

Between Earth and Sky

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the requirements for the degree of

MASTER OF ARCHITECTURE

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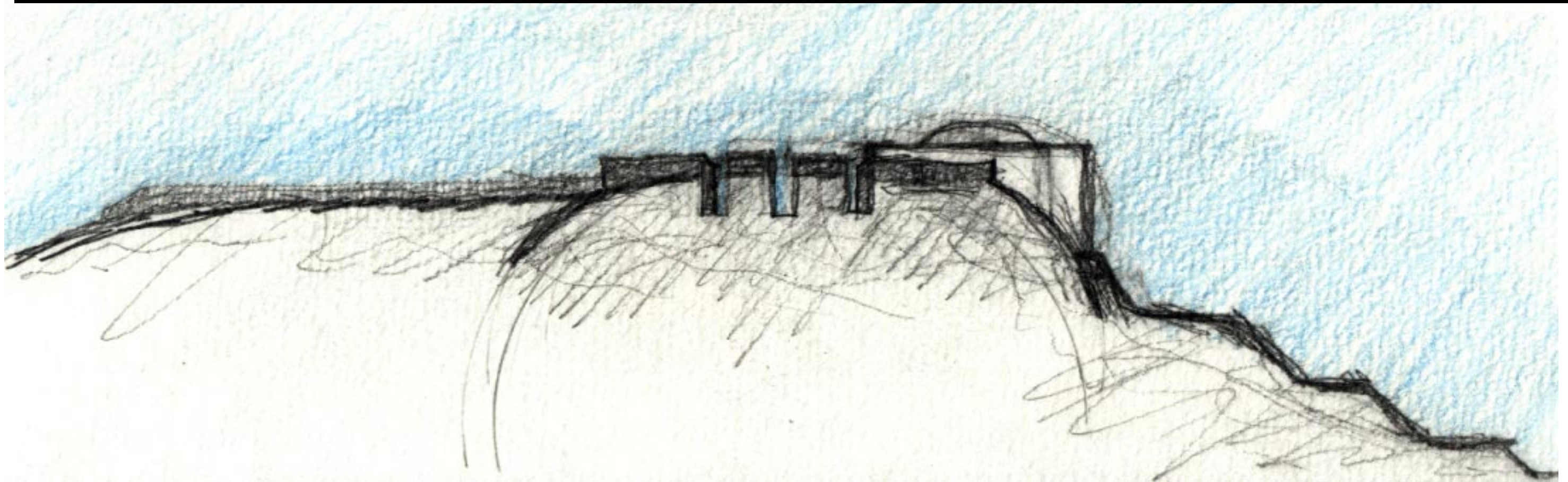
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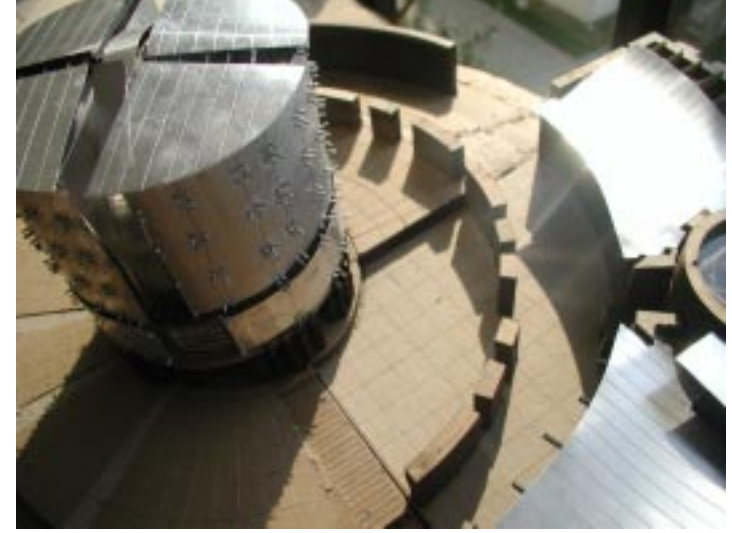
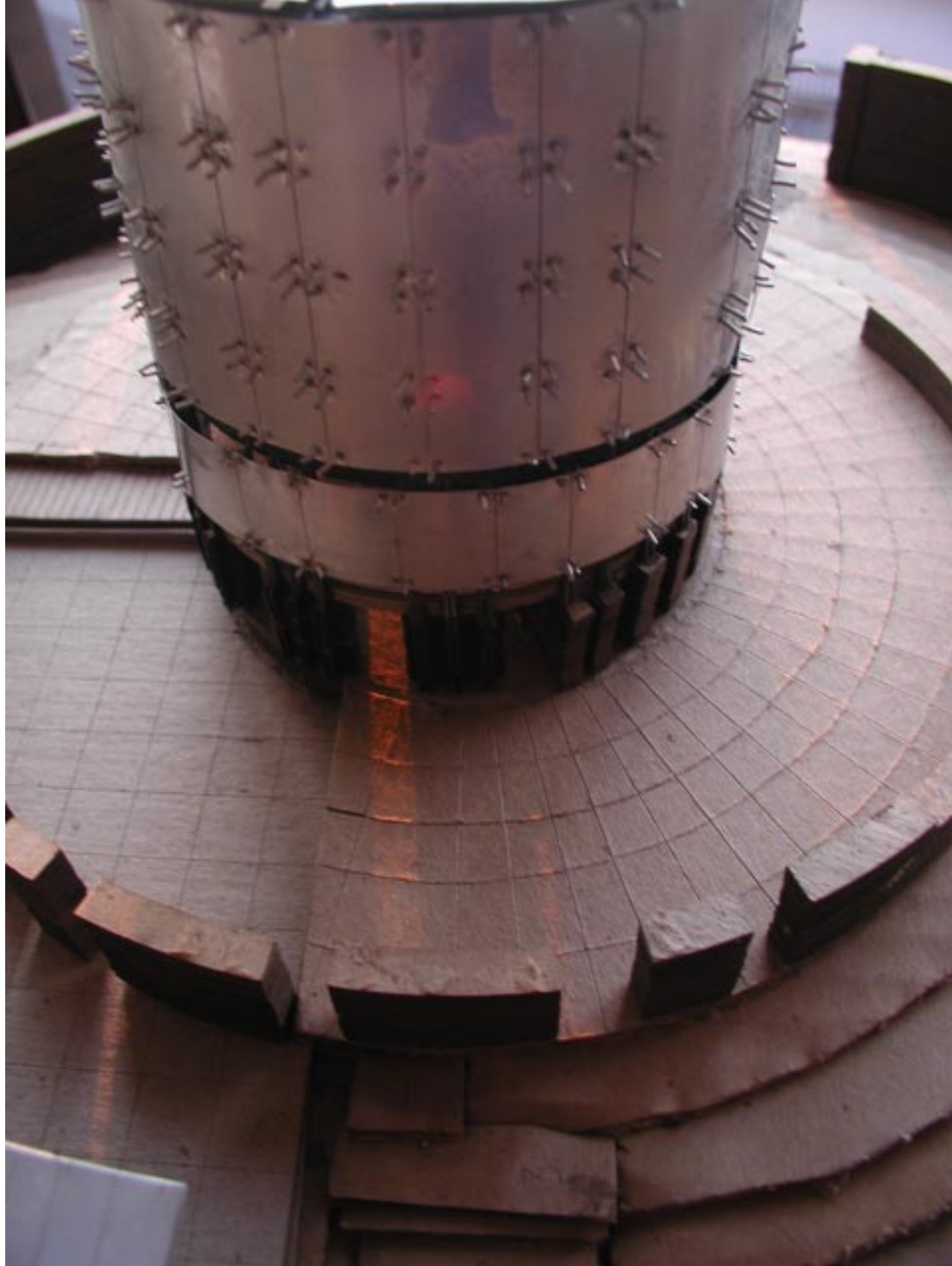
Master of Architecture

BETWEEN EARTH AND SKY

A thesis about primitive mass as it rises from the earth.



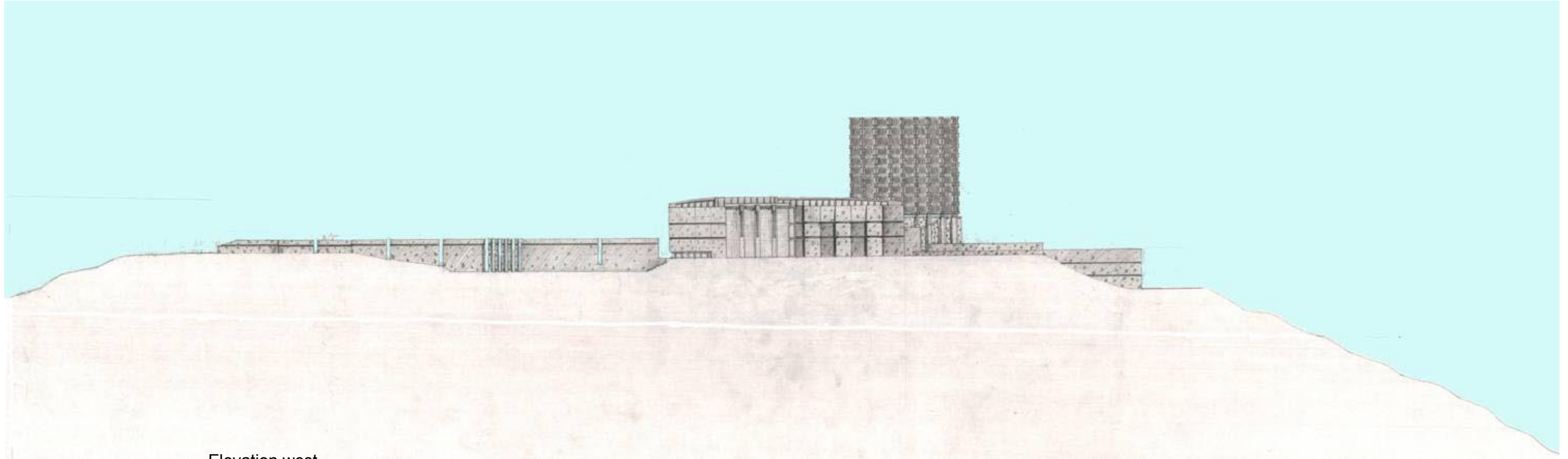
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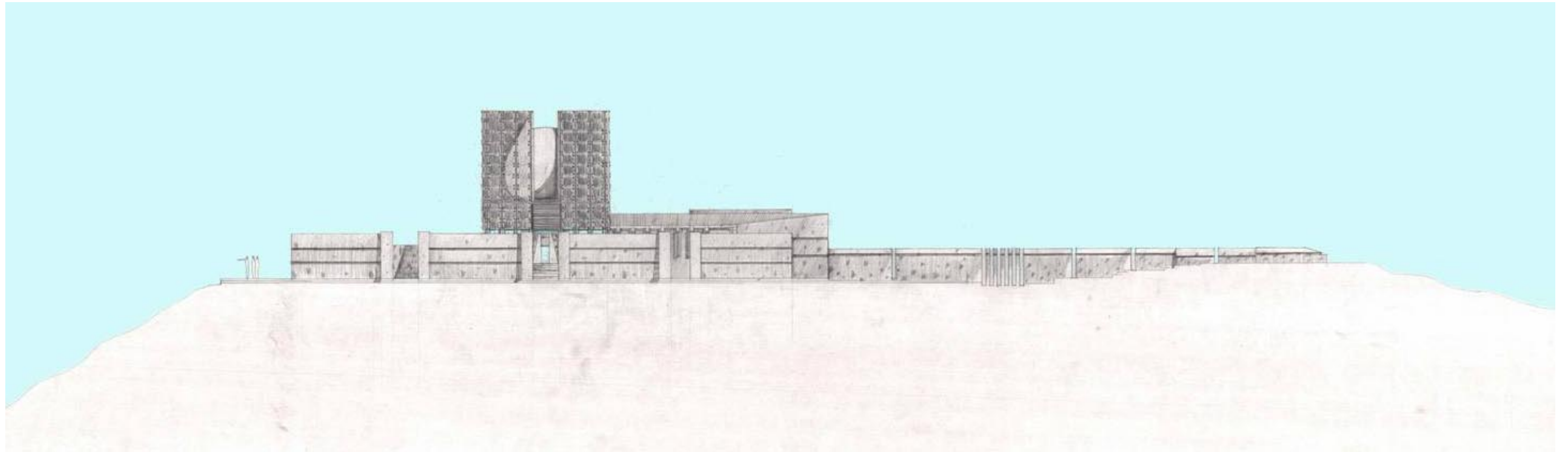
ABSTRACT

This thesis is about primitive mass that rises from the earth to receive modern structure and in doing so it becomes path, center, and boundary. Its thickness is carved, anthropomorphic, creating place for structure and light. The modern structure, is a place where science dwells, it is infinite, boundless, it allows precision to be born. The proposition suggests that when the two come together there is a moment when the construction changes, and it is in this moment an architectural event should occur. The project is an astronomical observatory for a small college physics department in central West Virginia, it makes a place for the observatory tower, a classroom, conference / exhibit hall, restrooms and office space, the in-between becomes a primitive observatory plaza marking the winter and summer solstice as well as the equinox sunrise, it is a place for gathering and teaching. The secondary focus is that of process, many discoveries were made during the beginning phase of the work, which will be revealed along with the project.

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Elevation west

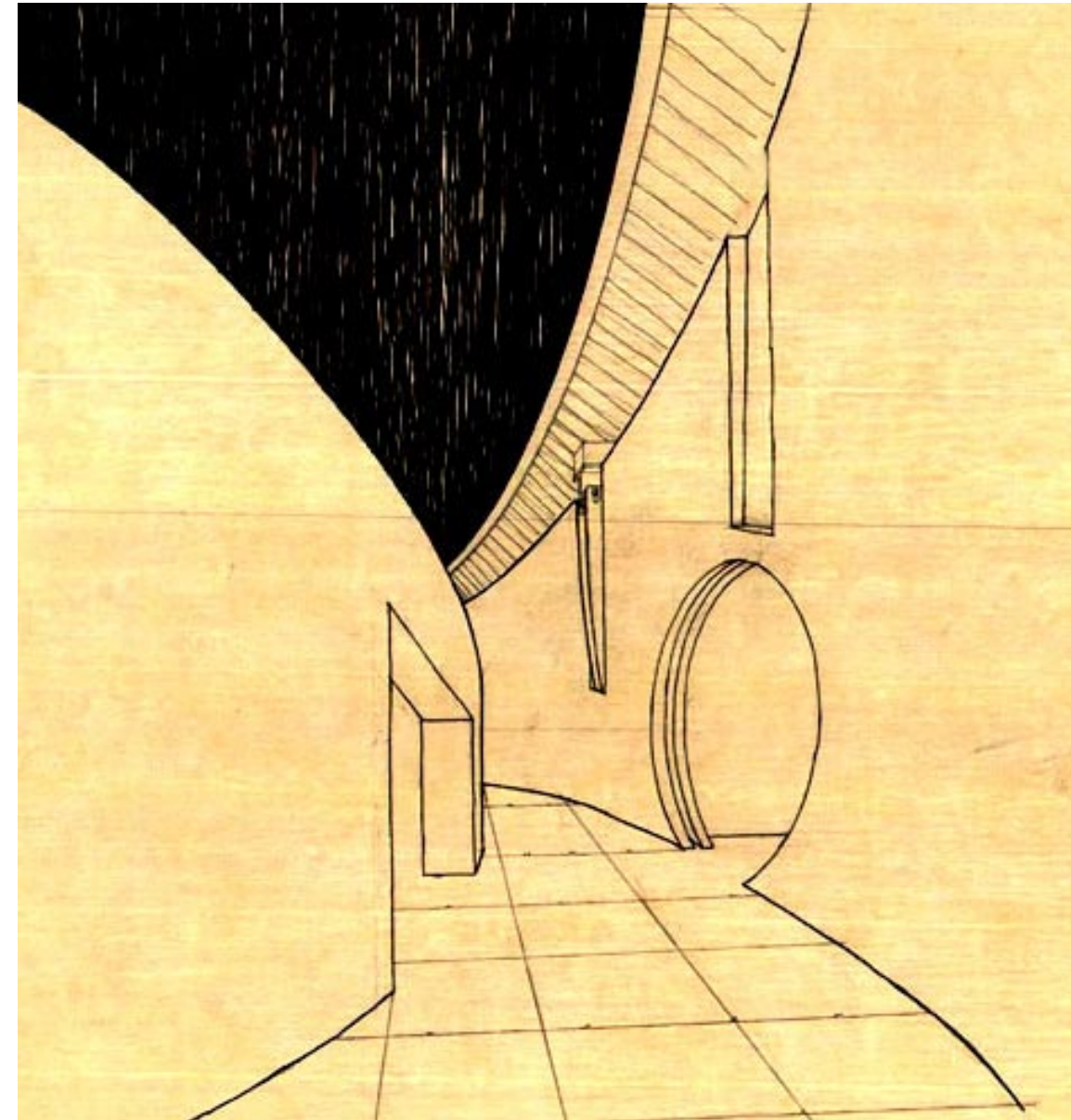


Elevation East

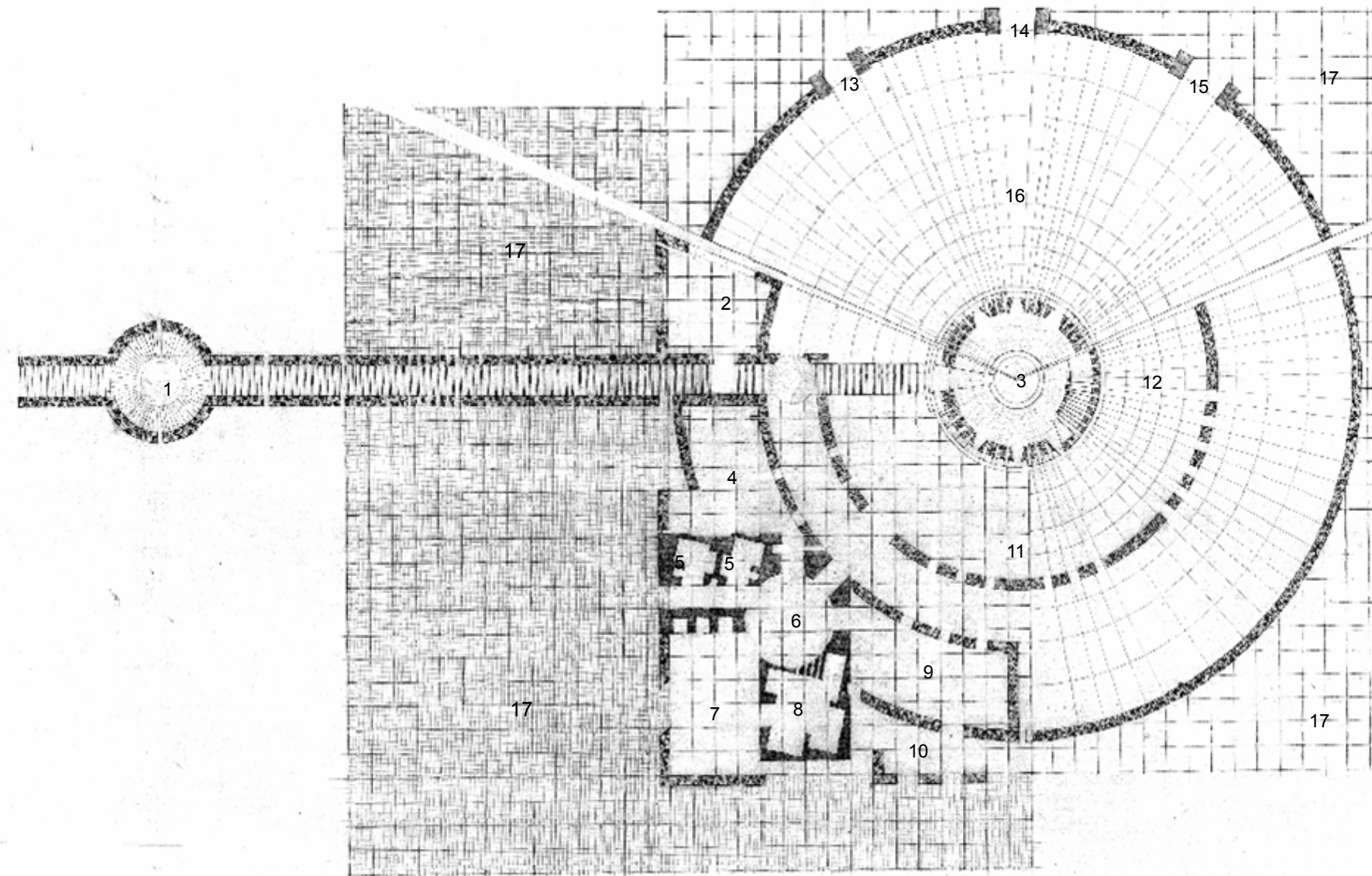
THE PLAN

Marco Frascari in *Thaumatic architecture* (Intersight 1993) describes the plan “as one of architecture’s most fascinating and puzzling enigmas. Plans present the entire building by simplifying its reality, yet at the same time, they manifest a complete view of the building’s interacting parts by showing at once what is visible.” The interaction of the parts for this project is important because it unravels their very synthesis. The path, for example is situated lower into the earth expressing its relationship to the project whole, that of horizontal direction toward something, a goal. It also becomes a balancing element between its own beginning and the seed of the whole plan, the modern observatory. The sun wall, higher than the path, stretches itself toward the sky to receive light as it sets a place for all the activity that dwells within. The square of the learning center becomes a manifestation of the earth, its thick and primitive frame stretched from below rising upward to be inhabited by man.

The large circle of the outer boundary walls cut into the square creating a radial path out of its void permitting a planar transparency between the parts using its radial power to create path. The circle became the dominant form for the project partly for this reason alone, but also the relationship can also be taken back to the ancient Mesopotamian rope stretchers who would use it as a generator of form. The circle’s richness also stems from a long mystical history as well, the alchemists viewed the circle as the mutation of elemental form suggesting a constant growth, decline, and change or life, death, and re-birth. It has always been the symbol of earth and man, as Sperone Speroni, a native of the Veneto, describes the resemblance between the earth, man, and a circle. He states, “**The circumference is like the outer garment, the surface of things; the center is like the person, man who is earth, water, fire, and air.**” (Carlo Scarpa *The Complete Works* pg. 22)

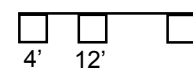


An early sketch of the passage as it cuts through the square of the plan.



PLAN VIEW

- 1.Path entry
- 2.Mechanical room
- 3.Primitive plinth
- 4.Office
- 5.Restrooms
- 6.Lobby
- 7.Classroom
- 8.Library
- 9.Conference room
- 10.Outdoor gathering space
- 11.Reflecting wall
- 12.Overlook to the south
- 13.Summer solstice portal
- 14.Equinox portal
- 15.Winter solstice portal
- 16.Plaza for gathering
- 17.Earthen boundary





The site topography.

THE SITE

“All Greek sacred architecture explores and praises the character of a god or a group of gods in a specific place. That place is itself holy and, before the temple was built upon it, embodied the whole of the deity as a recognized natural force.”(Vincent Scully)

The site becomes the basis of the concept model within which the particular position of the architect may be poured into to that brings the breath of life to the man made place. In his book *Genius Loci* (pg.14) Christian Norberg-Schultz says that:

“The character is determined by the material and formal constitution of the place. We must first ask : how is the ground on which we walk, how is the sky above our heads, or in general; how are the boundaries which define the place. How a boundary is depends upon its formal articulation, which is again related to the way it is “built”. Looking at a building from this point of view, we have to consider how it rests on the ground and how it rises towards the sky.”

The site is located on a small mountain set in North Central West Virginia, it was chosen both for its proximity to the local state college who would be promoting the project as an addition to a growing physics department and much needed place of study. The topography, with its naturally rounded peak creates the perfect center. The long slender ridge an entrance path, and steep sloping walls allowing clear views and a perfect natural boundary between earth and sky. The seclusion allows for pure darkness, away from light pollution and detrimental heat of the day in the small bustling city. In addition to the topography and natural geometry the site should also reveal something of its history, who has dwelt there, how have they lived and created place there, what are the colors, smells, and how is it to be there? The local vernacular is made of a host of materials but one of the most prevalent would be the natural sand stone of the region, sandy yellow, orange, and at times purplish-red, wood and steel are also easily accessed. The community in which the site rests is heavily steeped in the farming of live stock such as horses, and cattle, grains, corn and other plants as well may be found. It is owed to this industry that a host of forms may be found in these common vernacular structures. Cylinders rise into the sky as grain silos made with heavy stone bases clad in a steel or aluminum skin. Spheres, cresting the horizon, are present as water towers, and cubed feeding stables rest upon hollowed stone plinths that allow the live stock a place of repose to receive nourishment away from the cold of the winter wind and heat of summer sun. It is symbolic elements such as these that can be translated into the building’s properties that somehow make the natural character manifest. (Norberg-Schulz *Genius Loci* pg.17)



East Elevation



Looking Northeast



Looking South to the peak



From the North

VERNACULAR

Along with the topography, color, dimension, terrain, and other elements the site may also yield characteristics such as local built form. In this study, a barn, near the proposed site was used to investigate the use of local construction techniques and use of local materials. The main material being the sandstone readily available directly from the site. In this example the stone rises from the earth as a telluric mass used as storage, structural support, and feeding place for barnyard animals. The upper floor of the barn, used for storage of feed and equipment is made of more modern-like materials such as machined timber and steel, its structure rests on the stone mass below. It is with this study that the thesis proposal is made. As the telluric stone receives the machined elements a certain crudeness can be found, for example, in the photograph of the steel window frame, the mortar is simply scraped up to meet the frame, no exception is given to the stone to allow the for the window to rest, thus overtime the mortar will give way to the elements allowing no protection to the inside. The next discovery came when further attention was given to the manner in which the wooden joists met the stone, again nothing gave a reception for the wood as it met the stone, only the paint used to coat the wood. The thesis proposition is that when two materials meet, such as steel and stone an architectural event should occur.





A sandstone wall near the proposed site.

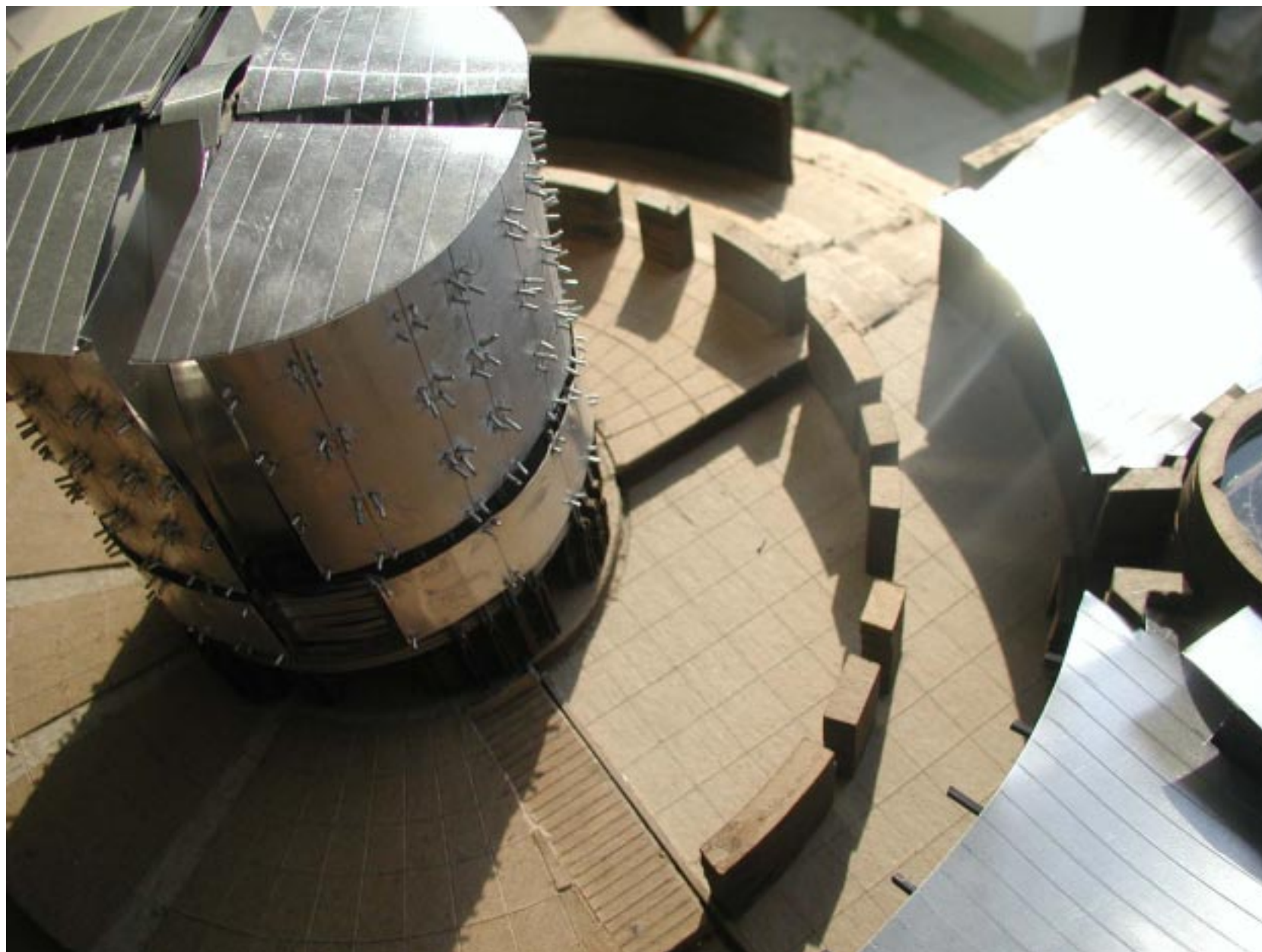
BETWEEN EARTH AND SKY

The sun walls and the those of the learning center will be constructed by building formwork from wood, filling them with the sandstone from the site and pouring concrete over the layer of stone. The concrete will then flow over the stone causing them to bond together thus creating one element of two. This method was chosen foremost because it speaks of the earth, of a primitive mass reaching skyward, making a place for the more precise industrial materials of steel and glass. The stone also becomes an integral part of the wall, not just a simple layer of skin but a skeleton and a skin, which also becomes more related to the primitive construction of wall.

In Taliesin West, Frank Lloyd Wright used a similar method of construction to make the structure more a part of the desert surroundings. He felt, because there were no mountains his building should grow from the earth horizontally and reach toward the sky high enough to break the flatness creating a connection between the horizontal and the vertical.



Local construction site with sandstone.



The telluric draws from the earth the mystery of her support. The stone and concrete become one, parting only when the precision of the industrial steel, holding the observatory needs a place to rest, as its towering makes the invisible air visible.

EARTH

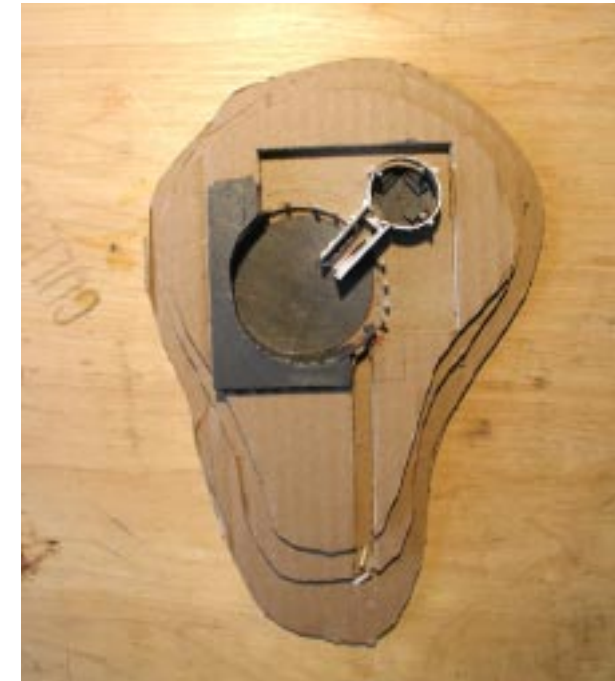
A series of site models were built to begin to understand the earth and how it wanted to be. Should the observatory rest lightly on top of it? or should it burrow down into the soil to become subterranean? The first model of the series investigated the question of insertion into the earth by carving a circular subterranean plaza-like element in the center of the peak, it was attached to a linear path that also burrowed into the earth. The second began to ask questions concerning the support facility. Should it be raised from the plaza or should it be of the plaza? It also began to form the center of the path by marking it with an encircled area. A second square appeared to balance the growth of the supporting building, the observatory also presented itself a little left of center of the path. The third iteration began to test the position of the observatory again working off of the diameter of the telescope, it was placed right of center, inside a second square, trying to create tension between the entry and its own position. The second building is removed and a plinth-like element from the earth and gives some of its mass to the plaza space as it cuts through. The fourth model in the series loses interest in the second building and allows only the plaza and the observatory to remain. The plaza has developed a second inner wall separating the center from the cut of the earth. The observatory sits directly in-line with the path, but still to the outside of the plaza. Importantly, the path has gained an entrance condition consisting of the earlier center condition of the second model, an encircled wall takes position at the beginning of the path as if to say this is where a special place begins. The models were also instrumental in the development of a series of sketches using the geometry of the topography of the site.



1. Earth



2. Observatory to the earth.



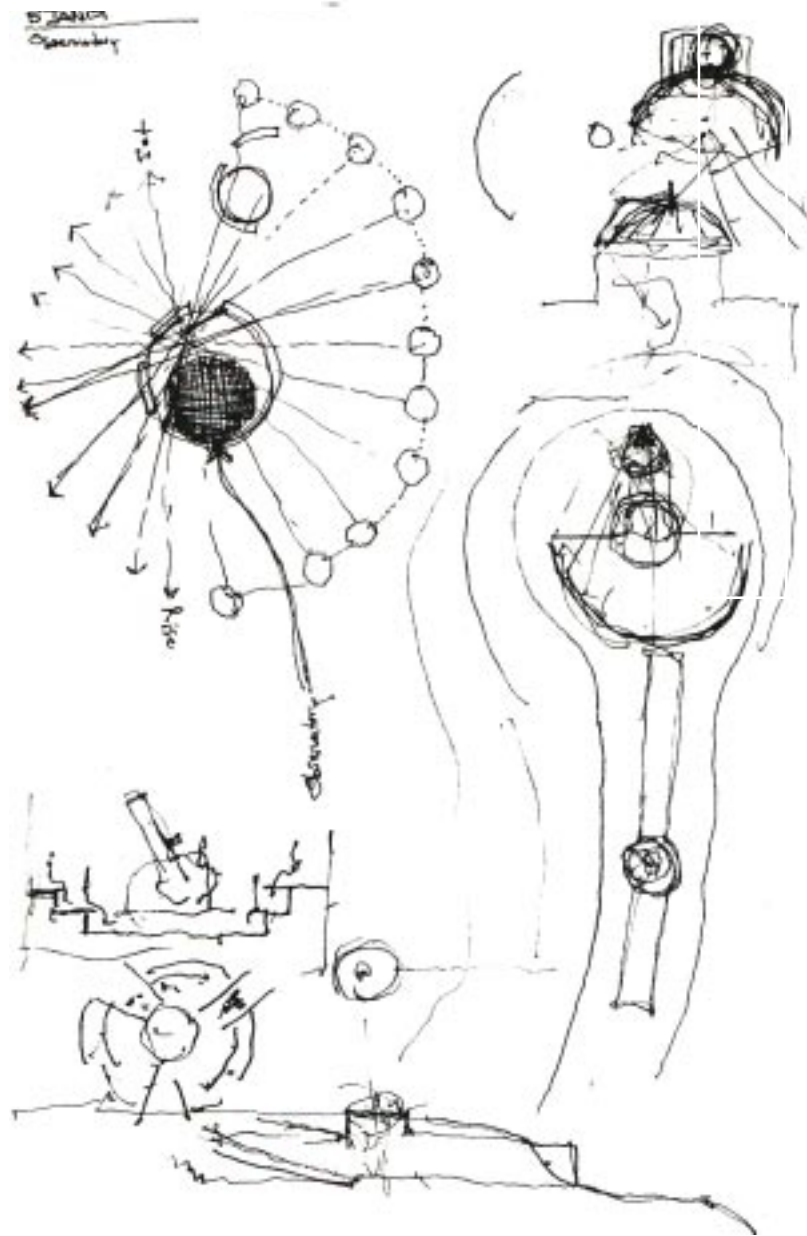
3. Plinth, primitive and modern observatories.



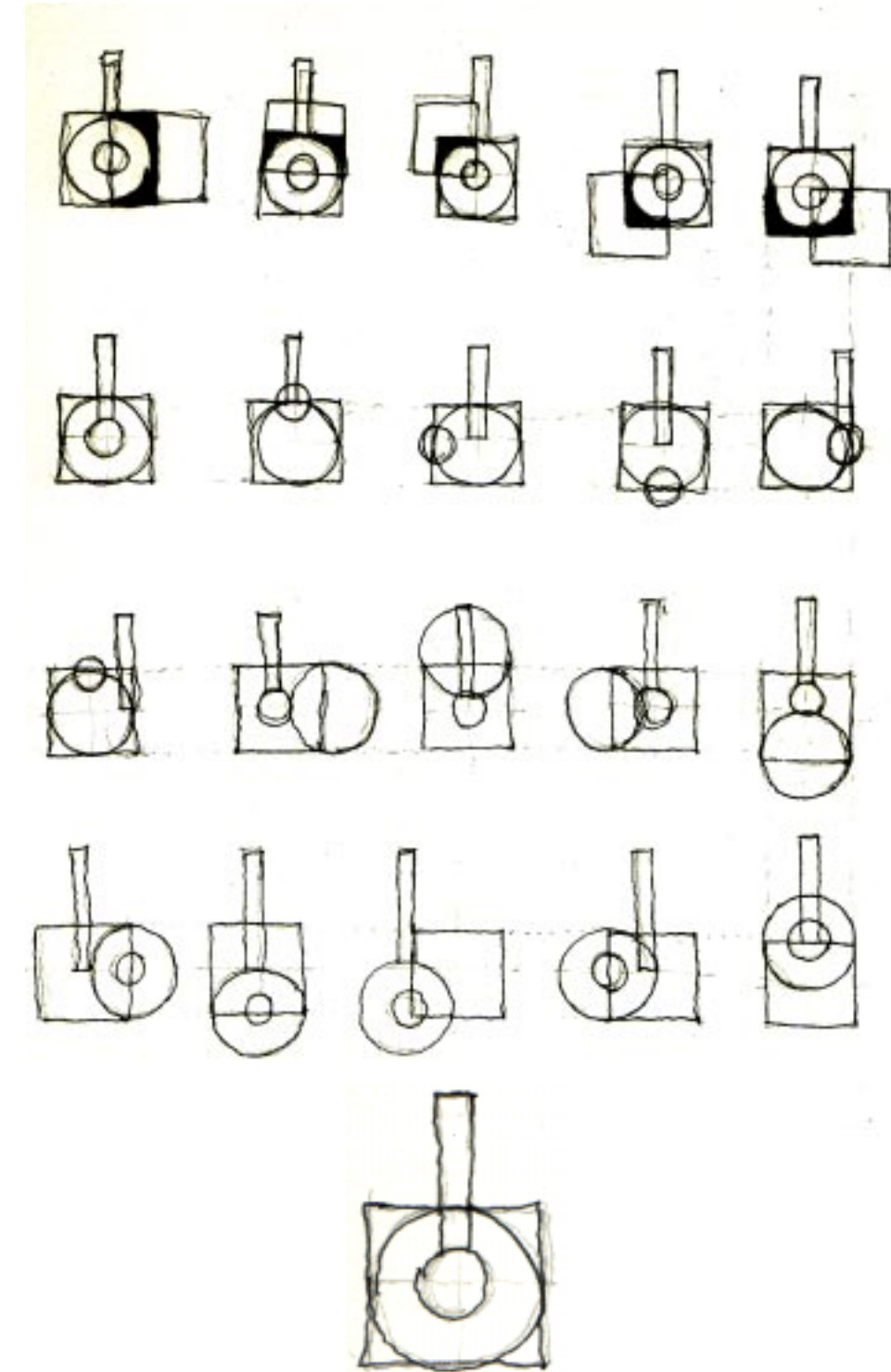
4. The observatory and the plaza.

THE CONCEPT

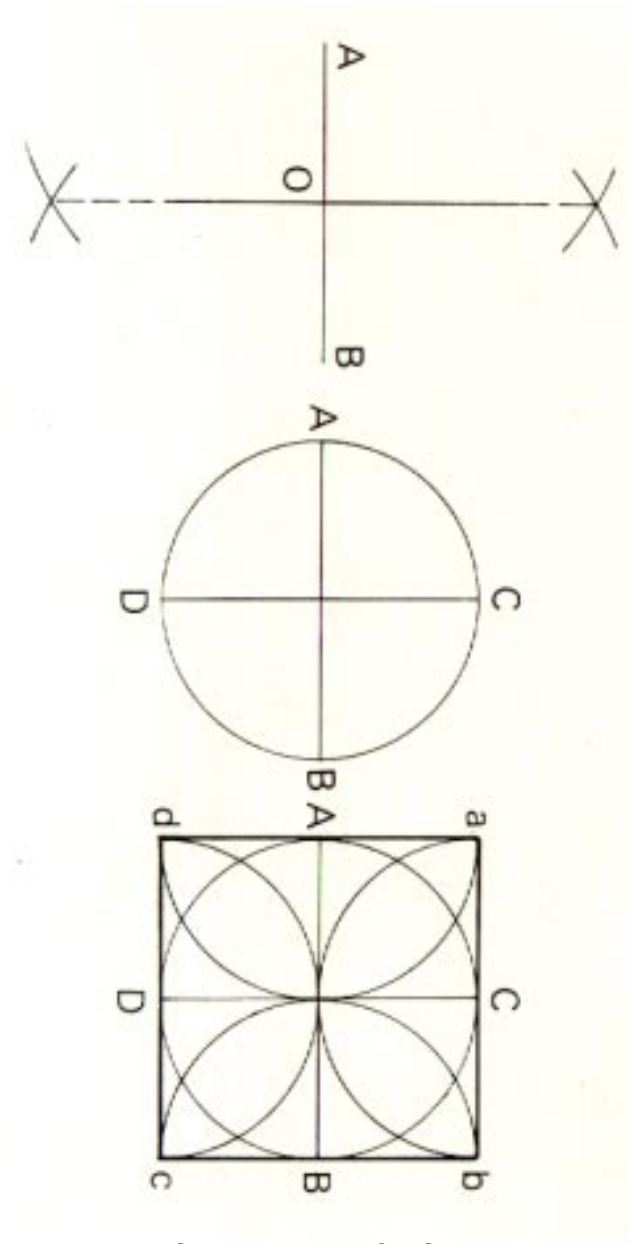
After an analysis of the site, certain natural geometries were discovered. For example, the peak has a rounded plateau creating the geometry of a circle 80ft.in diameter, the ridge from the North creates a natural linear path to this point. A third element was added to the mix, a smaller circle signifying the diameter of the telescope. A square was later added as a boundary for the diameter of the peak. This boundary was not a fortress-like element meant to contain or protect but a boundary that marks the beginning of a man-made place. The sketches were used as tools to find a hierarchy in the forms. The chosen sketch best fit the site conditions because it used the circle representing the telescope as center, the larger circle and square became a boundary, and the path, a rectangle leading directly to the center. Using the geometries as simple shapes at this point became important in organizing the parts of the project and recognizing them to the site's natural characteristics. Further study was needed to develop a complexity in the parts and their relationship to the whole which would lead to a greater understanding of geometry as a tool of proportion. Islamic Art and Architecture would prove to be helpful in this understanding.



Site schematic sketches.



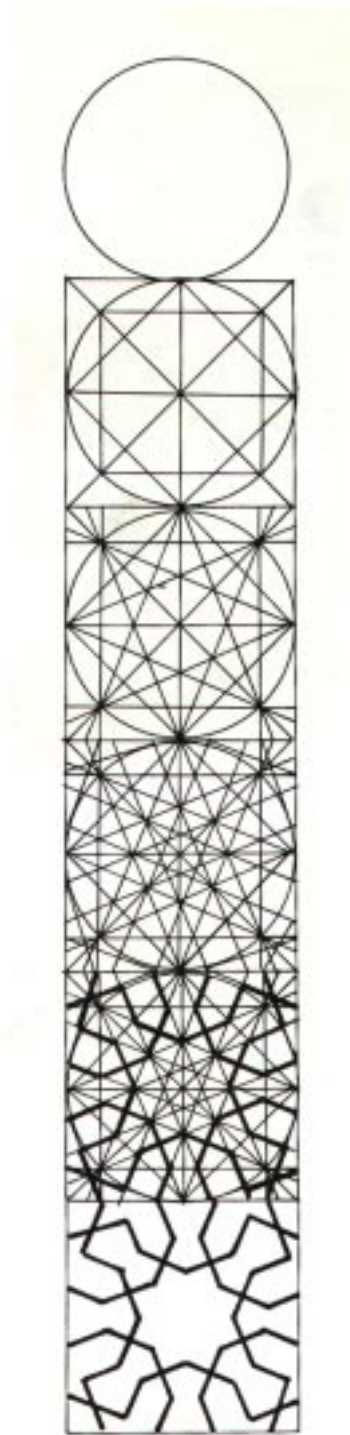
The chosen sketch



AB Construction of a Square

INSIGHT FROM GEOMETRY

The Islamic artisans engage in making mathmatically founded patterns in marble, metal, and ceramics, within two societies, the Mesopotamian state-cities and Egypt. The Egyptian rope-stretchers and temple surveyors developed what would seem to be a reproducible method by using a peg and cord to construct circles and straight lines in the sand. From here they could construct a geometric procedure for generating precise constructions such as the Tomb of Bibi Khanum seen at right. Later, the Greek genius through Euclid, would transform geometry into an exact abstract reasoning device, thus illustrating a borrowing of technology from civilization to civilization and development of methods of self expression that would serve their own particular beliefs and practices. For this project geomerty is used to develop system of proportion, size, shape, location, and form of the observatory, office building, and the boundary walls. A construction known as the AB method was used for its resemblance to earlier concept sketches using the circle and square. this relationship proved to be important because the two geometries can be proportionally related with the AB method. The shape of the unit of design is determined by the circle. The initial divisions of the circumference of the circle (described by the unit radius) into 4,5, or 6 equal parts determine the system of proportioning used to generate the repeat unit of the design(*Geometric Concepts in Islamic Art*). The Tomb of Bibi Khanum is an example of using this method as a tool for deriving architectural proportion. The center of the tomb becomes the genesis for the primary circle, then four half circles are constructed from center. When each one meets the other, a square is created. From these two geometries other ones following the same proportion can be made. This allows for a proportional ratio to brought into the design of the plan.



Making of a tile

The making of tiles in the example to the left also gives clues to how geometry can be used in art as well as in the smaller architectural details. The architects and craftsman using this technique see geometry and its forms in a more three-dimensional manner. Each layer adds more depth rather than more surface, as if we were to follow a stone being tossed into the water, the stone would make ripples, but the laws of physics tells us the stone continues until something stops it, this is how the lines are seen by the craftsman using geometry as a tool of design. In the tile example shown at left, each new iteration of the the drawing adds more complexity that the artisan can call upon to create the three-dimensional qualities of a finished tile. From studies such as these, a new way of seeing could be developed. Rather than using the geometry as a surface element brought about by the site, it can be used as guide for the elevations and sections as well.

A site section could then be drawn, using the “repeat unit” AB method of construction, a proportion of part to whole could be constructed beginning with a circle the demension of the telescope and ending with a diameter close to the that of the naturally rounded peak of the mountain. From this all parts may relate to each other thus creating a continuous flow of the order form one to the next. The siting of the structures became remenisent of an earlier study drawing of Tempietto Clitunno located in on a northern Italian hillside.



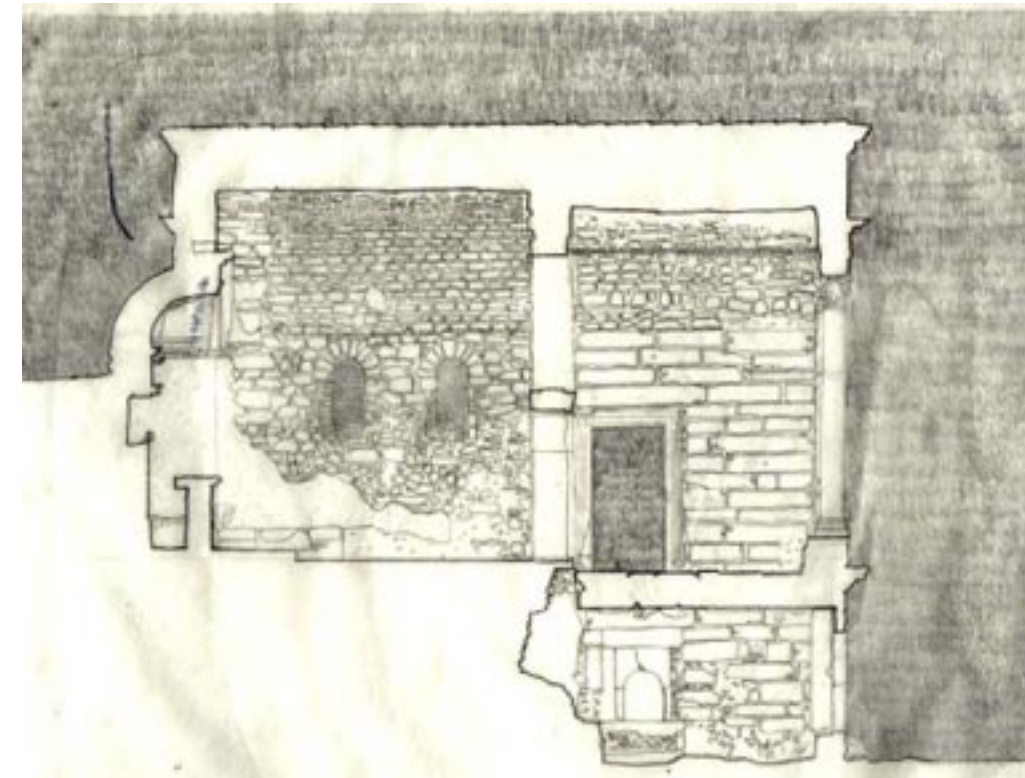
AB Repeat method used on the site

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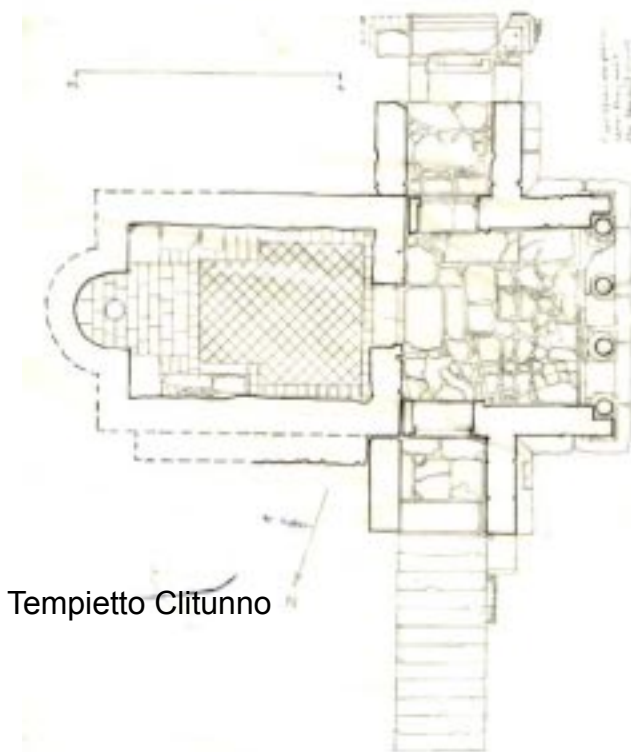
Tempietto Clitunno served as the church of San Salvatore in Pissignano Italy, a small Umbrian town, until 1810 when it was deconsecrated. The earliest record of the Tempietto was recorded in the papal tax register saying the holder of its benefice had paid to the Pope in 1333, however both its dedication and the building itself must antedate 1333 by many years (The Tempietto Clitunno near Spoleto). The appearance of the small church is that of an Ancient Roman Imperial podium temple designed for the worship of pagan deities, its most prominent element sets the keynote for the whole: its Corinthian order and variety of ornament resemble that of the festive ancient Roman Empire during the first, second and third centuries A.D. (The Tempietto Clitunno near Spoleto)

During the actual drawing of the Tempietto certain key understandings came about that would prove to be helpful later during the thesis study, for example the small building, eleven meters in length, stands perched on a steep hill commanding its site, which was the first important discovery, it answers the question of how a public building should be in relation to its site. The approach is given to the building by way of the north and south, the northern axis holds a stair leading to the portico, the south, level with the grade of the hill holds a walkway that leads to the entrance, giving one a choice upon entry. Typical Roman Temple Architecture would bring the patron directly off the road into the building. Once on the porticoed entrance one would find four columns of the Corinthian Order, and a wide stone paving roughly placed on the portico floor. A step up and a lowering of the ceiling inform one that they have entered a sacred place. In the sanctuary, designed for the worship of pagan deities, the space holding the altar becomes more compressed as the floor steps up, and the ceiling lowers again to receive the altar, an example of how architecture may express the spatial qualities of the sacred and the profane.

Latin quote directly translated as:
"Holy God of the Angels who made resurrection."
Taken from over the frieze of Tempietto Clitunno.



Southern Section of the Tempietto



Floor Plan of Tempietto Clitunno

**My guide and I came on that hidden
road to make our way back into the
bright world; and with no care for
any rest, we climbed-he first, I
followed-until I saw through a round
opening, some of those things of
beauty heaven bears. It was from
there that we merged, to see-once-
more-the stars.**

Dante Inferno Canto XXXIV

PATH

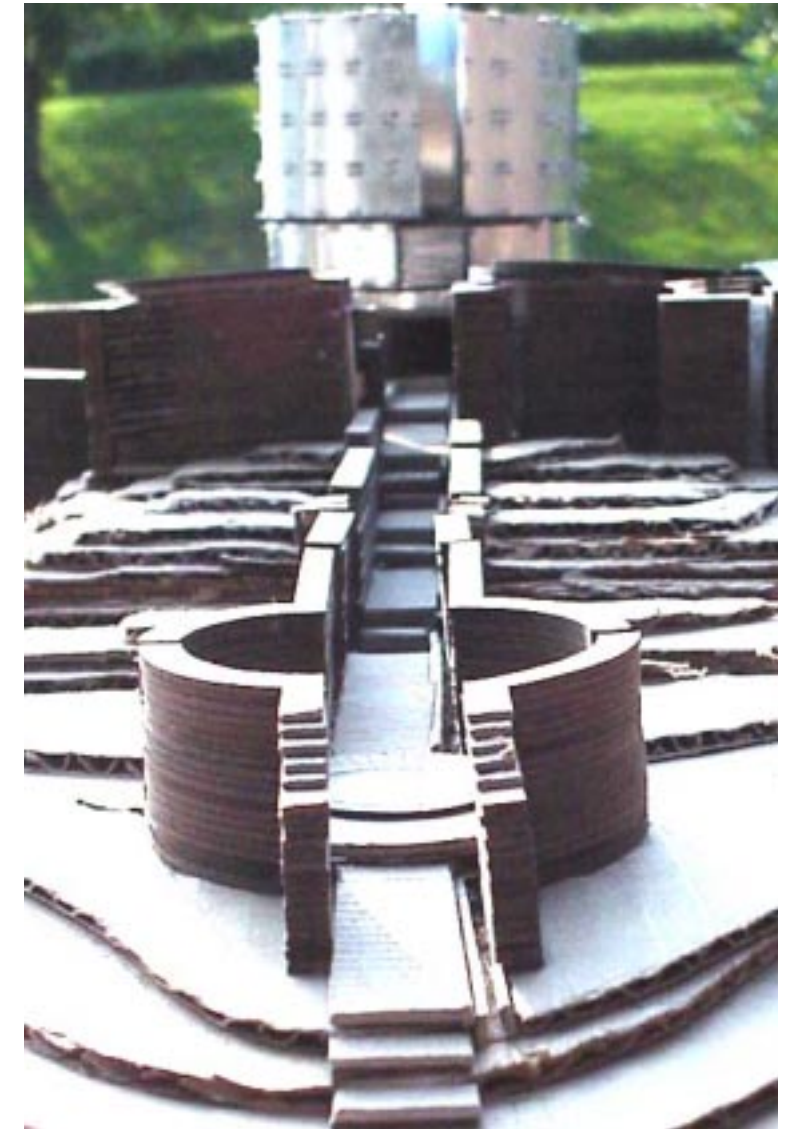
In his book *Toward a New Architecture*, Le Corbusier says **“An axis is perhaps the first human manifestation, it is means of every human act. The toddling child moves along an axis, the man striving in the tempest of life traces for himself an axis.”** Path is important on all levels of existence as Le Corbusier tells us with his quote, an axis is the basis of every human act, therefore we must be prepared to move across this axis. In general path represents movement on a variety of ways, some have a specific goal, others are more cosmic in that they have no specific goal but only meander their way across the landscape for what seems forever, a good example of such a path would be some of the street paths of the Northern Italian hill towns such as Umbria, where paths are found pressed between rustic buildings creating caverns of solid and void, light and dark without end space. Other paths become more qualitative using elements such as the cardinal points, North, South, East, and West becoming a reference system describing orientation. Christian Norberg-Schultz states in his book *Concept of Dwelling* that **“movement along a path can be distinguished by two different characteristics, rhythm and tension.”** Rhythm is the complement of tension which is connected to the vertical. We can find in the colonnaded sacristy of Santo Spirito, designed in 1489 by Giuliano da Sangallo, 12 huge columns creating the vertical axis with arches supporting the structure's roof, the tension may be found in the cramped spacing made by the columns as they lumber their way toward the altar at the opposite end of the aisle.



Path view to the beginning.

Center is also dependent on path in that one provides the axis that is necessary for the other to be. The observatory project has actually two such characteristics of path, one being directional path, toward center. The second characteristic is the qualitative path of the cardinal directions. The directional path takes its clues from the orientation of the site, it gently slopes upward toward the peak where center takes place, tension and rhythm are created by the walls that make up the physical presence of path. Rhythm is applied by light admitted into the walls by slits carved only at grade changes in the path. Tension is created much like the tension of the Italian hill town streets, the walls outstretch human scale and hover over them. The light and dark, coupled with the slight grade changes that take the would be observer from a space open to the natural surroundings to one of just wall and sky.

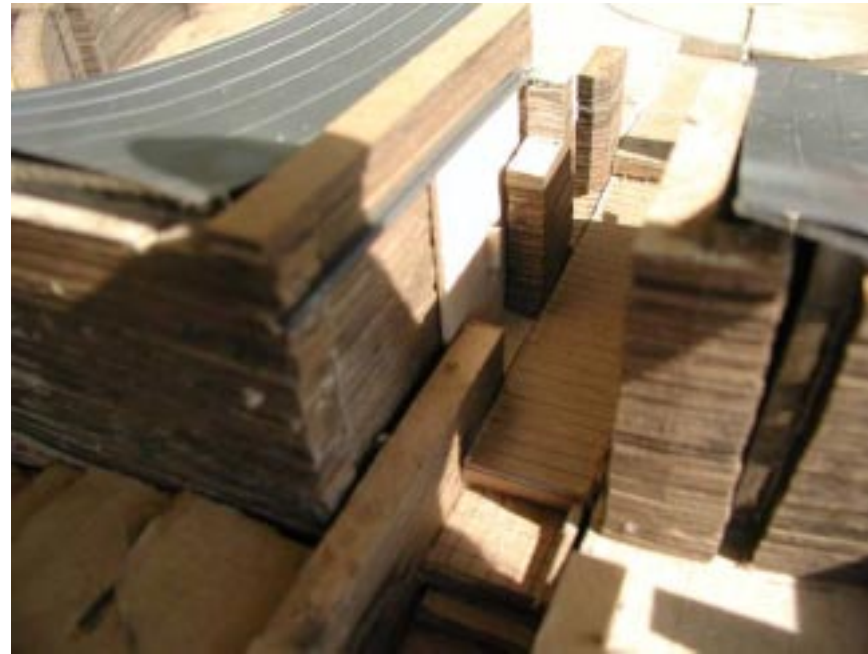
The path orients the observer first to natural surroundings by way of a low circular opening representing the entrance, to allow for pause and reflection. As they descend further into the path the walls gradually enclose them, only to be broken intermittently by the cuts in the wall at grade level changes that also allow for views of the sky and landscape below, and to let light to enter from the east and west. The path slowly brings into focus the assigned goal, that of the observatory, center, axis mundi, another path that of the vertical between earth and sky.



Path view to the plaza entrance.



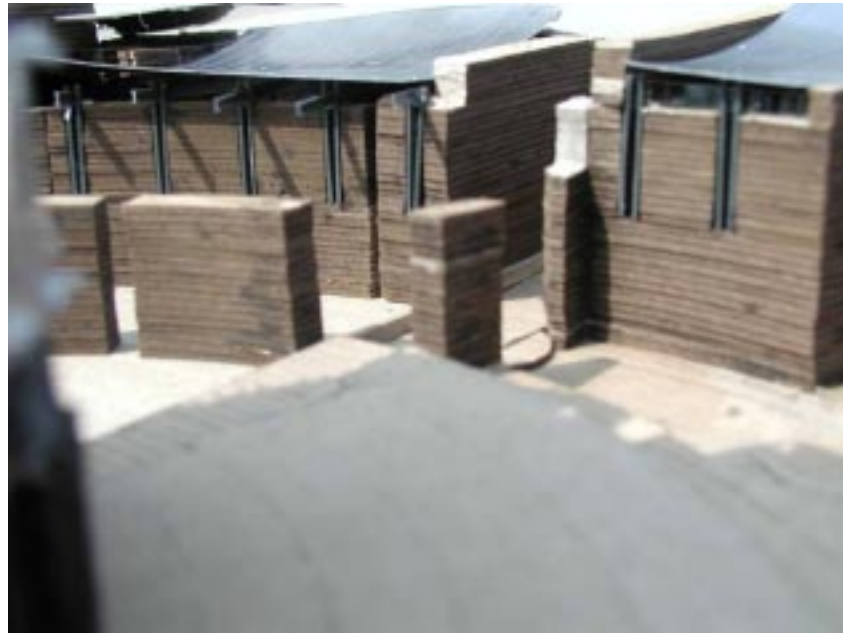
1. View of the path's center.



2. Threshold, between path and plaza.



Light study of the path to the north.



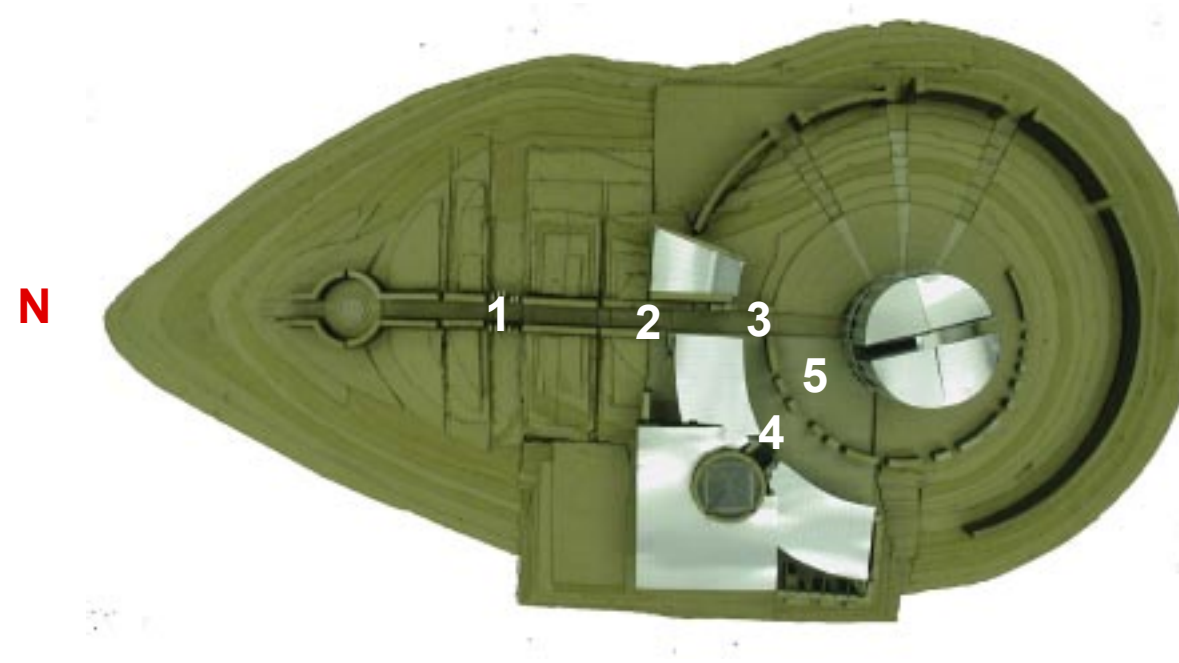
3.The Plaza entrance.



4.The entrance to the Learning Center.

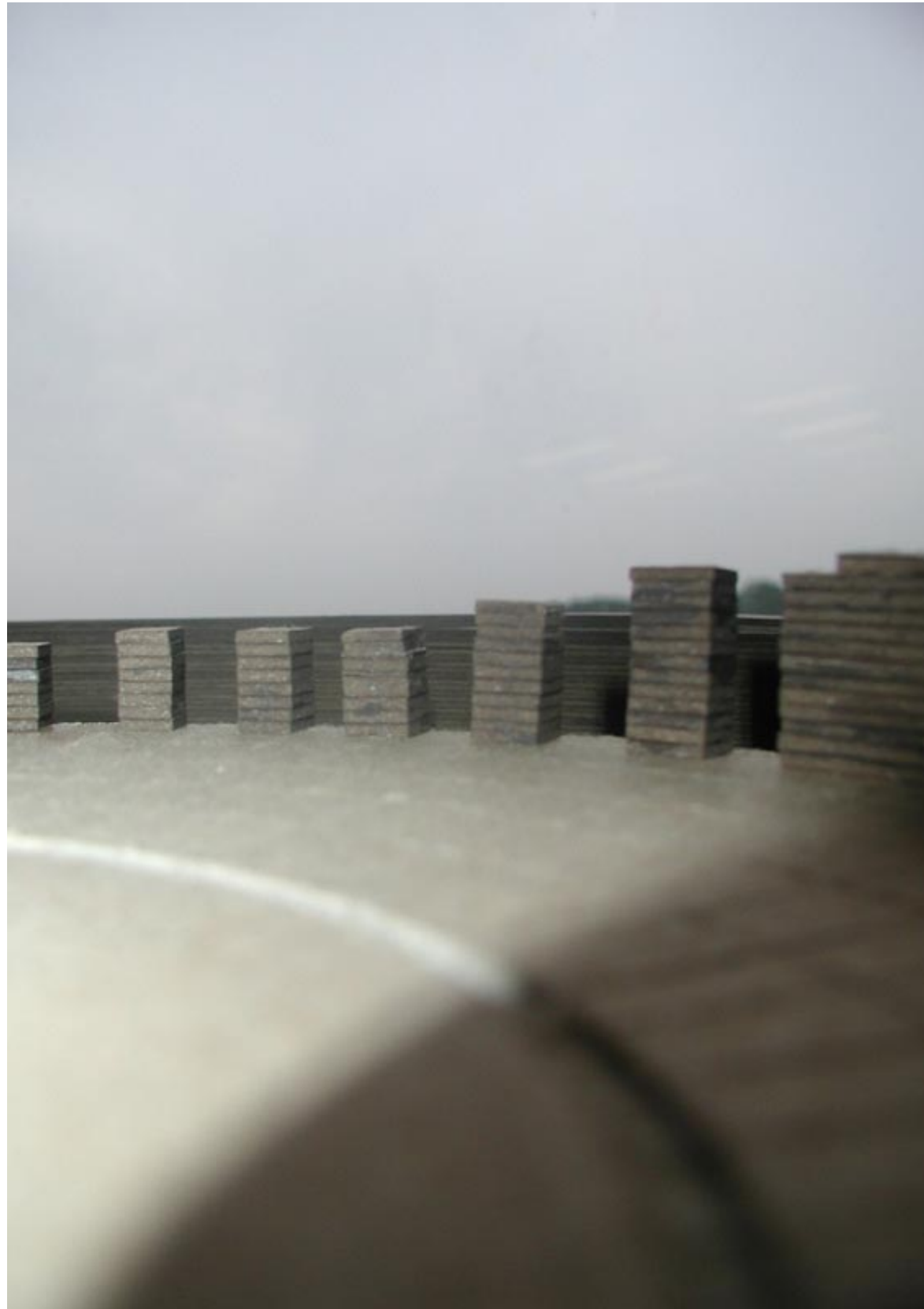


5.The "joint" in-between.



THE IN-BETWEEN

The space between the “outside sun wall” or the boundary and the tower or center becomes a plaza, a place where the sky meets earth, where human beings gather to learn, discuss, listen, and observe. As stated before the boundary is not a defensive one meant to keep things out but one that sets up a place to be. With this in mind the plaza had to be understood in order to create one worthy of the site. As a precedent Piazza Della Signoria in Gubbio Italy was studied. First, to understand piazza or plaza we must understand some certain properties, Christian Norberg-Schultz says “ A basic property of existential space is the distinction between horizontal and vertical, accordingly the two directions play a constituent role within the language of architecture. The horizontal relates to the earth and the vertical to the sky, and thus they determine the kind of dwelling which a certain work of architecture makes manifest. To become manifest, however, horizontal and vertical have to be built.” (Concept of Dwelling) It can be said then that the earth and sky become unifying elements in giving architecture an identity. In this project the identity is found in its position in the world. It relies heavily on the fact that it rests on the horizontal yet reaches into the vertical, in fact this reaching is its purpose, it reaches into space to record the passing of time. This passing of time then becomes very important, so much so that it should be given special place. Piazza Della Signoria gives special consideration to the horizontal and the vertical. The Piazza in Gubbio was designed by architetto Mateo di Giovanello, during the XIV century. Because the piazza rests on a hillside its floor and the sky meet with a boundary wall connected to the sky by pilasters and the mountains in the distance. As one stands facing its edge toward the city below, one only sees the pilastered edge and the sky touching, no clue is given to the city below.



The plaza overlook meets the southern sky.

The observatory plaza connects with the horizon in a few ways. First, the slits that allow the solstice and equinox sunrises to penetrate the outer sun wall and find their way to the center of the observatory base, finally washing against the lower wall between the tower and center for learning. The overlook to the south, shown at left allows a glimpse of the sky and the mountains beyond. If one would look from center to the edge of the “outer sun wall” they would only see wall and sky, facing due South in the plaza there is an overlook with crenelated elements making the connection between earth and sky, there seems to be a certain power in elements that extend above the wall to receive the blue offered by the horizon, a realization made by looking at the walls of castles such as Galfetti’s Castle grande project. A connection is also made in the tower itself, as one precedes up the stair to the observation deck, just at head height there lies a banded window running the circumference of the cylinder. At a certain point only the top of the “outer wall “ and the horizon are present.

The relationship between horizontal and vertical is also present in the support building as well, when entering the building through the main entrance one passes through a lobby space. The room is cylindrical morphing into a cube as it passes over the human scale. It ends in a four part window to the sky allowing sunlight to enter into the space. As the outer sun wall cuts through the mass of the cube it passes through the interior, bringing with it slivers of sky via sky windows that allow light to enter into the conference/ exhibitroom and the office space where the curve is present. The vertical is also present in both rooms by slits cut into the wall facing the plaza. In the classroom, sky and the vertical axis are made present by a window above the library entrance and a vertical slit running the entire height of the wall along the northern axis.



Plaza center seen from site line of the sun wall

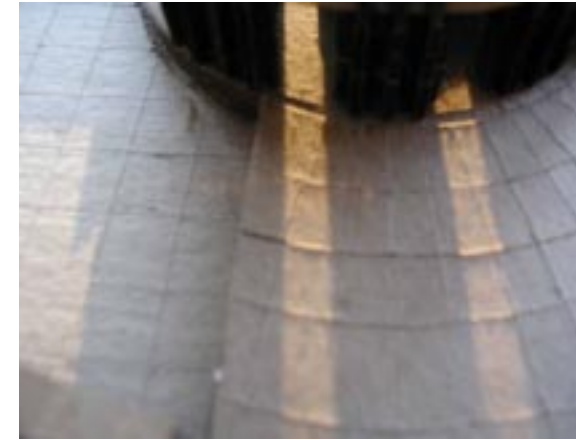
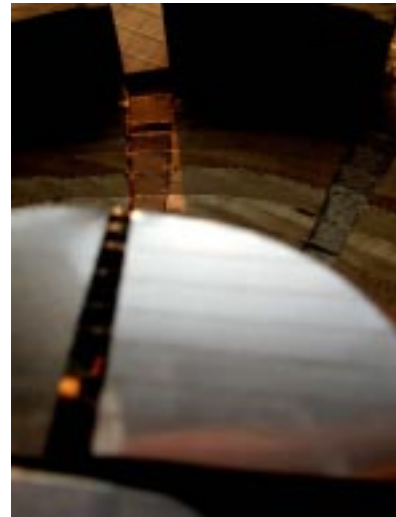


Plaza and Observatory meet

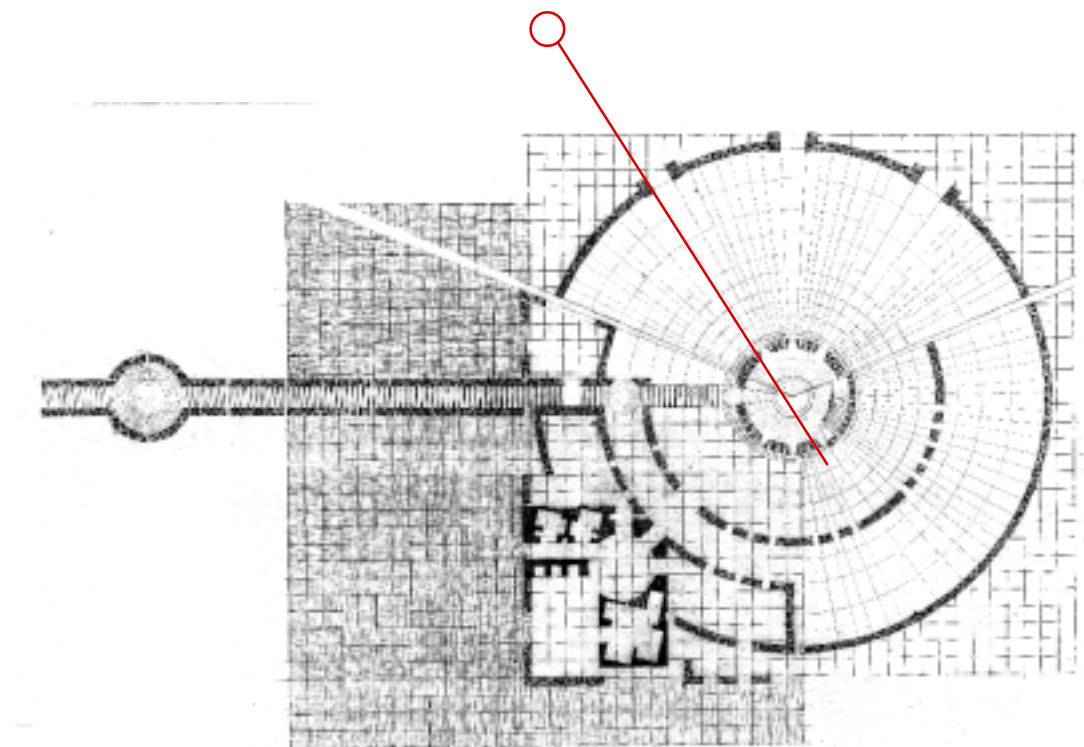
Phenomenally the plaza is where earth meets sky, the sky is given reason to be...With this project the plaza also takes on an additional role, that of teacher. It becomes an element that reacts to certain sunrise position throughout the year. For example, on June 21 the sun will rise and pass through the large aperture in the north eastern part of the boundary wall, or 'Sun wall'. As it continues to rise, the wall will accept a ray of light and allow it to slowly crawl its way to the underbelly of the Observatory's telluric foundation, where it will then pass through another aperture to the smaller boundary wall separating the tower from the 'Learning Center.'

Thus expressing one way ancient hunter-gathers may have kept watch on the changing appearance of the sun. For them, this luminous disk was created expressly for the keeping of time. It was a primal source of light, of the tides, of body rhythms, of the seasons which taught them when to plant, when to harvest, and when to hunt. The Ancient Maya of Yucatan, probably the cleverest astronomers in the Americas, incorporated the sun's movement into their architecture by way of an ingenious "solar observatory" which they erected during the beginning of the Christian era.

This plaza acts very much like the Mayan plaza in that it marks the longest day of the year, as noted above June 21, when it reaches the its most northerly sunrise position. Conversely, the Southernmost sunrise, or the shortest day of the year, December 21 will also be marked by the sun rising between the site marks in the wall, and entering the belly of the observatory once again. As with the Mayan Astronomer-Priest, the Equinox sun can be watched as well on March 21 and September 20 through the center aperture in the large wall.



Sunrise on June 21, the longest day of the year

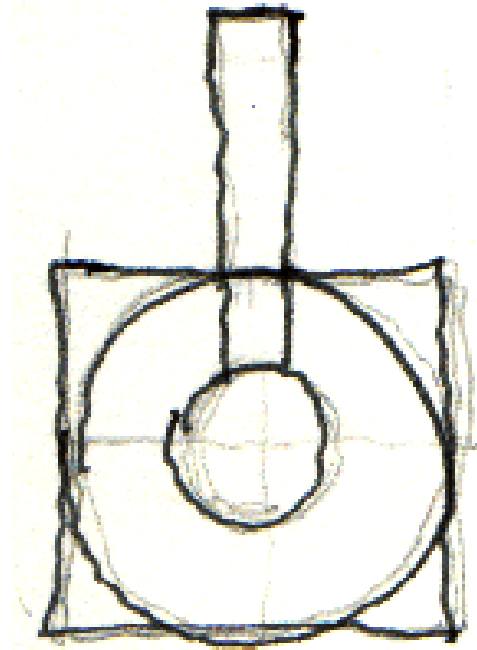


Italian painter Giorgio Morandi's paintings are a still life study of a particular genre of objects and ideas. He was coined a metaphysical painter along with De Chirico, and Mario Sironi in the early 20th century. Morandi was of particular interest because his work imbued a particular style that dealt with muted objects in the form of still life studies that created a tension between them that speaks of spacial relationships. Negative or carved space makes reference to the pre-modern mass, studies of figure and ground. Colin Rowe and painter Robert Slutzky collaborated to write an essay called "**Transparency Literal and Phenomenal**", in the work they describe Phenomenal Transparency as being "**effects of simultaneity, interpretation, and spacial overlap achieved by two- and three-dimensional organization.**" Their understanding comes not from a generic analysis of cubist paintings and architecture but rather they identify with specific elements from the work of the cubists of the 1910's and the early projects of Le Corbusier around 1927. Morandi's work falls under their definition of phenomenal transparency. They go on to elaborate that this type of transparency is found when an artist "**seeks the articulated presentation of frontally aligned objects in a shallow abstracted space,**" which is how Morandi draws the viewer into the painting to experience a sense of depth. The Literal transparency is described as being the optical or physical properties of transparent materials such as glass, or wire mesh. They also stated that it tends to be "**associated with trompe l'oeil effects of a translucent object in deep, naturalistic space**" (Richard Meier Architect pg 20).

It is also suggested in the essay that Phenomenal Transparency may be found in the work of Le Corbusier particularly as a compositional device. The first is the shallow depth of the facade that he allows to register the organization of the space behind it. The second, is in the "**promenade architecturale**", this is the path those who inhabit the house will move through and encounter "**frontally aligned objects**" that Le Corbusier would then turn into an imaginary picture of the buildings structure. This would be curved objects in the neutral grid that he would often employ. Italian architect Giuseppe Terragni also used a similar approach in his Casa del Fioricoltore and the Danteum project (unbuilt). His promenade pulls the circulation and the eye to the edge of the composition by placing light emanating from a window at the end of the path. Rather than using curved compositions as Le Corbusier, Terragni uses shifted rectangles in plan to create circulation. (Five Houses pg.14) Rowe and Slutzky also found in Corbusier's work that by creating Phenomenal Transparency, he could, "**through time, effort, and mental reconstruction, what is not immediately available can be made concretely perceptible**" (Transparency pg52)."

Corbusier would also develop tension between frontality and rotation, which we see in his early studies of cubist spatial principles, and in works such as Villa Stein at Garches France. Rosalind Krauss wrote that “ the counterpoint between frontality and rotation equals the contrast between ideation and experience and what Corbusier demands of an architectural composition is that it should acknowledge the mutual interdependence of the one on the other ”(Richard Meier Architect pg.21).

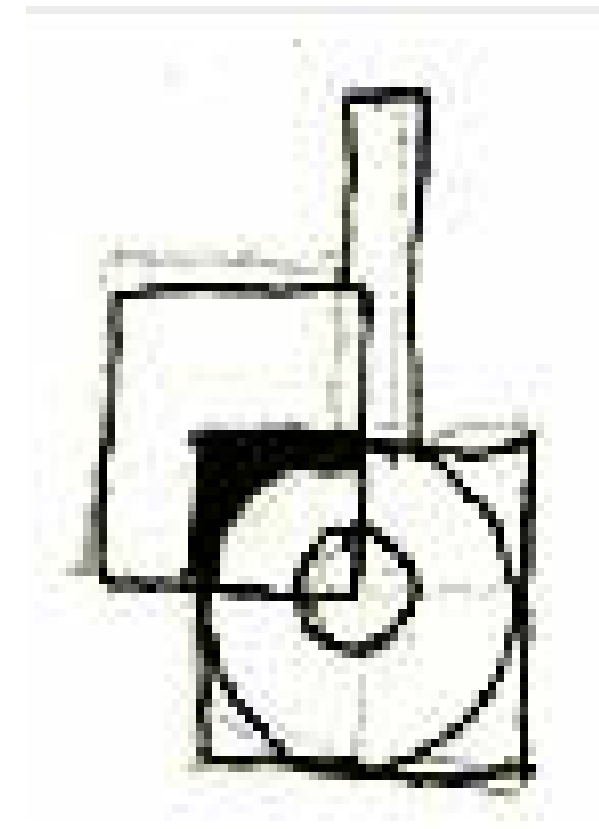
We can also link this study of Morandi’s paintings, Corbusier, and Terragni to architect Anthony Ames, having been inspired by the writings of Colin Rowe and Robert Slutzky(Five Houses pg12). In his project The Garden Pavillion 1985 in Atlanta Georgia the resemblance of a Morandi painting and the influence of architectural works of Le Corbusier and Terragni can be seen. Ames uses a rotation of geometries in his plan to create an occupiable poche`, a carved thickness in plan and elevation that pulls one into the space much like the paintings of Morandi. Terragni, in his Casa del Floricoltore centered around a promenade path coupled with shifted rectangles that lead one into the room as Ames accomplished with his thickened poche` that creates transition spaces without literal vestibules (Five Houses pg.20). This method of working creates spatial hierarchy and “perceptual thickness in walls that are otherwise hollow. Thus achieving primitive thickness without giving up modern aesthetics(Five Houses pg. 14). “



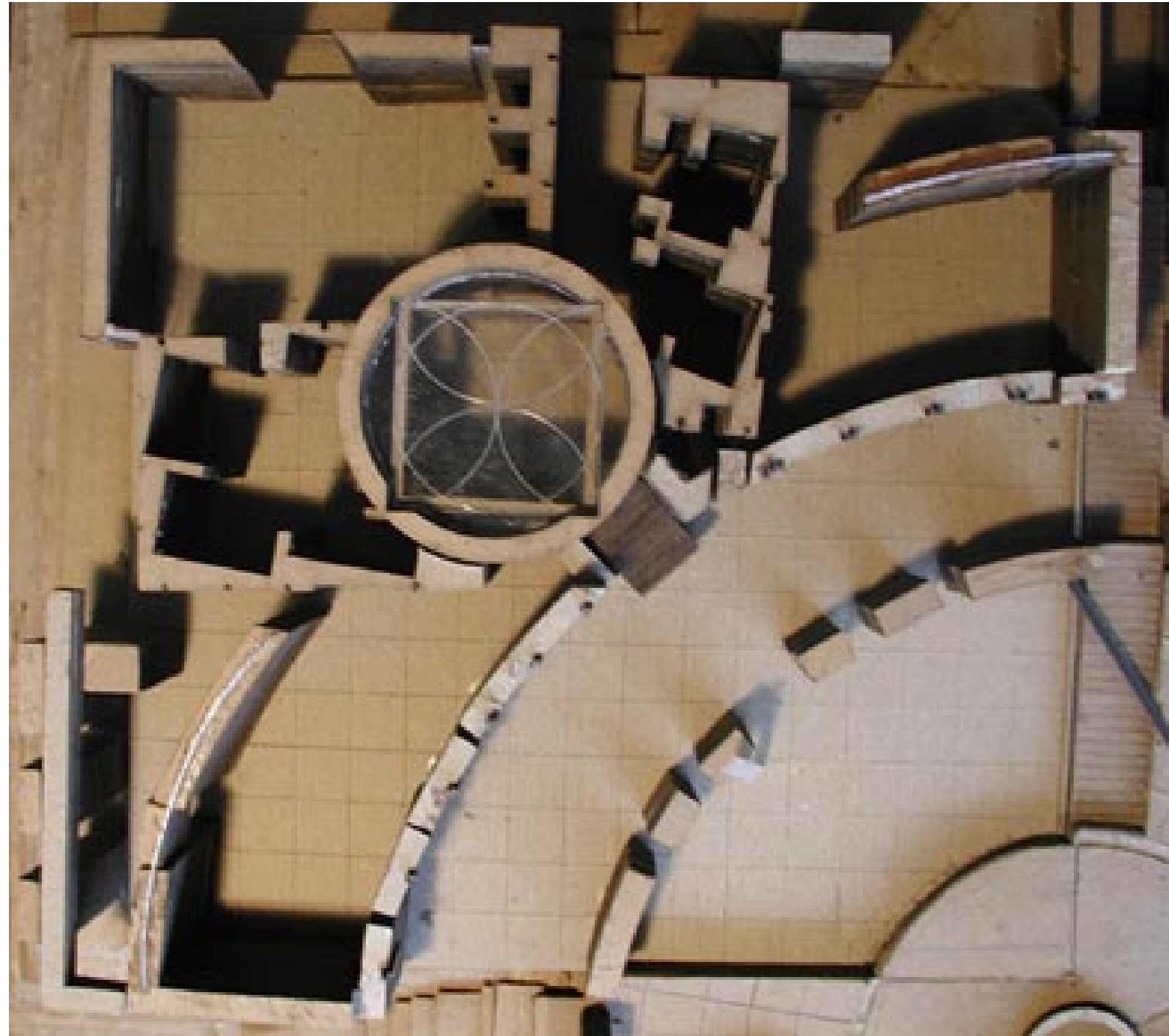
Beginning sketch

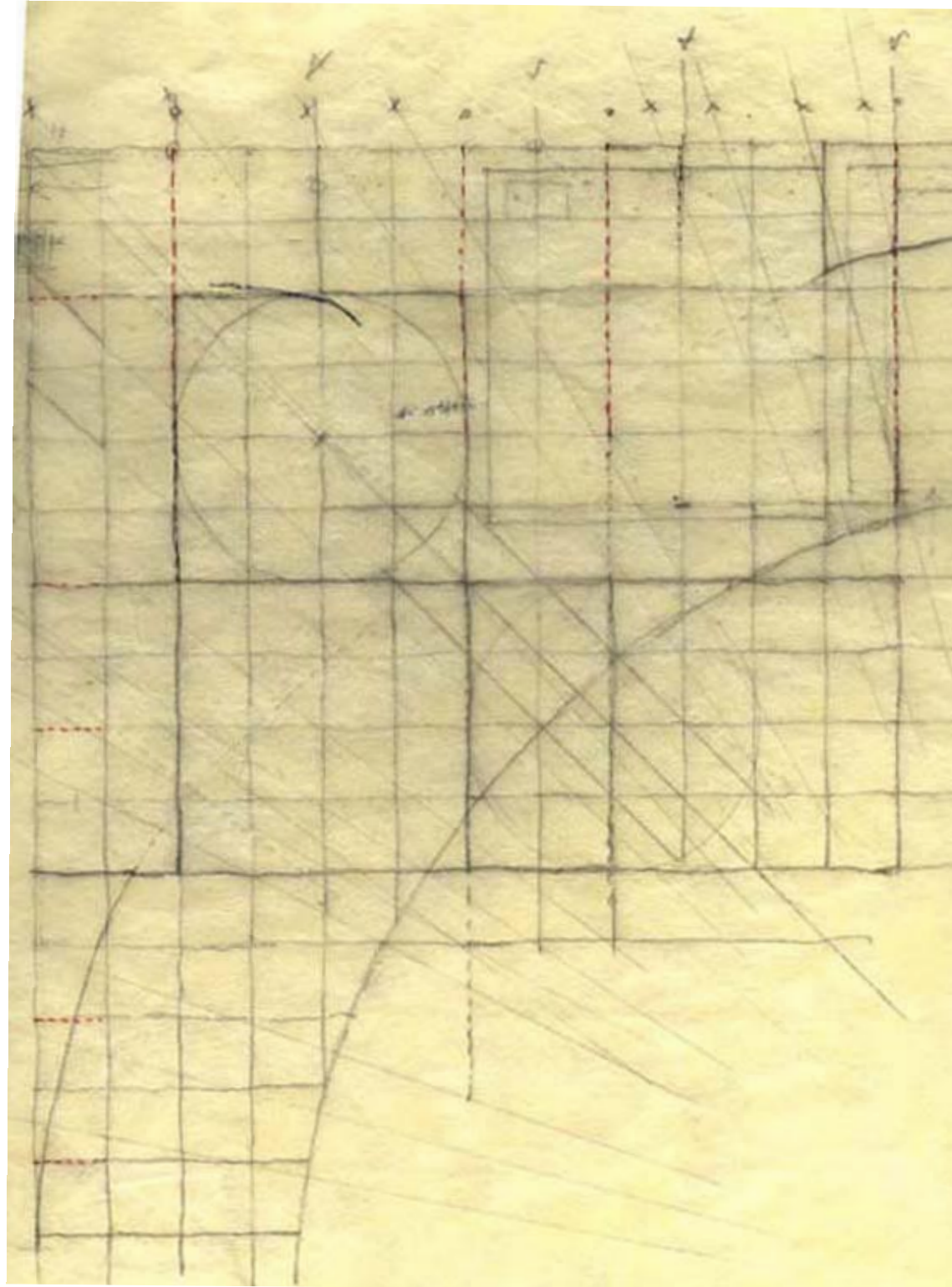
THE LEARNING CENTER

The design of the 'Learning Center' was born out of a simple rotation of the boundary square in the concept sketch. By making the rotation to the land mass on the western edge of the site an overlapping of geometries occur. The circle is overlapped by the corner of the rotated square, creating a carved place in the square. This is where the two squares overlap as well, a thickened element born from the mixture of the three is left, this is what would become the building. From this point a system of layers were drawn, much like the concept of the repeat unit of the Islamic design. To add to the complexity the a small portion of the corner of the square was kept to create a key or joint to connect the plaza to the observatory and the Learning Center. Because it was a perfect square, a grid was created that would help to control the design of the rooms that the building would hold. A rythm was then given to the grid, it consisted of four squares, measured at 4ft. X 4ft. To equal A, the B rythm would hold two 4ft.x4ft. Squares. The b rythm would then be considered as a solid mass or it could also be the more private spaces such as the rest rooms and small library. With the rythm, the grid could then be manipulated by twisting the squares within a certain rythm, for example, the restrooms and library were made by twisting the squares, then extruding them three-dimensionally.

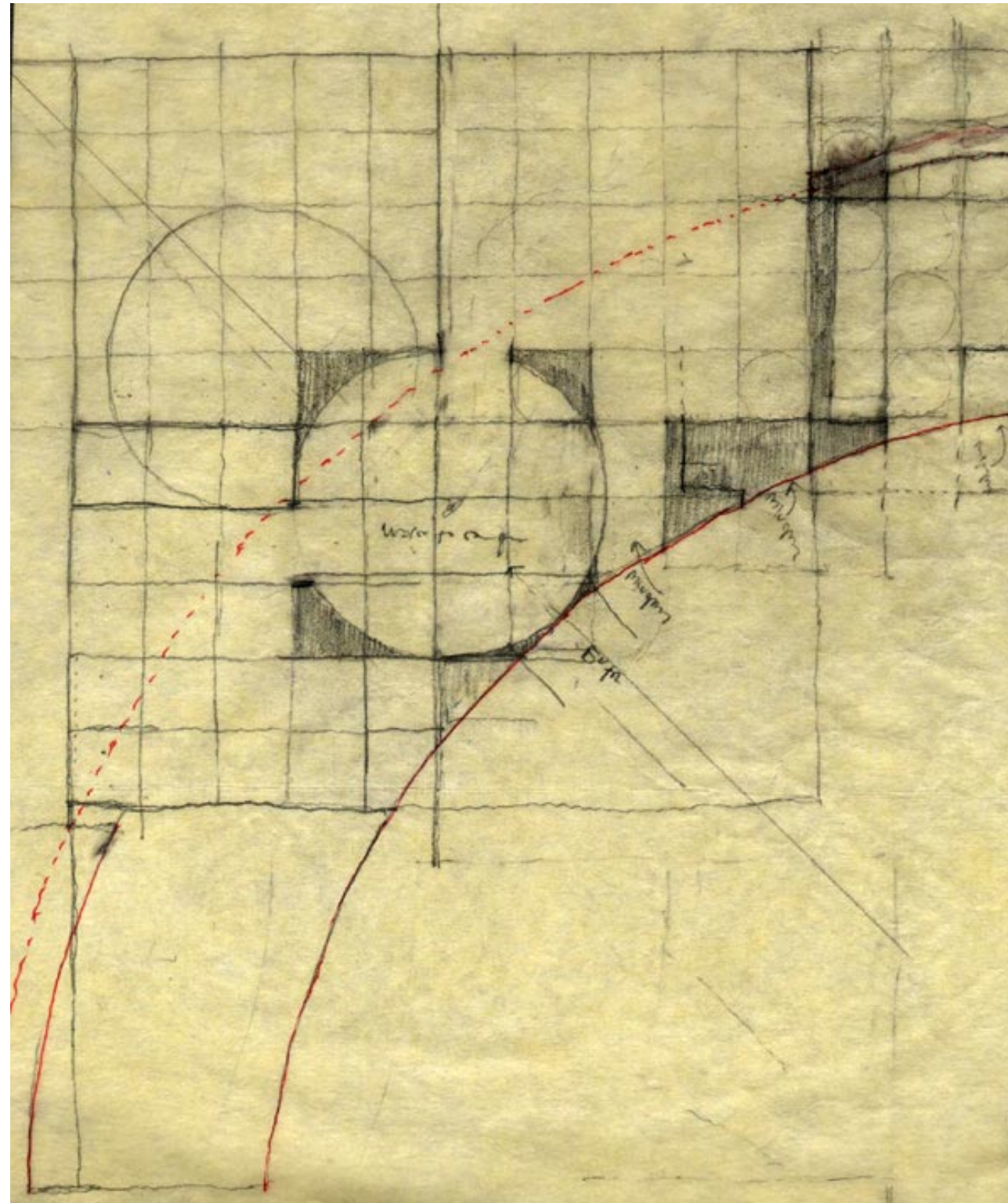


Post rotation

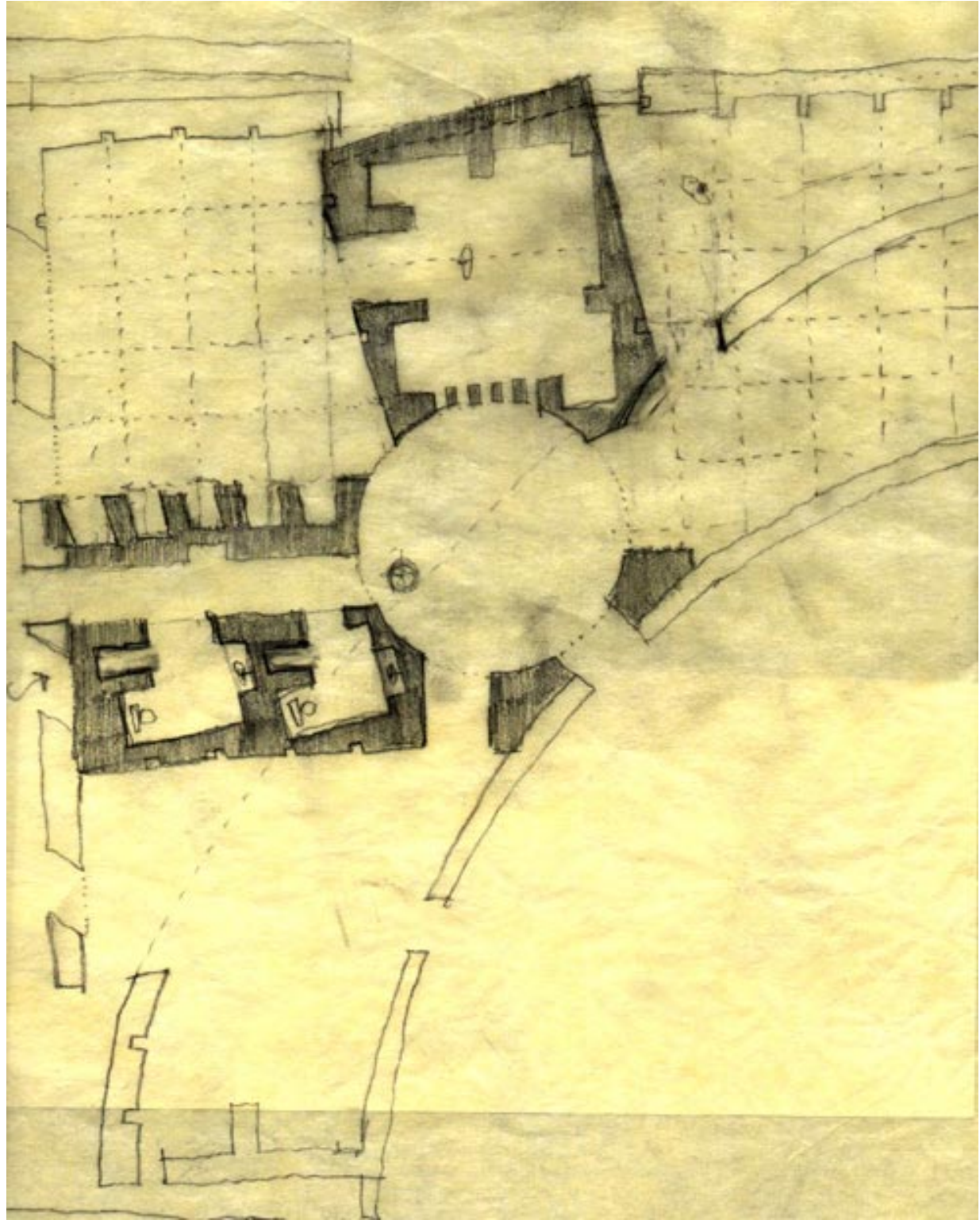




The beginnings of the grid.



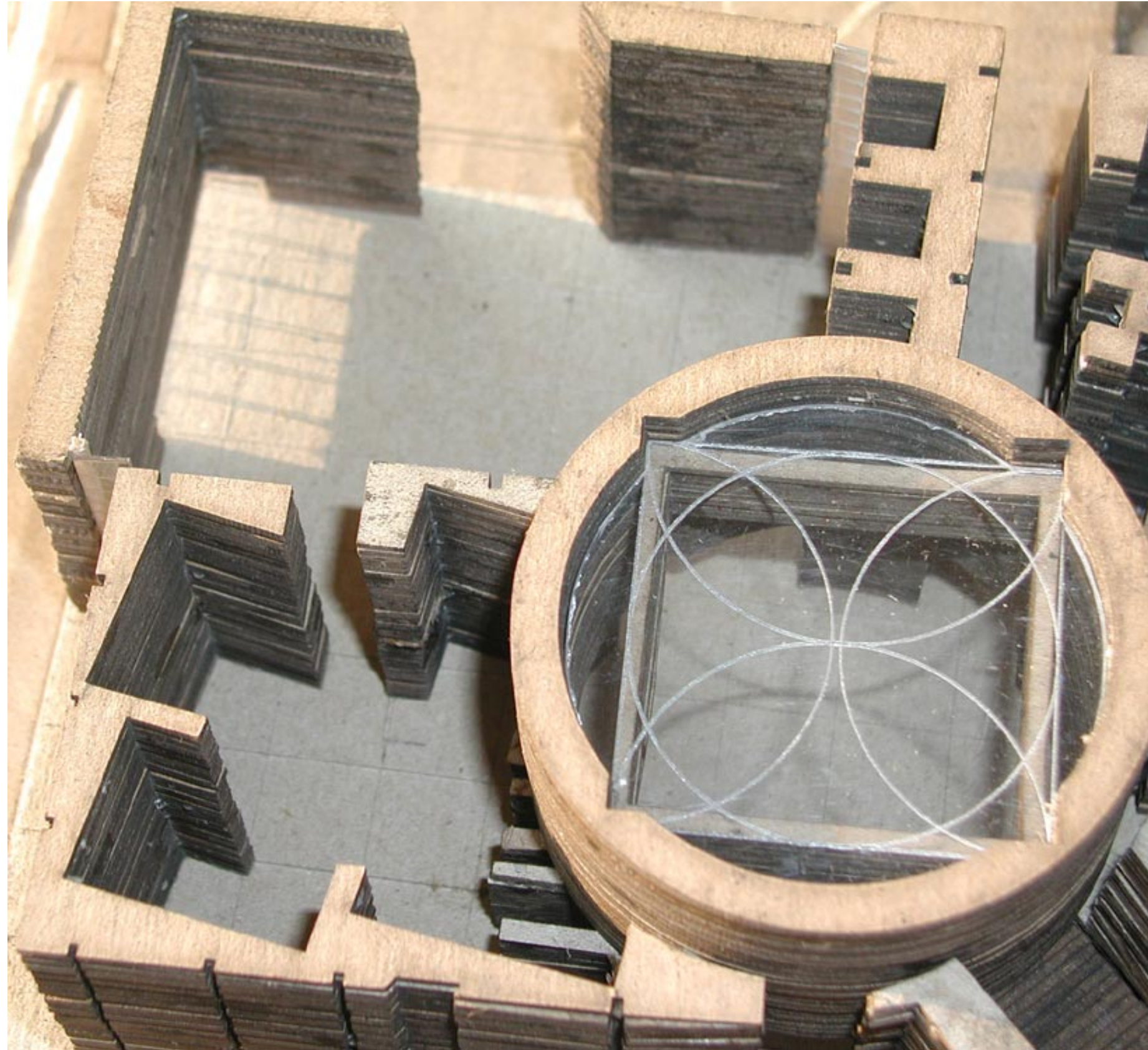
Developing the mass from the grid.



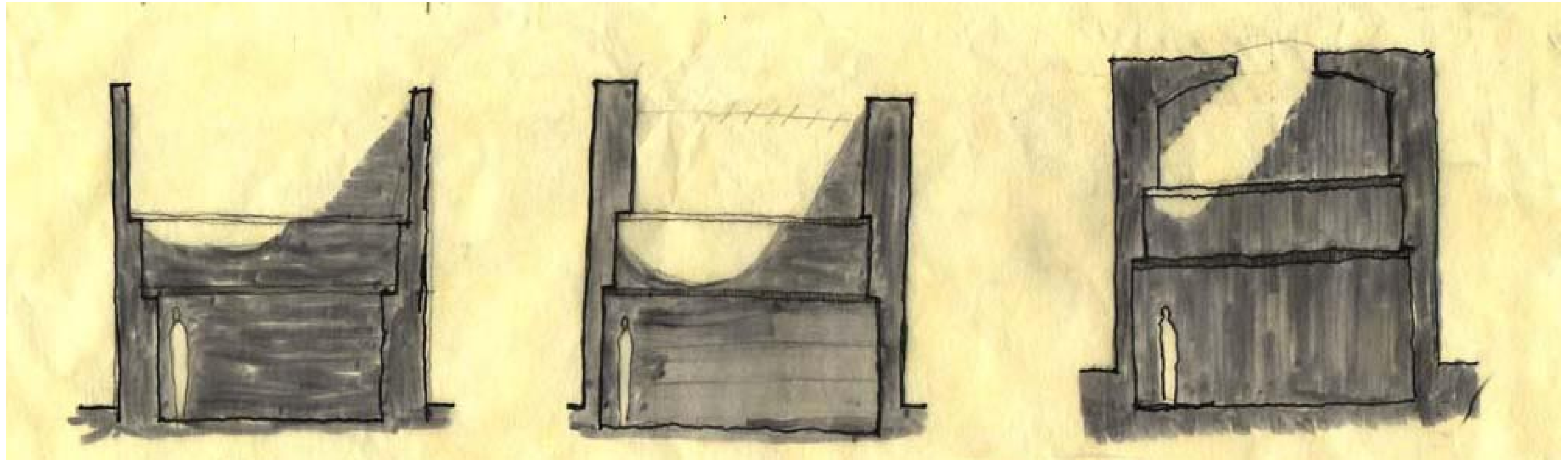
A layer showing the development of the rooms.



A layer showing final room development.



The classroom, library, and lobby cylinder.

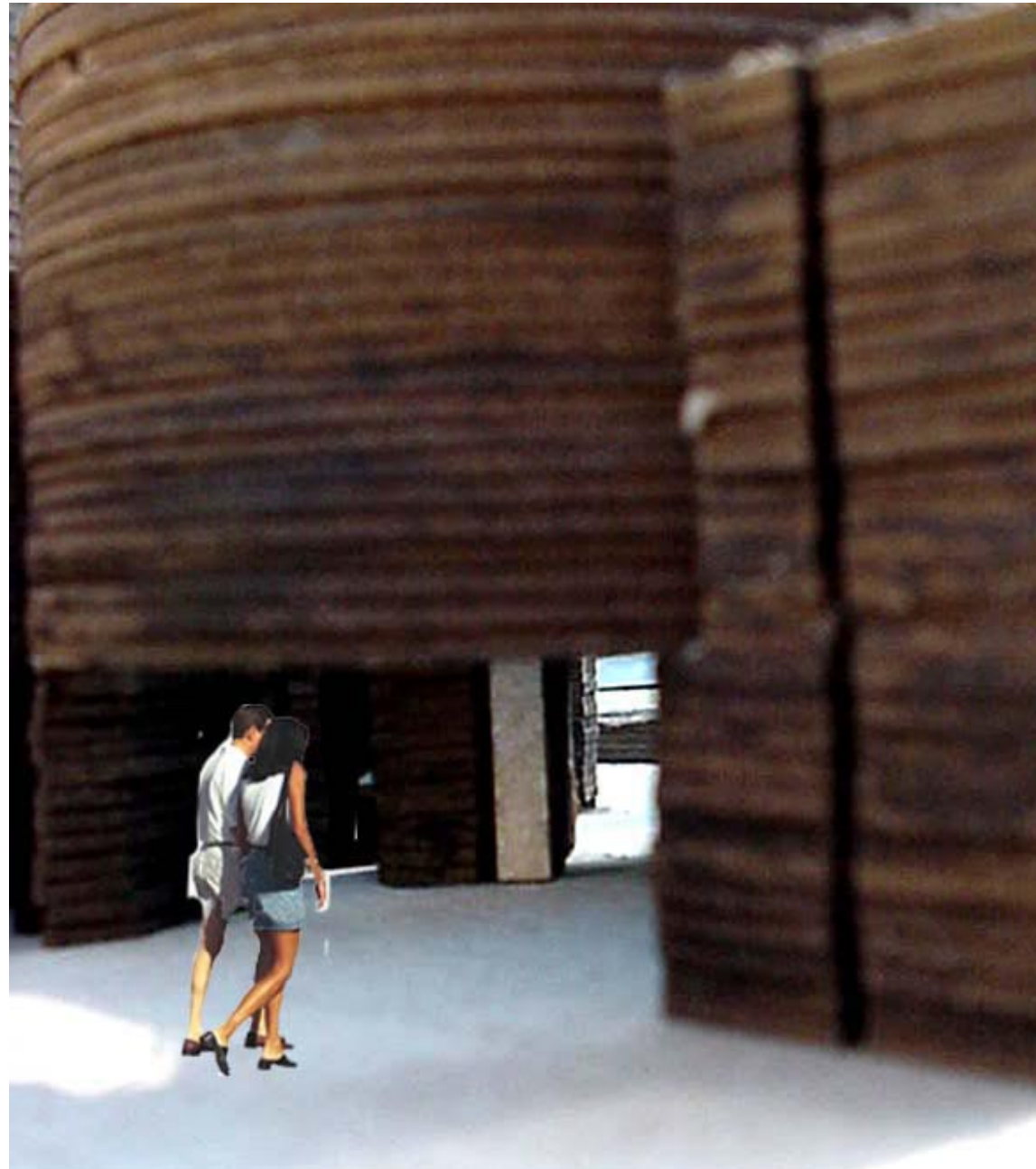


The entrance lobby to the learning center was born by first extruding a cylinder from the circle. The next step was to extrude the square created by geometry. Because the square is larger than the circle it carves a path and inscribes itself in the cylinder walls. The square finally comes to rest as both sun shade and structural element that helps to hold the sky window.

The sketches shown on this page are a series of studies that try to determine how much light and sky were needed for the room. By using the square as a sun shade more window could be used which then would let more enter the room. The result was an architecture that framed the sky.



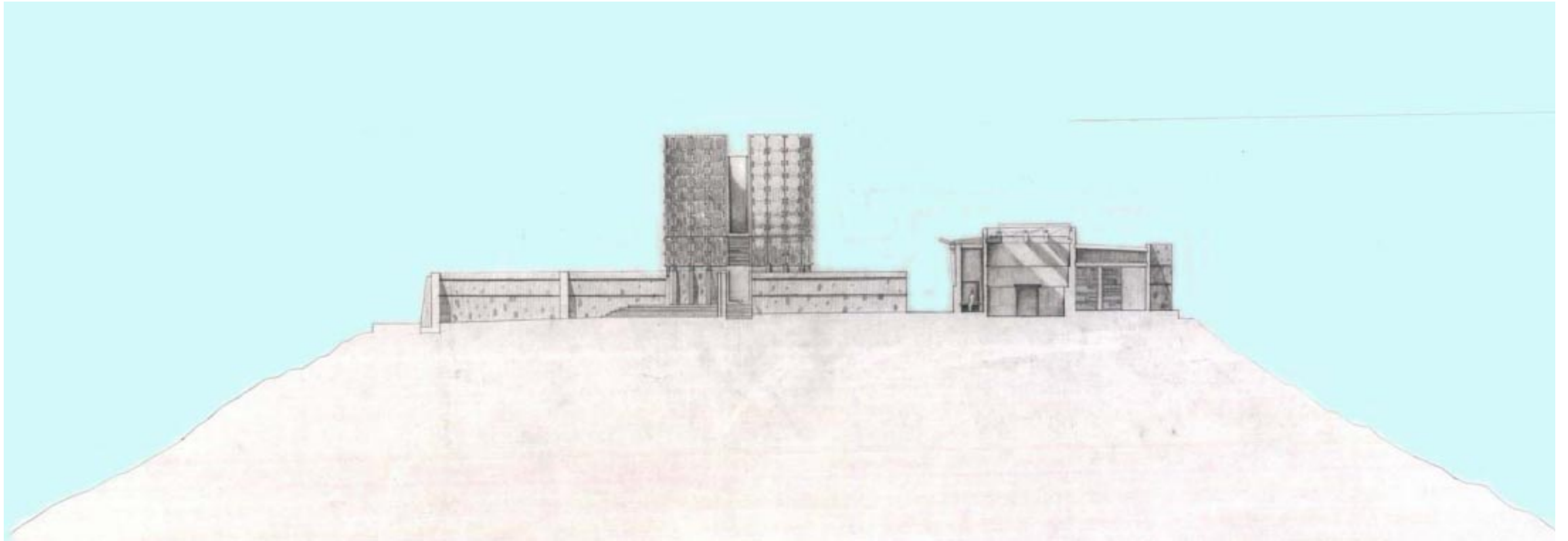
Entry from the plaza.



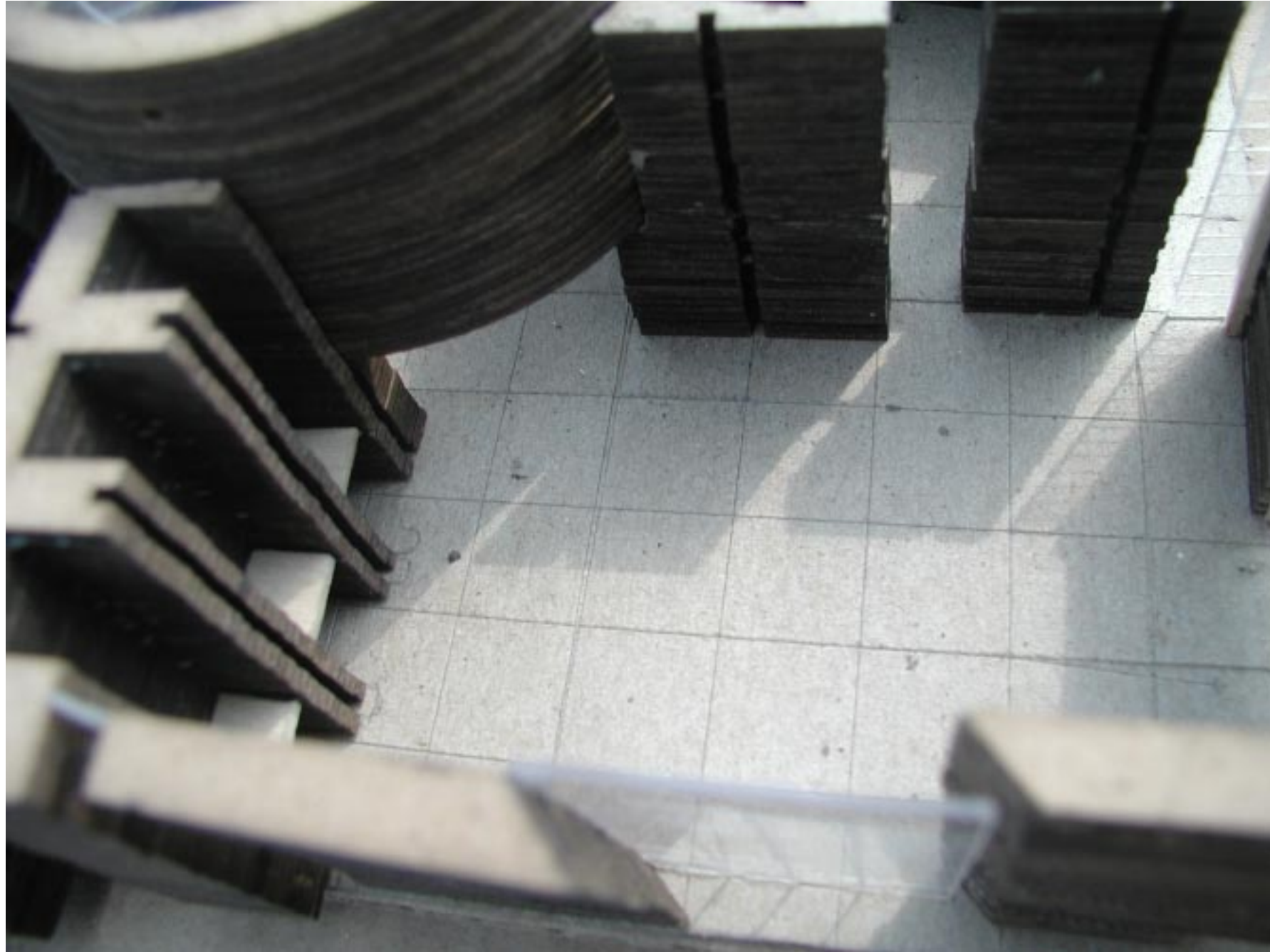
The entry cylinder as a threshold.



The sky through the oculus.



A section through the east elevation shows the entry, lobby, and classroom.



Classroom reading niches with entrance lobby beyond.



The origin of the grid stems from the square as it meets the circle .



Overhead view of the classroom with natural light and the grid on the floor.



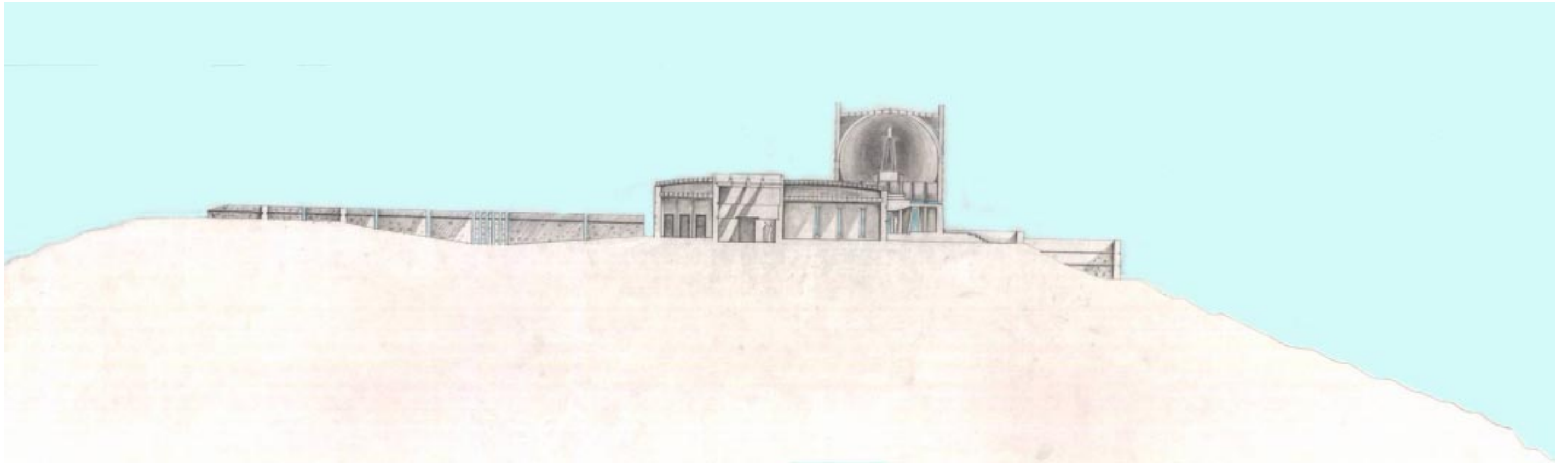
Perspective view of the classroom facing west.



The grid making a place for bookshelves.



The Library walls being made by an extrusion of the floor grid then a rotation toward the entrance.



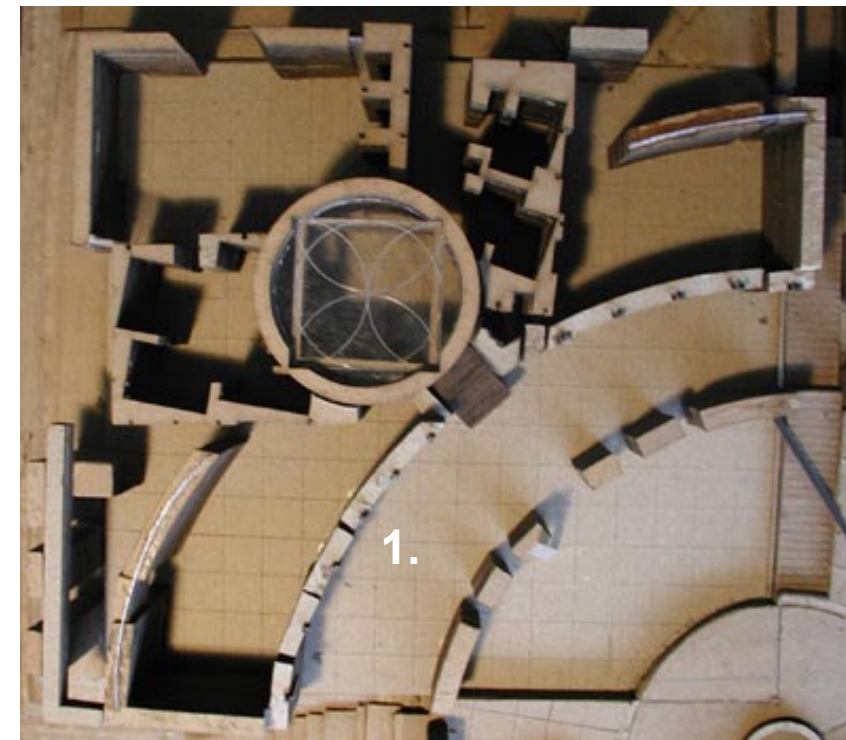
Section of the west elevation showing the classroom reading niches, the entrance lobby, and the interior of the modern observatory.

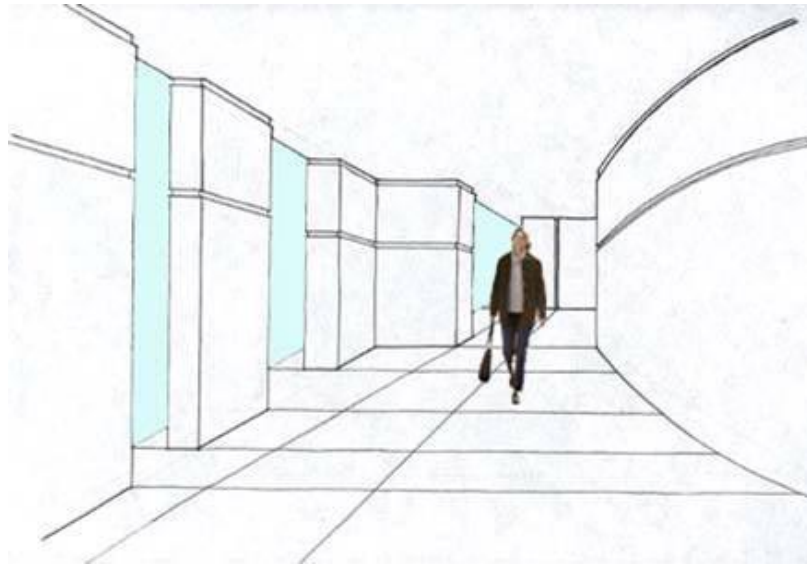


Light through the wall.

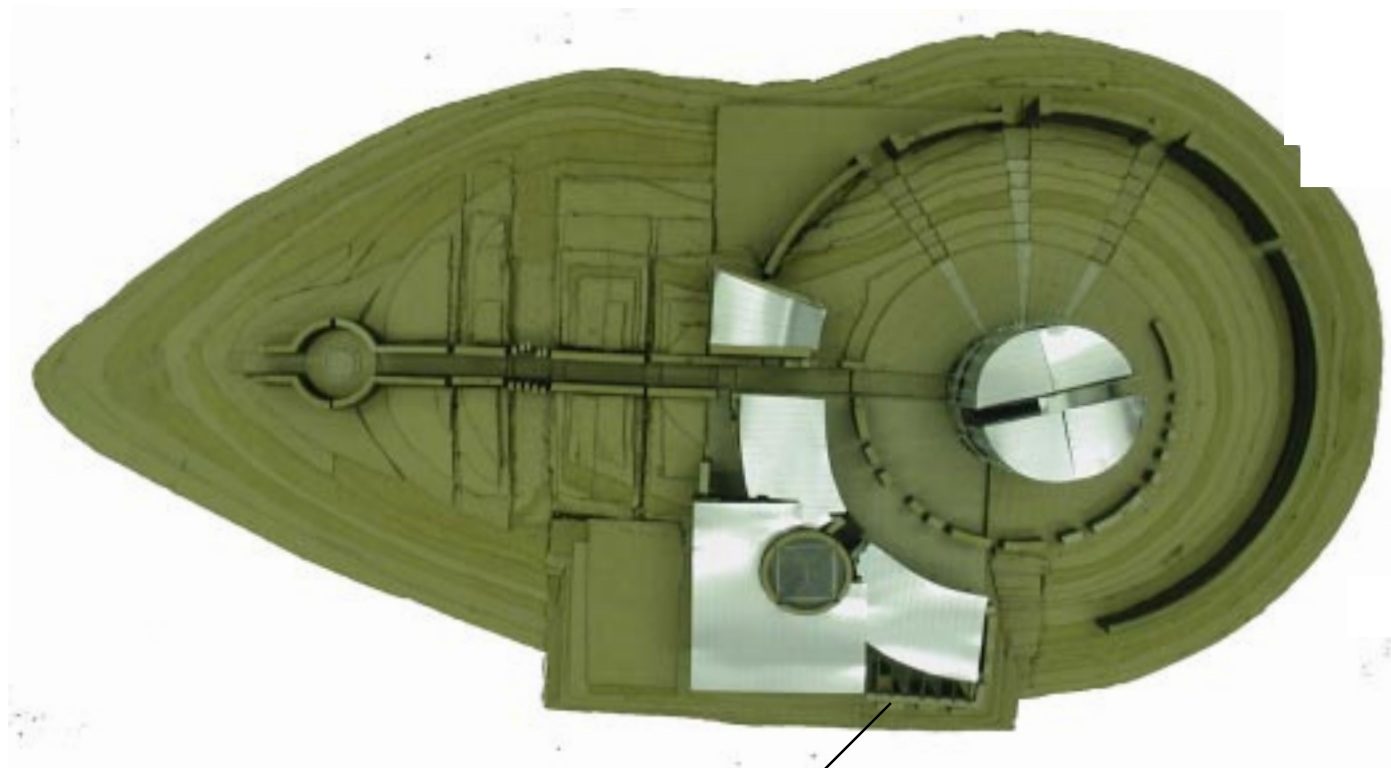


Perspective showing the conference room shown below in the plan photo marked as 1.





Perspective drawing of exterior gathering space.

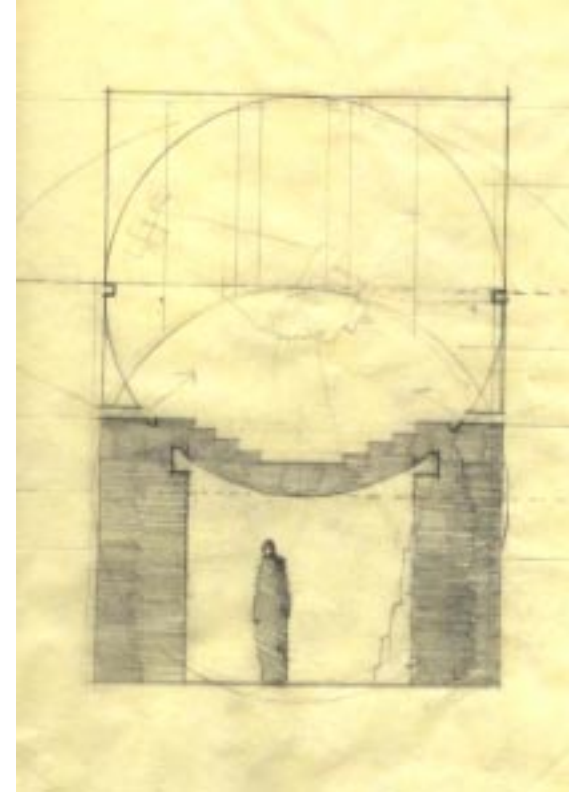
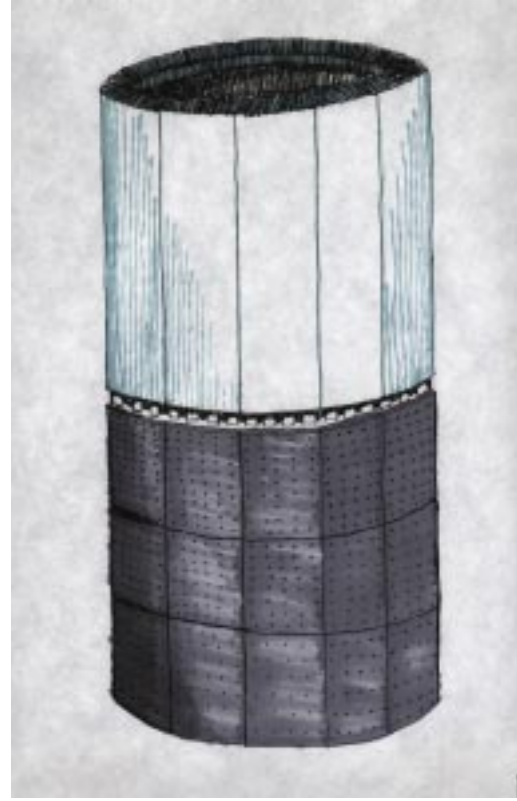
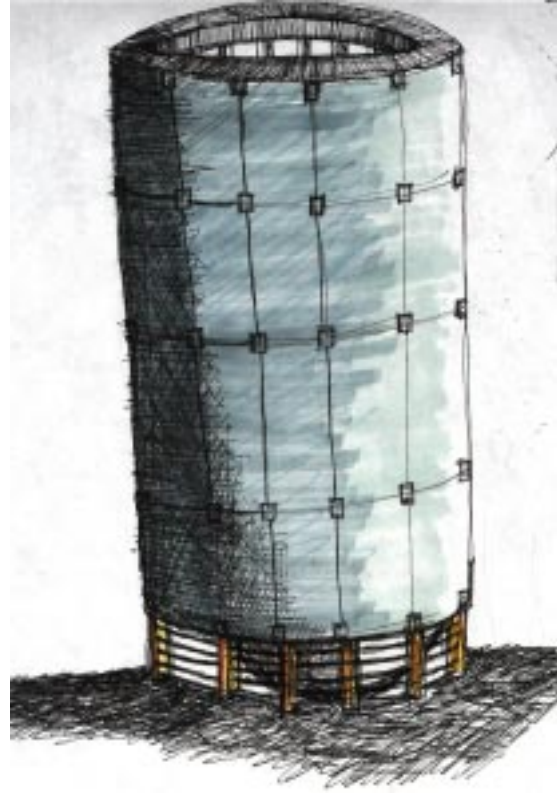
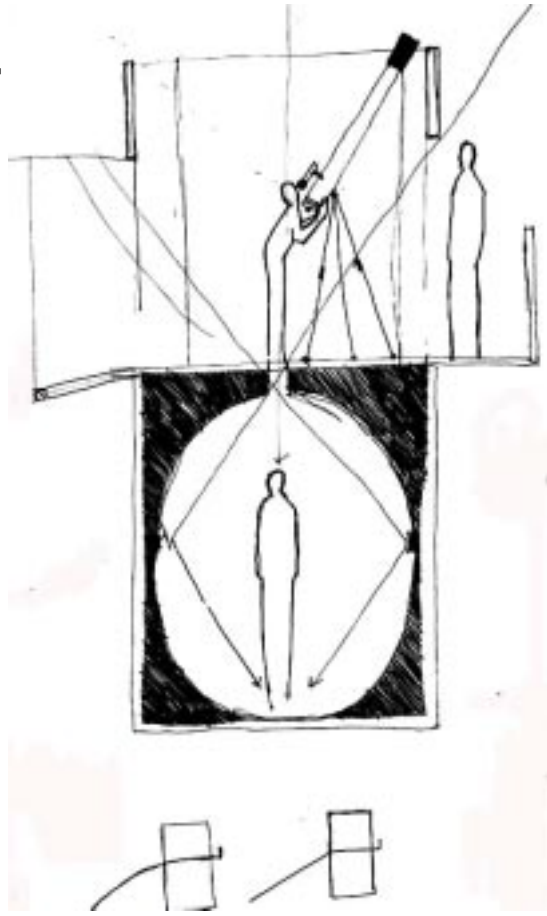


Gathering space facing the west.



Brise-Soleil over the outdoor gathering place, on the west facing facade.

43
44

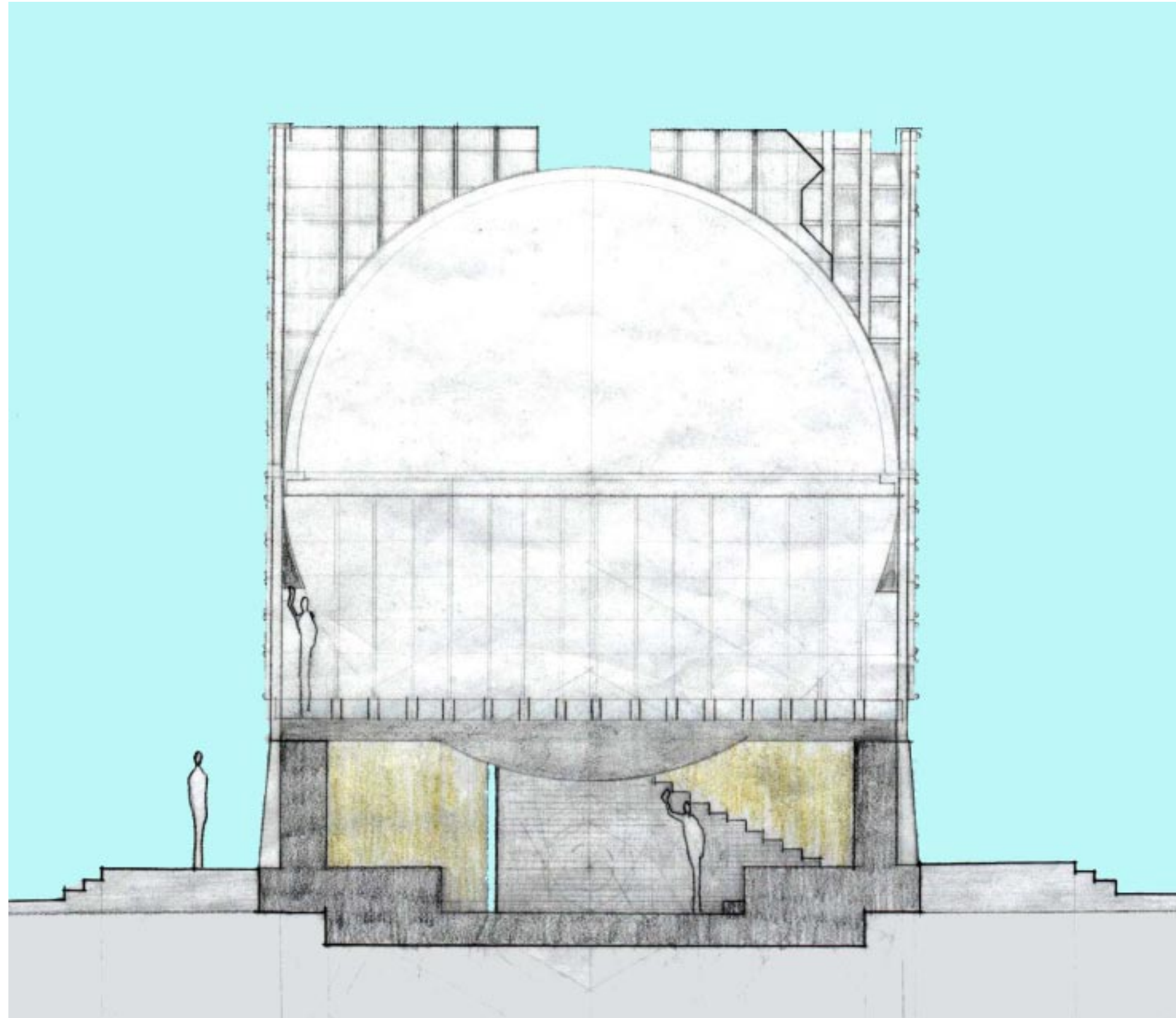


A series of drawings demonstrating the development of the modern observatory design.

THE OBSERVATORY

Ancient civilizations such as Egypt, India, South America and the Native Americans as well, made magnificent observation platforms and structures to observe the heavens and their natural phenomena, which all bring about a special reverence for, and make places that except magic, mystery, and science. These structures were a concretization of their understanding of the phenomena of things, order, character, light, and time. They were built to create a vertical axis between earth and sky and to receive the sun and stars as an element of time that informed them of when to plant, to harvest, to celebrate, and when to bury their dead. Because they were tools that bore the “magic” of the day those who interpreted their signs were revered as priests or shaman therefore they were a ceremonial architecture separated from the secular precincts by natural topography and courtyard-like spaces often oriented with some sacred element, such as the cardinal axis, mountain ranges, and the sun, they created a natural balance between the city they represented and the land they inhabited becoming like a microcosmos thus proving man can make his own world.

The order of materials were also expressed by means of a concrete understanding of the natural environment, for example in mountainous regions stone was used to create a megalithic architecture as a way to represent the solidity and permanence. For example, the ancient Egyptians, a civilization that believed in immortality, built their ceremonial buildings from stone despite the more available material of mud brick. The Assyrians who believed in a finite existence on the other hand, used only mud brick. (Geometric Concepts in Islamic Art). The form of the structure was also relevant to their understanding and interpretation of the natural, for example, the Big Horn Medicine Wheel in Wyoming, sites the summer solstice sunrise and sunset was an encircled structure made of stones with a mound - like cylindrical element denoting center, the boundary also of stone, is connected to center with 28 spokes (suggesting a lunar relationship). Here conical heaps of stones on the perimeter mark other stellar phenomena that occur on each of the 3 warmest moons of the year (Aveni, 288) only then can the site be approached by man. The above mentioned examples coupled with a solid review of the past two-and-a-half years of study made the decision to name an observatory as the project for the thesis, it could easily hold a solid exploration in pre-modern and modern construction. Science and technology, the “magic” of our day could find her precision with the modern materials like steel and glass, the primitive thickness could find a home in the use of natural stone of the region and concrete, and somewhere in between when the methods and the ideologies meet a position can be found .



Because the natural motion of the telescope is circular, the interior of the cylindrical tower is a carved sphere that serves as a container for the instrument and shelter for those who inhabit it. From the outside, the sphere peeks from behind the cylinder skin as the aperture that serves as the eye of the telescope. At a height of six feet the sphere ends, protruding from the cylinder wall just enough to create a ledge serving as the threshold or separator between the stationary part and the rotating portion of the volume. The volume completes itself in the primitive base of the observatory so that all who enter may experience it in both the modern scientific world and the primitive.

Inspiration for the sphere also came from Aurelio Galfetti's entry to Castle Grande in Switzerland. The architect created a sphere carved from massive concrete walls that serve at the base of a mountain in which the Castle Grande sits on top. The entry contains access to a stair that climbs the height of the mountain, and an elevator. There also seems to be a certain strength in solids being carved to reveal another geometry. The practice can also be found in the great roman pantheon which allows a beam of light to trace itself along the half circular cavity carved from its inside.

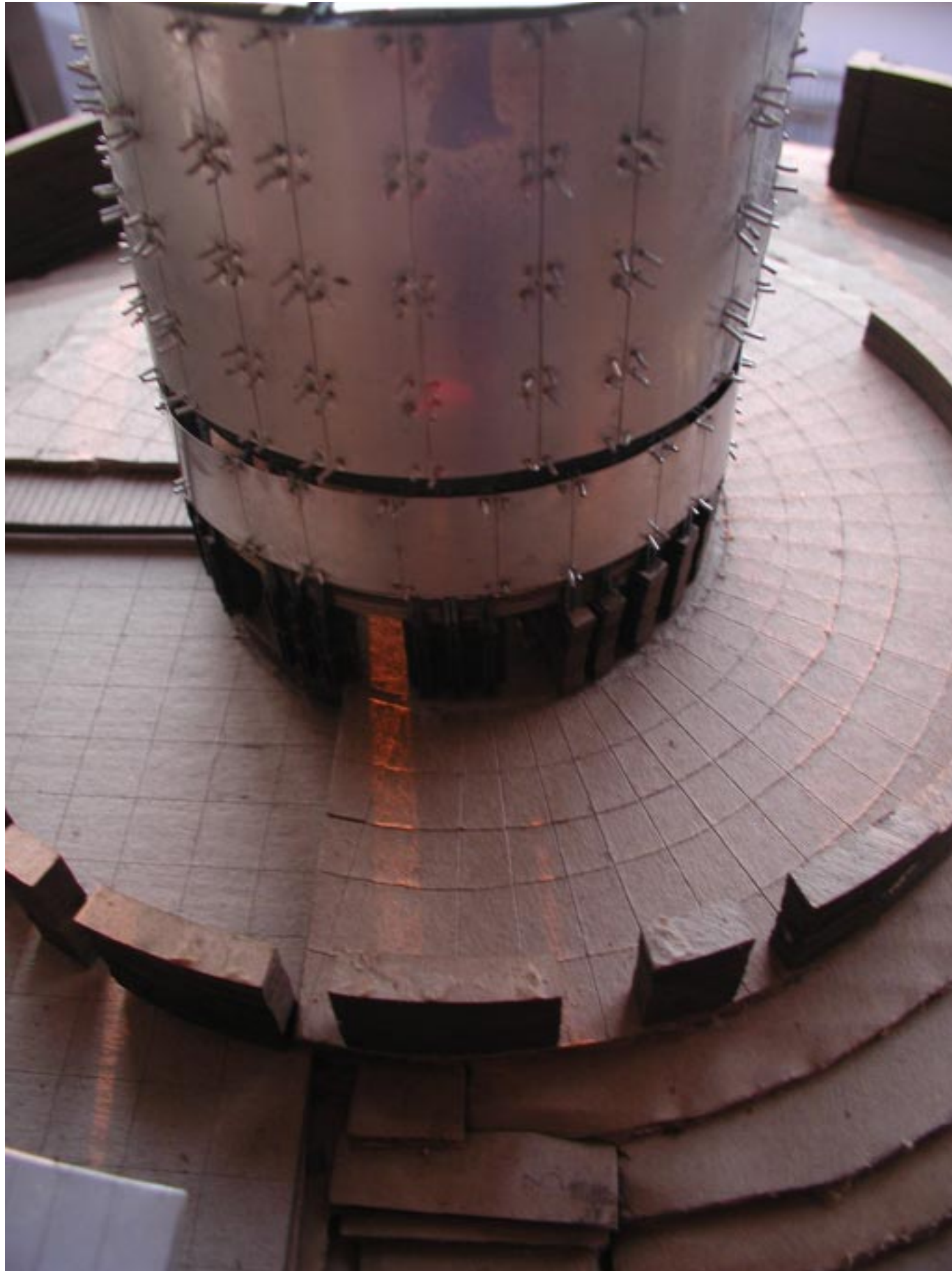
CENTER

Heidegger believed that spaces received their being from location and not from "space" which implies there is some degree of enclosure and extension. The man made elements would be the enclosure, the landscape the extension as Norberg-Schultz would describe it (Genius Loci pg.12). We can further surmise that there is a figure- ground relationship in which the settlement appears as an element added or carved into the landscape by an outside force, being that of man. For enclosure to exist it needs identity, in order to maintain its identity it must have center which acts as the order or focal point, from here space can extend horizontally or vertically in any direction, which for this project, is extremely important. To further the understanding of the importance of center we may look to several precedence studies: for ceremonial architecture such as the cloister of a monastery, center becomes a symbolic point representing the infinite cycle of life, death and re-birth, it is the focus during prayer, gathering, and the enjoyment of nature, it is marked by a tree, the perfect symbol of the following spiritual elements.

Public buildings use center to distinguish their importance from other structures comprising the settlement, the Boston City Hall is an excellent modern example of this, flanked by a squared piazza developing its boundary, the earth begins to taper itself toward the hall this lifting the structure above the landscape, a motion which continues to the interior of the building. Another example would be the techniques used by the painters of the "Quattro Cento" (4th Century Renaissance) in which the painters used geometry to construct complex axonometric painting as a means to add depth of field to a flat wall plane.

The School of Athens by Raphael is an excellent example. He idealizes center with the Ancient Greek philosophers, Plato and Aristotle. Depth of field is made by the surrounding the figures by high arches and tall columns, to make a connection with the vertical axis of center, the painter places the ceiling high overhead with a dome that seems to reach infinity, the figure of Plato holds a copy of Timaeus in his left hand, and points to the soaring heavens with his right. Aristotle holding a copy of Nichomacean Ethics and points toward the earth as a source of his observation of reality. The painter then supports center with the intimate goings on of many other famous faces such as that of Socrates, on the left engaging with the youth of Athens. Diogenese is portrayed as the old man sprawling on the steps a little right of center, Pythagorus also can be seen demonstrating his geometry system on slate. Ptolemy contemplates a celestial globe at the extreme right. Euclid bends to describe a circle. Another single, lonely, mysterious figure can be seen sitting in the foreground, his arm resting on a marble block, his head propped, his hand writing with a pen, seemingly oblivious to those around him. Dressed not as a philosopher but as a stonecutter, a craftsman. The technique differs from that of the other characters, therefore, an addition added during the process of painting. After further investigation it turns out to be the features of Michelangelo as a tribute to this master from Raphael. The precedence in this analysis is not only Raphael's use of geometry, but also its ability to gather so many figures, without losing the identity center or that of the figures themselves. The above mentioned precedence studies reveal center as created by each perspective culture and in doing so reveals their belief system as well as the development of technology of the time, examples were derived using geometric order.

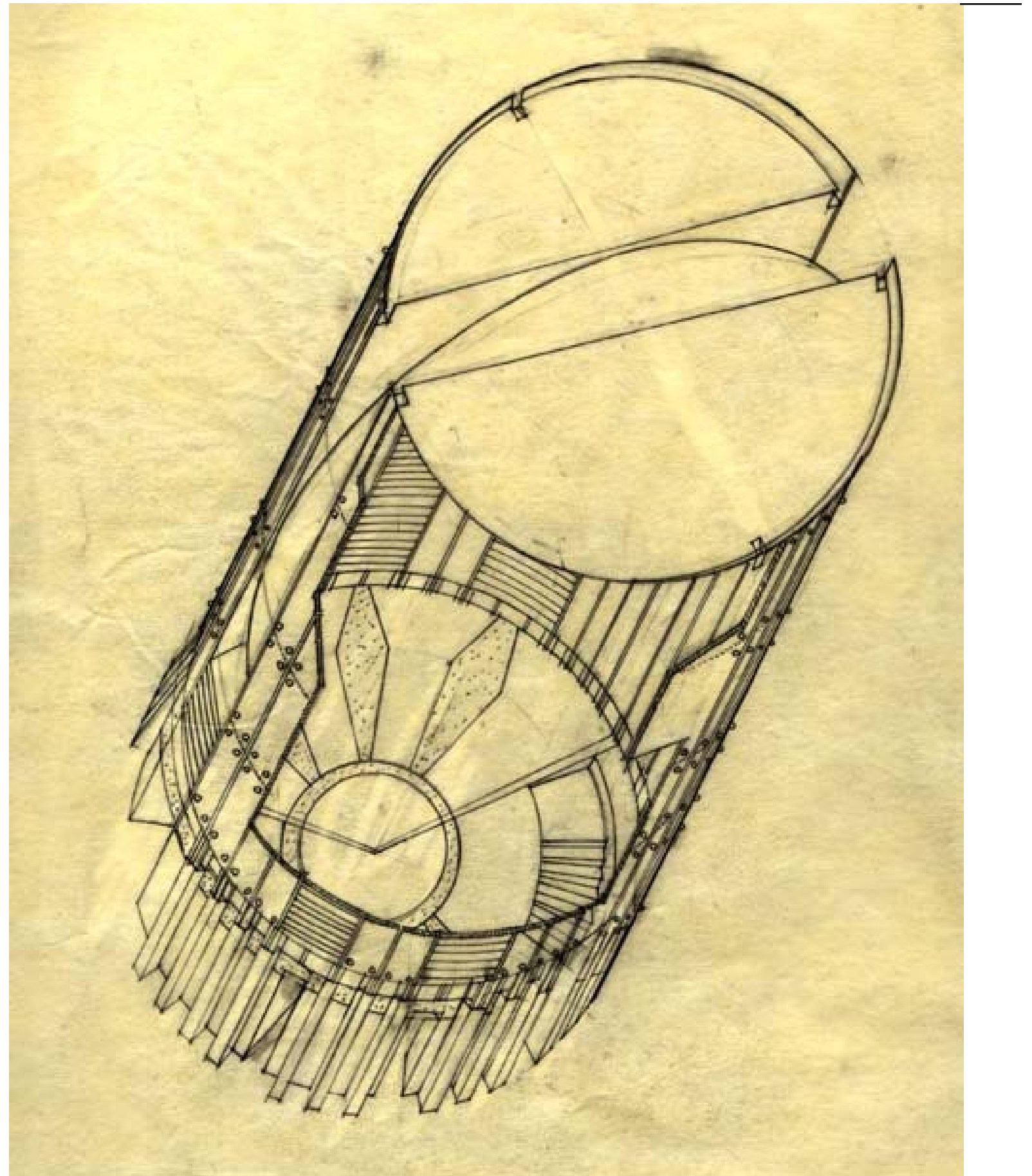
Between Earth and Sky - **Center**

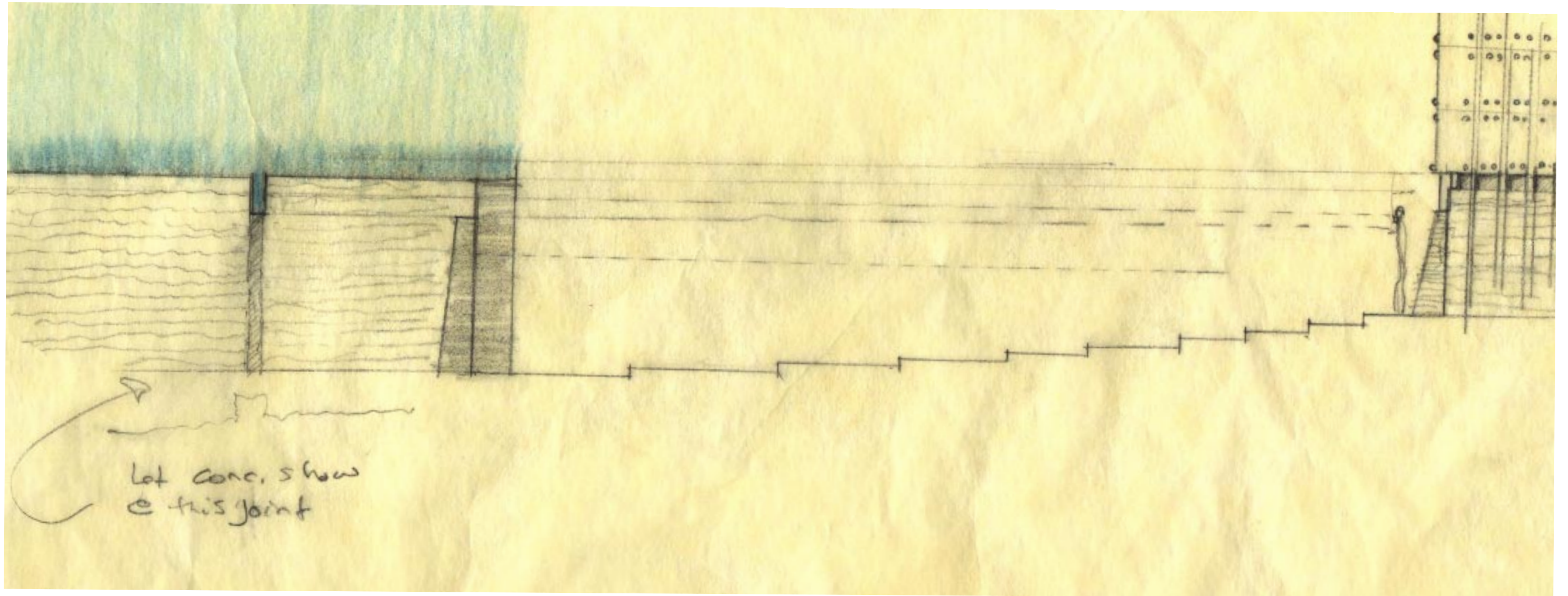


“The sun never knew how great it is before it struck the side of a building.”
Louis Kahn



This series of sketches and photographs demonstrate the observatory's ability to orient us to the horizon. Just before reaching the threshold between the telluric base and the telescope, one is met by a band window running the diameter of the tower. The view from the window allows only the top of the massive outer sun wall and the horizon to be seen. The intention was to continue the patron of the earth focused on the sky and to express the importance of the architecture as a link between earth and sky.





A sketch shows the relationship between observatory, observer, and the sun wall.

PARTS

The thesis proposition states: **“when two materials meet, such as steel and stone an architectural event should occur.”** This position related to the parts of the observatory stems from precedence in the ideologies found from the architecture of Carlo Scarpa but also from the simple idea that there should be a certain intelligence to the work much like a piece of music or lines of poetry. In the music and poetry there is a certain harmony that results from the movement of one piece to the next. The flow is important in the relationship of the parts to the whole, with it the structure begins to reveal its own nature piece by piece. This nature then acts as a record of the thing and its perfection. Saint Thomas Aquinas once stated:

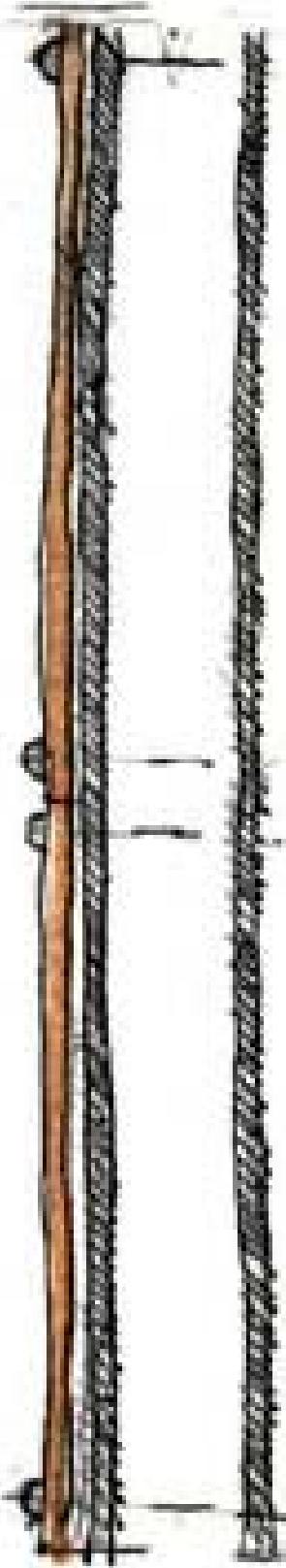
“Many stones fit together with one another in the building of a house; and in the same way, it is in the nature of existence that all parts of the universe fit together. The Areopagite says this because, while on account all things are in communion in a manner which accords with the properties of each.”

Saint Thomas is also subscribing to proportion and its involvement with the parts to the whole. Without proportion between the parts there would not be as strong of a relationship. With this project the proportion is derived from geometry, the geometry has been taken from the natural topography with tools that came from the study of early Islamic tile design and using as a way to further study the land and extract from it. **Alberti describes this proportion between parts as being beauty or “Concinnitas”.** In his work, **On the Art of Building in Ten Books** he states : **“Beauty is that reasoned harmony of all parts within a body , so that nothing may be added, taken away, or altered, but for the worse. It is a great and holy matter; all our resources of skill and ingenuity will be taxed in achieving it; and rarely is it granted, even to Nature herself, to produce anything that is entirely complete and perfect in every aspect.”** It was the goal for the project to make a structure that would weave itself into the earth and from the earth extract its being or its proportion which would then be the bridge between the worlds that would be called upon to make it, stone masonry, concrete construction, and steel construction. Alberti later states: **“Anyone who builds so as to be praised for it - as anyone with good sense would - must adhere to a consistent theory; for to follow a consistent theory is the mark of a true art. Who would deny that only through art can correct and worthy building be achieved?”**



The towers outer layer of skin, made of Core-ten steel was selected because of its rugged durability and patina. The steel, to protect itself, will continuously rust leaving the color a bright orange-brown that will show the passage of time by bleeding onto the earth creating an eternal ring around the observatory. The skin is held by stainless steel fasteners that protrude from the tower, a bright metallic element against a darker background of rust.

Section through skin.

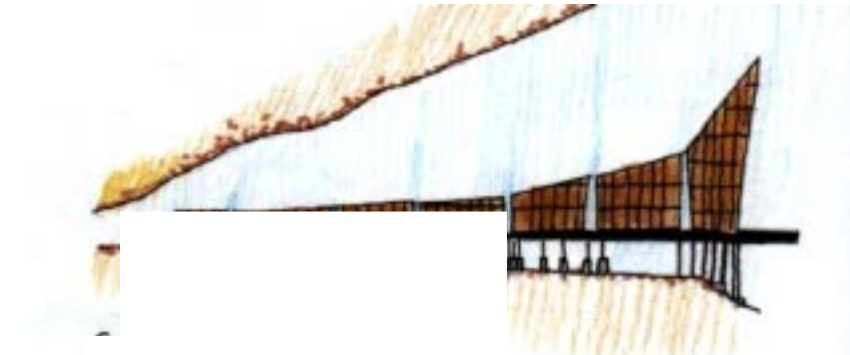


Sketch of front view of the skin.

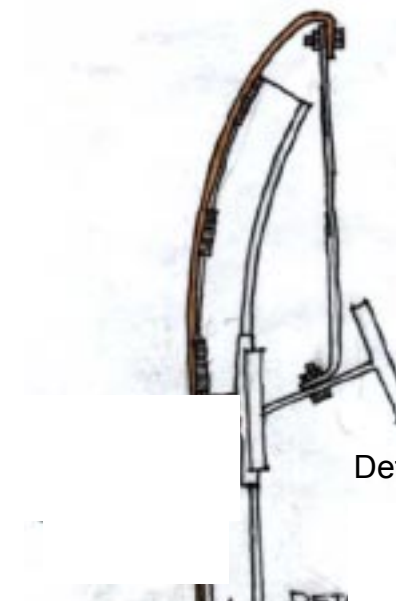
The first material to be used as a skin was copper because of its ability to beautifully patina. The problem became a compatibility issue. The copper would react negatively to the stainless steel fasteners holding it to the frame which would cause them to eventually tear from the structure. A much more compatible mix was needed. The new mate would need to be strong and mix well with the stainless fasteners. Coreten steel was an excellent candidate suiting well to the existing criteria. The steel also replaced the copper patina with one of its own. In order for the material to protect itself it rusts a bright orangish-brown color, leaving a dark contrast to the stainless steel bolts fastening it to the structure. A study was needed after making the decision to form the skin out of core-ten. Then question being how flexible will the steel be? and how small can the section be?

Two projects were the focus of the study, the first by Italian architect Massamiliano Fuksas, a grotto entrance to a cave used as a museum for primitive cave art. The second, King Alfonso Henriques Institute by Manuel de las Casas in Zamora Spain. Both used 3/16th inch coreten plating as building skin with minimal structure and in various shapes thus proving the steel to be flexible and light enough to carry through with the concept of the design. Manuel de las Casas uses the coreten as roof and skin allowing it drain against the weathered sandstone ruins of the 16th century Gothic Monastery leaving a record of its presence.

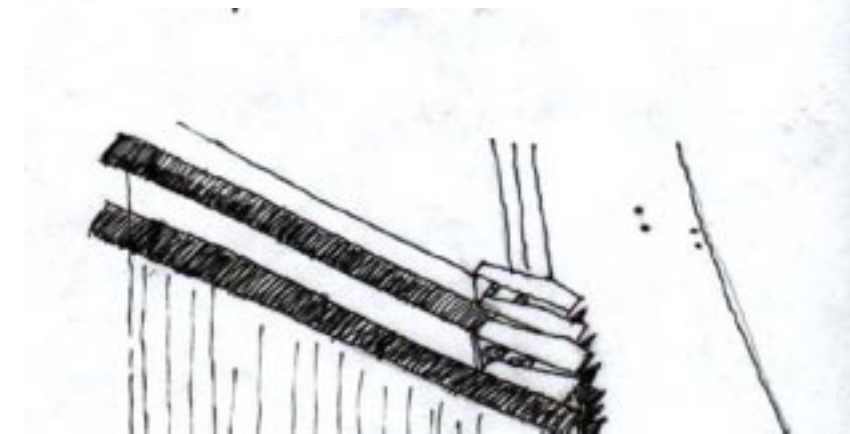
Fuksas similarly uses the steel against French sandstone as he creates a walk elevated up from the earth and into the cave as it serves as museum to the ancient paintings inside. The architect also folds the steel leaving a perfect example of its flexibility.



Grotto entrance to cave painting museum in France.



Detail for coreten steel attachment.



Detail of horizontal structural member.



Attachment of steel C-channels to the telluric base.



Placement of concentric rings as horizontal support members.



Creation of the sphere by steel sections acting as rails for the oculus.



Assembly of all structural parts.



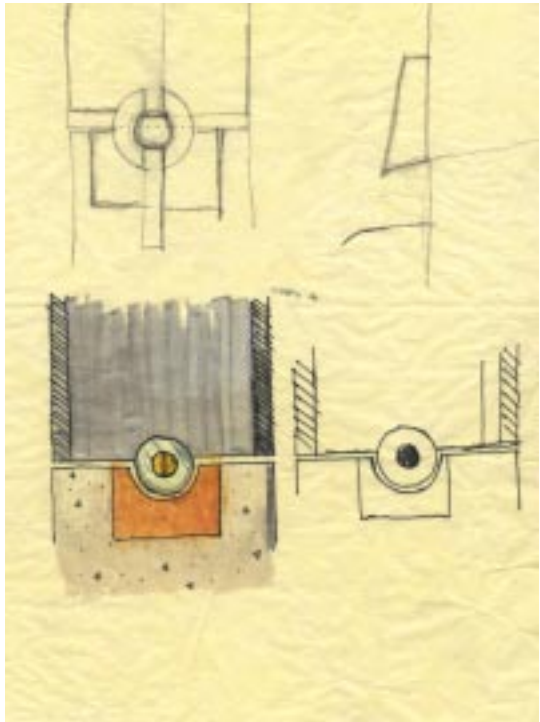
Addition of the steel panels acting as skin.

The model became an excellent tool for the study of the structure of the observatory. The skeletal structure built of steel c-channels with concentric steel rings that serve as horizontal support. The core-ten steel can be hung from the frame by the stainless steel fasteners. The turning portion of the tower can be made by transforming one of the steel rings into a track which would allow rollers to rotate the neck and oculus with the aid of a "worm", or a small motor driven winch system standard to most modern observatories. The observatory is allowed to see by a refracting telescope that looks through an oculus made by curved steel sections that make the track for the "gate" or eyelid that protects the inside of the telescope from the weather.

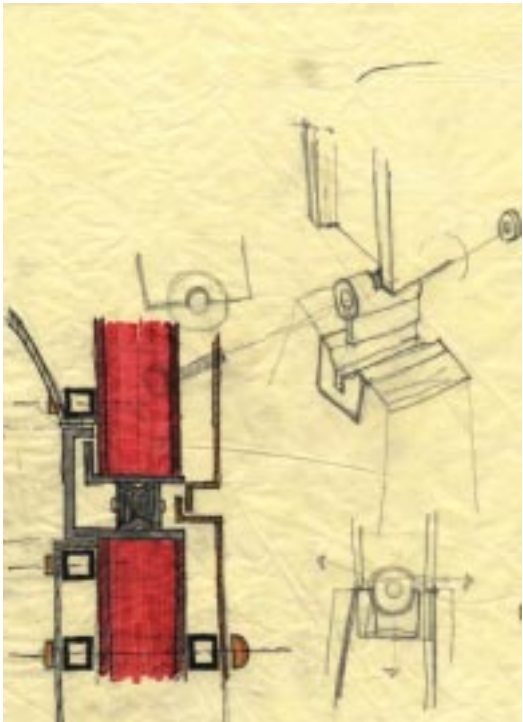
Fragments and Memory

As an architect the world around us offers much inspiration in its everyday happenings. One should be constantly aware of such happenings, looking, drawing, listening, and so on.... we may only retain fragments of such events but the fragments may some day turn into clues or some type of insight in our lives as an example the photographs on this page show a construction site in Blacksburg Virginia taken approximately two years ago only to be developed much later . The inspiration to take the photos came from the masonry ties protruding from the concrete block face of the structure. It was late in the day and the ties were grabbing the last rays of the sun as the CMU facade was shaded causing it to appear dark and the ties glowing. The discovery of the pictures came just before completion of the thesis defense, convincingly enough the distant memory of the day had to linger somewhere in the memory of the architect only to resurface again on the observatory tower skin and fasteners.



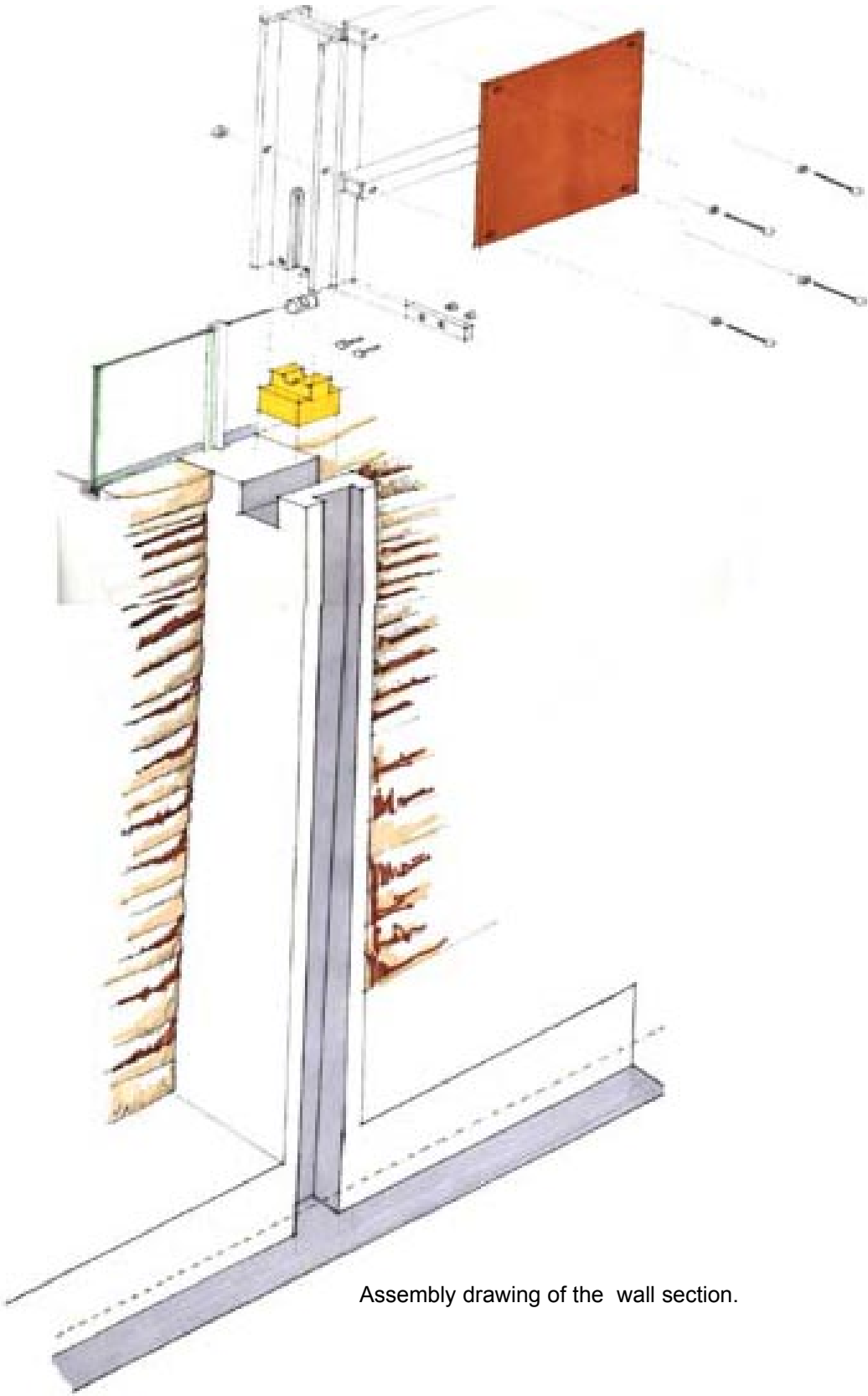


The 'knee joint' of observatory.



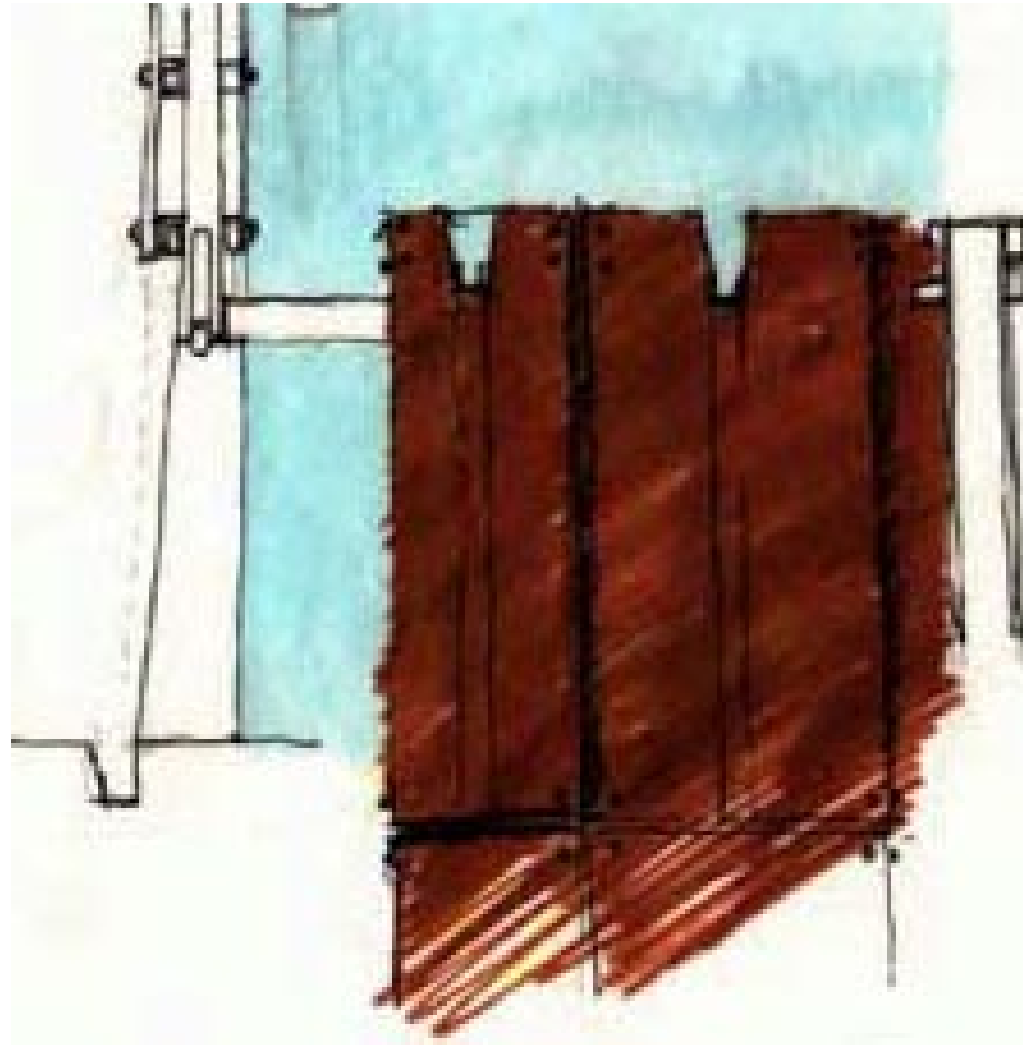
Connection at the turret

The observatory sits above its pre-modern plinth on legs made of steel C-channels held together by concentric rings that also make up its cylinder. Concrete legs protrude from the telluric mass of the base, making a place for the C-channels to rest. A knee is created at this connection between the industrial and pre-industrial material by way of a stainless steel pin acting as a joint, placed on a carved brass cube. The brass could be of engravers brass because it contains lead making it easier for the manufacturer to work with, it will be stronger and it also shows the passing of time as the weather will cause it to age. The concrete parts at this point allow a place for the pinned joint to rest. The legs also have water ways carved into them to capture some of the rusty drainage and channel into a trough at the base of the tower to give the corrosion a place to live making a record of time out of the layers of rust.

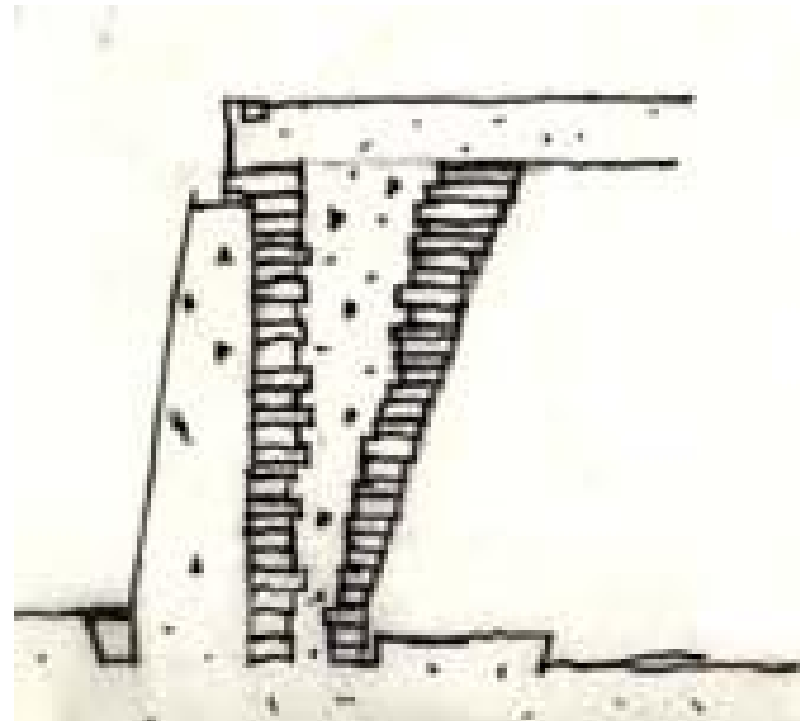


Assembly drawing of the wall section.

Details of the
drainage from
the tower's roof
and the connection
with
the earth.



A wall section through
the telluric elements
showing its drainage
by way of concrete 'legs'
and trench.





The primitive and modern parts working together to form the function and the whole in a view of a late summer solstice sunrise passing through the primitive base and marking the wall on the other side to the west.

MATERIA PRIMA

The process of discovery and learning for this thesis became somewhat of an academic journey. When something was unknown, the hidden knowledge set into motion a journey that would lead to the fruit of some conclusive finding that in some shape or form would serve as nourishment for the thesis or the project. The drawings would also take on this same process, when an understanding of a certain part of the project was needed it was sought out by looking and thinking through drawing, which developed a series of layers in which each one then became the sub-structure for the next, making each drawing, no matter how complex or simple, just as important as the previous one.

The process then became a quest or search for the right mixture of order. The geometry studies, for example, were a search for a method to bring a proportional order to the forms reminiscent to that of the alchemists search for gold or the philosophers stone as C. A. Burland stated in his work "The Arts of the Alchemist": **"The artist was a very true title for the alchemist. Only a long and devoted dedication to the mysterious path could lead him to the conclusion of his search. As in art the search has never been properly defined. It was growth which brought personal enlightenment of the kind which all mystics seek, and with it came the possibility of the mysterious transmutation. There is no reason to suspect the alchemist of insanity. We must conclude that even a few well-checked examples of transmutation were sufficient to keep a small but devoted band of researchers busy with the fantastic search which absorbed all their energies."**

The appropriateness of Burlands quote stems from a more personal understanding of art as a non- defined search and growth with enlightenment being a transmutation of sorts, not of gold, but of ones being, of a way of thinking, drawing, discovering, the Materia Prima from which we approach our work as architects. Not that architecture could ever be reduced to some chemical formula, but rather we may follow the alchemists example of a devoted dedication to finding our personal philosophers stone, or position in which we can approach whatever the muse of architecture may hand us.

**...Is God unknown?
Is he manifest like the sky? I'd sooner
Believe the latter. It is the measure of man.
Full of merit, yet poetically, man
Dwells on this earth. But no purer
Is the shade of the starry night,
If I might put it so, than
Man, who's called an image of the godhead.**

(Poetry, Language, Thought quote from Holderlin pg. 219)

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Sincerely,
Phillip A. Cosco

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2. **Page 16** Drawing of AB square construction.
3. **Page 16** plan drawing of the Tomb of Bibi Khanum.
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18. **Page 49** The painting of the School of Athens by Raphael.
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20. **Page 55** Two Photographs of entrance to King Alfonso Henriques Institute Zamora Spain.
21. **Page 60** A painting of the Alchemical Splendor Solis by an unknown painter 1582.

**My guide and I came on that hidden
road to make our way back into the
bright world; and with no care for
any rest, we climbed-he first, I
followed-until I saw through a round
opening, some of those things of
beauty heaven bears. It was from
there that we merged, to see-once-
more-the stars.**

Dante Inferno Canto XXXIV

VITA

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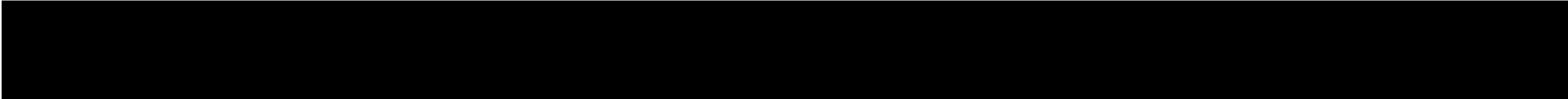
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Franciscan Roger Bacon once stated : There are two methods of obtaining knowledge, by argument and by experiment; argument makes conclusions and forces us to agree to them, but it does not make us feel certain or so remove suspicion that the mind rests in assurance of truth, unless this be found by experience. This thesis gains its knowledge by experience from the study of precedence in the form of construction methods, geometry, and the natural elements of the site. Primitive mass is introduced as a reaction to the site in that it makes a place for modern construction of an observatory and learning center in a way that is related to what is given, the particular qualities of the site.