A Synthesis of Geometry and Light

Prakhyaa Mukesh Jain

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Master of Architecture

Steven R. Thompson
Committee Chair

James R. Jones

Howard S. Gartner

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Contemplation, Geometric Transformation, Light, Cube, Cone, Sun Path

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Abstract

The poetics of an architecture of a moment is explored through design of a contemplative room (wherin the geometric transformation of a cubic base to a cone) demonstrates the rhythmn and proportion of the construction of the room and the relative motion of the sun in the space. The relationship of the sun rays on the walls of the room passing through a reflecting pool are shown using demonstrative and constructive means of descriptive geometry as both the design generator and poetic expression. The composition of the buildings reveals the play of light on form.

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General Audience Abstract

An exploration to understand the relationship of architecture and the material sensible world. The work seeks to reveal that through the tangible architectural strategies of form, structure, material and light, the intangible qualities of architecture are defined.

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Introduction

"The Ultimate meaning of any building is beyond architecture; it directs our consciousness back to the world and towards our own sense of self and being" Juhani Pallasama.

When I started the thesis year, I wanted to explore the relationship of architecture and the material sensible world. I explored individual senses such as sight, sound and touch. The drawings are limited in doing that. Only the presence of a building can offer this. While at the Steger Center for International Scholarship in Riva San Vitale in Switzerland for the final semester, visits to buildings like Convent Sainte-Marie de la Tourette, Notre-Dame du Haut, in western France; Church of San Giovanni Battista in Mogno Switzerland; Bascilica de la Sagrada Familia and Casa Mila in Barcelona helped me realize that I have to experience it first hand.

"A great building must begin with the unmeasurable, must go through the measurable means when it is being designed and in the end must be unmeasurable." Louis Kahn.

The work seeks to reveal that through the tangible architectural strategies of form, structure, material and light, the intangible qualities of architecture are defined.

The poetics of an architecture of a moment is explored through design of a contemplative room (wherin the geometric transformation of a cubic base to a cone) demonstrates the rhythmn and proportion of the construction of the room and the relative motion of the sun in the space. The relationship of the sun rays on the walls of the room passing through a reflecting pool are shown using demonstrative and constructive means of descriptive geometry as both the design generator and poetic expression.

The composition of the buildings reveals the play of light on form. The interplay of geometry and light occurs when walking down the ramp experiencing the transparent glass container wrapping the stone conoid and when light reveals the geometric transformation of the cubic base to a truncated cone in the contemplative room. The contemplative room reveals the more universal geometry of the sun's course throughout the seasons and througout the day.

Figure 1

In the aerial view of the site, the universal geometry of the sun in its course setting at the end of the day is captured.

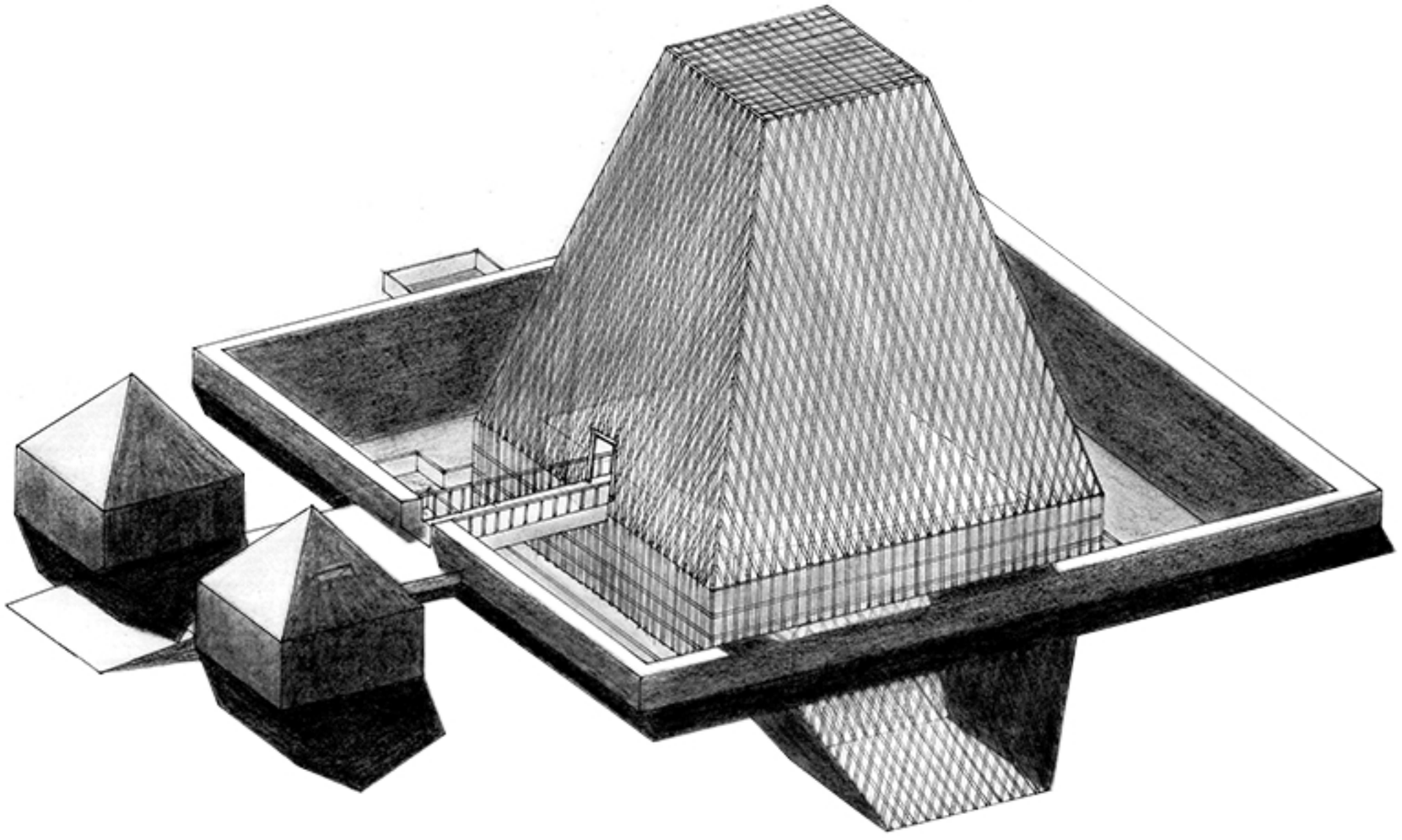


Figure 2

Architecture is the masterly, correct and magnificient play of masses brought together in light - Le Corbusier.

The architecture is percieved as a composition of geometric masses. The play of geometry as light interacts with it through light, shadow and contrast is going to reveal the geometry of the building. Descriptive geometry is instrumental to project the overall form: an earthly cubic base projects upward transforming into a conical form tending toward the spiritual realm.


Hollins
81
Hanging Rock
Wooded Acres
Bonsack
581
81
81
Salem
Roanoke
Vinton
Mill Mountain Star
220
Proposed
Site
Cave Spring
Narrows
N

Figure 3

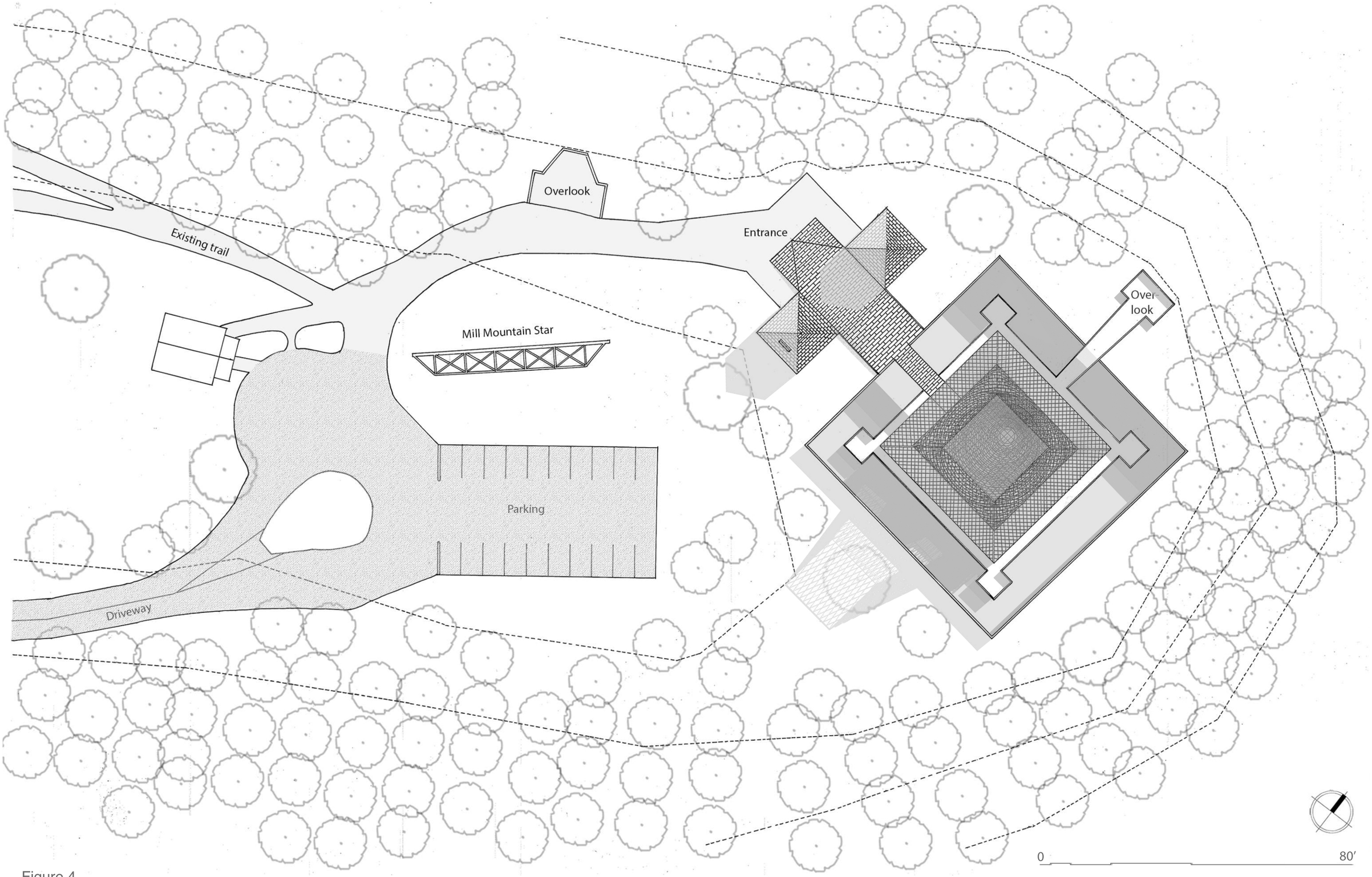
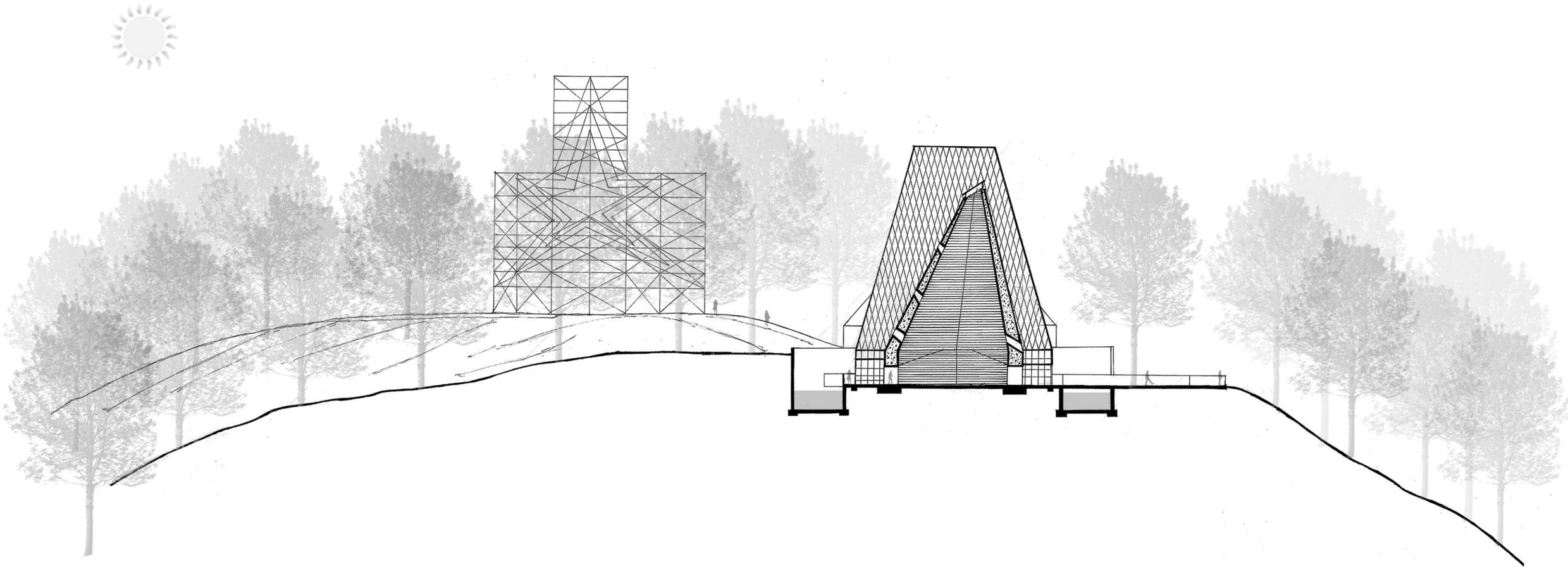


Figure 4

SITE PLAN



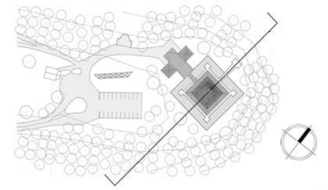


Figure 5

SITE SECTION

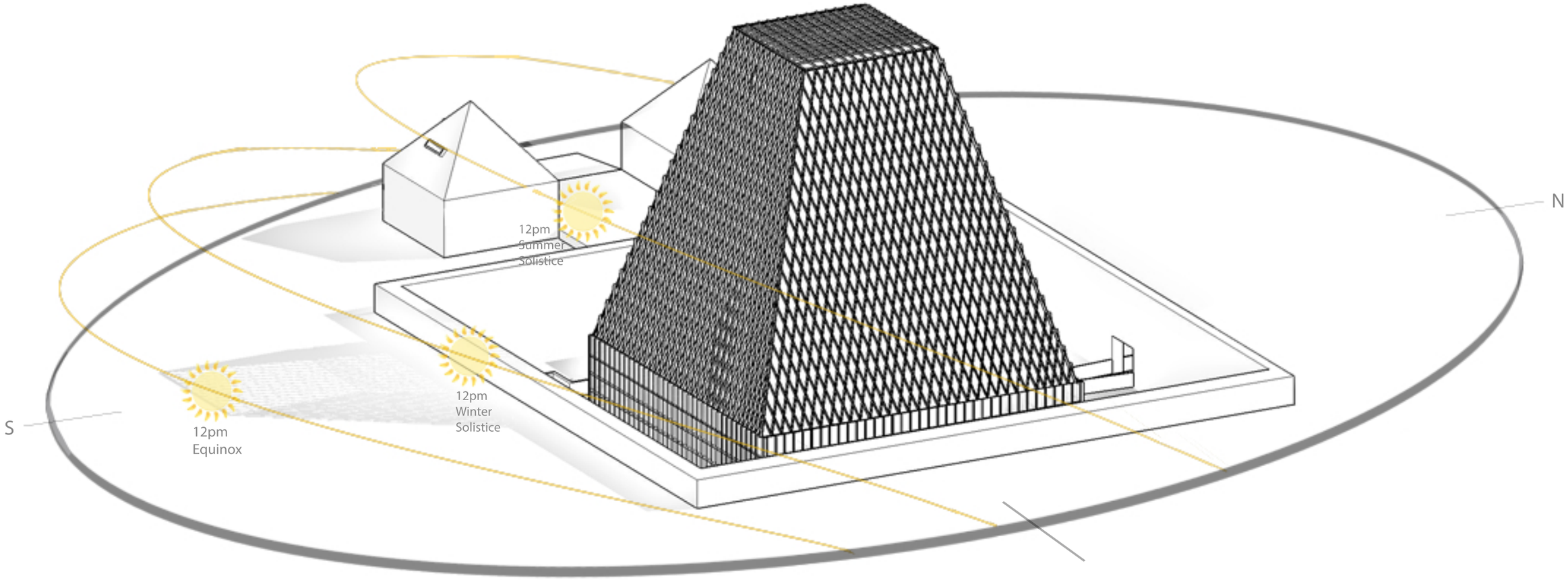


Figure 6

SUN PATH DIAGRAM

The sun in its course throughout the seasons and throughout the day form a universal sensible and intelligible pattern described through geometry giving a sense of a greater world beyond the immediate material world.

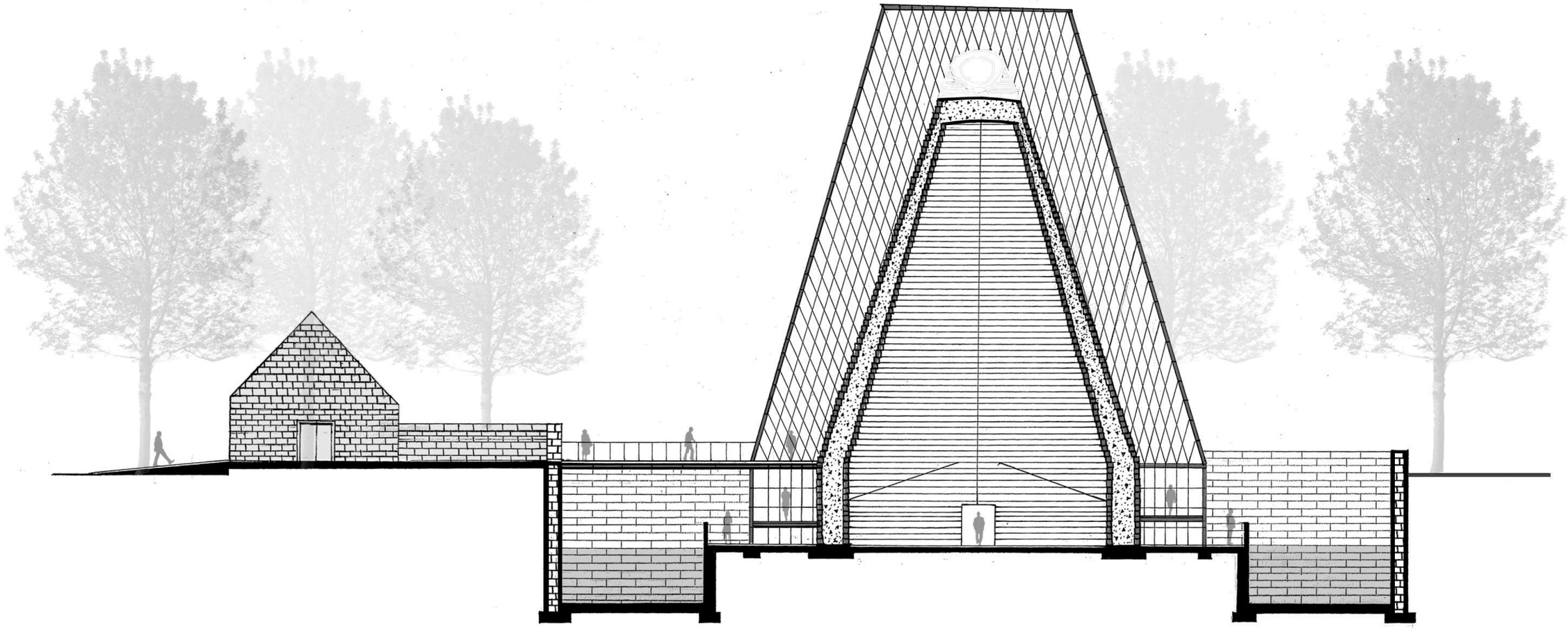


Figure 7

SECTION - AA'

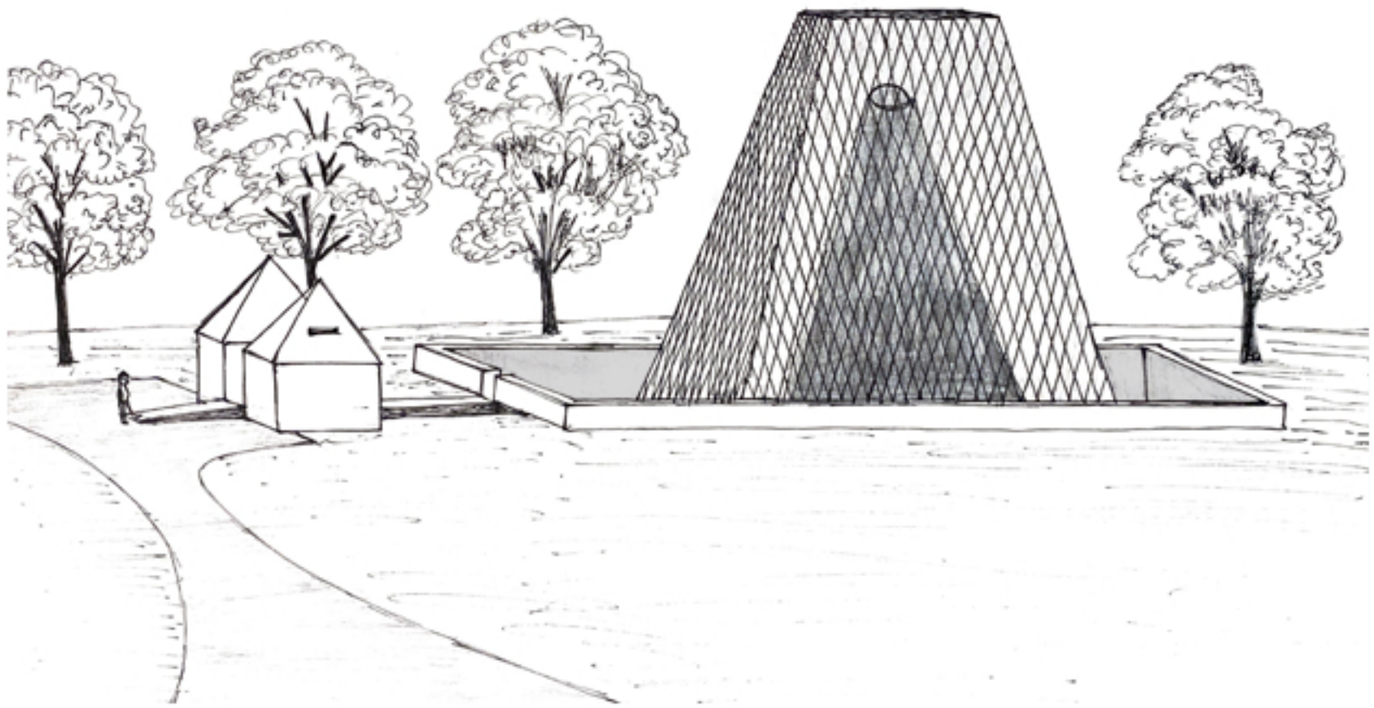


Figure 8

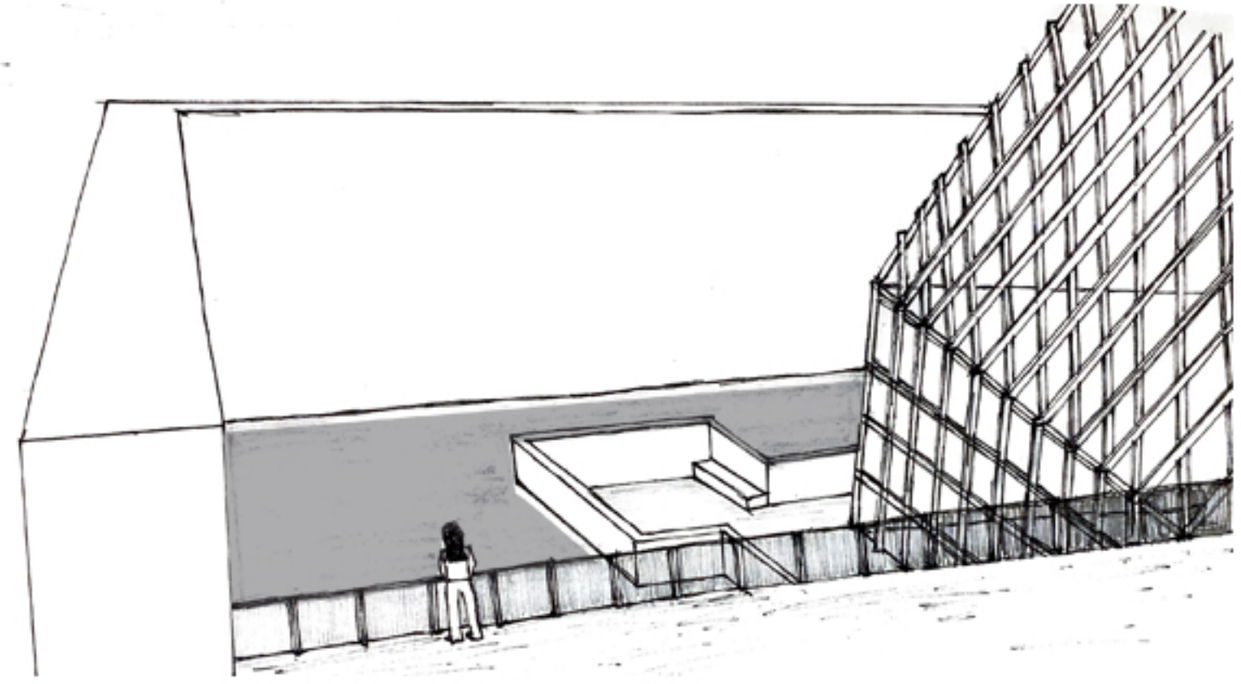


Figure 9

Figure 10

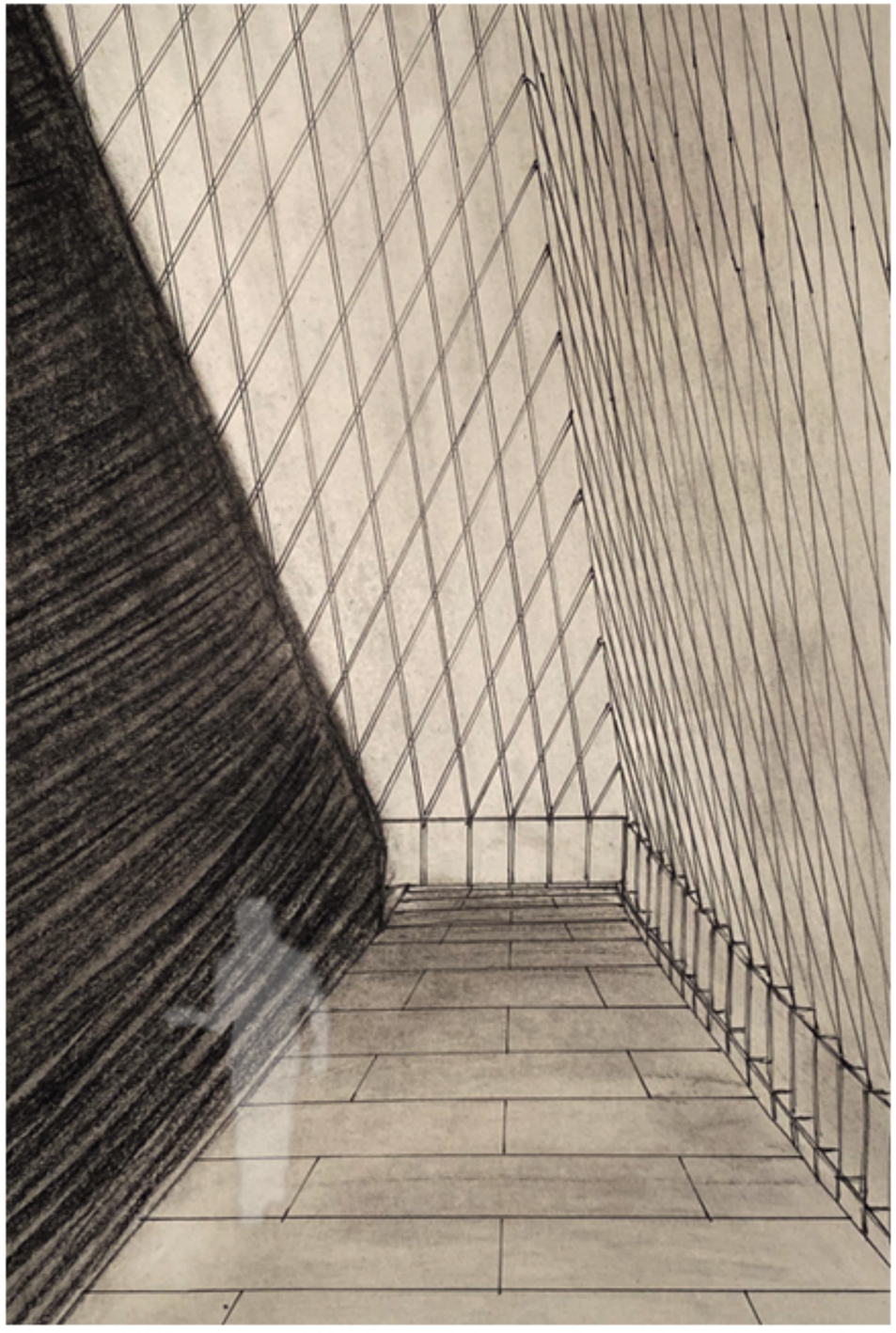
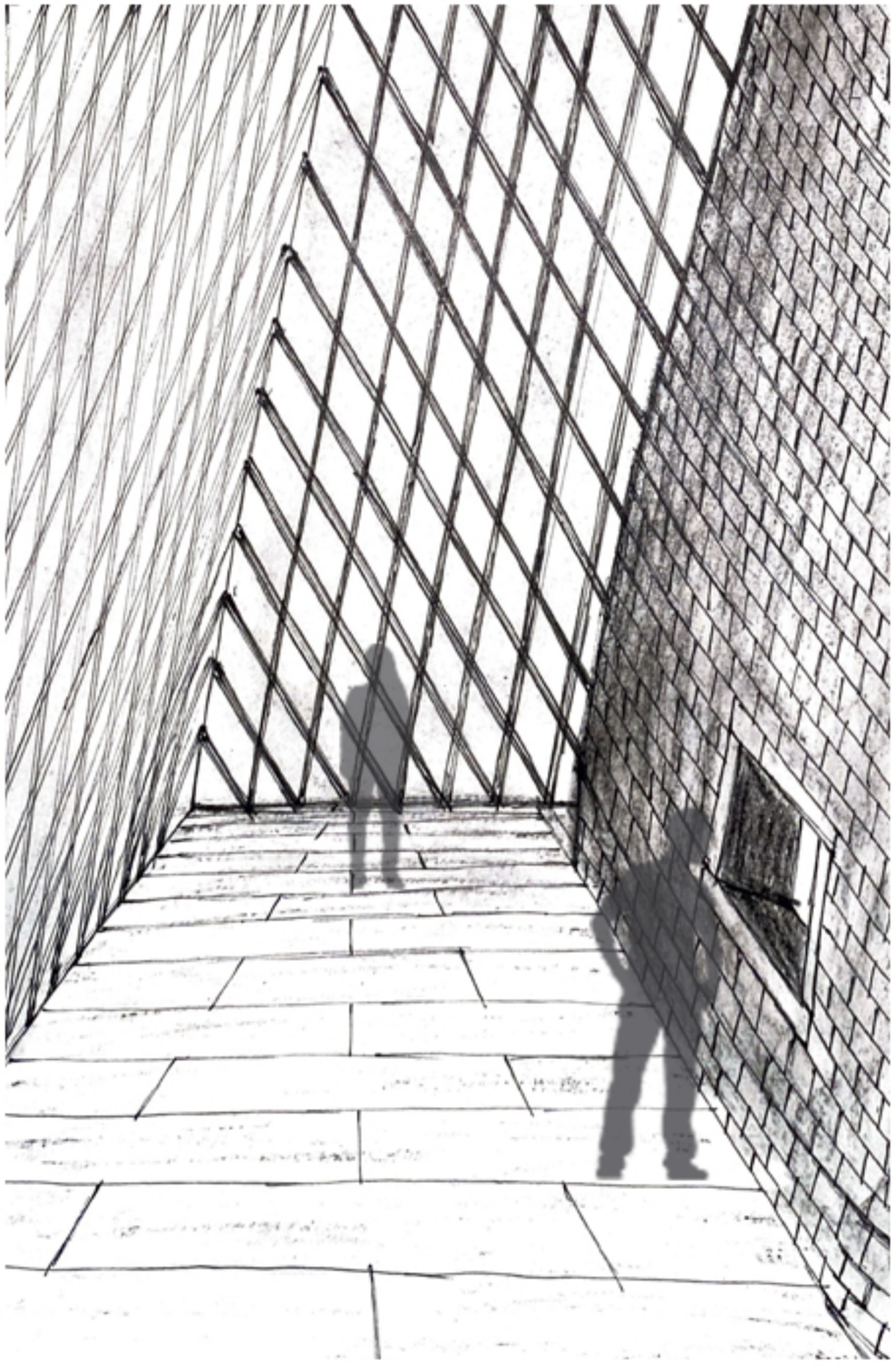


Figure 11

The texture of the surface of the stone is experienced walking along the ramp. The roughness of the granite contrasts with the transparent and smooth surface of the steel & glass pyramidical enclosure.



While walking along the ramp, a person can look into the conoid and experience the contrasting condition of the light steel and glass enclosure he stands in and the thick dark contemplative room that he is about to enter.

Figure 12

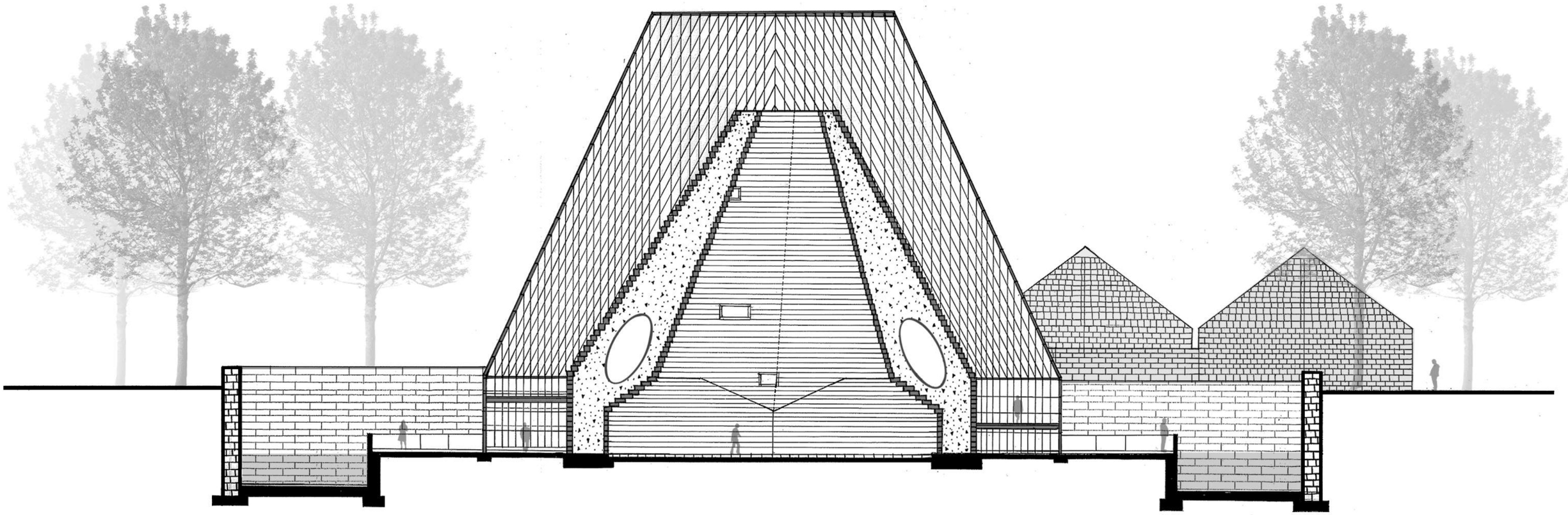
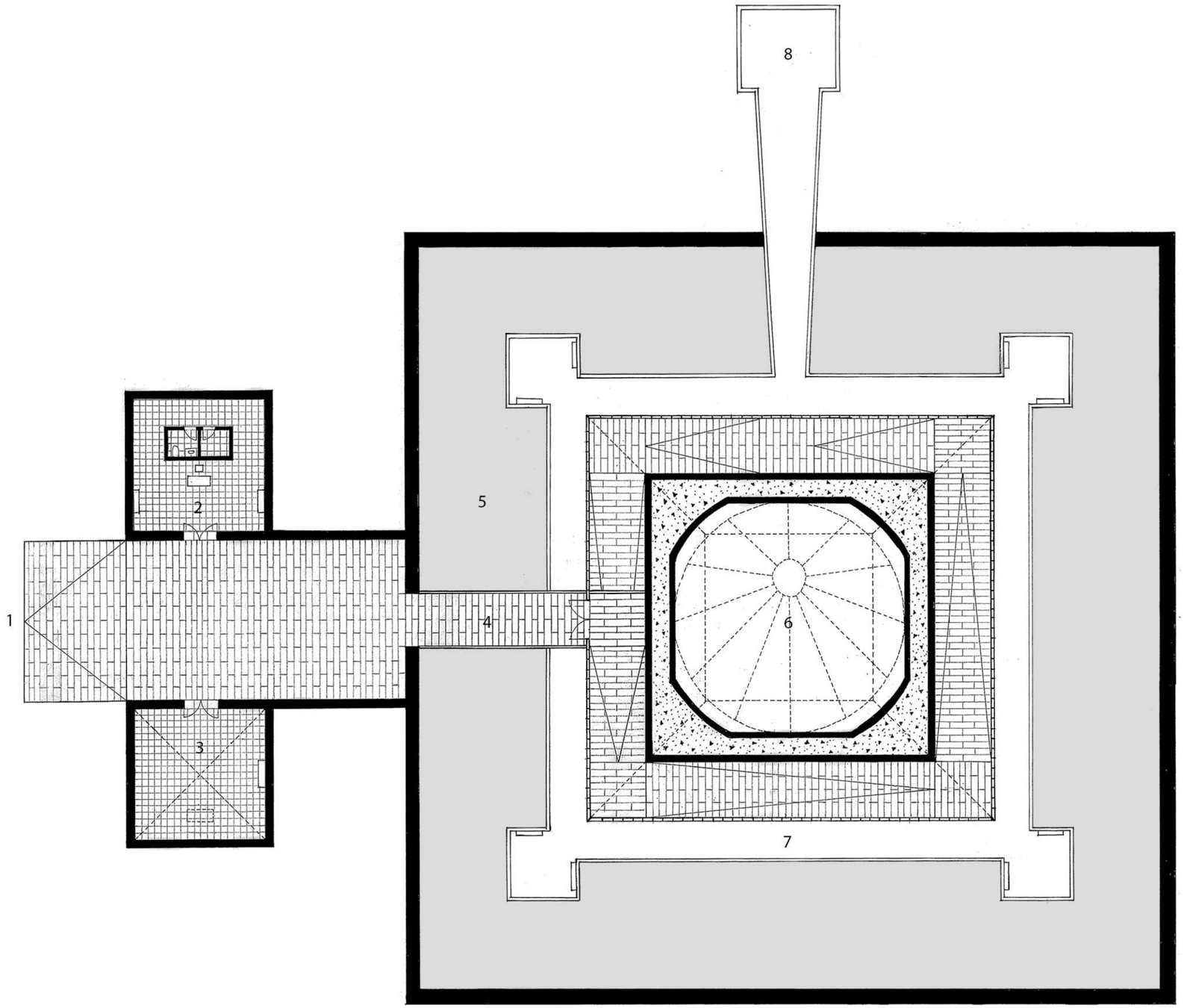


Figure 13

SECTION - BB’



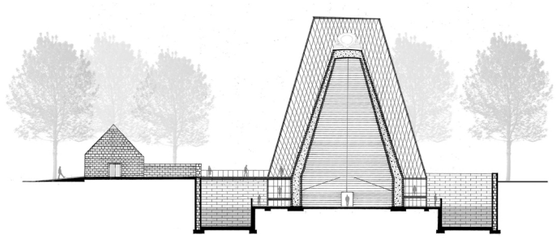
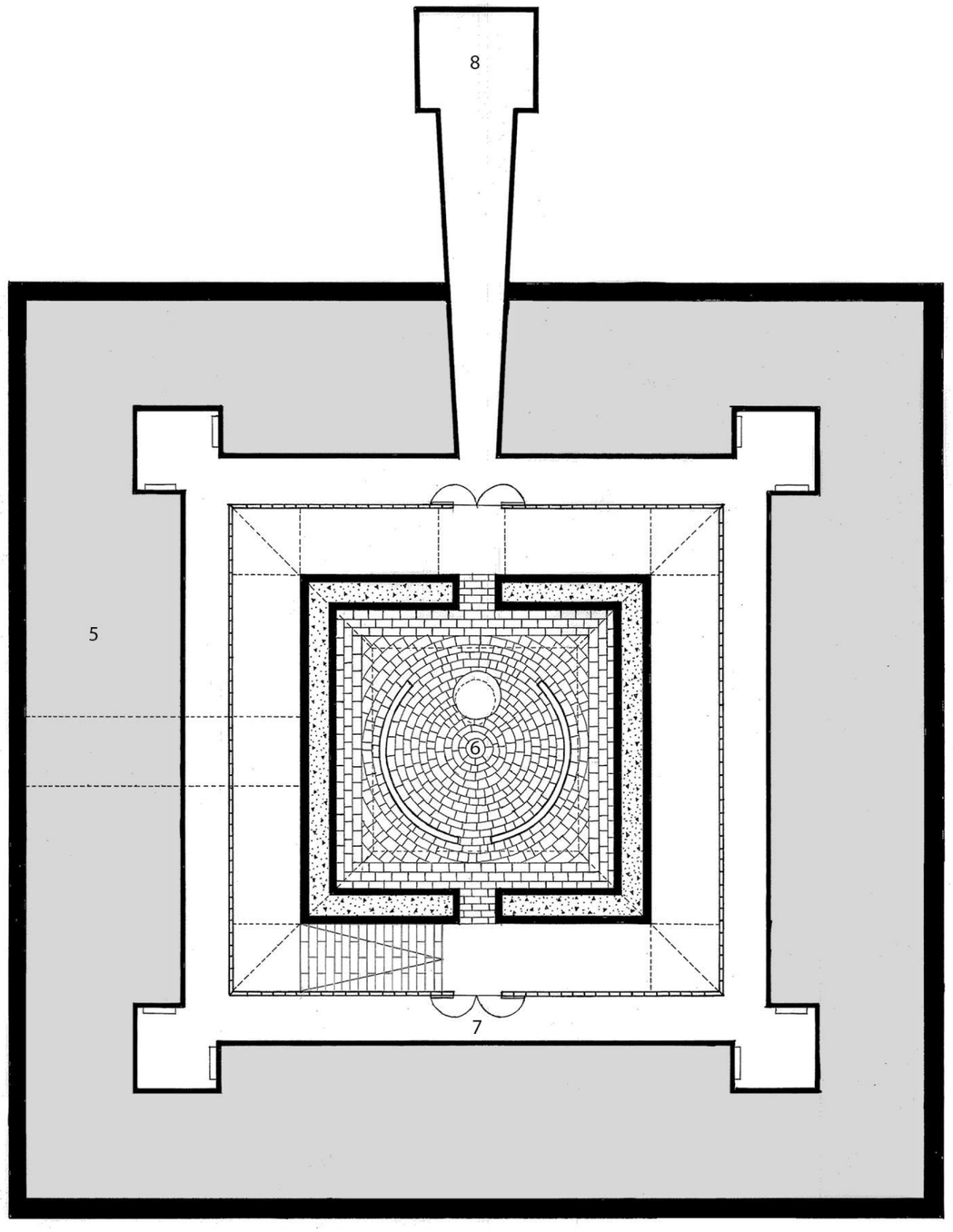


Figure 14

1 Entrance
2 Reception
3 Reflection room
4 Bridge
5 Reflective pool
6 Main Reflection room
7 Walkway
8 Overlook

GROUND FLOOR PLAN

0 40′



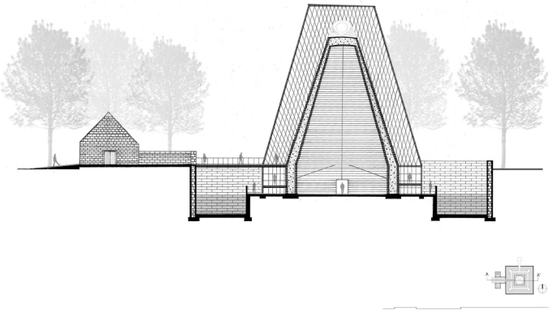


Figure 15

5 Reflective pool
6 Main Reflection room
7 Walkway
8 Overlook

BASEMENT FLOOR PLAN

0 40′

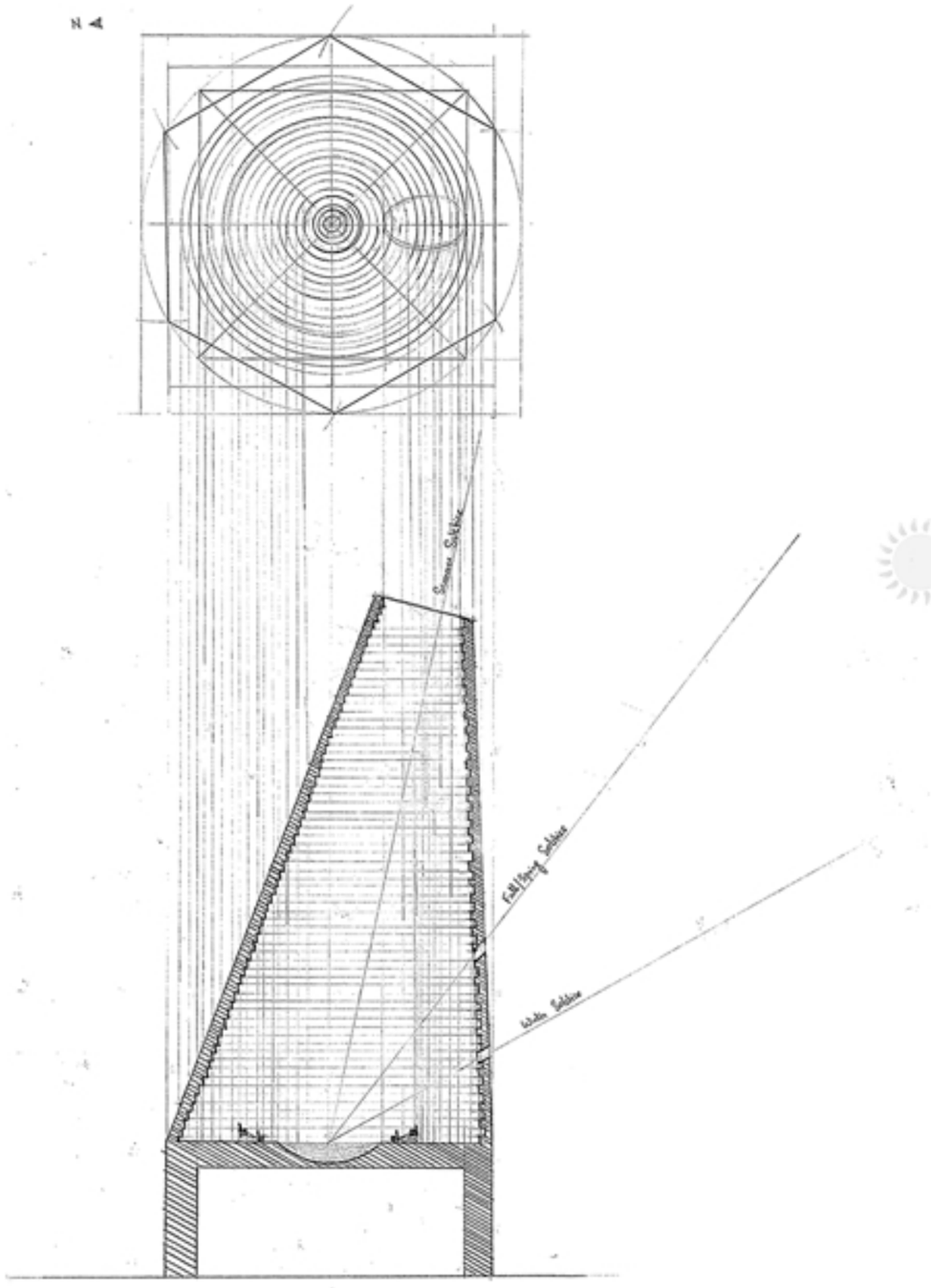


Figure 16

Working with the cubical base and truncated conoid, the conoid is inclined to bring in sun at solar noon on the summer solictice, sprin/fall equinoxes and winter solictice respectively which passes through the apertures on the south wall of the cone and reflects off the pool of water in the room.

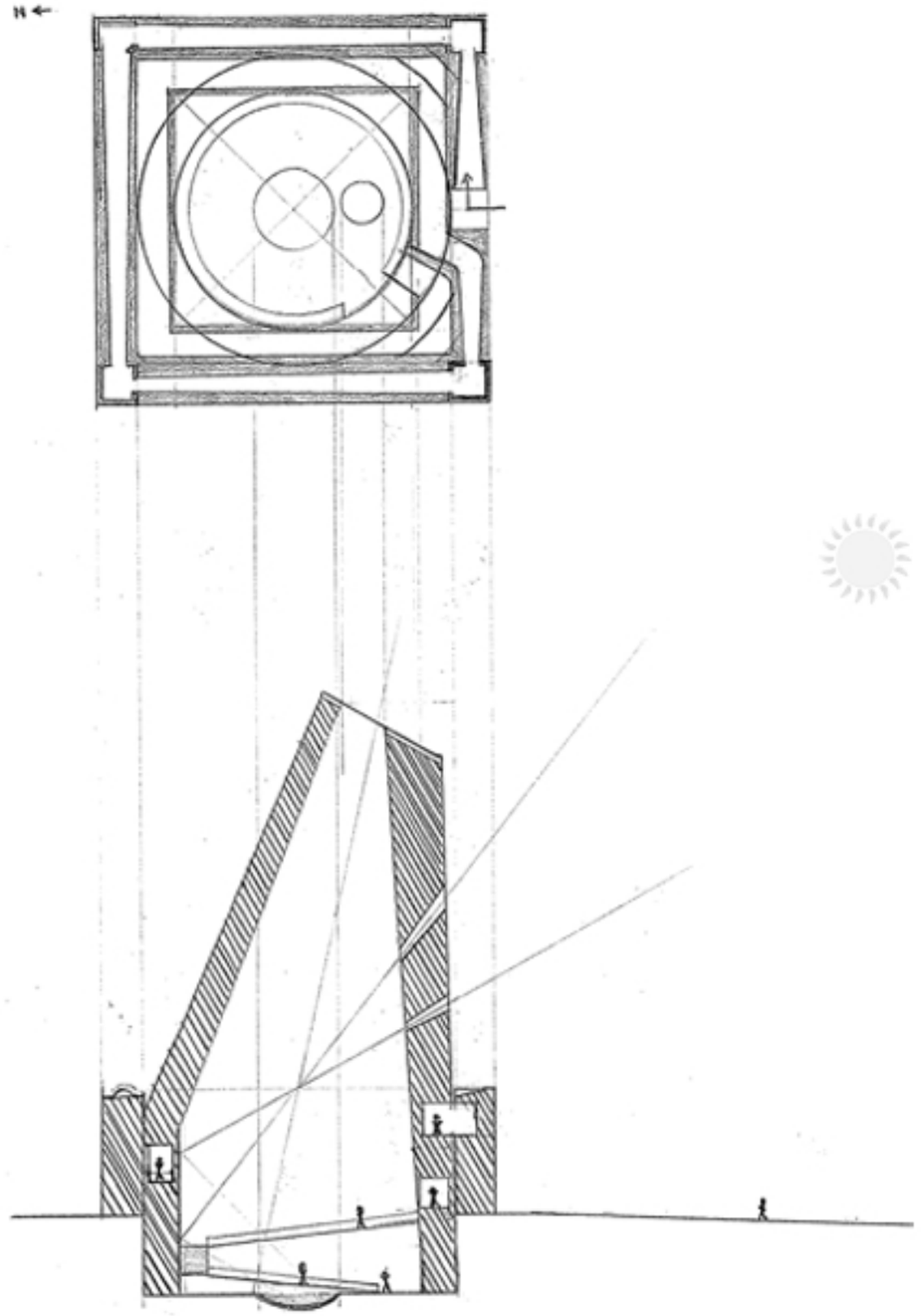


Figure 17

Here, the thickness of the enclosure is used to accomodate a ramp that would lead to the base of the contemplative room.

Figure 18

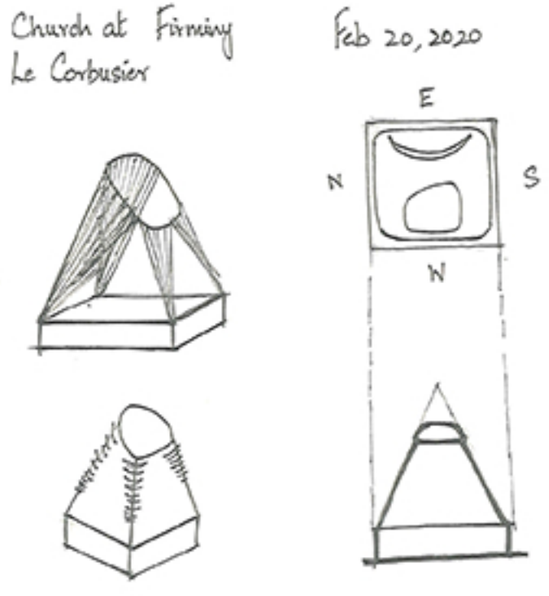


Figure 19

Figure 20

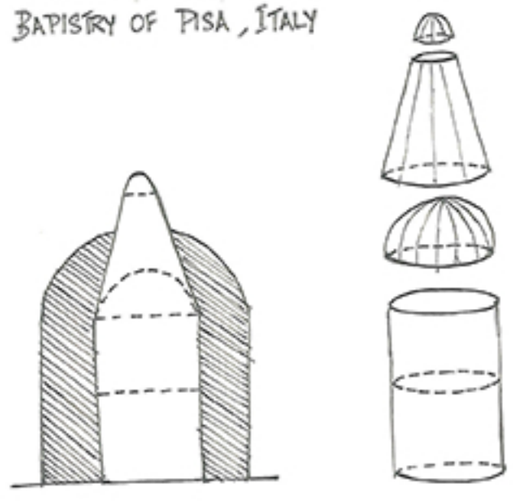


Figure 21

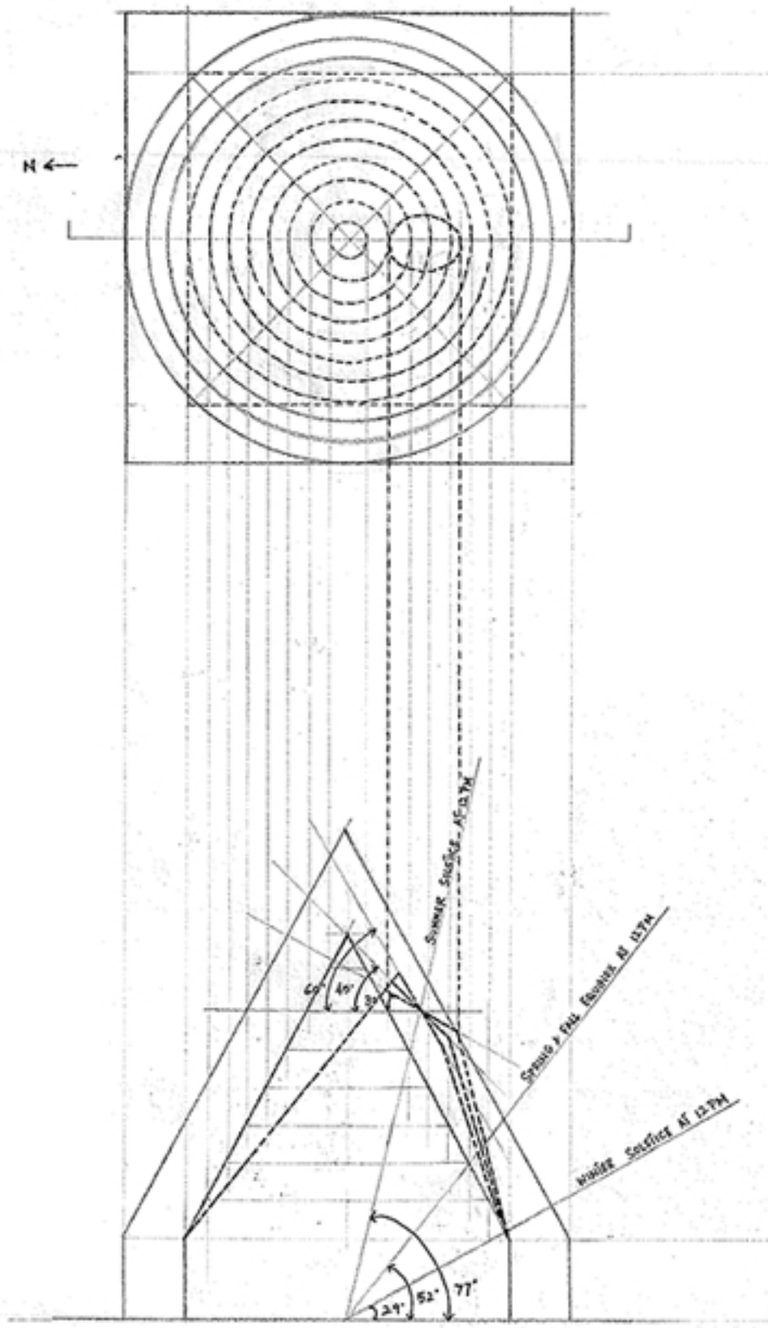


Figure 22

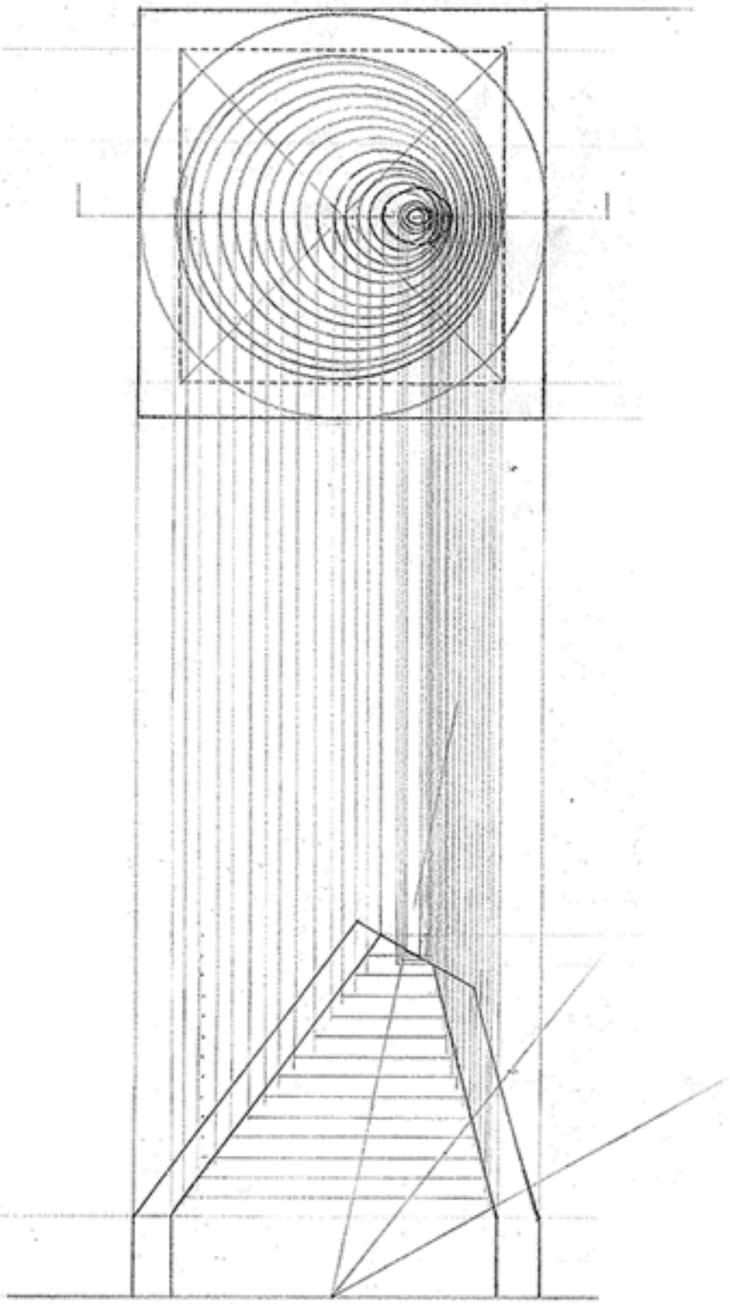


Figure 23

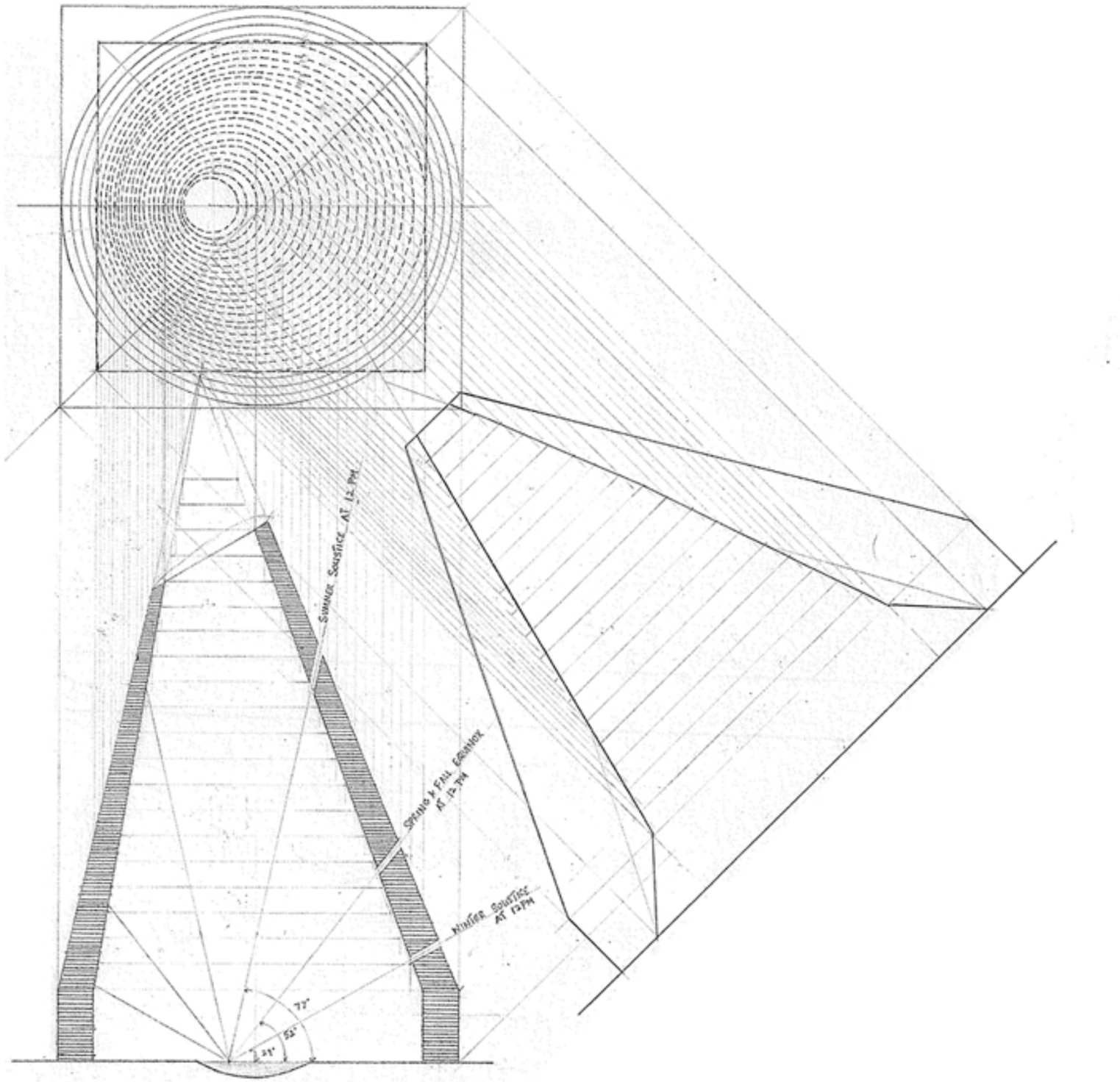


Figure 24

This attempt at the inclined cone with an angled oculus uses the same defining geometry, but accomodates the slits on the south wall and attempts to resolve the intersecting geometry between the cubical base and the conical top.

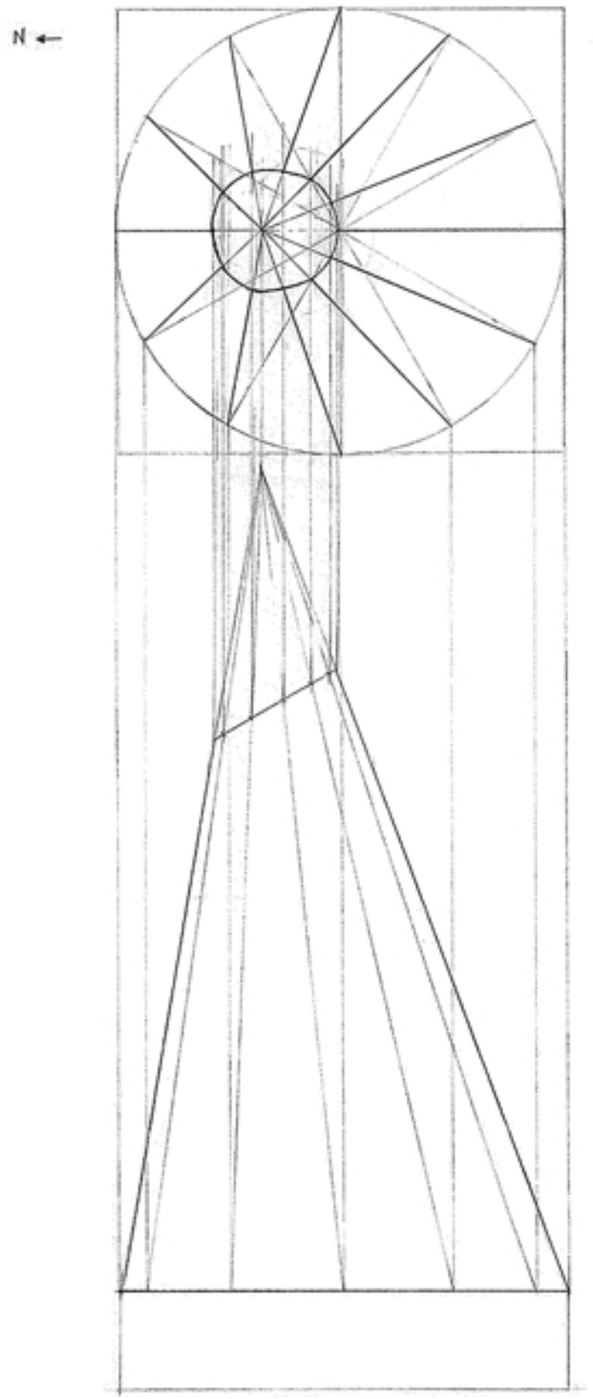


Figure 25

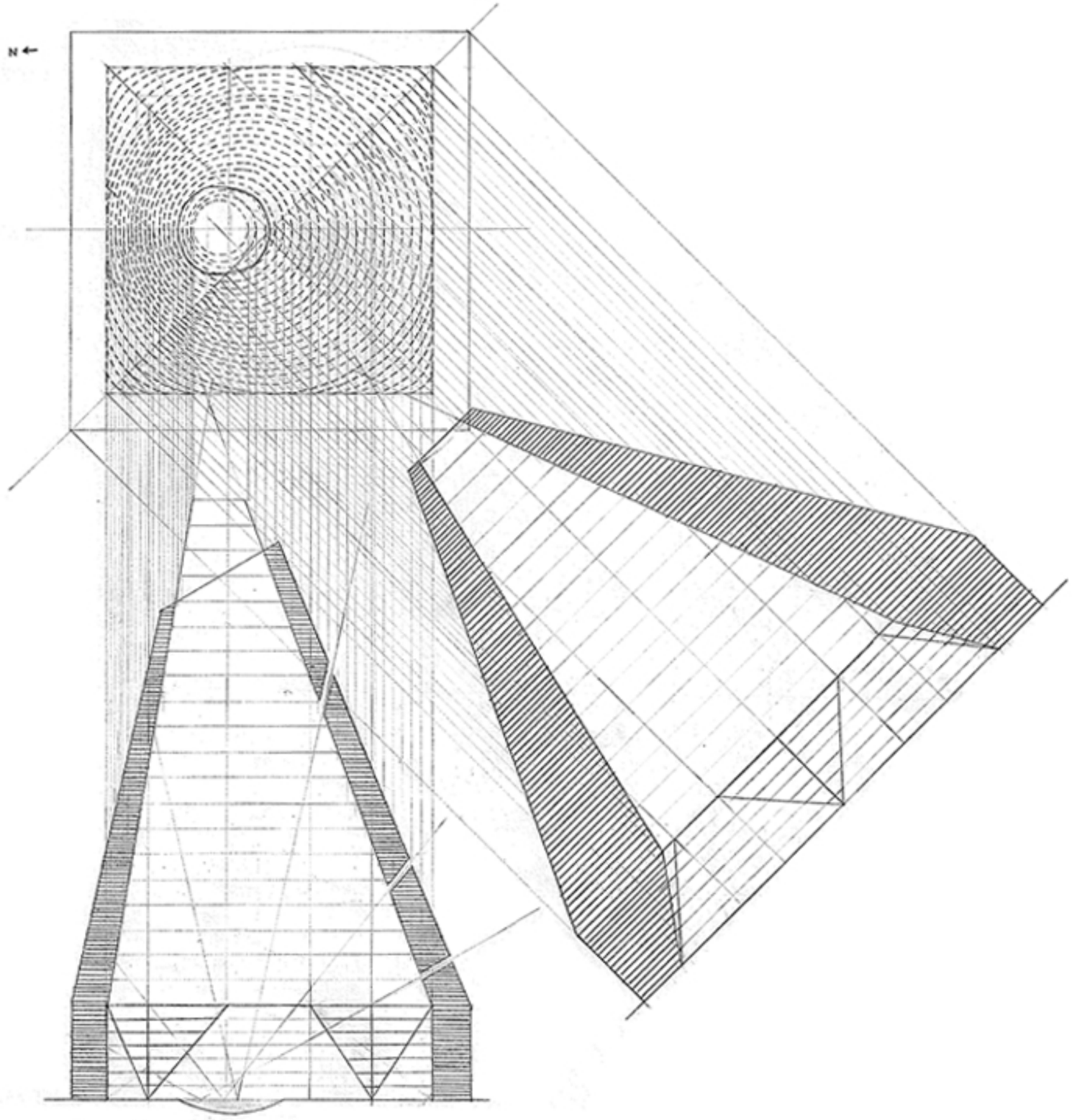
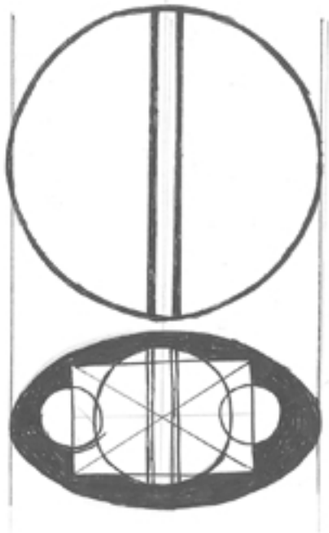


Figure 26

The demonstrative basis of these studies is the use of rectilinear logic through circular constructions. This drawing uses descriptive geometry to resolve issues discovered in the previous drawing. It resolves the intersecting geometry between the cubic base and the conoid.

Church of San Giovanni Battista (1986-1996) Mogno, Switzerland March 9, 2020

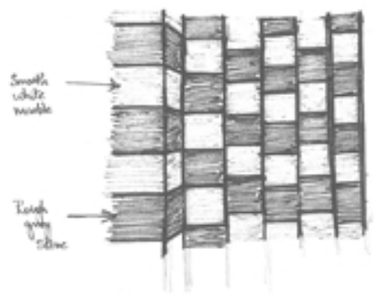
Mario Botta



Transformation of geometry ⇒ ellipse - rectangular - circle
(form) - (floor) (roof)

- cylindrical form of the church rises above the surrounding village ⇒ the vertical axis expresses the spiritual axis.

- The interior walls demonstrate the transformation of geometry of the building form :-
  "a rectangle inscribed within an external ellipse that ultimately changes into a circle at roof level"



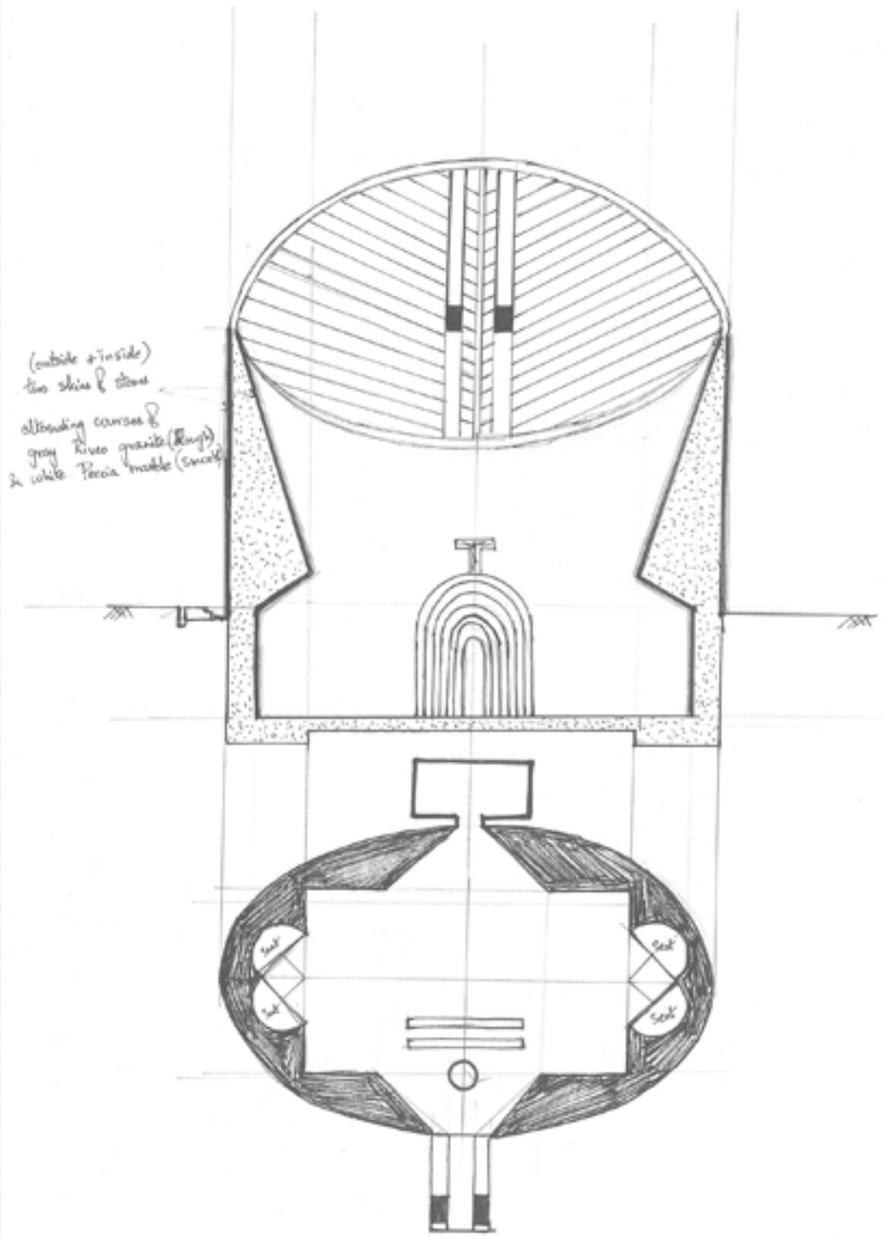


Figure 27

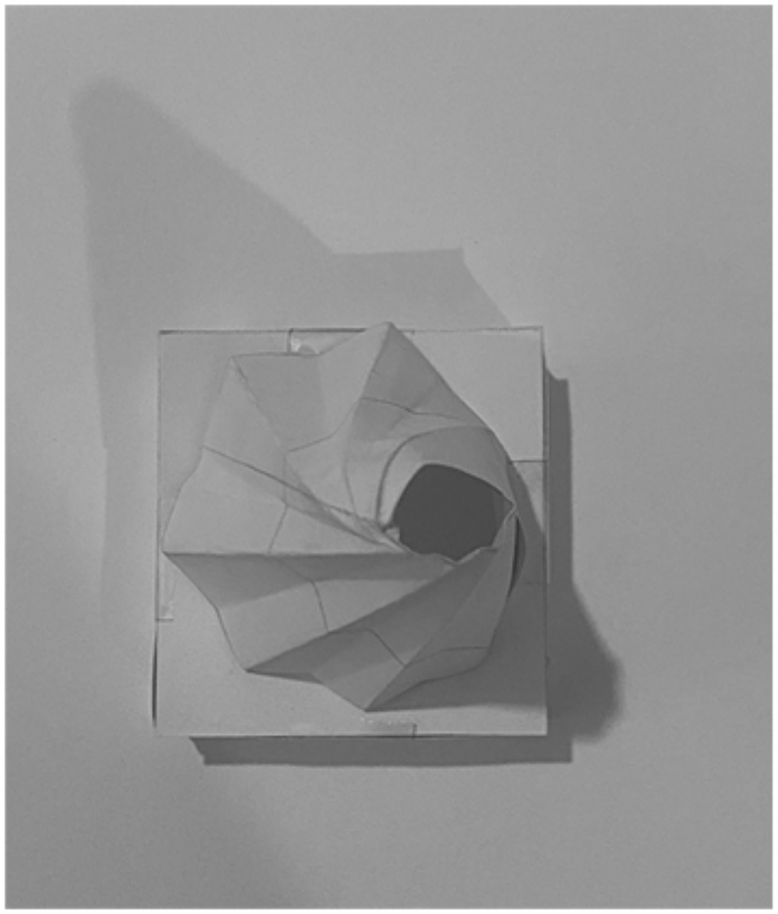


Figure 28

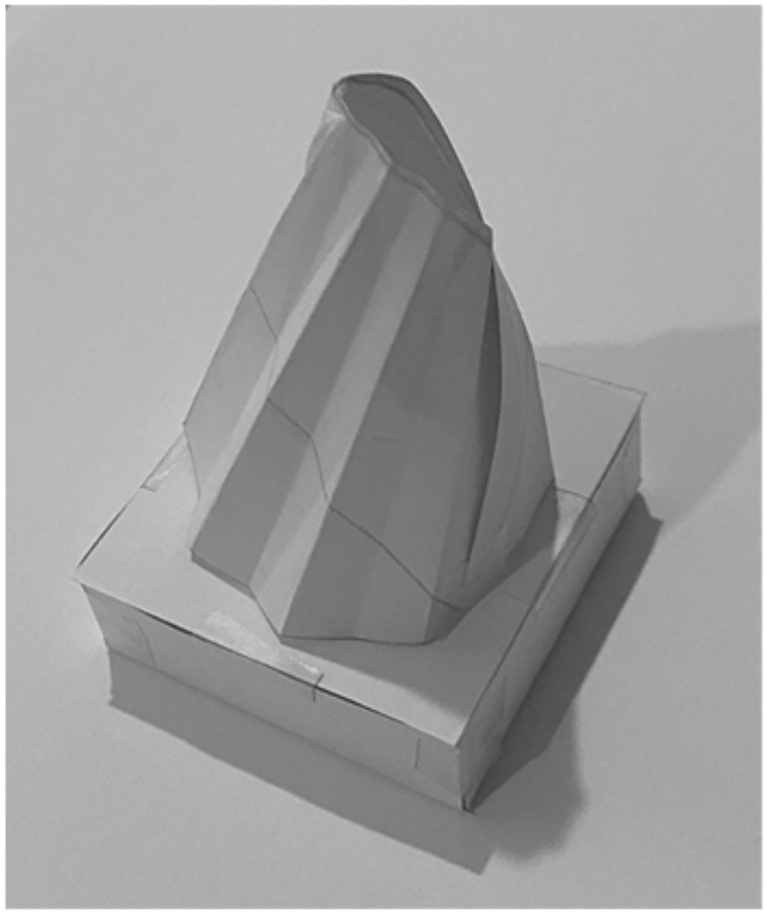


Figure 29

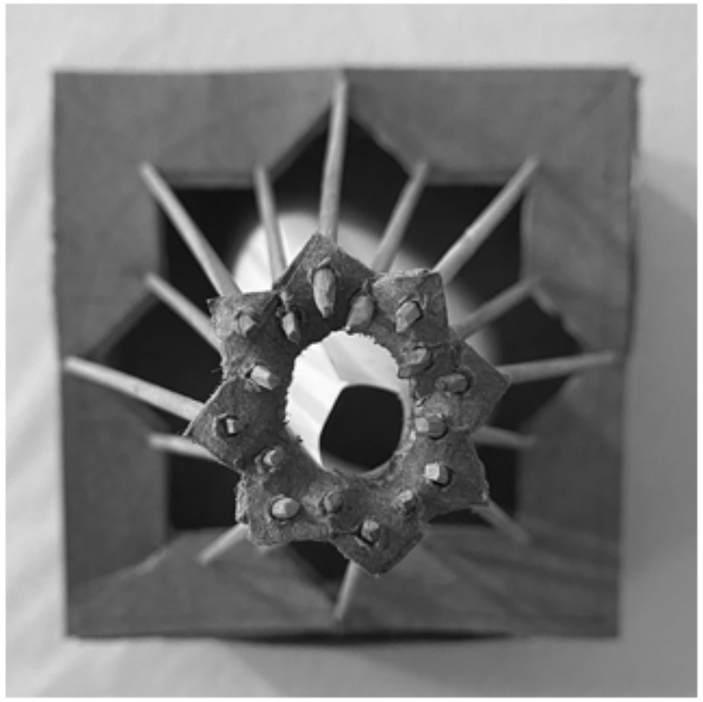


Figure 30

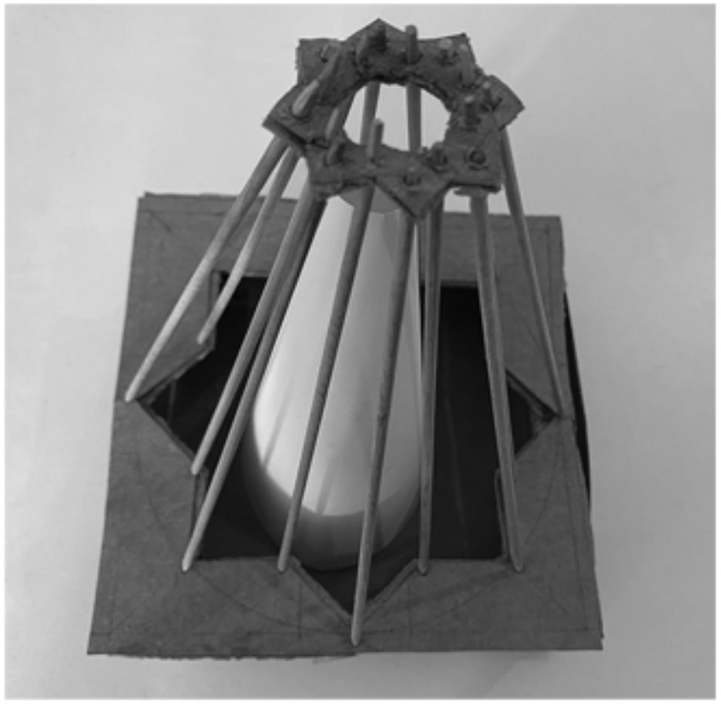


Figure 31

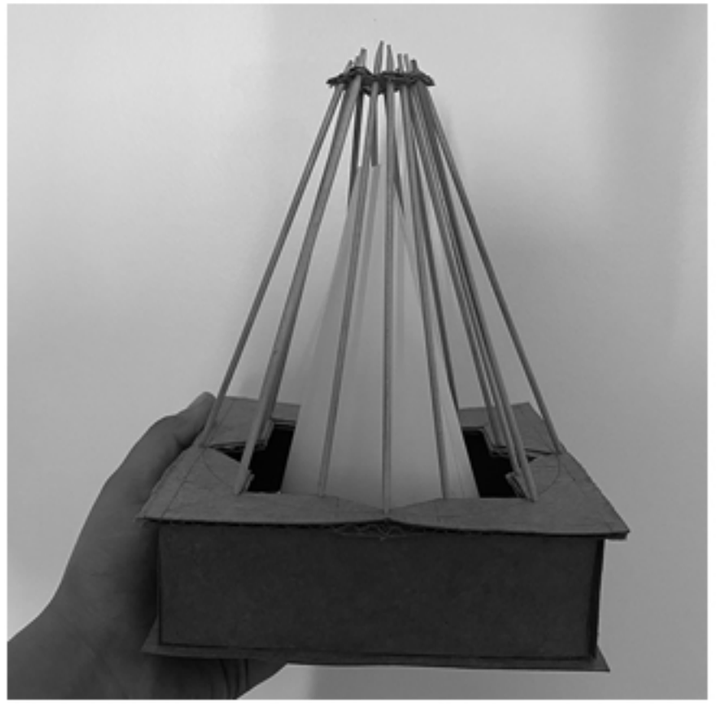


Figure 32

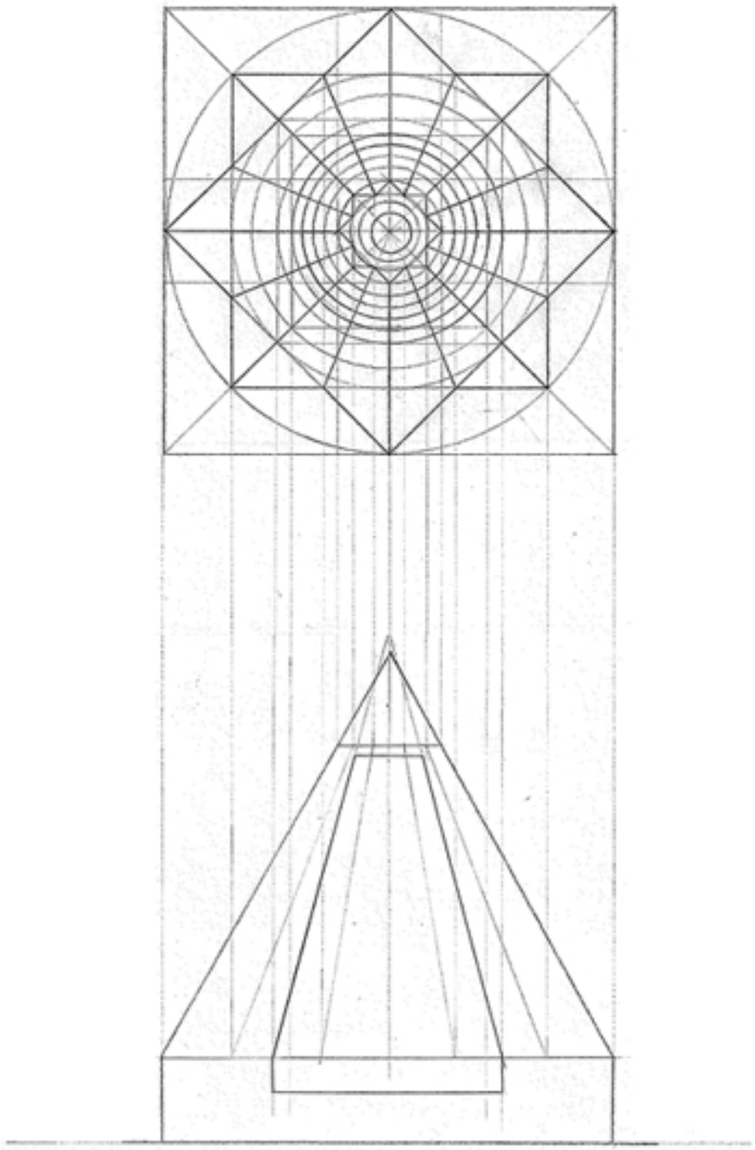


Figure 33

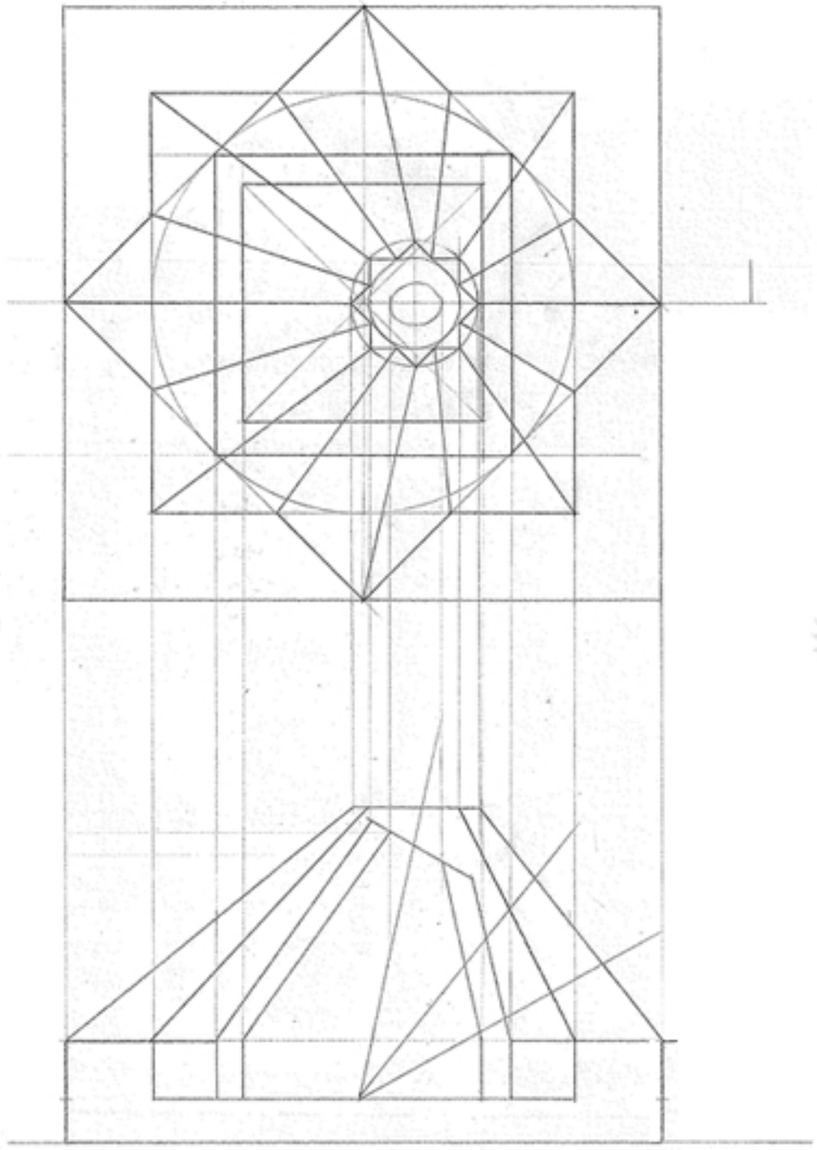


Figure 34

These geometric projections explore the interplay of the interior conic form and the outward crystaline form.

Figure 35

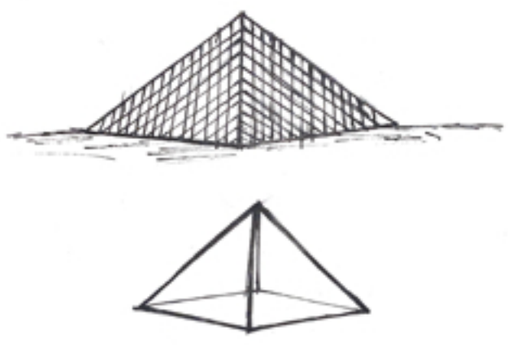
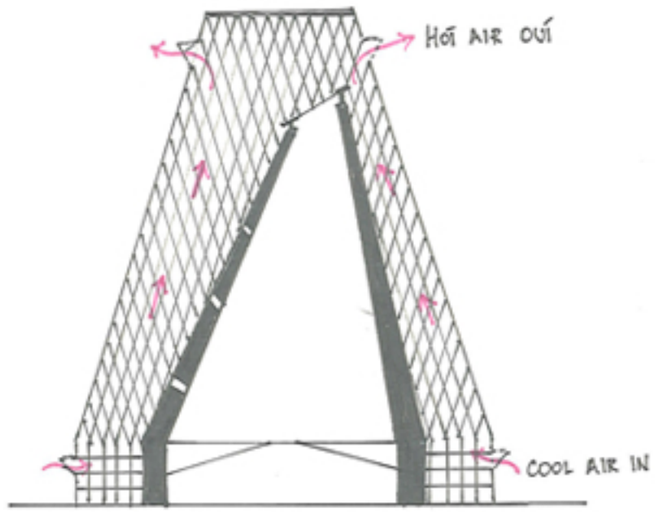


Figure 36

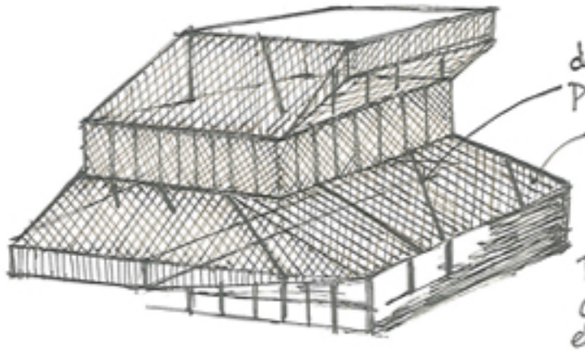
Low-emissivity (Low-E) coated glass
- reduces heat gain & heat loss

Emissivity of clear glass is 0.84
Emissivity of low-e coated glass is 0.15
- 15% of heat is absorbed & re-emitted, rest is reflected.

For ventilation :



Seattle Public Library - Crystalline diagrid form



diagonal steel columns provide additional support

Glazing supported diagrid

The exterior diagrid frame carries lateral wind loads efficiently, creating stiffness that is complemented by the axial action of the diagonal member.

Glass enclosure - diagrid

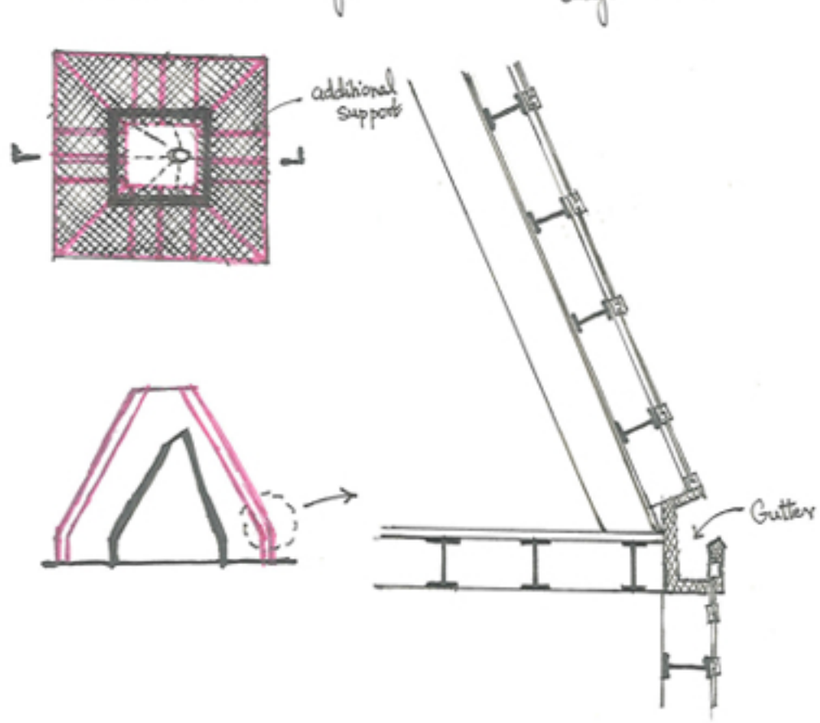
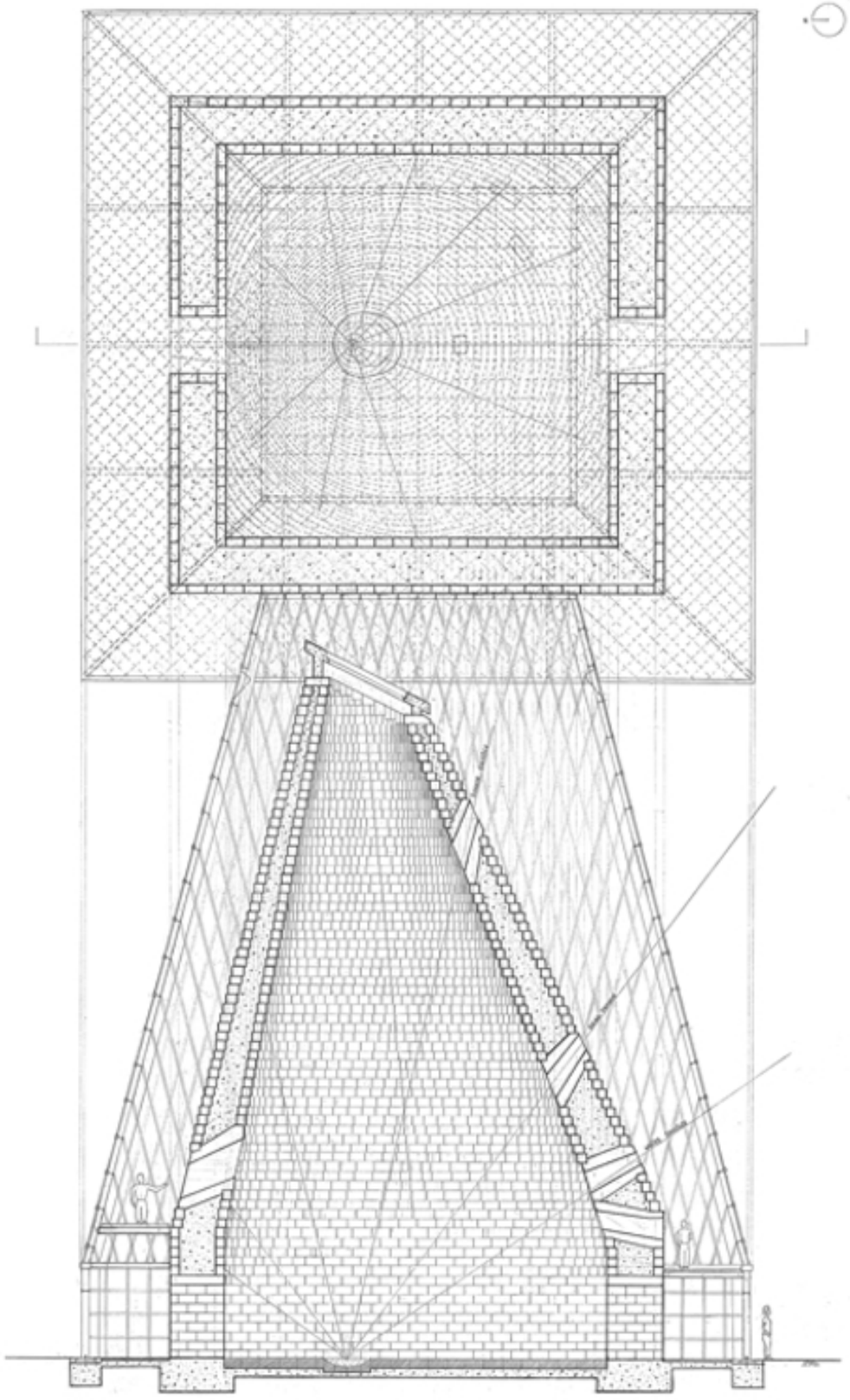
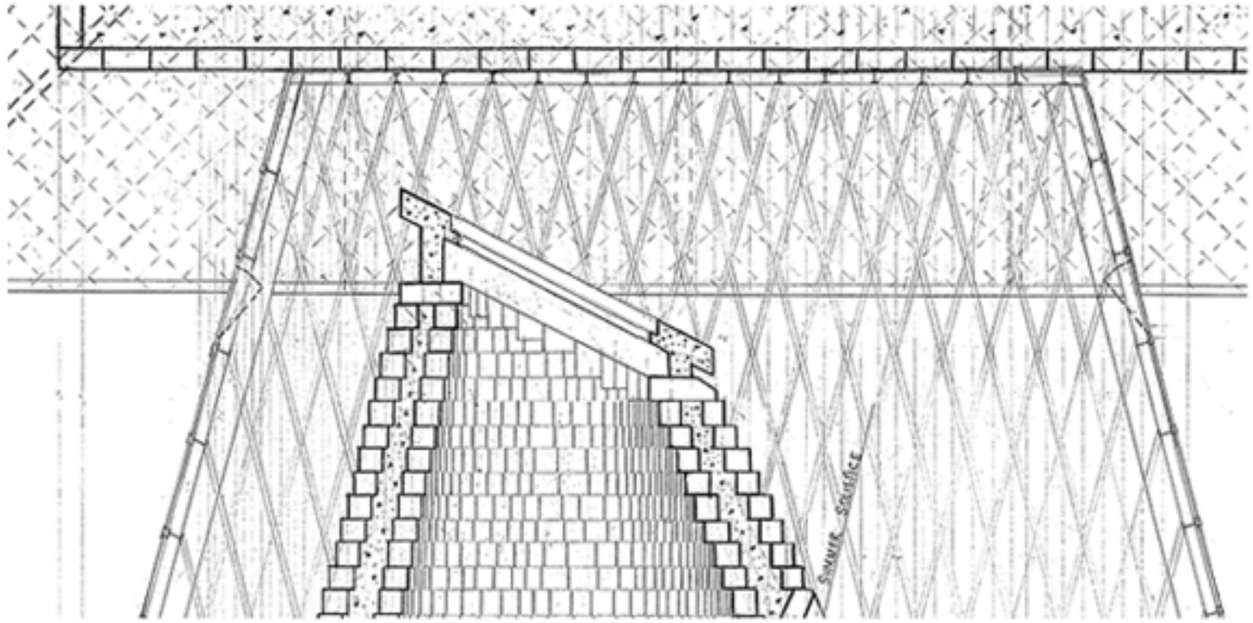


Figure 37





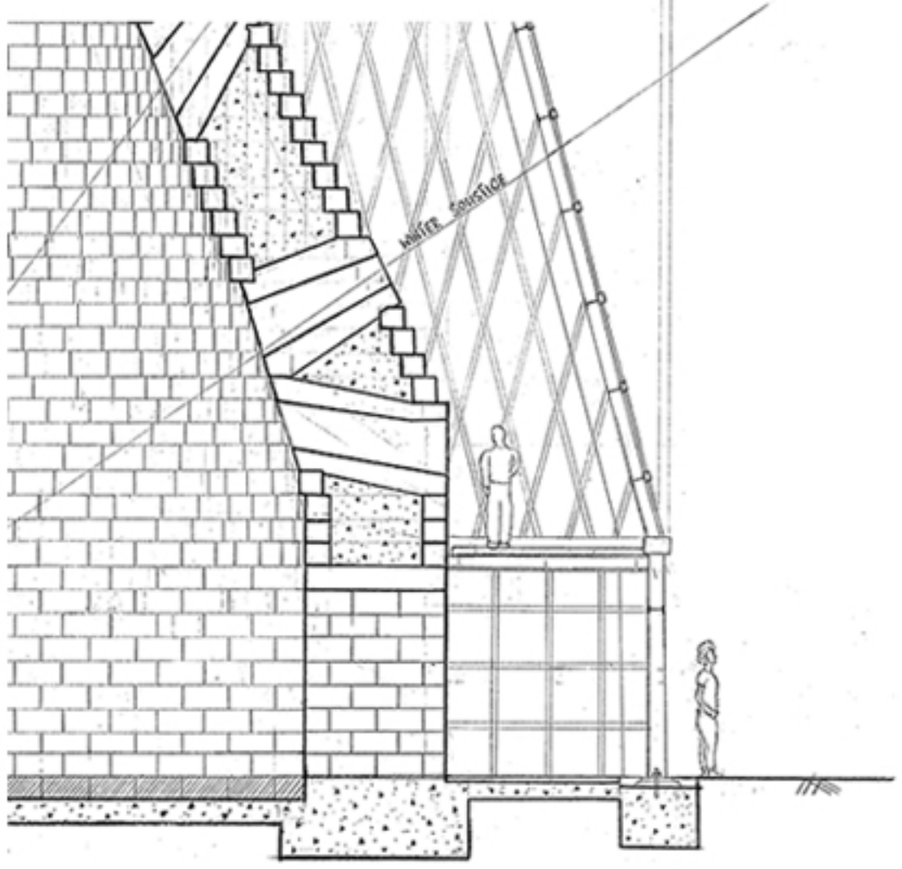
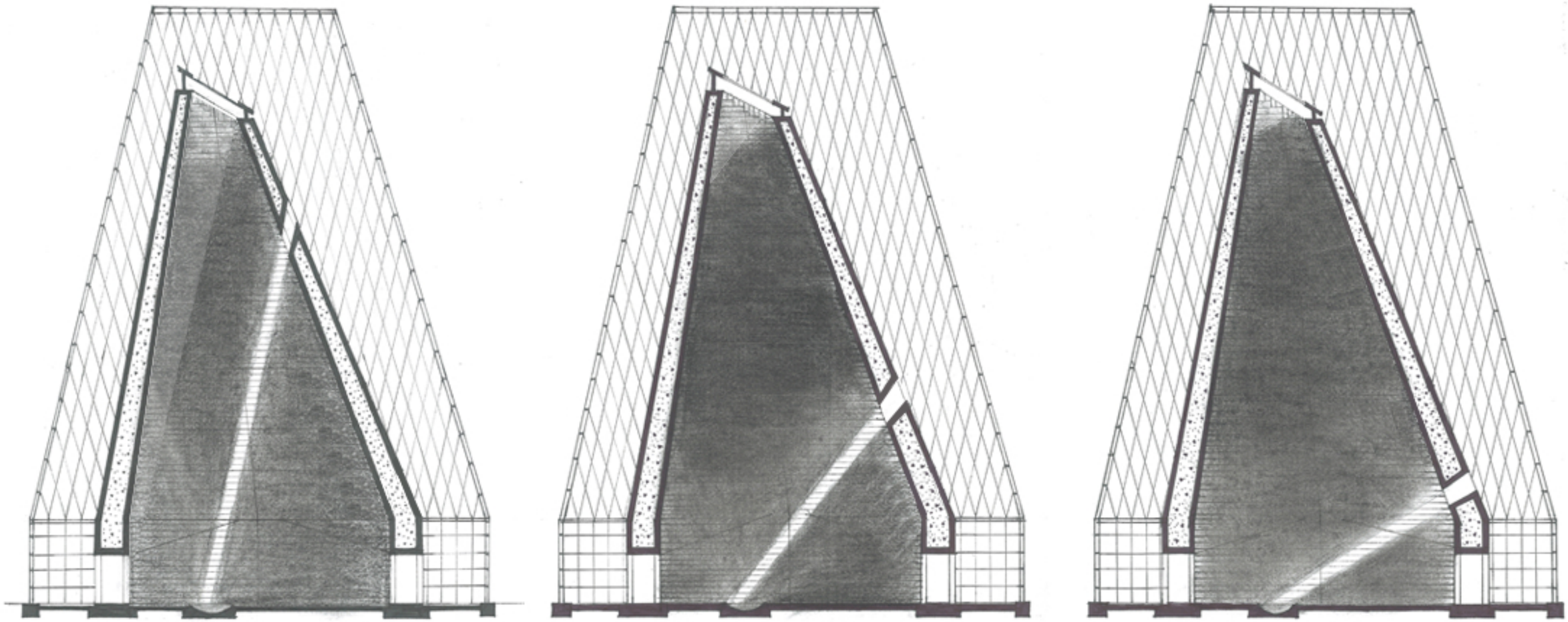


Figure 38 DETAIL SECTION



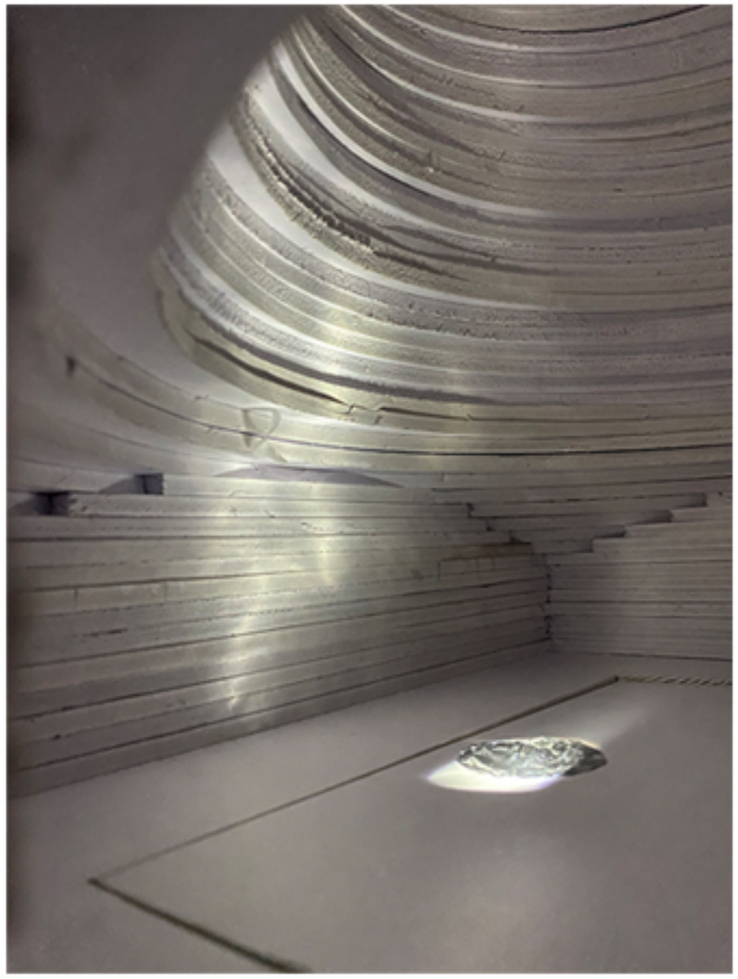
SUMMER SOLISTICE

SOLAR EQUINOX

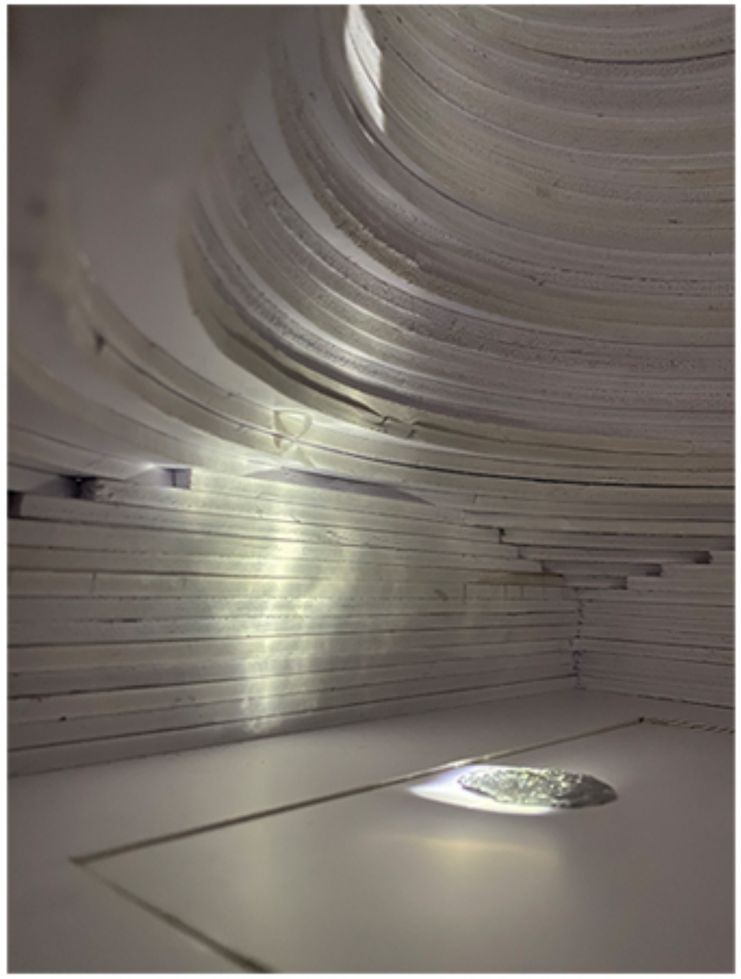
WINTER SOLISTICE

Figure 39

The charcoal drawings represent the desired effect to be created with the three conditions - bringing in daylight at solar noon on summer solistice, equinox and winter solictice. The slits cut in the cone allows one to experience the passing of time and making of time in a sense.



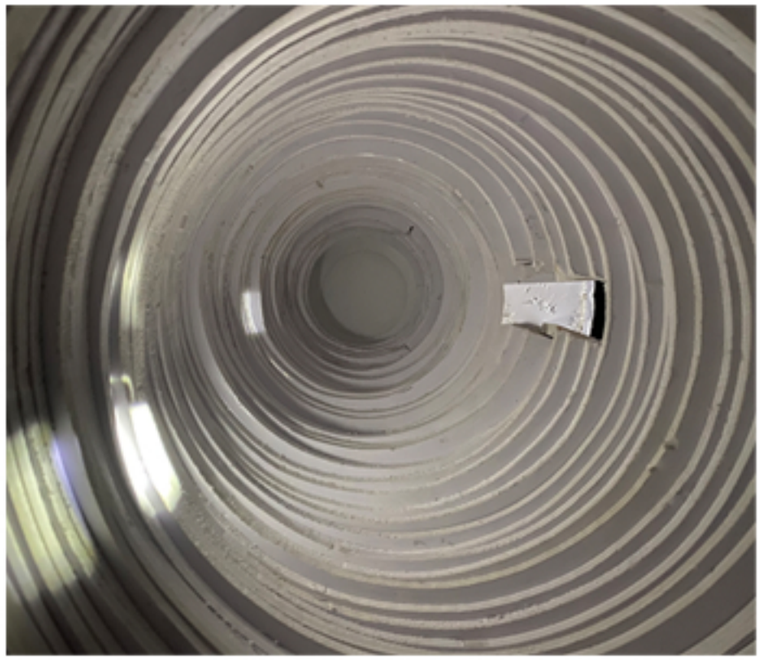
SUMMER SOLISTICE



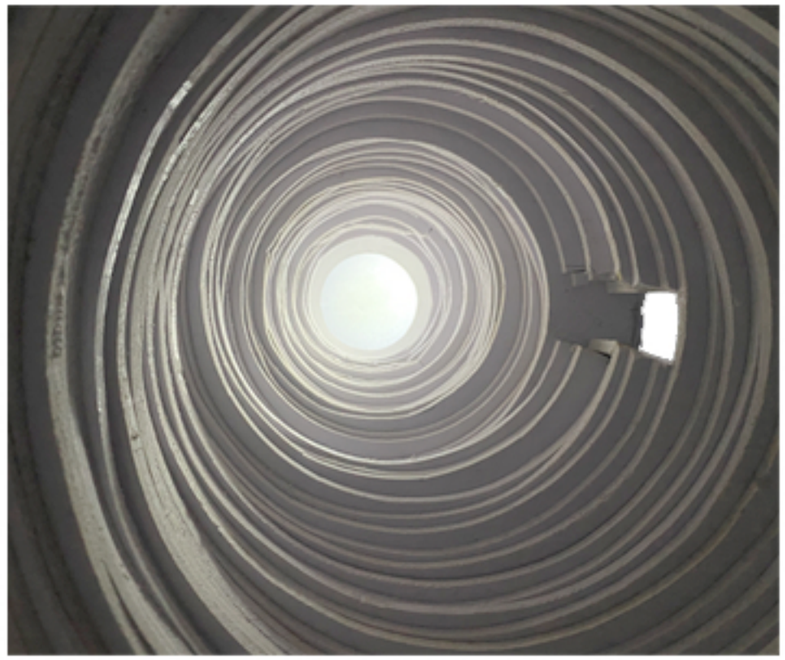
SOLAR EQUINOX

WINTER SOLISTICE

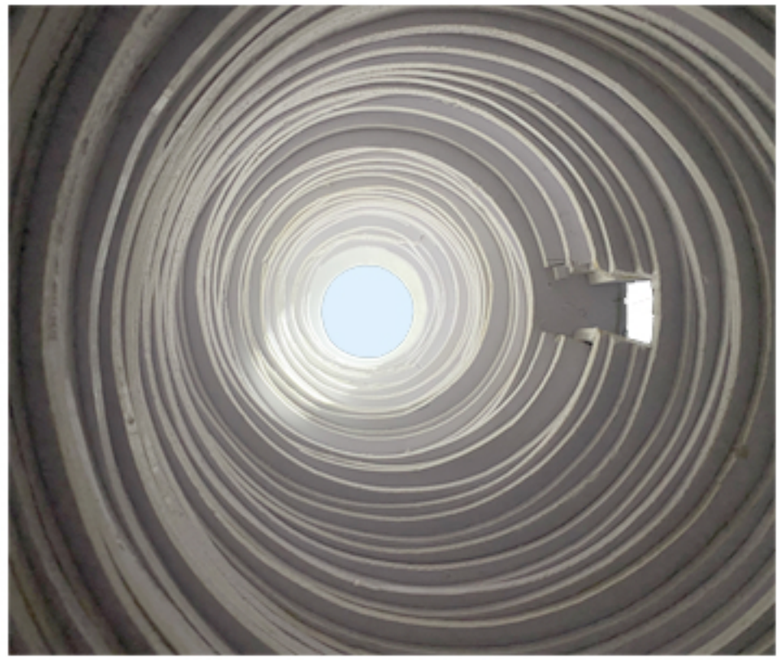
Figure 40



OPAQUE



TRANSLUCENT



OPEN TO SKY

Figure 41

TREATMENT OF THE CROWN

The exploration for the treatment of the crown lead to the decision of the openess to the sky due to the spiritual connections to the heavens that it brings.

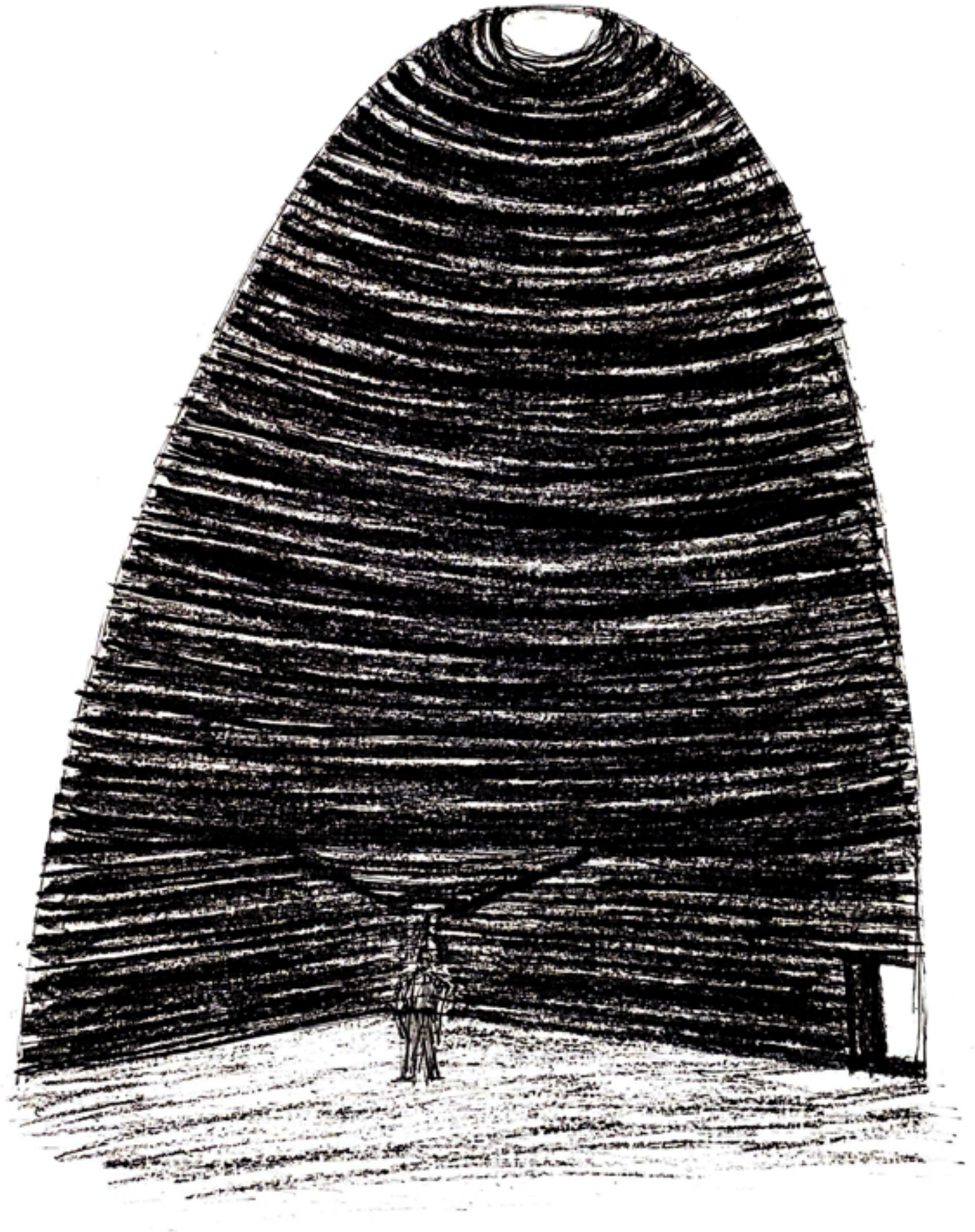


Figure 42

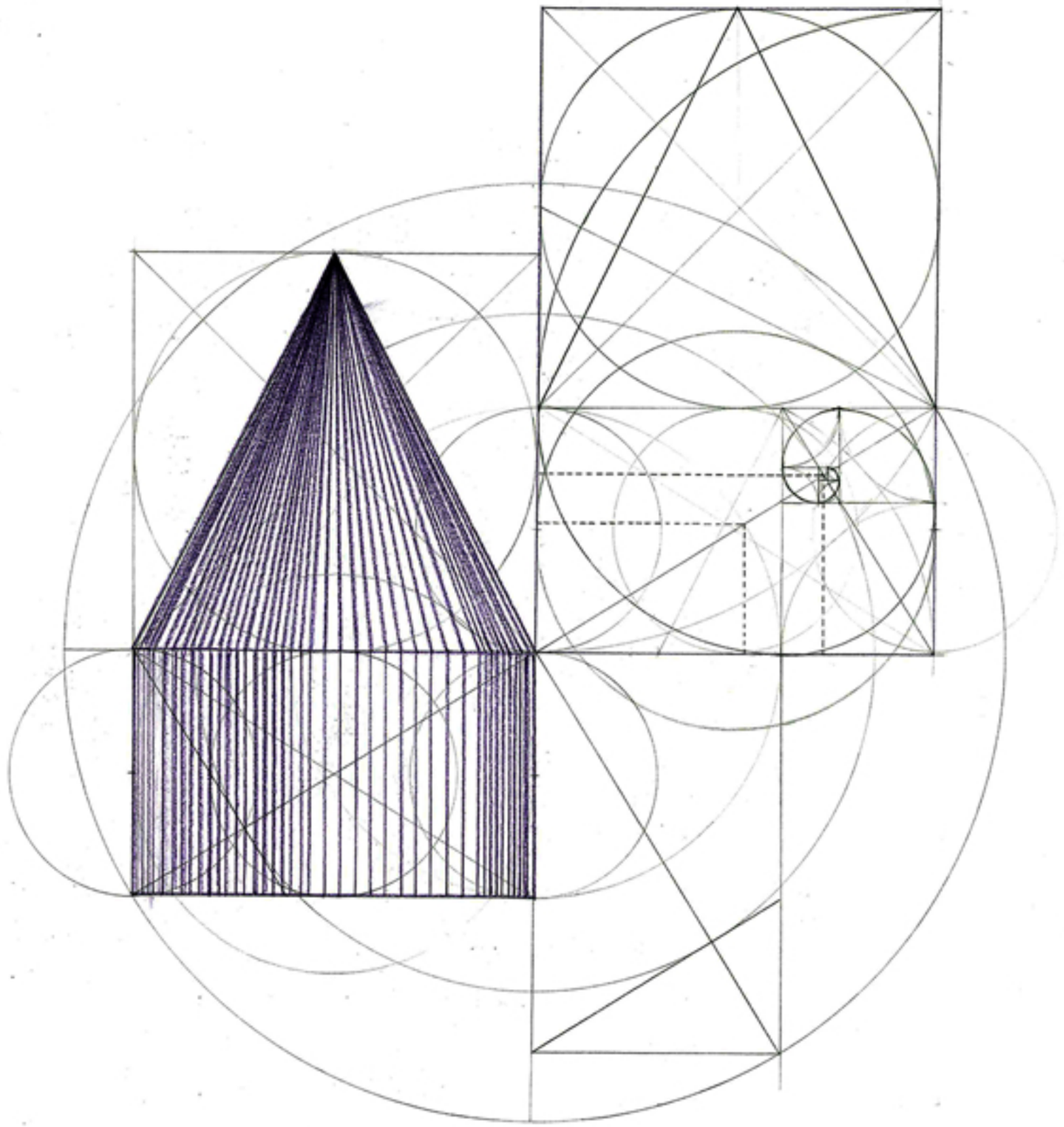


Figure 43

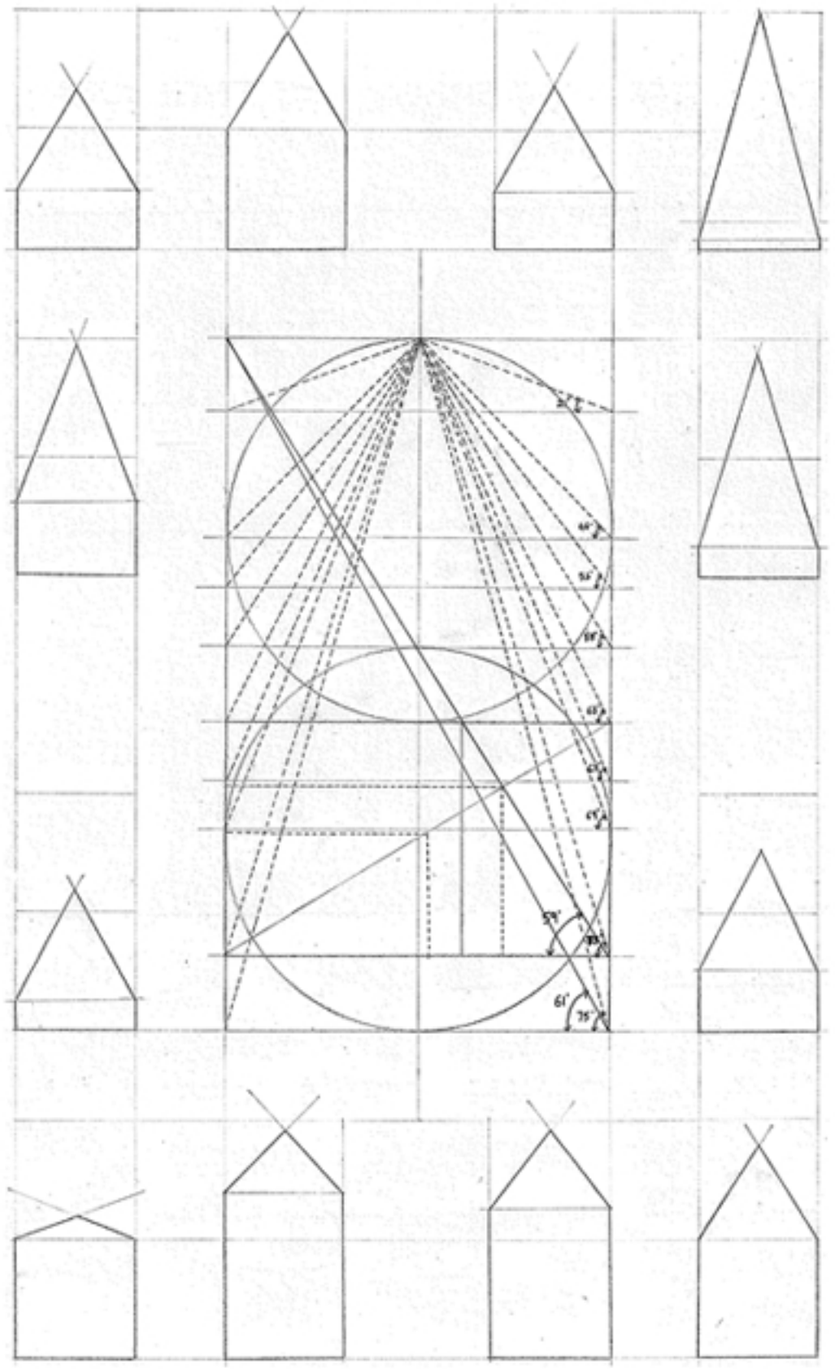
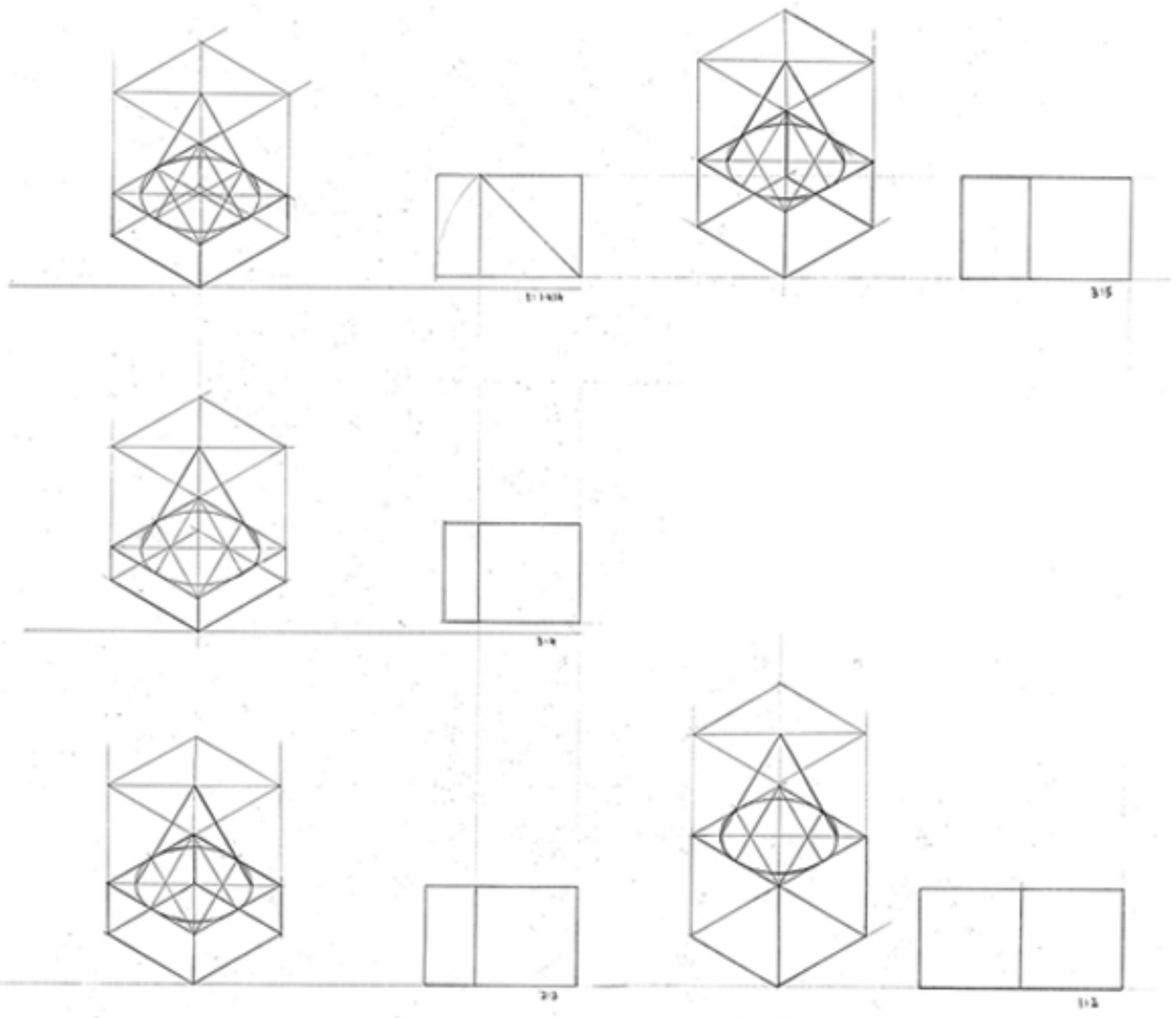


Figure 44



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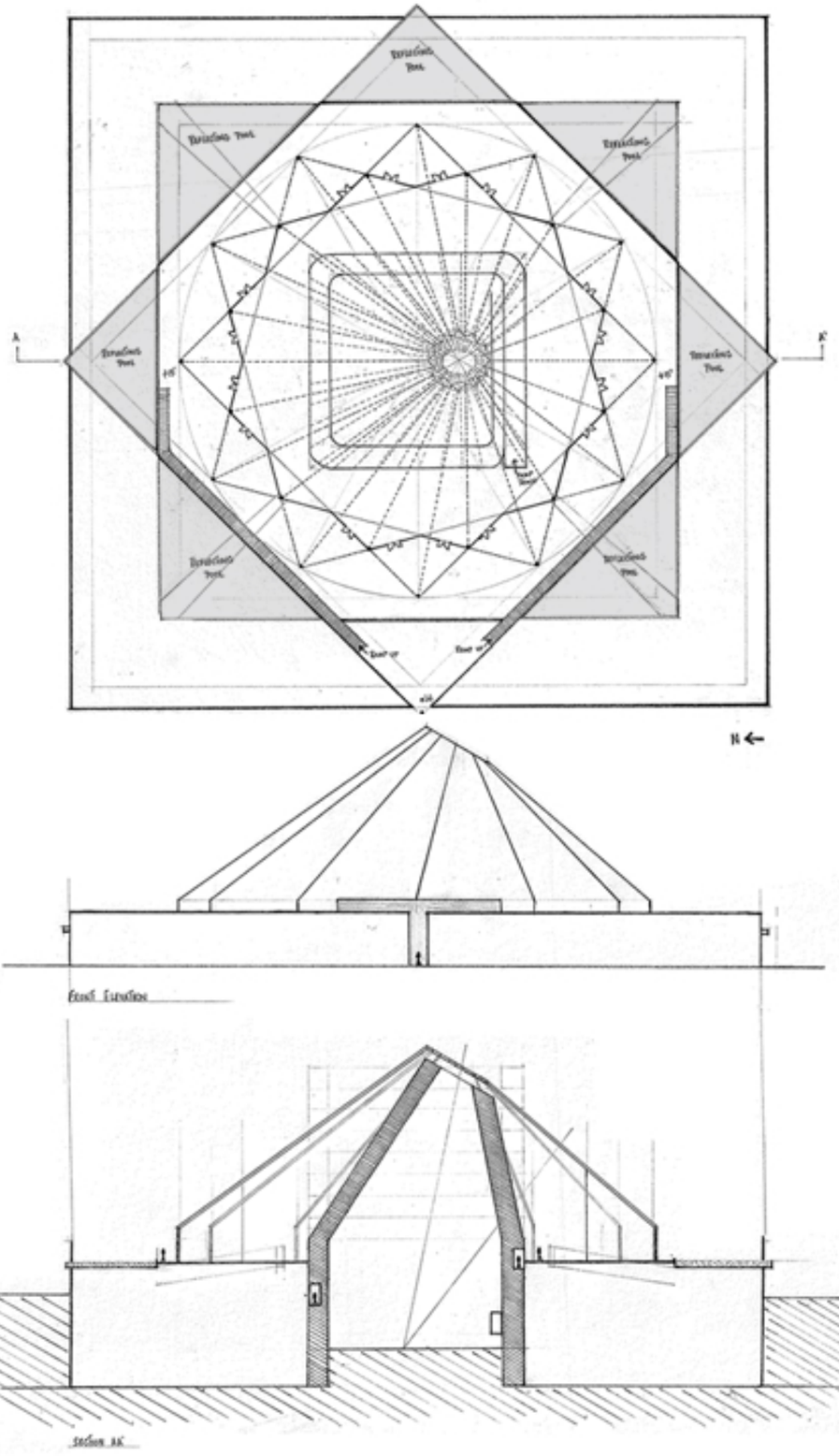

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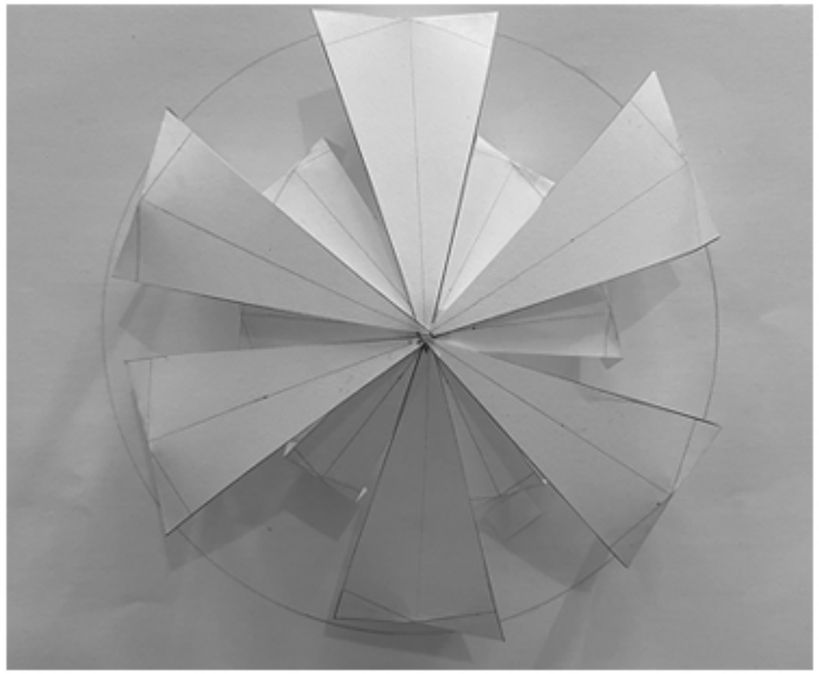
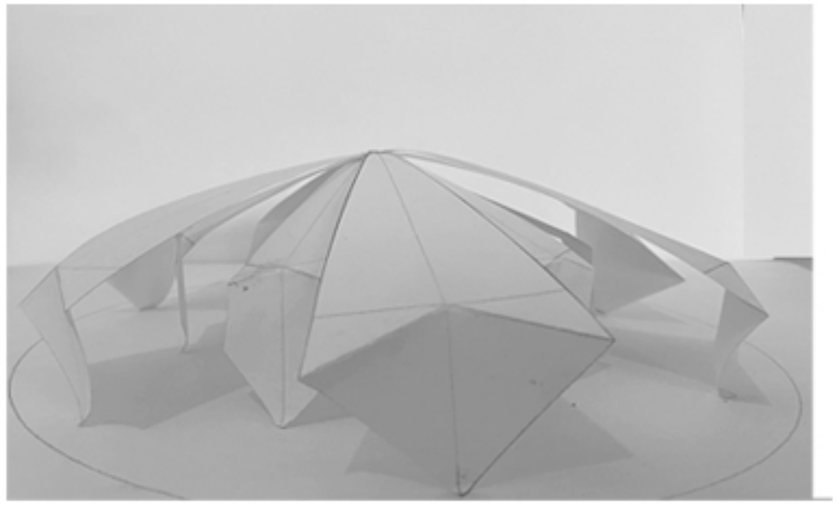


Figure 47



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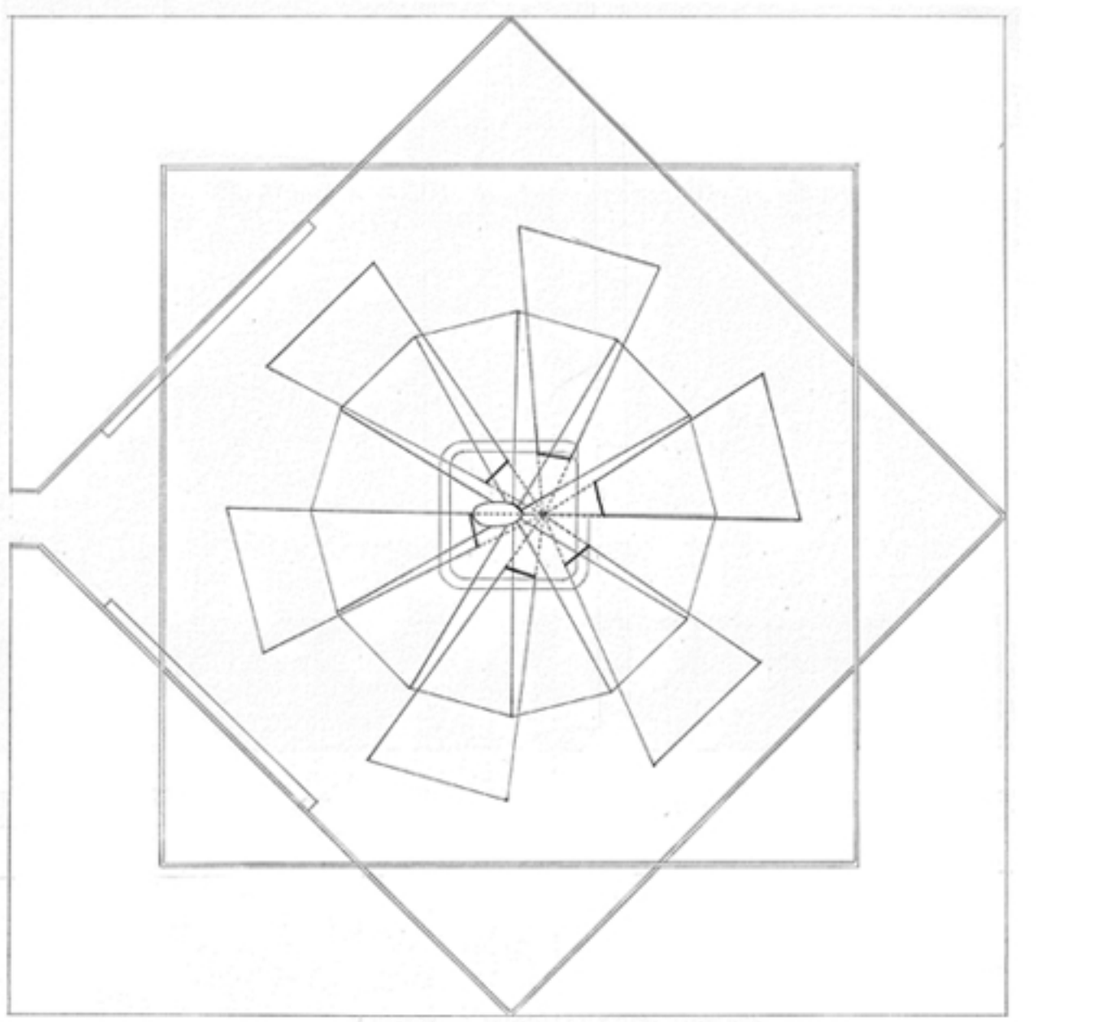

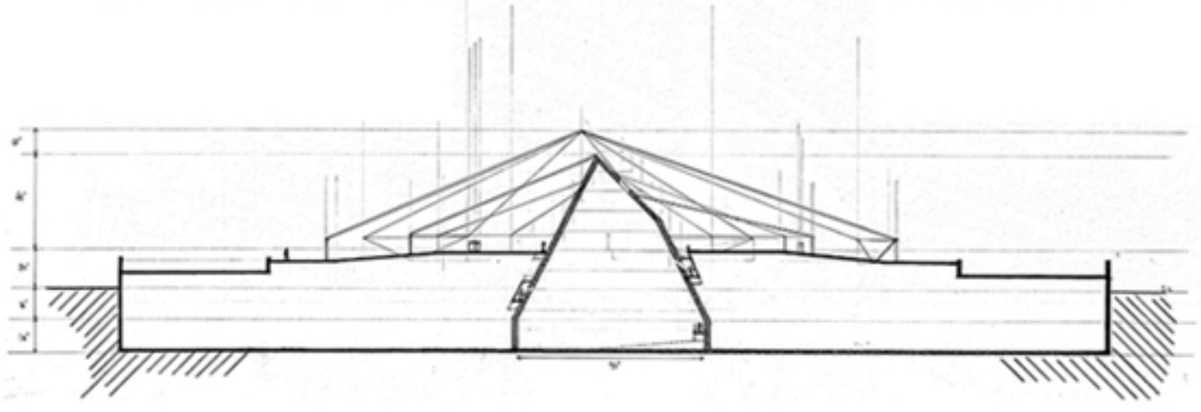

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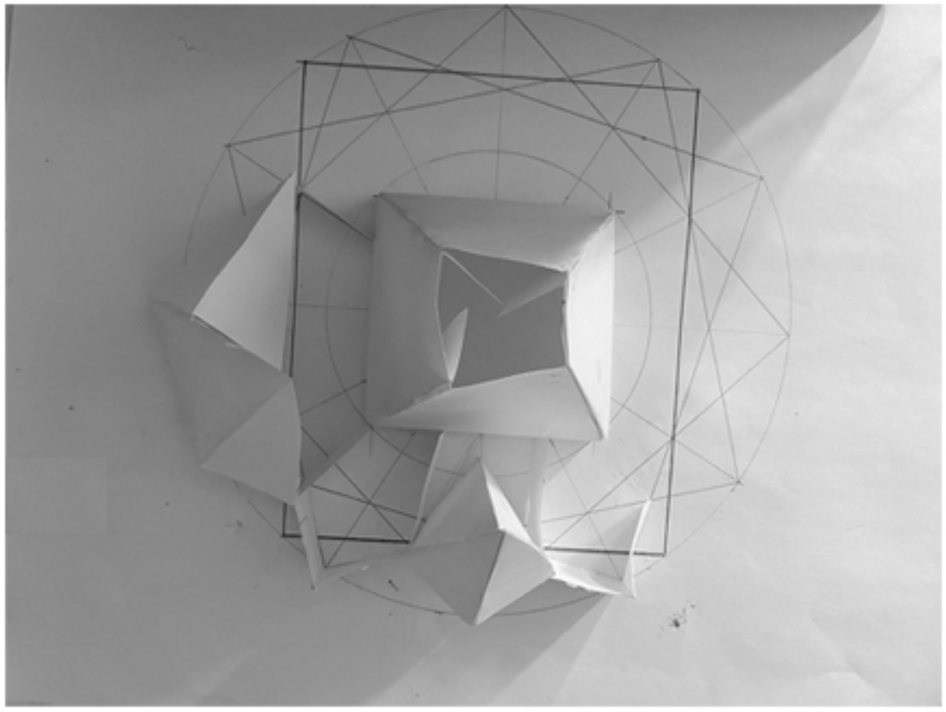
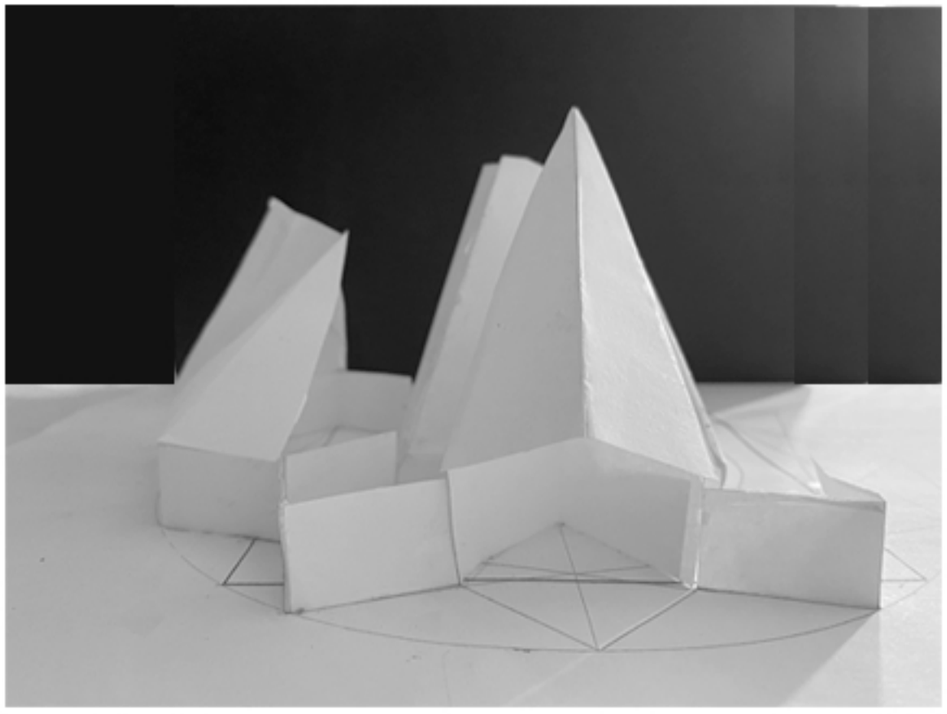


Figure 50



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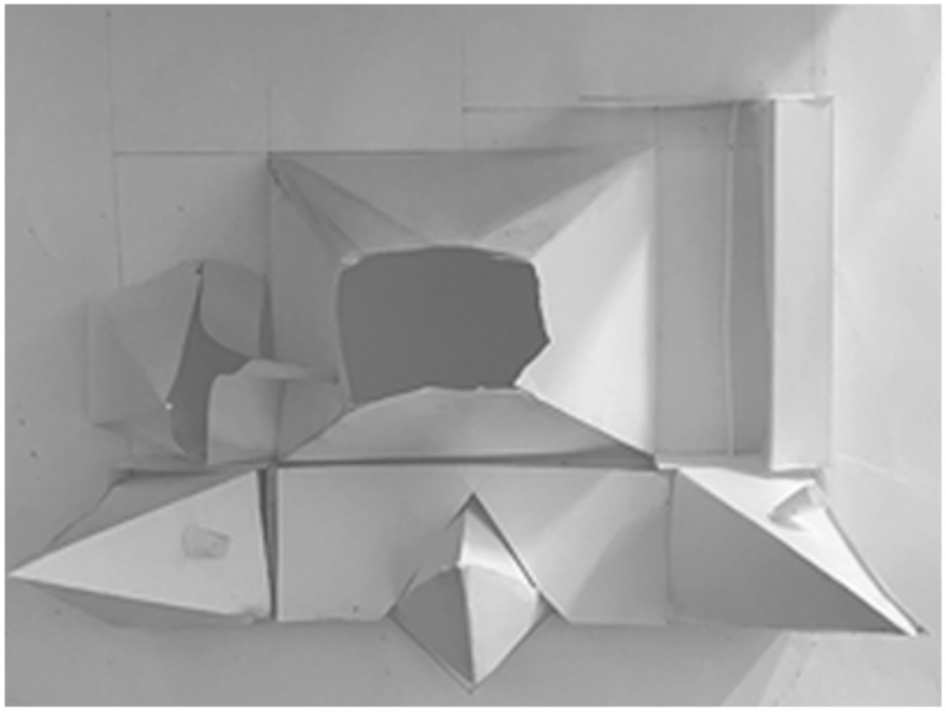
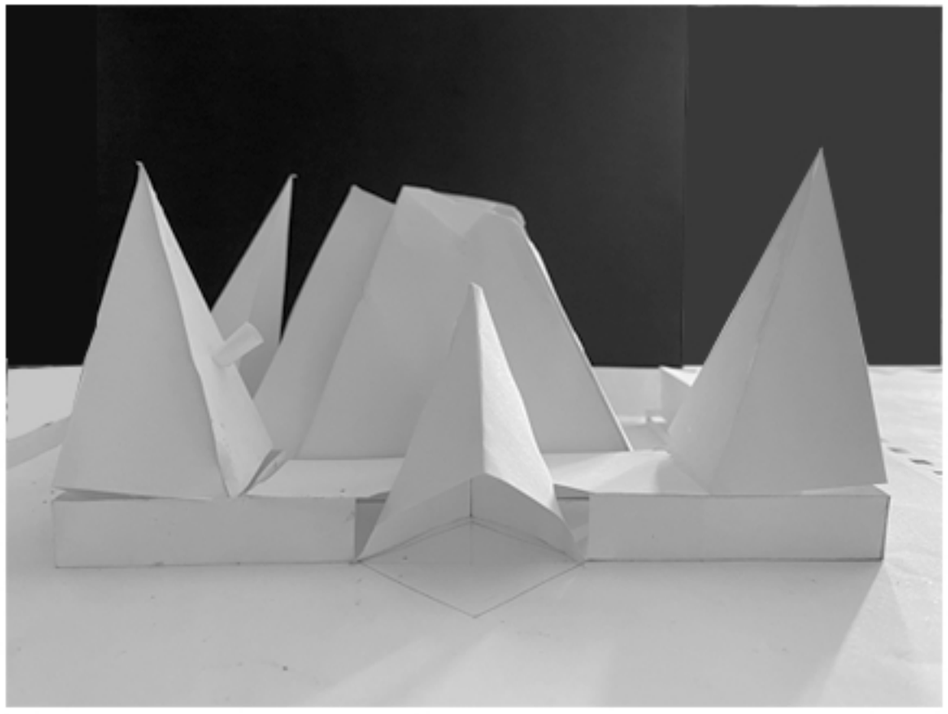


Figure 52



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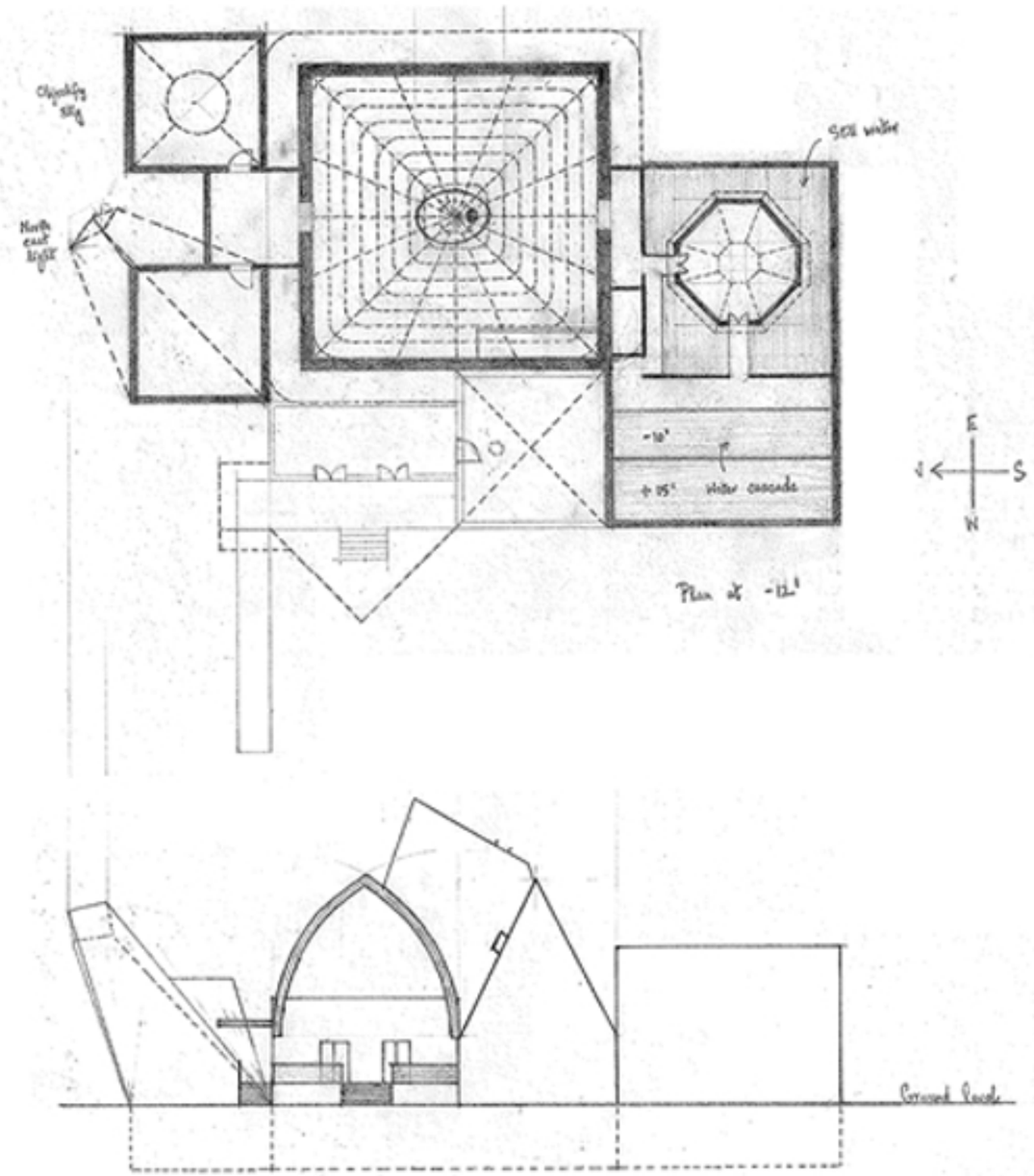

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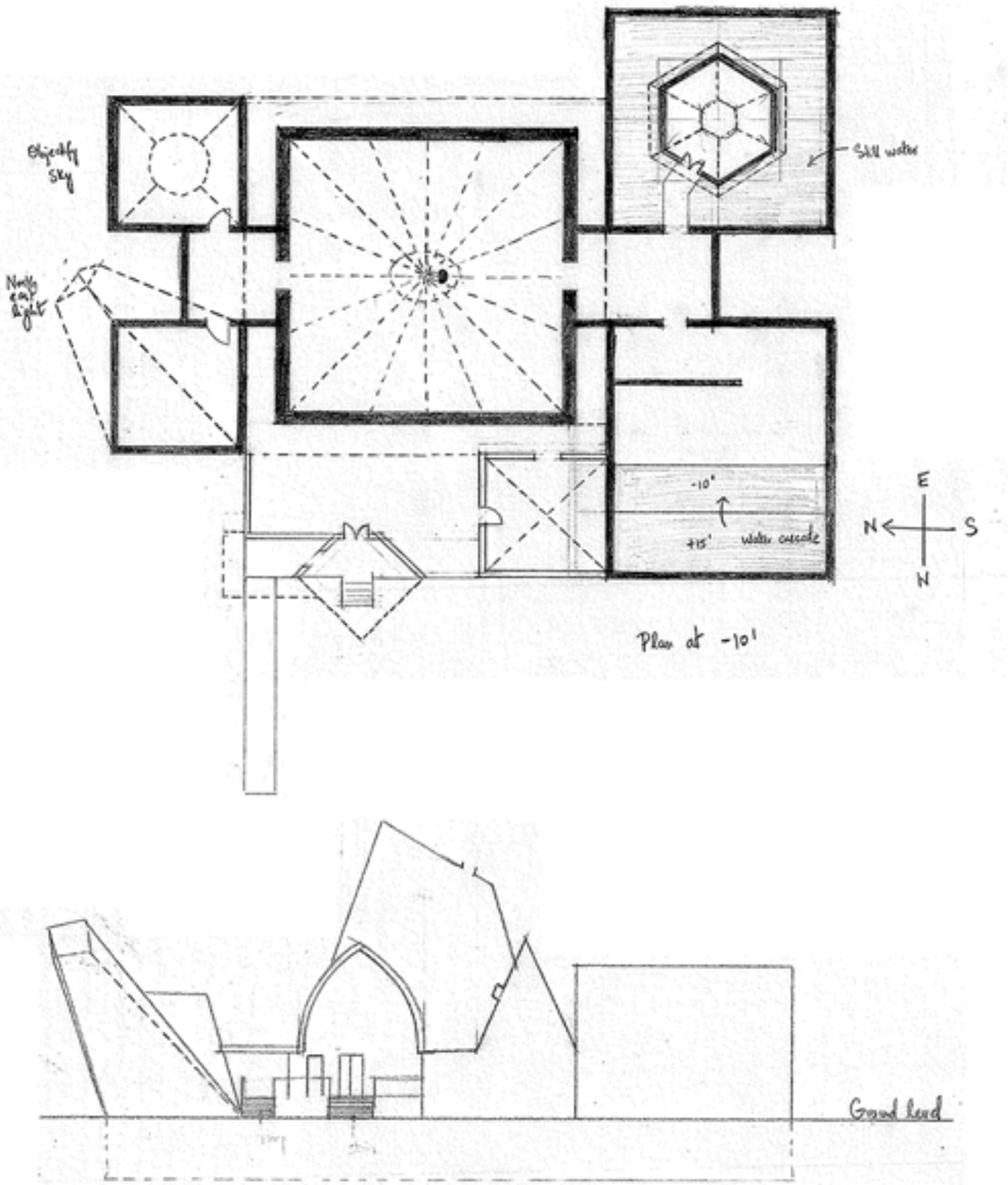

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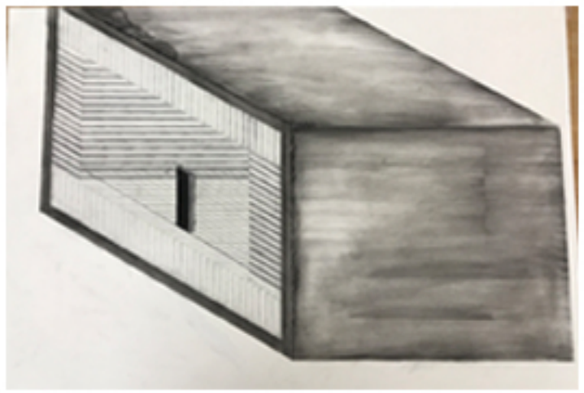
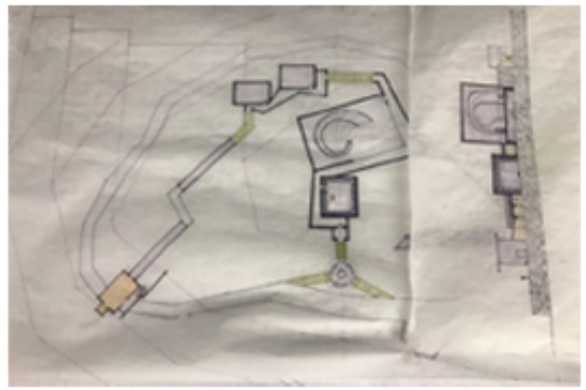
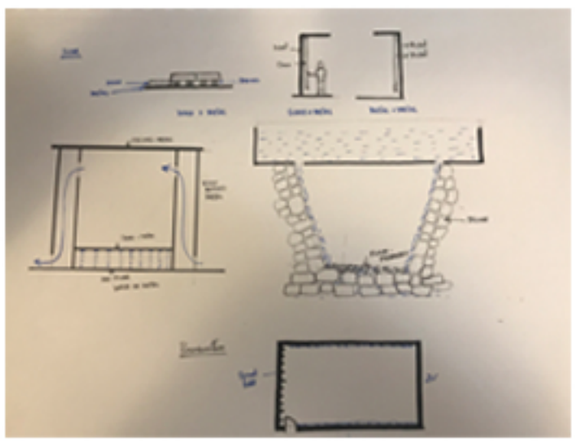
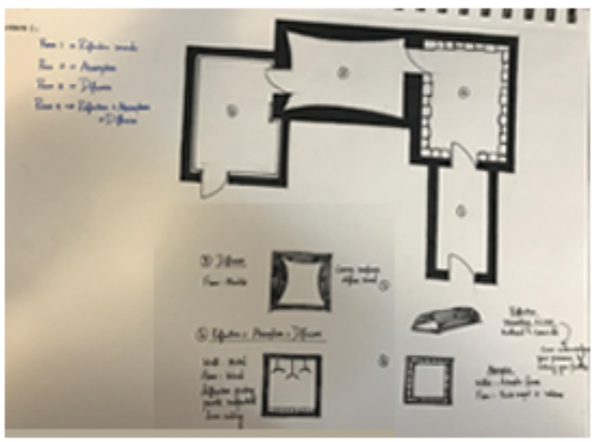
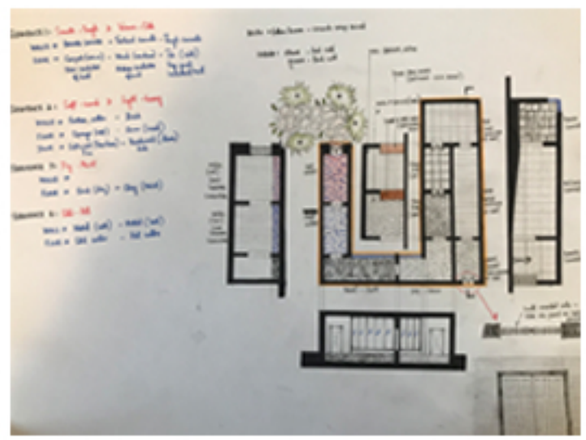
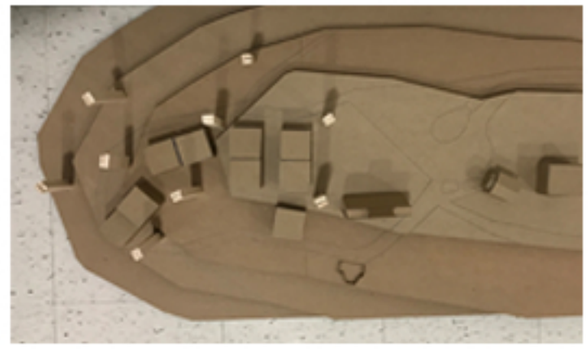


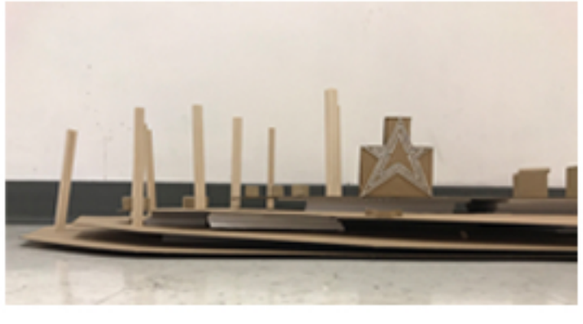


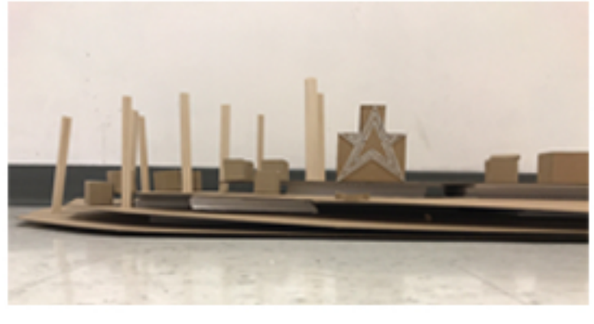


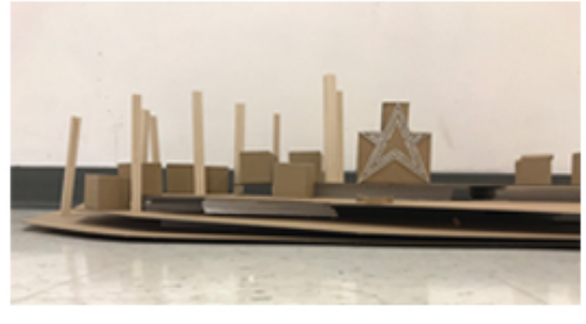


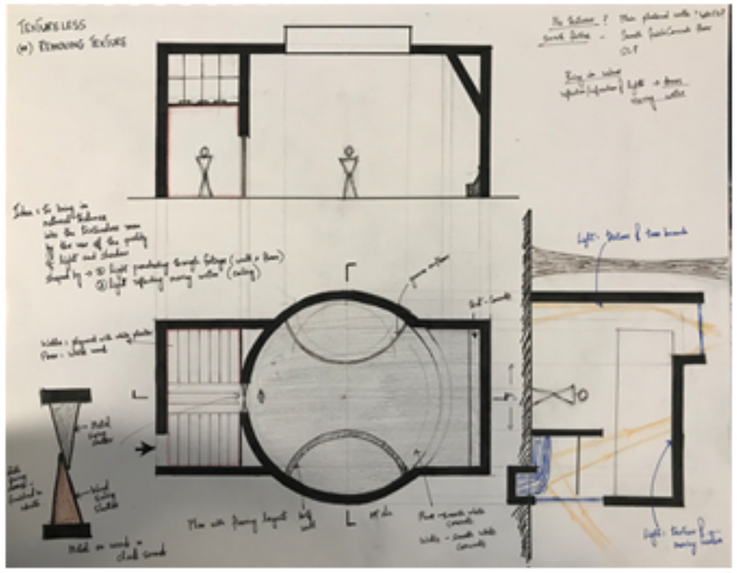


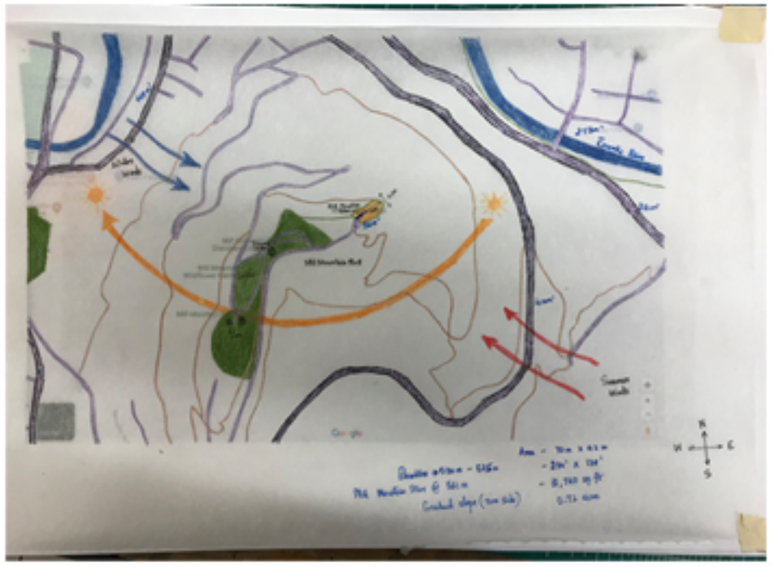


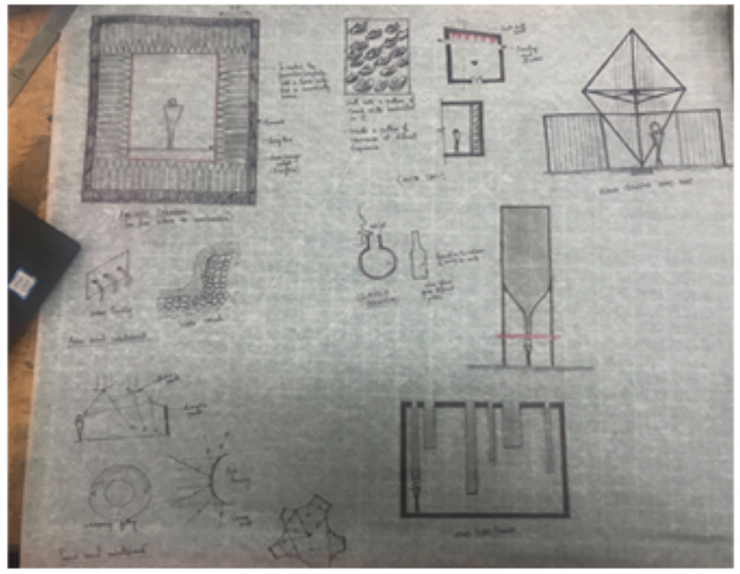


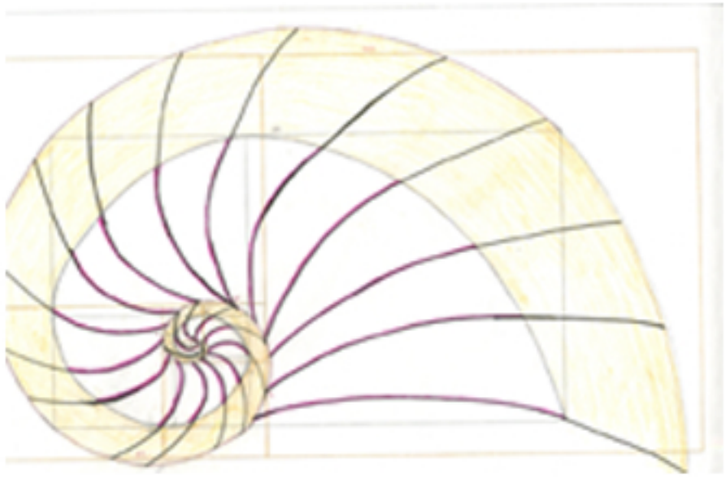


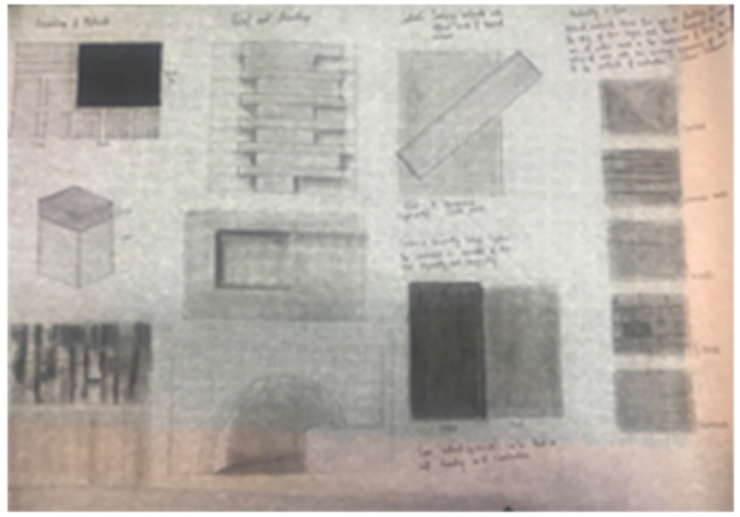



TEXTURELESS
(w) REMOVING TEXTURE

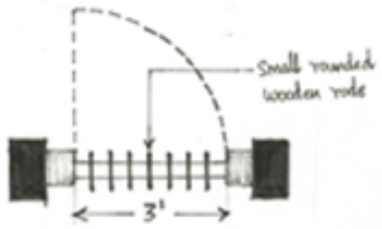


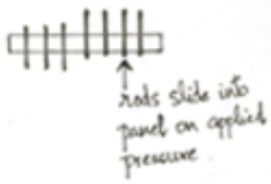


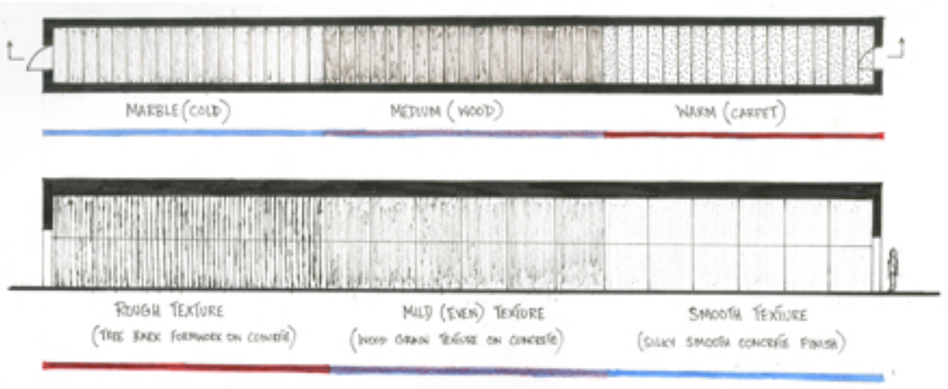


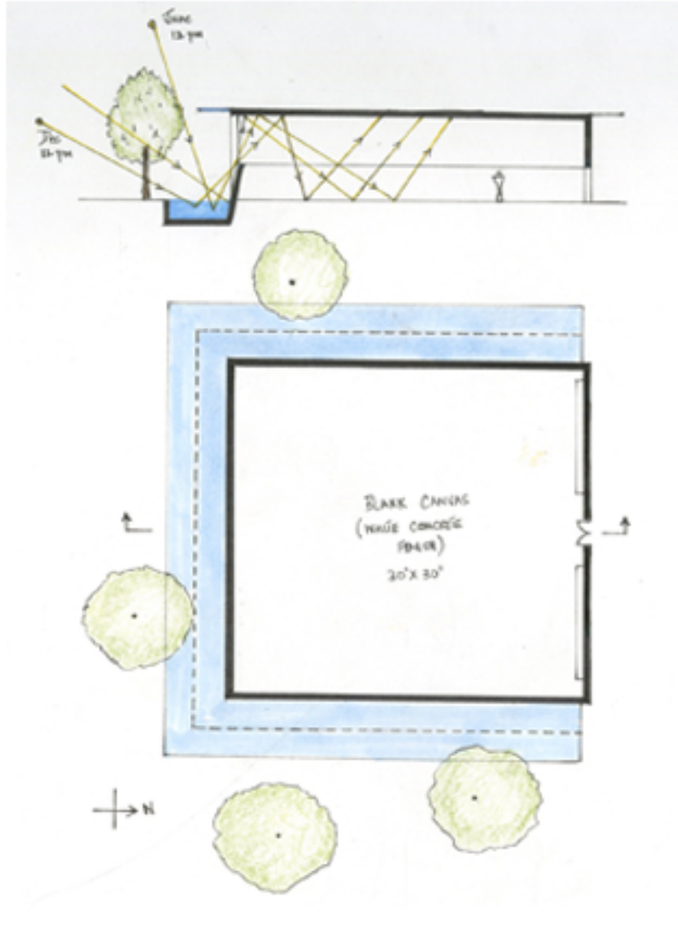


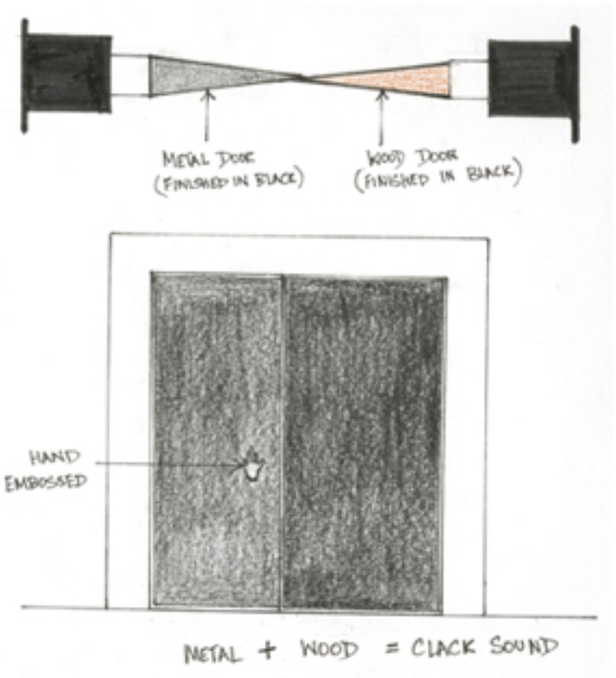

6'

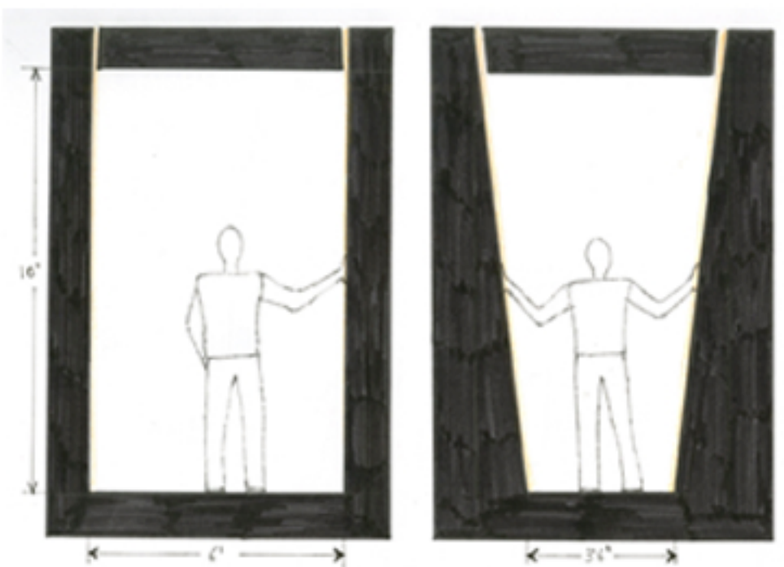

Small rounded wooden rods
3'


rods slide into panel on applied pressure


MARBLE (COLD)
MEDIUM (WOOD)
WARM (CARPET)
ROUGH TEXTURE
(TREE BARK FORMWORK ON CONCRETE)
MILD (EVEN) TEXTURE
(WOOD GRAIN TEXTURE ON CONCRETE)
SMOOTH TEXTURE
(SILKY SMOOTH CONCRETE FINISH)


BLACK CANVAS
(WHITE CONCRETE
FINISH)
20'X 20'
N


METAL DOOR
(FINISHED IN BLACK)
WOOD DOOR
(FINISHED IN BLACK)
HAND
EMBOSSED
METAL + WOOD = CLACK SOUND


10'
6'
36'

List of Figures

All photographs, models and drawings are the original work of the author unless otherwise specified.

Bibliography

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