

# A Study of Path and Light

by Dhruva Samal

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A monastery in Blacksburg, Virginia

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in partial fulfillment of the requirements for the degree of -  
**Master Of Architecture**

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## Abstract

Light rays emanating from the sun, interact with objects which we see in our everyday life and give them presence. Without light these objects would not be visible to us. The interaction of Light with objects of different qualities within a space creates a variety of environments. People direct their attention to elements of the visual environment which provide information needed to carry out conscious and unconscious activities. These activities include movement along a path, introspection in the form of meditation, fascination. In conclusion, this is a process which involves more than just what is visible to the eye in terms of luminance levels but the overall sensory experience. Personal experience is the vehicle for interpretation for both designers and inhabitants.





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If many activities take place simultaneously within a space, it would be ideal to provide a general quality of lighting which would encapsulate the requirements conducive for these activities. However, my project of a monastery with its basic limited functions, doesn't allow for such situations to arise.

Lighting should be provided to serve the primary functions intended.

For example "the light at the end of the tunnel" would lose its meaning if there were other sources of powerful light entering the tunnel at intermediate points.

It is the quality of the lighting from each source and their relationship to other elements in the visual field which eventually determines the overall quality of the space.

*The Mount Angel Abbey Library by Alvar Aalto is an example of desirable lighting with attention given to each of the activities housed within.*



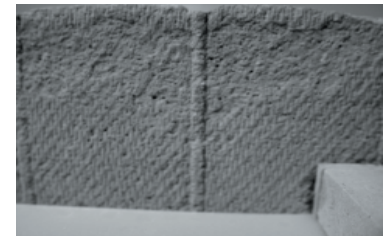


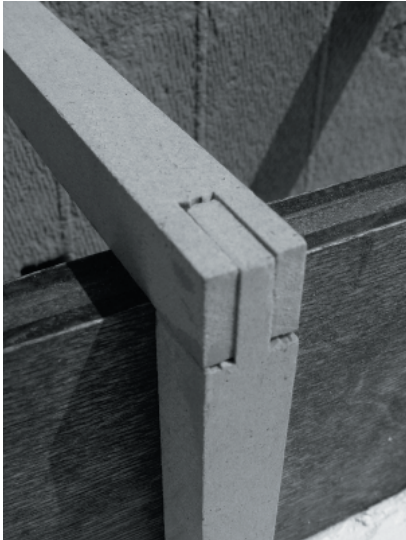
The clarity of object characteristics such as form, texture, contrast, color, light reflectance qualities etc. has a great influence on how well we can see at different levels of illumination.

It is very important to define the intended function of each of the materials as they individually play a significant role to the project. The quality of the materials and the lighting conditions of a space are inter related. This is because every material has a different reaction to the light which is presented to them, in terms of their ability to reflect, transmit, diffuse and absorb light. There should be a conscious material selection for all the elements of design such as the walls, floors, beams, columns and ceilings as they all have the ability to affect the quality of the luminous environment. These materials can be manipulated within a space to create desirable lighting conditions.

## Concrete

Concrete walls when used in the project give a very dominating impression and create a territorial tone when set against the surrounding landscape and architectural volumes because of their impression of being large monolithic pieces. Wherever present, they encourage movement along their direction due to their impenetrable or unsurpassable nature. Concrete Columns, when independently constructed, seem to emerge as a continuation of the contoured sloping landscape in the vertically upward direction





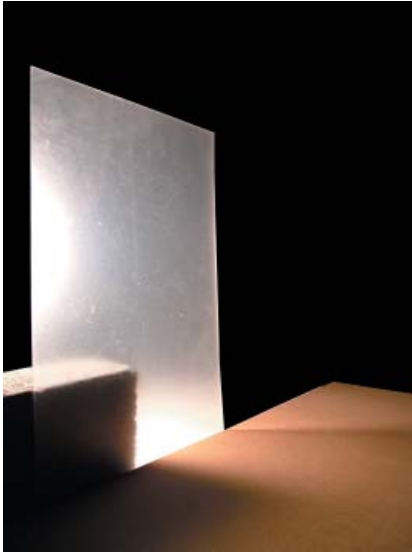
## Wood

There are certain qualities which are inherent in wood such as the direction of grain, texture and color. These factors as well as the reflection of incident light determines the “warmness” based on the glow and color imparted from the surface of the wood. The project sees varying characteristics of wood used in terms of their interaction with light from a soft glow imparted in the entrance “tunnel” to the highlighted point of focus at the far end of the plaza. In all portions of the project wood is used against a more “dominating” material like concrete and has submissive qualities and thus is reduced in function to assist with the movement along the direction of the concrete.

## Rock/ Stone

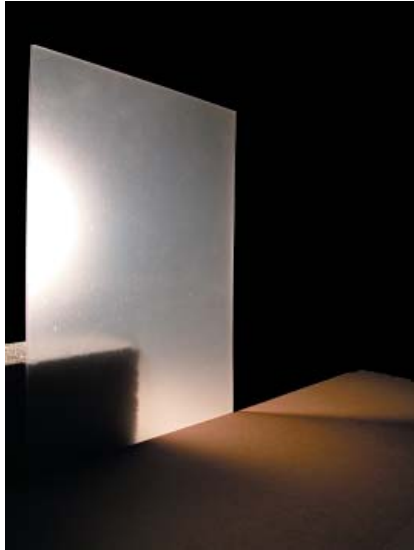
Rock and stone are materials of perceived permanence which stand the test of time. Many excavated monuments dating back to centuries ago have been known to be constructed in rock and stone and thus display the quality of permanence. Stone is a naturally occurring material and thus when used in its natural state, blends into the landscape. Stone masonry with invisible mortar joints is used for the construction of the cells for staying which are for most part located underground and thus forms part of the landscape.

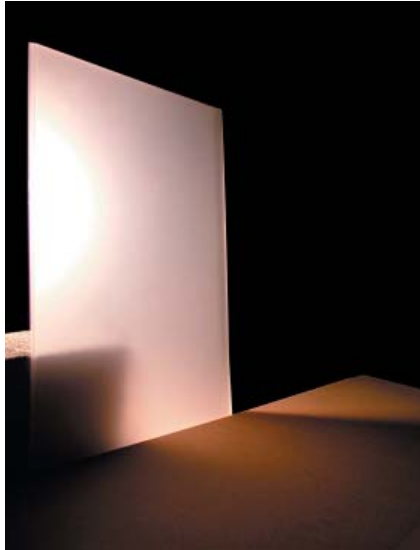




## Glass

Glass is seen as a means of entry of light into the structure. The percentage of light which is transmitted or retained through the structure is determined by the quality of the glass.





The “sharpness” of the light passing through the glass decreases as the surface increases in opacity. There is a more evenly spread and less brighter glow. This is contrary to a fully transparent surface of glass which doesn't play any role in changing the condition of light between the outside and the inside. The translucent surface of glass embodies a majority of the light and appears as an illuminated body of its own.

## The art of meditation

Vipassana which means “to see things as they really are” is one of India’s most ancient techniques of meditation and has its roots in India more than 2500 years ago. Even though it started off as an idea of Buddhism, it is now universally applied. It was a remedy for the many ills which people were confronted with.

There are many centers around the world which offer ten-day residential courses to teach the method of Vipassana. These courses are very strict and follow a prescribed Code of Discipline. The students learn the basics of the method, and practice it sufficiently to experience its beneficial results after the completion of the course. The course is taught at no cost as the costs of living and eating are covered by the donations from past Vipassana members who have reaped its benefits.



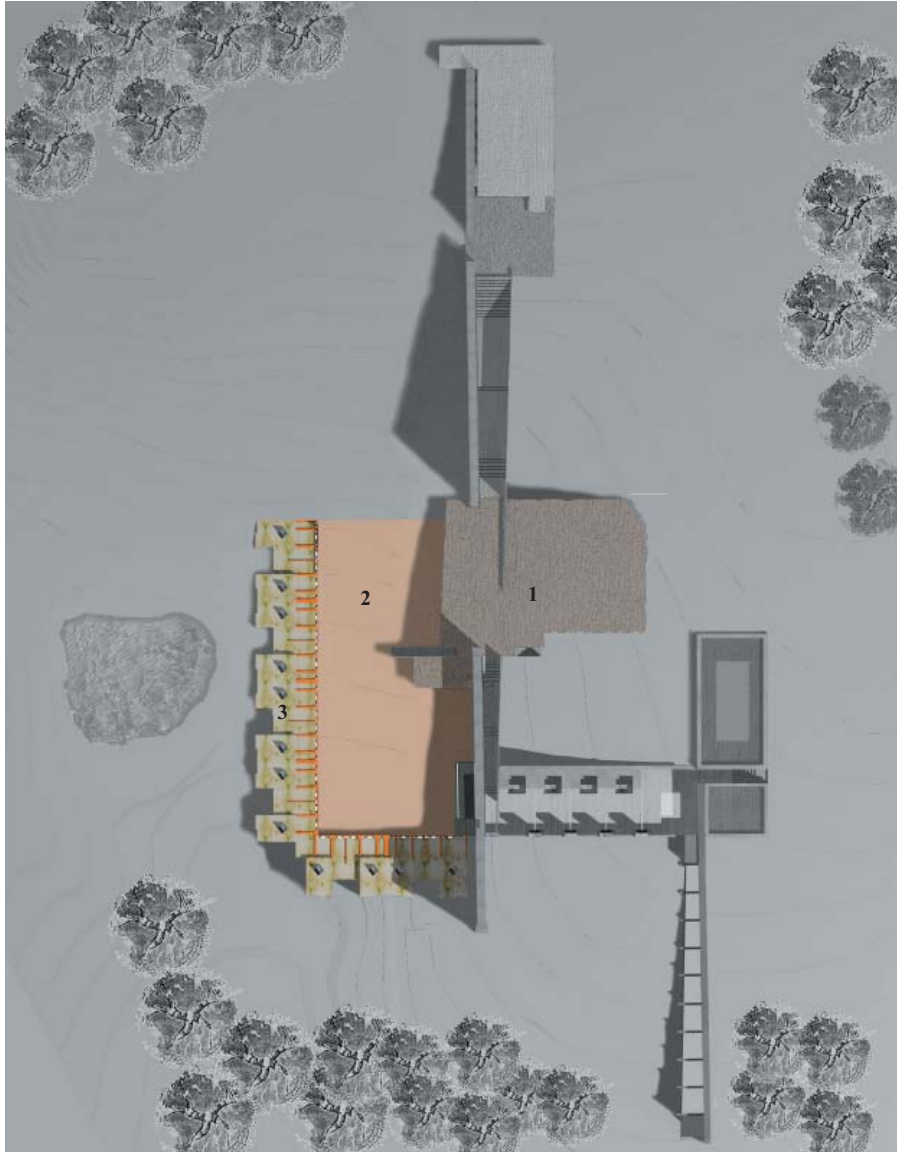
Vipassana is based on the belief that the three causes of all unhappiness are craving, aversion and ignorance. Its main purpose is to heal and cure human suffering. It aims for the total eradication of mental impurities which results in full liberation through a high level of spirituality. This happens through the process of introspection. It focuses on the deep interconnection between mind and body, which can be experienced directly by disciplined attention to the physical sensations that form the life of the body.

There are three steps to be followed for the training process . The first two steps serve in adjusting the students mind and body to carry out the meditation process.

The first step is, for the period of the course, to abstain from killing, stealing, sexual activity, speaking falsely, and the use of intoxicants. This serves to calm the mind, which otherwise would be too agitated to perform the task of self-observation.

The next step is to develop some control over the mind by learning to fix one's attention on the reality of the flow of breath as it enters and leaves the nostrils.

Finally, on the last full day participants learn the meditation of loving kindness or goodwill towards all, in which the purity developed during the course is shared with all beings. With continued practice, the meditation releases the tensions developed in everyday life, changing the way we react in everyday situations.



LEGEND

- 1 Gathering Space
- 2 Central Court
- 3 Cloister of Cells

The monastery at Blacksburg

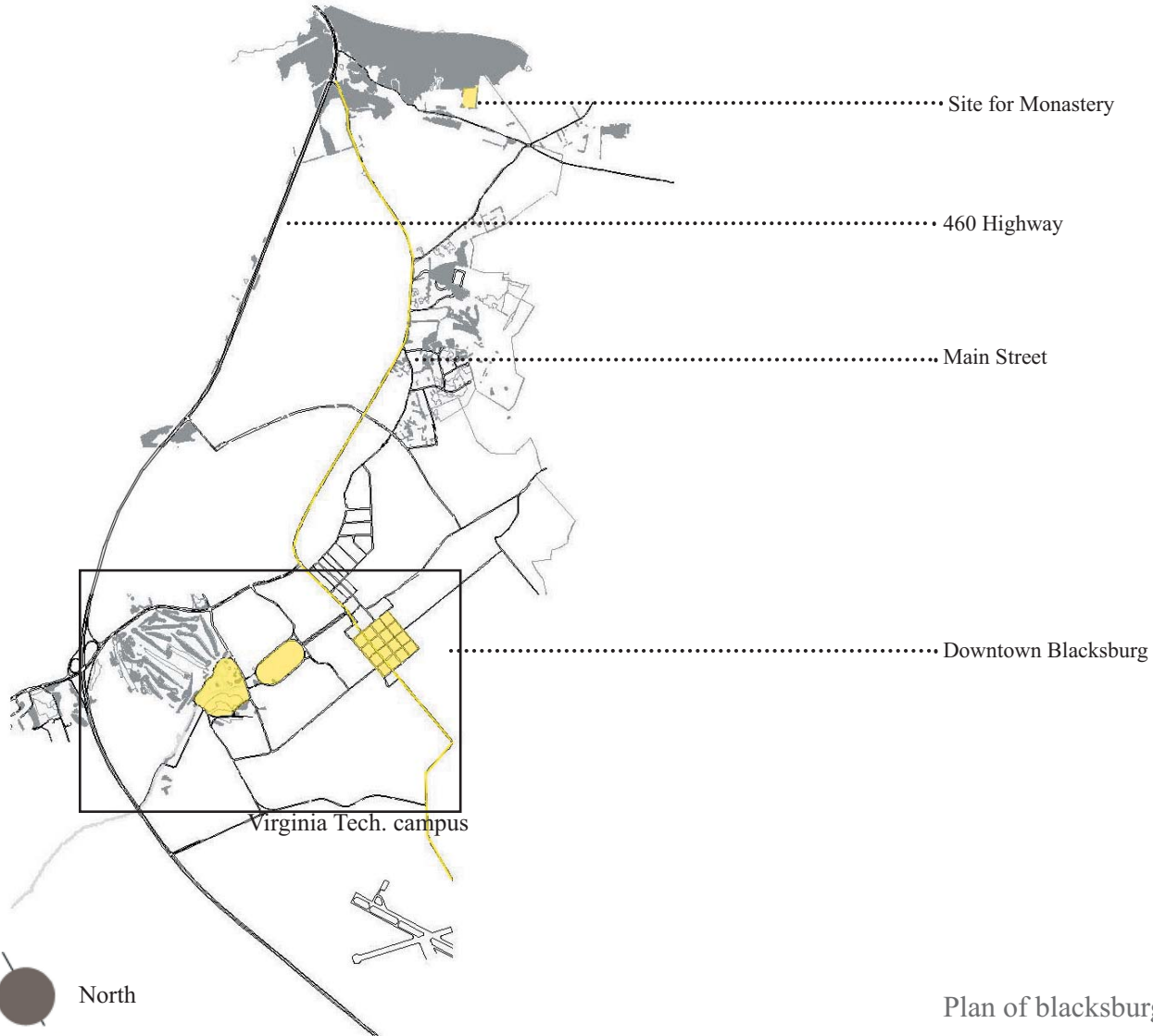
Most of the early Christian monasteries had a strong association with gardens which emerged by the monks need to work for their livelihood.

The idea of the buildings of a medieval monastery grouped round a peristyle was constant in the West, where the monks had the strict discipline of a life in common, as in the East, where they were allowed more personal freedom; for even the isolated cells in an Oriental cloister were mostly grouped round a central court. This arrangement gave the monks two things which they required before all others—a common centre and complete seclusion in the form of the cells. This, in my opinion, would be the best solution for the desire to live together, yet apart from the rest of mankind.

The monastery at Blacksbury mirrors the idea of having a central court as used by many early monasteries

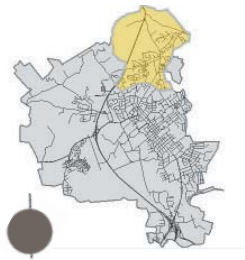
## The Site

The challenge lay in the selection of a site which would best create an environment to support the program of the project. The site for the proposed Monastery is located in a rural setting in the Northern boundary of the hilly town of Blacksburg, Virginia. Blacksburg lies in the broad picturesque area between the Appalachian plateau and the Blue Ridge Mountains with an elevation of approximately 2000 feet above sea level. The topography of the surroundings varies from gently rolling to steep mountainous terrain, with elevations varying from 1,300 to 3,700 feet above sea level. Blacksburg is well known for housing the campus of Virginia Polytechnic Institute and State University. The site, however, remains rural in character as it is disconnected from the campus activities. The only convenient means of access to the site is by car or by bicycle due to the absence of public transport services.

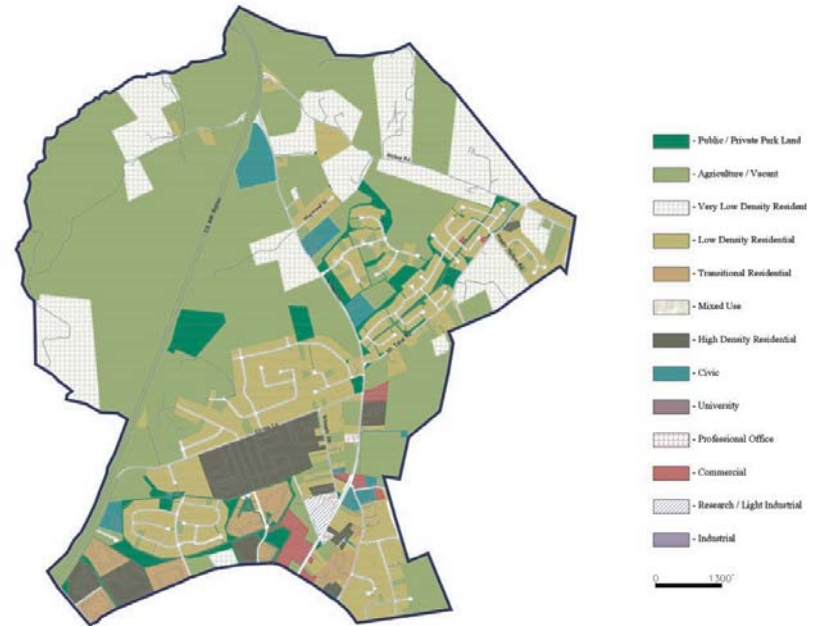


Plan of blacksburg

Approximately 53 percent of the North End sector is vacant or in agricultural use. These areas of open space contribute to the rural feel of the area and create a natural boundary between the more urbanized areas of Town and the rural county. The feeling of openness and picturesque views of open fields and surrounding mountains contribute to the overall quality of life in the north end of Town.

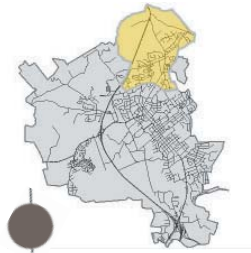


North End  
Existing Land use Plan  
2001

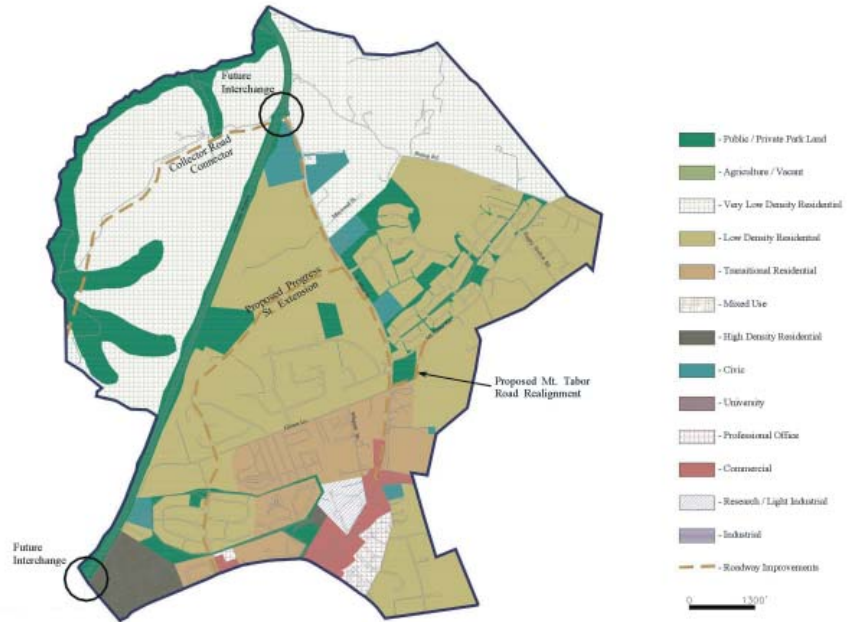


Special considerations for future development:

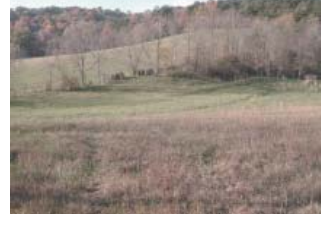
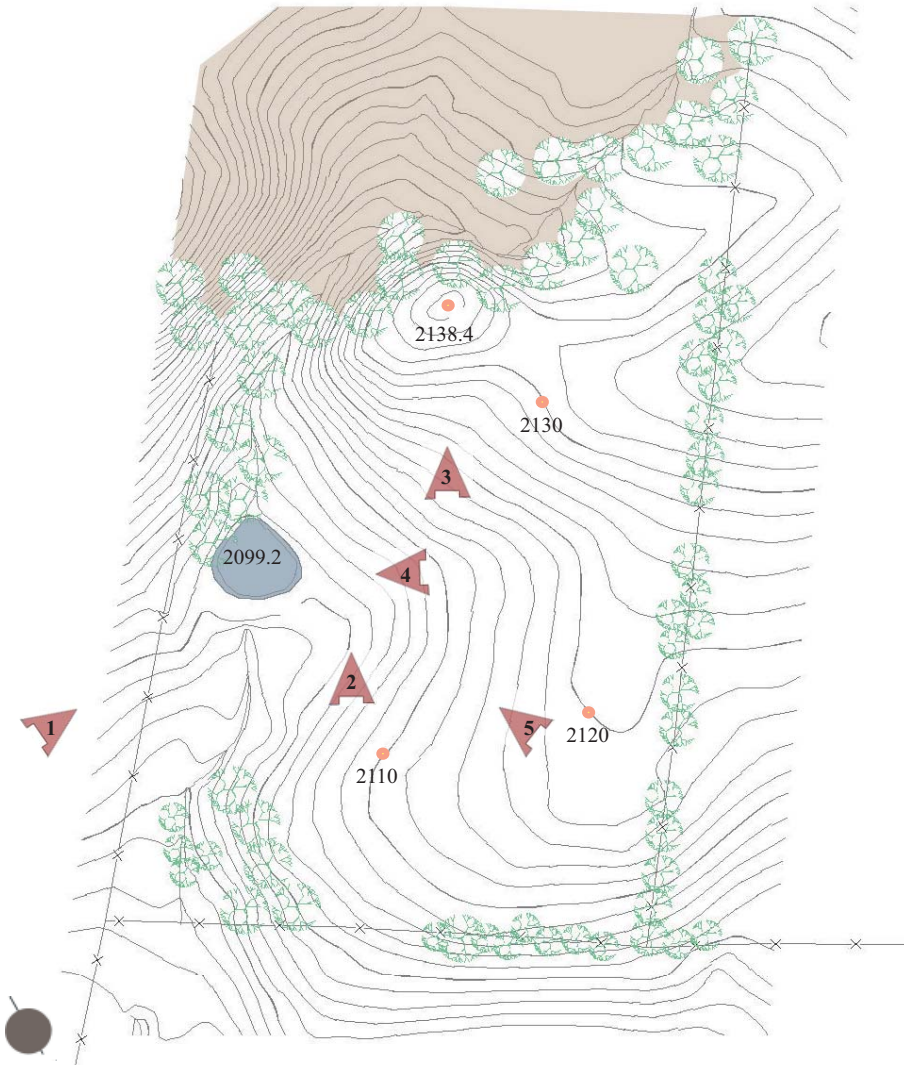
Development north of Bishop Road should be single-family residential homes on lots of five acres or more. As little of the natural vegetation should be disturbed as possible to preserve scenic views of the mountainside and to control erosion. Any development that does occur should blend in with the natural landscape to minimize impacts on scenic views.



North End  
Future Land use Plan  
2046









## Site Features

The site is oriented in the North south direction with the larger edges on the East and the West. The land is contoured with the generally gradual slope and with the highest points in the form of a mound in the northwest direction.

On the northern edge of the site, emerge from the ground, the steep woody slopes of the Brush Mountain. This area of Town is an important part of the town's view shed as it enjoys views to the natural surroundings. The site edges are defined by an irregular line of trees on its southern and eastern edges. The site is located at a distance from the road with some vacant land located in between.

A water body is a unique feature located on the the western edge of the site and is introduced into the design making process of the project.

The site is at the base of a hill range so it is like scaling a huge ramp, with the hilly region slowly unfolding before one's eyes. The actual physical effort required in accessing the monastery begets the sensation of private retreat. The chapel remains elusively hidden along the uphill climb, its facades slipping in and out of sight as one progresses through a path, and then, once at the top, the plaza space looms starkly in front yet concealing all the wonders within.

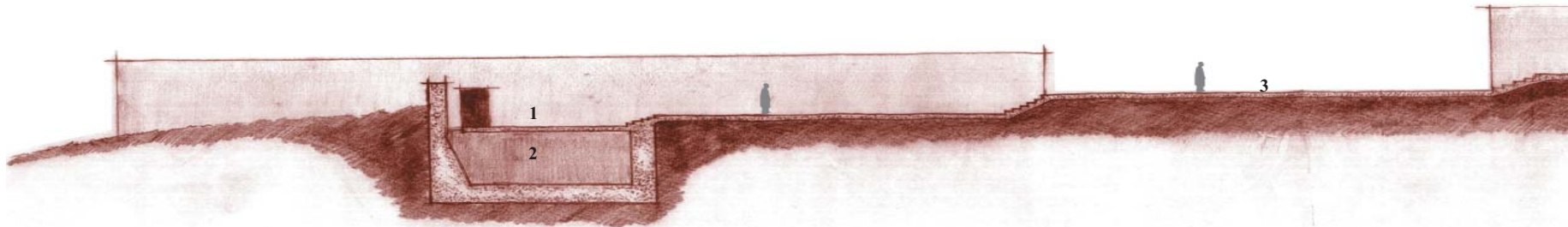
## The Project.....

Addresses more of the metaphysical aspect of light than the religious as the symbolism of light to religion has less significance on the design. The idea is to provide an environment conducive to life of meditation and prayer. The purpose of this project is the study of light and religion is used as a means to carry out this exploration.

## The Paths

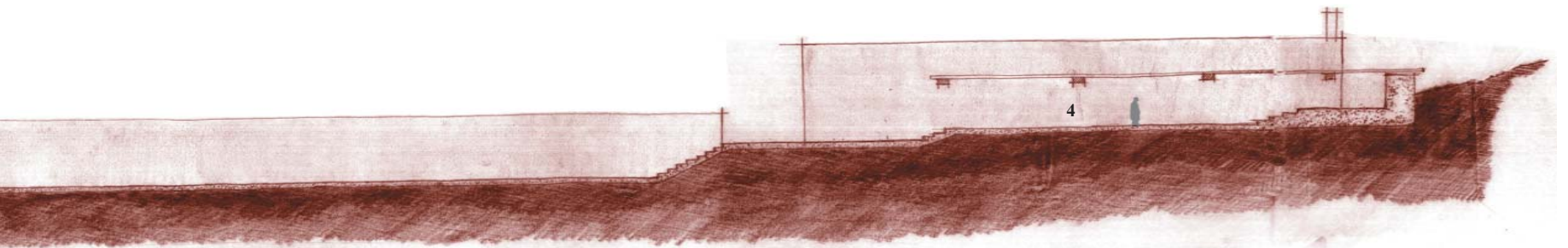
As soon as a person enters the site, one embarks on a constant journey which eventually sees them in the chapel as the altar exercises a gravitational pull towards it. This journey is conceived as a variation in spatial sequences as one progresses through a path. This path plays the role of datum in the project branching away on occasions to allow for events to take place. Irrespective of the activities which a person is participating in, one is in constant visual connection with this path as a form of reference.

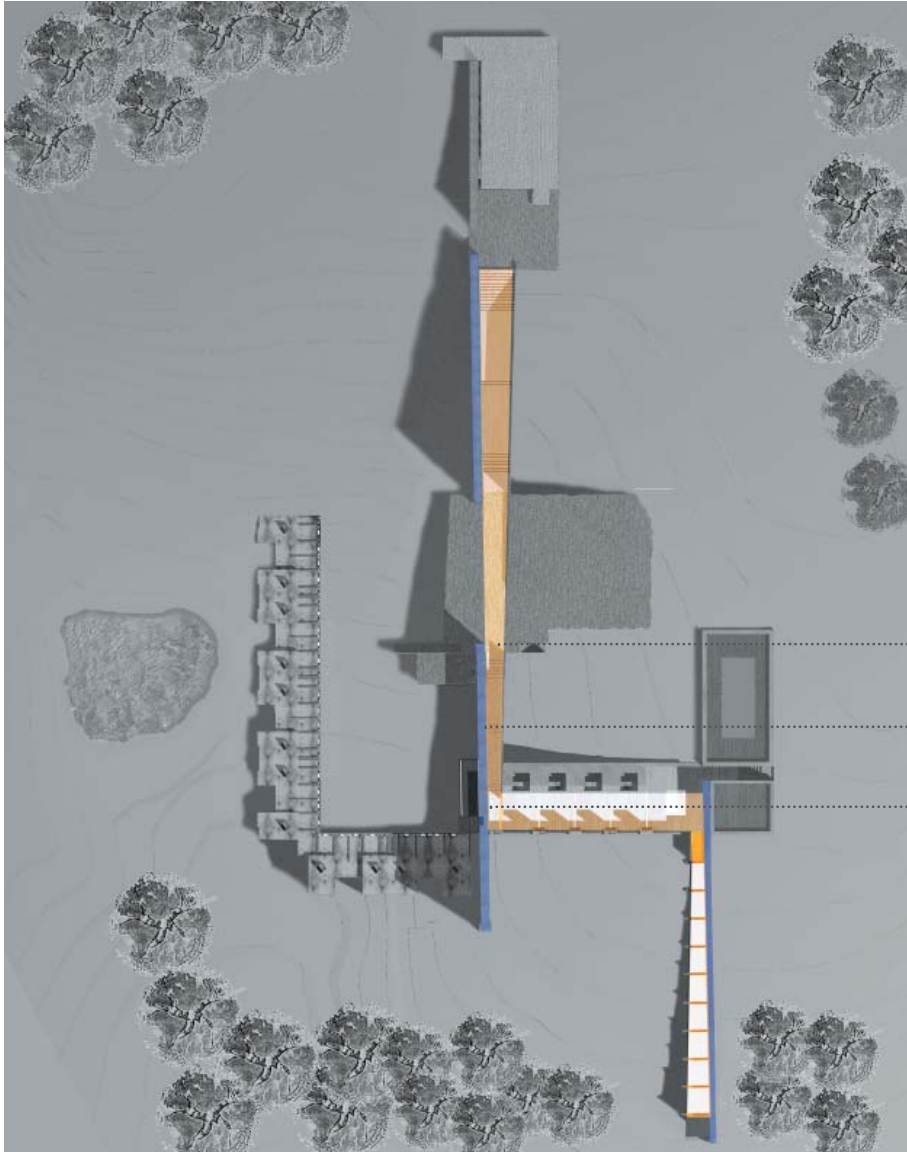
The horizontal is often used as a reference in this process. The more clear the horizontal edge, the larger is the directional quality.



## LEGEND

- 1 Plaza
- 2 Corridor to Refectory/Kitchen
- 3 Terraces for Gathering
- 4 Chapel





The primary path can be seen as two separate stages:

- The initiation to the project in the form of a tunnel entrance leading up to the plaza space
- The onward final journey from the plaza to the chapel

Primary Path

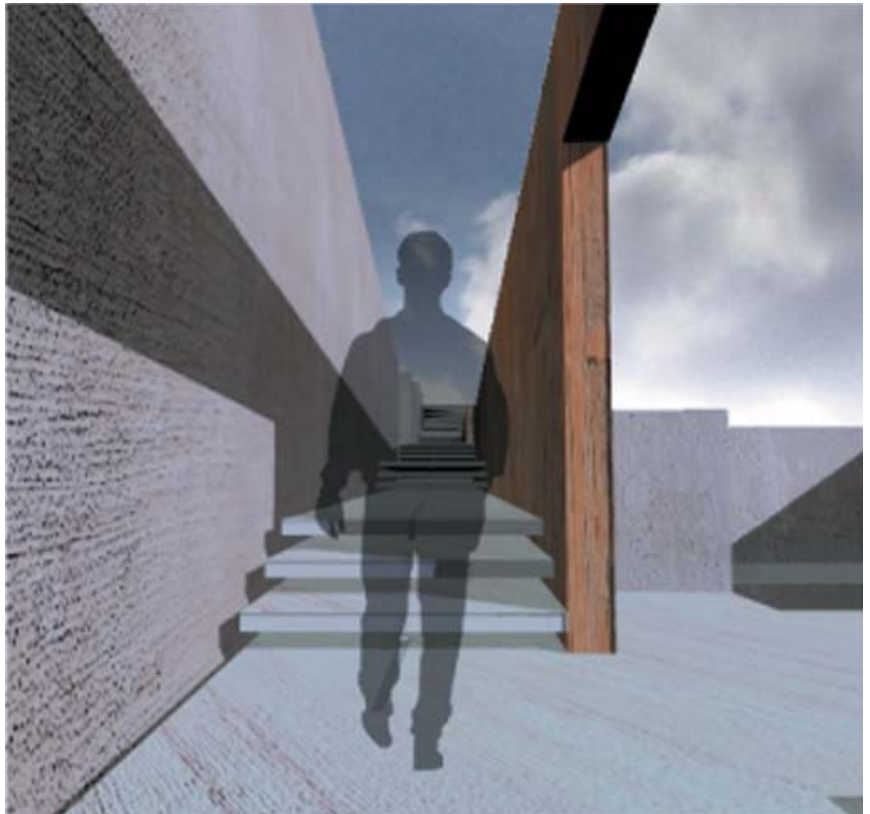
Concrete walls as a mean to generate the path

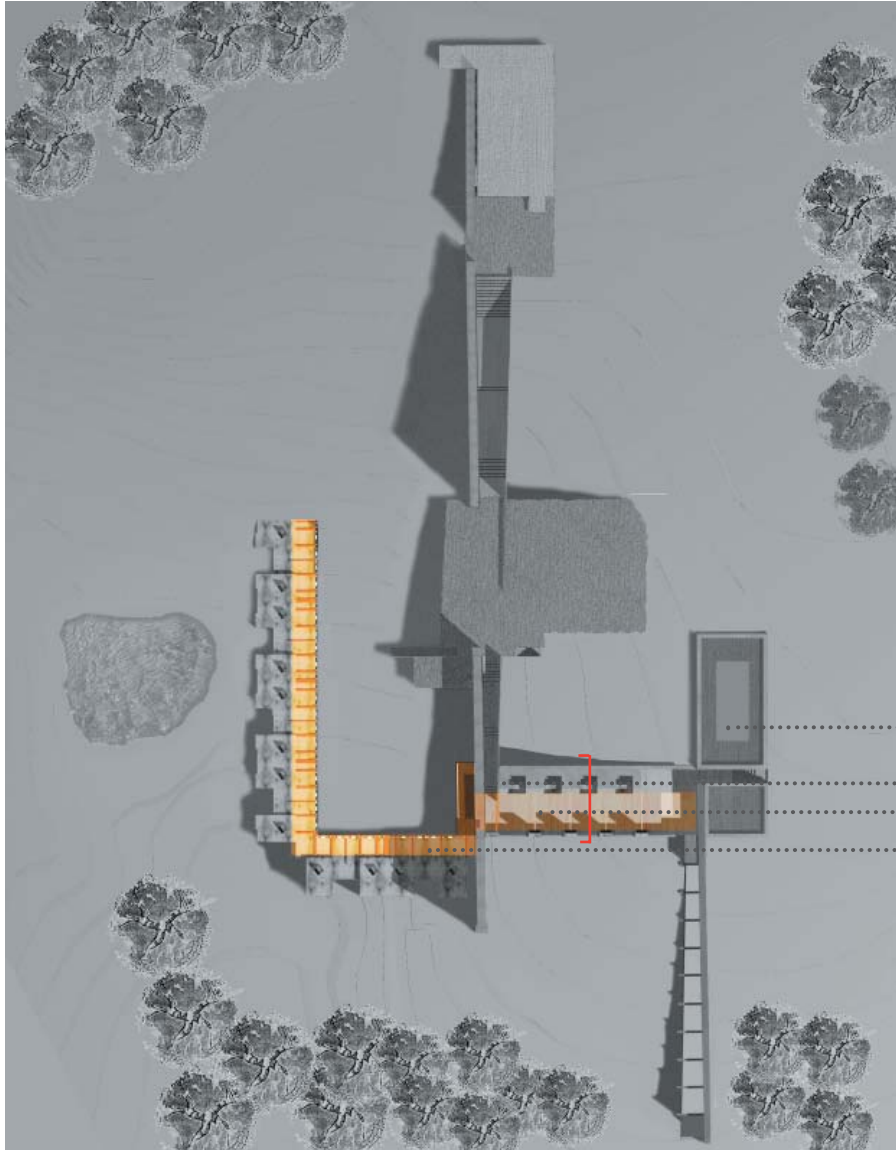
Access point to lower level

Primary Path Diagram

While embarking on the path towards the chapel in the upward sloping direction, there was a design intention to create a sense of apprehension. This was by cutting off visual contact to the end, thus leading to unfamiliar conditions. This condition continues till the culmination of the path at the chapel. Thus, as one progresses through the path, there would be an increasing sense of curiosity and desire to know whether there lies an end to this path and what what awaits one if there is one.

Concrete plays a major role in generating this path due to its colossal appearance. Its gigantic mass punches through the site and thus has visual connectivity to all levels and spaces of the structure. The concrete runs through the length of the site and encourages movement along its direction.



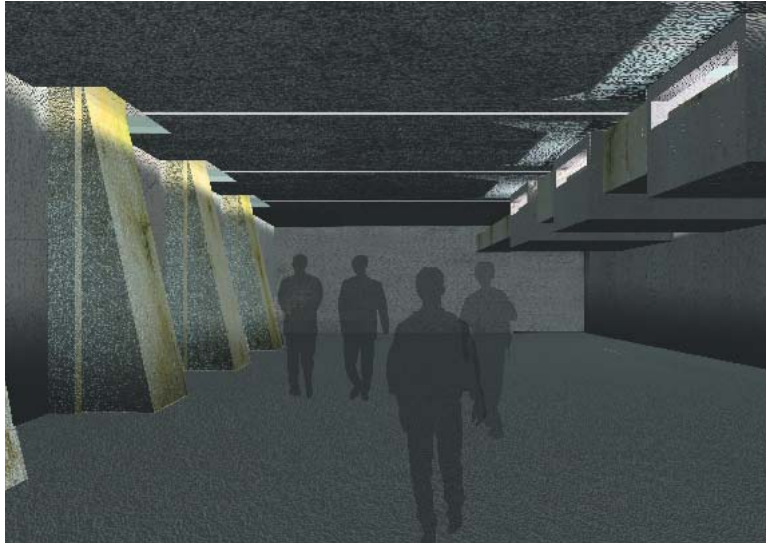


The secondary path consists of the connection between the living cells and the refectory. At all points, there is a strong sense of connection to the primary path as the concrete wall reaches down great depths into the earth and thus serves as a binding member for all parts of the project.

- ..... Refectory
- ..... Access to higher plaza level
- ..... Corridor connection cells to the refectory
- ..... Individual cells for the monks

Secondary Path Diagram (underground)

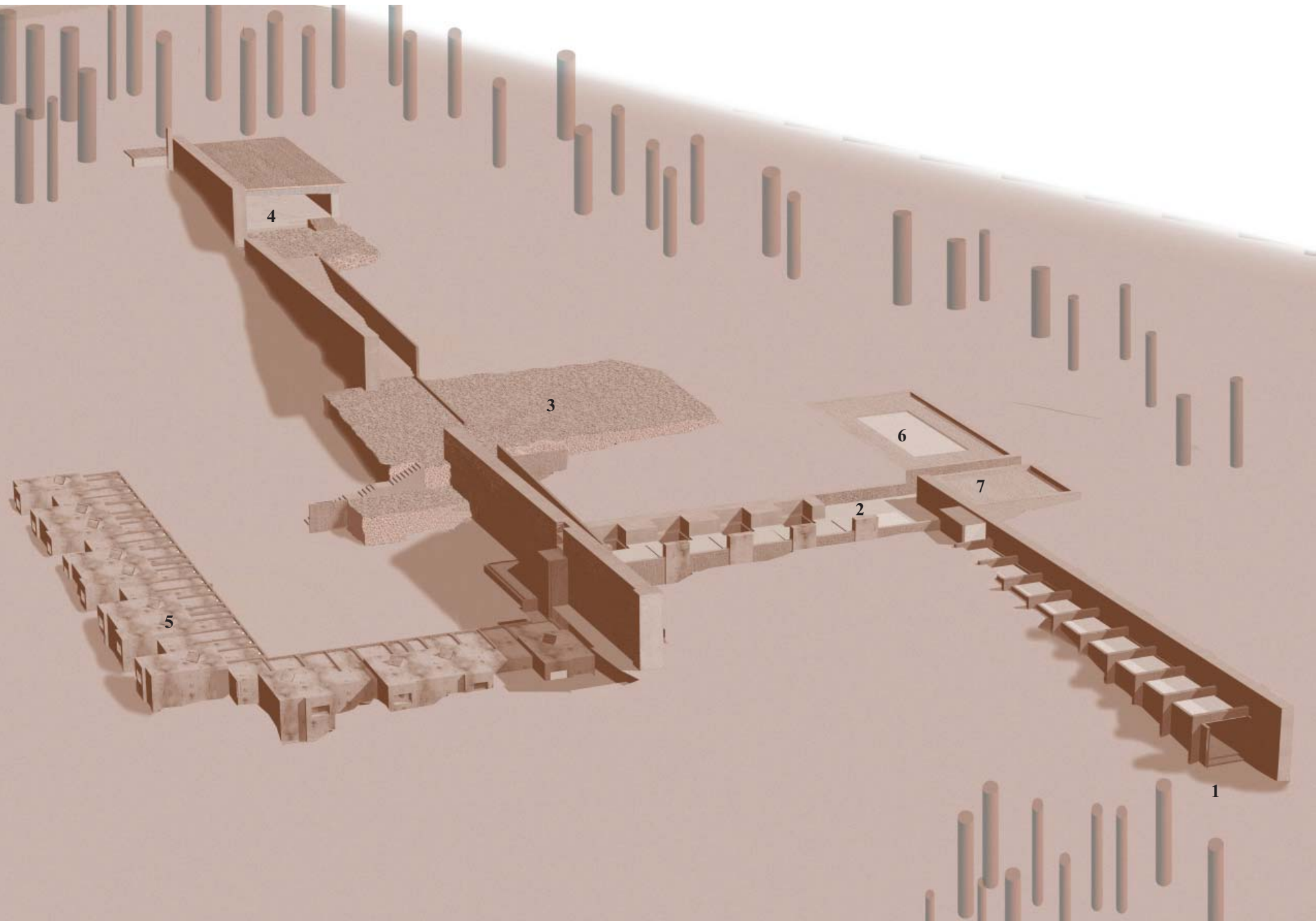




The lighting quality of the underground passage between the cells and the refectory varies with time of the day.

At early daybreak, there is a slight glow in few portions of the ceiling suggesting the beginning of a new day of thought and prayer. As the day progresses, the light slowly creeps its way down the faces of the sloping columns. The light then reacts with the rough texture of the column and scatters itself within the space creating an overall diffused condition of lighting.





Perched on the slope of a steep hill, the chapel forms the basis of the path. The cells for the monks form a cloister leading unto the refectory. The very simplicity of this strict plan mirrors ancient monasteries as they are found in the modern day.

From the outset the user is engaged in a series of spatial sequences along the path which eventually culminates into the chapel exercising a gravitational pull onto the altar.

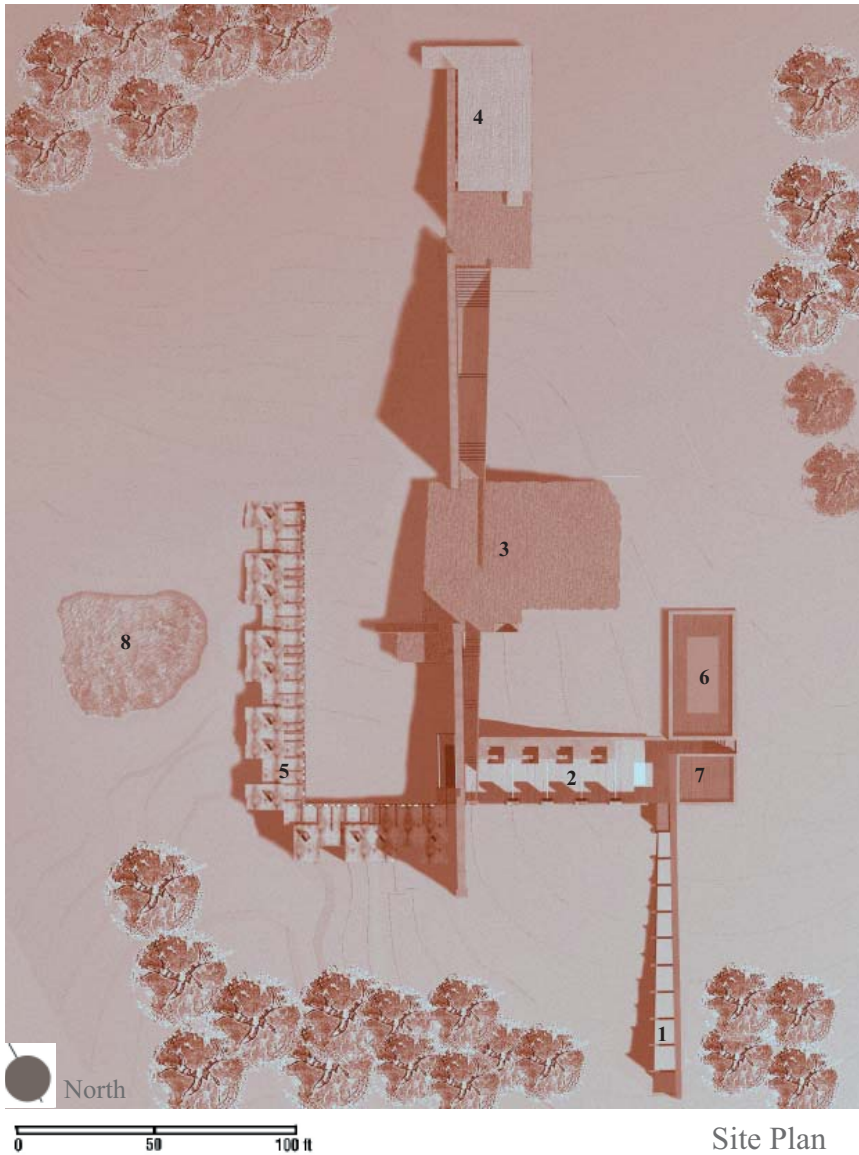
Branching off from the path at particular points, the site is designed to accommodate terraces which follow the natural slope and form interaction areas for the users. The various elements reach down from the “horizontal top line” of the terrace and the massive concrete walls, each of them reacting with the ground in different ways. The surface of the site continues upwards to form the sides of these terraces, thus giving the impression of merging with the landscape.

#### LEGEND

- 1 Entrance
- 2 Plaza
- 3 Gathering Space
- 4 Chapel
- 5 Cells
- 6 Refectory
- 7 Kitchen

## Birds eye Perspective of Project





LEGEND

- 1 Entrance
- 2 Plaza
- 3 Gathering Space
- 4 Chapel
- 5 Cells
- 6 Refectory
- 7 Kitchen
- 8 Water Body

Site Plan

*“I sat in dark corners under the cavernous arches and closed my eyes; I walked in a narrow line along a shaded path, then I walked a narrow line along a sunny path, then I just walked. I learnt that concentrating on detail draws you into yourself “*

Gautham Bhatia Architect



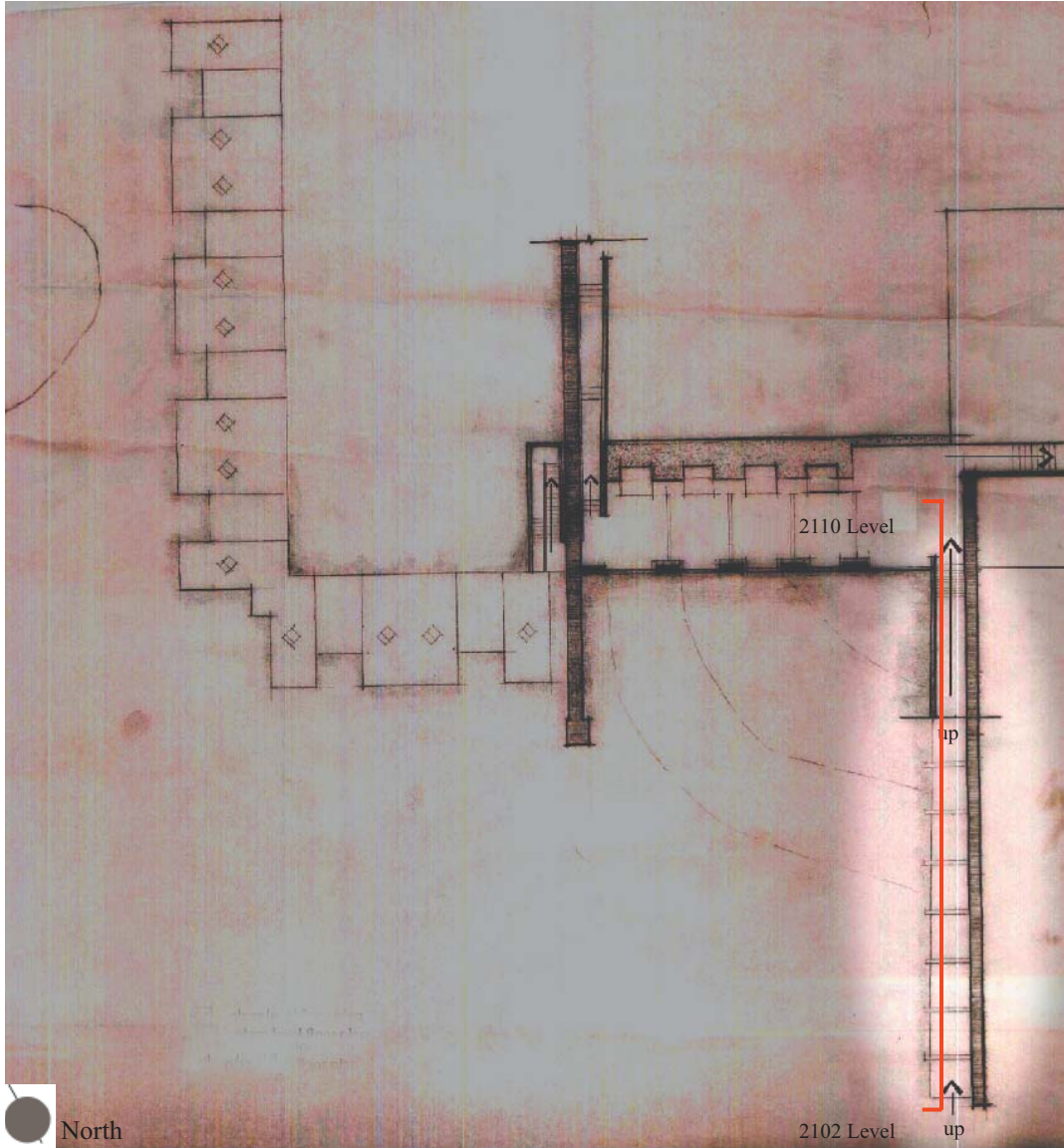




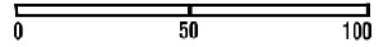








48  North



Plan at Plaza (2110) Level

The entrance to the project is at the edge of the site and forms a tunnel which emerges from the clearing in the vegetation. This arouses the curiosity of passing visitors and thus serve as a means to encourage movement into the site.

The condition of the space is in a constant state of change as one progresses through the tunnel such that the two ends have significantly varying conditions. Explorations were carried out for varying end conditions with consideration for the topography of the landscape. Finally it was decided to narrow the tunnel along the vertical and horizontal dimension in the forward direction. This was done in order to create an increasing feeling of "being cut off" from the surrounding environment.

Wider and Shorter



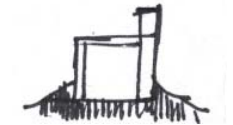
Narrower and Taller



Wider and Taller

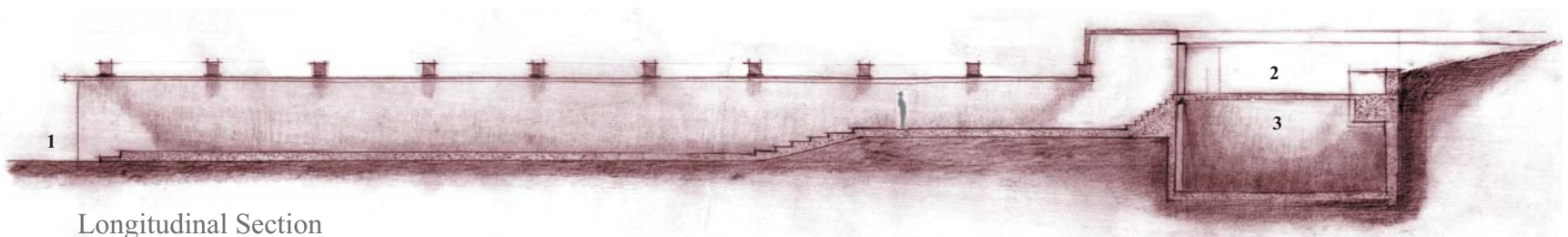


Narrower and Shorter



#### LEGEND

- 1 2102 Level Entrance
- 2 2110 Level Plaza
- 3 2100 Level Corridor



Longitudinal Section

There are many factors specific to light which affect the quality of a particular space such as the direction of light, its source concentration, brightness levels and color which impart a character. This can only be understood by the means of creation of the physical environment.

Lighting and material play a significant role in encouraging movement through the “tunnel”. Upon entering, one is deprived of a direct view of the outside. The overall quality of the space is determined by the characteristics of the overhead glass plane. There is a low transmission of the light through this plane, thus imparting a soft glow of low intensity. This reflects off the surface of the wood wall to give off a warm glow. The ceiling appears as an illuminated floating plane within the space preventing direct visual contact to the outside. The column/ beam construction is seen only in the form of silhouettes robbing the scene of visual richness. Thus, all these factors contribute to the gloominess of the place. This dull character allows for a larger contrast to the end of the tunnel.

There is a constant condition of Light at the end of the tunnel facilitated by the highly reflective surface of the concrete at the end walls. The light progressively gets brighter as a person walks through the tunnel, thus leading to a desire to get to the end.

Light penetrates through punctures in the concrete at floor level and creates sharp outlines on the surface of the floor. These patterns of light cause a rhythm in the forward direction.

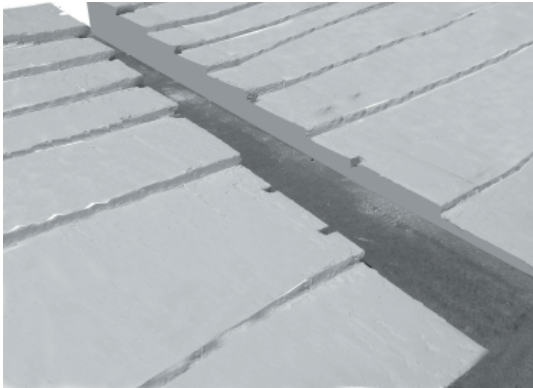


*This image taken of an overcast sky at sunrise in the Himalayas in Northern India is reminiscent of the lighting conditions present in the entrance to the monastery*

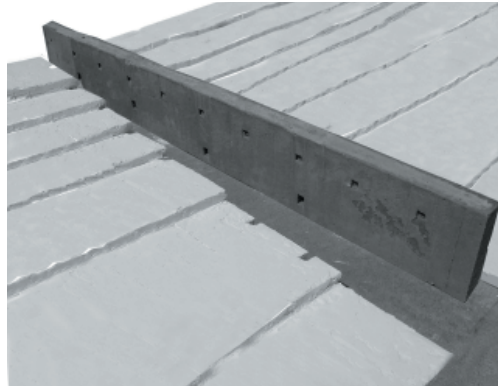




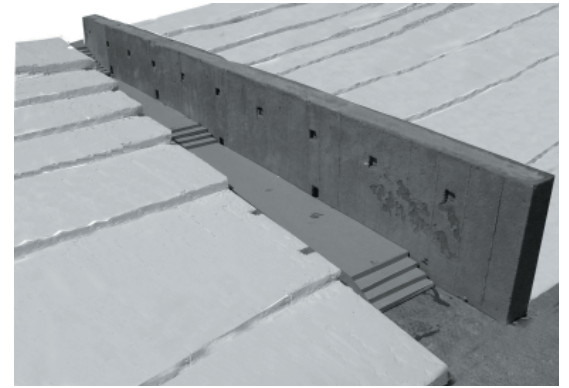
## Construction of the Entrance



The contoured site

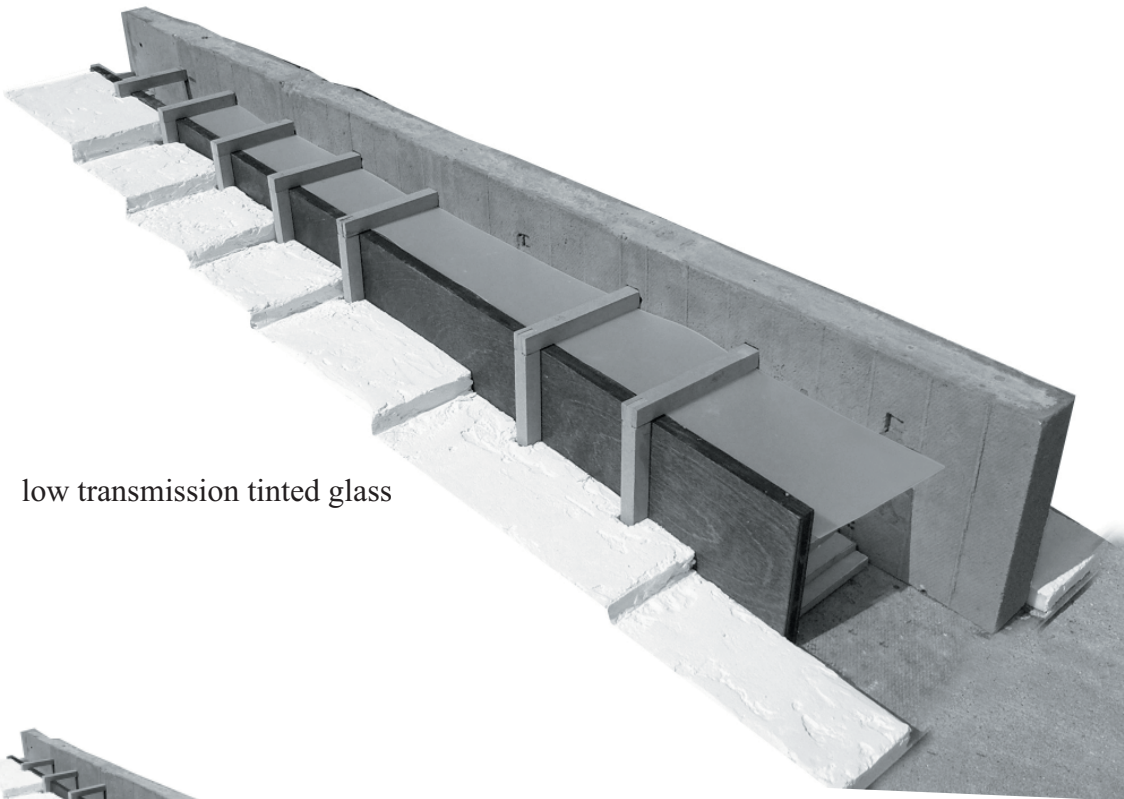


The concrete wall

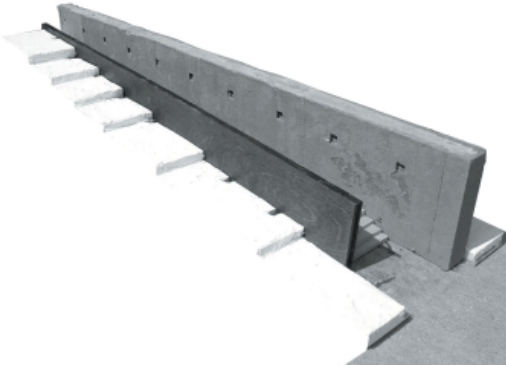


The concrete ground plane

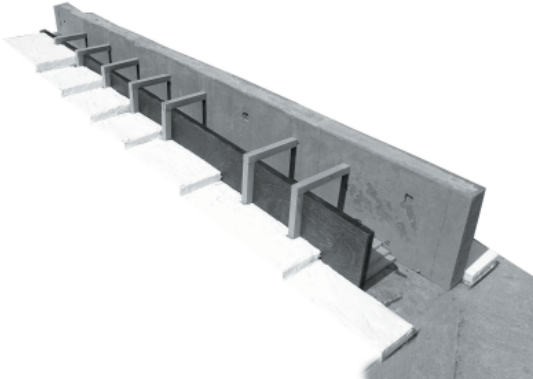




low transmission tinted glass



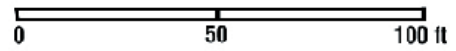
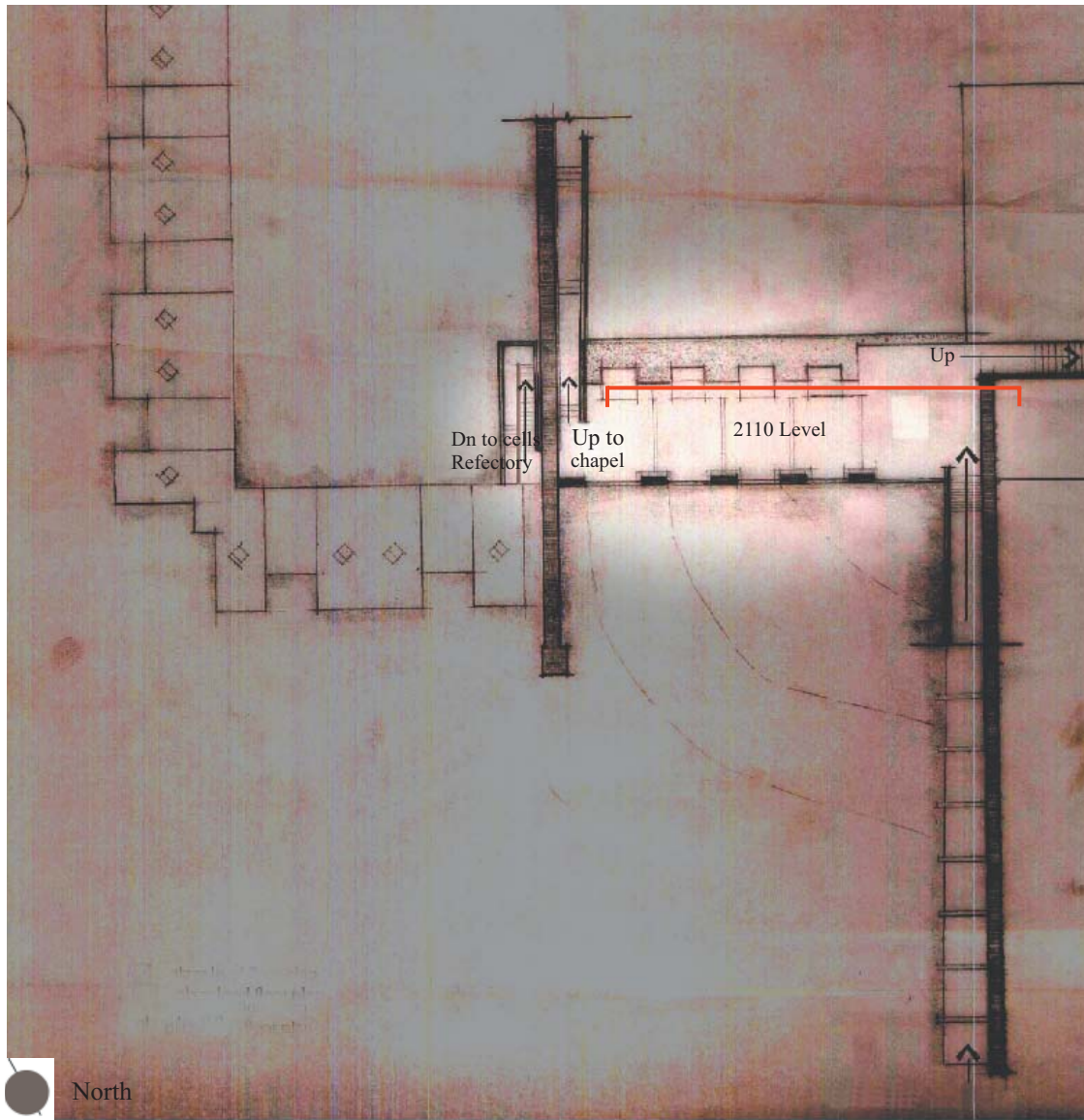
The wood wall



wood column/beam construction







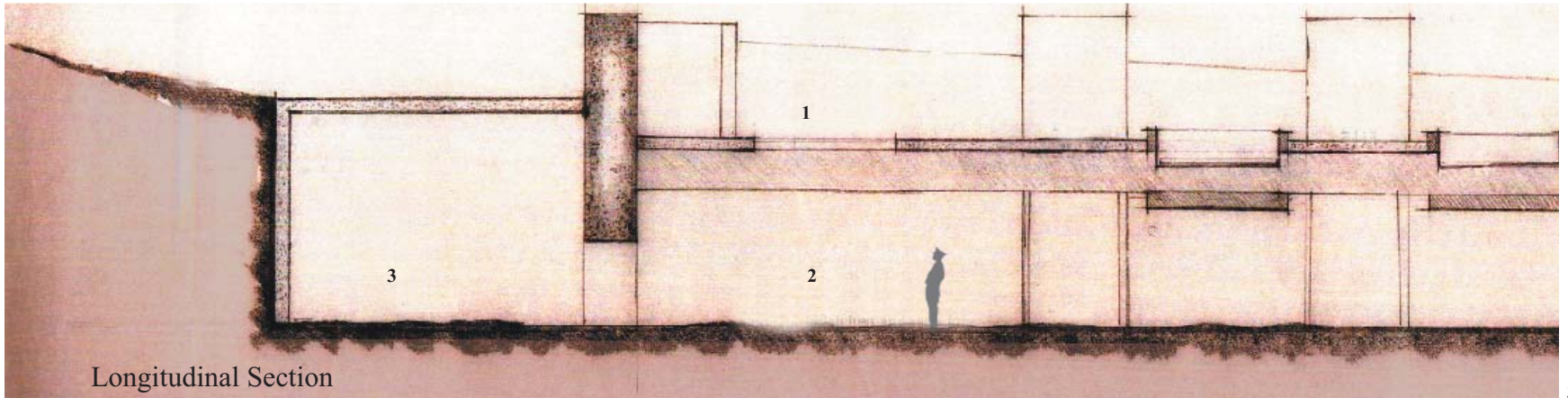
Plan at Plaza (2110) Level



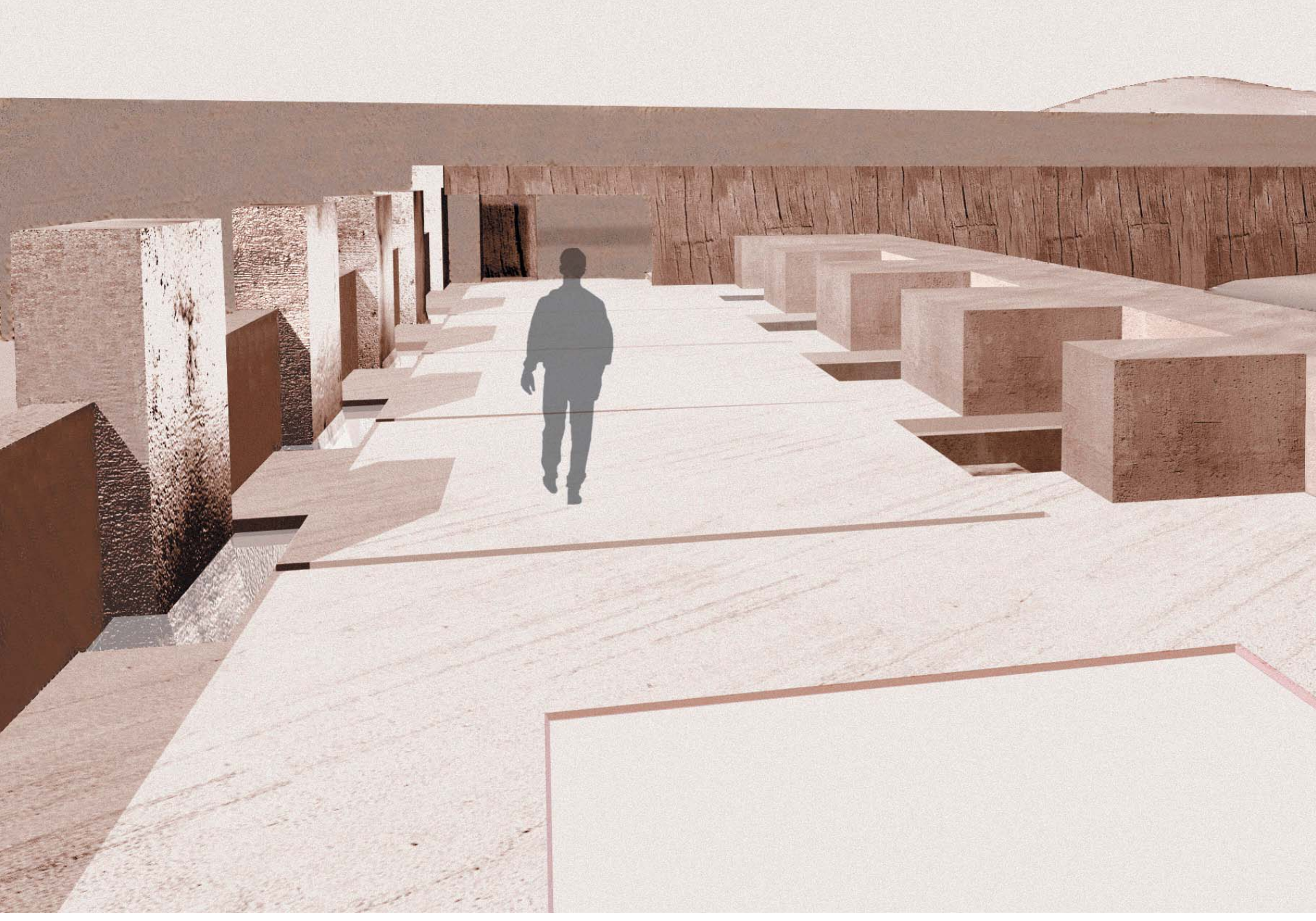
The plaza serves as a means to connect the two parts of the primary path. It also marks the point of access to the lower levels of the secondary path which serve the cells and the refectory. It is an open sunken in space enclosed by the earth on the sides which rise up to form the retaining wall thus giving a feeling of enclosure to the space. This also keeps with the intentions of the program as it is visually cut off from the surrounding landscape.

LEGEND

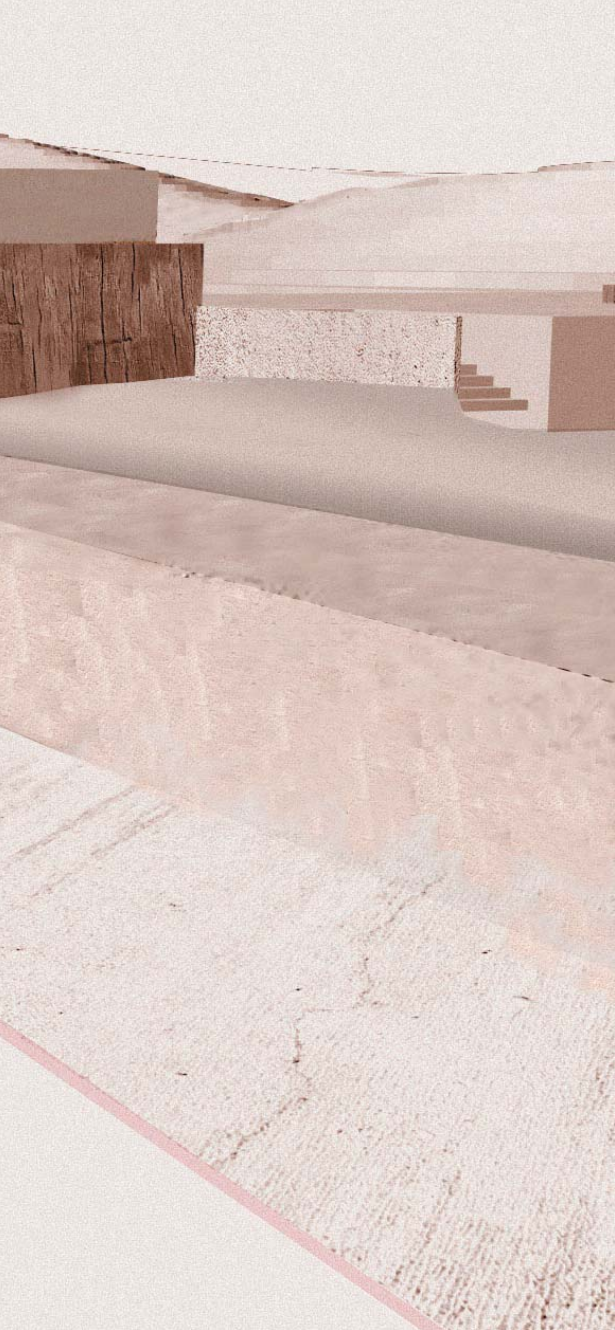
- 1 2110 Level Plaza
- 2 2100 Level Corridor
- 3 2100 Level Kitchen



Longitudinal Section





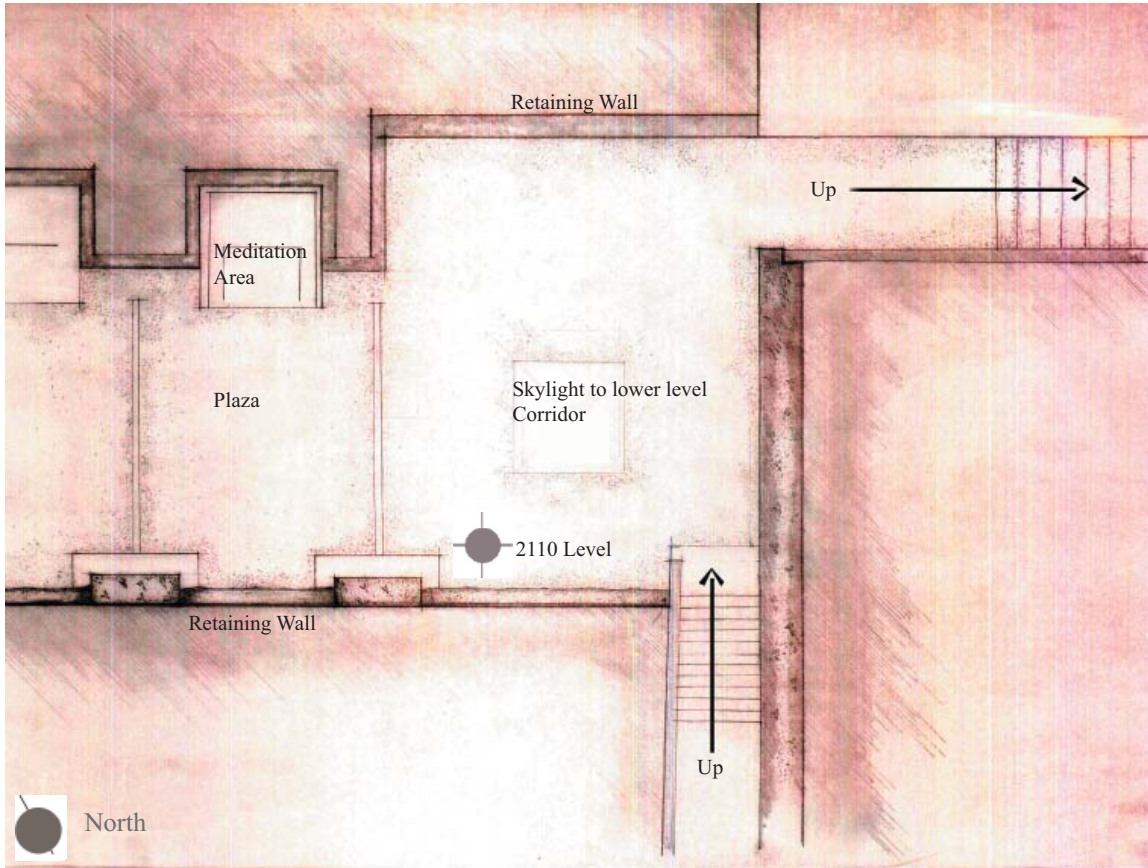


The plaza presents itself as a linear space in plan, with the far end serving two purposes i.e to continue to progress along the primary path towards the chapel and to access the lower depths of the project to the secondary path.

A red glow is seen at the far end of the plaza space which accentuates the perspectival linear condition. This red glow at the entrance to the lower level, denotes a change in material from concrete to wood. This strong focal point serves as the only means of access to the secondary path.

There is a subtle change of material inlaid in the flooring starting from the plaza and continuing along the direction of the primary path in the upward direction. This is revealed only once a person approaches the far end. A part of the wood guiding wall for the primary path reaches out to meet a column in the plaza space. This creates a visual connection between the plaza and the primary path.

At all points on the path, the floor and the columns hold back from the path generating wall as a form of respect for its monolithic mass.

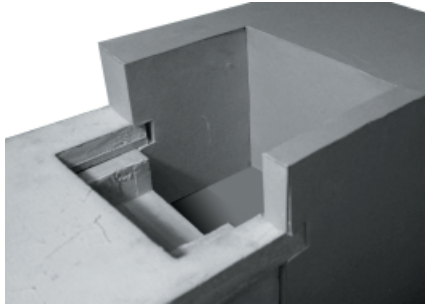


Depressing a space alludes to the introverted qualities and has a meditative nature. Some parts of the plaza space are articulated by depressing a portion of the base plane. The boundaries of the field are defined by the vertical surfaces of the depression.

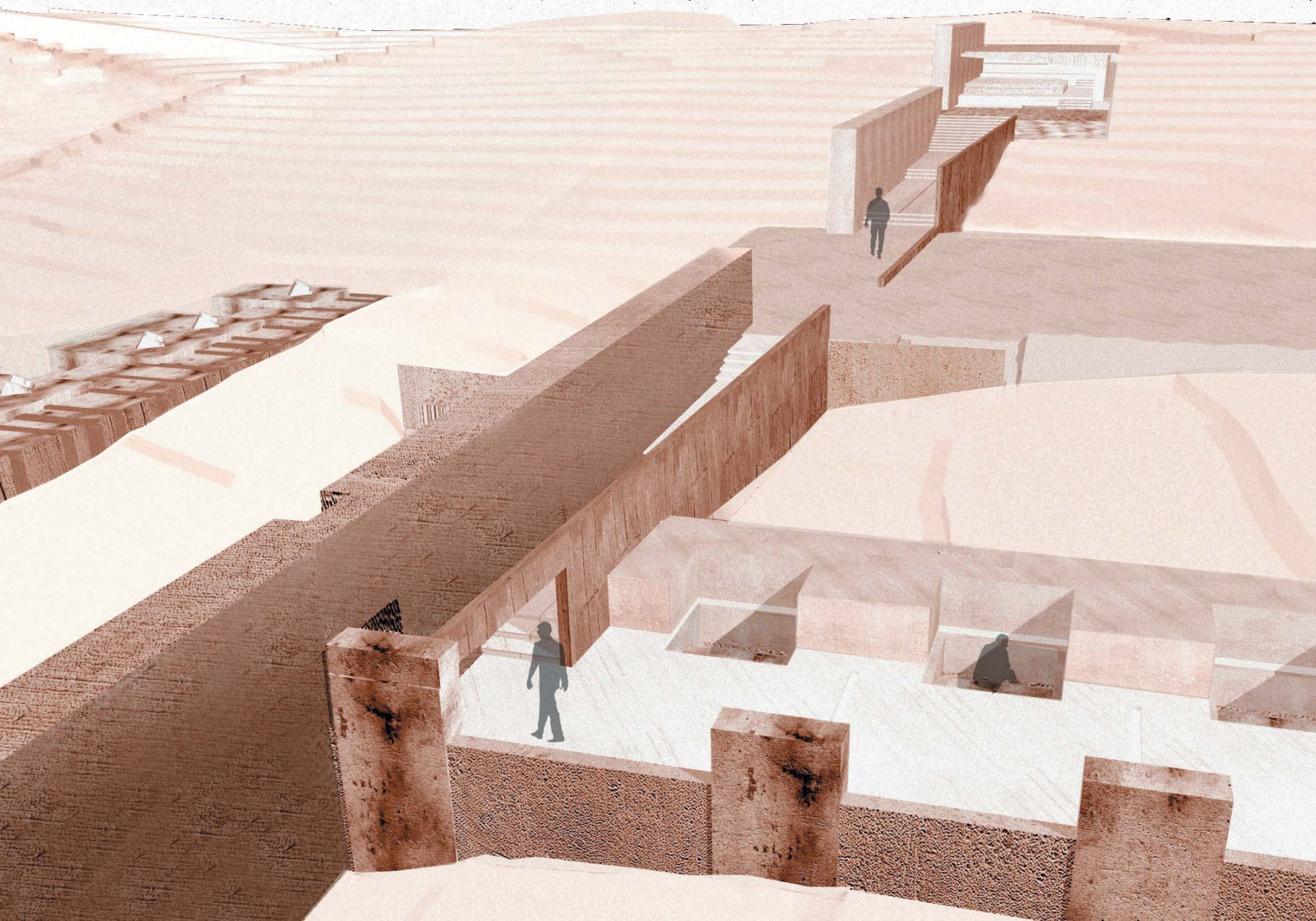
A spatial continuity is maintained between the two as the original base plane does not lie above the eye level of a person once seated within the depressed plane.

Plan at Plaza (2110) Level

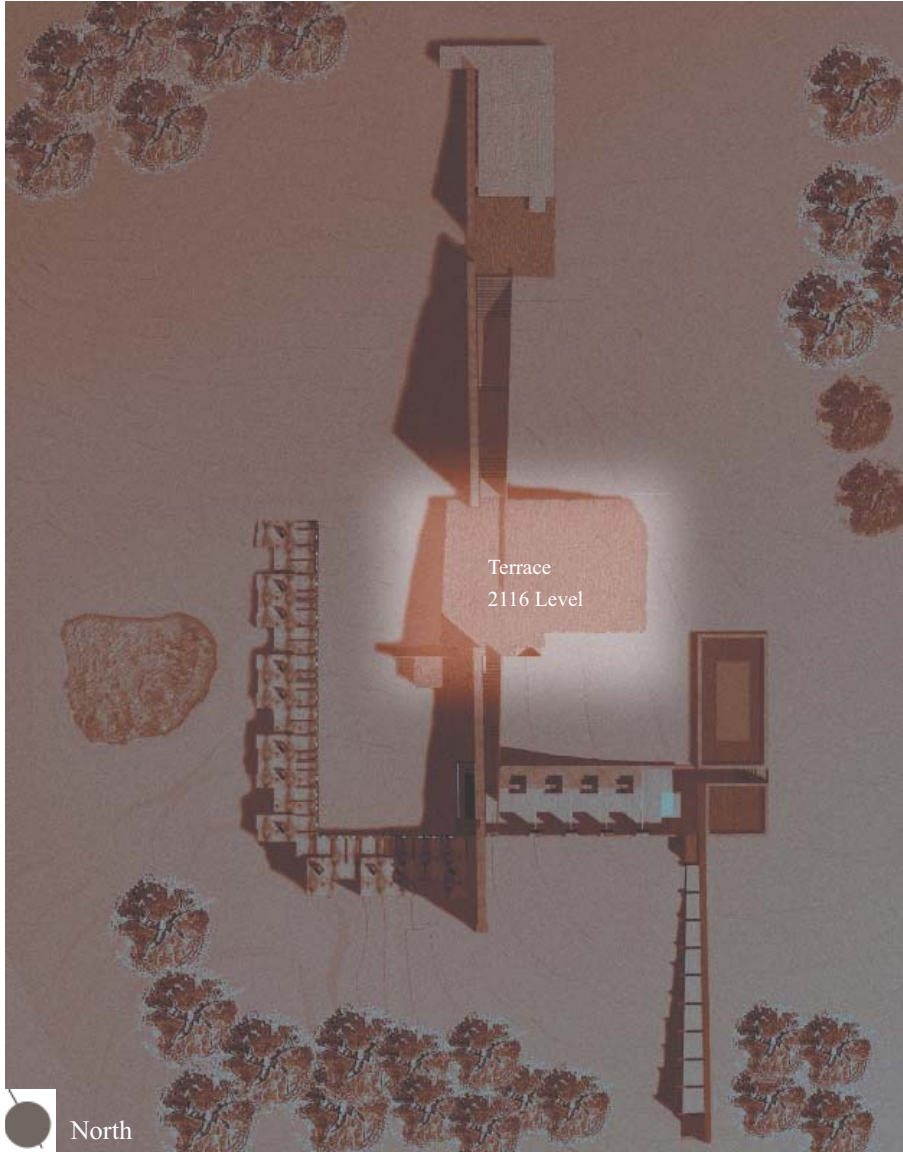












The primary path branches off at intermediate points to form spread out flat terraces which eventually merge with the landscape at the ends. These form the assembly spaces for the monks prior to entering the chapel.

There are points of access to the central courts and enclosed landscape areas from these terraces. A connection to the path towards the chapel is suggested by means of continuity of the wood wall within the terrace as a low rise element. The height of a vertical plane relative to the viewer, creates different levels of enclosure, which is the critical factor that determines the quality of the space. If the height of the plane exceeds the height of the viewer, it breaks the visual and spatial continuity between two fields and thus creates a strong sense of enclosure. Thus this low rise element does not disturb the visual and spatial continuity of the terrace and yet suggests a continuity of the path.



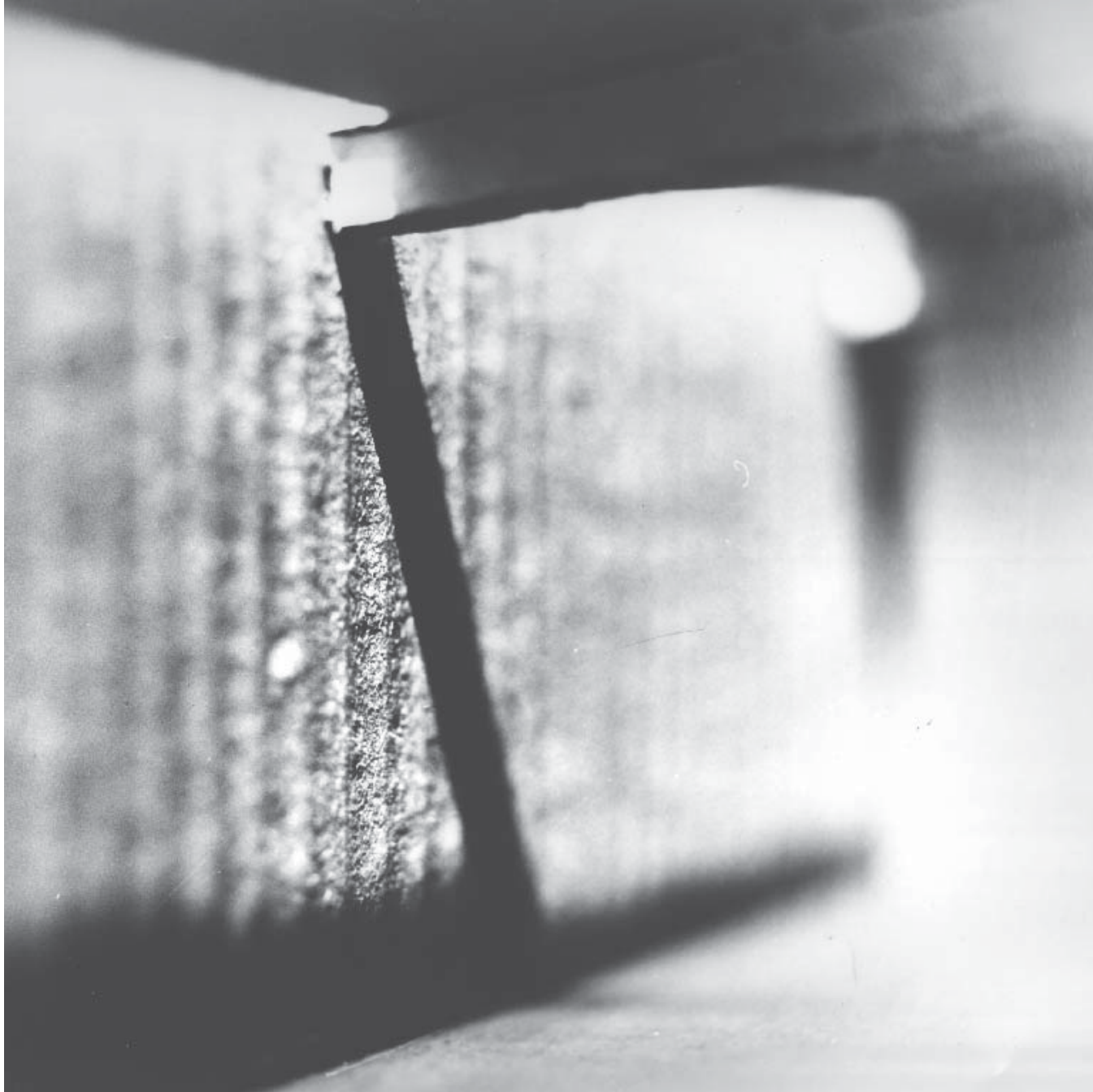








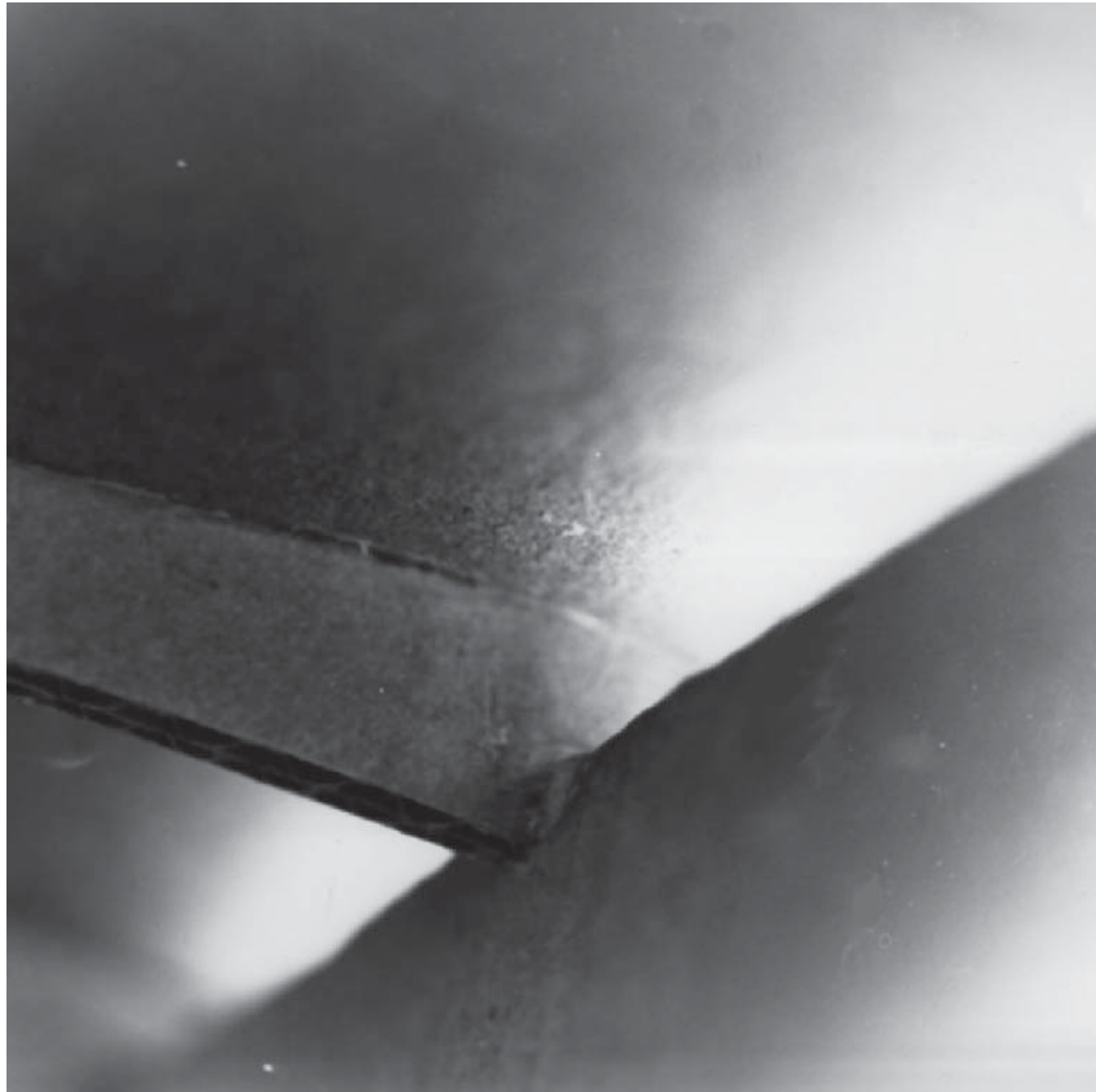






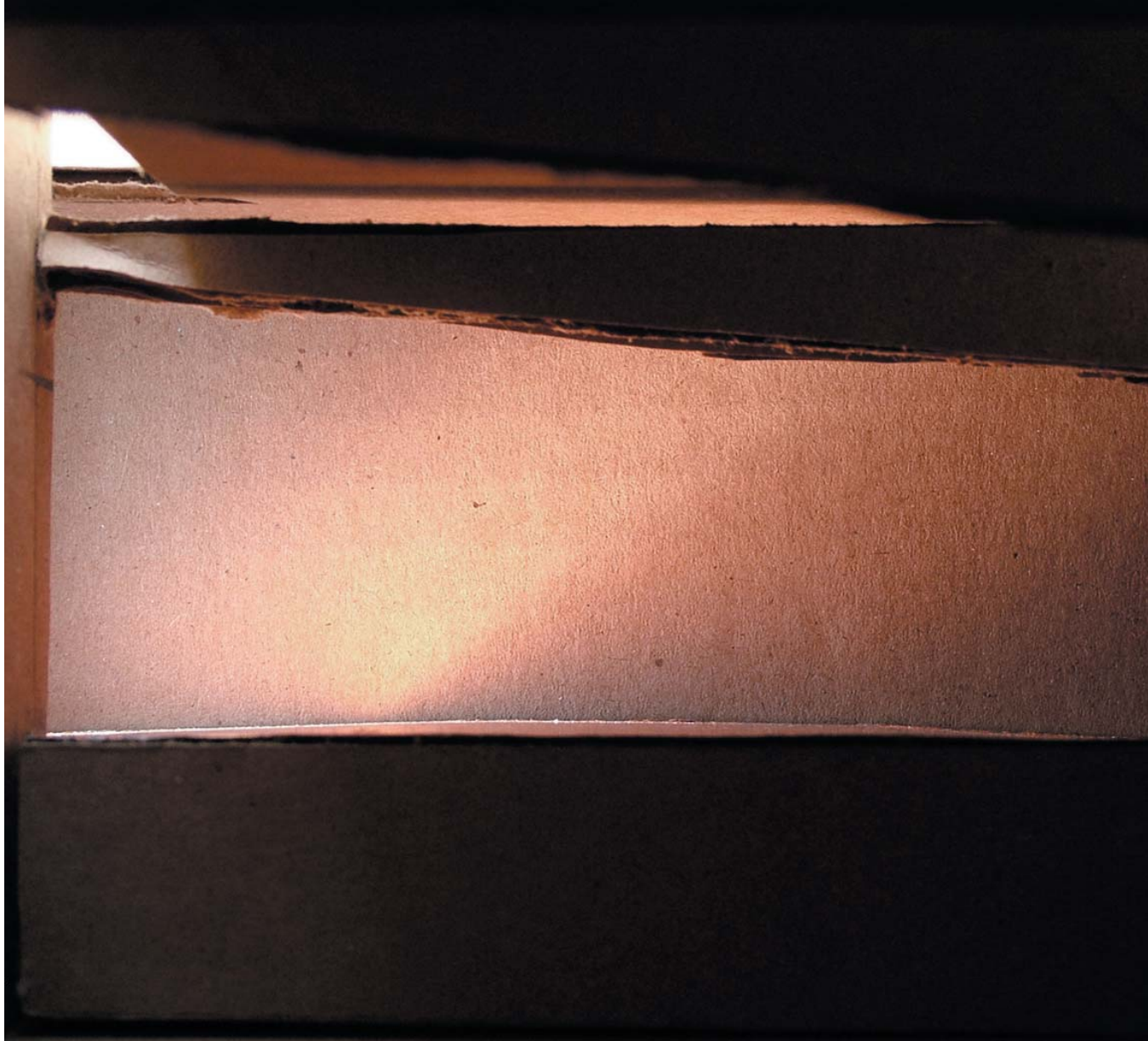




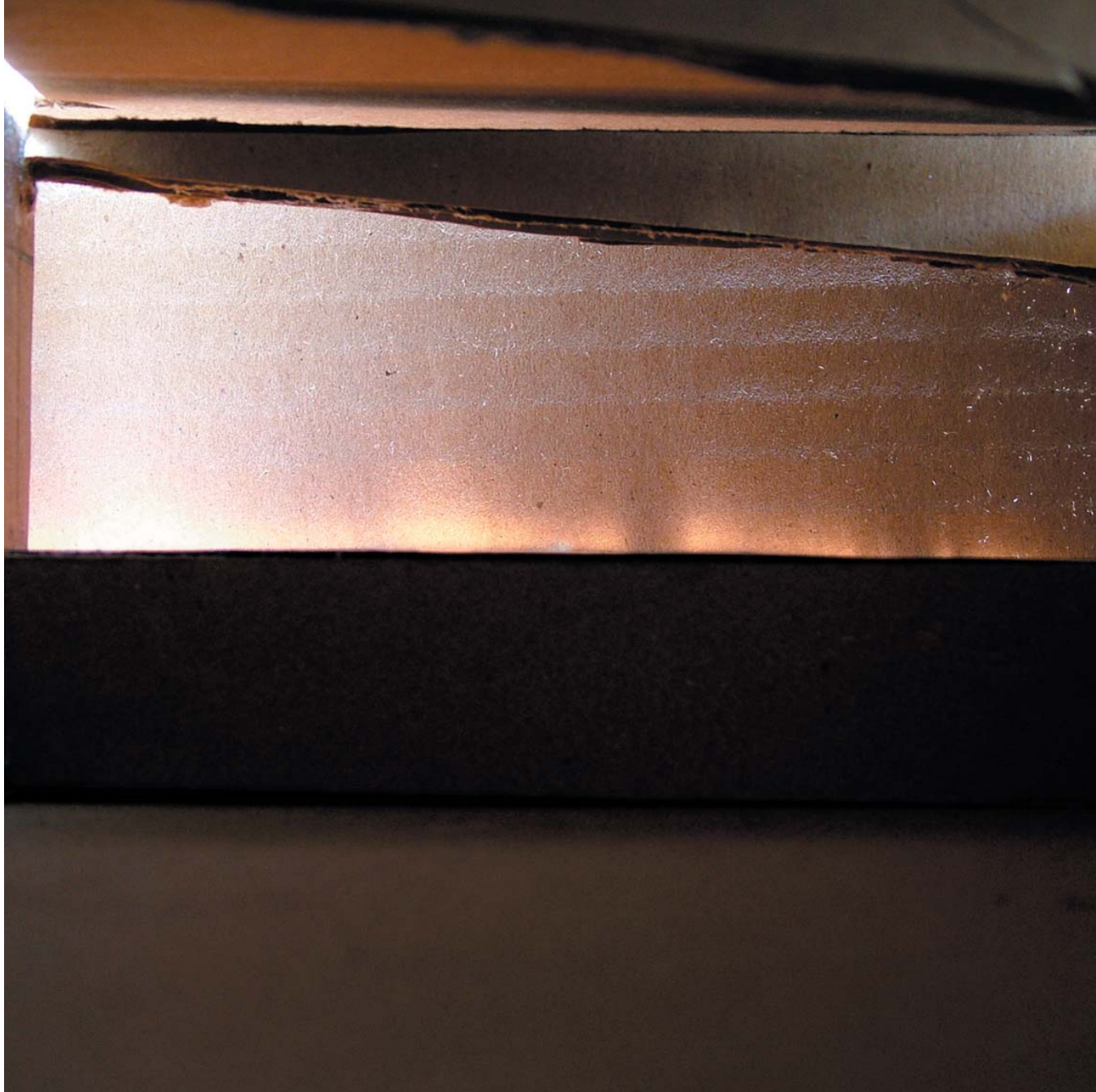


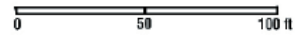
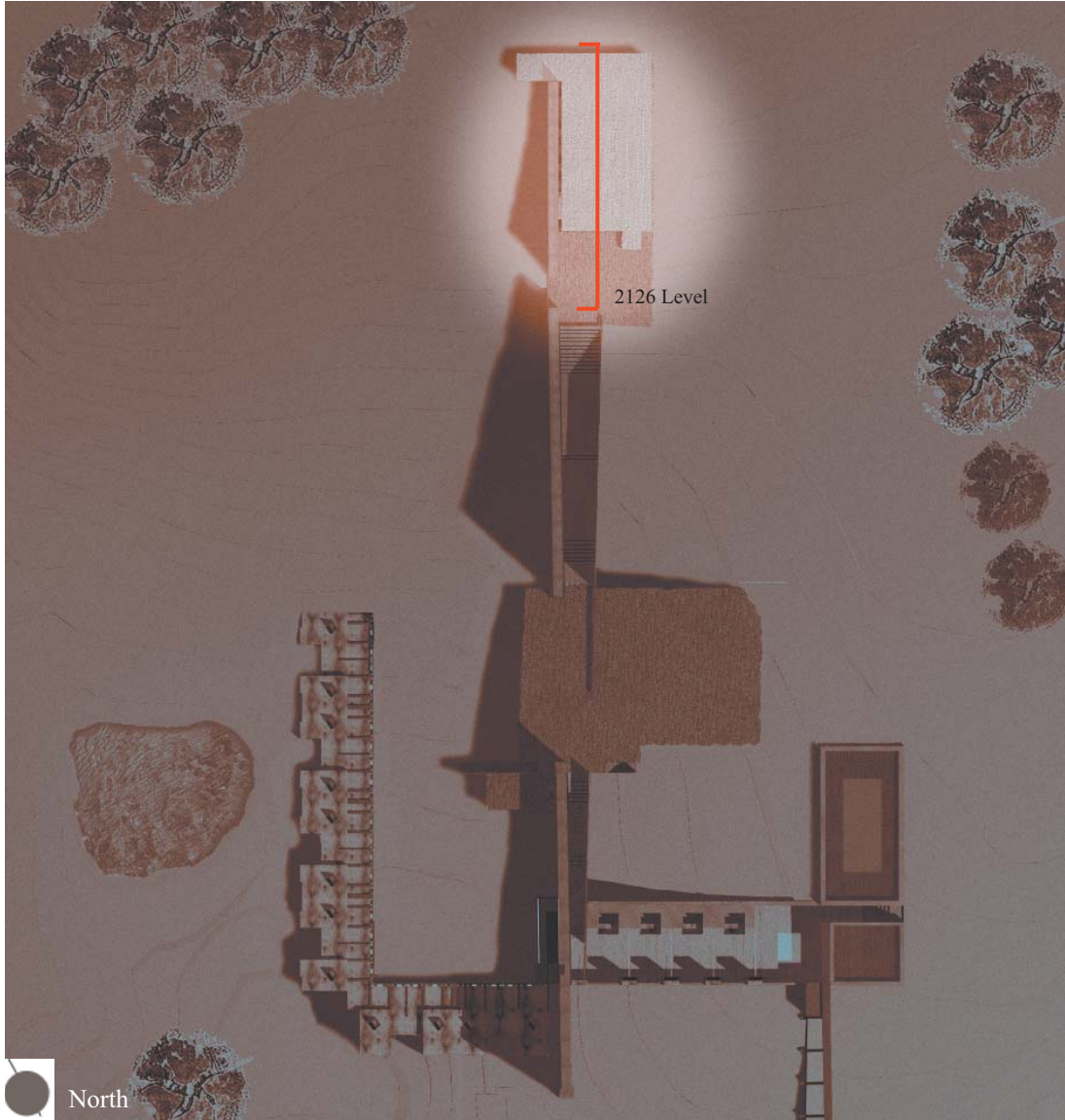








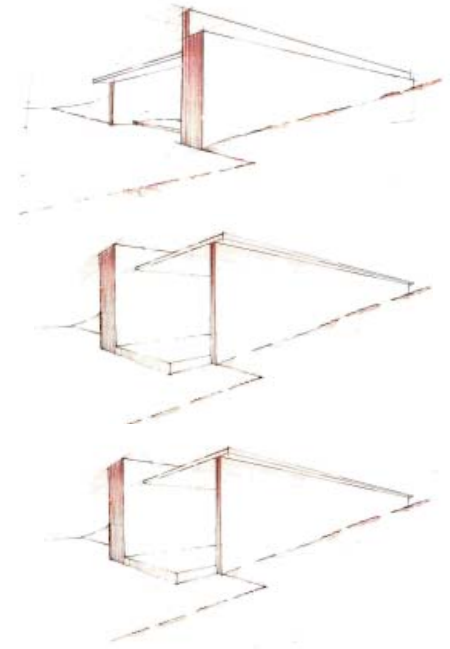




Plan at Chapel (2126) Level

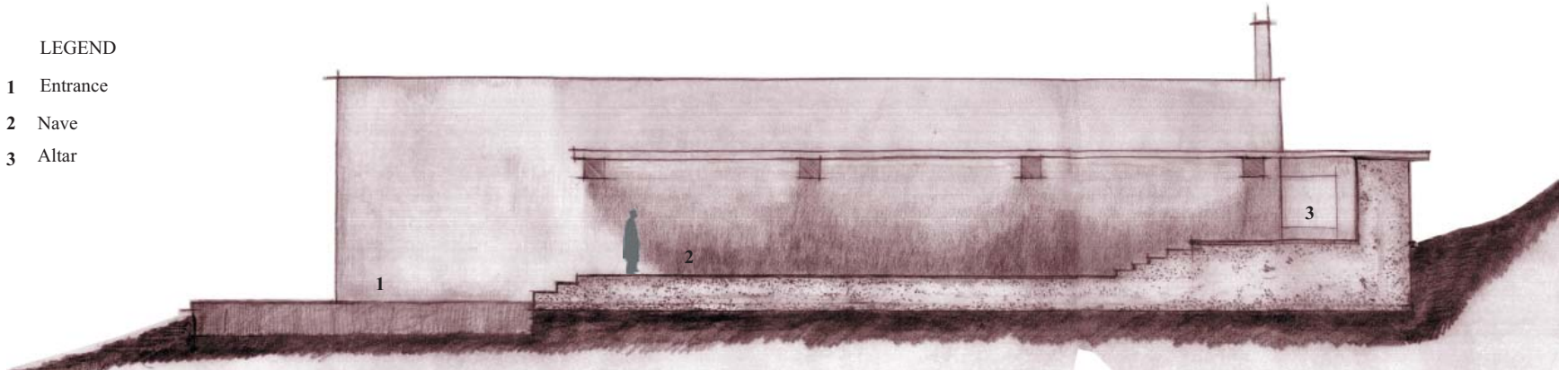


A series of explorations were done through sketches and physical form for various configurations of the chapel in terms of interaction of the floors, walls and ceilings. Since the material of this chapel would be concrete, it would be assumed that the need for columns would be eliminated. The floors, walls and ceilings were seen as reclinear planes. The main consideration while designing the chapel was the minimal impact on the site and also work out a configuration would best allow for the light to enter the structure.



LEGEND

- 1 Entrance
- 2 Nave
- 3 Altar



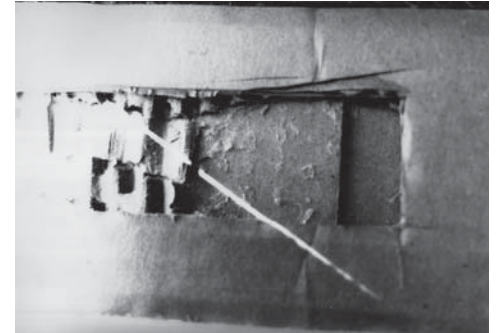
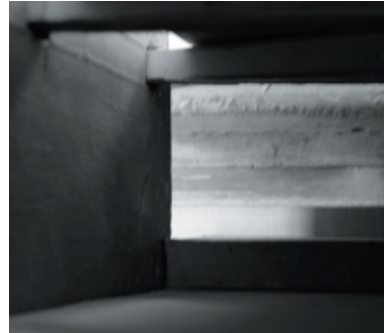
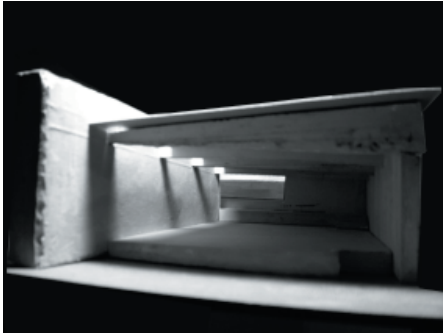
Longitudinal Section

The main guiding wall for the path continues and forms the side wall of the chapel. As in other parts of the project, the ceiling holds back a slight distance from the wall. This condition gives the opportunity to light to interact with the structure in a series of different ways.

At early daybreak, when the sun is in the East, there is a bright glow in the upper face of the ceiling in the form of a band. As the day progresses, this band slowly begins to get wider and gradually starts to cover more and more of the surface of the wall. At noon, when the sun is directly overhead, the entire wall is illuminated. This allows for the textural qualities of the concrete to be displayed. The concrete wall then acts as a light source of its own and imparts a soft glow within the space. The wall then gradually loses its brightness as the light makes its way to the floor. The image of the light on the floor reflects the construction of the wall, beam and column. With time, this vanishes signalling the end of the day.

The wall which has travelled a long way from the initiation of the path to the chapel, finally holds back at a point.

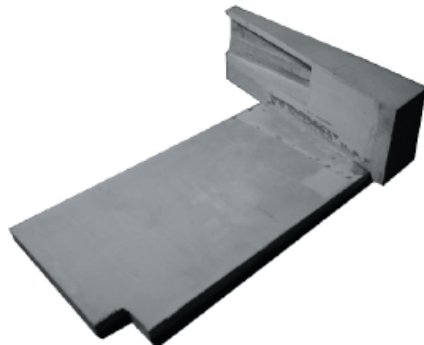
The lighting condition at this altar is different to what is present at all other points of the project, as the light rises from the ground. There is no evidence of the source of creation of this light, until, one actually makes a journey to the altar. Upon entering the altar, one finds themselves as one in the presense of the light rising from the ground. This would provide a sense of invigoration within a person and thus one would forget all their worldly sins and worries.



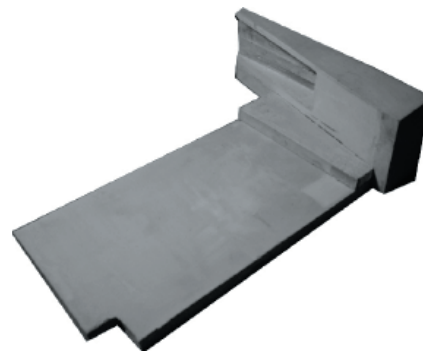
## Construction of the Chapel



Altar



Floor Slab

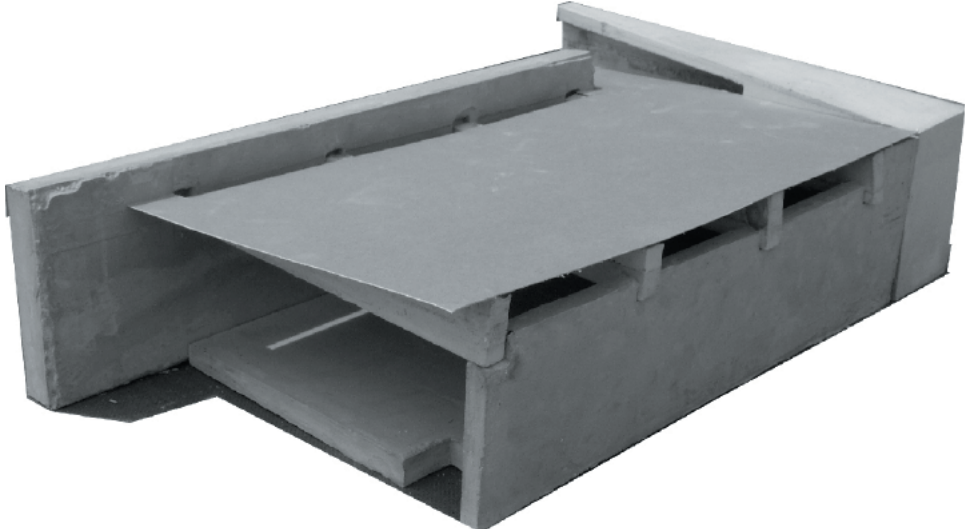


Podium

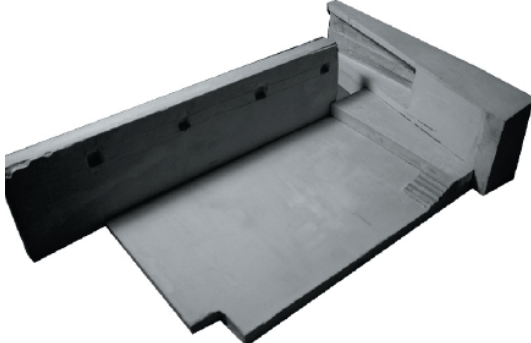


Steps

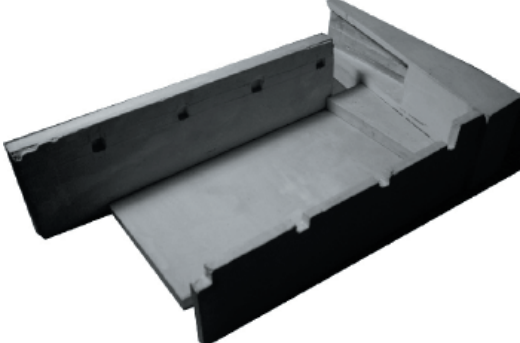




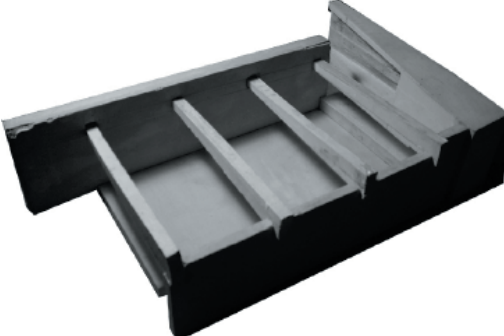
Ceiling



Main Wall



Side Wall



Beams



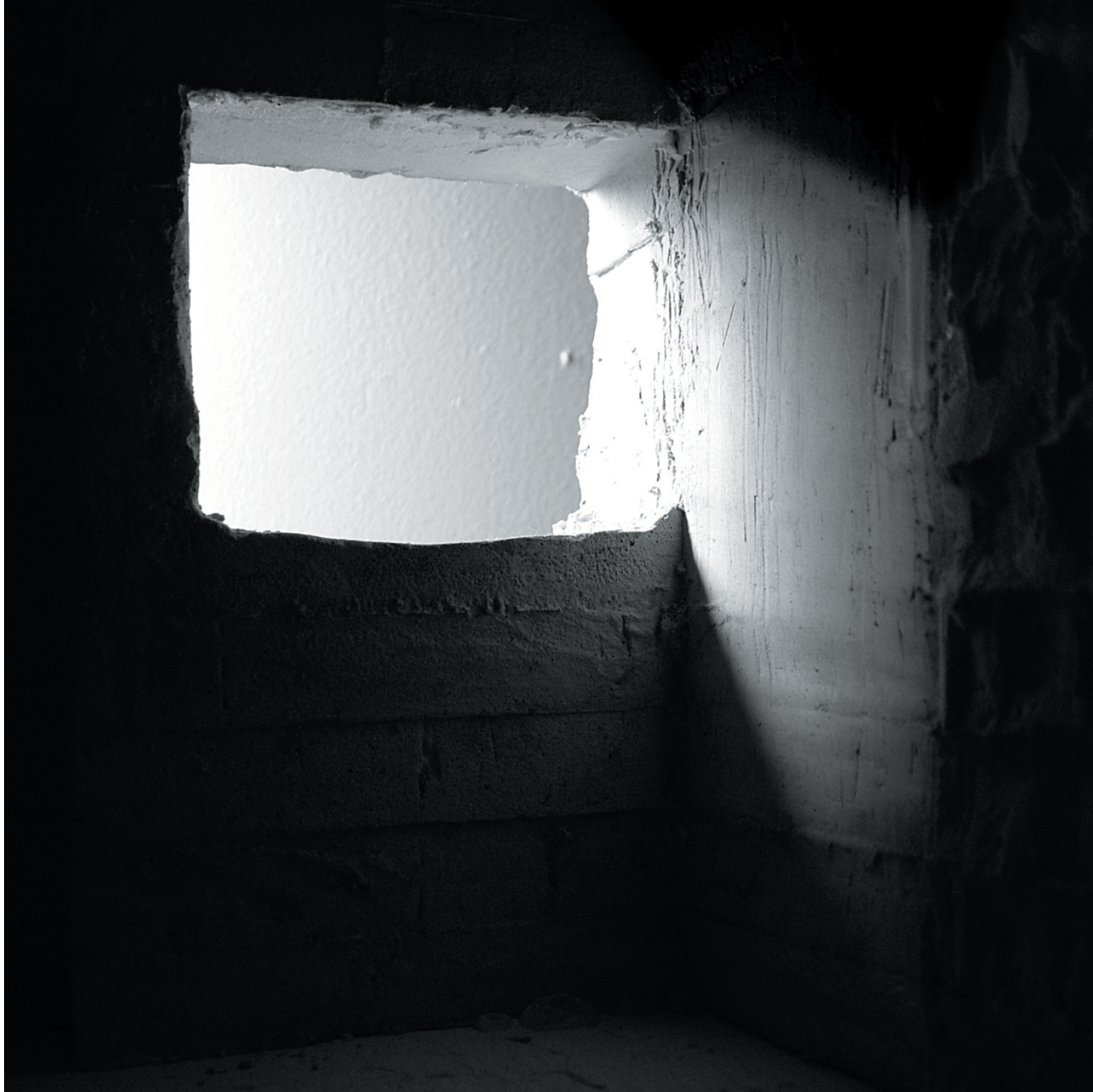








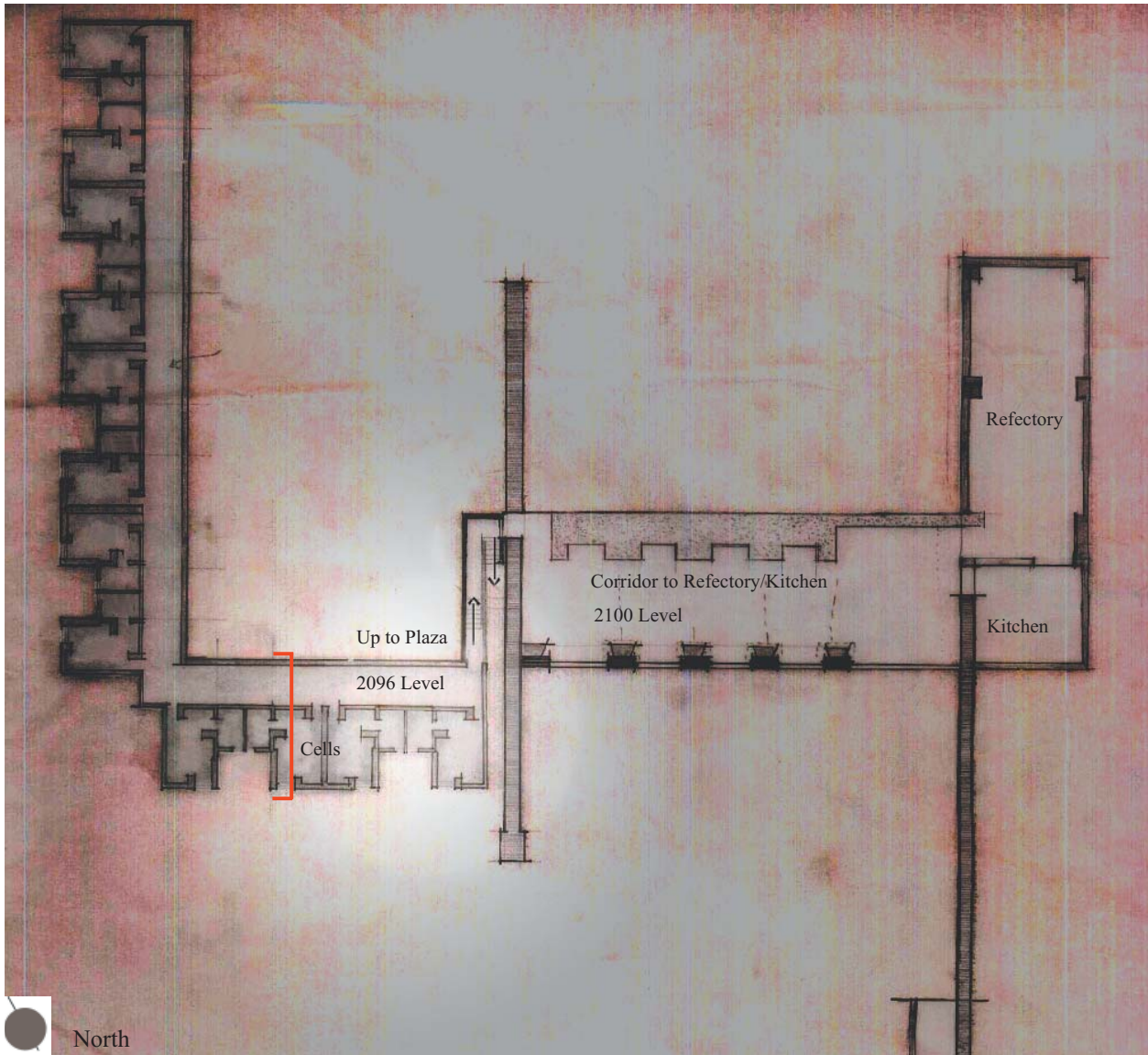






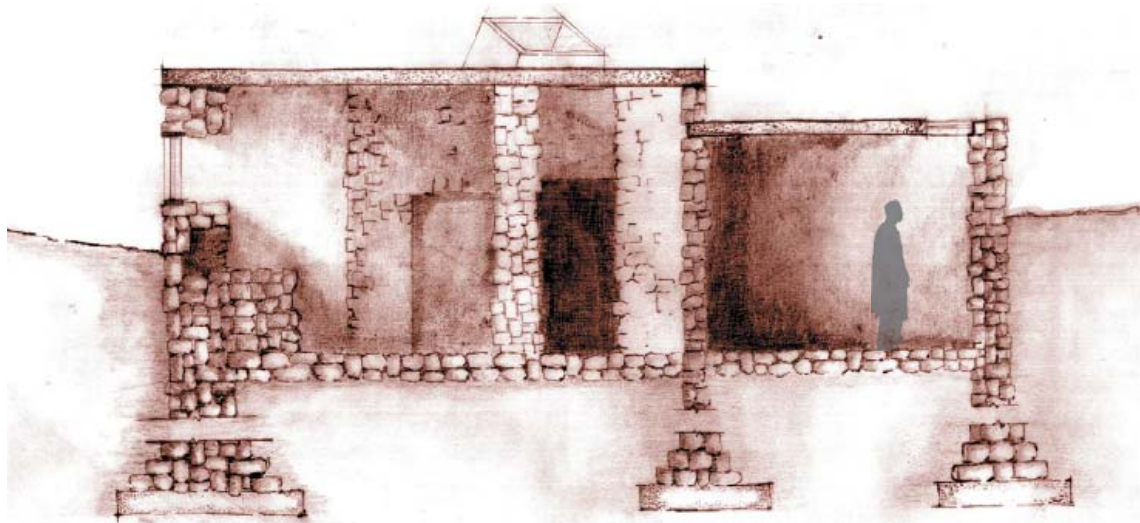
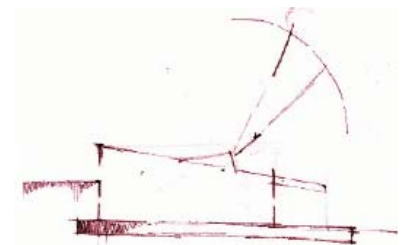
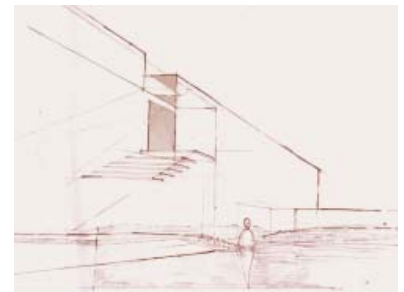
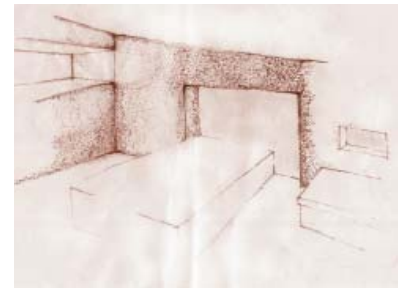
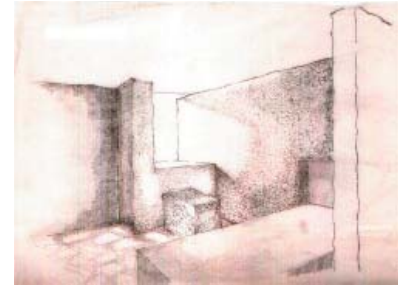




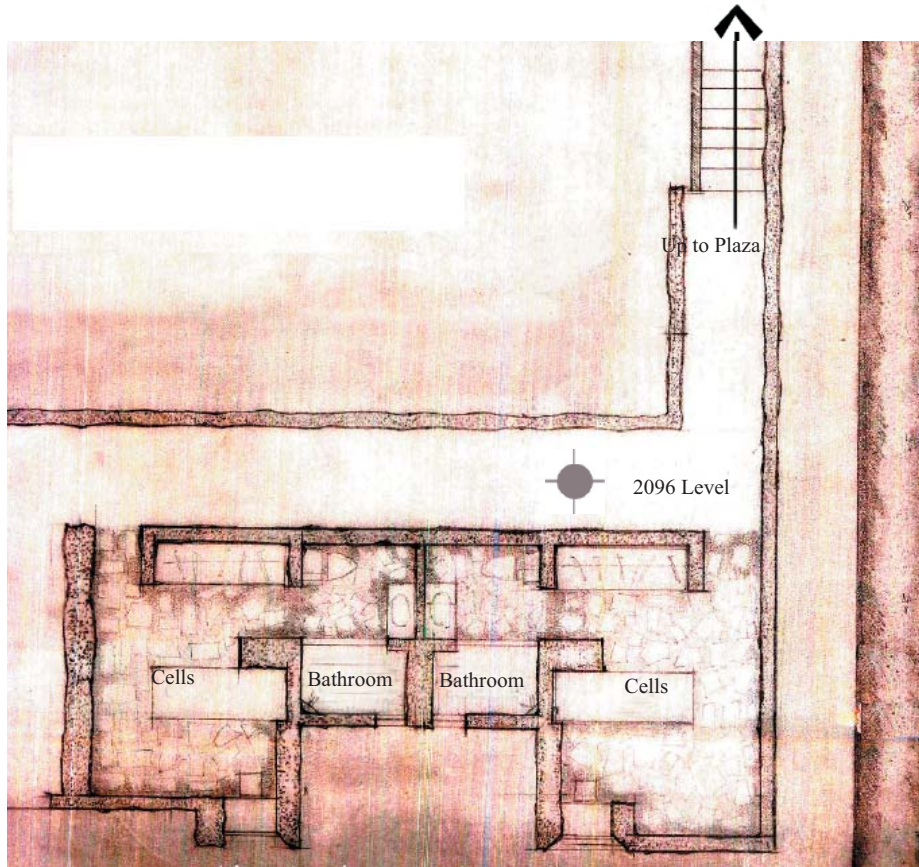




As one descends down into the lower depths of the project, there is a slow transition in material from concrete to wood to stonework. The stonework starts showing signs of emergence at some point along the path downwards towards cells, until finally, one finds themselves in the presence of thick stonewalls and devoid of sunlight. They are now in the underground portion of the project and part of the secondary path.



Section through cell

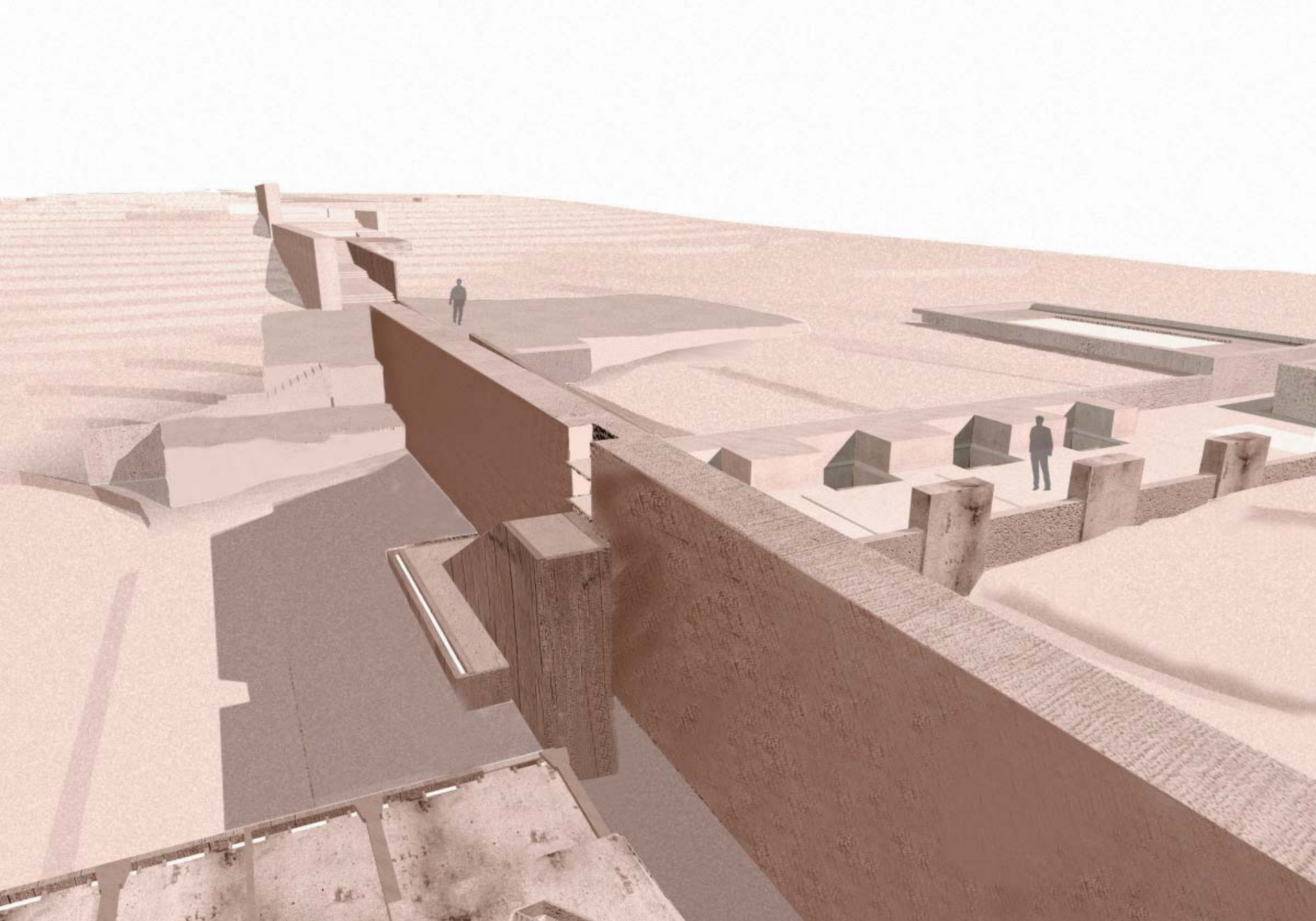


The stonewalls of the cells “reach out” to form part of the entrance to the lower levels. There is a transition in lighting from really bright lighting in the open plaza space to the darkness in the cells as one makes their way towards the cells from the plaza entrance.

The cells are dark and of mortared invisible joint stonework. Each contains the basic needs of storage, sleeping space and a reading area. Each cell is lit by two sources of light each displaying a different character. The first is a skylite which diffuses and allows only a small portion of the sunlight to pass through it. The second is an opening in the wall at the reading area which contains a sharp quality of light. This light strikes the face of the side wall which has a reflective polished stone surface. It then imparts a glow to that area and creating a “room” of its own conducive for reading and reflection.

Plan at Underground (2096) Level

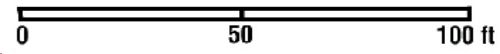
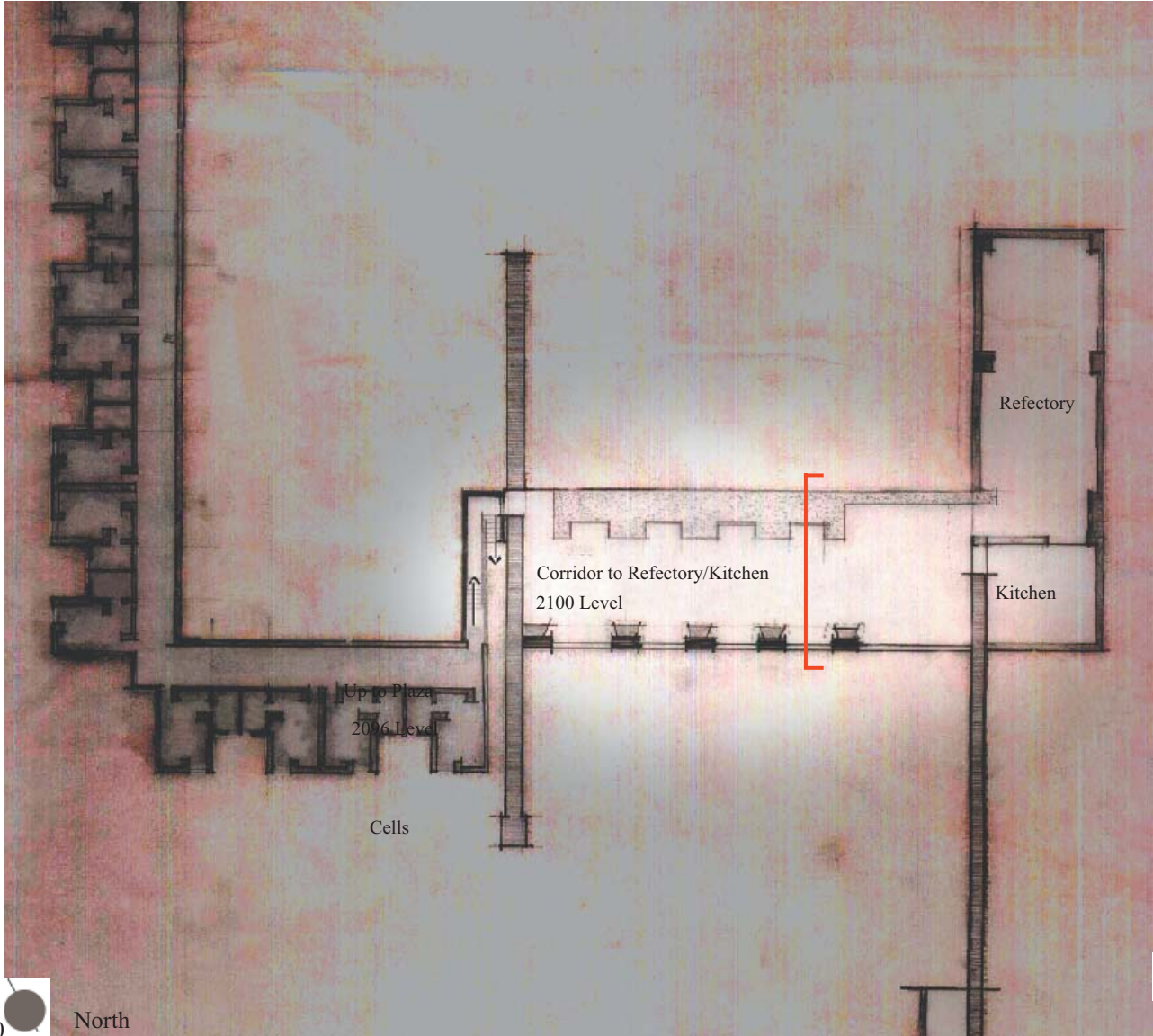








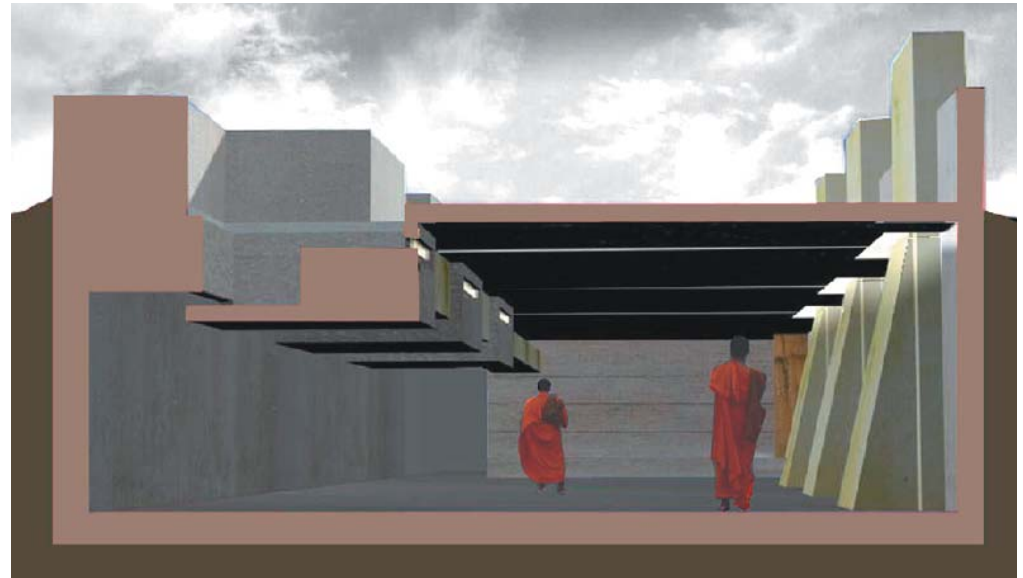




Plan at Underground (2096) Level

The cells are connected to the refectory by means of a corridor space which lies below and runs along the plaza. In order to access the corridor, a person would require to pass through a puncture in the concrete wall. At that point, the concrete wall forms the floor, walls and ceiling for the person. Thus one gets a sense of orientation within the site as one would realise that this concrete wall forms the basis of the primary path.

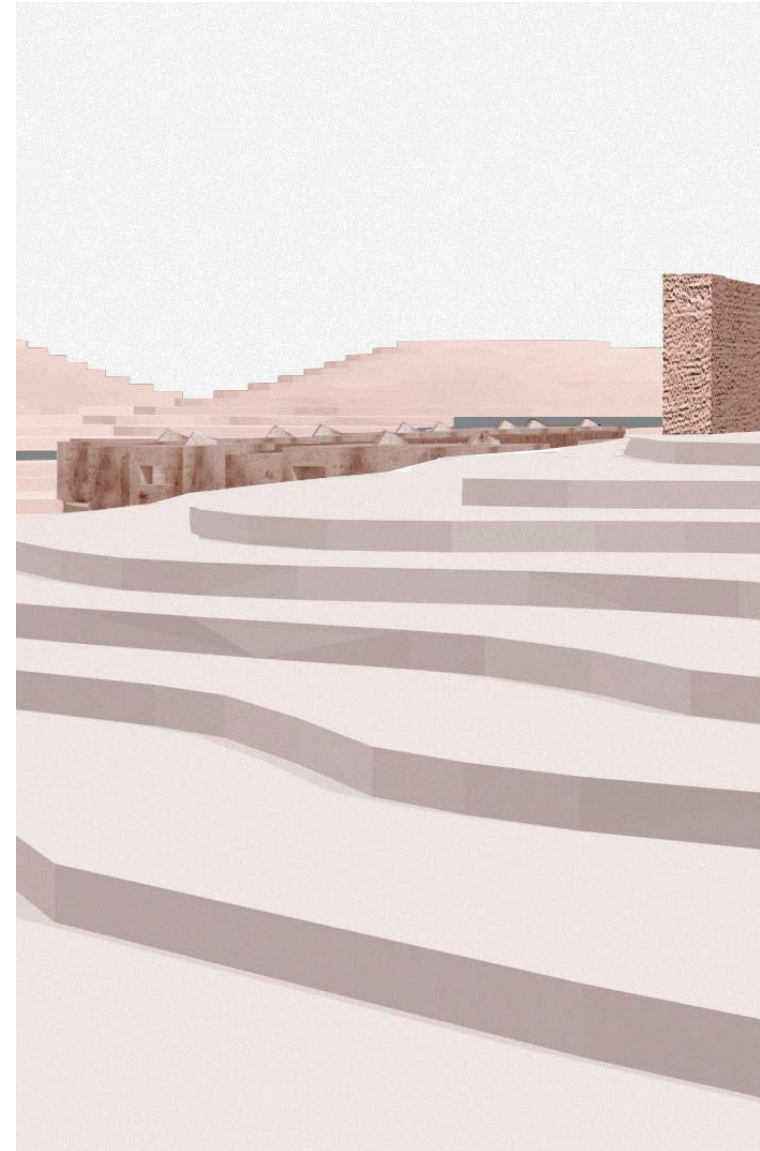
There is an honesty in the architecture as there is clear understanding within the user in terms of the intention of each member. There is a strong sense of connection between the plaza space above and the corridor below. The meditation areas in the plaza double in function as light boxes and beams within the corridor space. The columns continue downward to the corridor.

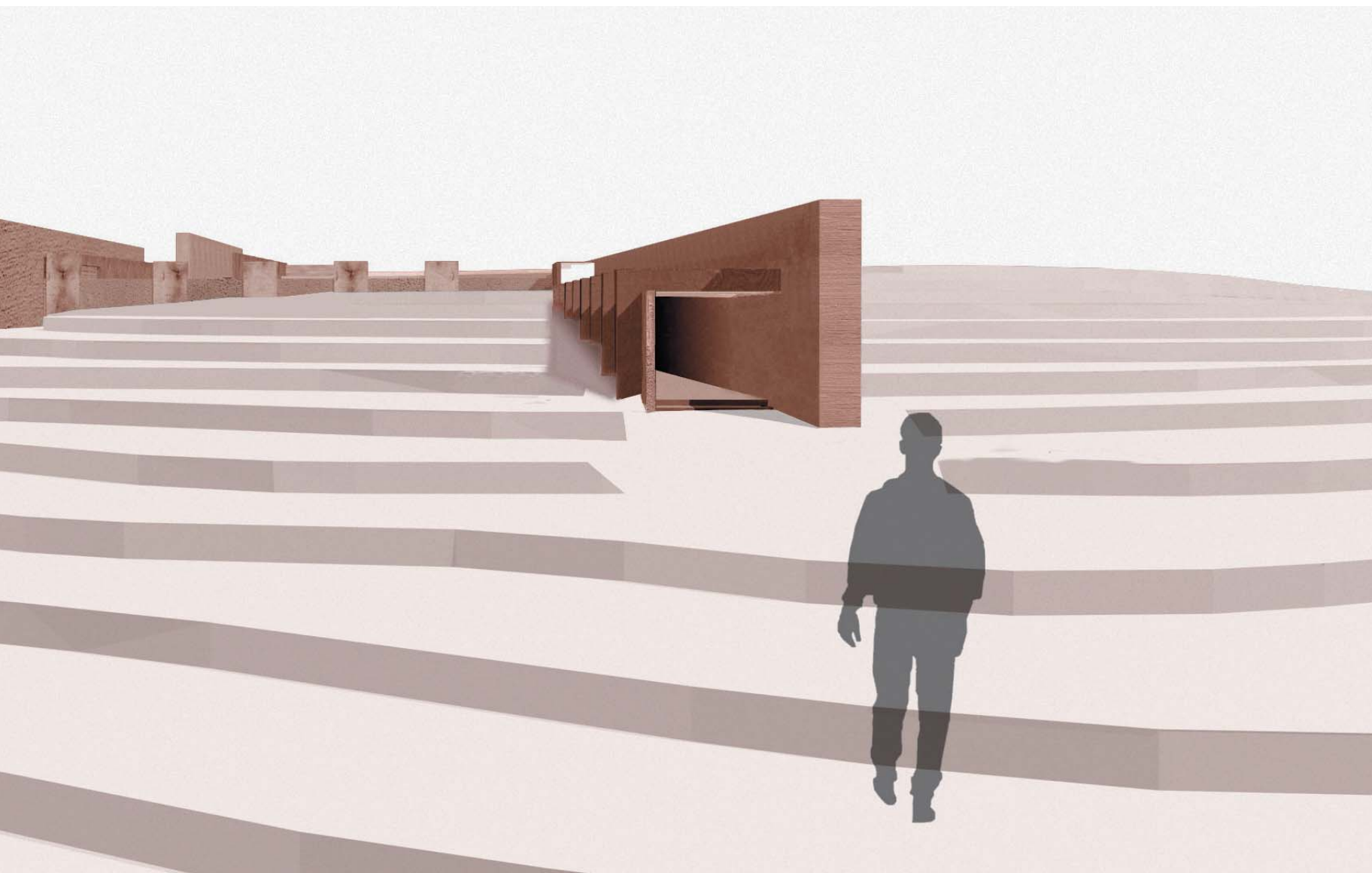


Sectional view through Plaza/underground Corridor

From the exterior, this complex appears as an isolated series of building elements emerging from the landscape.

“For Kahn, the expression of the eternal in a building was its ability to adapt and change through continually changing circumstances”-  
Gautham Bhatia Architect













## A conclusion?

My desire to study light in architecture emerged as a consequence of some of my travel experiences to the Himalayas in the Northern parts of India. During these trips, I visited some monasteries perched on the top of the mountains and was overwhelmed by the manner in which light from the sun interacted differently with different parts of the buildings to impart a different character to each space. The feelings which were generated within me left a lasting impression and I decided to embark on another journey to these monasteries, but in an academic setting, from very own desk in school.

The understanding I have gained through this thesis on light would never have been possible had I gone with the common ignorant belief that “light is taken for granted in architecture.” However, questions will arise throughout my life and knowledge will be an outcome of addressing these questions. The knowledge, once applied in the practise will without doubt contribute greatly to my development in the field of architecture.



## Selected Bibliography

- 1 **Architecture, Form, space & Order** - Francis D.K Ching, New York 1979
- 2 **Mind & Essay: an essay on art and architecture** - Herb Greene, Lexington 1976
- 3 **Daylighting performance and design** - Ander Gregg D. , New Jersey 2003
- 4 **The Owner Builder's Guide to Stone Masonry** - Ken Stern, Steve Magers, Lou Penfield, New York 2003
- 5 **In Praise of Shadows** - Tanizaki Junichiro, New Haven 1977

## Acknowledgments

I would like to thank my committee members Hans, Bill and Jim for their time and support towards my thesis. Each person, with a different perspective on my design, helped me research a broad range of topics and have provided me with different ways to look at design. This will without doubt prove very valuable in the profession. I would like to extend a special thanks to Hans for his dedication to my thesis through busy times in Europe and also during relaxing times on vacation.

## Image Credits

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