LINES DRAWN BETWEEN SUN AND EARTH

William Hodges Hendricks

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Master of Architecture

Committee:
Susan Piedmont Palladino, Chair
Jaan Holt
Jonathan Foote

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The purpose of this thesis was two-fold. First, an investigation into the design process was conducted in order to find the influences, which bring forth architecture from various methods of play and interaction with materials, media and idea forming. This work was documented with several stop motion animations and compiled in the form of a movie that is attached to this book. Following this examination, a more traditional design method was used to create a Montessori School that would draw inspiration from its position between the earth and sun to guide its architecture. The result of this method is evident through the following drawings and models.

DEDICATION

To Family, Friends, and the Memory of Loved Ones no longer with us.

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INTRODUCTION

Architecture is a very focused concentration on the manipulation of materials and design of envrironments around us that requires an unusual amount of knowledge of many diverse topics outside of this focus. On the other hand, it is also an art that demands room for the creative spirit to thrive and resonate with the human experience in order for it to be good. This thesis tried to explore both of these aspects.

It was important to begin this challenge with an open mind, and receptivity towards the path that the object making self would realize. I tried to input as little of my own self into this project, but in the end it is covered with the evidence of my personality. With little conviction towards a particular project or a site, I wanted to experience something that would bring forth its own direction.

In the beginning of this process, before much had been decided about the course or direction of this thesis, it was suggested (perhaps jokingly) that someone should make an animation about architecture or even turn his or her thesis into a claymation. I thought this was a rather interesting idea, and with a clump of clay on my desk I stepped into a realm of discovery which I had not anticipated finding.

I began by making short stop animation clips that were several seconds in duration and were mostly a free range of content, though they all dealt with modes of representation and aspects of making. As these were accumulated I then desired a narrative development that led back to architecture, with the results compiled into a movie attached to this book.

Parallel to this movie making I also started to do what I thought was the real work of researching for an architectural thesis project. I somewhat arbitrarily chose a site (Del Ray neighborhood of Alexandria) and program (a Montessori School). There was nothing very significant about the site except that it was near my home, so I was very familiar with its conditions. Also, at that time I was ignorant of the Montessori Educational Program, but my committee had used it for projects in the past. These decisions then helped guide the animation production, thesis and architecture.

The educational experience of creating a film being independent of considerable limitations was a good opportunity to extract information out of a foreign process and find new ways to build upon a knowledge base that would be informative to the decision making process. However, at the conclusion of the movie production there was more being revealed about the making of illusions, images and movies than of tangible architecture. I felt I needed to change direction, so I chose to begin a more traditional design method.

The process of making continued, and soon many models and drawings were being developed in more variations than this book can and should really document. I was churning out more and more disparate ideas everyday not really feeling I could coalesce them into a single project. Abandoning one idea at the mere thought of beginning another. Some of the models represented here were in that category, while the majority of them I believe play supporting roles to the later comprehensive design.

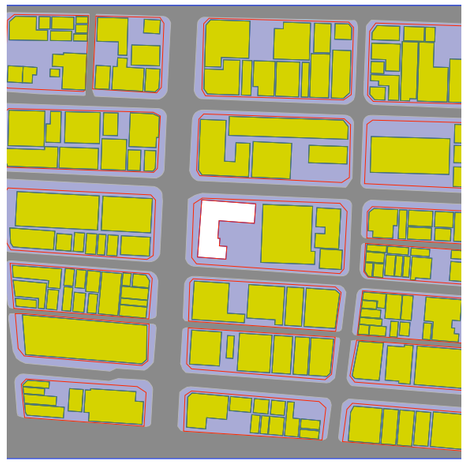
So a big part of this thesis towards the final stages was finding a way to evolve a project beyond its first initial strokes, which only suggest at an idea, to a more developed design that could become a constructed reality. Many rational decisions went into the projects final drawings and models that had been informed through the earlier studies. The question I leave wanting to know the most is when does a designer know for certain to close the process loop and commit to the project that is in hand. From this study it comes from some form of luck and adaptation.

Some of the influences and experiences that were drawn upon in the creation of this project originated outside of the development of the design, site and program. These other observations were of artful imagery, urban design, thought provoking usage of materials, technological ingenuity, and writings about architecture. These settings and sources were helpful in inspiring and/ or informing the thoughts of my process.

Thinking about the third dimension of time was a major jump in the movie portion of the thesis. As I did so, the artistic photography of sculptor Liz Hickok's molded Jell-O Houses was an invitation to laugh. Video produced by the San Francisco based artist captures the unintended dynamics of moving architecture in an earthquake. Also, the colorful houses in the film reminded me of the most important users of the building, the children.

A separate earlier academic project was a day care center designed for a site in the Kannai neighborhood of Yokohama, Japan. The Kannai urban plan, which is similar in footprint and scale to the Del Ray site, was a glimpse at what a denser vision of the neighborhood could become. With spaces of varying size between all of the buildings, a phenomenon known in Japan as *roji* occurs. *Roji* are the connection ailses of human activity or ambulation that occur in the semi public spaces between buildings that are not officially slated for pedestrian use. With its abundance of alley spaces, Del Ray could benifit from this same idea.

During a search for local materials, a discovery was made of the little red sandstone schoolhouse outside of Washington D.C. It had been built by quarrymen for their children using the materials that were most economically available to them. This was a beautiful representation of what a school is. Something built by the community that reflects its values and stands symbolically through material. It is not very flashy as a landmark and is somewhat economical in its scale, which is oftentimes a necessary approach for designing a school.



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The first sign of human settlement and rest after the hunt, the battle, and wandering in the desert is today, as when first men lost paradise, the setting up of the fireplace and the lighting of the reviving, warming, and food-preparing flame. Around the hearth the first groups assembled: around it the first alliances formed: around it the first religious concepts were put into the customs of cult. Throughout all phases of society the hearth formed that sacred focus around which the whole took order and shape.

It is the first and most important, the moral element of architecture. Around it were grouped the three other elements: the roof, the enclosure, and the mound, the protecting negations or defenders of the hearth's flame against the three hostile elements of nature.

According to how different human societies developed under the varied influences of climate, natural surroundings, social relations, and different racial dispositions, the combinations in which the four elements of architecture were arranged also had to change, with some elements becoming more developed while others receded into the background. At the same time the different technical skills of man became organized according to these elements: ceramics and afterwards metal works around the hearth, water and masonry works around the mound, carpentry around the roof and its accessories.

Gottfried Semper, The Four Elements of Architecture

Given the opportunity to work on the finishing phase of the 2005 Solar Decathlon Entry for Virginia Tech, I was rewarded with an unforgettable experience which has helped chart the course of the thesis work. Architecture is dependent upon various technologies and scientific laws, but one of the most important relationships it has is orientation to the sun and climate in which it resides. This Competition entry was designed to take the sun's energy via photovoltaics and to convert it into electrical current usable to the occupant of the building. The elegant form of a roof and its structure tilting to receive the sun's rays is a wonderful expression of the dwelling's technological evolution. Its architecture directly reflects its utilitarian needs.

Another example of architecture invigorating the spirit of this project was the Cruise terminal pier in Yokohama, Japan. Its main purpose is a transportation hub for passengers embarking and disembarking on ships, but its secondary and perhaps most enjoyed use is as a public park. The building's entrance slopes upward pulling a visitor onto its grass covered roof and provides a place for sitting to enjoy the view of the harbor, city and Mt. Fuji. Japanese architecture has long embraced the melding of nature into the built environment. However, this building especially seems to create the idea of nature by morphing itself into a hill that in the densely populated area it occupies becomes an oasis for city dwellers.

As a final place of inspiration, I looked back to some of the historical writings on architecture. Semper's words, at left, speak with a cultural anthropology that deconstructs the arangement of architectural forms into their root purpose and subconscious level of understanding. He implies that there are some fundamental constants that exist in all forms of architecture as well as variables that are specific to the conditions of site and culture. Writings such as these have given me a background to reference and have justified reasons for allowing some elements of a design to remain while others might be edited.

a Kannai Neighborhood Plan, Yokoham Japan
b Senneca Quarryman's Schoolhouse
Montgomery County, MD
c Onabashi Pier Yokohama, Japan by FOA.

The program chosen for this thesis project, a Montessori school for young children, relies on Maria Montessori's (1870-1952) philosophy of childhood development. Briefly stated her belief was that children particularly at early ages have the ability to learn vast quantities of knowledge if in the appropriate environment and some specific simple nurturing can be provided. By focusing on the concentrated desire to learn innate within all children she could give them the tools necessary to learn anything they may wish in the future.

This project was chosen for its compatibility with the movie experiments as well as its plethora of unique programmatic needs as applied to the designing of a school. The two most prevalent program issues noticeable in a Montessori school are the abundance of objects and materials in a classroom, and the second is that students will remain in one home room for several consecutive years.

The bounty of shelves subdivides classrooms into smaller areas where a child will place her little rug (Defining yet another space within a space), on which she begins her lesson with the material she has chosen. Dr. Montessori always emphasized that the hand is the chief teacher of the child. In order to learn there must be concentration, and the best way a child can concentrate is by fixing his attention on some task he is performing with his hands. (Wolf 4) When the child chooses to end his lesson he will put the materials and rug back to their respective storage area. By working this way there is a certain homage paid to these objects, and it is in that same spirit that architects take individual materials and order them into a building. Architecture is the need to place materials in space and in relationships that are respectful of their inherent physical qualities.

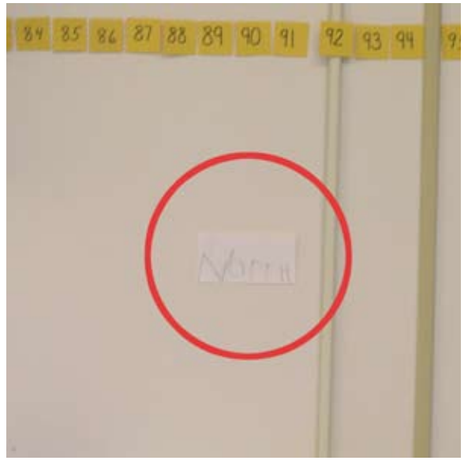
In addressing the needs of building a school in addition to the compulsory items of safety, security, orientation, circulation, ingress, egress etc., it becomes important to acknowledge the familiarity a student will have with her classroom for the several years she is there. It will become almost an extension of her being and therefore the other parts of the school should play into this role as well, becoming like the individual rooms of a house with different roles and characteristics. The school while making adequate enclosures and smaller spaces for concentration should have some ability to reconnect with the greater whole, allowing for domestic life to spread throughout the building. Any area, be it outside or on a set of steps can become an ideal setting for learning.

a

b

The Montessori idea, indeed, comprises so-called housekeeping duties for all children as part of the daily programme. Thus much emphasis is placed on looking after the environment, whereby the children's emotional affinity with their surroundings is strengthened. Each child, too, can bring along his own plant to the classroom, which he or she has to care for. (The awareness of the environment and the need to look after it figures prominently in the Montessori concept. Typical examples are the tradition of working on the floor on special rugs - small temporary work areas which are respected by the others - and the importance that is attached to tidying things away in open cupboards) A further step towards a more personal approach to the children's daily surroundings would be to make a it possible to regulate the central heating per classroom. This would heighten the children's awareness of the phenomenon of warmth and the care that goes into keeping warm, as well as making them more aware of the uses of energy.

Herman Hertzberger, Lessons for Students in Architecture



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a Classroom at Montessori School of Northern Virginia. The Movalbe Alphabet, Montessori Materials (foreground).
b The Golden Beads, Montessori Materials.
c Lesson on Cardinal Directions
d Discovery Blocks

The objects in a Montessori school are indeed special to observe and touch. In fact emphasis is placed on all the senses used to perceive them, touch, smell, sound etc. Rich in color and Textures there are many that are large in quantity and scale. When there are multiples it is apparent that a proportional system is used in ordering them. Another fascinating system of toys, based more on form relationships are the gifts of Friederich Freobel designed for children in kinder garden. Like Montessori objects the Freobel blocks encourage free play among students and have the capability to become beautiful compositions in certain arrangements.

On occasion I would craft my own discovery blocks and keep them near my desk for three-dimensional doodling. I believe these items inform design decisions on a subconscious level, and are quite handy as reminders to the material world one is referencing. Finally, in recognizing that although a great majority of learning takes place inside the school I realized that some lessons must point to the outside world of which the school is undeniably apart of. Beneath a lesson in numbers, a student writes the word *north* and affixes it to a wall. As the designer of the school I wish to make that wall a memorable experience of the direction *north*, thus making the architecture an active participant in the learning process.

d

The first essential for the child's development is concentration. It lays the whole basis for his character and social behavior. He must find out how to concentrate, and for this he needs things to concentrate upon. This shows the importance of his surroundings, for no one acting on the child from outside can cause him to concentrate. Only he can organize his psychic life. None of us can do it for him. Indeed, it is just here that the importance of our schools really lies. They are places in which the child can find the kind of work that permits him to do this.
Any enclosed space, of course, favors concentration. All the world over, when people wish to concentrate, they seek out a place set aside for it. What do we do in shrine or temple? These create an atmosphere favorable to concentration. They are forcing houses for character formation. Children are seldom admitted to the ordinary schools before they are five and then the most formative period is over. But our schools offer the tinies a sheltering refuge in which the first elements of character can take shape, each of which has its own importance.
When I first pointed out the great value of an environment specially adapted in this way to the needs of little children, this idea aroused great interest in architects...

Mari Montessori, The Absorbent Mind

The aforementioned movie making portion of this study was created with a range of stop-motion movie experiments, that is, when the appearance of smooth real time motion on film is actually a sped up sequence of many singular slow movements captured one frame at a time. The films were then organized into three acts that when put together suggested a narrative that added a unique view into the process of creating architecture.

The first act dealt with the issues of location and context by using a wall surface in plan view and a diorama set in birdseye view to set up a narrative about the specific conditions and considerations of the existing site.

In the second act, an investigation into material was started with the manipulation of various objects in two modes of representation. The first mode was through the use of clay as a representation of some other type of material i.e. block, brick or metal, and the second mode was through the use of materials representing their actual materiality i.e. tool = tool and stone = stone etc.

The final act was a rush through the process of designing a building, by taking a look at the development of drawings and models in real time. The camera tediously follows each mark made on a drawn surface with the unexpected interactivity of 3-d elements on top of those drawings. The building of models occurs from the ground up but also from above and in the round thereby toggling between representation and reality. This documentation was perhaps more about the decision making involved in designing process than the actual design produced.

The method of studying architecture through this specific process of stop action filmmaking had very little precedent and was very much an interesting experiment within itself. In this humble effort it was difficult to muster the focus needed to make architecture without becoming lost in issues of photography, narrative, production and so forth. This is a markedly a common problem for the representation of architecture in general practice. We only tend to recognize architecture in a pure and un-distilled form most evident in the built reality and secondly in the small scale and simplicity of drawings, models or other objects of careful intent and craft. It is by the visual absence of the actual human involved in making the stop motion film that we can appreciate that there was a hand and labor in the efforts to achieve it. This is a similar vicarious feeling we get about the greatness of labor that is left evident in the material reality of architecture. Ultimately the questions that arose during the film production such as what material should be used, how a certain visual effect can be achieved and for what purpose are some of the good questions shared by architecture. The inherent nature of both means is similar but to a different end.

A few still frames from the movie and their respective concepts are presented at right.

ANIMATION STILL FRAMES:

a Mixed media wall site plan, a time and cultural montage via a specific location.
b Bicyclist and used car lot diorama, evidence of human and natural activity on the site.
c The urinal, the transformation of one material into another.
d Clay model tripod brick arch, the representation of building masonry elements.
e Bandsaw, the tool and its functionality.
f Bandsaw and gypsum wall board, mismatched tool and material.
g Bandsaw and medium density fiberboard, favorably matched tool and material.
h Bucket, concrete and knife, preparation of a material for use.
i Wet saw and brick, the manipulation of material into usable parts.
j Clay model wih yellow sky, monumental sense of scale revealed by size relationships.
k Drawn section with toys, drawing while inhabiting space.
l Clay model of school, the making of a model and reconsideration.

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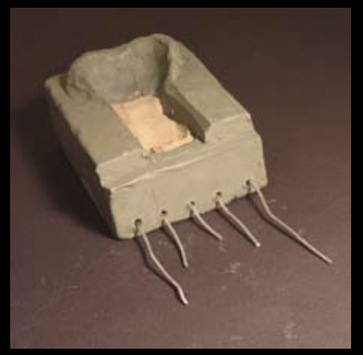

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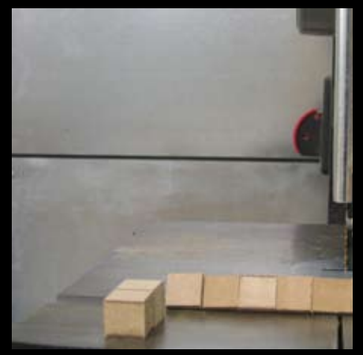

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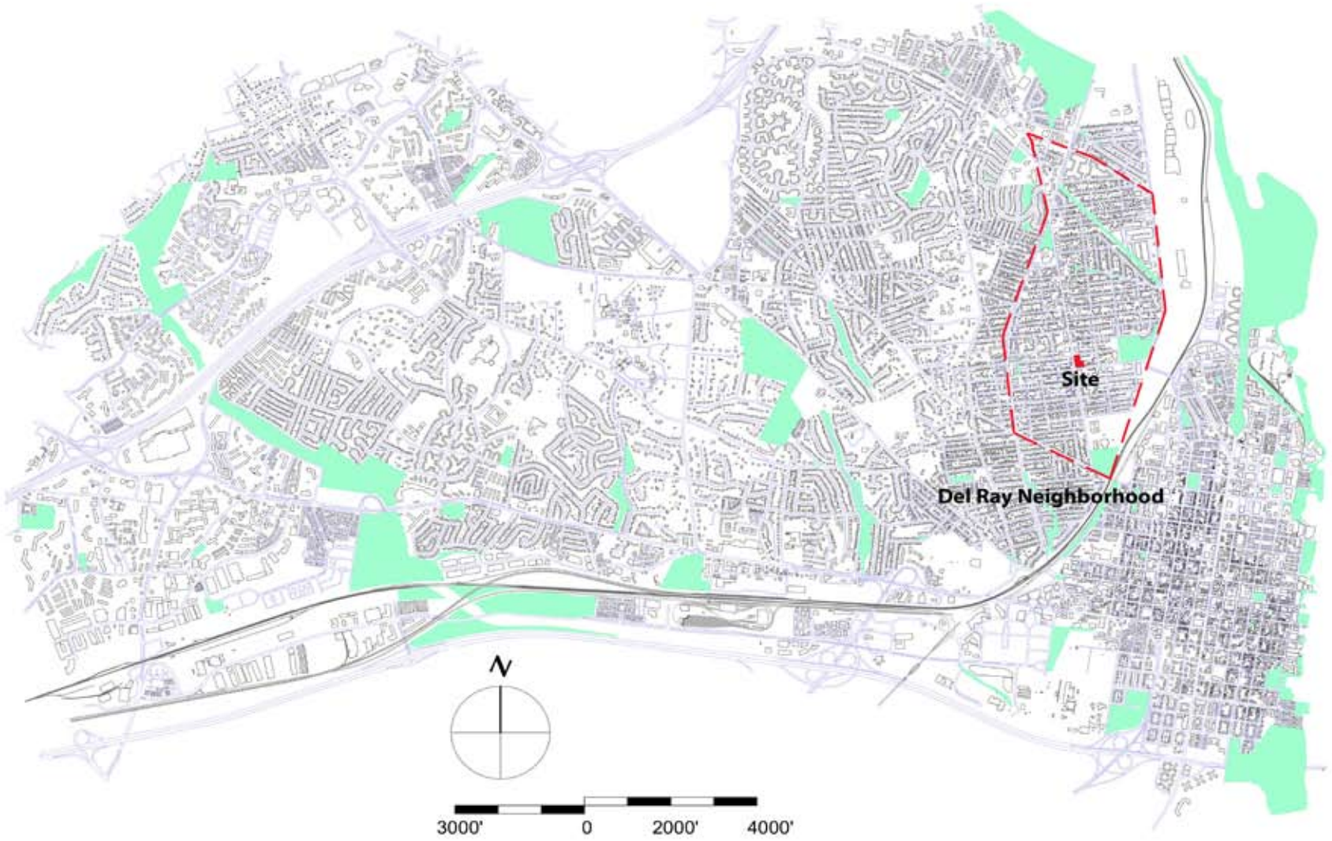
LOCATION: Alexandria, Virginia

The site selected for the Montessori School is located on the primary commercial street of Mt. Vernon Avenue between the secondary avenues of Monroe to the south and Mason to the north. This location is at about the center of a neighborhood known as Del Ray within the larger city of Alexandria, Virginia (founded 1749). The neighborhood was originally known as the town of Potomac, Virginia (incorporated 1908) and was a residential community for commuters into Washington D.C. and for workers at the adjacent railroad yard. The character of the neighborhood is primarily one of a low to medium density, with many 20th Century single-family houses and apartment buildings Businesses mainly occupy the corridor of Mt. Vernon Ave. that connects Old towne Alexandria with Arlington, VA. The demographics of Del Ray today could be described as being mostly young professionals who commute to D.C. or even work from home. Within the neighborhood there is an emphasis on raising families. Therefore, the school could draw its population from its own walkable community.

a Potomac Region AerialPhoto



b The City of Alexandria, Virginia

c Site and Mt. Vernon Avenue Context

d Aerial Photo of the Site

SITE PHOTOGRAPHS

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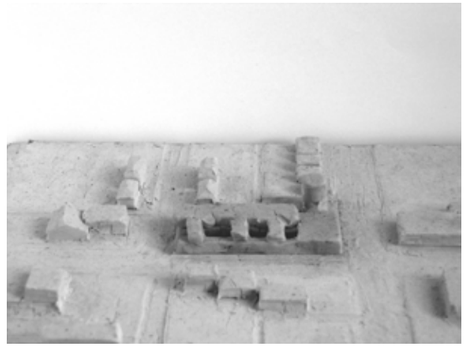

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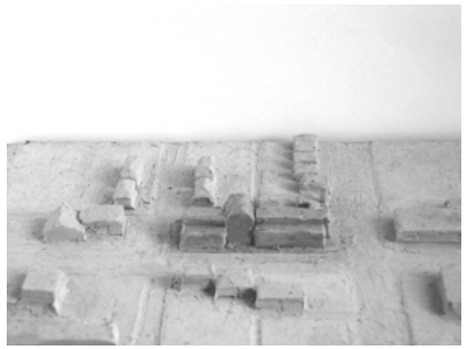

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CLAY MODELS: SITE VOLUME ARRANGEMENTS:

a An organization of foreground and background masses that would recede away from the street edge emphasizing privacy and scale.

b Spaces set up in a linear mode to direct rhythm leading to a particular corner, with volume shape and size to represent change in program.

c Sculptural Forms playing off one another, without relating to the context relayed a message of containment and exclusivity from the neighborhood. Reflecting the inward focus of student's concentration.

d Volumes organized about a Central Space affronting the street providing clarity of entrance and program, and civic presence of the school building within the community.

e

f

g

h

CLAY MODELS:

e Coil Method Study: With an emphasis on the material construction of the actual model, this approach mimicked the child's rolling of clay to create coils which were stacked to make walls for the representation of the inner vessel (the enclosure of a big room) and a tapestry of outer walls (the enclosure of classrooms around the big room). An analog to this method was interpreted as masonry.

f Trees inside buildings: This scheme elevated the classrooms to the height of the tree foliage on the front of the lot and utilized large voids along the central spine of the school to bring in light and to potentially grow trees on the interior courtyards of the lower levels.

g Big Room on Corner w/ Faculty tower: This model conjoined individual classroom spaces on the rear of the site with shared classroom spaces at the front by means of bridges that also acted as walls for outdoor courtyard classrooms. A gymnasium occupies the busy corner and an administration tower is on the back lot.

h Building as Playground: Volumes on this model were organized on the periphery of the site to maximize a central outdoor space that was secure. Each classroom could be housed in a unique identifiably shaped room. Bridging pathways joined spaces across the site.

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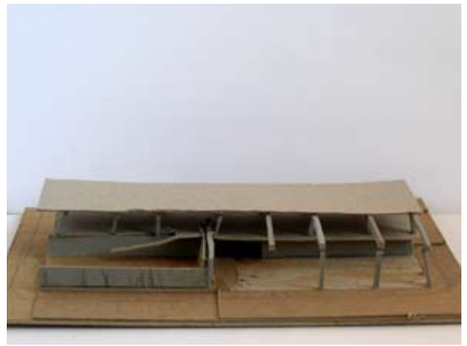

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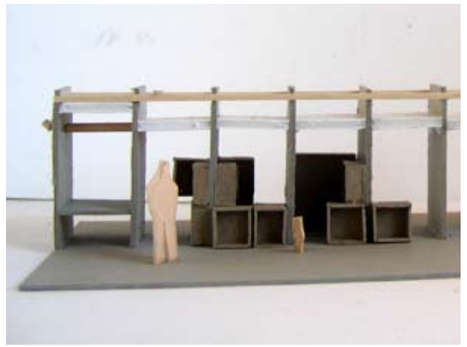

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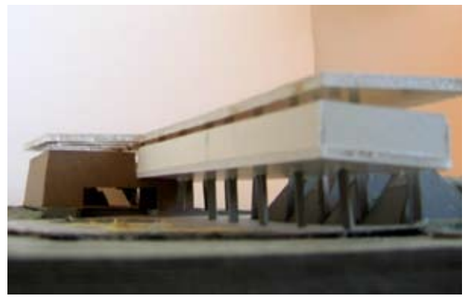

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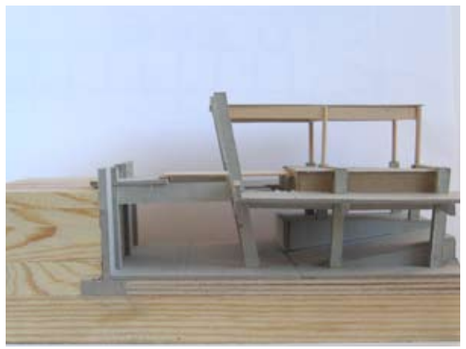


o

p

CHIPBOARD + CLAY MODELS:

i Program Organization: With a mixed-use program of retail on the busier corner of the site, this scheme had an entrance for the school setback from the street and elevated the classrooms to the second level. An alley through the middle of the building provided a safe means of dropping off and picking up children from the school

j Program Organization: Removing the retail portion of the earlier scheme created an out-door space that could be used as a public open space, for gardening, farmer's market or other gatherings. The school's leading street edge was brought forward but the entrance now affronted the open space.

k Big room with Raised Classrooms and Hill: An idea of material weight was attached with this progress model. The heavy big room below and the lighter classrooms above empha-sized a distinction in the organization of breaking down spaces from public to more private.

l Big room with Raised Classrooms and Hill: A Hill element was added to the rear edge of the building that could be created using the earth excavated from the site. This provided a means of egress for the classrooms but also created an elevated playground, which was a more secure vantage point from the street.

CHIPBOARD + WOOD MODELS:

m Classroom Study: The ideal space of a classroom for 25 students was revealed to be approximately 24 x 32 feet. The way of dividing a space into classrooms was either by walls or furniture. This approach used a hybrid of thick concrete wall segments with shelves that were hung from the beams. Classrooms would semi-flow into one another and could share objects and materials between classroms on either side of the shelf.

n Closet Study: As an alternate to hanging shelves this model explored swinging bookcases attached to wall segments that have been re-oriented to become more like columns. Small intimate spaces are created when the shelves are closed or removing the bookcases entirely could make a larger nook or connecting.

o Spaces below the Street: In this representation of where the earth meets the building a deep reveal is made so that light can reach the lower levels of the structure. It also creates an urban dynamic of two different levels to the sidewalk, one which belongs to the street grade, and one belonging to the building's grade.

p Raised Classrooms each with its own roof: An examination of the buildings orientation with sun and the desire to break down the mass into easily identifiable modules led to the saw tooth roof form. With the big room's roof being an enlarged version of the smaller classrooms' tops. This version also included a cantilevered space for faculty.

a

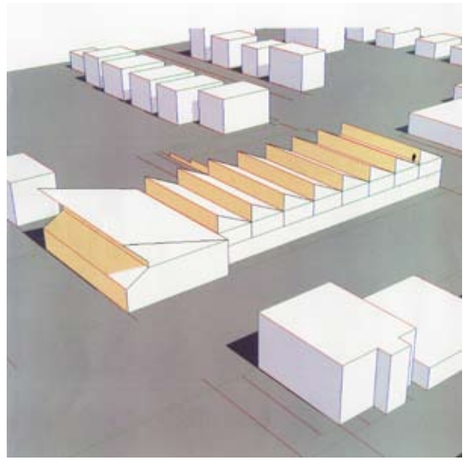
b

CHIPBOARD AND WOOD MODEL FRONT + REAR VIEWS:

The physical model synthesized all of the information gathered in the previous study models into a whole that could be constructed with a specific strategy. From the street a viewer would see that a series of similar spaces on two levels would terminate with a large single level space at the end. The roof above each room would be pitched towards the south for maximum exposure to the sun and to establish a series of north facing clerestories allowing light into the central regions of the building. The front edge of the building would reinforce the importance of the avenue with tall columns, while the back edge was broken down by elements such as the alley, drop off, rear entrance, enclosure and man-made hill. Variation was achieved by playing with the grade line and the roofline at various locations around the building becoming the two critical lines between the sun and earth.

DIGITAL MODEL, AERIAL SUMMER AND WINTER SOLSTICE VIEWS:

In the digital representation of the context and building's form, the site is placed to its exact position on the earth of 38º 49' with a bearing of slightly 7 º NNW. A sun study was then done to test the surfaces for exposure to sunlight and occlusion of light on adjacent forms. During the summer solstice a condition of minimum solar gain through potentially transparent surfaces was achieved by keeping the clerestories vertical and using overhang shading devices. By tilting the roofs at an angle of 30 degrees and minimizing their rise to 12' they could also maximize their exposure to the sun during the critical heating months of winter. Thereby making the rooftops of the school optimally sloped for active solar energy colleciton systems.



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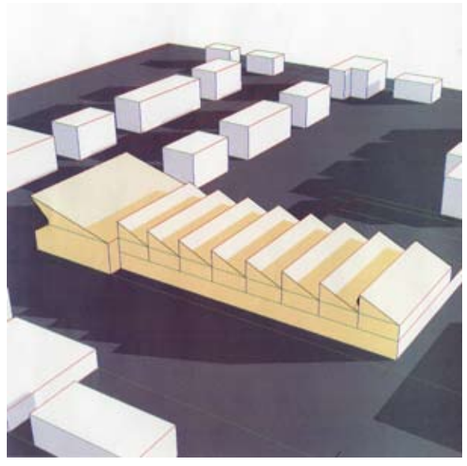

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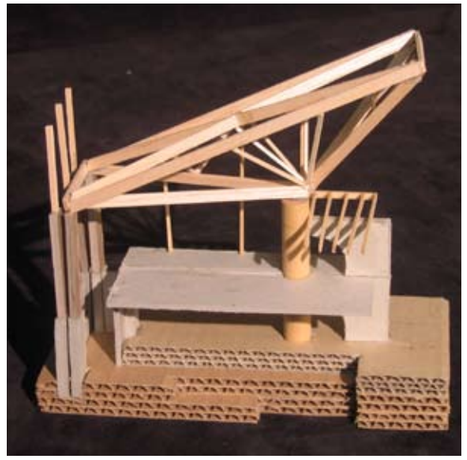

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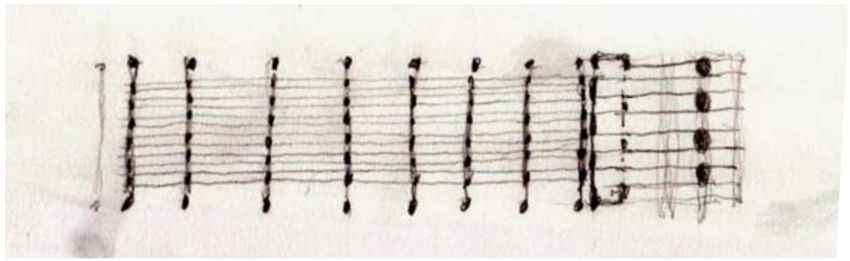

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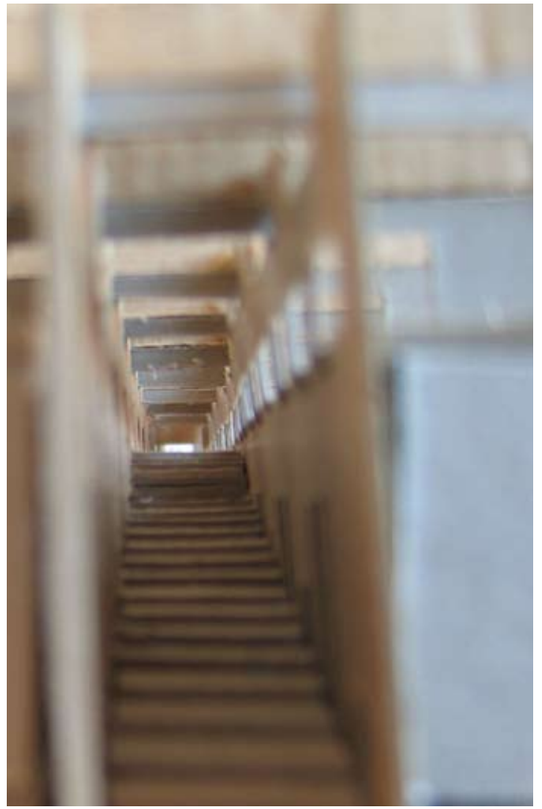

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CHIPBOARD AND WOOD MODEL OF TYPICAL CLASSROOM + BIG ROOM STRUCTURE; AND A STRUCTURAL DIAGRAM:

Small study models were made to find the structural order of the building. The vertical elements would begin as large concrete walls in the foundation level and separate into columns as they rose through the upper levels. Pre-engineered wood beams for the floors would then be affixed to notches in the sides of the columns. Spaces between the beams could be used for stairs or plumbing stacks, and floors pulled away from the beams could allow light and air to penetrate through various levels.

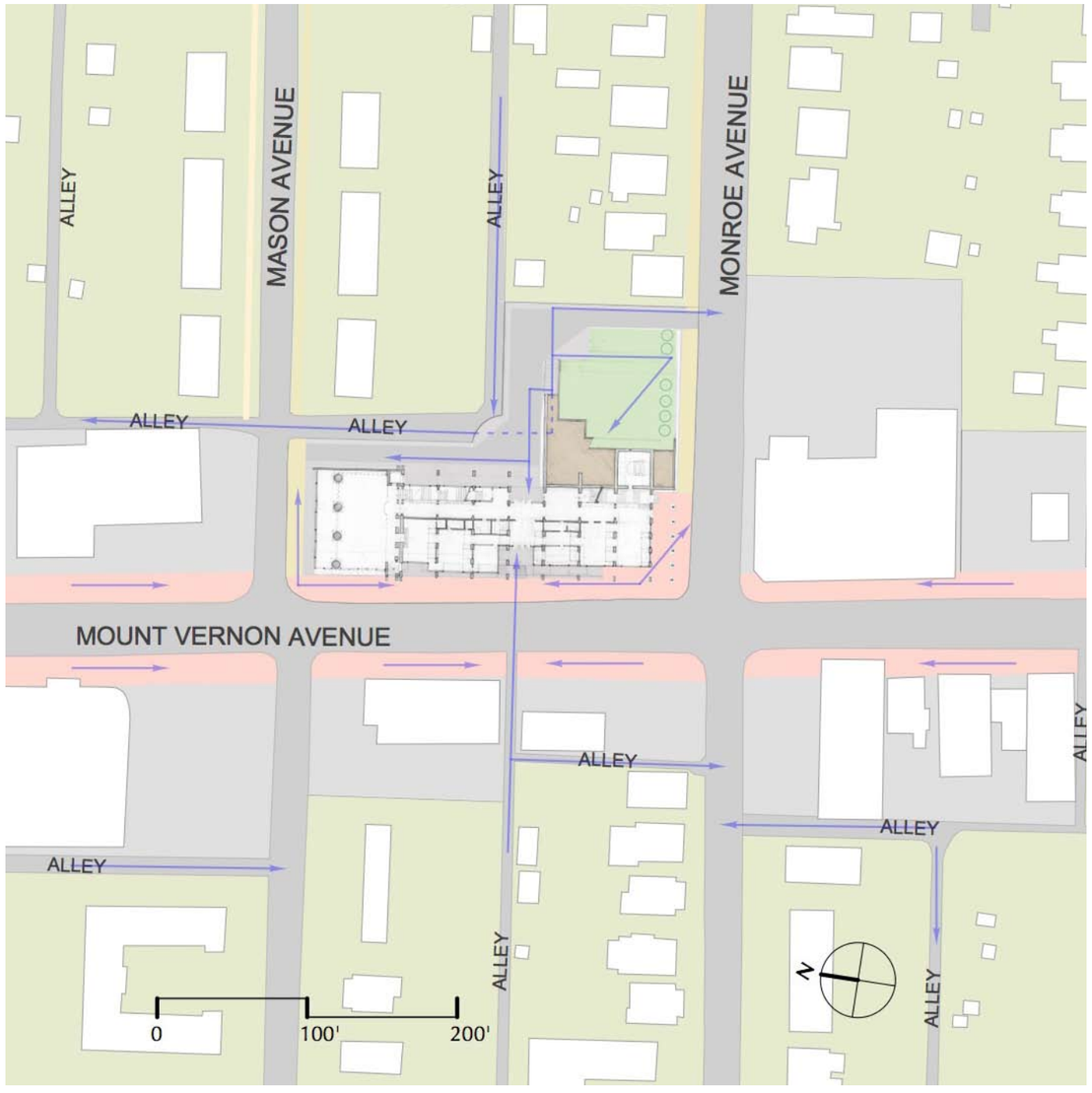
The Big room's structure is different in composition in that concrete beams are used to span over the Poolroom in the basement and large inverted trusses supporting the roof above bear on gigantic round columns which come down though the Dance room into the pool itself.

CHIPBOARD MODELS: STAIRWAY VIEW + LIGHT STUDY:

The interior space of the converging stairwell acts as the spine of the building running the entire length of the classrooms uniting the building in circulation and space. The ceiling is a continuation of the light monitor pattern established in the classrooms, there by unifying the individual room to the whole.

A small light study was done to decide the placement of the second floor plate and light well openings in each bay/classroom. Light that reflects off of the highest part of the ceiling is given to the second floor, while light that reaches the lowest part of the ceiling is bounced to the first floor through the aperture in the floor.

VIEWPOINT: AFAR



a *Roji* Circulation

MASON AVE.
ALLEY
MONROE AVE.
WAY
DRIVE
OFF
DROP
PLAYGROUND
ALLEY
ALLEY
PV AND THERMAL ROOFS
MOUNT VERNON AVE.
ALLEY
ALLEY
N

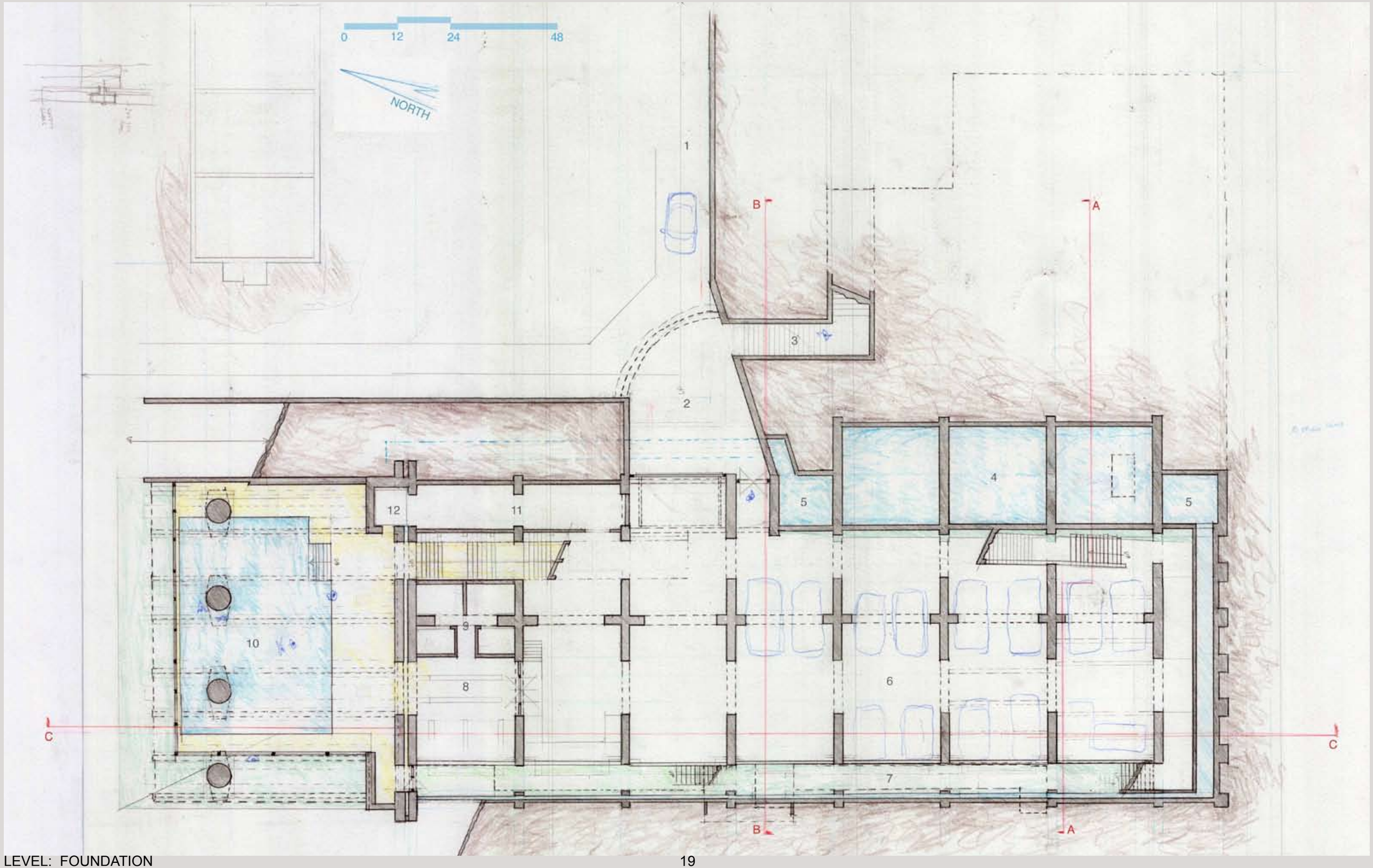
b Site Plan

THE FOUNDATION LEVEL AKA POOL LEVEL

A unique activity for the students of the school is wading and swimming in their indoor pool under the big room area at the foundation level. The stairs descending from above continue into the entrance of the shallow end of the water. The pool's depth ranges from 30" to 8'. In the transition from shallow to deep ends are the bases of large round columns, which the students are challenged to swim around. Adjacent to the pool are changing rooms and bathrooms.

The intersection of the alleys behind the school is where the lowest point of grade reveals itself at the entrance to the garage. Here faculty has a place to store their vehicles and come directly up into the entrance of the school. Underneath the cars and slab, arrays of wells collect geo-thermal energy to be coupled with-solar thermal and used in the winter for heating the floors above. Massive perimeter walls do the work of holding back the earth and hydrostatic pressure that pushes from outside the building. To remedy the heavy flooding the area has experienced during above average rain events, three large cisterns are provided to collect 64,000 gallons of water to be used in various ways such as supply for the water closets, make up for the mechanical system, and irrigation for the garden. The water collection system is designed to contain a run-off from the site during a 10" storm and can easily collect run-off from neighboring sites during the annual average 42" of rain.

1 ALLEY
2 VEHICULAR ENTRANCE
3 STAIRWAY
4 CISTERNS
5 FILTRATION
6 PARKING
7 MOAT
8 CUBBIES
9 CHANGING ROOMS
10 SWIMMING POOL
11 MECHANICAL
12 ELEVATOR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THE FIRST FLOOR LEVEL AKA STREET LEVEL

It would be hoped that eventually this school would be primarily used by children in the neighborhood who could arrive and depart by foot or bicycle, but for the majority of students a plan must include a way for this transfer to occur by individual vehicles in a very short time frame. Thus a drive way was placed along the back of the site that is considerate to the dropping off of children away from the busy traffic of Mt. Vernon Ave. The terms of this situation also requires two entrances: a rear, private but heavily used door, and a front public but perhaps seldom used door. In order to simplify security, these entrances meet in a common reception vestibule in the middle of the school.

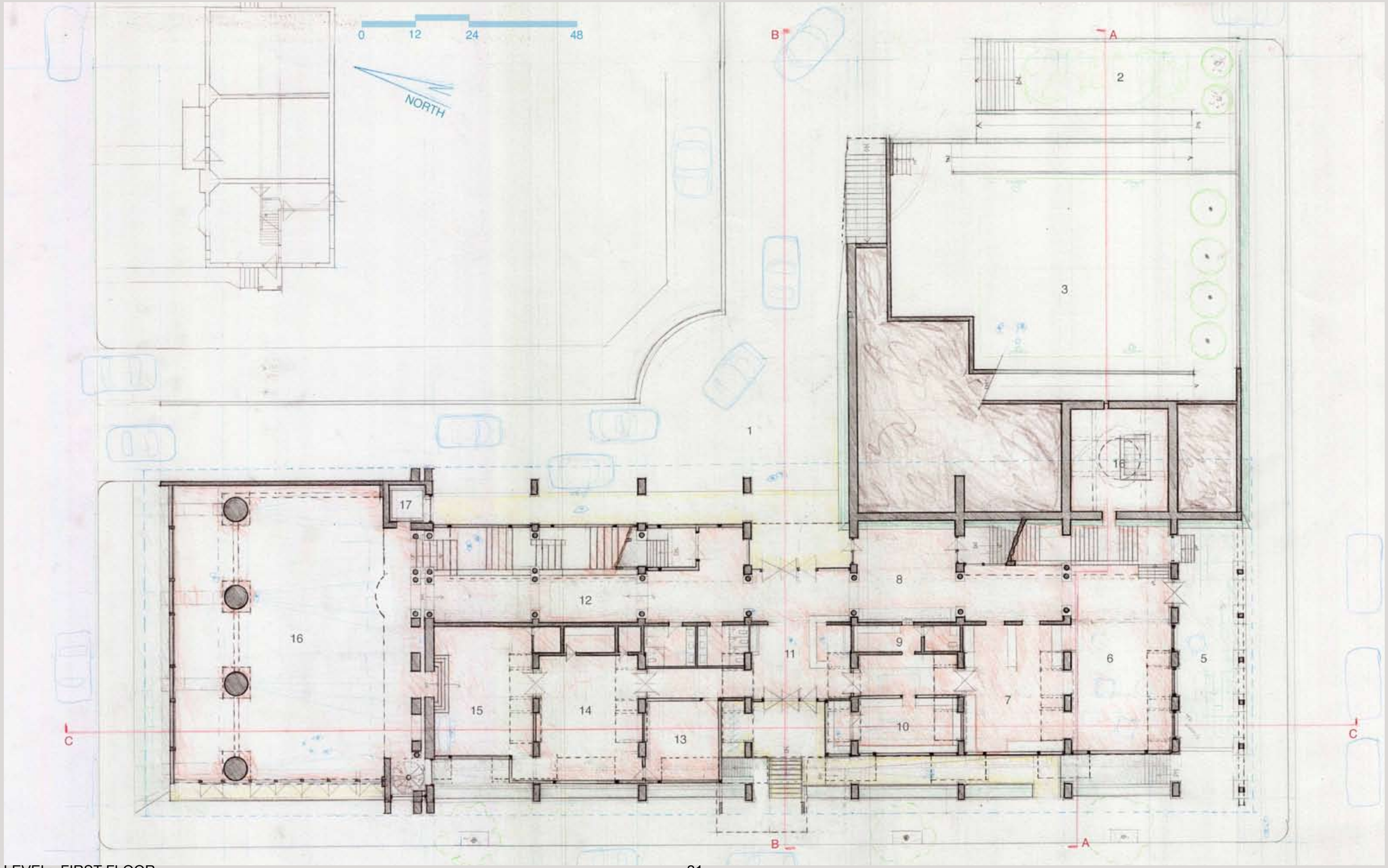
Flanking the Public entrance are offices and support rooms for the administration to the south and a conference room lounge for the faculty. Providing an interface between the school and the avenue, these spaces allow the adult users to reconnect with the grown up world.

As the day begins for the students they are greeted by faculty and then place their belongings in cubbies along the hall. They may congregate in the big room or proceed up the stairs to the classrooms. Throughout the day they may come down the stairs to attend lessons in the shared classrooms (i.e. kitchen, art, music, cinema, and dance areas.)

The dance area's facade to the street is glazed to encourage interaction between the life of the street and the movement of the students. This transparency also exists at the opposite end of the building for the Indoor and Outdoor Dining Area to compliment the neighborhoods other sidewalk cafes.

Buried within the hill, the quiet room lit only from above provides a place for students to refocus their concentration by napping, reading, or meditating.

1 DROP OFF
2 GARDEN
3 PLAY FIELD
4 QUIET ROOM
5 SIDEWALK DINING
6 DINING
7 KITCHEN
8 CINEMA
9 STAFF SUPPORT
10 OFFICES
11 LOBBY
12 CUBBIES
13 CONFERENCE
14 ART
15 MUSIC
16 DANCE
17 ELEVATOR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THE SECOND FLOOR LEVEL AKA CLASSROOM LEVEL

A primary feature of the building in terms of its common space and circulation is the converging stairwell, which students will use to go from the shared classrooms below to the individual classrooms. By its commonality as well as a metaphor of learning the library will be arranged along the sides of the steps with niches in each column for a place to read by the window. There niches act as hearth's for the small spaces throughout the building.

The landing at the top of the stairs is a critical place of orientation where students either travel along the balconies, which act as a single loaded corridor, or they exit the building onto the playground hill.

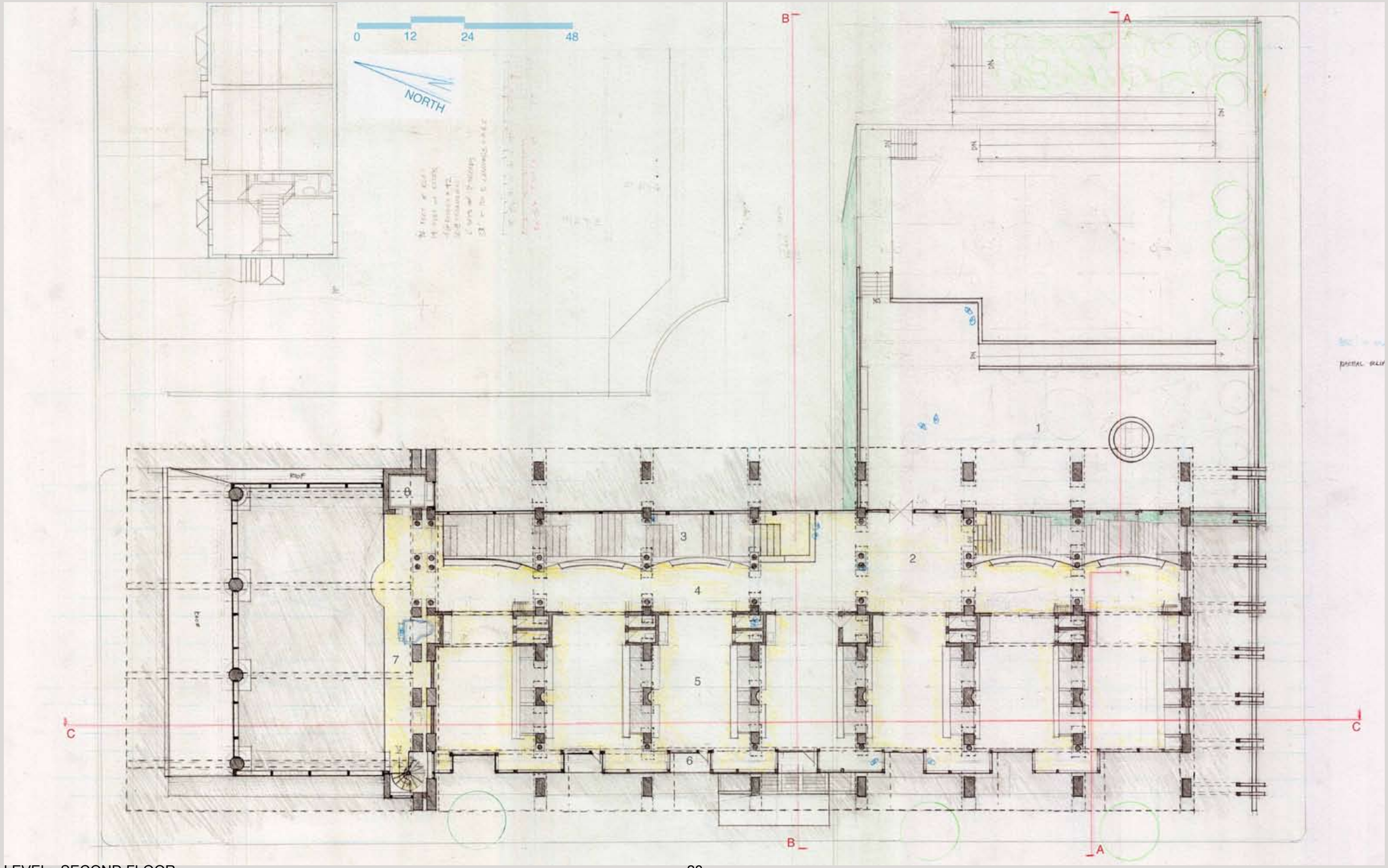
The corridor terminates to a window at the south end and to another balcony at the north end that overlooks the big room below. An elevator is accessible off of this balcony, which descends to the big room and further down to the pool. Opposite the elevator a spiral staircase is yet another means to access the first floor of the big room.

Each classroom entrance is made of three suspended sliding doors, that are inclusive of the balcony corridor space when open. The framed threshold could be used as a space for a small impromptu performance or group lesson that is shared with the school at large.

The classrooms are fitted with individual water closets, counters, and sinks. Each space has shelves on three sides of the edges of the room where students can choose materials and then bring them to the central carpeted area to begin their lesson. Each classroom is identifiable by the color of its carpets: red, orange, yellow, green, blue, indigo, and violet. This reinforces the schools dependency on the sun's energy by emphasizing the visual light spectrum, and gives a visual clue to which classroom a student is in at any given moment.

The classrooms are also connected via small rooms on the facade of the building. Here they can observe the street or the activities of another classroom with relative privacy. Several classrooms also have access to their own balconies on the street side, where small plants may be kept outdoors.

1 PLAY GROUND
2 LANDING
3 STAIR LIBRARY
4 CORRIDOR
5 CLASSROOM
6 OUTDOOR BALCONY
7 BIG ROOM BALCONY
8 ELEVATOR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THE LOFT LEVEL AKA CLERESTORY LEVEL

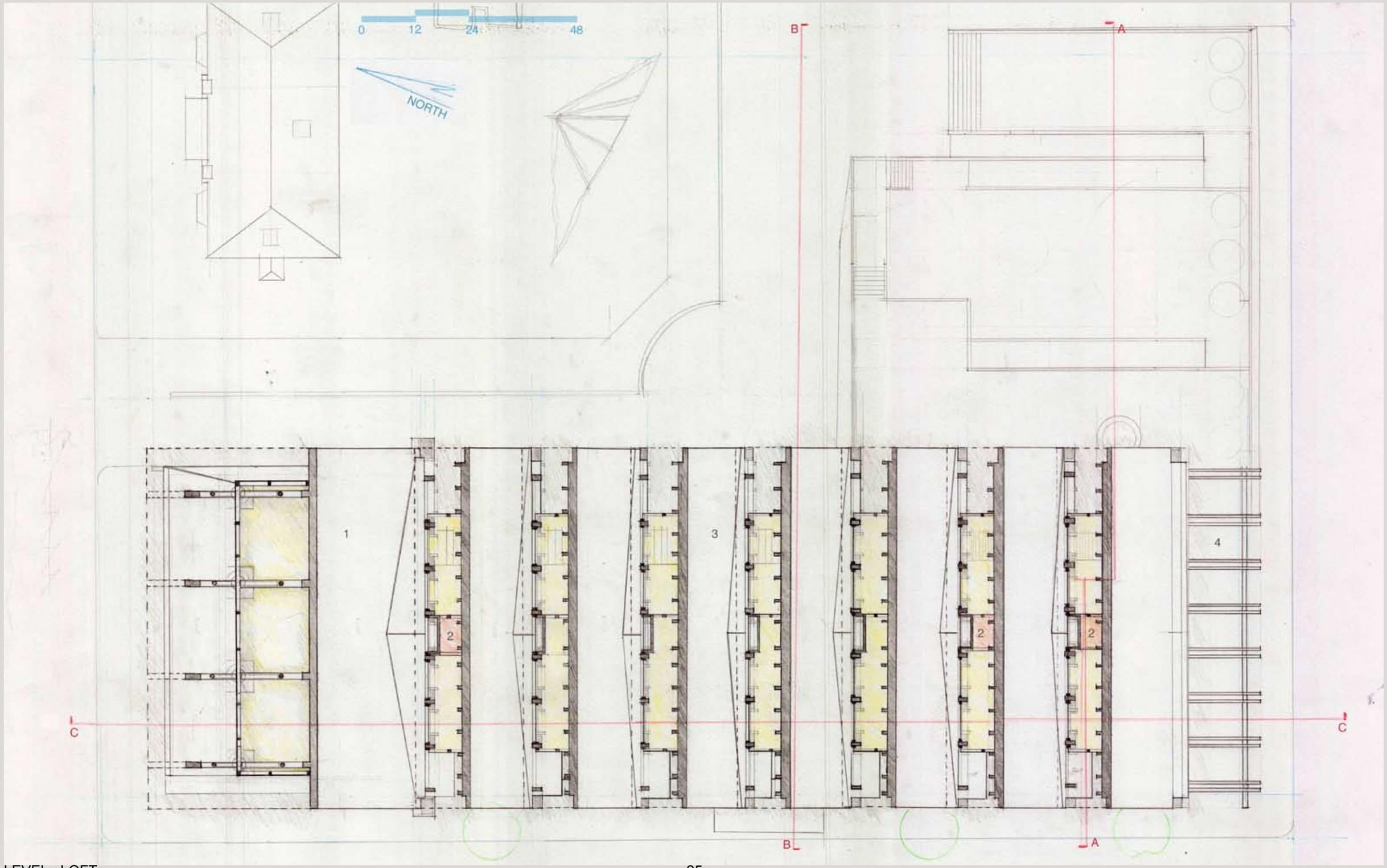
Above the heads of the classroom doorways and over the water closet/ sink areas, there are spaces that teachers may build lofts for their students to work above the room, or they may become storage spaces for seasonal items that are not needed.

The ceilings in the classrooms, corridor, and stairs alike are washed with northern light coming from the clerestories above. During the warmer months the operable units can be opened to draw up cooler air from below.

The roof over the big room is arrayed with the lighter photovoltaic panels to provide some electrical energy for the buildings lighting needs. The seven smaller classroom roofs support solar thermal tubes that are coupled with geo-thermal wells assisting to heat the building's columns and radiant floors. These systems where possible have remained unconcealed for the benefit of the child's understanding. Underneath the solar equipment the metal clad roof systems are sloped to drain from both sides into large pre-cast catches. From there water falls through downspouts cast into the exterior columns down towards the cisterns.

A vine such as Virginia creeper or wisteria can be grown on the southern most segment of the building's roof system to provide shading in warmer months, and absent of foliage in the colder months allows for passive solar heat.

1 SOLAR THERMAL ROOFS
2 GREEN PERGOLA
3 LOFT
4 PHOTOVOLTAIC ROOF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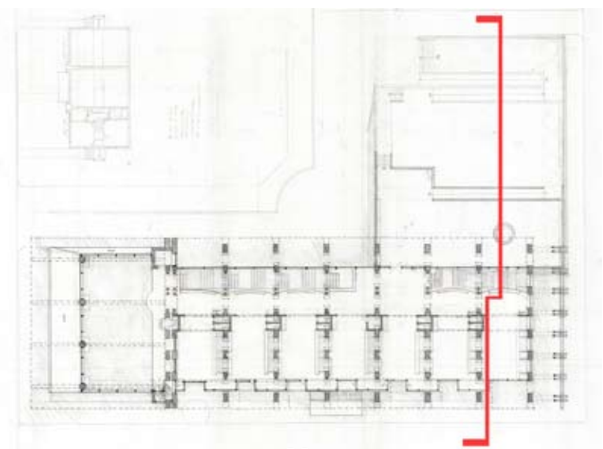
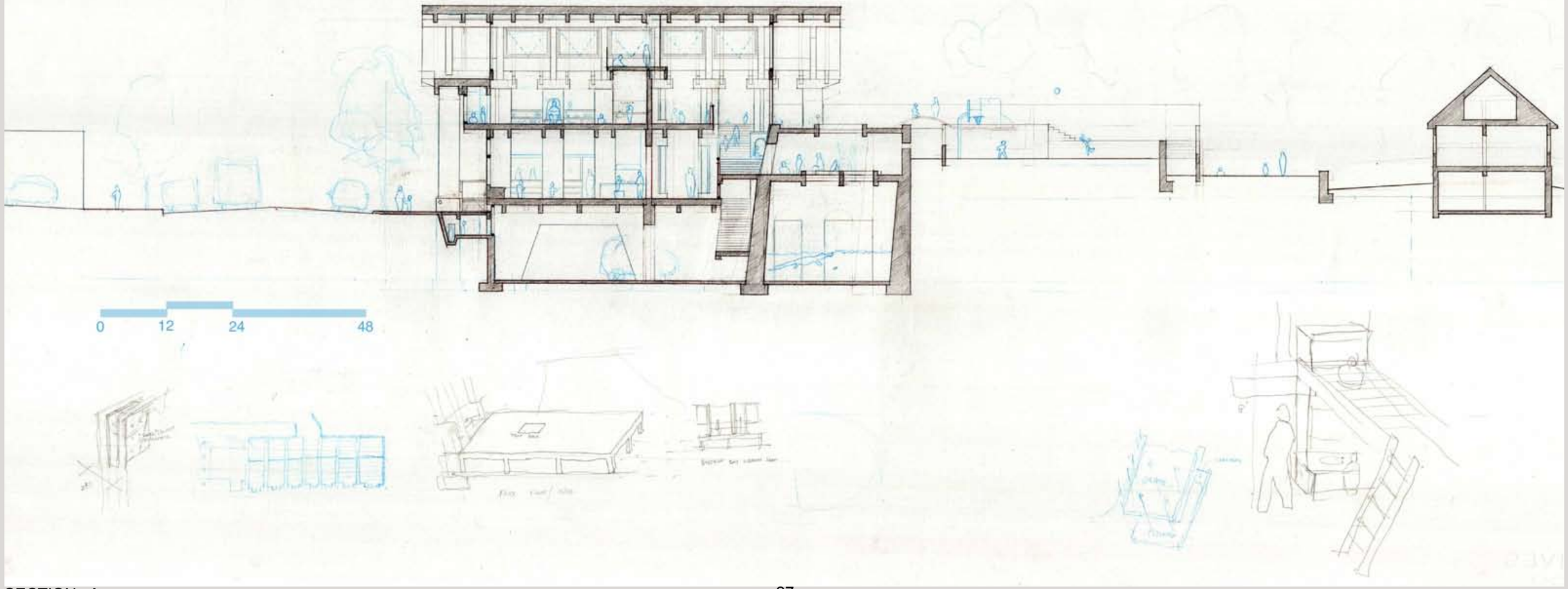
THE HILL SECTION

The Section through the hill displays the early excavations cut and then filled as well as the organization of the outdoor play space. Closest to the school a small, soft playground for the smaller children is available for convenient access. Downhill from that area is a larger playground appropriate for field play and games, and finally at the base of the hill there is a garden where the children can tend to growing their own food. Within the depths of the hill, the quiet room resides over the cisterns.

The roof, supported by pre-engineered lumber, ascends to a clerestory view of the sky. The classroom is inwardly focused and has a centrally located niche that can serve as an area for short readings to occur. The bays that push out beyond the first floor are an area that can afford students a place to watch the street without directly being noticed. On the lower floor an equal exchange of gazes can be encouraged, although the setback nature of the facade enables students to maintain a focus on their studies. The lower sidewalk level allows light to enter the basement.

The construction of the building is primarily of poured in place concrete, wood, and glass. The concrete is formed in places using a stone veneer that remains in place after pouring. As the concrete rises from the ground some of the block like columns change shape at cold joints into cylinders. Before reaching the ceilings they change back to block forms that provide voids that will receive the beams for the floors, and finally are capped with preformed concrete pieces supporting the roof, each having two rafters and a timber post.



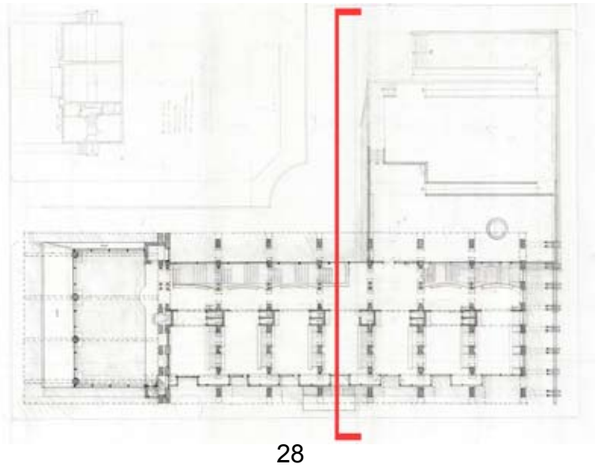


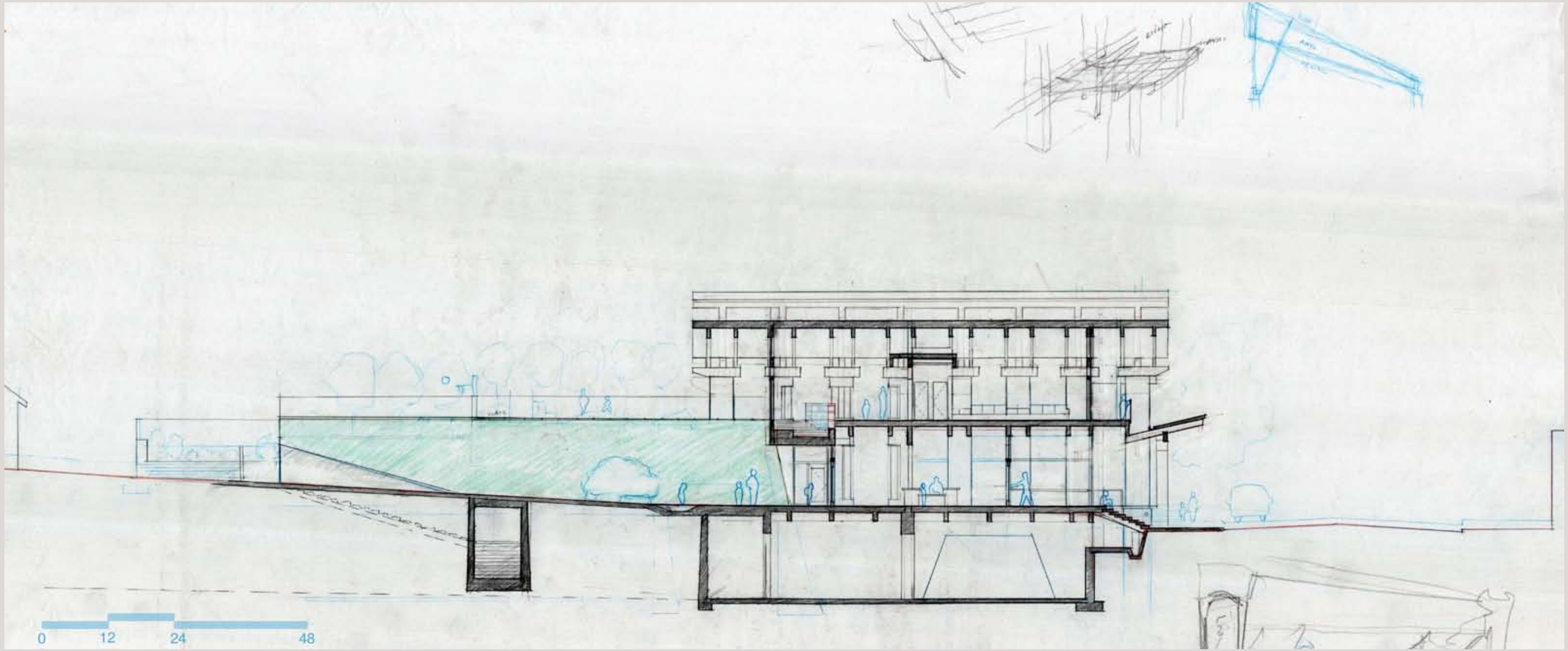
SECTION: A

THE ENTRANCE SECTION

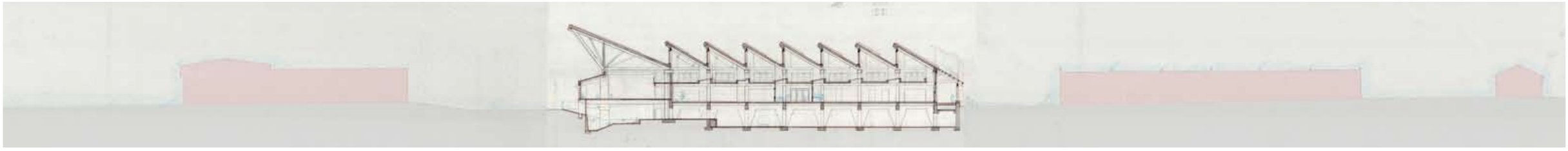
The public entrance is inviting to the pedestrian flow and emphasizes the tallness that is present in the columns affronting the street by sheltering a smaller canopy. Acting as a porch to the community the exchange between sidewalk and store front is maintained. On the other side, the more private entrance is controlled and quiet as a rear door to a house that assists in the specific utilitarian needs of the user. The business of the backdoor is to always be available for the comings and goings of the pupils and to have their safety in mind. It is a place to stand out of the weather and wait for the opportunity to transfer to a parent's vehicle.

At the base of the hill, the set of stairs in the back is the implementation of the roji concept, or a flow of connectivity allowing travelers through the alley below to access the driveway above and vice versa.





SECTION: B



THE LONG SECTION

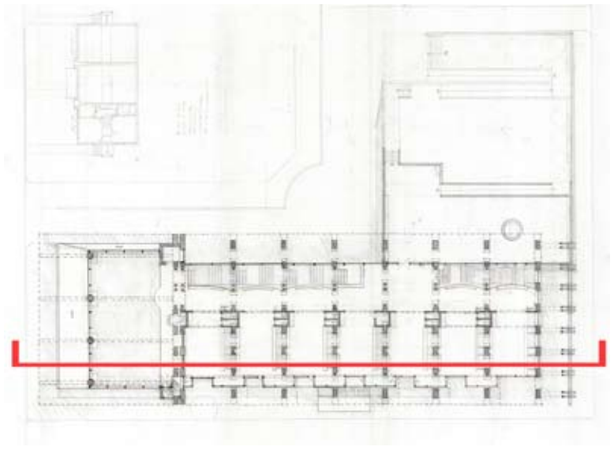
The 93 million miles between the sun and earth are most consistently reflected in the construction of architecture, more so than in any other art. In every section there is a story told of how humans have sheltered themselves from the elements above and below. The roof is like a blanket and the floor like a mattress for all of the other pieces to rest within the ambient environment in-between. The floor keeps us a comfortable distance from the cold and damp earth, and yet we need to be able to quickly reconnect with the knowledge that we are grounded and can easily have the freedom to stand on soil and feel nature around us. The need for the roof is obvious in the sense that we need to stay dry, but perhaps more important is the choice that roof gives us in experiencing the sun. We sometimes require shelter from the sun, and according to season we must adjust how our roof allows the sun to enter our interior. In higher locations the roof line may soar into the sky, reaching for the sun and exposing our heads, where as lower locations may flirt with the grade line, retreating or hiding spaces we chose to conceal.

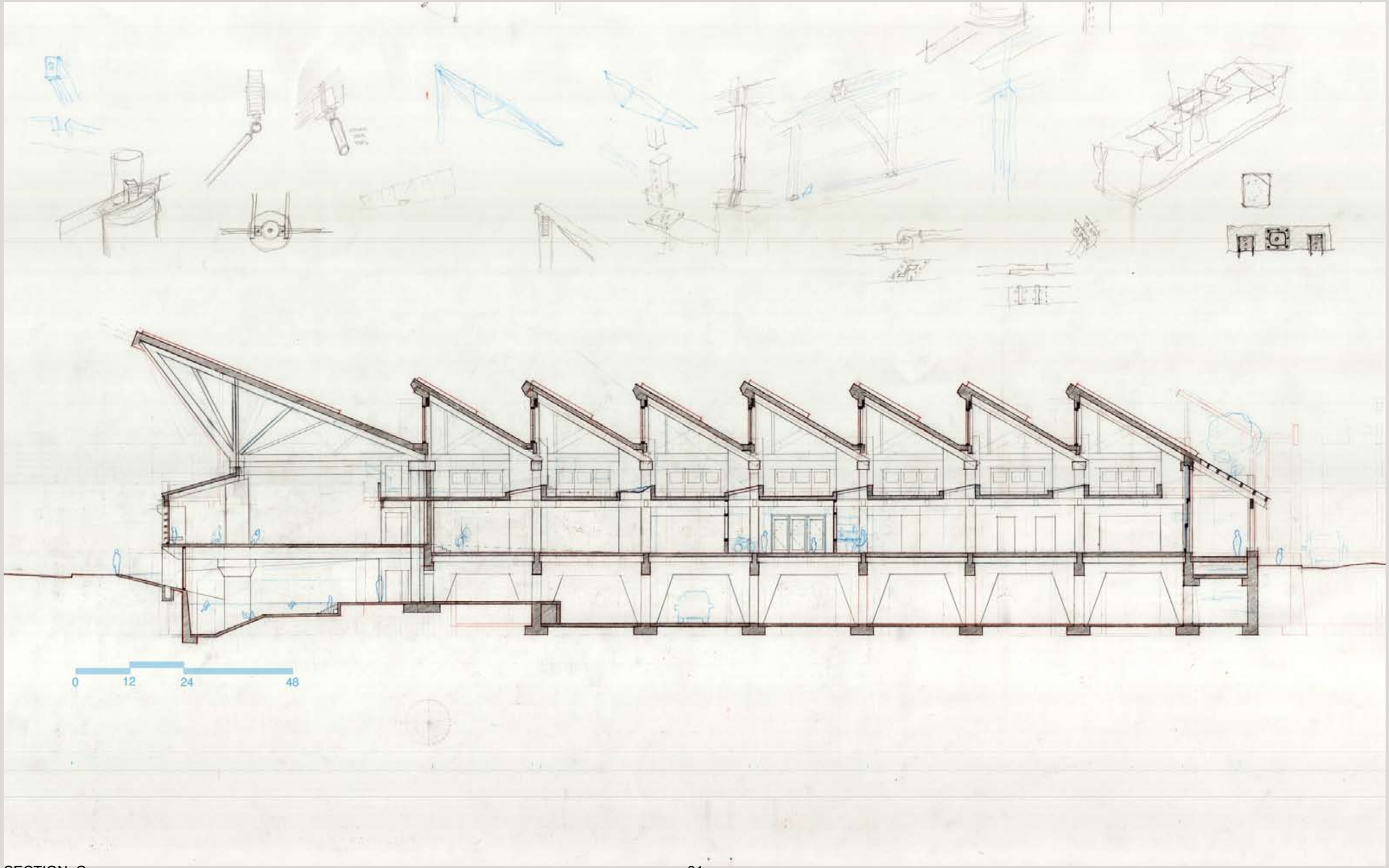
A roof tells its raison d'etre right away: it gives mankind shelter from the rain and sun he fears. Geographers are constantly reminding us that, in every country, the slope of the roofs is one of the surest indications of the climate. We "understand" the slant of a roof. Even a dreamer dreams rationally; for him, a pointed roof averts rain clouds. Up near the roof all our thoughts are clear. In the attic it is a pleasure to see the bare rafters of the strong framework. Here we participate in the carpenter's solid geometry.

As for the cellar, we shall no doubt find uses for it. It will be rationalized and its conveniences enumerated. But it is first and foremost the dark entity of the house, the one that partakes of subterranean forces. When we dream there, we are in harmony with the irrationality of the depths.

We become aware of this dual vertical polarity of a house if we are sufficiently aware of the function of inhabiting to consider it as an imaginary response to the function of constructing. The dreamer constructs and reconstructs the upper stories and the attic until they are well constructed. And, as I said before, when we dream of the heights we are in the rational zone of intellectualized projects. But for the cellar, the impassioned inhabitant digs and re-digs, making its very depth active. The fact is not enough, the dream is at work. When it comes to excavated ground, dreams have no limit.

Gaston Bachelard The Poetics of Space

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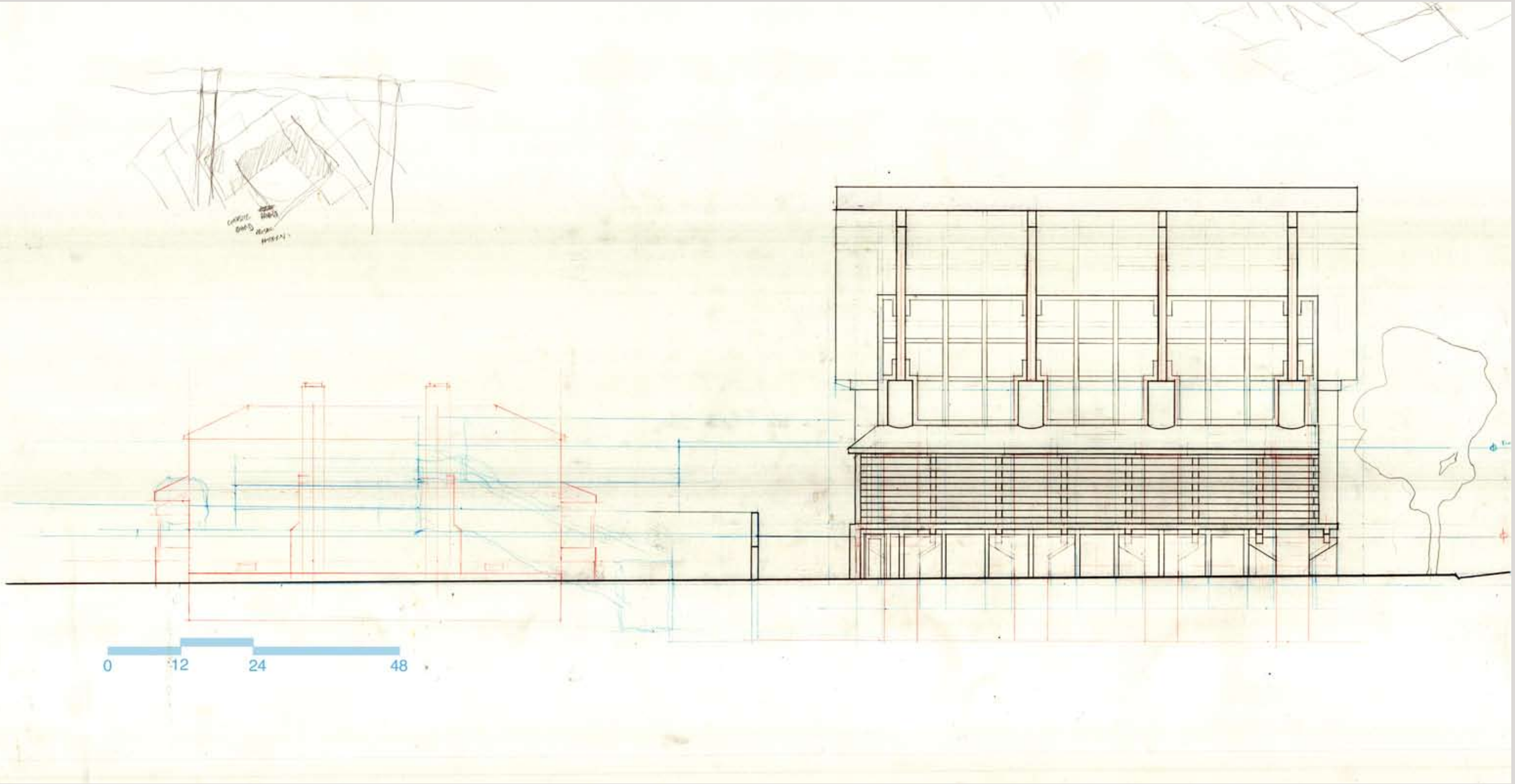
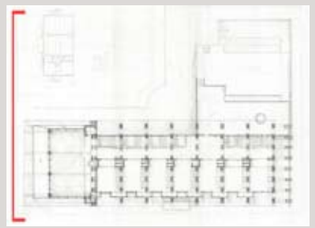
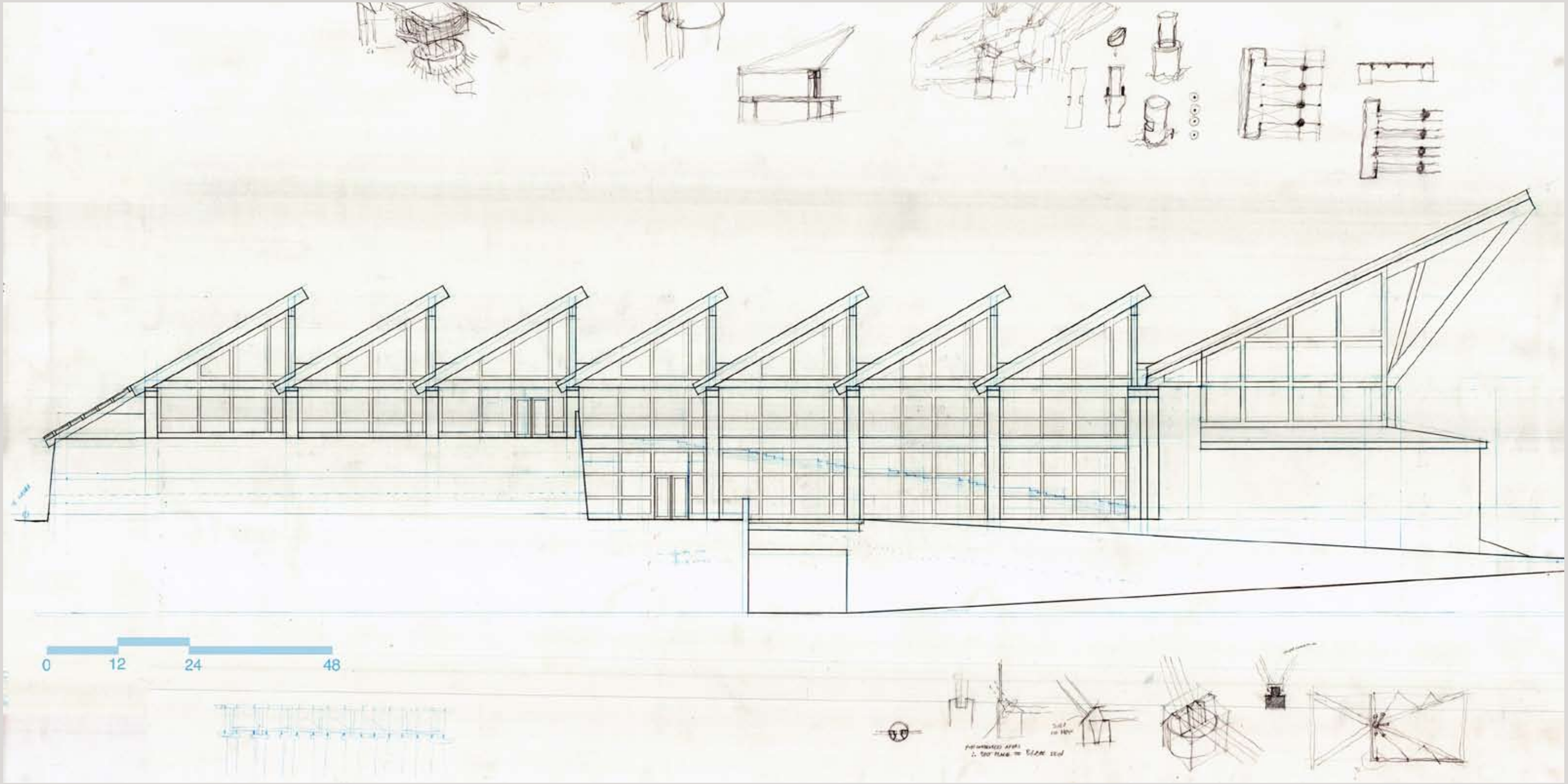
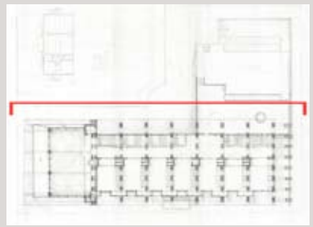


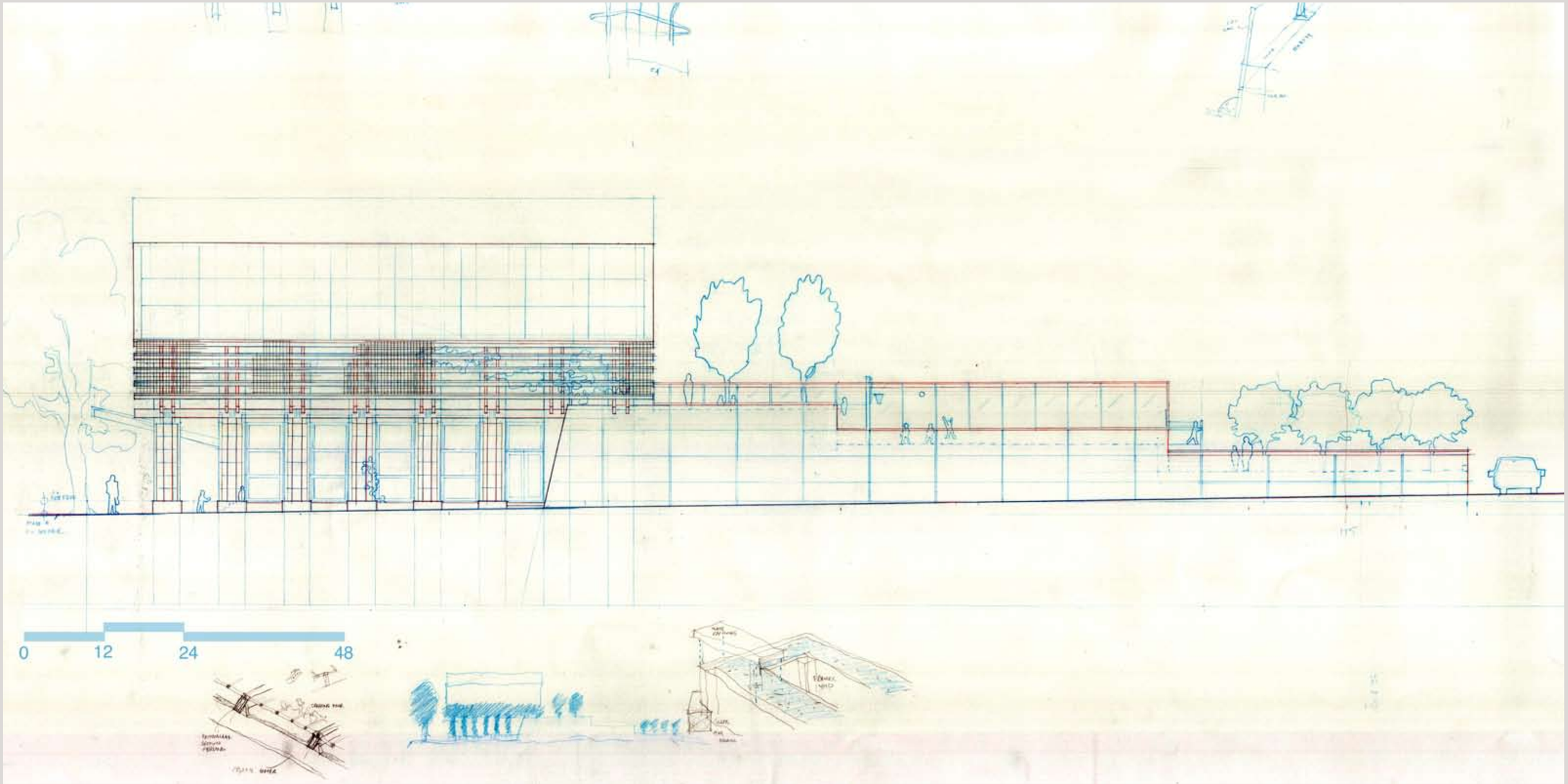


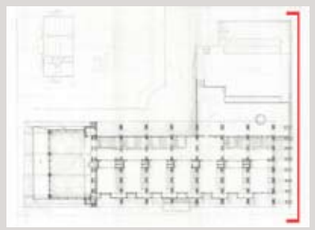
ELEVATION: NORTH



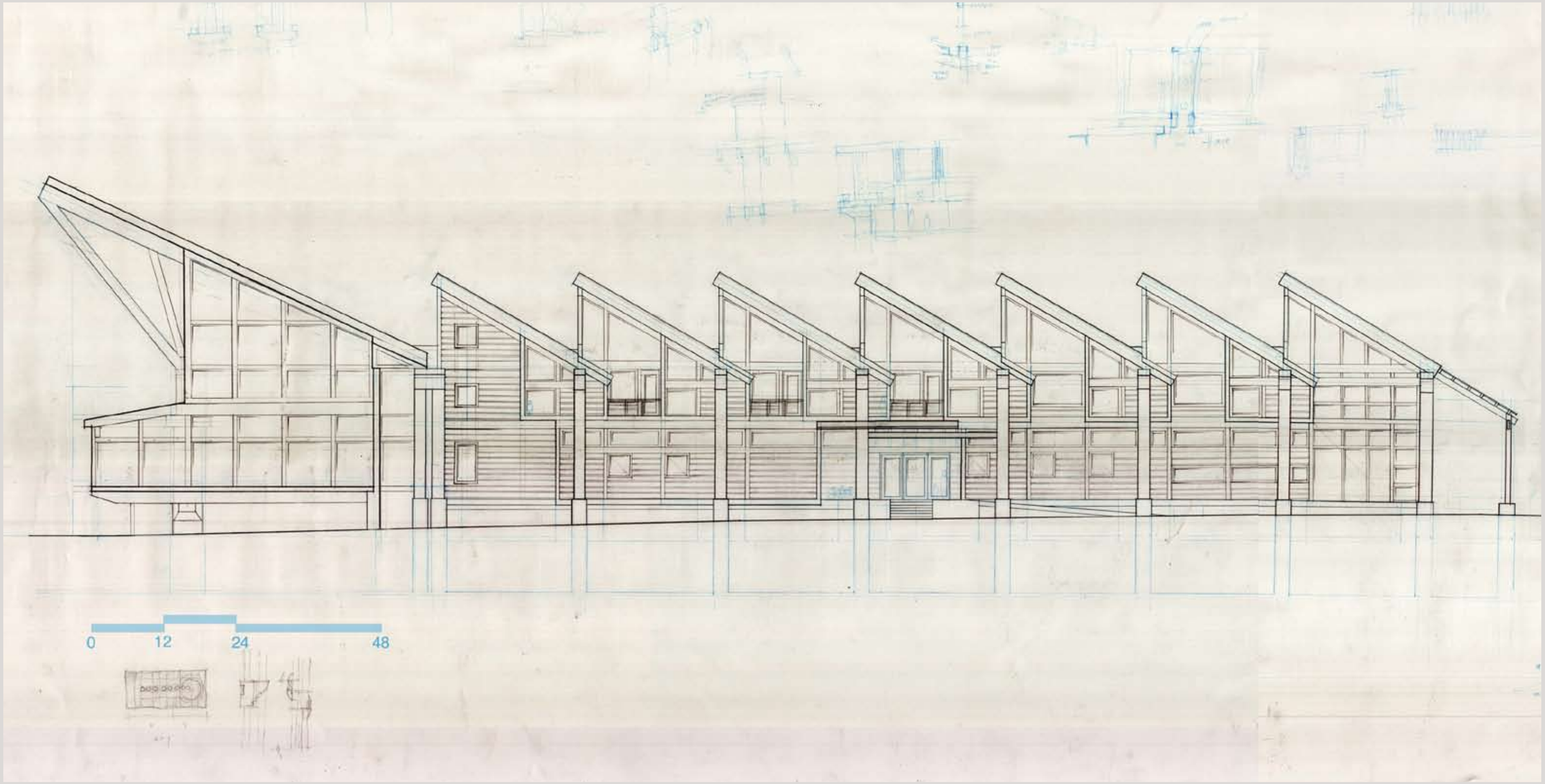


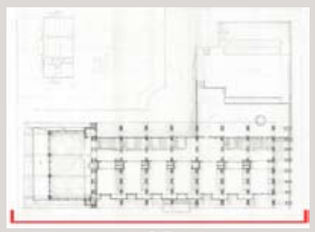
ELEVATION: EAST





ELEVATION: SOUTH





ELEVATION: WEST

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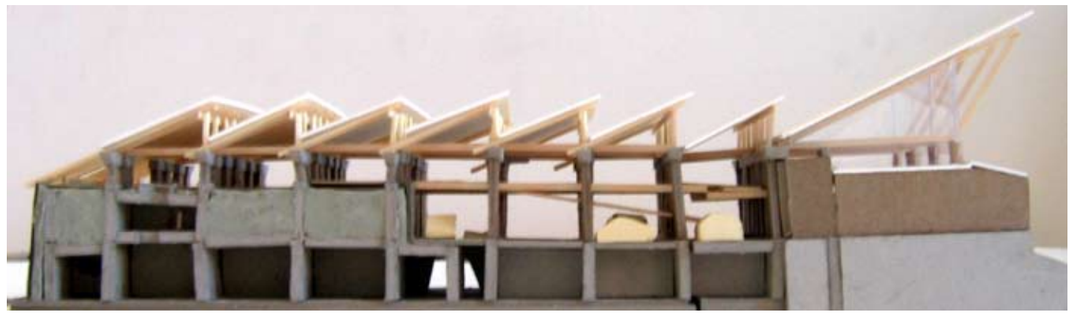

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CHIPBOARD, WOOD, + CLAY SITE MODEL:

a Southeast Aerial
b Section View

(opposite page)

CHIPBOARD + WOOD SECITON MODELS:

c Section at Stairway and Corridor View
d Aerial View into Classroom
e Aerial Fascade View
f Roof Overhang View.
g Classroom Bay View from Street
h View of Lower Sidewalk and Water Collection Trench

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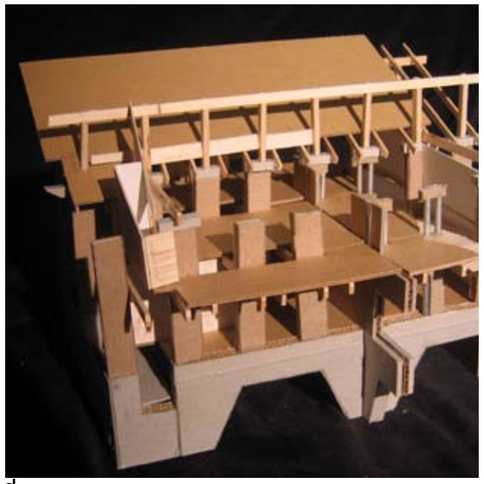
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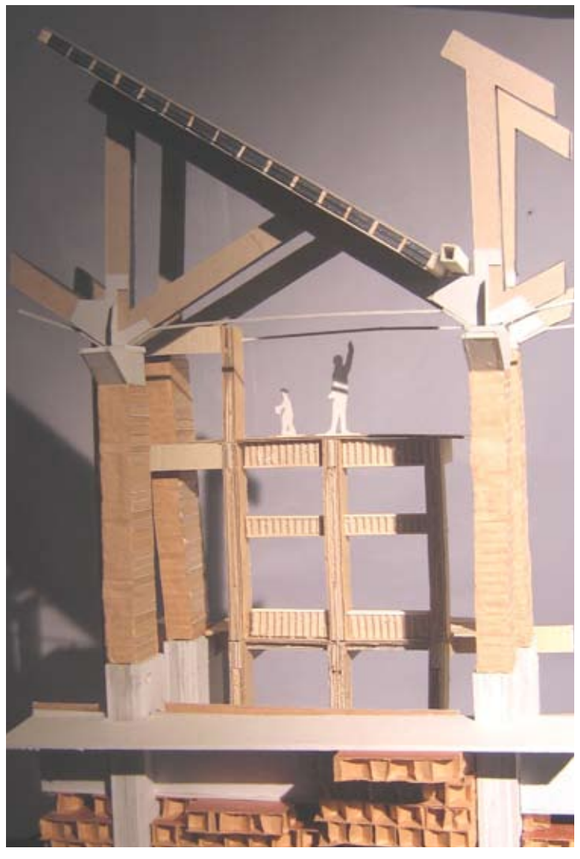
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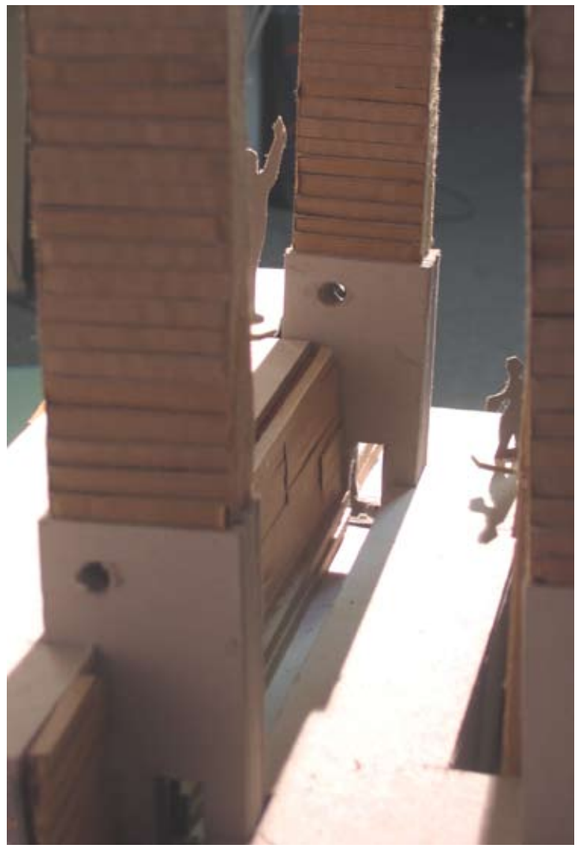
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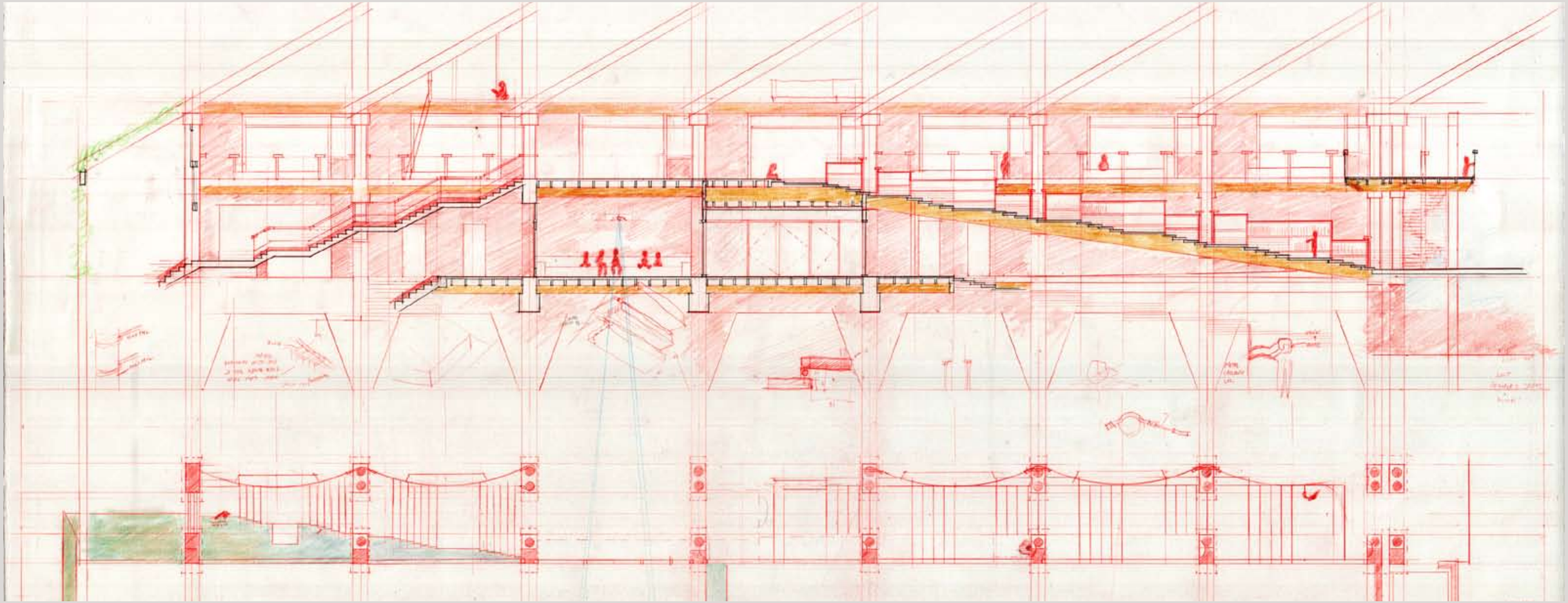
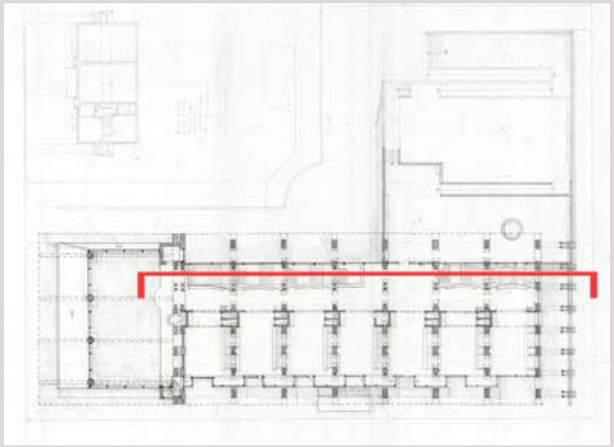
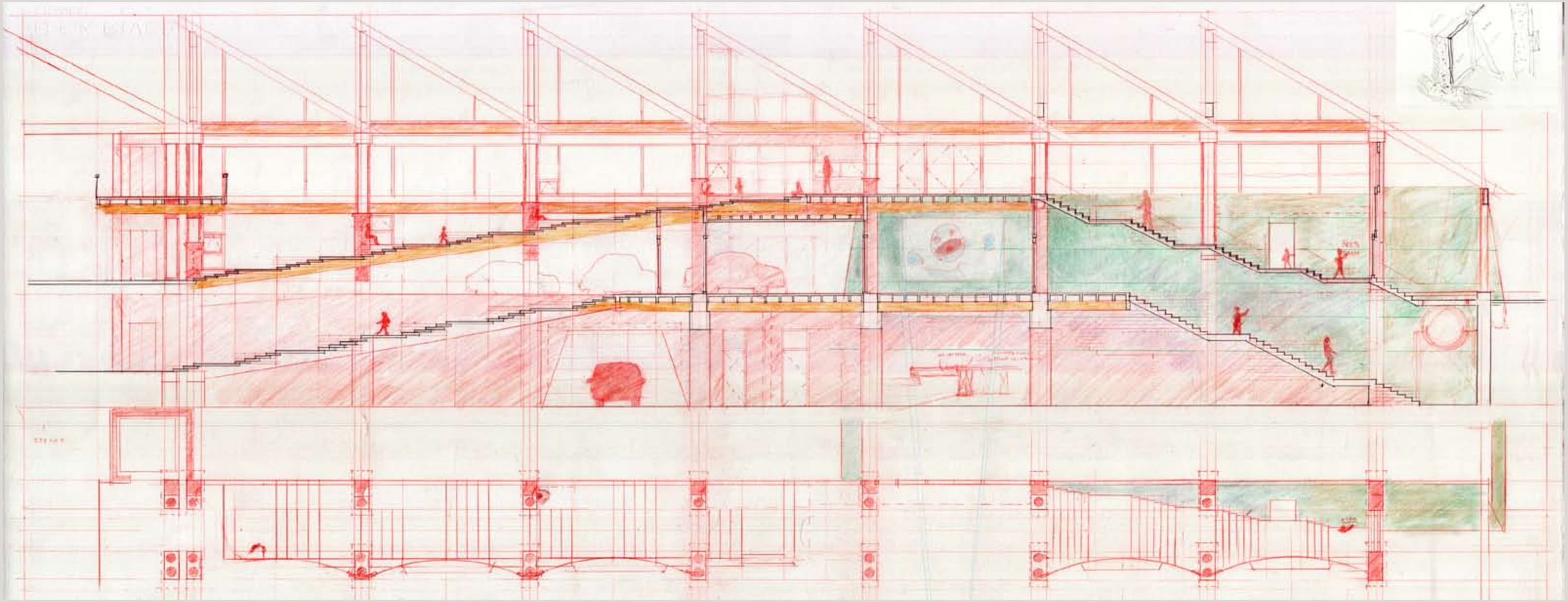


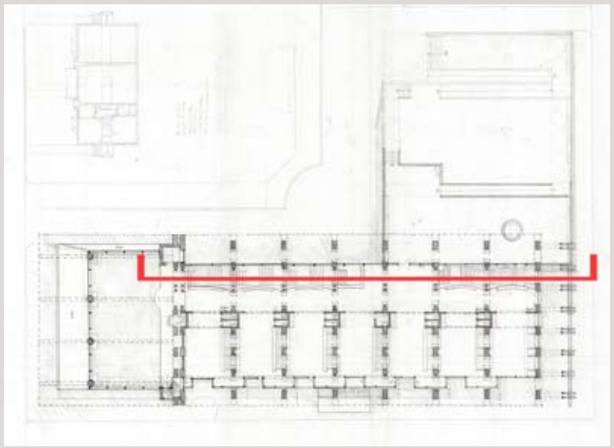
STAIRWAY SECTONS IN AND OUT

The stairs become an active participant in the lesson of the child. The slowly ascending wooden stairway is the library, creating the pause in which the child may choose a book and sit down by the window to read. Where as the faster slate formed concrete stairway provides an adjacent slate wall on which to draw. The immediacy of the chalk to the stone surface is analogous to the body's more forceful gesture of climbing steep stairs.



STAIR SECTION: IN





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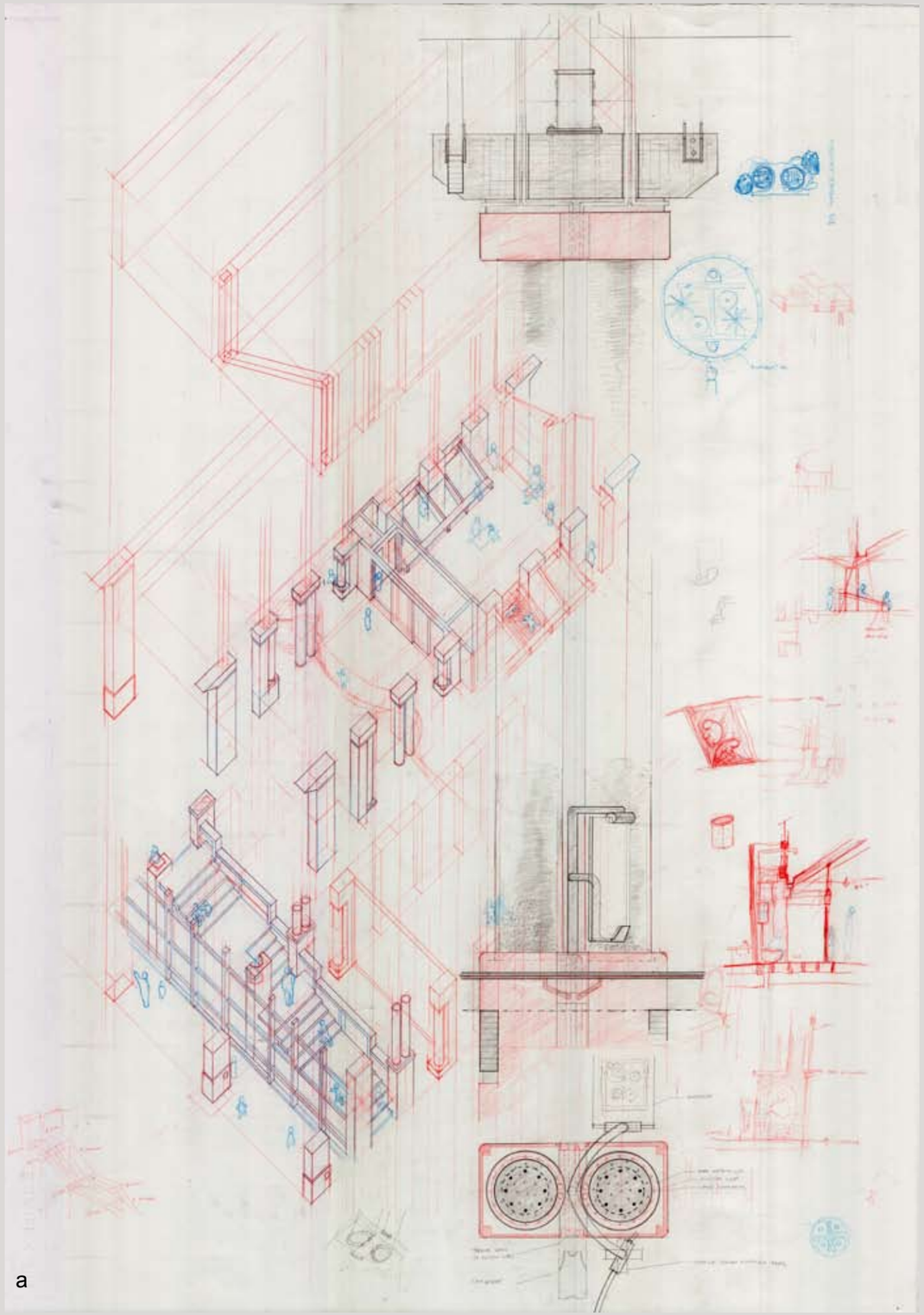

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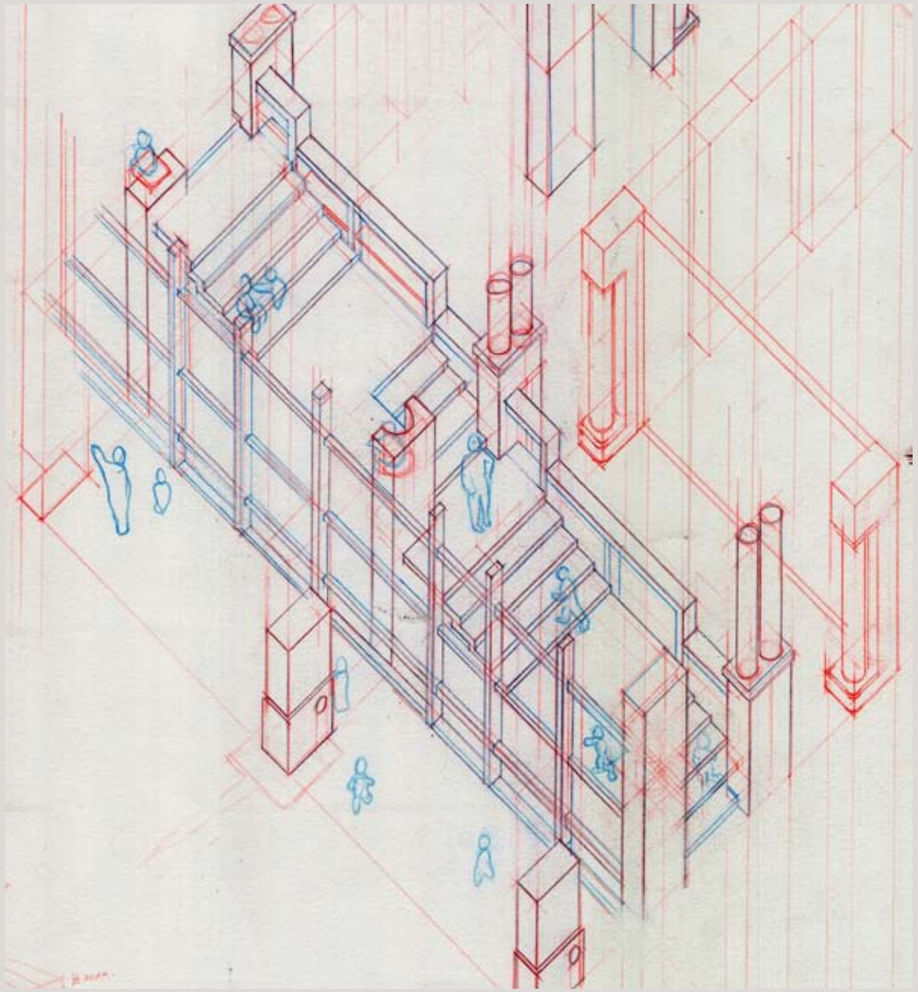

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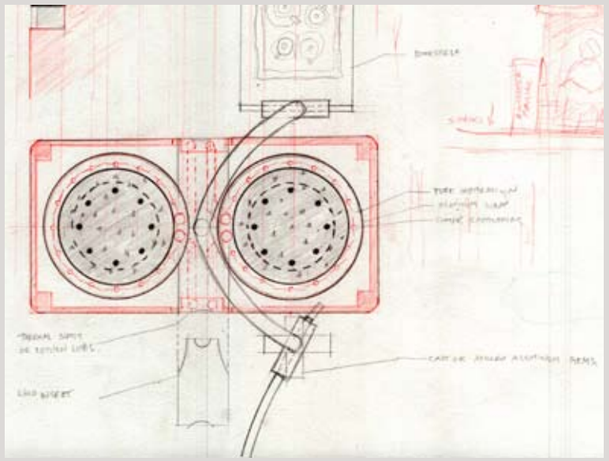

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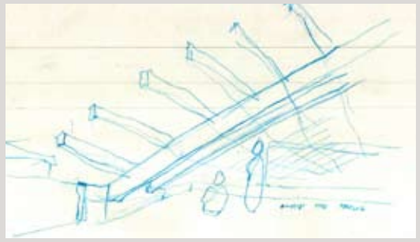

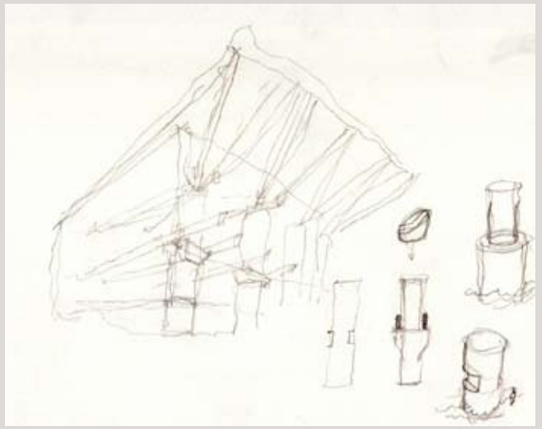

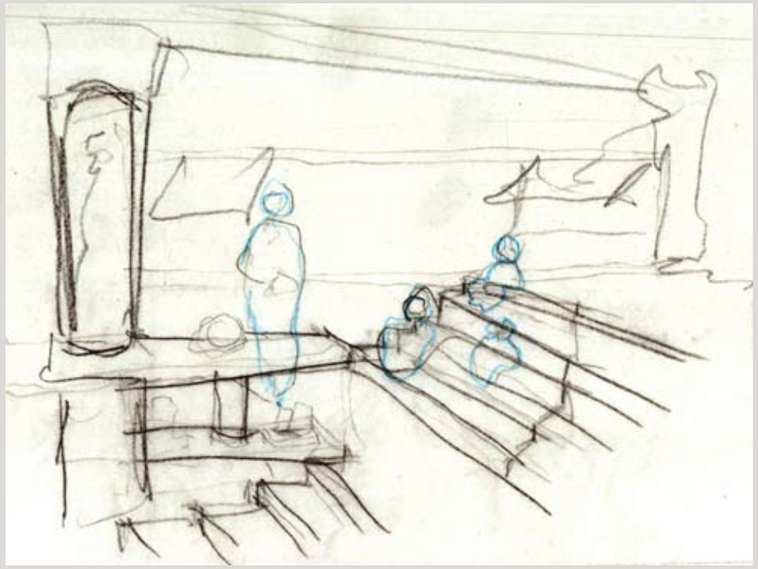

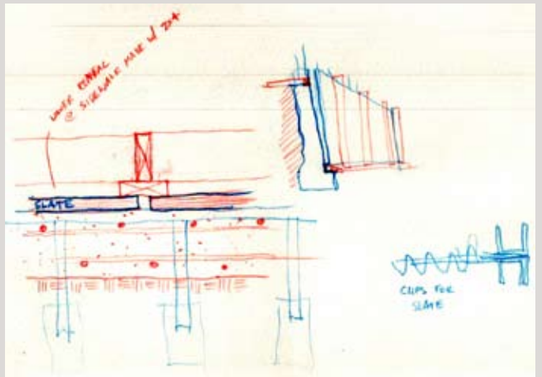

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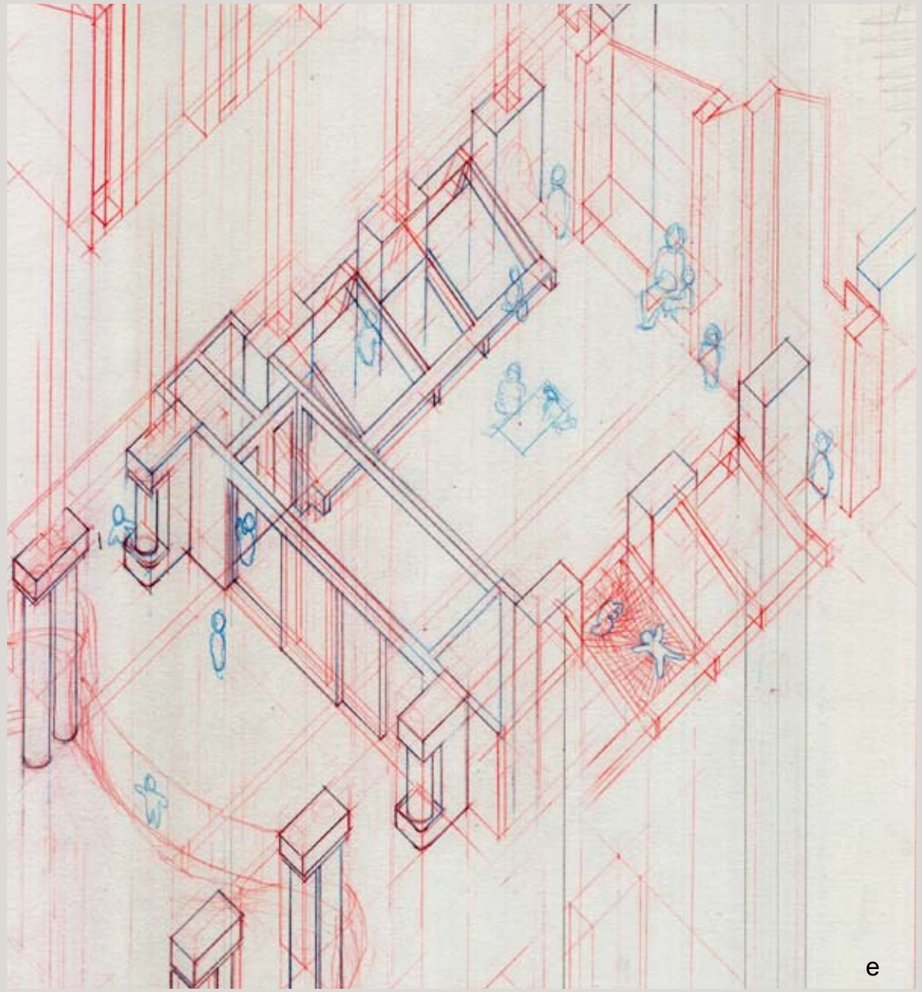

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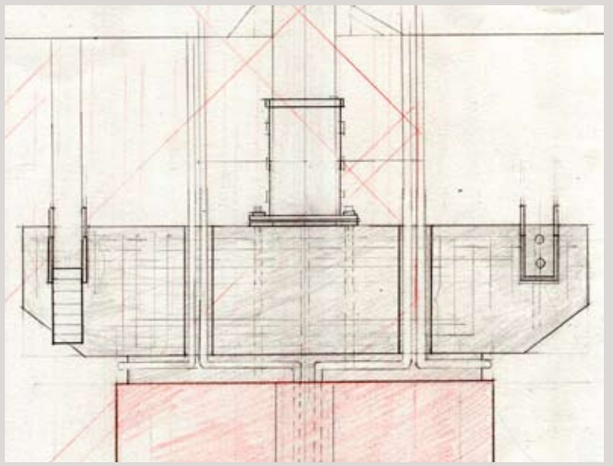


f

a Exploded Axonometric from the northeast showing the arrangement of corridor and classroom spaces amongst columns.

b Enlargement of the Library Stair Section showing book shelves doubling as hand rails and voids in the columns as private reading niches.

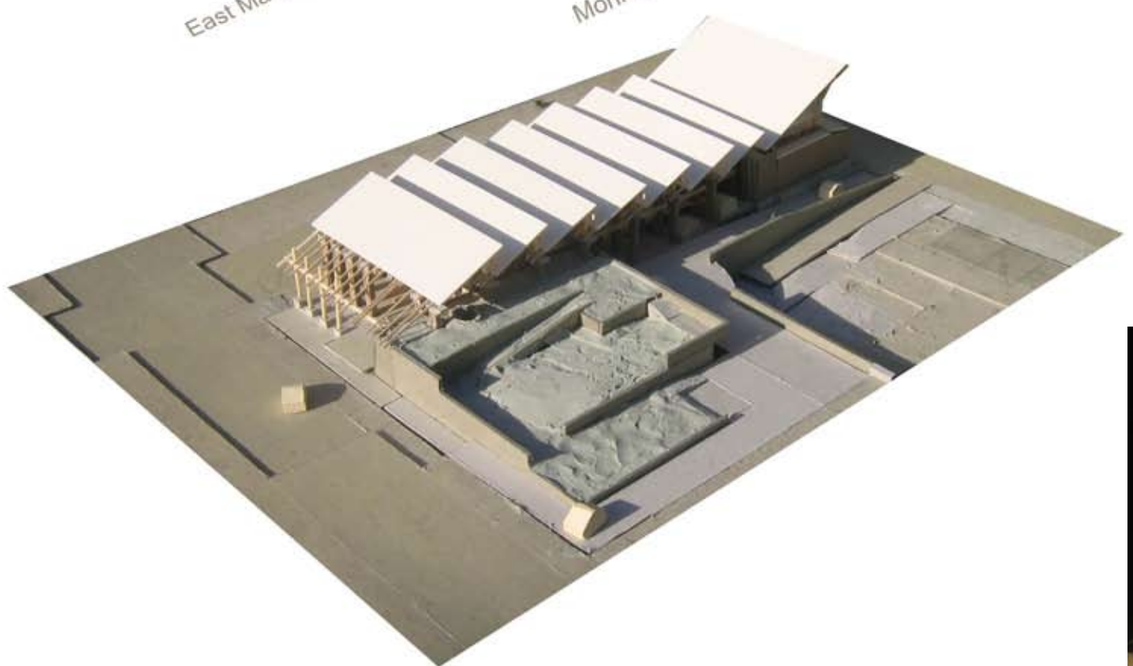
c Plan cut through column at double round segments showing reinforced concrete structure, radiant piping fins and shells, stanchions in the bookshelf and railing positions.

d Various development sketches for columns, stairs, exterior spaces, and a concrete formwork.

e Enlargement of the classroom showing from foreground to background the corridor, triple sliding doors, the wet bay w/ individual water closets, and classroom floor area. The reclined translucent fabric light wells and the exterior wall weave.

f A detail of Pre-cast Capstoe on Column showing metal connections for wooden members and formed reveals for thermal piping loop.

a



b

A REVISION OF PROGRAM

As fate would determine, the project took a small detour near the completion of the thesis study. A competition called project Greenway was being held for the development of a new type of convenience store and vehicular energy station. The impetus for this new building type was derived from the disconnect between the rather static position of current gas station design and the more forward evolving automotive industry i.e. hybrid, fuel cell, electric, ethanol, and solar technologies.

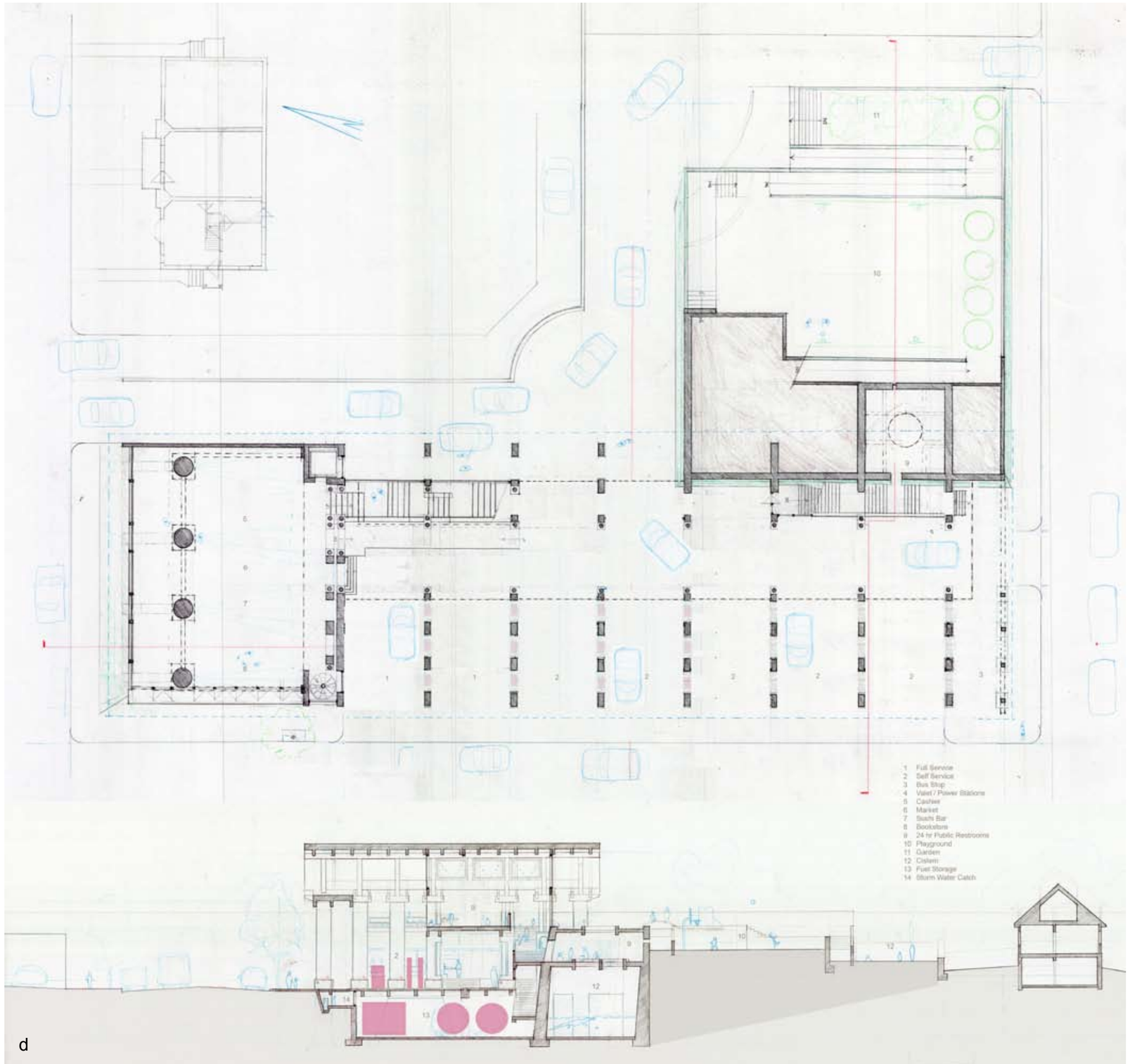
The suggested sites for Greenway's stores were flexible with the exception that they consider various urban contexts for ease of access and for marketability be near areas of high traffic density. The emphasis of the design competition concept was one of sustainability; whereby the building would reflect in its existence the philosophy of its environmentally friendly cars and customers.

In the transformation of the Montessori school for the purposes of the competition, several weaknesses and strengths of the school's design could be used to the advantage of the Greenway design. The extremely busy nature of the site (its existing occupant being a gas station) was conducive to the use suggested by the competition. The removal of the second floor gave way to a new higher ceiling height, which was appropriate for the movement, light and ventilation necessary for vehicle bays. The redundancy of the bays affronting the Avenue allowed for a clear vehicle approach and a single pedestrian entrance to the market, and the drop off drive allowed for cars to move easily about the sight. The roof lines developed specifically for solar energy collection fulfilled a mandatory energy production piece of the program, and the excavation needed for fuel storage still gave reason for the poetic placement of the hill at back. The big room was simply given over to the use as a market, and a balcony running the length of the building could add another commercial space. With these simple changes, an adaptive reuse of this project was successful in creating a new awakening to the project.

c

TEXT FROM THE SUBMITTED ENTRY

GREENWAY: A sustainable alternative fuels market.
Located centrally in the Del Ray neighborhood of Alexandria, VA the 35,000 SF lot fronts 2 main through fares. This new facility is sited on the brown fields of a former gas station, car lot and bank. The concept of the building, which could become a branding theme for the company's expansion on other sites, is a strong connection between earth and sun. The building's identity is composed of two key features, its strong roof profile which is designed to harness solar energy, and its re-use of excavated earth from fuel tank burial into the creation of a garden hill. The multi-story structure is constructed of concrete columns and laminated wood spanning members that evoke a forest canopy on top of stone obelisks. The main non-vehicular spaces (market, bookstore and garden) are organized at each end and on top of the seven service bays. Two converging straight run staircases make their landing at the upper junction between the bookstore and hill. From within the bookstore viewing of the service bays and market offers allocation to read or just watch activity below. The market's cafe component opens its views directly onto Mt. Vernon Ave. taking advantage of commercial traffic. Clerestories in the roof's structure bring natural light into each space. The earthen hill is available to the community as a playground and meeting place near the crest and flower garden fed by gray water can be enjoyed at the foot of the hill. Underneath the hill are three cisterns with a capacity of 64,000 gallons of run-off water. This water capture system can service the surrounding neighborhood given the low placement of the site. The roof has 21,000 SF of surface optimally pitched for photovoltaic or solar thermal panel placement through out the year. Circulation for cares is easily identifiable and weaves through the building and site while maintaining a pathway for those walking from their cars to the entrance.



d

SELECTED BIBLIOGRAPHY

Bachelard, Gaston, The Poetics of Space. Boston, Massachuseutts: Beacon Press 1994.

Hertzberger, Herman, Lessons for Students in Architecture. Rotterdam: Uitgeverij 101 Publishers 1991.

Semper, Gotfried, The Four Elements of Architecture. Cambridge: Trans. Harry F. Mallgrave and Wolfgang 1989.

Montessori, Maria, The Absorbent Mind. New York, New York: Trans. John Chattin-McNichols, Henry Holt and Co. LLC 1995.

Wolf, Aline D., A Parents' Guide to the Montessori Classroom. Hollidaysburg, PA: Parent Child Press 1995.

IMAGE CREDIT

page	*image*	
8	a	Google Earth
9	b	http://earth.google.com/
10	a	
17	b	
42	a	
8	b	GIS Data Version 2, CD ROM
9	a	City of Alexandria Department of Planning & Zoning 2002
16	a	

All other images and photos produced by the author.

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