to experience instead of hiding behind solid walls.

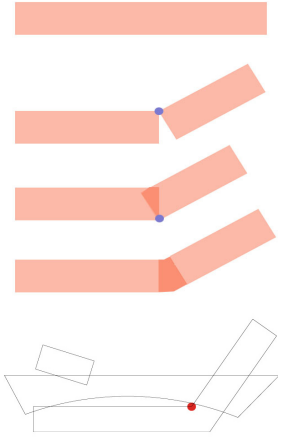


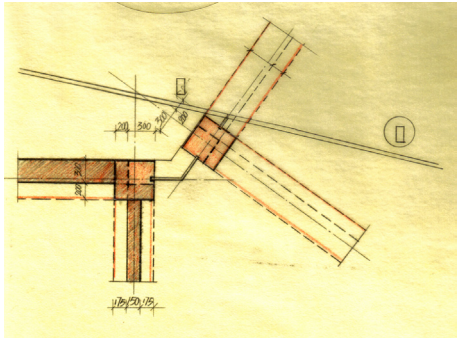
Sketches of corner condition studies

CORNER CONDITION STUDIES



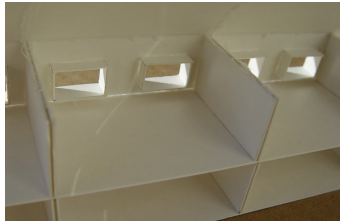


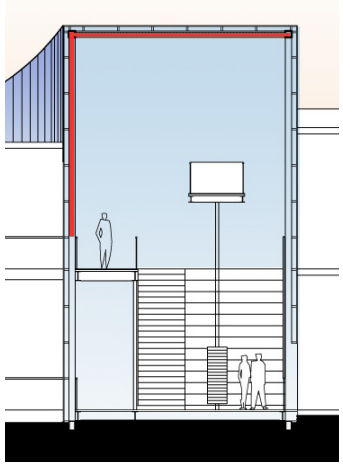




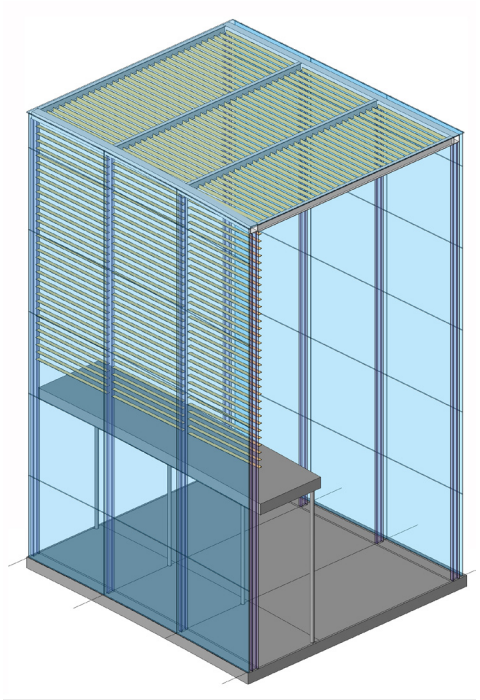
LIGHT QUALITIES

Daylight is the first sign of nature allowed to penetrate the space. A transparent skin gives opportunities for spaces to be bathed in daylight. Plenty of sunlight not only enlivens the spaces, but also forms shadows, which extend the space. On one hand, daylight use could become an energy efficiency lighting. On the other hand, too much solar heat gain due to the transparent skin could diminish the efficiency. As a solution, L-shape louvers on the south side and the top of this glass volume block out the direct sunlight. For the classrooms and the library volume, the solid skin is designed to protect the equipment and books inside. Meanwhile, the relatively closed skin helps screen views, which might minimize distractions. Due to limited openings on the exterior walls, electric lights are needed to contribute a better light quality for table top settings.





Model images of lighting studies



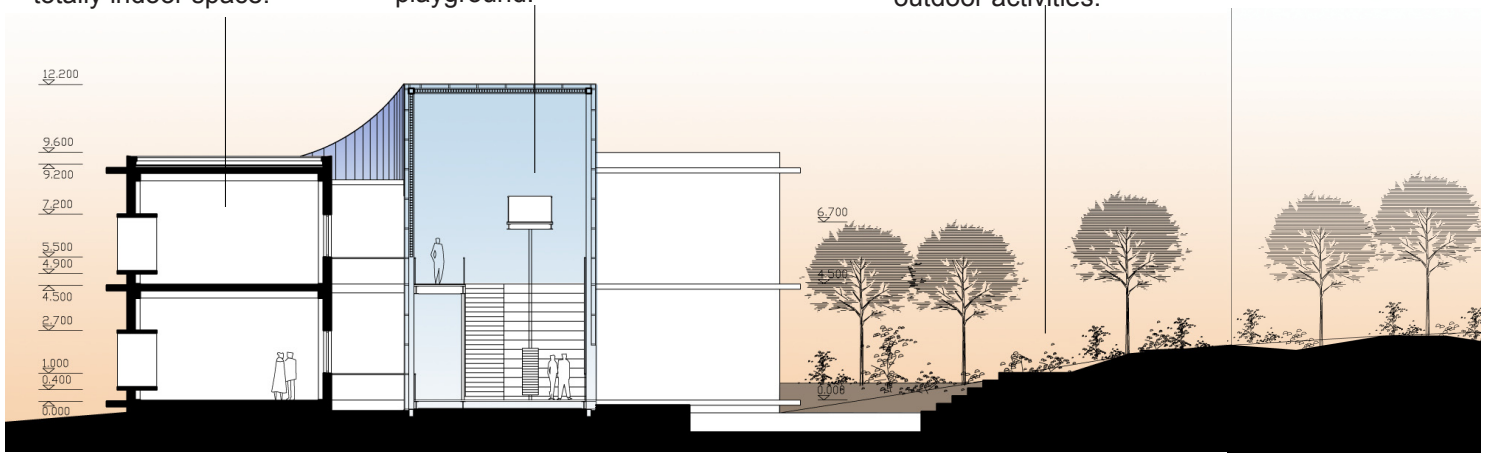
3D model of L-shaped louver on the south side and the top

Section and model image show the classrooms and common area

Opaque enclosure,
relatively close,
totally indoor space.

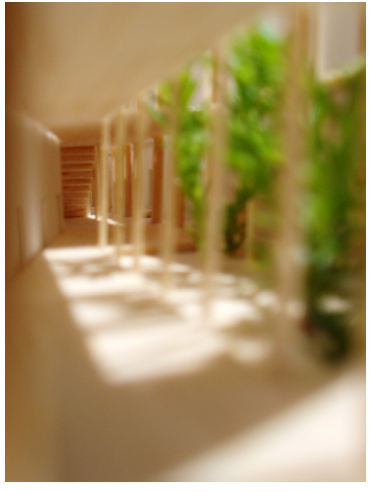
Transparent enclosure,
visually connects the indoor space and out; natural light can pass through the skin, common space flows through the boundary to the playground.

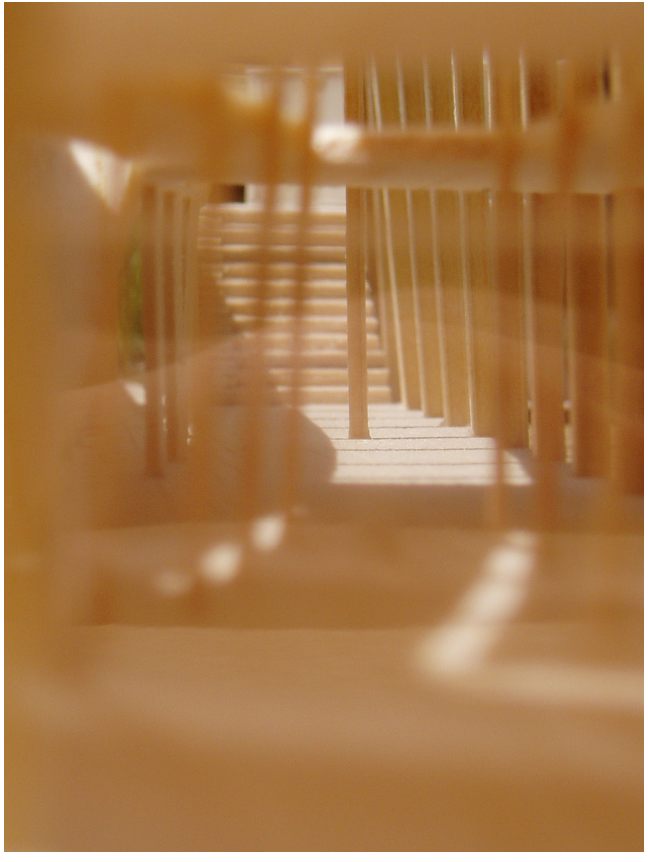
Playground for
outdoor activities.



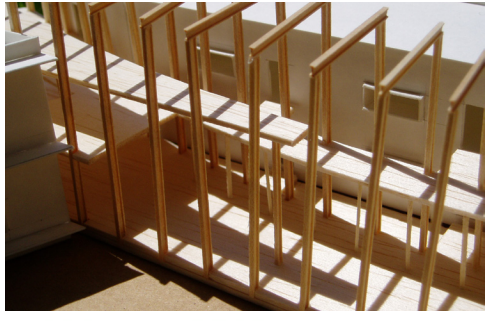
INSIDE AND OUTSIDE SPACE

The building surrounds a playground for outdoor activities. The north elevation of the glass volume becomes the main separation of the indoor space and out. Because no direct sunlight comes from the north, no louver needs to be installed. It allows the north elevation to be more transparent. Also, a series of doors to be located along the north side glass wall opens the inside space to the outside. Air, light and views diminish the boundary between indoor space and out.



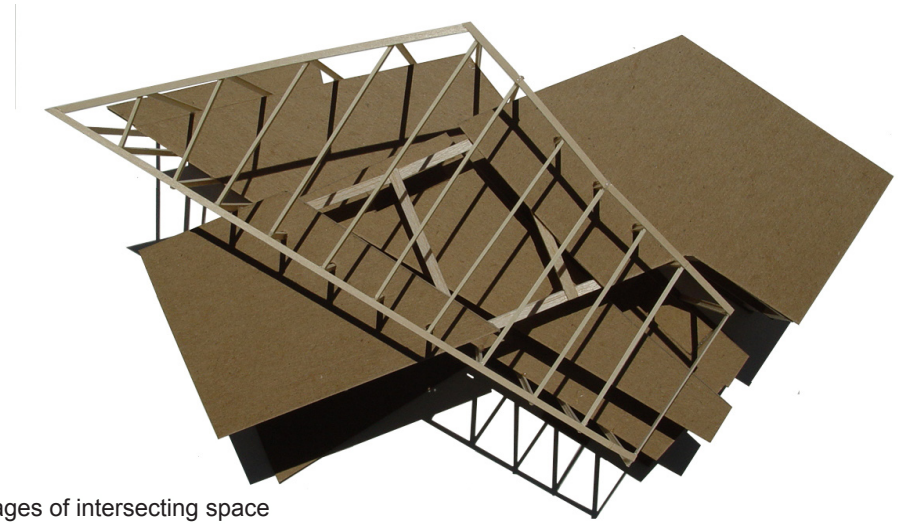


A transparent skin allows sunlight to reach every floor. At the same time, various floor planes cast shadows on each other, exposing the spatial layers within the volume.



model images of lighting studies in glass volume

The glass volume is primary when the two volumes intersect at the entrance lobby. The glass skin cuts off the concrete walls at the intersections of the two exterior systems. The concrete volume only leaves the structural frames in the glass volume. The mezzanine floor is flowing in-between the concrete columns and beams. The glass volume is bathed in daylight. The light quality in the volume defines the spatial character. The concrete structural frame belongs to the concrete volume. But when the structual elements pass through the glass volume they become sculptures defining a special zone in the glass volume.



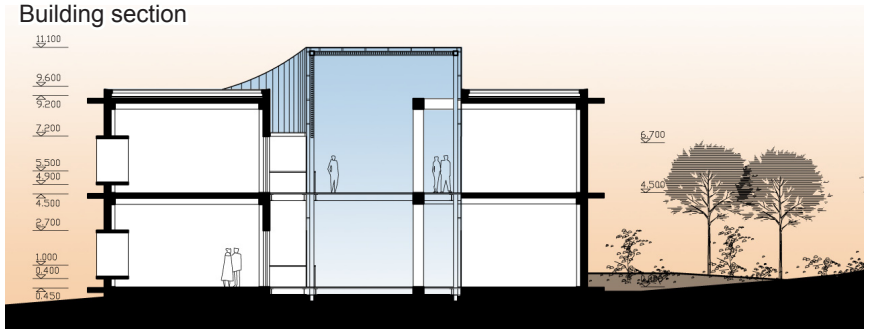
model images of intersecting space

TWO STRUCTURAL SYSTEMS

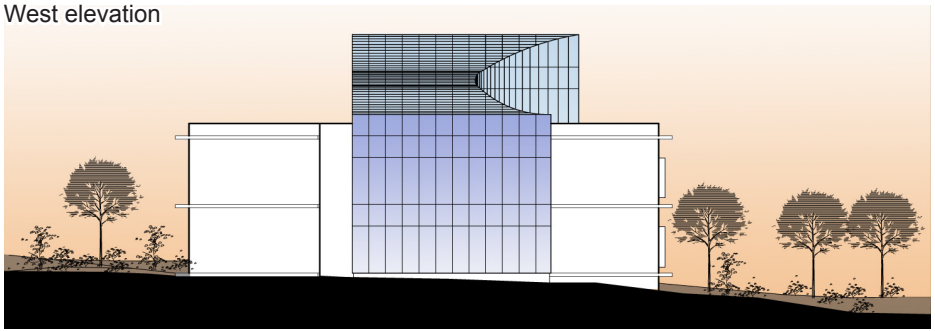
Exposed structural elements located next to each other declare their distinctive appearance. The steel columns and supporting glass volume, penetrate the concrete slabs in the intersecting zone. Therefore, light can pass through the holes washing the columns. This unique light condition celebrates the intersecting of two volumes.

Model images shows the differentiation of two structural systems

Building section

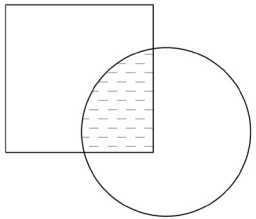


West elevation

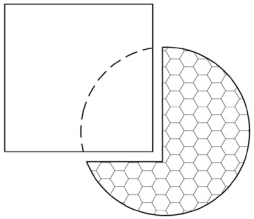


STUDY OF INTERLOCKING SPACES

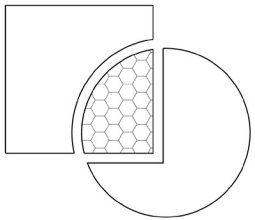
An interlocking spatial relationship results from the overlapping of two spatial fields and the emergence of a zone of shared space. When two spaces interlock their volumes in this manner, each retains its identity and definition as a space. But the resulting configuration of the two interlocking spaces is subject to a number of interpretations.



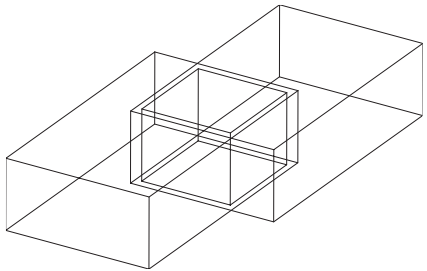
The interlocking portion of the volumes can be shared equally by each space.



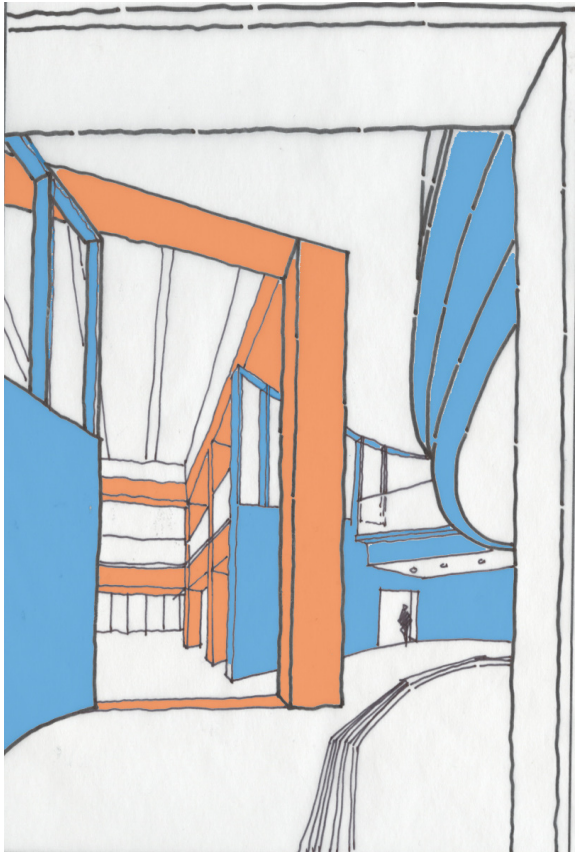
The interlocking portion can merge with one of the spaces and become in integral part of its volume.



The interlocking portion can develop its own entity as a space that serves to link the two original spaces.

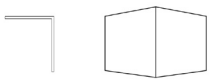


CASE STUDY
Toyosaka City Libriary

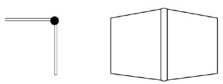


The building features a circle inscribed in a square. Each of the figures has a square and round double-height void in the center respectively. At the location where the square volume meets the round volume, Tadao Ando opens up the spaces, eliminating most of the partitions, only having the structural framework continued. It is not simply a void, but a space that ties two different shaped volumes as a whole. And this is one of the design approaches Ando frequently uses to enhance experience of spatial differentiation.

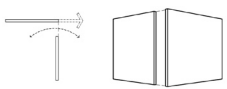
sketch shows the intersecting spaces in Toyosaka City Library



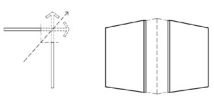
Corners define the meeting of two planes. If the two planes simply touch and the corner remains unadorned, the presence of the corner will depend on the visual treatment of the adjoining surfaces. This corner condition emphasizes the volume of a form.



A corner condition can be visually reinforced by introducing a separate and distinct element that is independent of the surface it joins. This element articulates the corner as a linear condition, defines the edges of the adjoining planes and becomes a positive feature of the form.



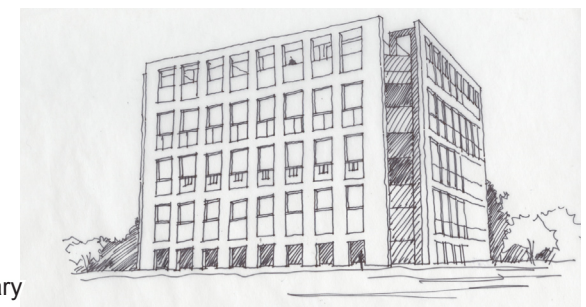
If an opening is introduced to one side of the corner, one of the planes will appear to bypass the other. The opening diminishes the corner condition, weakens the definition of the volume within the form, and emphasizes the planar qualities of the neighboring surfaces.



If neither plane is extended to define the corner, a volume of space is created to replace the corner. This corner condition emphasizes the volume of the form, allows the interior space to leak outward, and clearly reveals the surface as planes in space.

CASE STUDY
EXETER LIBRARY

Louis Kahn cropped the corners of the library instead of introducing a third element to solve the classical problem of " turning a corner". As a result, the building strongly appears as four independent elevations. Kahn thickened the walls as they reached downward and narrowed the piers between the windows as they rose. It is an honest way of expressing loads carried at different levels of the façade. The library elevations are reflecting the depth of the reading area due to the reveal at the corners. From the exterior, the whole library fully expresses the reading carrels. And it is the best explanation of Kahn's belief in the way a library begins: A man with a book goes to the light.



Sketch of Exter Library

CONCLUSION

Architectural elements define a spatial identity. Essential parts of elements explored in this case are the structural system, building enclosure, space proportion, spatial organization and light quality. They are an integral part of the overall experience of spaces. Their differentiation carries the uniqueness of each volume. One is an open transparent multi-story space; the other is a close stacked solid volume. One identity stands out the other when two volumes intersect with their own clear identities.

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All photographs and drawings are by Min Liu

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