HEALTHY BUILDING, PEOPLE, PLANET a place for learning and play



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HEALTHY BUILDING, PEOPLE, PLANET

a place for learning and play

by Amber Leigh Wirth

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

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A B S T R A C T

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"Of course the good school building must be functional. But it functions for the pupil in an environment peculiarly created to help him learn in whatever teacher-pupil or pupil-pupil relationship he finds himself. Far more than mere housing for an academic educational process, no matter how excellent that process is, the good school is a part of the process itself - a primary aid and a constant stimulus to learning - a human instrument. Until we learn this, we will never find the approach to great educational architecture." - William Caudill, Toward Better School Design, 1954

This Thesis attempts to question how the built environment affects public and planet health. I am particularly concerned with childhood obesity and how it is related to the affordability of neighborhoods, accessibility to public parks, availability of healthy food, and accountability for sustainability within our cities and suburbs. The architectural design proposal is an Elementary School, in Old Town Alexandria, that promotes learning through activity and play, is a living laboratory for environmental stewardship, and fosters a strong sense of community.

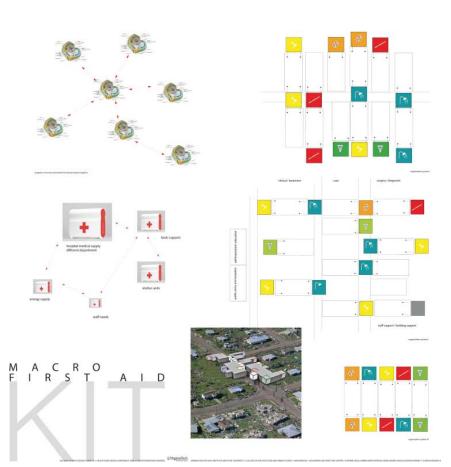
"Let my playing be my learning, and my learning be my playing." -Johan Huizinga, <u>Homo Ludens</u>, 1938

DROUGHT / FAMINE DISASTER ZONES Timpgort That All / Hann Timper That All / Hann Therrain-Sand Shelter-Ford and Alk / Terra and Alk EARTH-QUANC DISASTER ZONES Transport Bload / Plane Timper Bload / Plane Timper Bload / Plane Cilmater-Wer / Cold Shelter-Ford and Alk WINDSTORM DISASTER ZONES Transport Bload / Plane Cilmater-Wer / Cold Shelter-Ford and Alk WINDSTORM DISASTER ZONES Transport Bload / Plane Cilmater-Wer / Cold Shelter-Ford and Alk Cilmater-Wer / Cold Transport-Bload / Plane Cilmater-Wer /

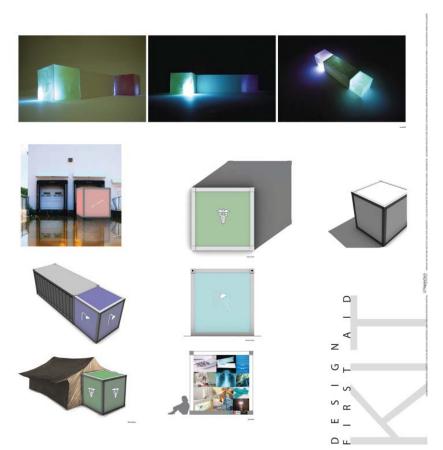
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INTRODUCTION

In the fall of 2008 I participated in the AIA/AAH Student Design Charrette at the Healthcare Design Conference 2008. Our challenge was to design a Disaster Response Hospital, and our concept was based on the most basic form of healthcare provided: the first aid kit. This experience opened my eyes to a world of design and a way of creating that I was not familiar to me. After the presentation we celebrated by having a much needed drink with our competitors. Unexpectedly, I received an unofficial "thesis bar crit" from the McGill professor. The two things I got out of it were: to make my inspirations and research architectural as soon as possible, and that architecture doesn't solve the world's problems...It actually creates even more problems...I interpreted this to mean that my thesis building isn't going to solve childhood obesity, or global warming, or social injustices, but I can attempt to bring awareness to the issue by providing a space that promotes activity and nourishment and play!

In the spring of 2009 I volunteered with Architecture in the Schools in DC. This program creates the opportunity for designers and teachers to collaboratively expose students to architecture. Our class was in the morning so we had the pleasure of sitting through the pledge of allegiance. The students also recited another pledge called the uniform pledge. It talked about the reason why they wear uniforms is to eliminate competition, but the thing that disturbed me the most was that it said "a school is a place for learning not a place for play..." This motto was apparent in this school as it did not have an official playground. It was an urban school with outdoor rooms on various levels that were open on one end to light and air with a metal fence for safety. No play equipment. The roof was converted to an outdoor activity space that had a net over the top also for safety, but again no play equipment. In all spaces there were padded walls to cover the brick for safety. An elementary school with no playground! Needless to say...one day over a bittersweet cookie and tea...I decided to play...I constructed the game of hopscotch in the WAAC parking lot with sidewalk chalk, a tape measurer, and a camera. I recorded myself playing hopscotch. A couple of days later it rained, and I wondered if my hopscotch had survived. I walked outside to see two fellow classmates playing on my hopscotch. It made me laugh and smile and confirmed my premise that we all need to play.

TITLE PAGE	
ABSTRACT	
INTRODUCTION	i
CONTENTS	į
INSPIRATION	
PRECEDENCE IMAGES	4
SITE SELECTION	4
PROCESS	
STUDY MODELS	
SKETCHES	(
MIRROR OF DESIGN	12
FINAL DRAWINGS	16
FINAL MODEL	24
BIBLIOGRAPHY	28
IMAGE CREDITS	29
ACKNOWLEDGEMENTS	3
VITA	3;

P R ATION

Childhood-Obesity -The average 10 year old girl weighed 77 pounds in 1963; today, 88. The 10-year-old boy weighed 74; today, 85.

-A 2006 study tracking 2000 low income children in 20 cities found that a third were overweight or obese before the age of 4.

-Children and teens consumed 110 to 165 more calories than they burned each day over a ten year period. Adding up to 58 pounds of extra weight, according to a Harvard University study

-One-fourth of all vegetables eaten in the US are French fries or chips. One-fourth of all Americans eat fast food at least once a day.

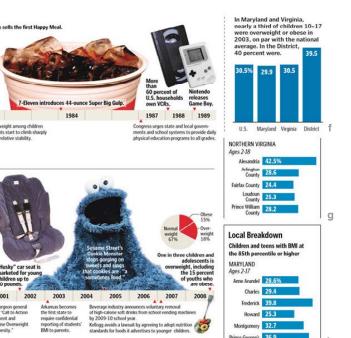
-A study of 200 neighborhoods showed that white neighborhoods have four times as many supermarkets as African American

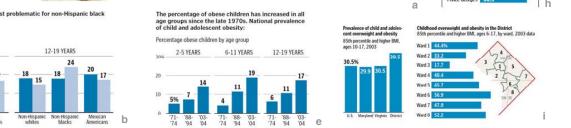
-The majority of Northern Virginia children and teens spent four or more hours at a computer, TV or video game screenonatypicalweekday,twicewhatisrecommended.

earning/Play Children learn though playing. Free Activity is as important as standardized testing in school curriculums.

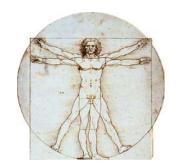
0 C The simple child's game. It is physical and has progression. I looked at this concept quite literally, exploring the hopscotch idea more, I discovered that maybe the boxes and arrangement, or the way you play it could be very architectural. The two side by side squares provide relief and balance while the single box you exert energy and it creates tension. This translated to indoor and outdoor spaces for me. Even though this is pretty straight forward, I decided to explore it more and overlay the site and program with this as the structure for organization of spaces.

e t a m o r p h o s i s I am inspired by nature and the fundamental necessity to sustain itself. The metamorphosis of the caterpillar to a butterfly represents the way a school moulds students and has the ability to nurture young minds into becoming the future of our society.





CHILDREN AND TEENS CONSUMED 110 TO 165 MORE CALORIES THAN THEY BURNED EACH DAY OVER A 10 YEAR PERIOD, ADDING UP TO 58 POUNDS OF EXTRA WEIGHT, ACCORDING TO A HARVARD UNIVERSITY STUDY



Nutrition Facts

acial/ethnic breakdown in 2001-04 for:

LIPOSUCTION AMONG TEENS HAS TRIPLED, TO 5,000 LAST YEAR, ACCORDING TO U.S. NEWS AND WORLD REPORT.



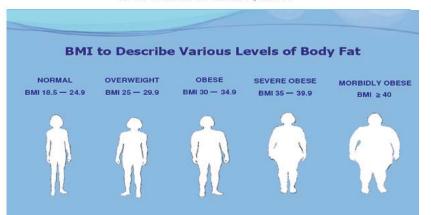








THE AVERAGE 10 YEAR OLD GIRL WEIGHED 77 POUNDS IN 1963: TODAY 88. THE 10 YEAR OLD BOY WEIGHED 74; TODAY 85.





















































PRECEDENCE-IMAGES

Earthramps

a.Maritime Youth House. Copenhagen, Denmark

b.Heatherton Park Play Space. Heatherton / City of Kingston.

c.The grass roof of TU Delft Library. The Netherlands

Columns-and-Structure

d. Francis Parker School. San Diego, California.

e.Kwantlen Polytechnic University Cloverdale campus

f. John Niland Scientia Building University of New South Wales. Sydney, Australia

g. Gullo Student Center.San Jose, Californiaj.

Skin-and-Roof

h. Hale County Animal Shelter. Greensboro, Alabama.

i. Sheep stable. Netherlands.

j. Benjamin Franklin Elementary School. Kirkland, Washington

Stairs - and - Bridges

k. The International School The Hague. Netherlands

I. The Claude Watson School for the Arts. Toronto, Canada

m. Lick-Wilmerding High School. San Francisco, California

n. Mossbourne Community Academy. Hackney, London

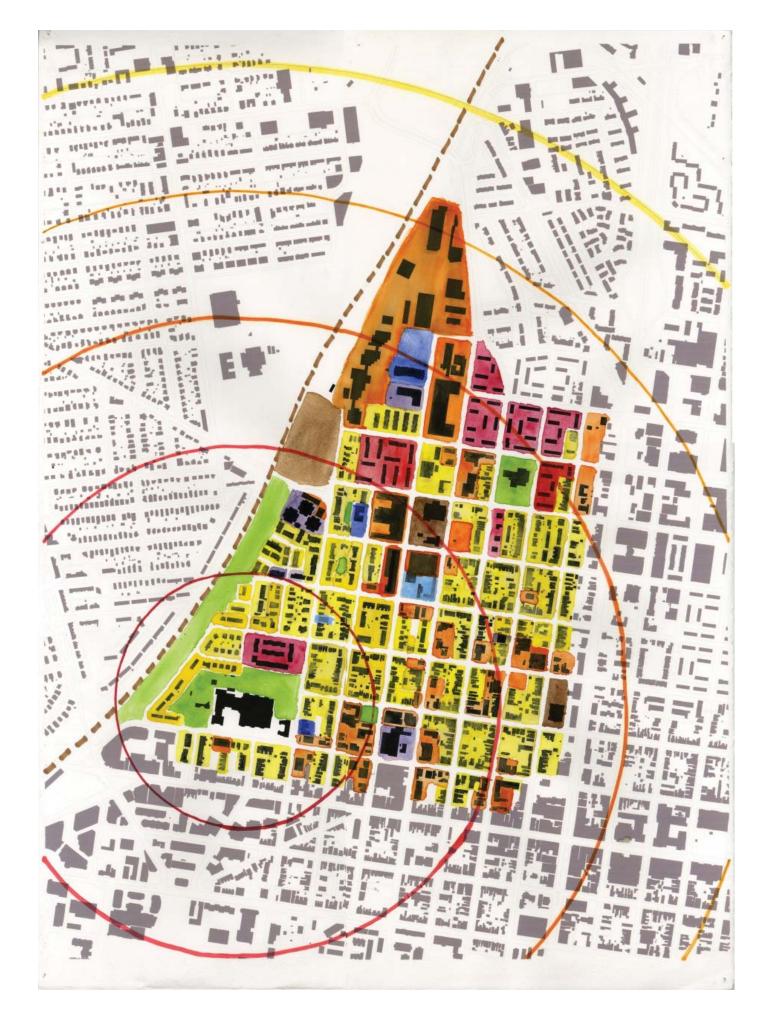
Skylights

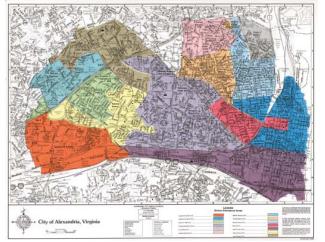
O. Cesar Chavez Library. Phoenix, Arizona

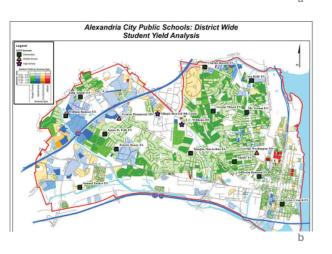
p. Pavillion l'Esprit Nouveau. Paris, France.

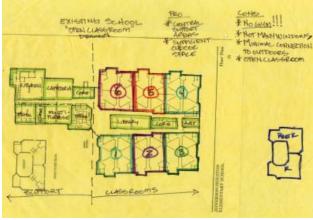
q. Kingsmead primary school. Northwich, Cheshire

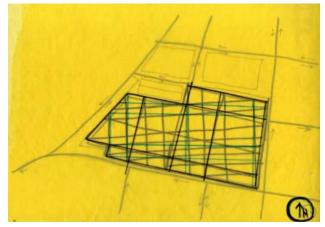
r. la Tourette. Eveux, Rhône, France











SITE-SELECTION

C i t y / S u b u r b Initially I was debating between Alexandria and DC, city vs suburb. They each have positive and negative aspects with regard to accessibility, walkability, affordability, and accountability. The city may be walkable but not affordable or have access to healthy food and faced with safety concerns. The suburb might be affordable but not walkable and is less conducive to activity. I chose to take on a site in what I consider an inner ring suburb, Alexandria, the middle ground between the two extremes.

Existing-School The site is located on the west side of Alexandria's Old Town near the King Street Metro Station. There is an existing school, a community pool, and a Head Start program currently located on the site. The current school facility was built in 1969, with an "open classroom" design which is no longer considered an ideal learning environment, has few windows and needs modernization of mechanical systems. The attendance zone, which includes 11 of the city's 27 public housing projects in Alexandria, has been blamed for the under performance of the school. According to the Washington Post, "More than 80 percent of the students qualify for free or reduced meals. More than 90 percent of the students are black and Hispanic....Close to 80 students who live in the school's attendance zone, the majority of them white and affluent, opted to go to other city public schools this year." After reviewing the current options the school district is considering to modernize the school; I am proposing to build a new school on the current site that promotes health, learning, play and sustainability for the students and the surrounding community.

O r i e n t a t i o n Alexandria's street grids are skewed from true north, and I wanted to bring awareness to how the sun will truly affect the students environment. I started giving meaning to the continuation of lines through the site from the street grid and the perpendicular intersections, then overlaid an orthogonal grid and started to define what is built and what is an extension of the landscape. This process informed the language of the indoor and outdoor spaces. I developed the idea of the ground becoming the roof and various levels of the building. This allowed a well defined relationship with the structure of the neighborhood surrounding the site.









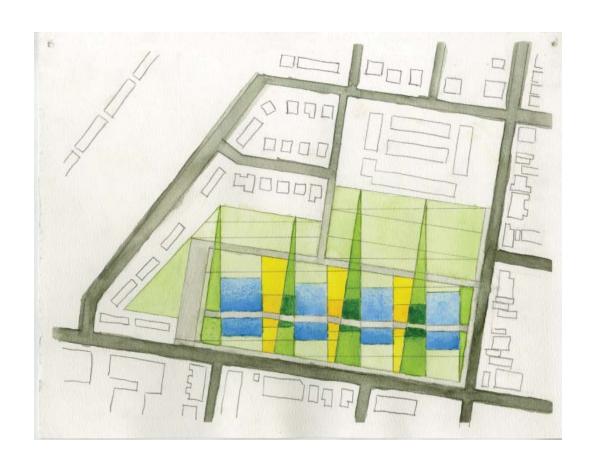








25. parking lot 20. pool 15. playing field 10. cafeteria 5. historic sign 24. neighborhood 19. pool 14. playing field 9. gym 4. stairs 23. neighborhood 18. pool 8. community bldg. 3. school sign 13. fire lane 22. neighborhood 17. playground 12. rear entry 7. school sign 2. playground 21. pool 1. headstart 16. basketball 11. parking lot 6. entry



ARCHITECTURAL GOALS

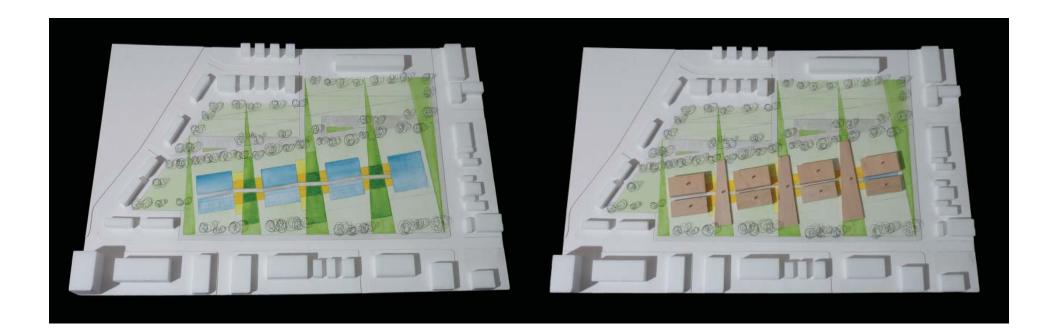
- · ARCHITECTURE THAT PROMOTES LEARNING + PLAY
- · ARCHITECTURE THAT PROMOTES HEALTHY PEOPLE
- · ARCHITECTURE THAT PROMOTES HEALTHY PLANET
- · INDOOR OUTDOOR CLASS, ACTIVITY of PLAY
- · SPREAD OUT ACTIVITIES
- · INTERACTIVE SUSTEMS
- " EXPRESSIVE STELLCTURE
- · HATURAL LIGHT I VENTILATION
- · CONNECTION TO FOOD
- · GREEN ROOF/ACCESSIBLE ROOF
- . WATER COLLECTION
- · OPIENTATION · MULTIFUNCTIONAL STATES · BRIDGES
- · ENVIRONMENT FOR LEARNING THROUGH EXPERIENCES, CREATE THE POSSIBILITY FOR ACTIVITY & PLAY

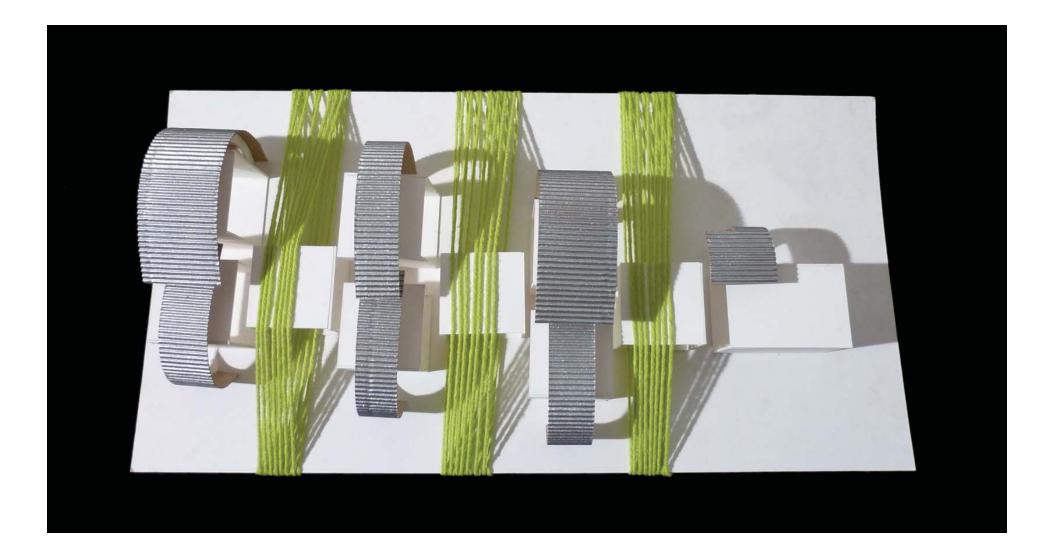
PROGRAM ELEMENTARY SCHOOL (K-5) 400 + SUDENTS
CLASSROOM (21 TOTAL/20 STUDENTS) HEADSPART
ART THEATER MUSIC ZOCOT ZOOOT ZOOOT CAFETERA
MEDIA/ LIBRARY CLIMIC GOODIA
RESOURCE HEADONACT GOOD \$ 1000 \$

TYPES OF MOVEMENT

SYMBOLIC	HAMUH	ARCH ITECTURE	ENVIRONMENT
BEGINING/ENT TIME LINBAR (MIGHT BE) WINDING)) LIFE LEARNING	PATH WALKWAY COPPIDOR BRIDGE	SITE SLOPE WATER DRAIN
CROSSRATES INTERSECTION CROSSONER CROSSINDER	CHOLE FELOTION PHYSICAL PLAY	RAMP	PREFAILING WINDS
EROUND AVE	SPIRITUAL HIBRARUTY CYCLE GROWTH COMBOTONS	STAIRS VECTICAL CIRCULATION	SUN RISESULETS
	BEGINING/ENT TIME LINBAR (MIGHT BE) WINDING) CROSSINDER CROSSINDER HEAVEL EARTH EROUND AIR	BEGINING/END LIFE TIME LEARNING LINBAR (MIGHT BE) (MIGH	BEGINING/END LIFE TIME LEARNING LINBAR (MIGHT BE) WINDOWN CROSSINDER THEORY INTERSTORM CROSSINDER PLAY HEAVEL SPIRITUAL STATES VERTICAL CROSSIND CYCLE GROWTH GROWTH

After deciding to overlay the hopscotch idea on the grid, and defining indoor and outdoor spaces connected by a spine I began to consider my architectural goals, how the school program might be redefined for community integration and accessibility for all, and the flow of movement through the site. I set out to create an environment for learning through experiences, and the possibilities for activity and play for the students and the community that surrounds it, while integrating sustainable solutions for a healthy planet and future generations. The site is about 10 acres and is a transition from the denser more commercial King Street and the less dense residential areas of Old Town. I made a conscience decision to spread out the built spaces to create a deliberate inefficiency of circulation to create movement through the site. The site slopes from east to west down 10 'so I decided to make the buildings relate to this decline and step down with the natural slope of the site. This allowed me to discover the idea of separation of spaces not only in the horizontal direction but also in the vertical direction. I recessed the building focusing the lower levels to the connection with the earth and the upper levels to the connection of the sky. This represented to me a true footprint / emplotment on the site. I then began to consider the scale of the built spaces and how they relate to the community surrounding the site. The north buildings are the larger scale community spaces, the south buildings are the lower scale classroom spaces, the open space on the south is used for the playgrounds, and the earth ramps connect the school and the community to the playgrounds and the playing fields perpendicular to the flow of the school activity. The entry to the school is on the east, the community garden is on the west side of the school connected to the cafeteria, and the on site parking is limited. There is a fire lane that separates the parking and playing fields from the school; all parking and car access is perforated pavement allowing a more permeable surface for water to naturally flow. The north roofs drain to water bioretention ponds to filter the runoff from the parking and facilities and can be reused for the garden on the west or cycled back into the school's gray water system. The site is surrounded by a forest of trees.

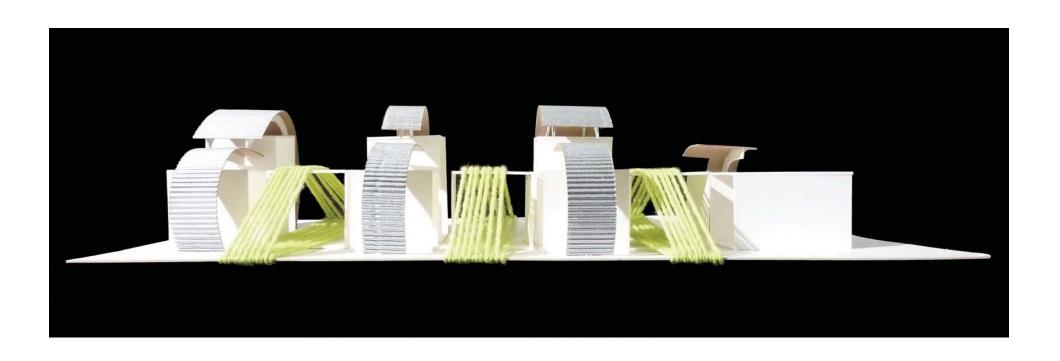




STUDY-MODELS

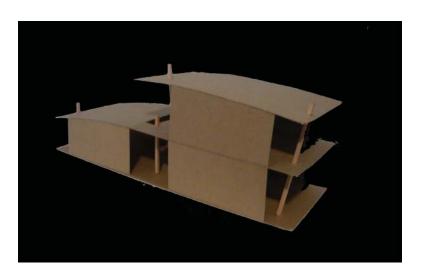
S i t e - M o d I continued to play with study models. The site model has a game board / children's puzzle quality to it. The neighborhood buildings are foam cut with a hot wire, the trees are metal wire twisted and stuck into the foam base, and the site plan is watercolor. The blue squares represent classroom and indoor activity spaces, the yellow represents outdoor covered play space, the green triangles represent the earth ramps connecting the playgrounds to the playing fields, and the gray spine is the school circulation of ramps and bridges. There are no stairs in this design, providing an excess of accessibility. The proposed school building masses are wood blocks, and the actual built up earth ramps are also represented in wood. The site plan is an organization of activity while the wood blocks represent emplotment with structure and order of events. They have their place relative to the site plan, and the nature of the footprint begins to reveal the materials of the buildings.

Concept-Model The architect does not determine the functions of the inhabitants, he can only create the possibilities for people to create their own stories as they inhabit the building. The concept model begins to give form and dimension and ideas of space how I envision it to be perceived and explored. The white boxes are the physical form given to the hopscotch order, with openings for light, air and movement starting to be The silver corrugated curves represent a second skin that envelopes the buildings forming covered areas where the roofs could be inhabited. The green yarn represents the earth ramps, where the earth would form bridges across the flow of the school creating this underworld of covered outdoor play space to be explored. The next iteration of this concept would explore scale, proportions, structure, and the recessed building into the earth vertically separating the levels above and below ground level accessed by the earth ramps. I struggled with how to bring light and air through the second curved cocoon skin and n later iterations would decide to simplify the roofs and structure for the purpose of this thesis exploration. The final study model illustrates the transition from the curved skin to a more simplified sloped roof and angled columns

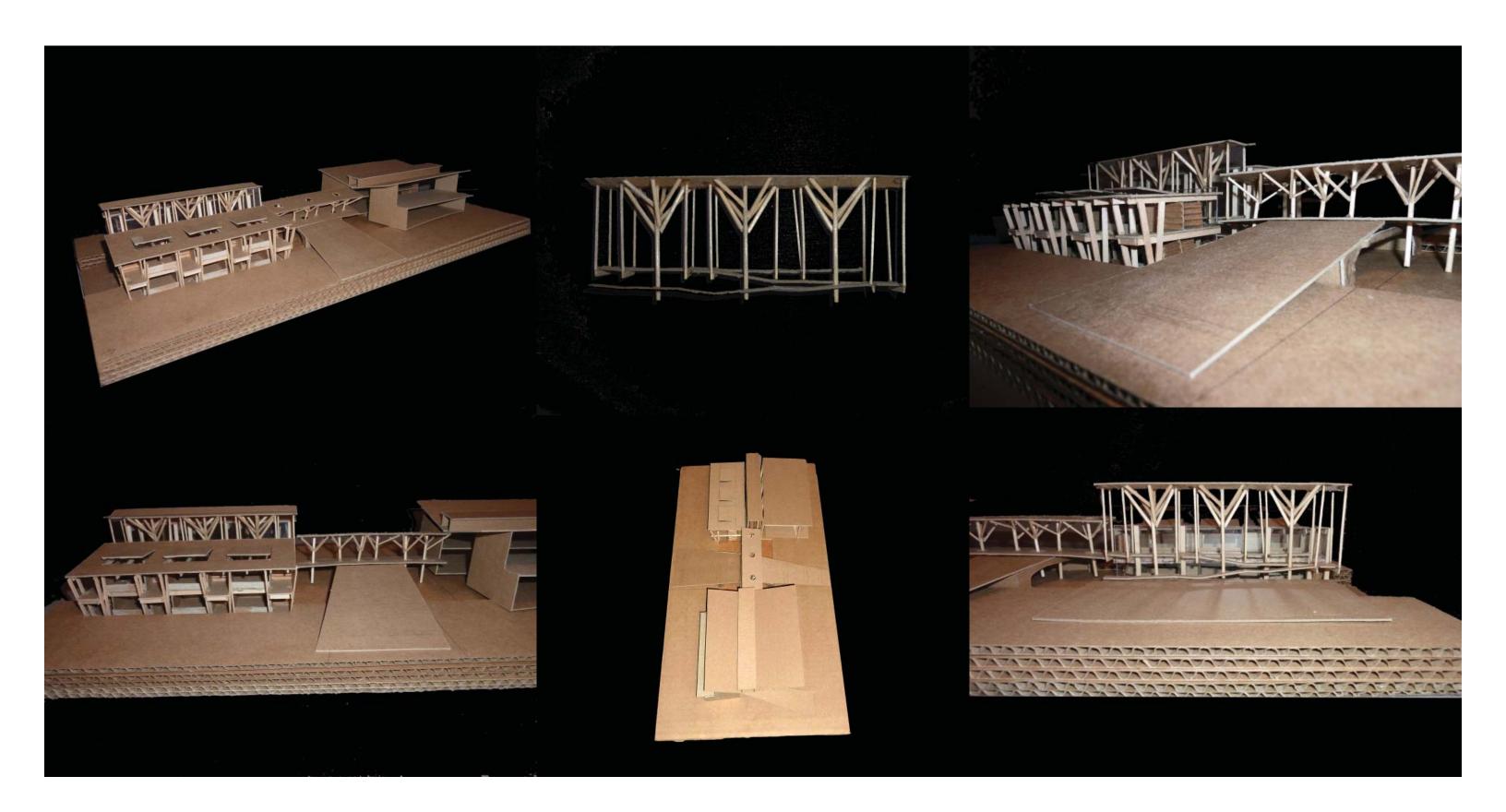


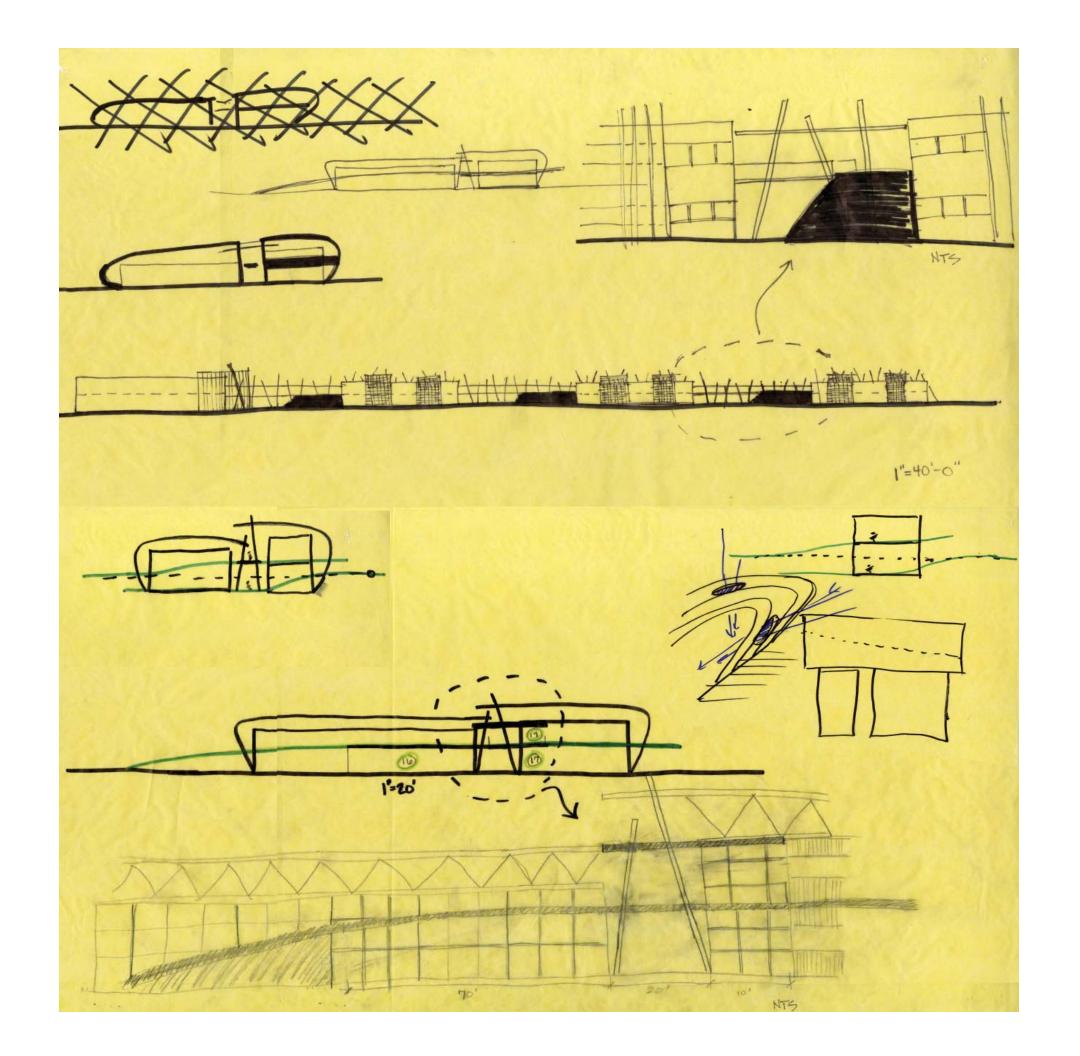










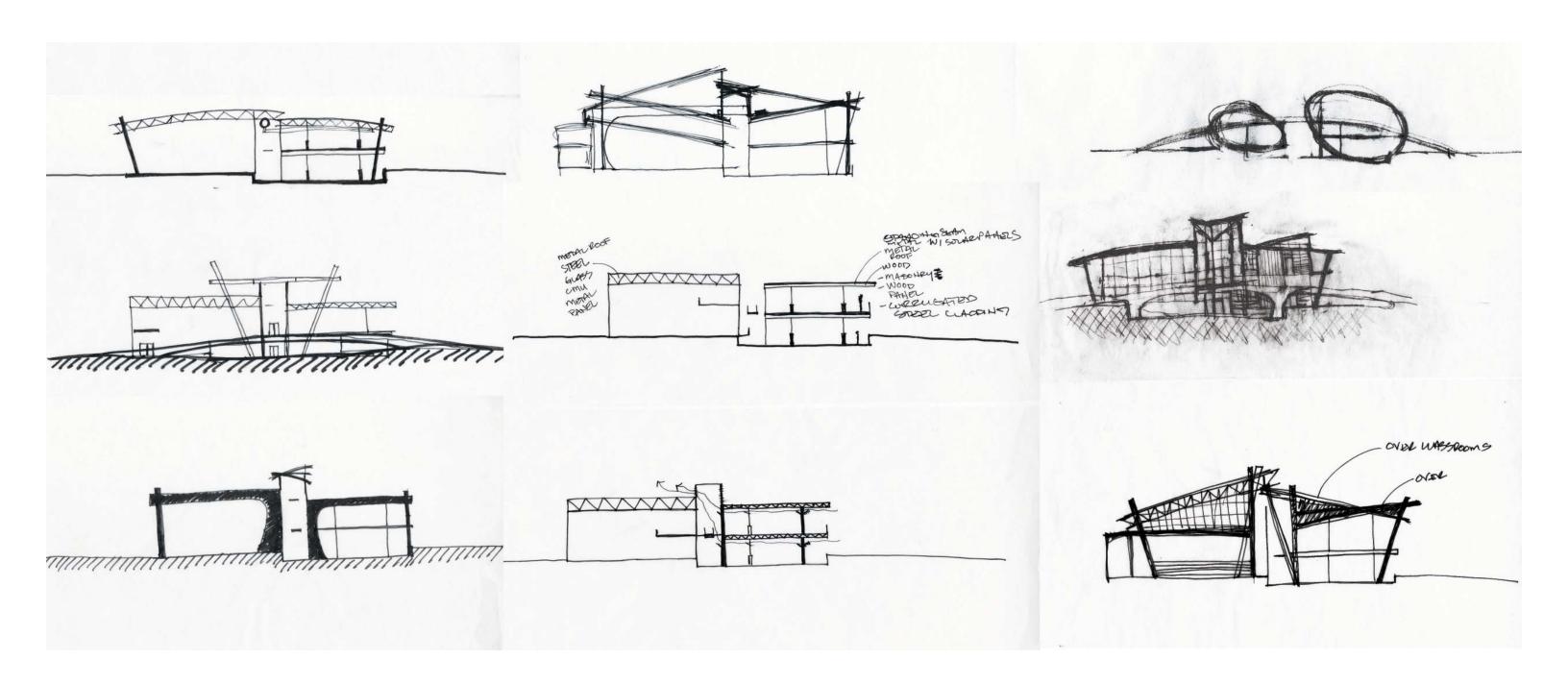


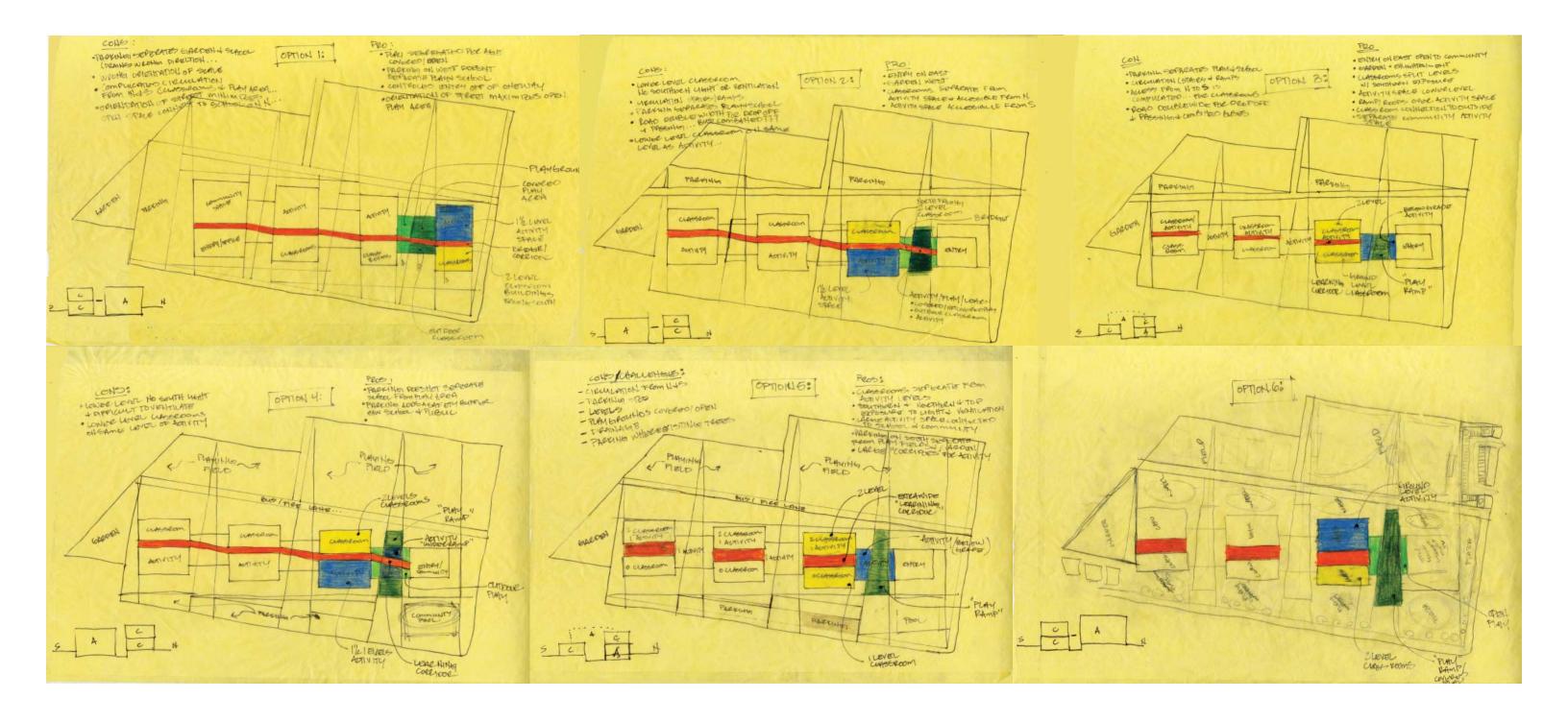
S K E T C H E S

E I e v a t i o n - O p t i o n s The elevations are not simply an extrusion of the plan or section. A facade and the structure supporting it is similar to a skull and a face. The difference between the skull and a face is the opportunity for expression and character. The outward appearance might not always reveal the inward character. For me the elevations were a reflection of the surrounding neighborhood relative to scale and material, while defining a rhythm appropriate for what was within relative to light and structure. The initial elevations explored the second skin idea and it became purely expression, completely separated from the bones of the building. I had a hard time justifying this which helped me decide to simplify my ideas and focus on fewer challenges.

Section - Options The overall concept of the building is simple and the character of the building is in the section. I was able to understand the level changes, how light and air would penetrate the facade, and how the structure will support the skin. I began to define overhangs and angles of the roof and recesses in the skin. This is also when I decided to define the structure of the classrooms slightly different from the community spaces, and entirely different from the spine. The early elevation sketches suggested a rhythm of the spine structure that was more prominent than the buildings themselves. And how it varied from inside the building to the outside. This idea developed into the bridge in the tree canopy. with a more delicate and light feel than the heavy wood structure of the classroom and activity spaces.

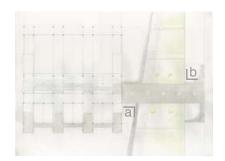
S i t e - O p t i o n s
The one struggle for me with sketches is the endless
possibility of options, especially with trace paper.
The exercise of organizing the pros and cons of site
arrangement relative to access, connection, and flow
helped me to narrow down the options and come up
with the best possible solution for the goals I set out
to achieve. This process allowed me to challenge
the entry and exit to the site and buildings, the priority
normally given to parking, and conceptualize the site
features all while keeping in mind the natural flow of
the site slope and orientation to the neighborhood.
The final design ended up being a combination of
the schemes producing yet another option. The key
is making a decision, committing to it and moving on.



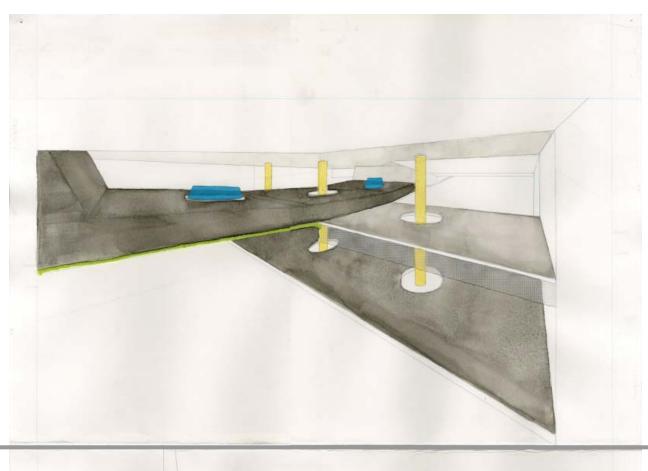


MIRROR-OF-DESIGN

My intent for the following exploration is a very literal interpretation of Paul Emmon's class Mirror of Design. The process is meant to allow me to see what I might not have otherwise discovered. Children's books inspired the format, and the drawings are intended to be touched, folded, flipped, and explored.

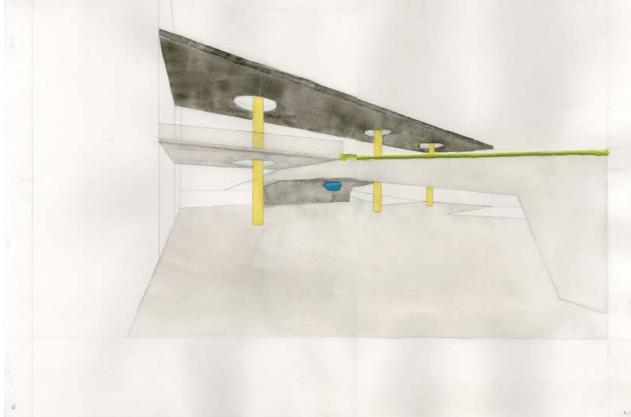


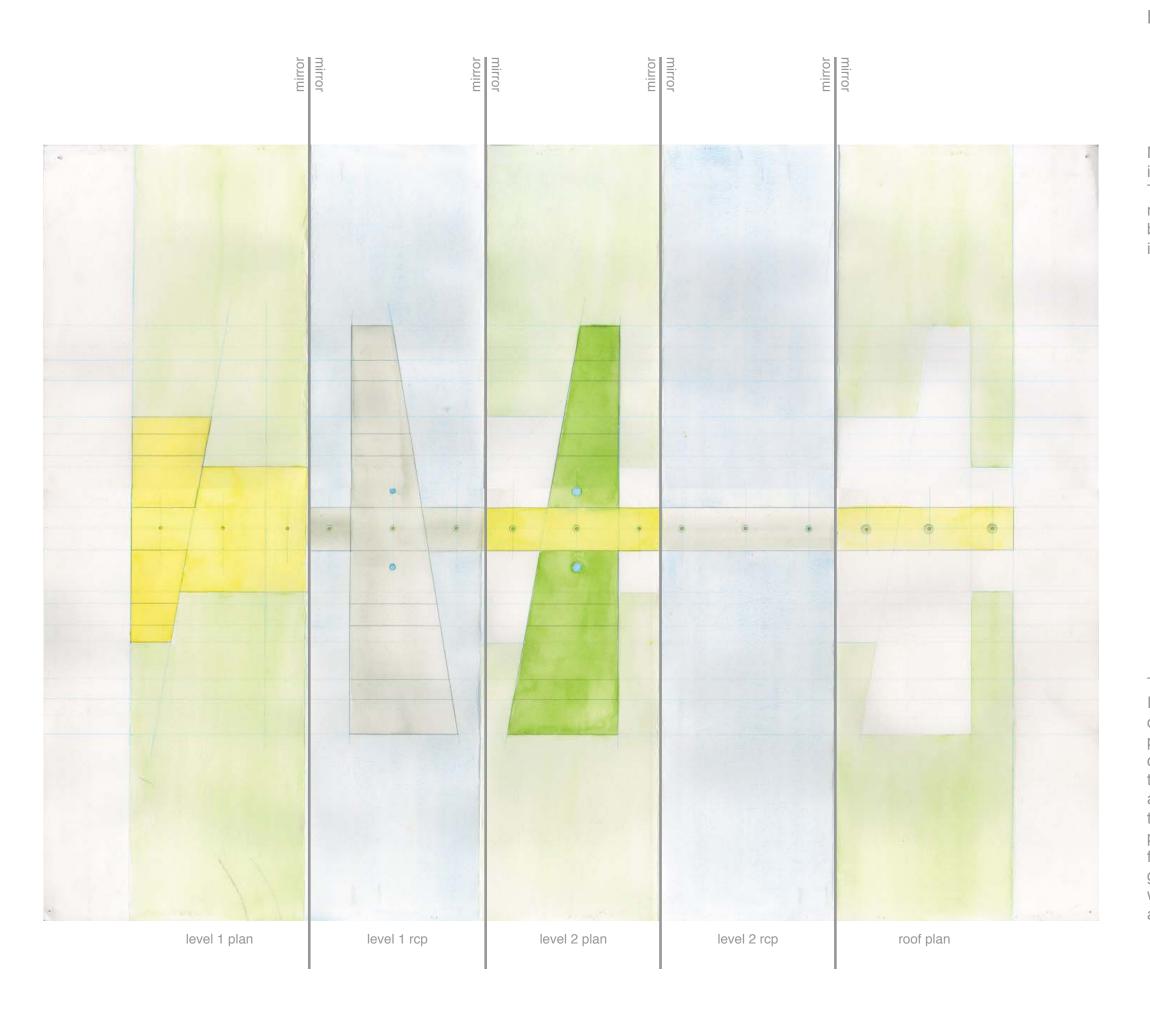
Bending-the-Corner/Synaesthetic-Presence I chose to draw perspectives of the outdoor covered play area and earth ramps. I used pencil, watercolor, yellow trace paper, green yarn, blue post it tabs, and clear mesh to represent my concept. This drawing allowed me to understand the three-dimensional space and bring attention to the important elements, and I thought about how the building can tell this story to the children. I thought about how the railing and structure of the bridge meet the earth ramp and how those two systems are different. I thought about how the varying structural systems and volumes of spaces affect the sound differently. The covered playground is quite large and I have a desire to provide light in various ways that might create lessons on the sun. I thought about incorporating the water collection from the roofs in this area since the children will most likely occupy this space when it is raining and that would provide an opportunity to learn about building systems.



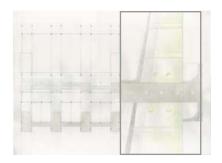
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mirror שוגגסג

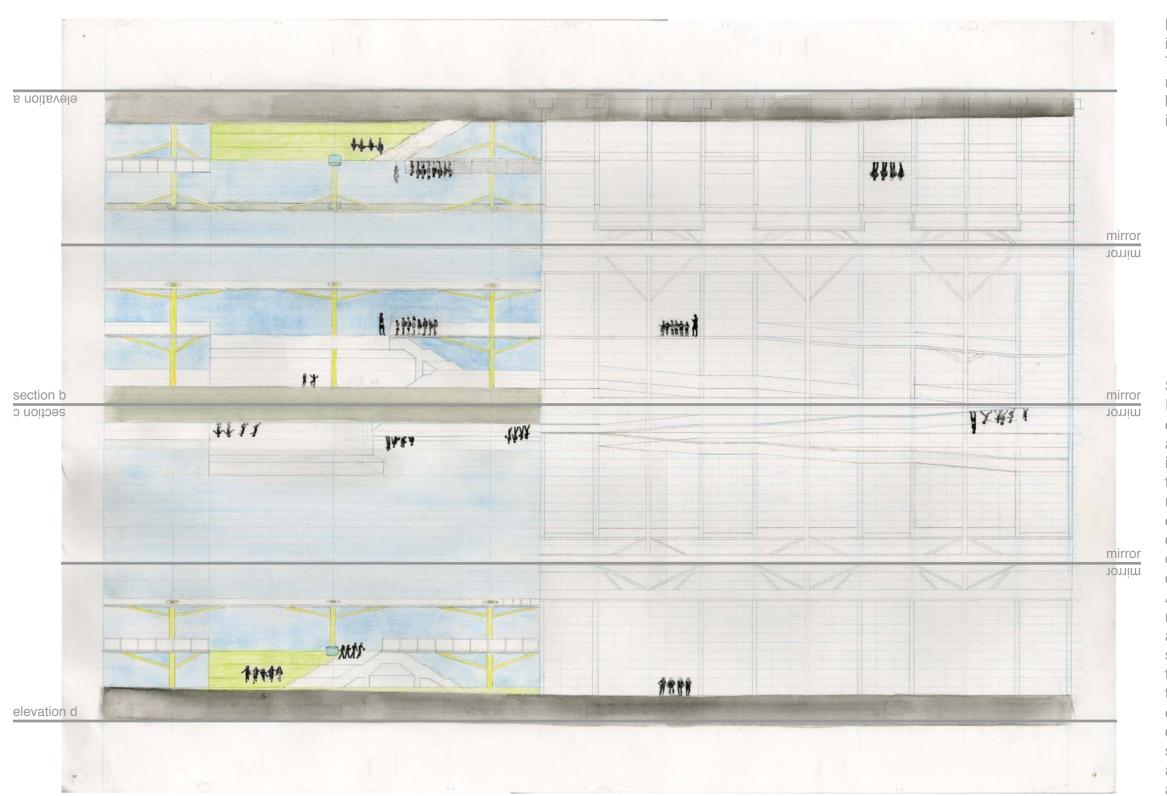




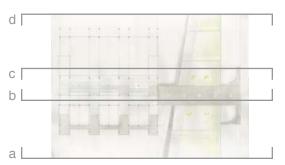
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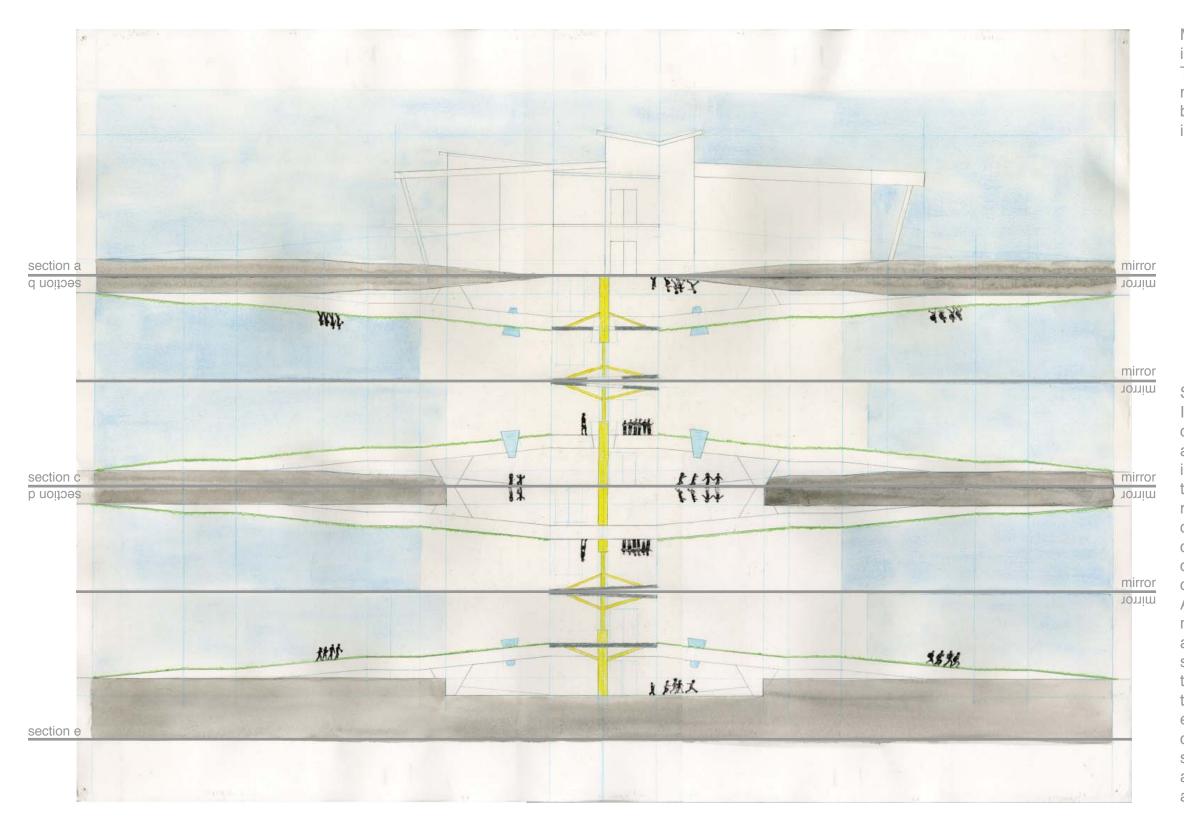
To u c h i n g - B e I o w - a n d - S e n s i n g - A b o v e I chose to draw plans and reflected ceiling plans of the outdoor covered play area and earth ramps. I used pencil, and watercolor to represent my concept. This drawing allowed me to understand the relationship of the floor plan to the earth and the ceiling plan to the sky, and I thought about how the building can tell this story to the children. The ground surfaces vary from grass to pavement, to a recycled rubber while the ceilings vary from sky to steel trees and metal to concrete beams and glass skylights. I thought about light and protection from weather, and how the children might occupy the space as a hidden, sunken, covered, playground for learning.



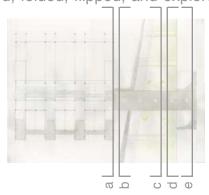
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Seeing-Through (recto-verso) I chose to draw elevations and sections of one block of classrooms, activity space and outdoor covered play area and earth ramps. I used pencil, watercolor, and images of children to represent my concept. These two drawings allowed me to understand how the relationship of the bones of a section relates to the skin of the elevations, and I thought about how the building can tell this story to the children. The site slopes down from the east to the west, and the buildings and outdoor spaces respond to the topography accordingly. A driving concept in the design is to promote movement and activity through series of ramps that allow all occupants to experience the building the same way. The earth ramp connects the playgrounds to the playing fields and become a playscape for the children while providing shelter on rainy days. I explored structural questions and how the steel "tree canopy" of ramps and bridges can contrast to the long span concrete earth ramps. Expressive structure is another opportunity to tell a story about the building and provides a learning experience for the children.



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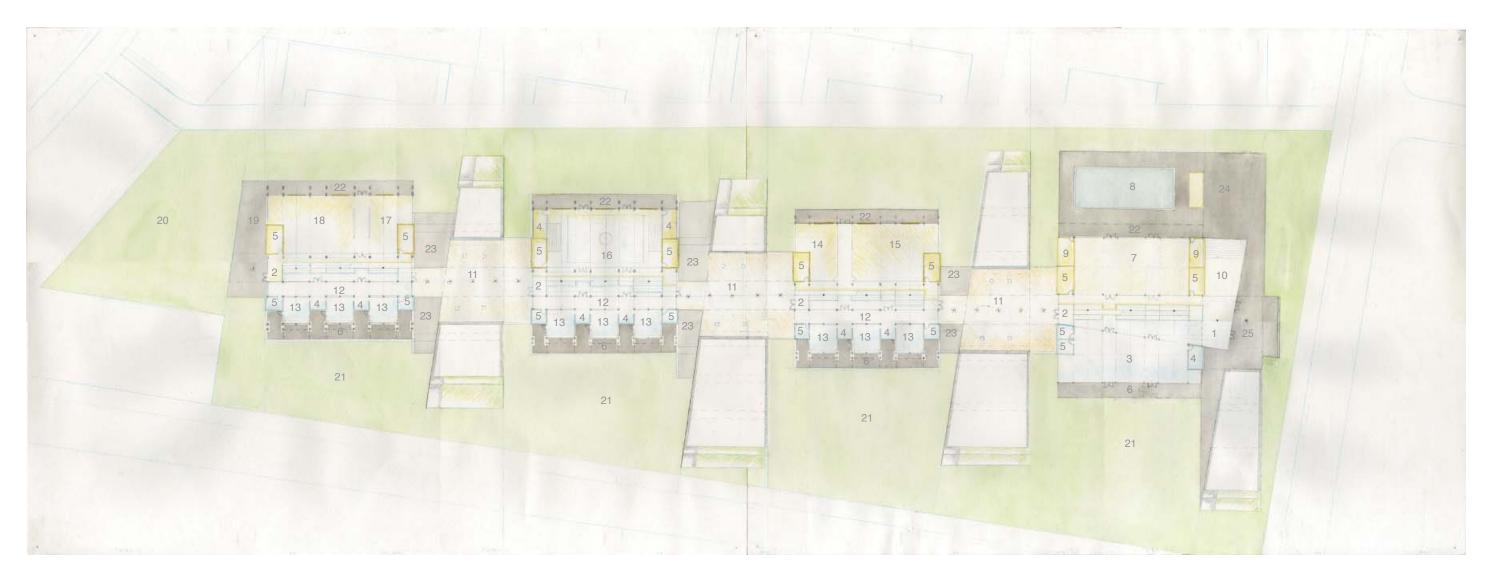


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FINAL-DRAWINGS

1	lower level lobby	13	classroom	25	covered ground level entry
2	lower level ramps	14	art	26	covered upper level entry
3	pre k / kindergarten classroom	15	music	27	earth ramp to upper level
4	teacher storage	16	gym	28	covered outdoor auditorium
5	toilet room	17	kitchen	29	upper level lobby
6	lower level outdoor classroom	18	cafeteria	30	upper level ramps
7	community space	19	covered outdoor cafeteria	31	clinic
8	community pool	20	garden	32	office / administration
9	locker room	21	playground	33	upper level outdoor classroom
10	bike storage	22	covered outdoor patio	34	library / media
11	covered outdoor play space	23	outdoor ramp to lower level	35	covered bridge
12	classroom common space	24	plaza		

The final drawings are constructed by hand and rendered with watercolor and pencils with acetone transfers. I used Revit as an aid for massing studies, 3D views, and to understand the various level changes This process allowed me to discover ideas I might not have if I had used the computer based design tools exclusively. This way of designing is very physical and represented for me a parallel between physical activity and computer video games for playing. Both the physical activity of drawing and playing are fundamental for growth, but both digital formats of drawing and playing are the way of the future. There has to be balance.

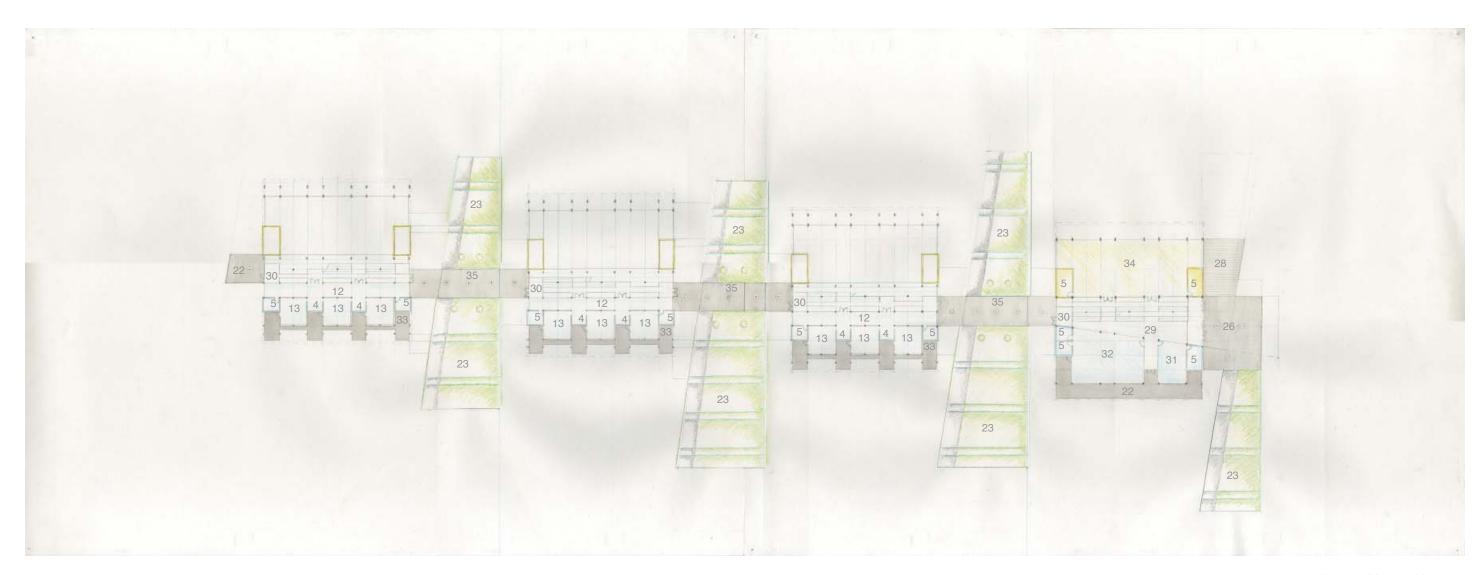




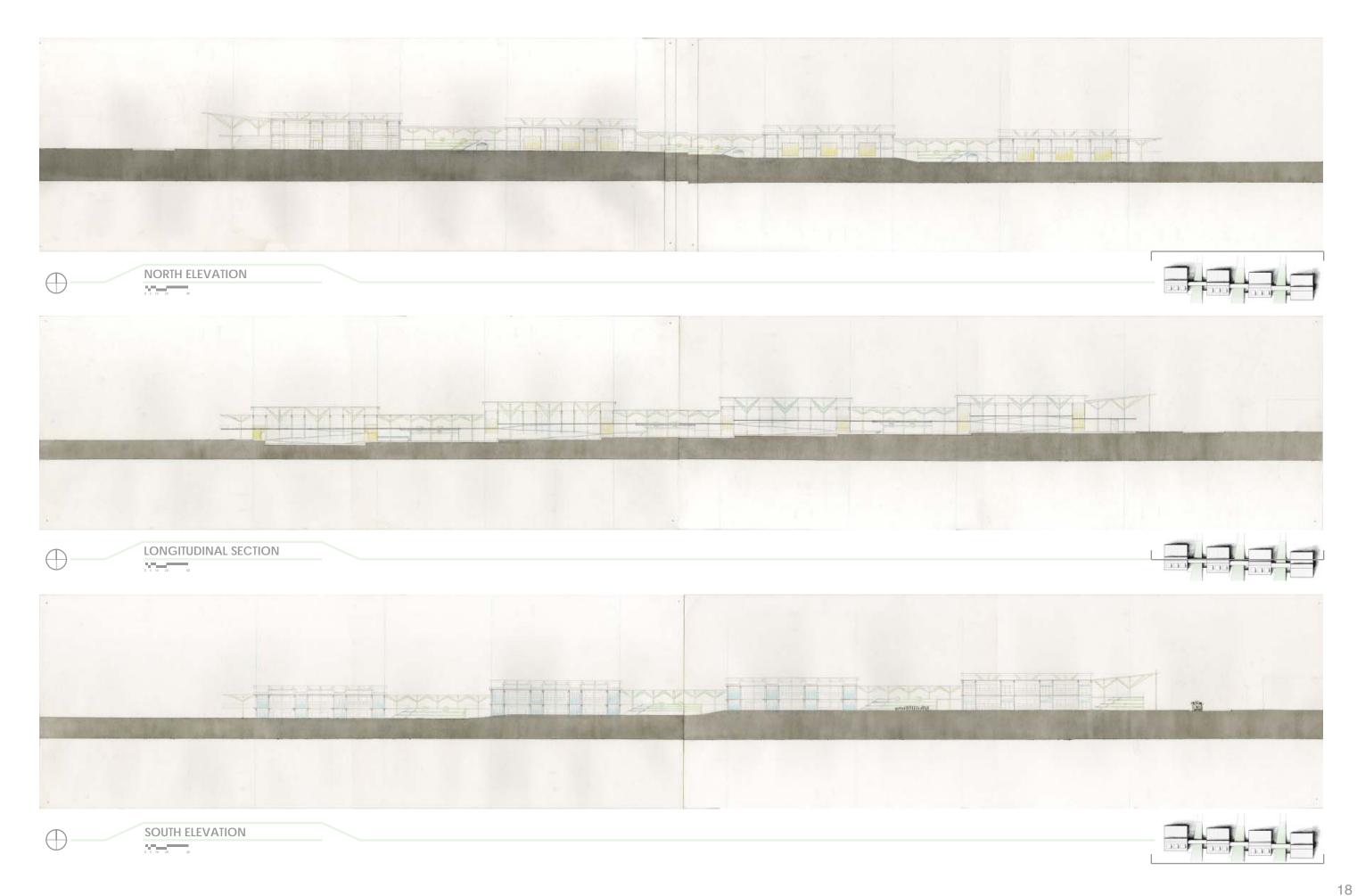


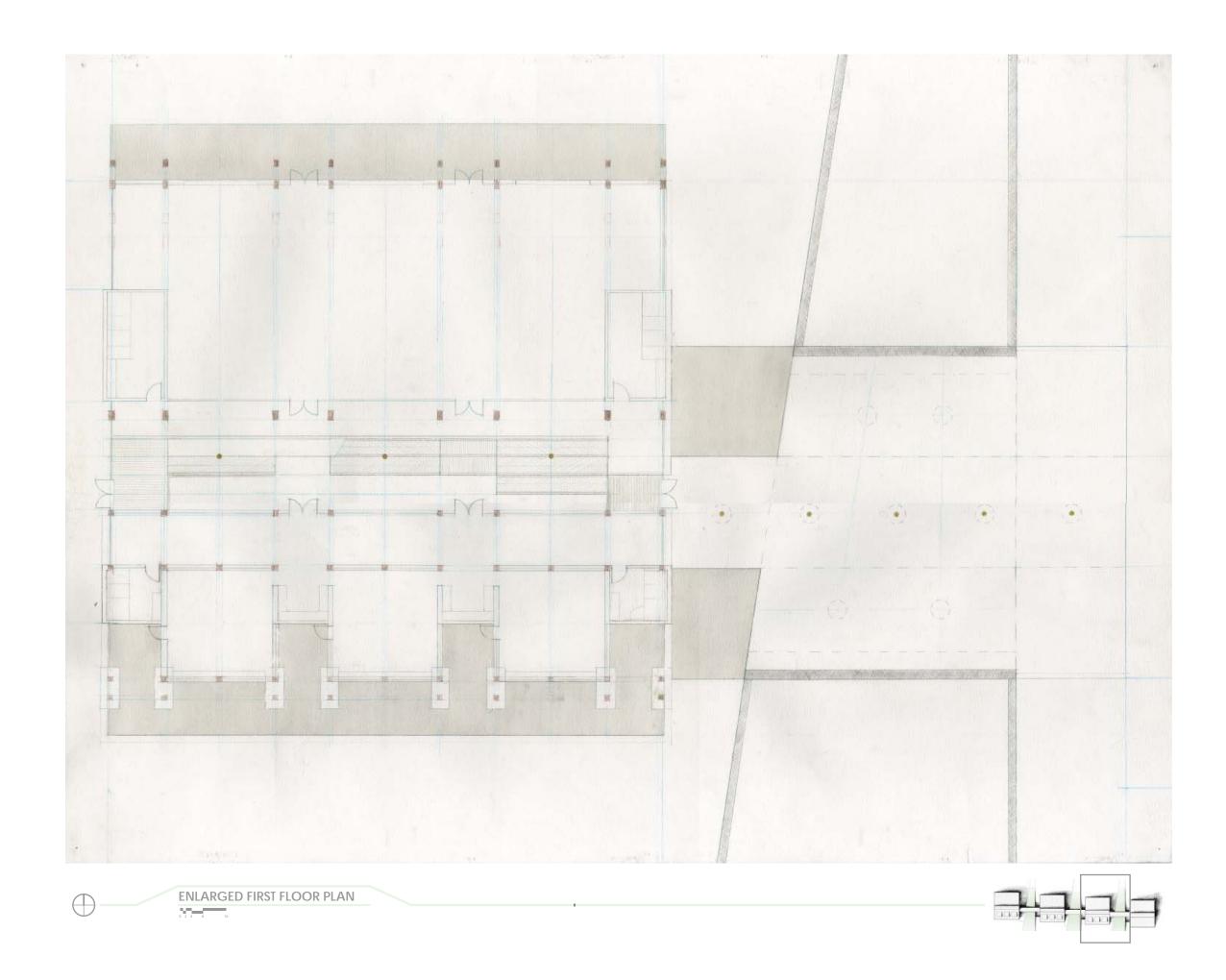


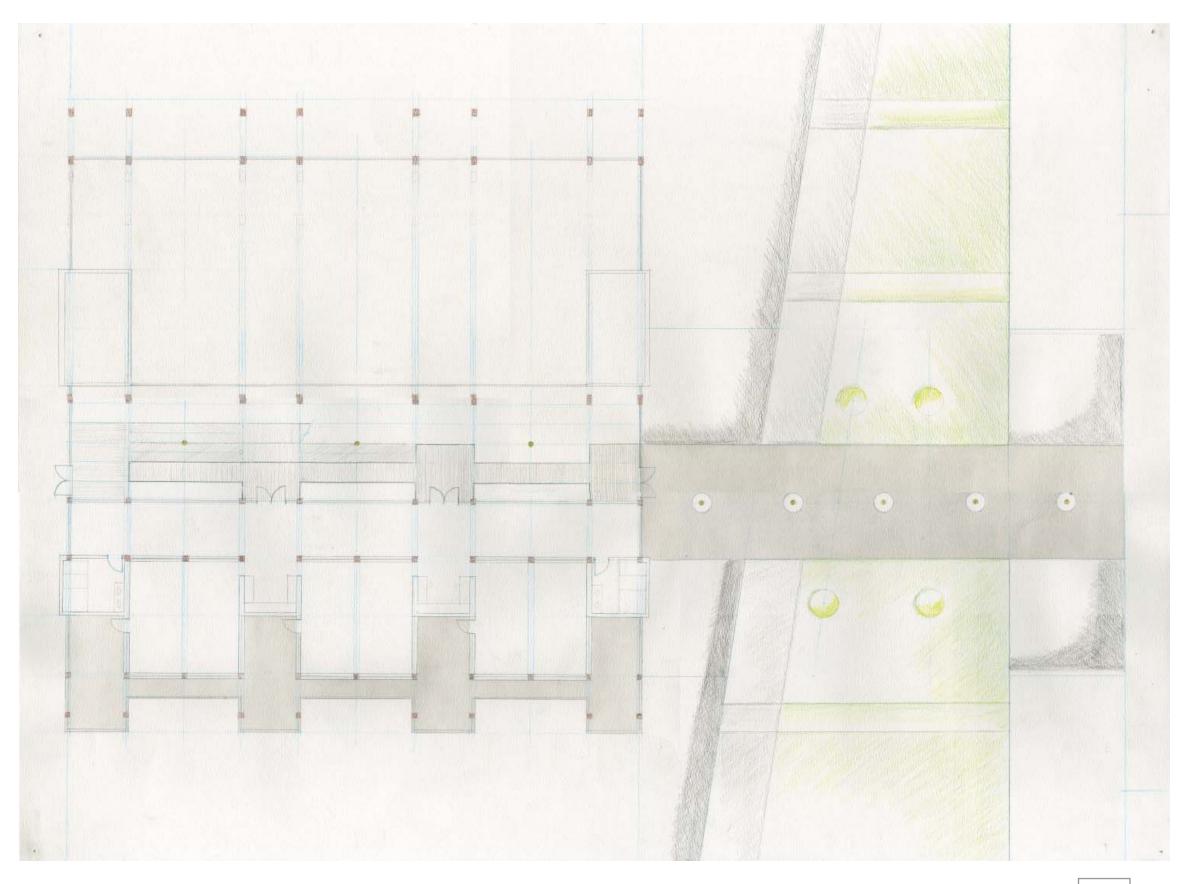
1	lower level lobby	13	classroom	25	covered ground level entry
2	lower level ramps	14	art	26	covered upper level entry
3	pre k / kindergarten classroom	15	music	27	earth ramp to upper level
4	teacher storage	16	gym	28	covered outdoor auditorium
5	toilet room	17	kitchen	29	upper level lobby
6	lower level outdoor classroom	18	cafeteria	30	upper level ramps
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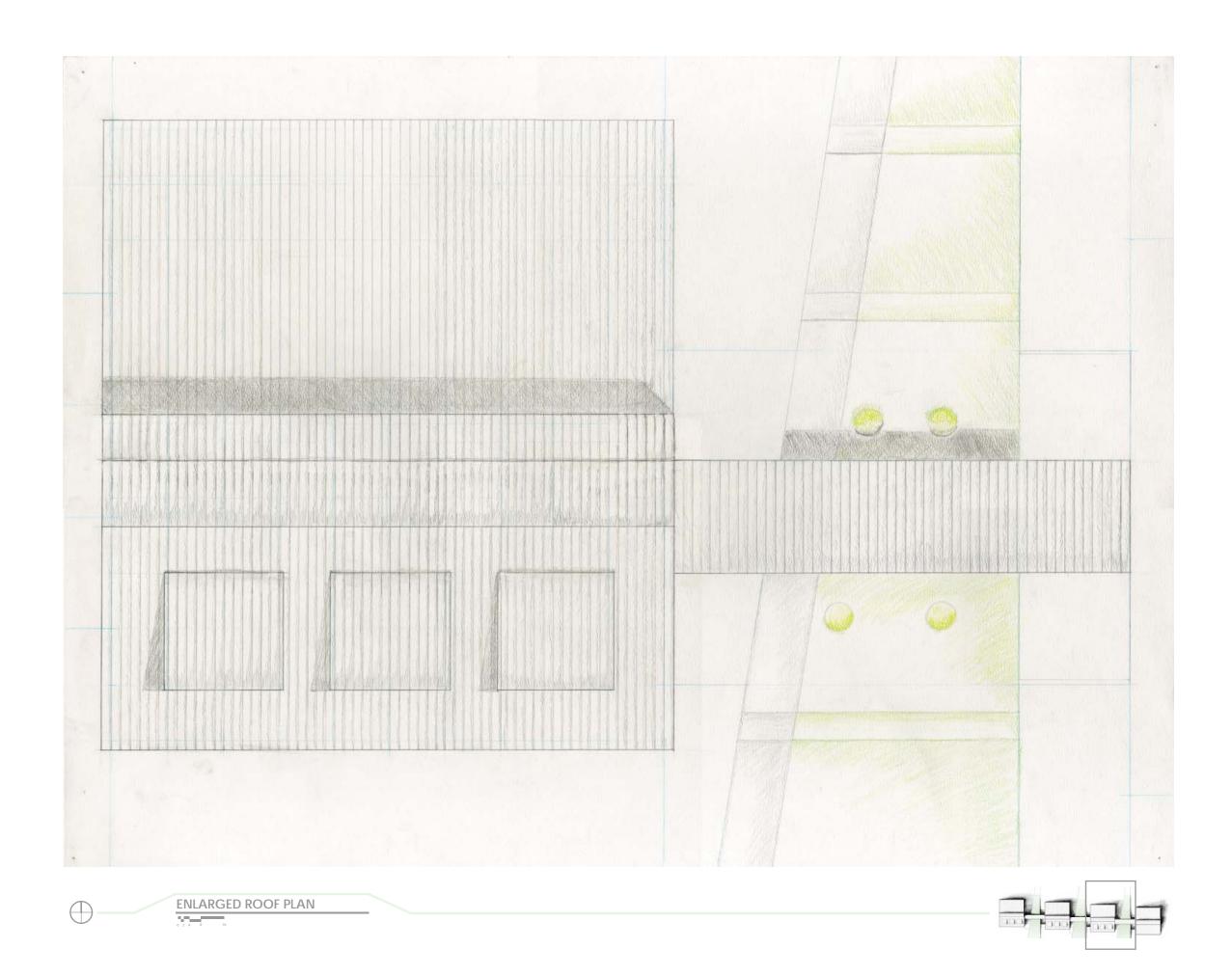


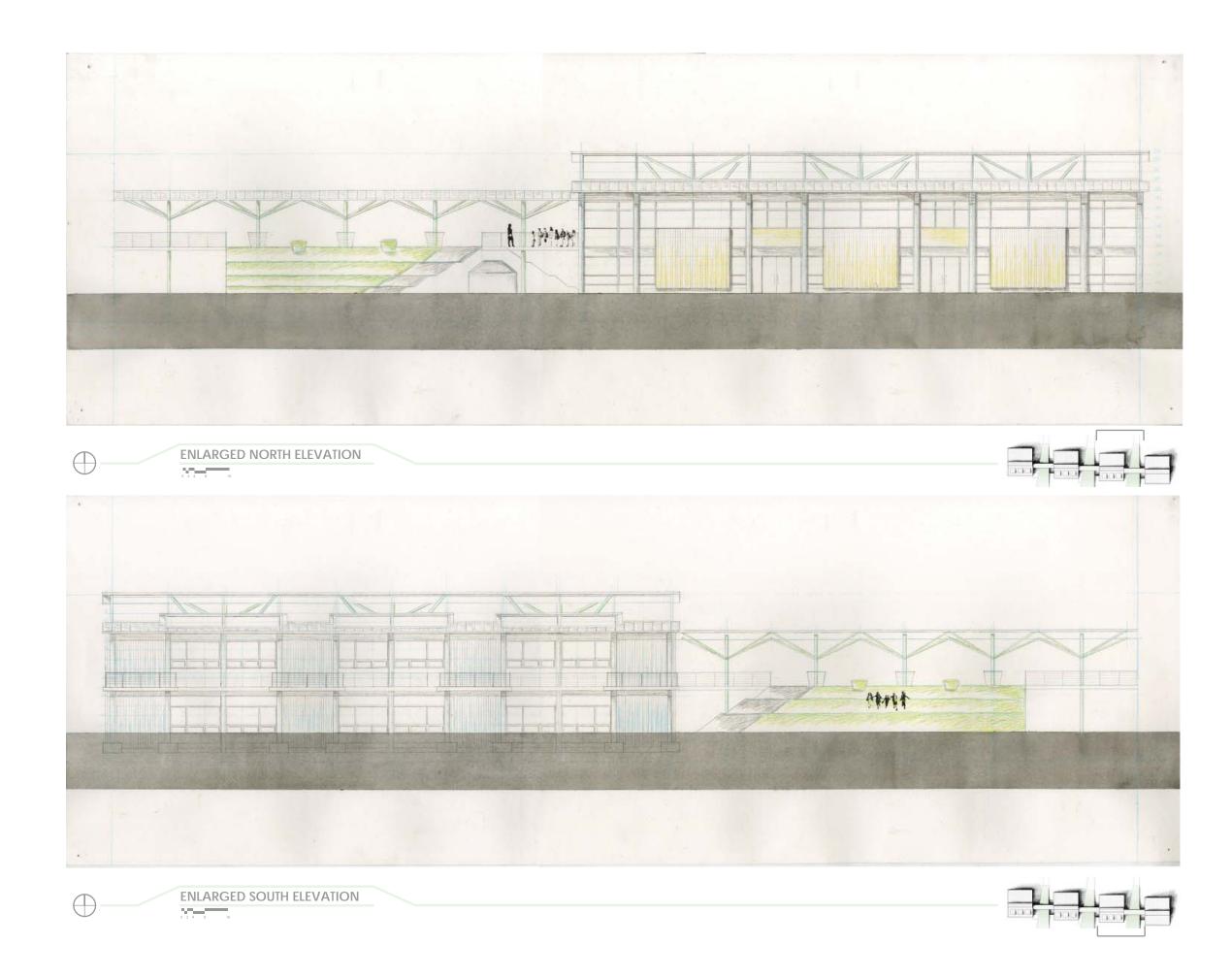




ENLARGED SECOND FLOOR PLAN











The final model is a section cut of one bay of one building and earth ramp. The materials are plywood, chipboard, bass wood, wood dowels and sticks, Plexiglas, and glue.

Structure-and-Materials: The final physical model allowed me to fine tune the design with regard to structure and material choices. The lower scale classroom buildings on the south are smaller scale glulam columns so more are required, and the materials on the south mimic more of the neighborhood with wood siding and metal roof and a smaller scale window pattern. There are porches and overhangs to allow outdoor classroom space. The upper level balconies are shallower above the lower level classroom space to allow more natural light to penetrate the space. The upper classrooms have the skylights to allow the natural light to illuminate the space. The north community buildings are larger scale and require more open space so they have larger glulam members, similar structural concept but different in scale and rhythm. The materials on the north are more metal and glass and less residential. On both the north and the south there is a play with the light and dark spaces using corrugated metal. There are operable windows all throughout the building to allow for natural ventilation. The corridor bridges are suspended from the trees that create a sense of walking in the canopy of the trees, and the ramps make it possible for everyone to have the same experience. The earth ramps are concrete structure with grass and light holes to penetrate light to the lower covered play areas. This simulates playing under bridges in creek beds, a favorite pastime of mine as a kid. The light holes are masses of glass that penetrate light to the lower levels. The railings are metal mesh to allow visibility, and the earth ramp railings are planters to soften the mass and continue the natural landscape. The retaining walls are stacked stone to allow a sense of weight and strength needed to hold back the earth. The roof angles mimic that of a butterfly in motion, and the earth ramp structure creates a cocoon around the covered play spaces. The outdoor tree columns continue the pattern at a smaller scale and more repetition continuing the spine of the building from beginning to end and back again as you play hopscotch through the spaces.





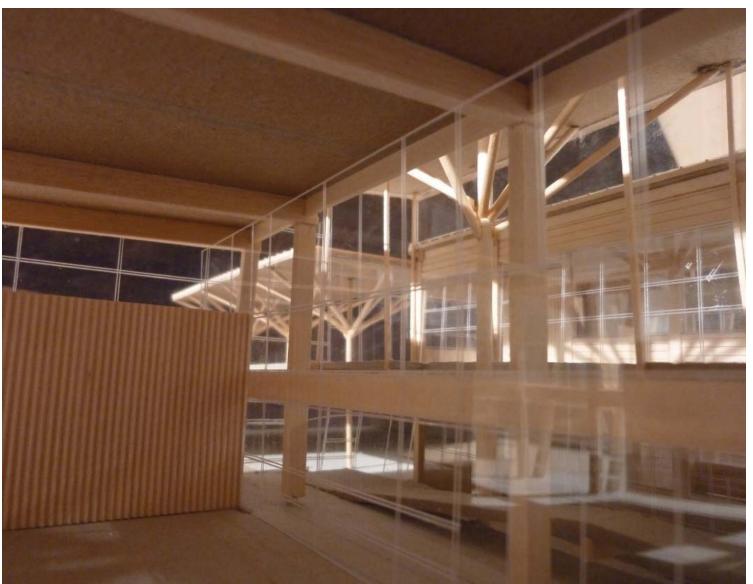














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-page 3 image b: http://www.acps.k12.va.us/enroll/zonelocator.php

-page 4 image a: google maps

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