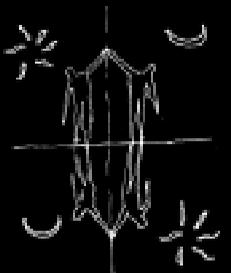


National Museum of Film and Photography



A Study of Light and Architecture



Thesis submitted to the faculty of the
Virginia Polytechnic Institute and State University

Prepared by

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in partial fulfilment of the requirements for the degree of

Master of Architecture

Approved

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Marco Frascari

Susan Piedmont-Palladino

Friday 13th of August, 1999
Alexandria, Va

Acknowledgements

Thanks to the vision and tireless efforts of a few special people, a place as wonderful as the Center exists.

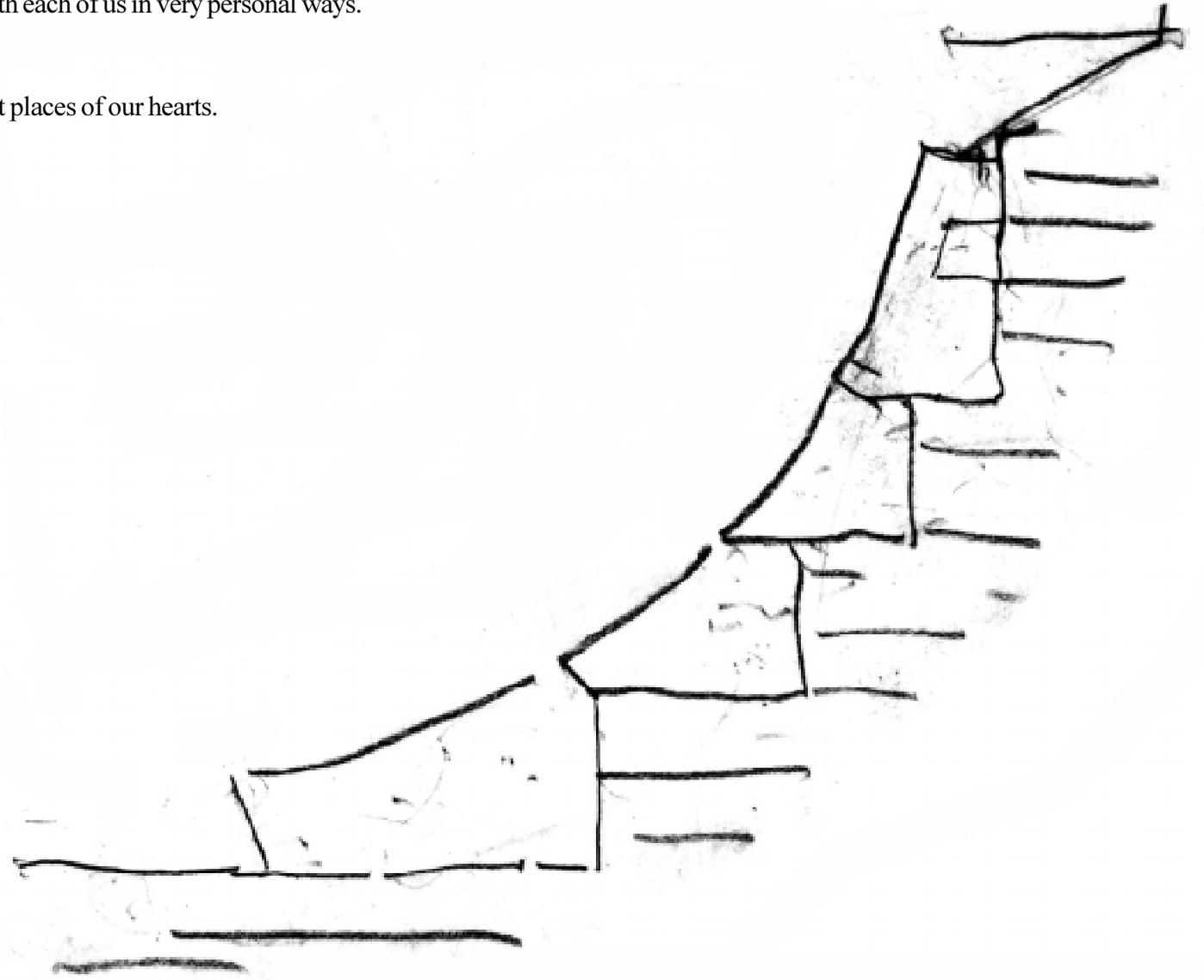
It is only by fate that a student comes upon such a place.

The meaning behind our time here, and the immense value of the lessons we receive, stay with each of us in very personal ways.

The paths we choose to follow may not all be the same; most aren't likely to meet.

But those of us who chose to stay awhile share a special bond.

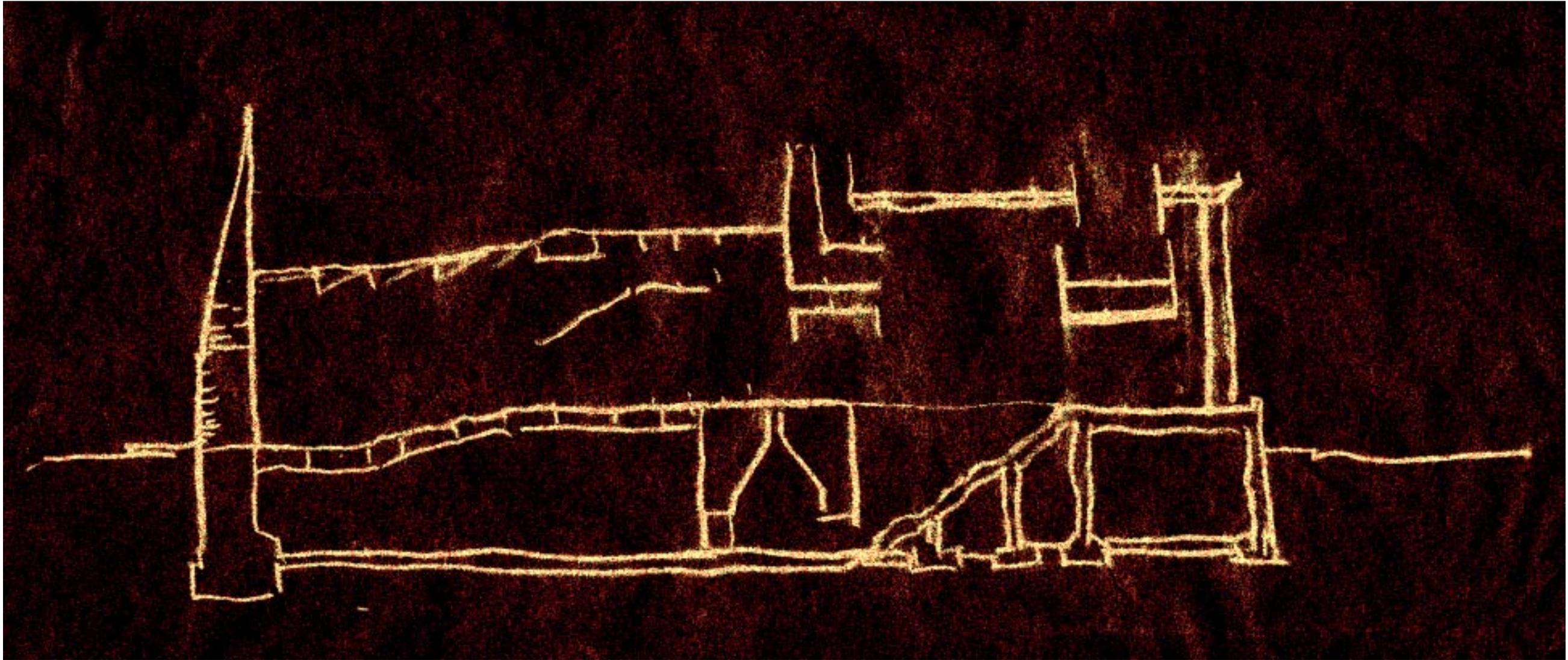
We share memories of this place and of its people, as they will forever remain in the warmest places of our hearts.



Special thanks to the faculty and friends of the Center, to my family, my peers, and most especially to my teacher, Jaan Holt.

Abstract

The origins of this project lie in a desire to understand the relationship that exists between light and architecture. Natural light has always played a role in the evolution of architecture, helping us make countless decisions about the things we build. From their siting, to their plan, to the nature of their openings, our buildings have to a great extent been shaped by the sun and the moon. The project became a search for new ways for architecture to express the conscious relationship that needs to exist among light, material, structure, and space.



National Museum of Film and Photography: a study of light and architecture.

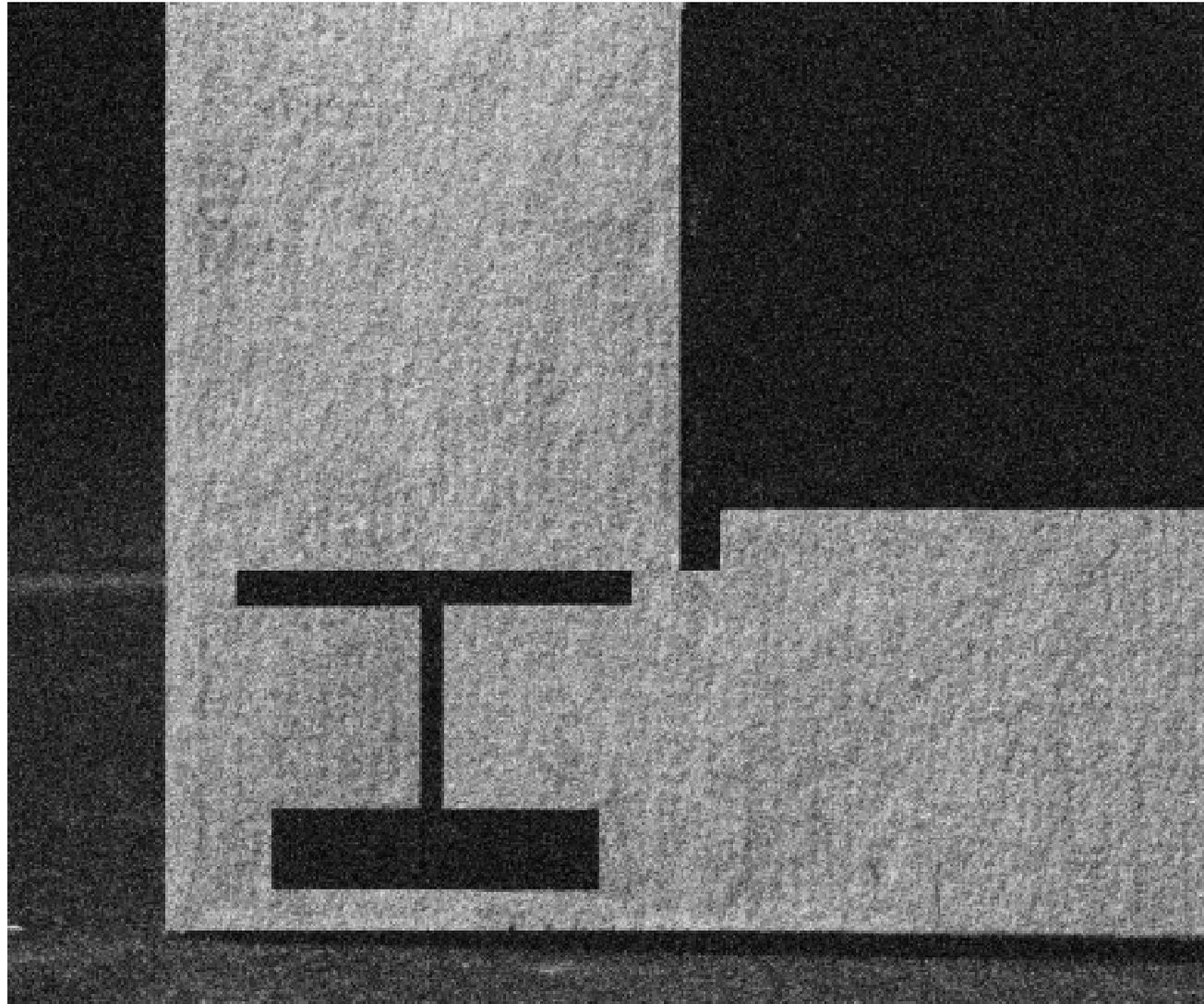


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Introduction

“With time, the city grows upon itself; it acquires consciousness and memory. In the course of its construction, its original themes persist, but at the same time it modifies and renders these themes of its own development more specific. Thus, while Florence is a real city, its memory and form come to have values that also are true and representative of other experiences. At the same time, the universality of these experiences is not sufficient to explain the precise form, the type of object which is Florence.”

*Aldo Rossi,
The Architecture of the City*

The National Museum of Film and Photography, Washington DC

The project was conceived as a series of large scale architectural experiences which in turn are buildings for established institutions in the city. They in fact are rooms of the city. The integration of the arts, national monuments, and modern systems of transportation were essential factors in the design.

The Smithsonian Metro Station was developed as an extended processional ramp from which the George Washington Monument slowly reveals itself, and which becomes the entrance to the National Mall. Along the ramp are displayed announcements of current exhibits and important events in the city.

Facing the obelisk is a plaza which consists of a large stone floor with an elongated fountain, and a series of steps and gentle ramps. Along the edges of the plaza are bus stops and provisions for private automobile passenger exchange. North and south of the plaza are the main building and the open theater, respectively.

The main building was conceived as a sheltered gathering place where thousands are able to come together year round. The rooms inside the museum are scaled accordingly, providing opportunities for gatherings and events at the scale of the city. The spectacle of film is enjoyed by all in any of three enclosed theaters. The roof of the building is a rich architectural playground, offering a fourth theater, eating terraces, and magnificent views of the city. The photography exhibits are scaled down to smaller groups and individuals. These exhibit places were thought of as three dimensional organizations of paths and walkways, along which photographs are exhibited. The walkways of the photographic exhibitions provide opportunities for chance encounters and the unexpected meeting of friends.

Massive gatherings take place at the equinoxes for special viewings, as light from the setting sun is concentrated and filtered through a prism, transforming into a rainbow inside the building.

South of the main building, across the plaza, is the open theater, a place where over ten thousand people are able to gather for films, concerts, and other civic and educational events. The floor of the theater rises towards the Washington Monument, making a balcony for the city, from which the tidal basin and the monuments around it are viewed. Under the theater floor are information and concession stands, along with city scale restrooms and other support spaces of the city.

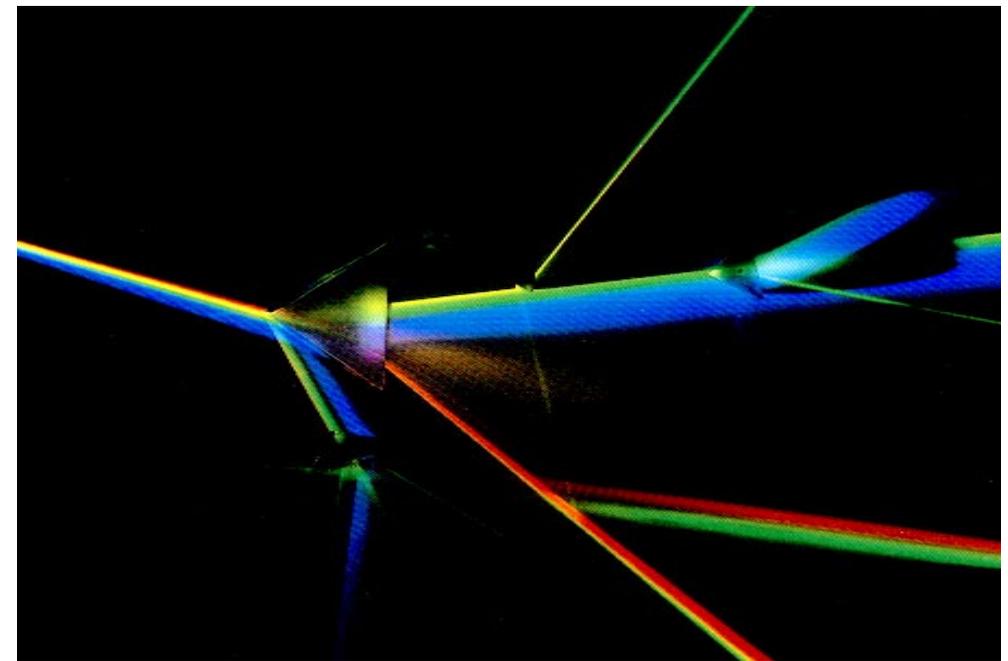
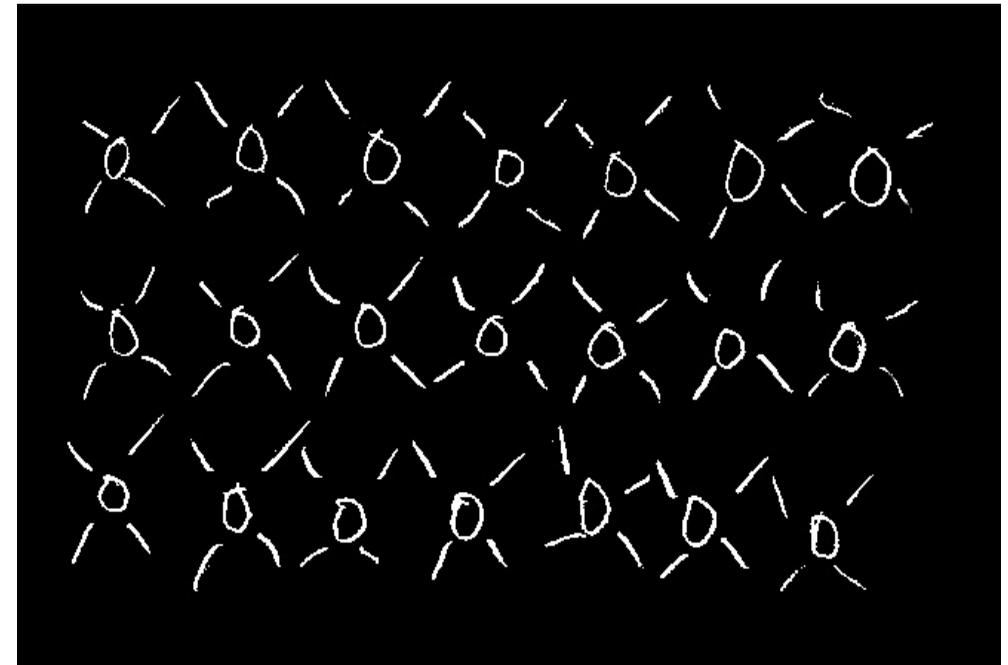
The project includes developing the grounds around the George Washington Monument into a series of steps and ramps. The monument itself is used as an urban timepiece as yearly events are marked by its shadow on metal pieces cast into the floor.

The entire project was conceived as an addition to the urban rooms and places of Washington DC.

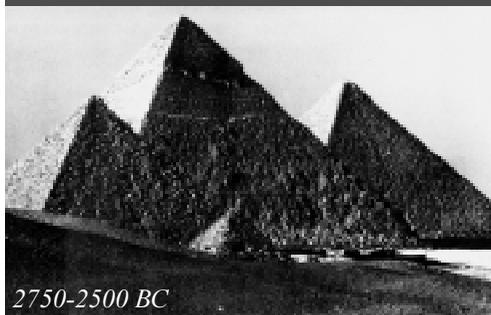
A Study of Light and Architecture

*“Silence to Light
Light to Silence
The threshold of their crossing
is the Singularity
is Inspiration
(Where the desire to express meets the possible)
is the Sanctuary of Art
is the Treasury of the Shadows
(Material casts shadows shadows belong to light)”*

-Louis I. Kahn



*Top- First thoughts on light
Middle- Light defraction*



2750-2500 BC



2750-1500 BC



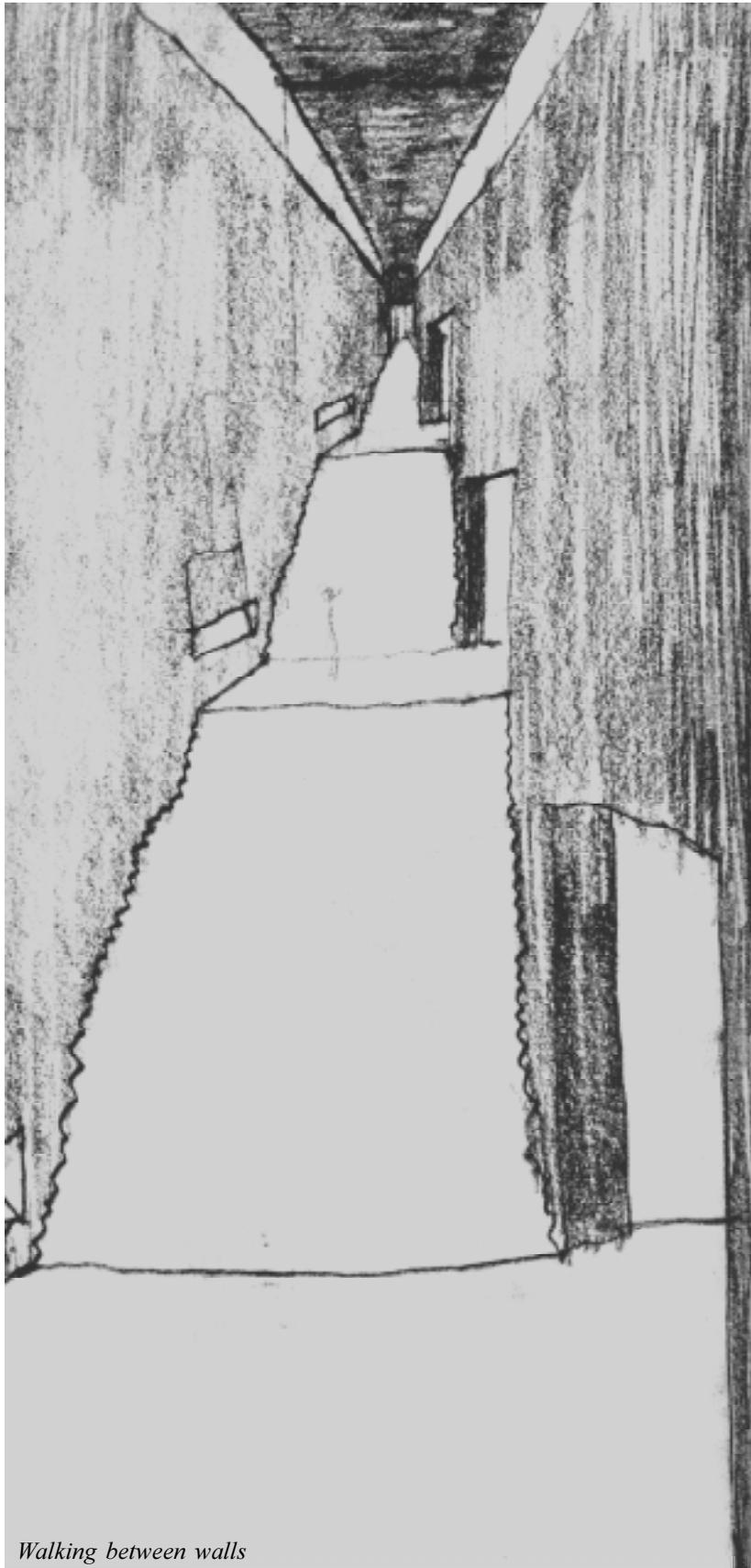
118-26 AD



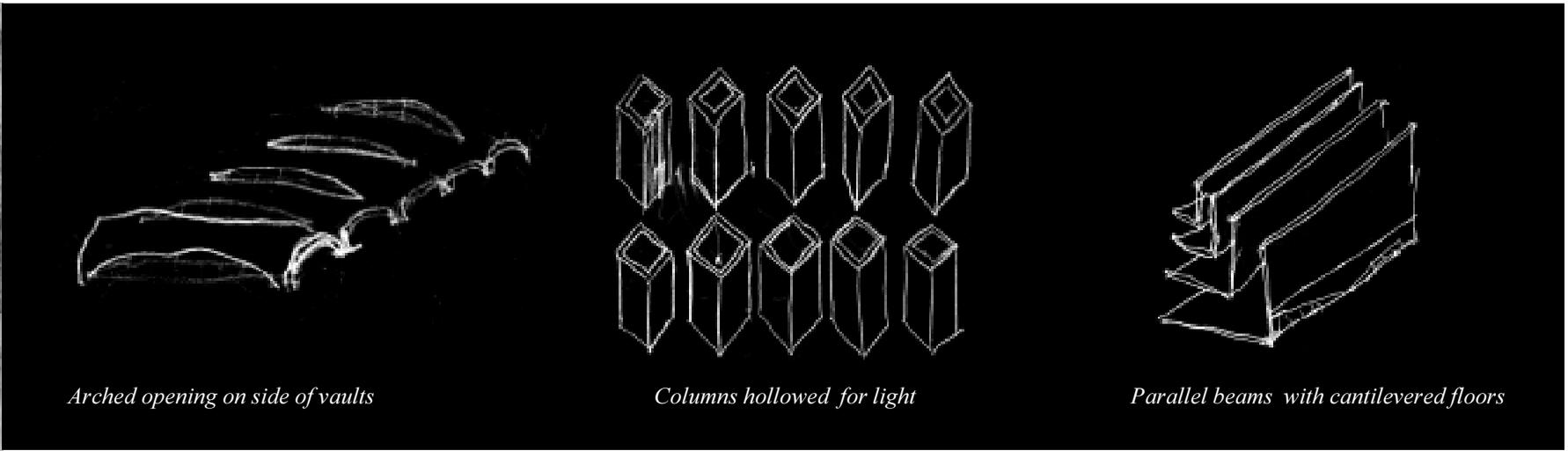
1950-55



1966-72



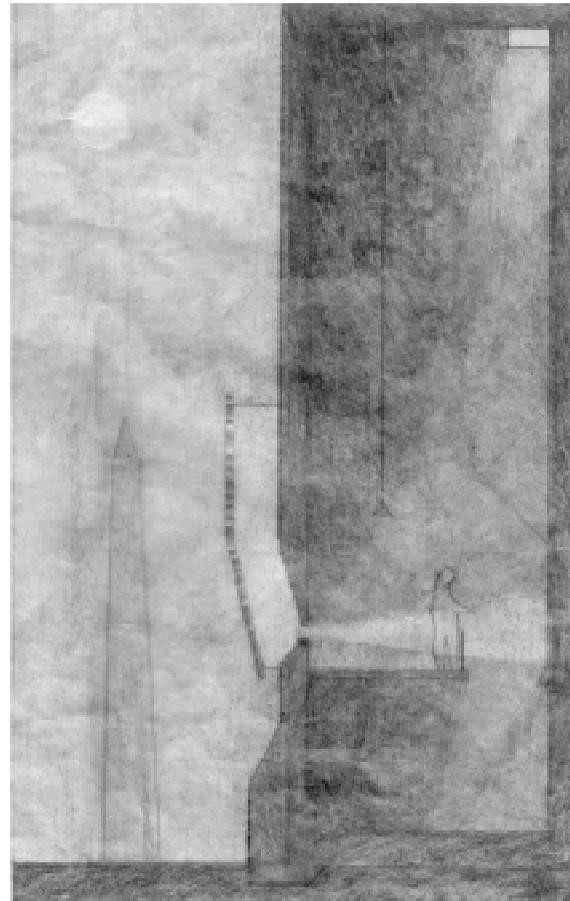
Walking between walls



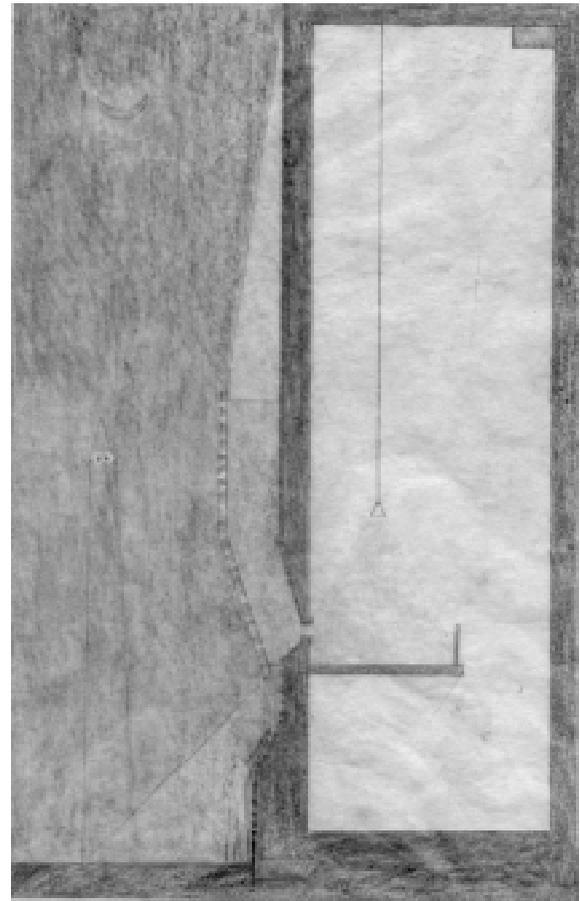
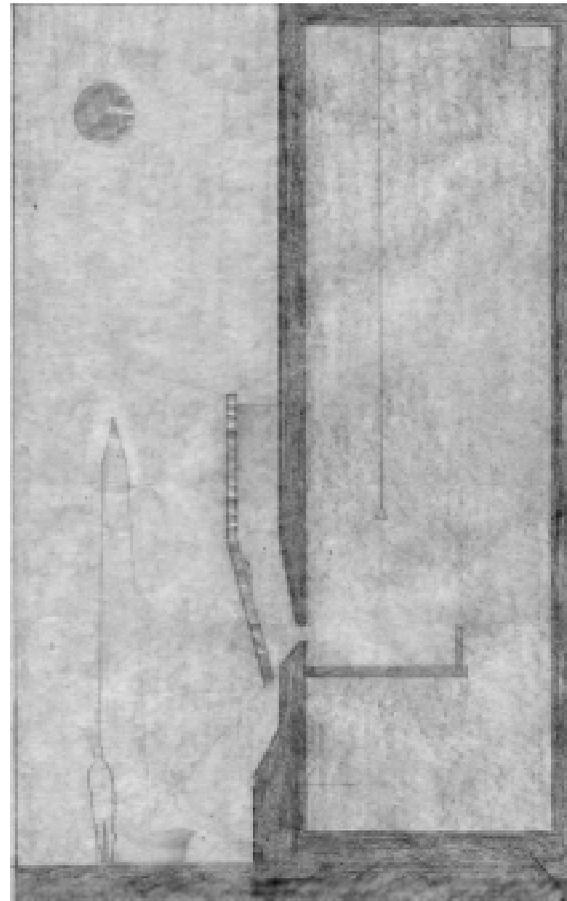
Arched opening on side of vaults

Columns hollowed for light

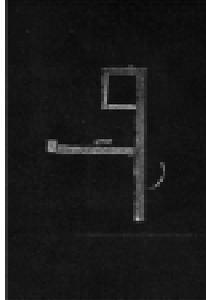
Parallel beams with cantilevered floors



Thoughts on light



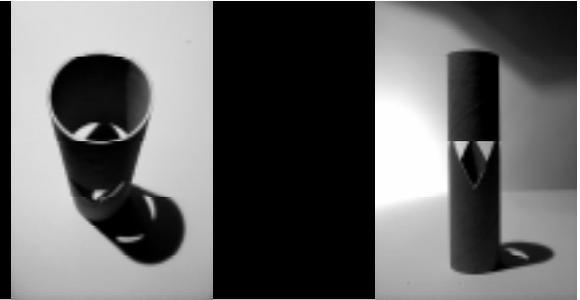
Column as source of light



Section study

"No space, architecturally, is a space unless it has natural light...Structure is the giver of light."

-Louis I. Kahn

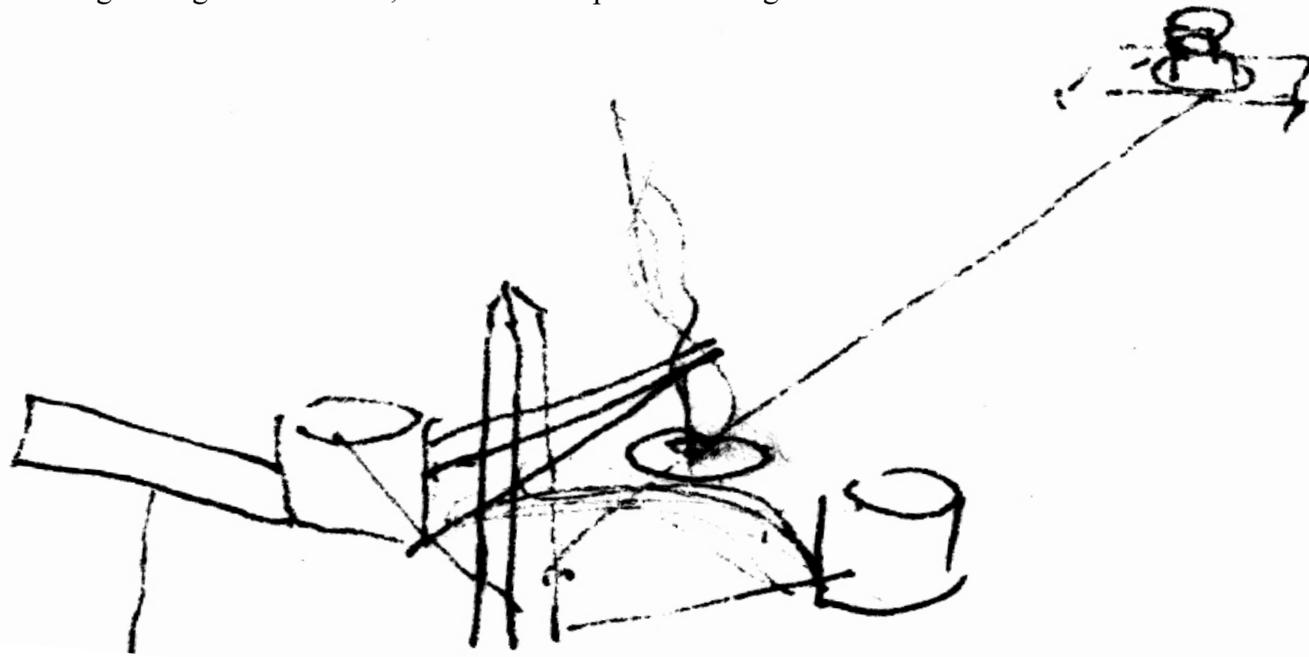


Building in a Monumental Core

The implications of building in close proximity to an architectural icon as the George Washington Monument can be thought of as having historical scale.

In addition to the urban considerations of building in a modern city and in a site of the significance of the National Mall, a number of issues emerge that are particular only to projects of this category. The building must attain -and retain- its own power and presence. The relationship that exists between scale and form must become much more intimate and complex if the building is to survive architecturally in this environment.

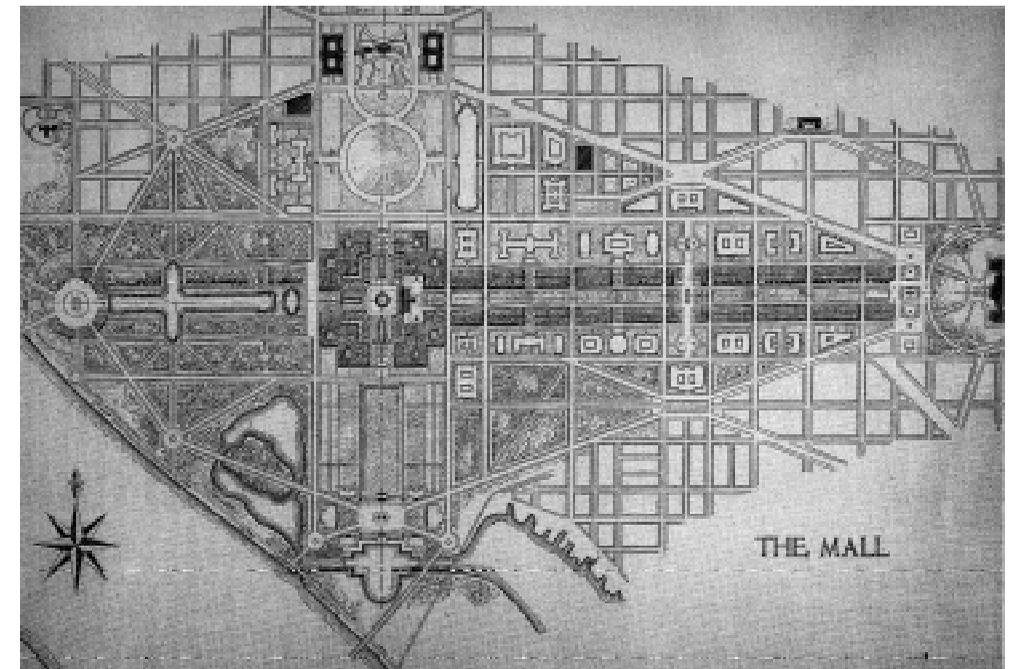
The site consisted of three separate plots located across the George Washington Monument between 14th and 15th Streets and Constitution and Independence Avenues. The sites are accordingly referred to as North Site (between Constitution and Madison), Middle Site (between Madison and Jefferson), and South Site (between Jefferson and Independence). The main building of the museum would be located on the North Site; the Middle Site would become a plaza; the South Site would become a large open theater. The project also connects to near by Smithsonian Metro Station through a series of escalators, stairs, and elevators, and a large processional ramp which would display announcements of current exhibits and events in the museums of the Mall. The McMillan plan for Washington, DC was studied, which resulted in a proposal for the straightening of 14th Street, and the development of the grounds at the obelisk's base.



Analytical Sketch (above)
Views of Mall (below)



Near Right: Smithsonian
Metro Station
Far Right: George
Washington Monument



McMillan Plan 1901



The Mall 1999

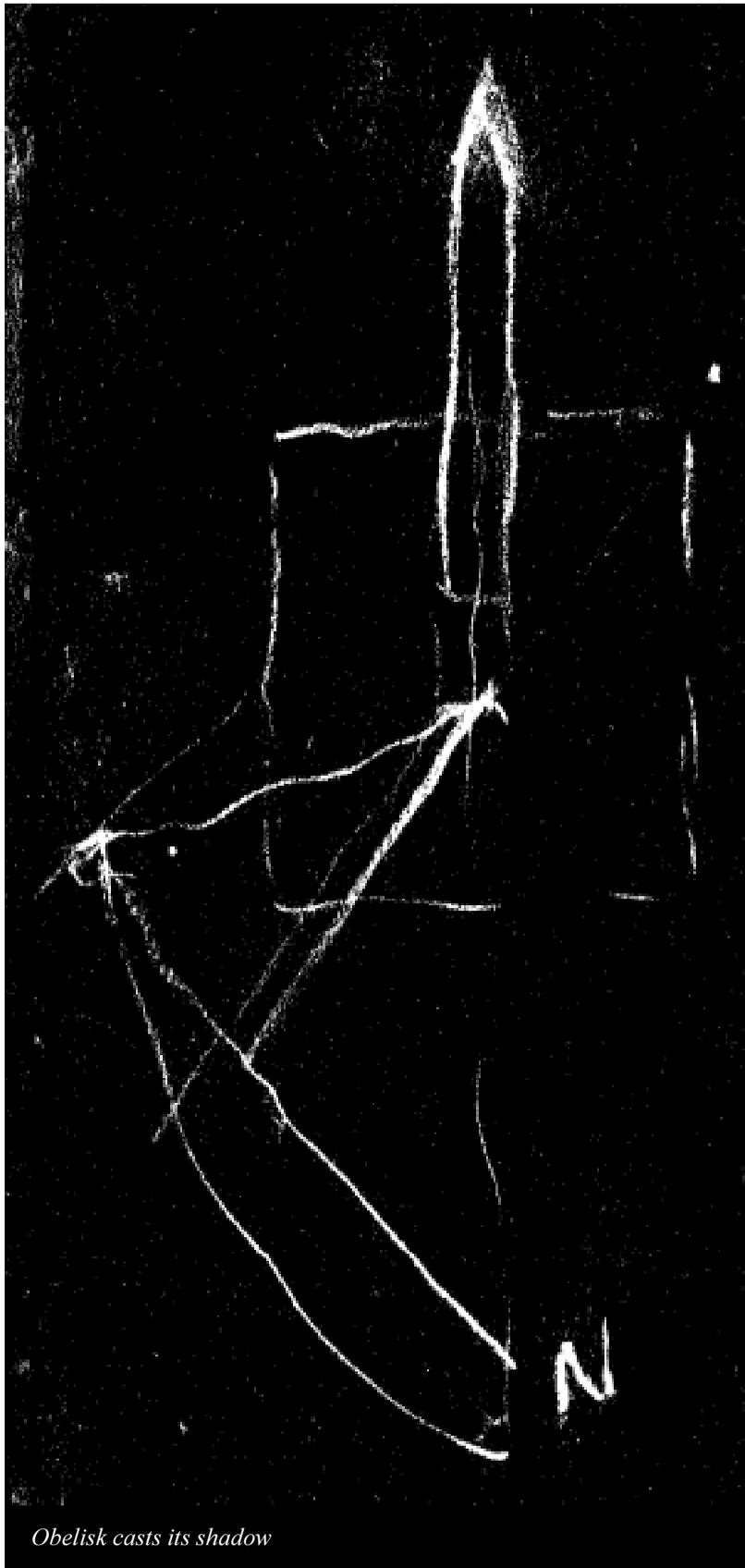


North Site

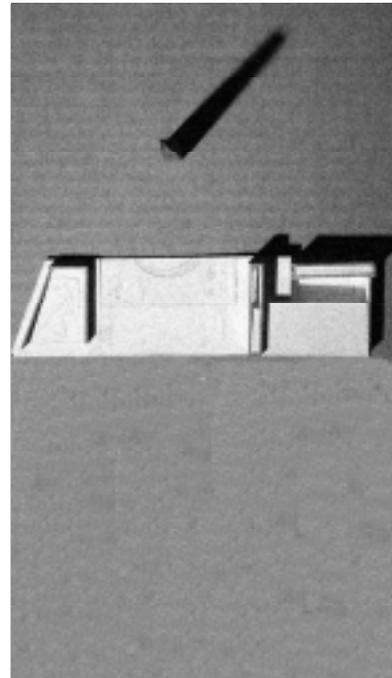


Middle Site

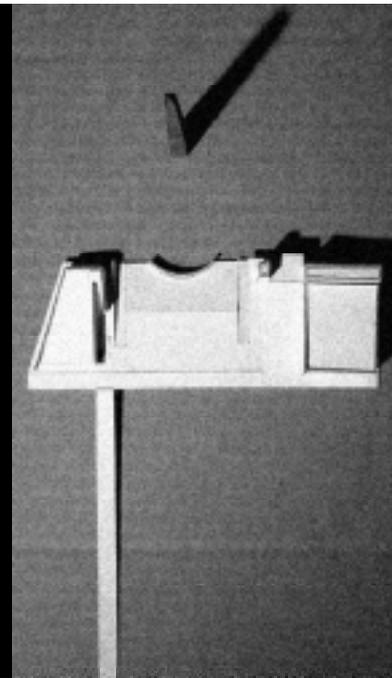




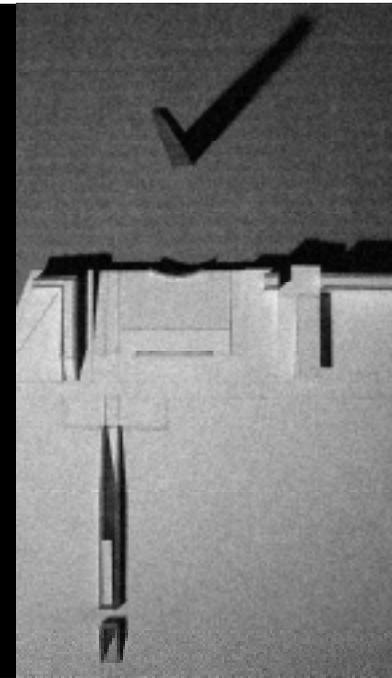
Obelisk casts its shadow



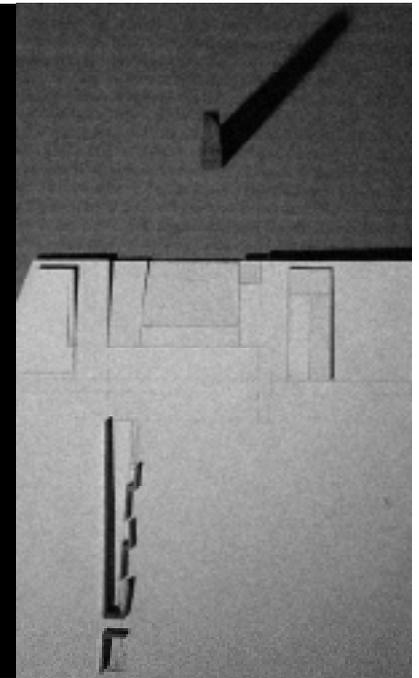
*Site study 1-
Relationship of project to
Washington Monument.*



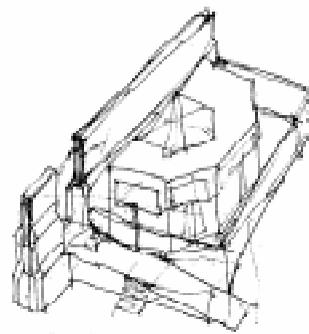
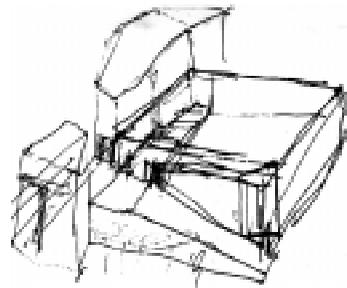
*Site study 2-
Initial thoughts about ramped
access to main building.*



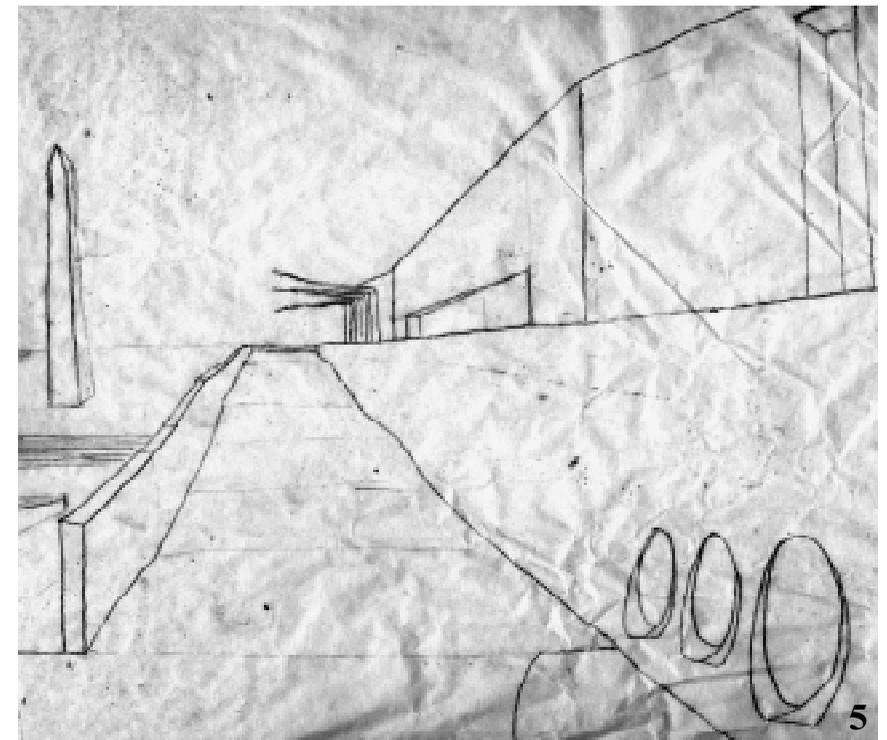
*Site study 3-
Ramped access to metro.*



*Site study 4-
Building forms reconsidered.
Further articulation of the
ground plane.*



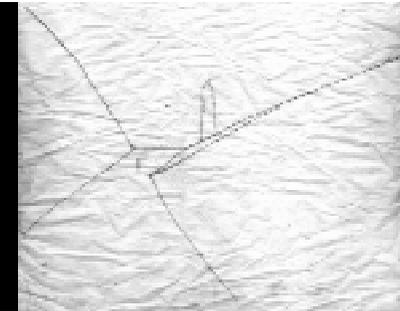
Studies of ramped entry



View of ramp



Early site model



The Walls of the Museum

Building among the museums of the Smithsonian Institution it became clear another museum belonged on the site. The question remained as to the kind of museum it should be. The project originated with thoughts about light and architecture. The translation of the origins of the word *photography* -to draw with light- helped determine that it would be a museum of film and photography.

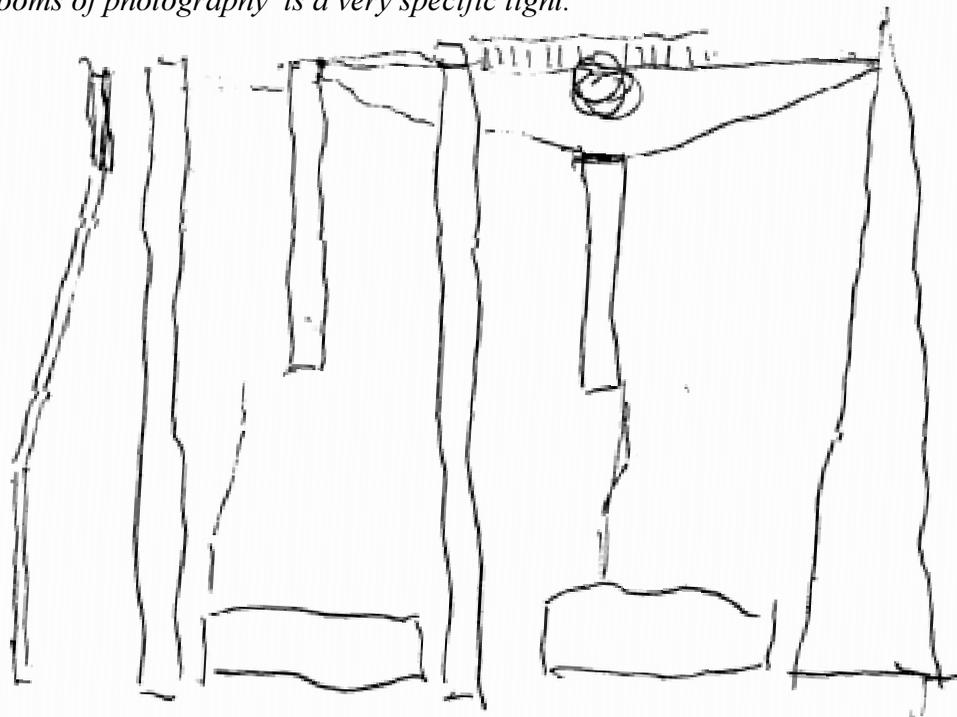
The nature of a Museum of Film and Photography remained undiscovered. Film and photography are collections born of light; their existence depends strictly on very controlled light; they require large even surfaces on which to be displayed. These realizations about the nature of film and photography helped determine that the architecture of the museum would be one of walls and light, rather than the architecture of volumes that sculpture and other three dimensional objects require. A clear separation of film and photography needed to come about according to their specific needs.

It was determined then, that the rooms of film were of large scale, where thousands of people would gather. These rooms require projection towers, the movement of large volumes of air, and strict control over their acoustics. The rooms of film need darkness at times yet should have direct access to natural light. The rooms of film are rooms of a static nature where people are still and the picture is in motion.

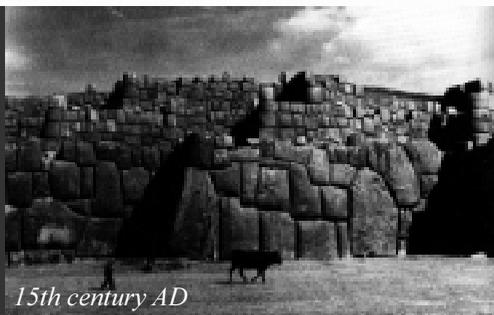
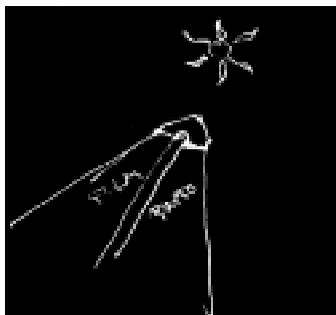
The light of the rooms of film is a very generalized light.

The rooms of photography are dynamic rooms, through which people usually move individually or in small groups. They require walls of different scales, which in turn require different qualities and quantities of light. The rooms of photography should be full of natural light, yet the collection needs protection from direct exposure to the sun's harmful rays.

The light of the rooms of photography is a very specific light.



Conceptual sketch

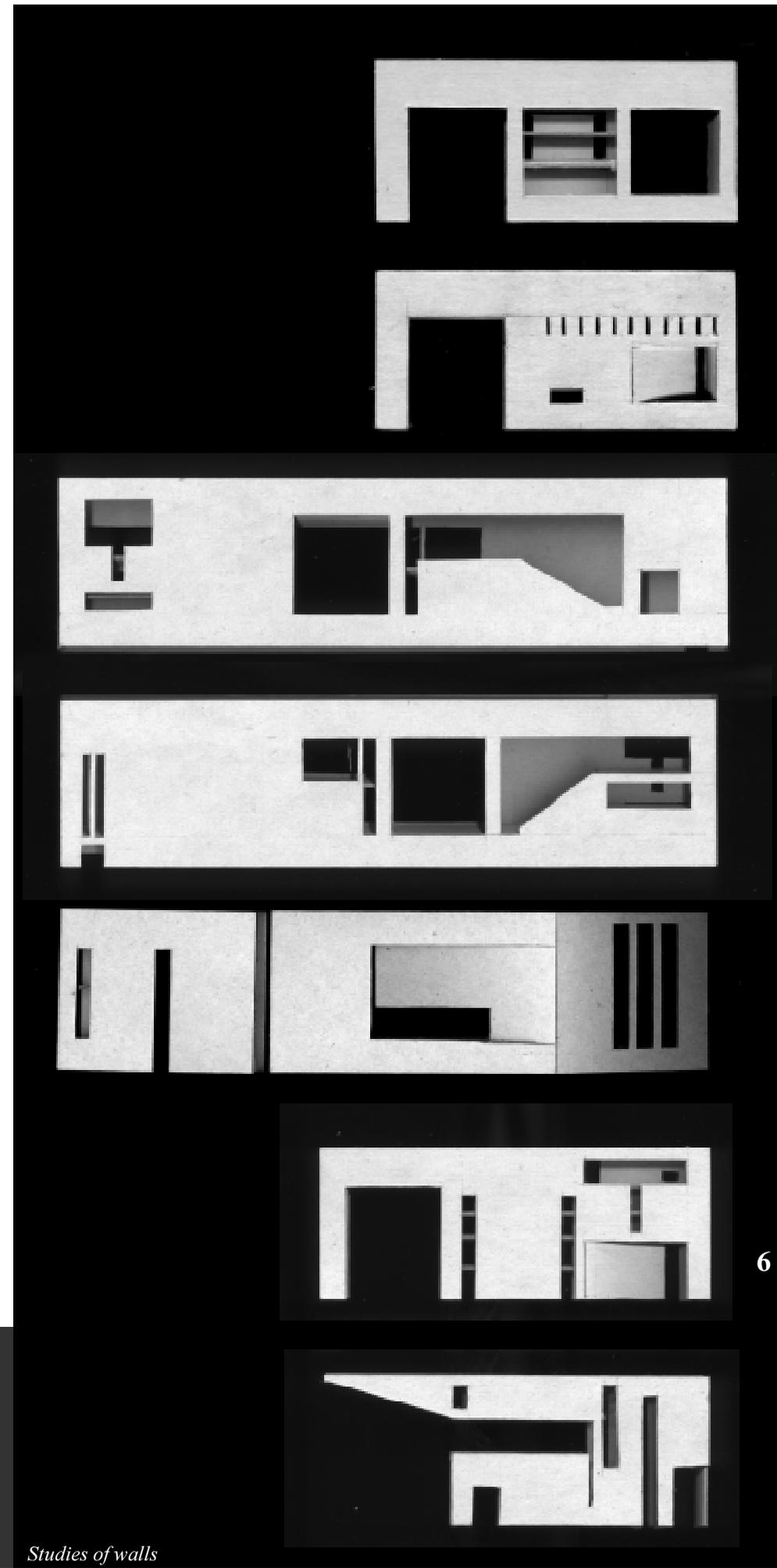


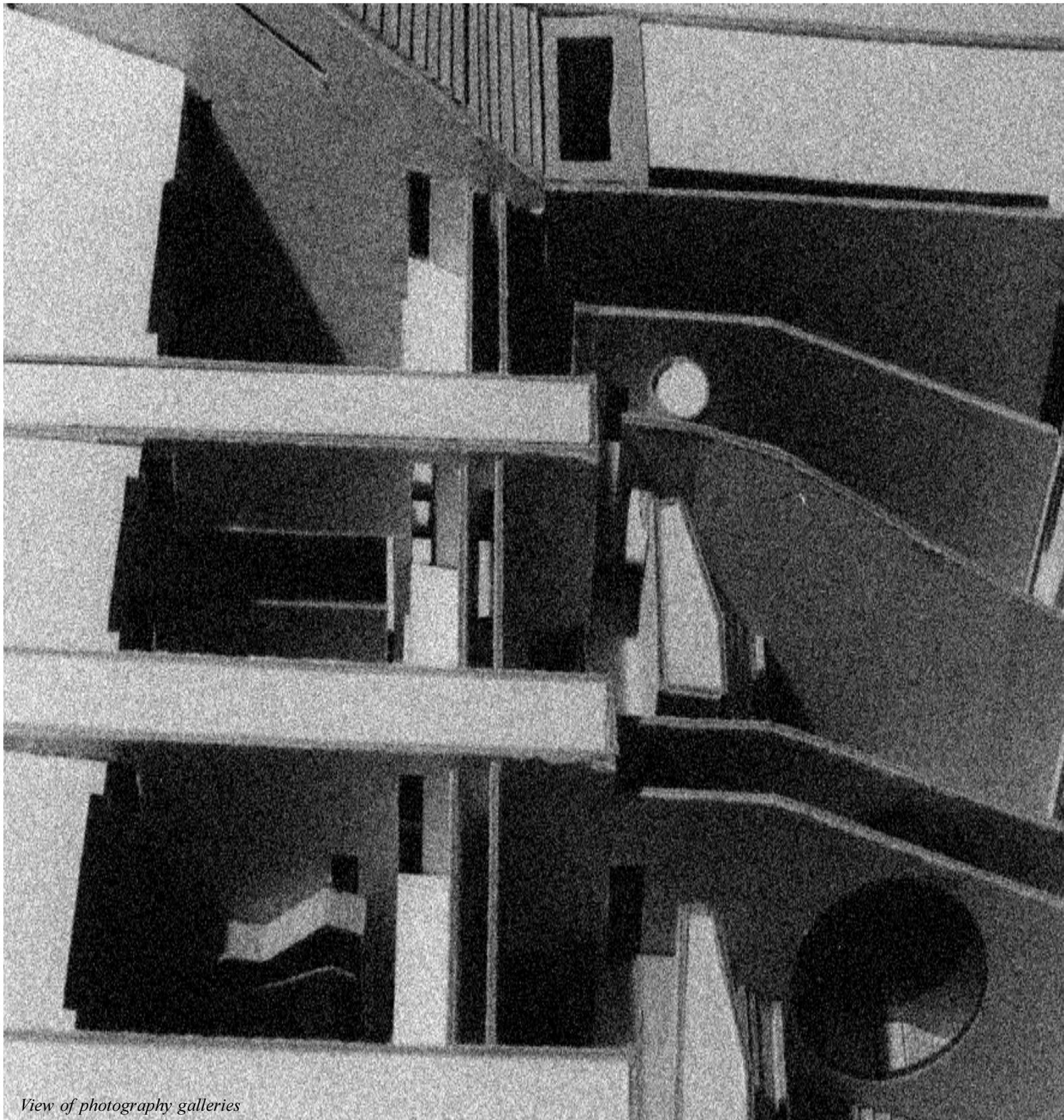
15th century AD



1984

Studies of walls

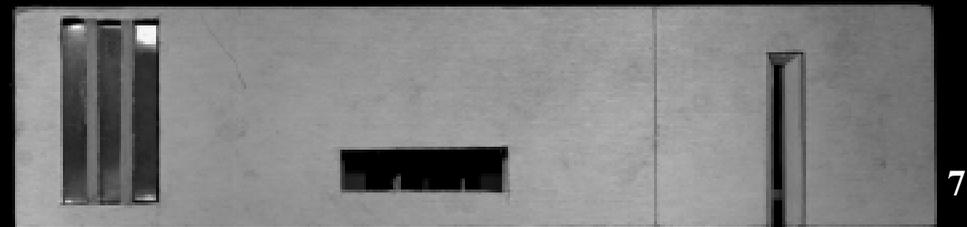
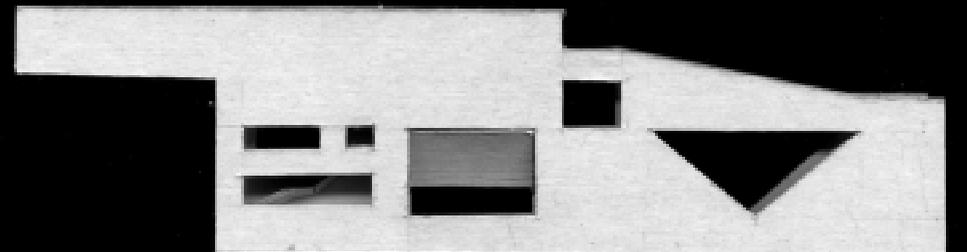
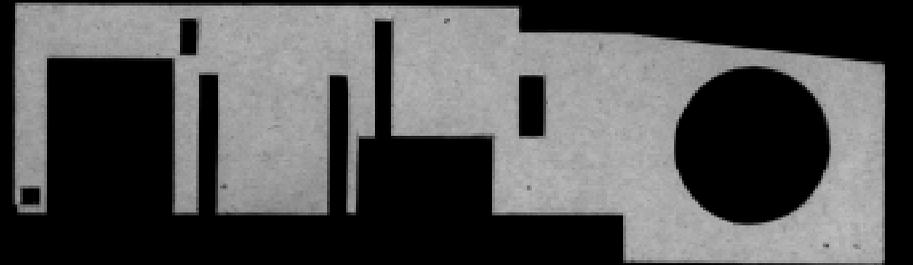
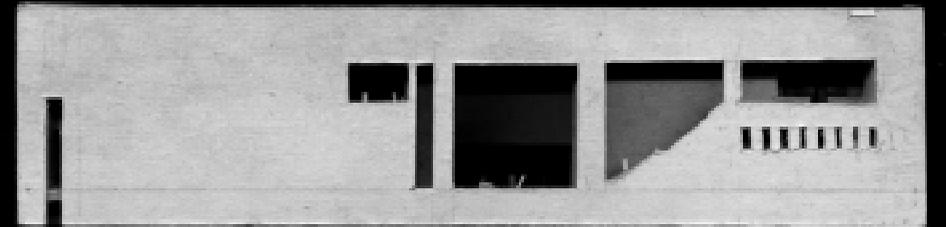




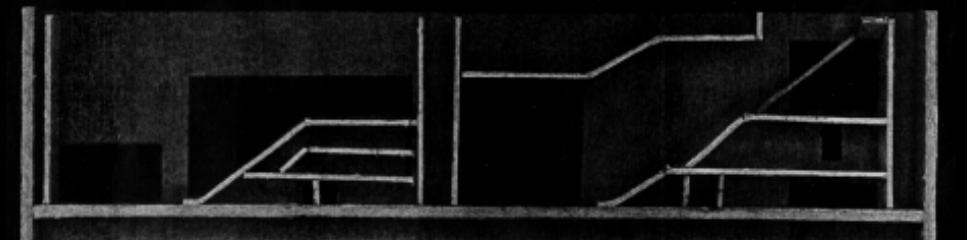
View of photography galleries

“...And the painting must reveal itself in different aspects if the moods of light are included in its viewing, in its seeing. This is another example of what one sets in his mind as being the nature of something. I think that’s the nature, really, of a place where you see paintings. And research would never have given it to me because all I could find were ways of doing it completely contrary to the ways I think a museum might be. So it must be derived out of your own sense of its nature, of its service, of the nature of...the rooms of a museum.”

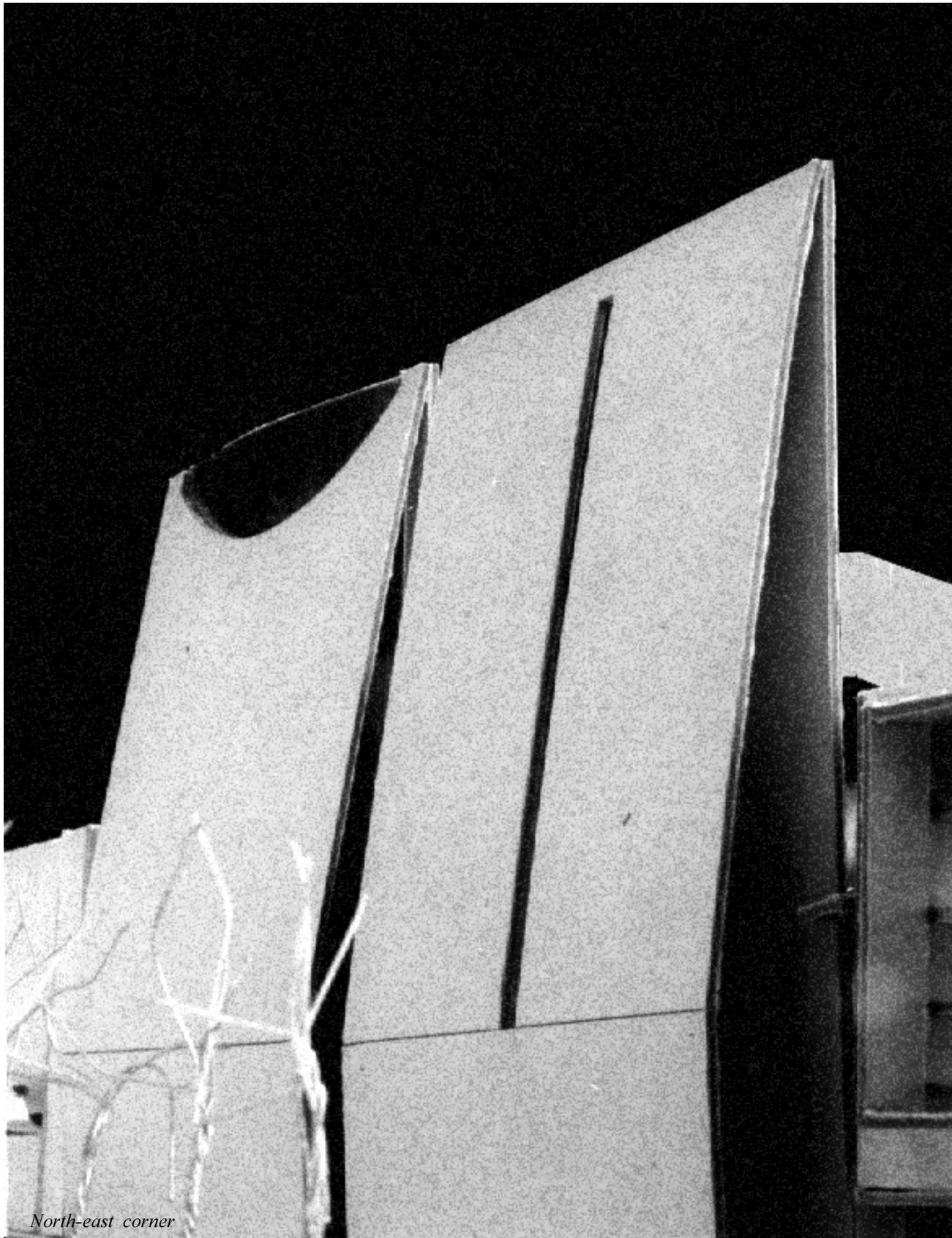
-Louis I. Kahn



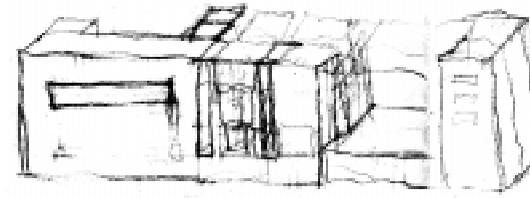
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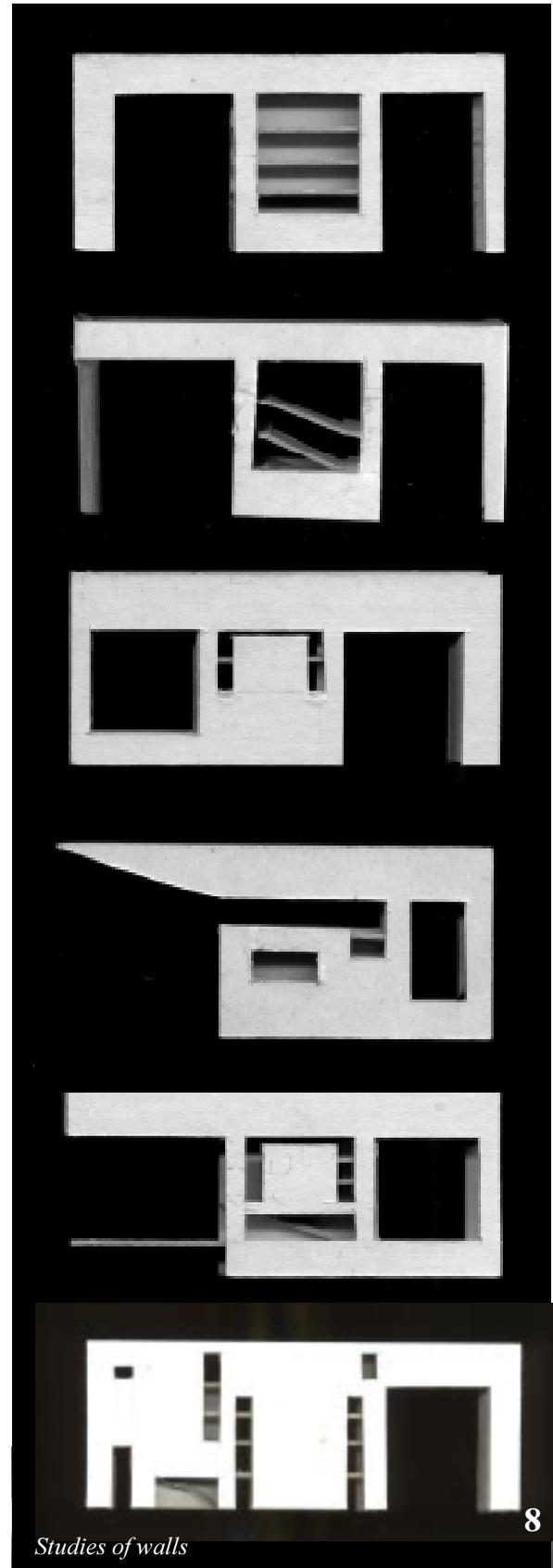
Studies of walls



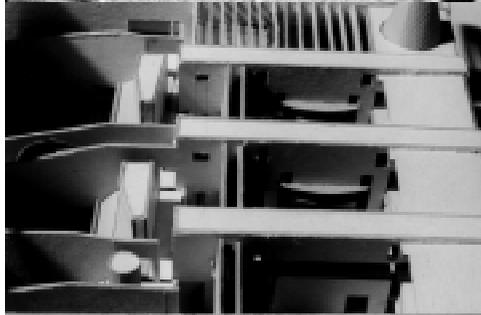
North-east corner



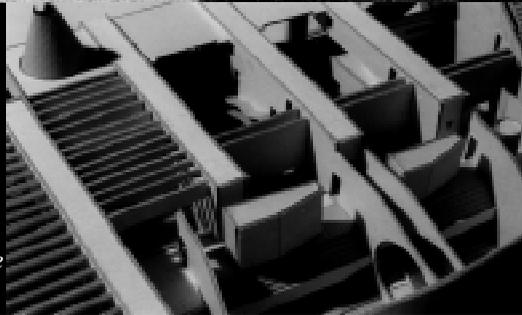
The walls of the museum became more than load bearing elements. They were given a ‘thickness’ of 20 feet making them able to house stairs, elevators, and many other of the museum’s required support spaces. Their spatial complexity developed further as they became a series of vertically arranged galleries with stairs and large elliptical balconies overlooking the large bays of the photography exhibit. These galleries gradually come together towards the top, first through two ‘beam-galleries’ spanning between the walls, then at the very top, through a series of ‘hollow-roofs’ which were conceived as vaulted roofs inside of which galleries exist.



Studies of walls



The walls connected by the ‘beam-galleries’

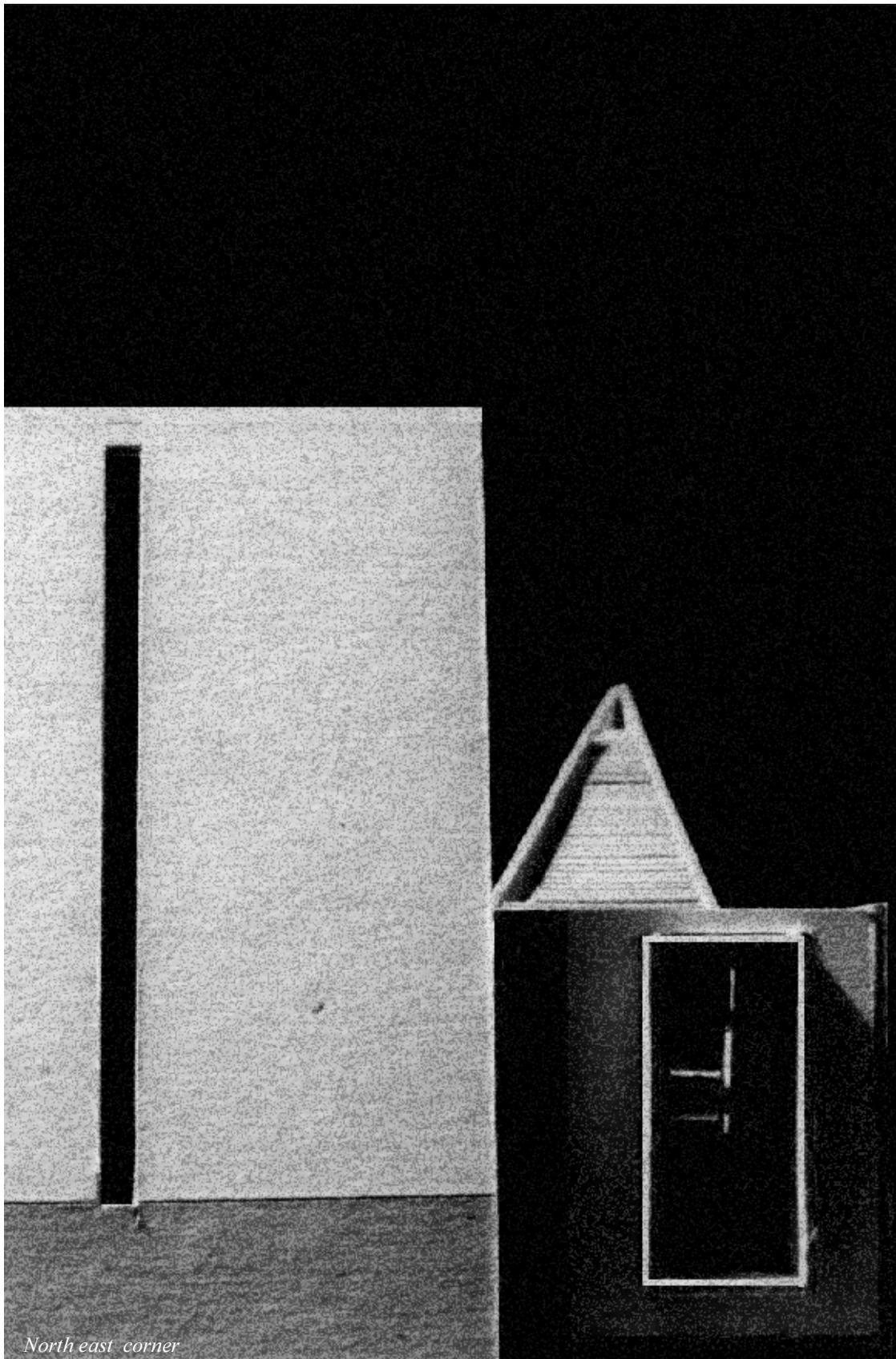


“Any work of architecture which does not express serenity fails in its spiritual mission. That is why it has been an error to replace the protection of walls with today’s intemperate use of enormous glass windows.”

-Luis Barragan



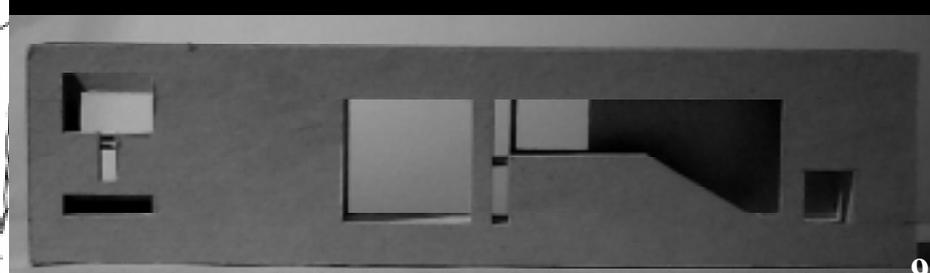
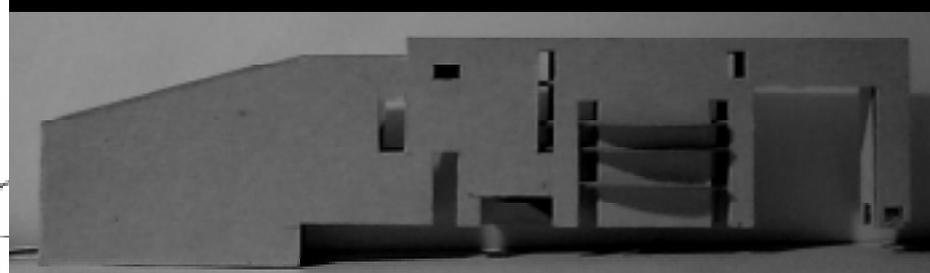
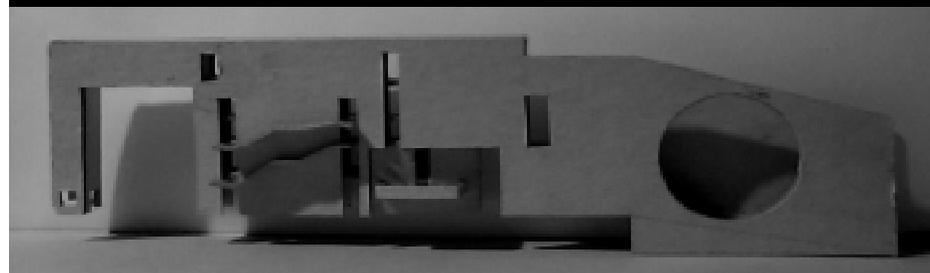
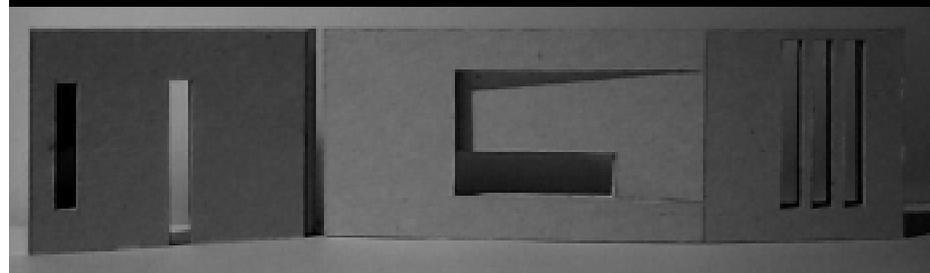
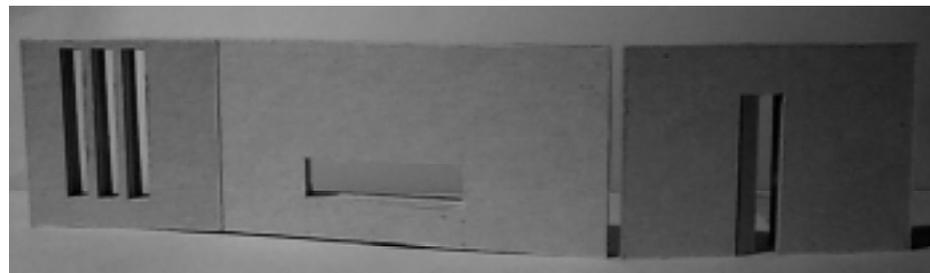
Interior of large theater



North east corner



Photography bay



Final walls



Vaulted 'hollow-roofs'



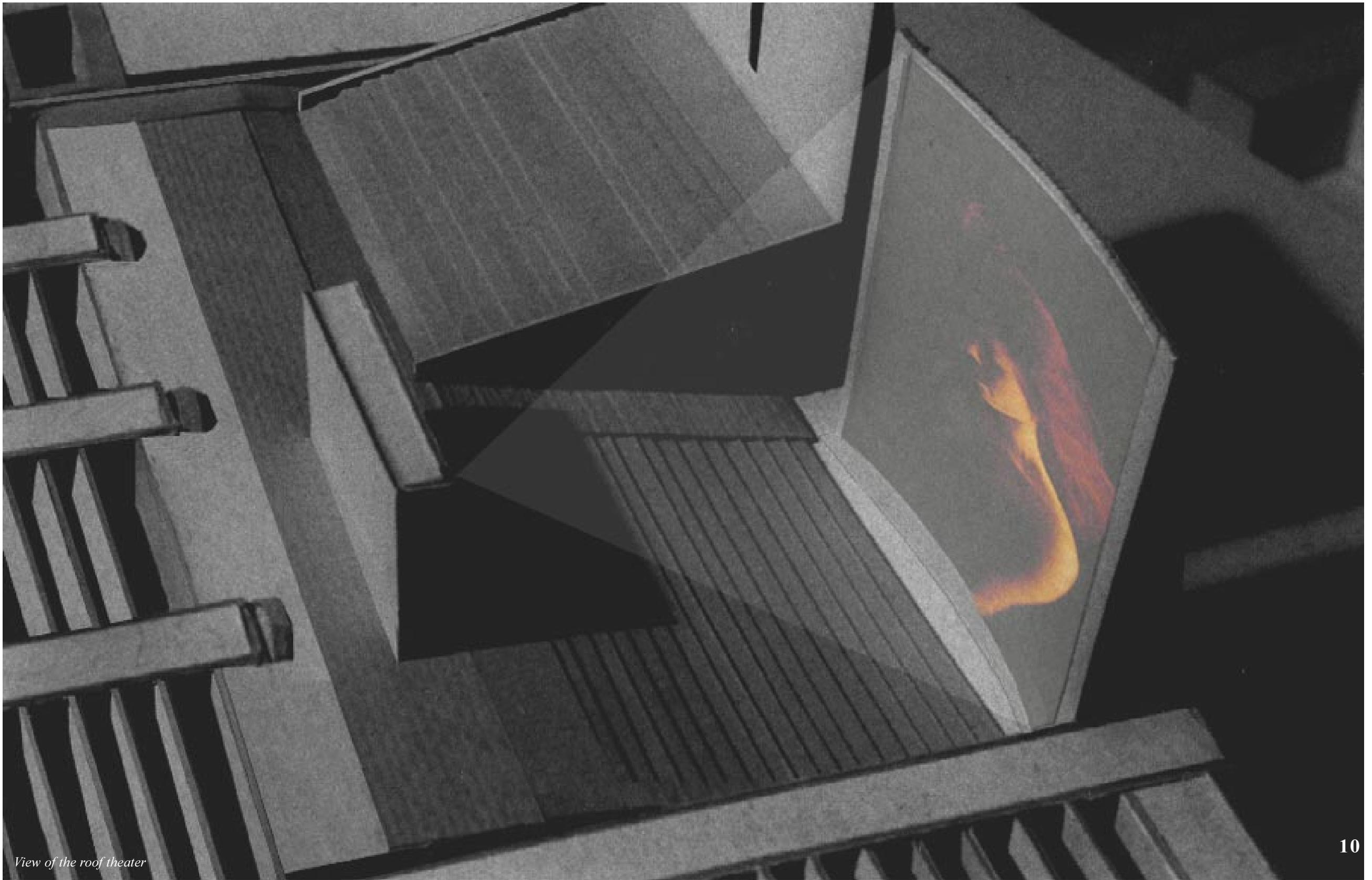
Library roof and 'beam gallery'

"The architecture -or perhaps rather the character- of the building is that of the sum total of the components, and not that of a composition or that dictated by the facades."

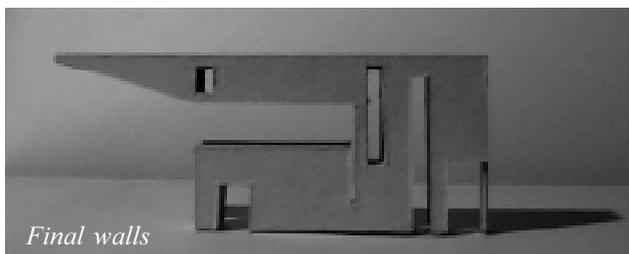
-J. Utzon



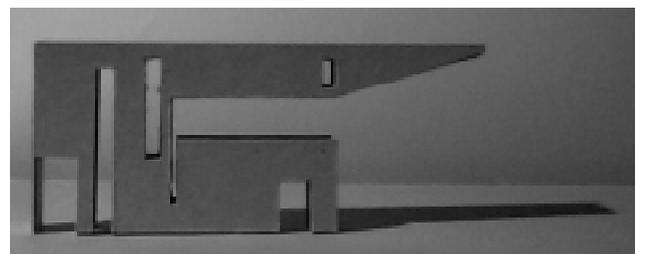
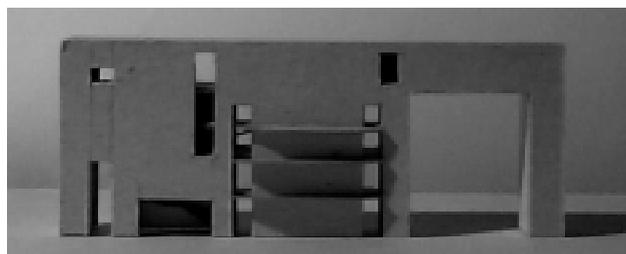
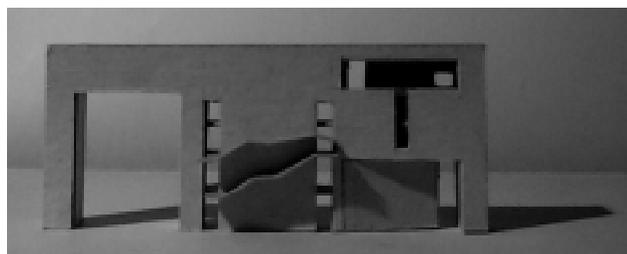
Photography bays

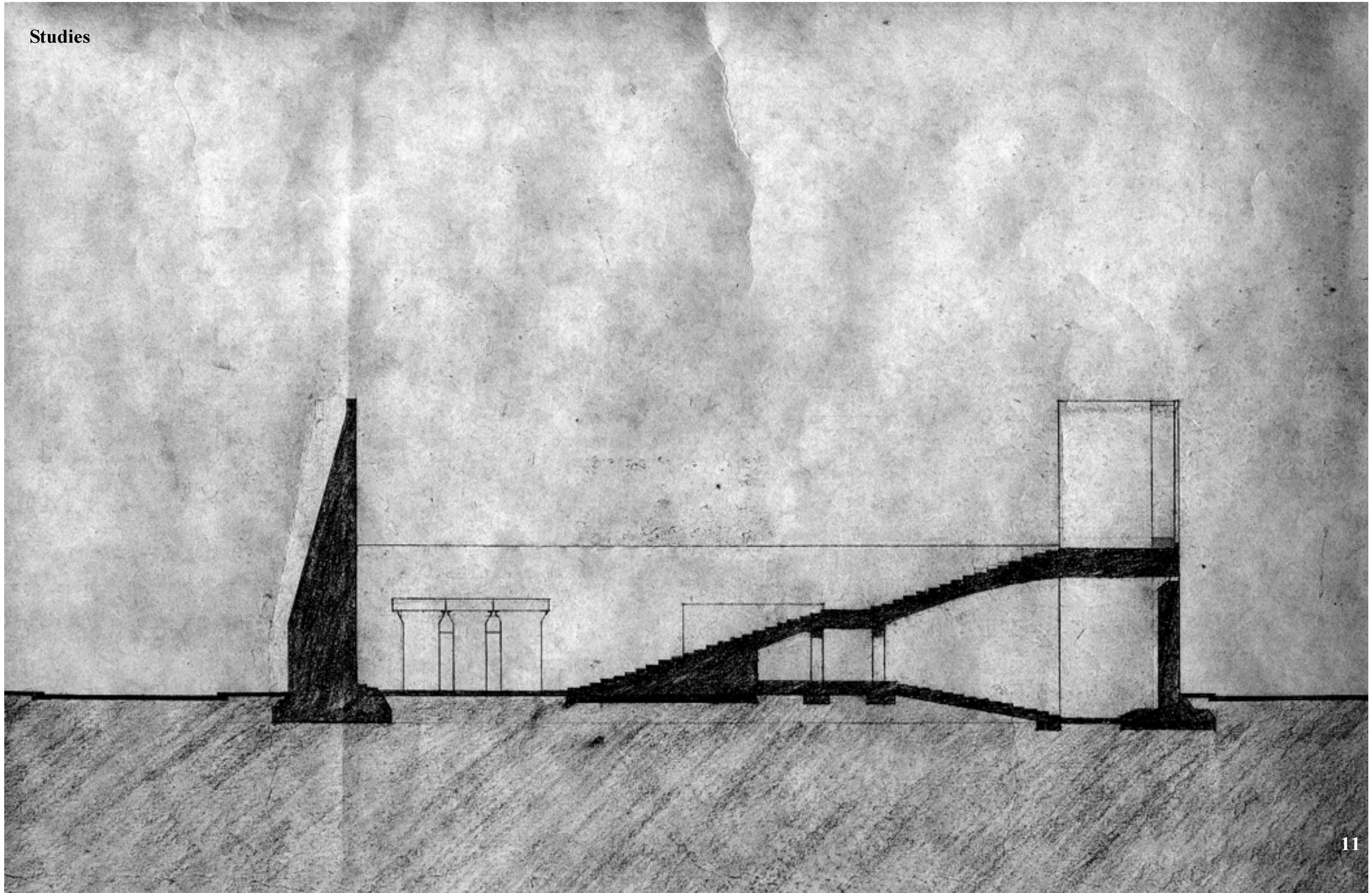


View of the roof theater



Final walls

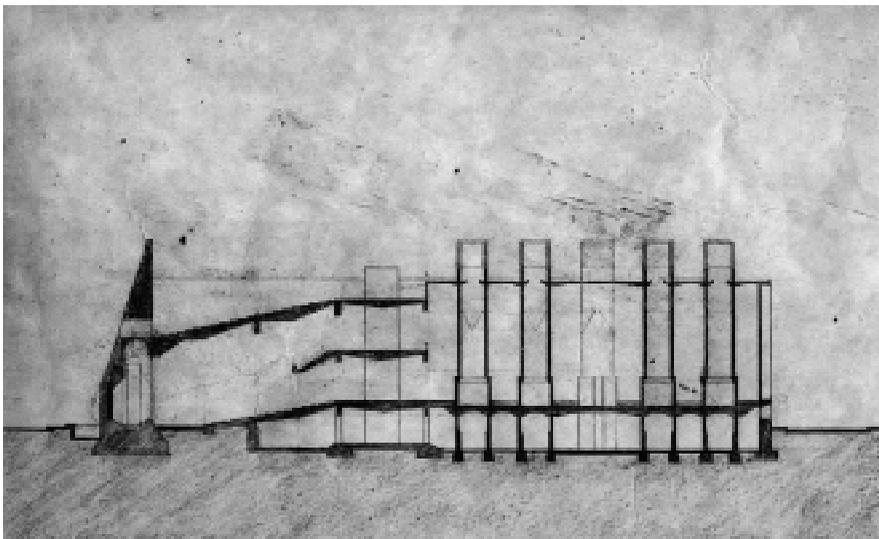
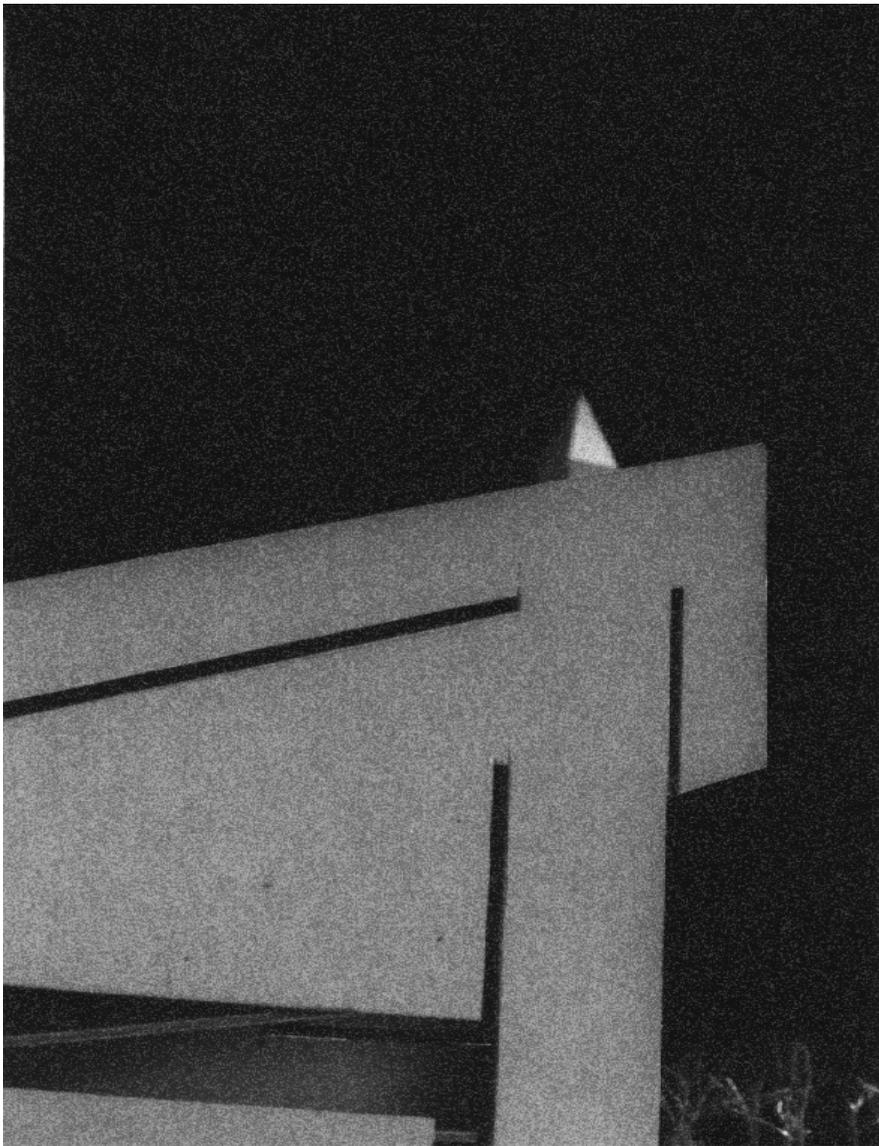




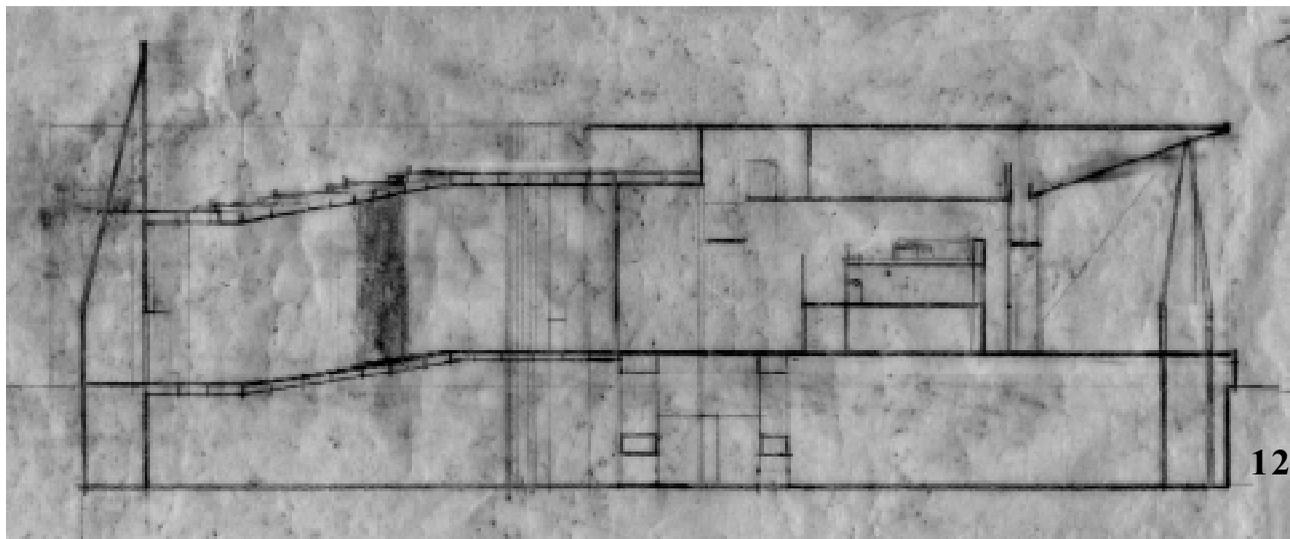
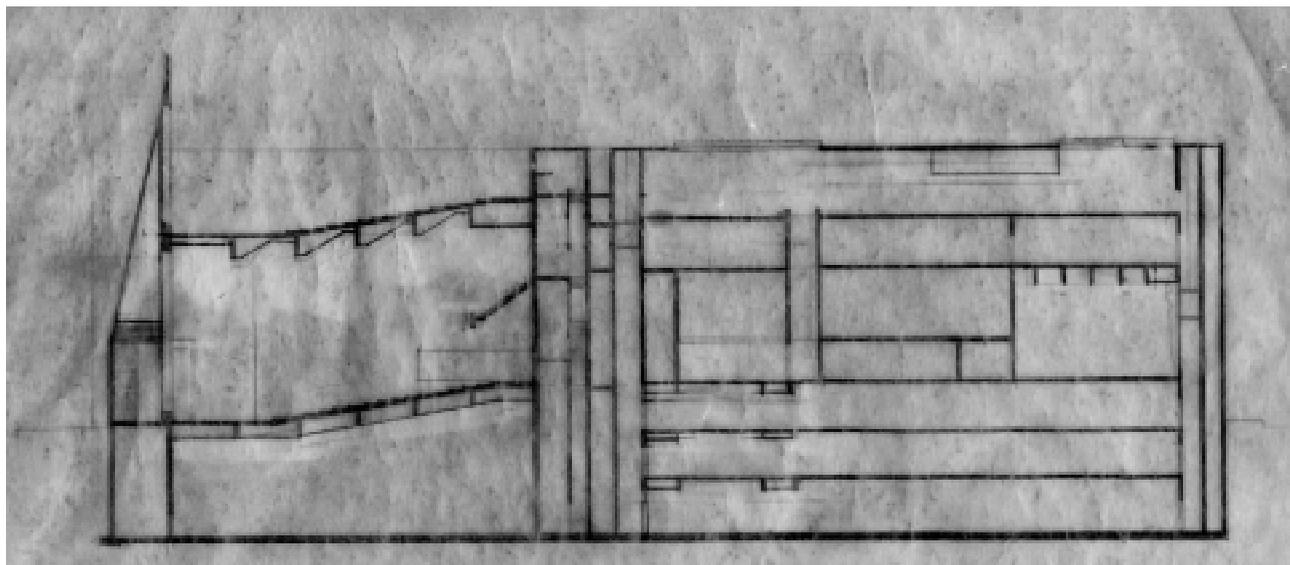
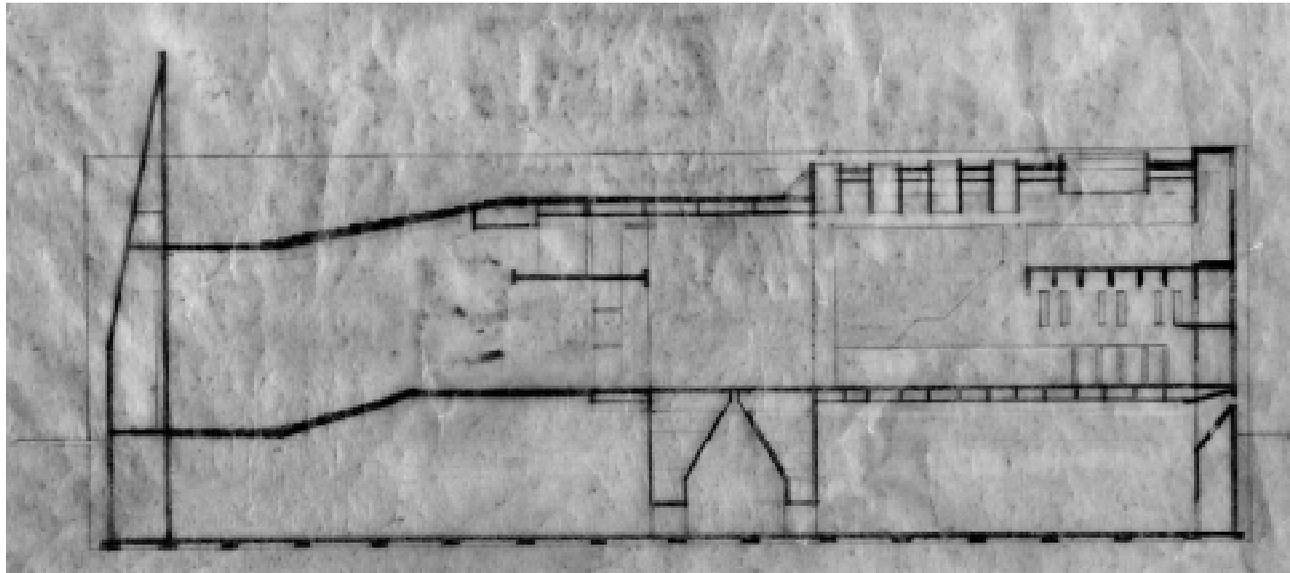
Early thoughts of open theater on South Site.

“...It is good for the mind to go back to the beginning -because the beginning of any established human activity is its most wonderful moment. For in that moment lies the whole of its spirit and resourcefulness, from which for present needs we must constantly draw our inspiration. We can make our institutions great by giving them, in the architecture we offer them, our sense of this inspiration.”

-Louis I. Kahn



Top: Partial view of north facade, which became a study in the structural capabilities of reinforced concrete.
 Bottom: Early thoughts about separating building into areas of film (left) and photography(right). Photographic exhibit consisted of a series of hollow columns which were natural light-sources as well. Photographs would be exhibited inside these columns, which had an interior diameter of 18 feet.

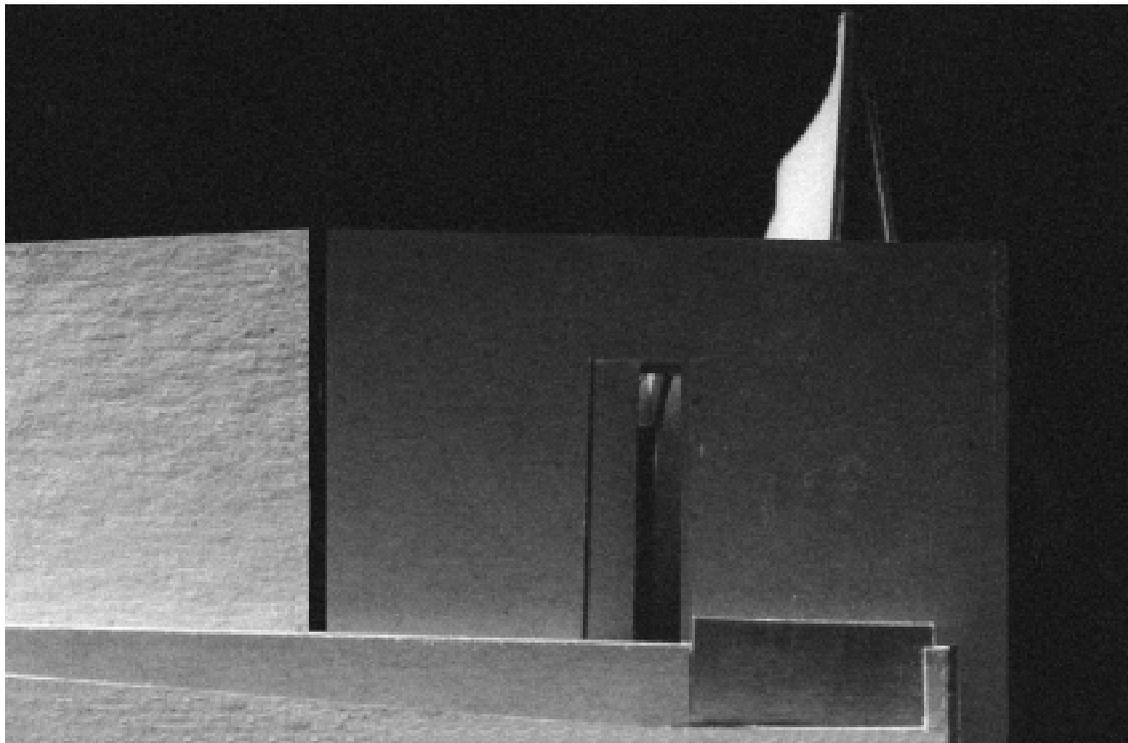


Top: Early studies of skylights over library bay.
 Middle: Section through 'hollow-wall' shows service rooms, elevators, and underground areas.
 Bottom: Wall articulated to direct beam of sun light into building.

East - west sections at varying intervals through early stages of the building.

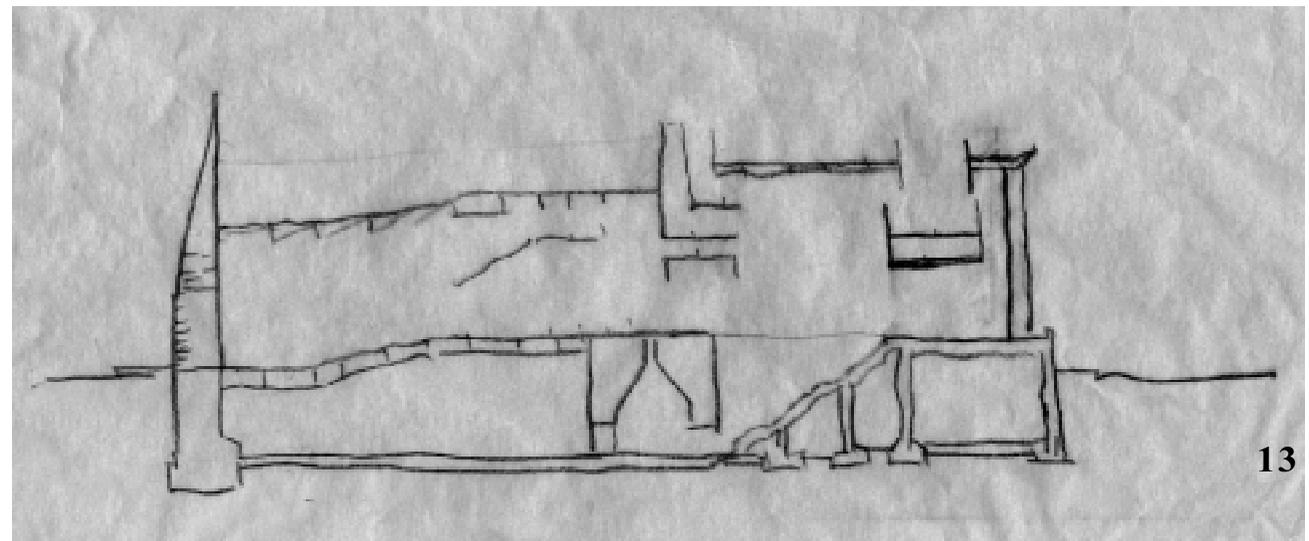
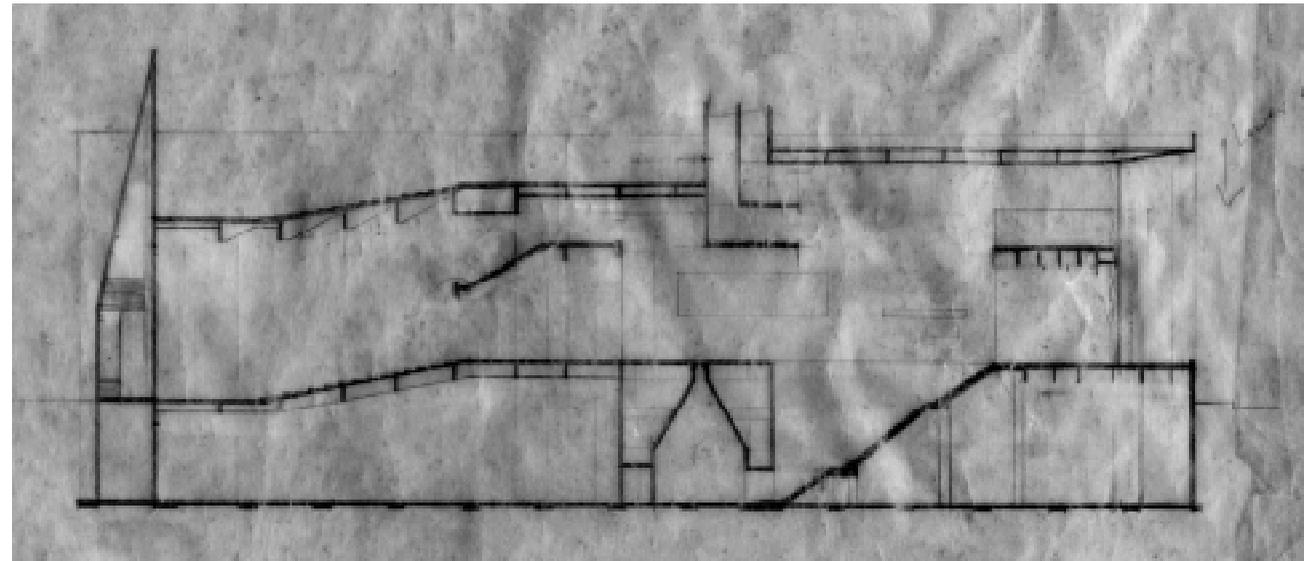
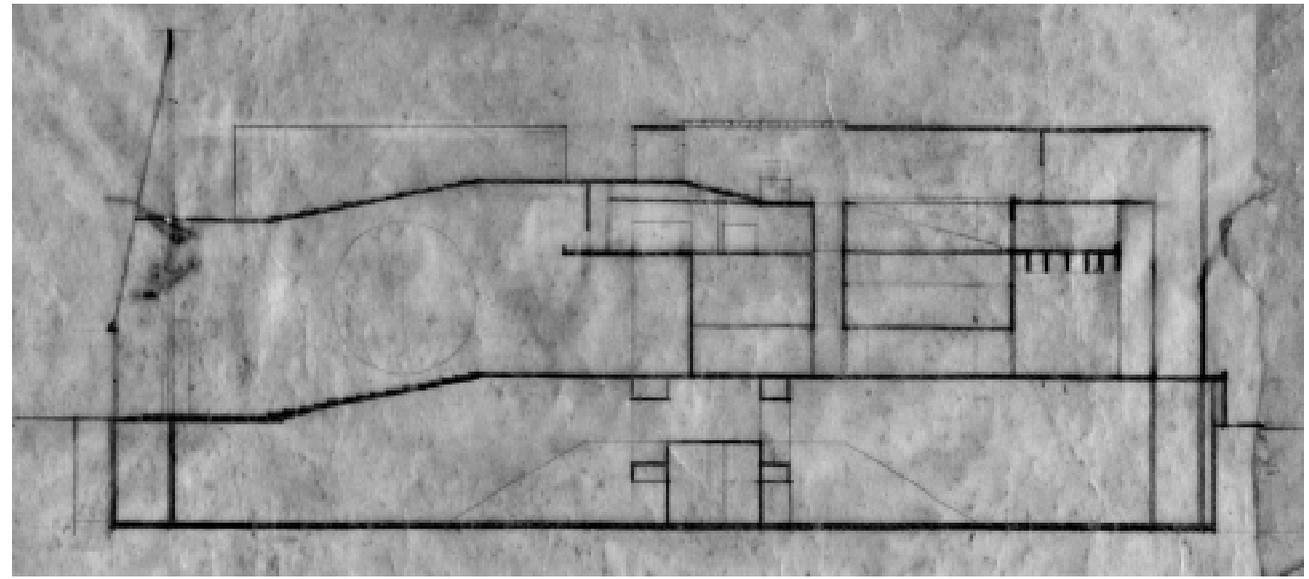


View of 'light-scoop' designed to let light into east end of lobby.



Approach to entrance.

As the wall changes direction an opening is made for ease of construction (above). The opening runs the full height of the wall, revealing the change of direction and allowing a long slender shaft of light to enter the lobby .

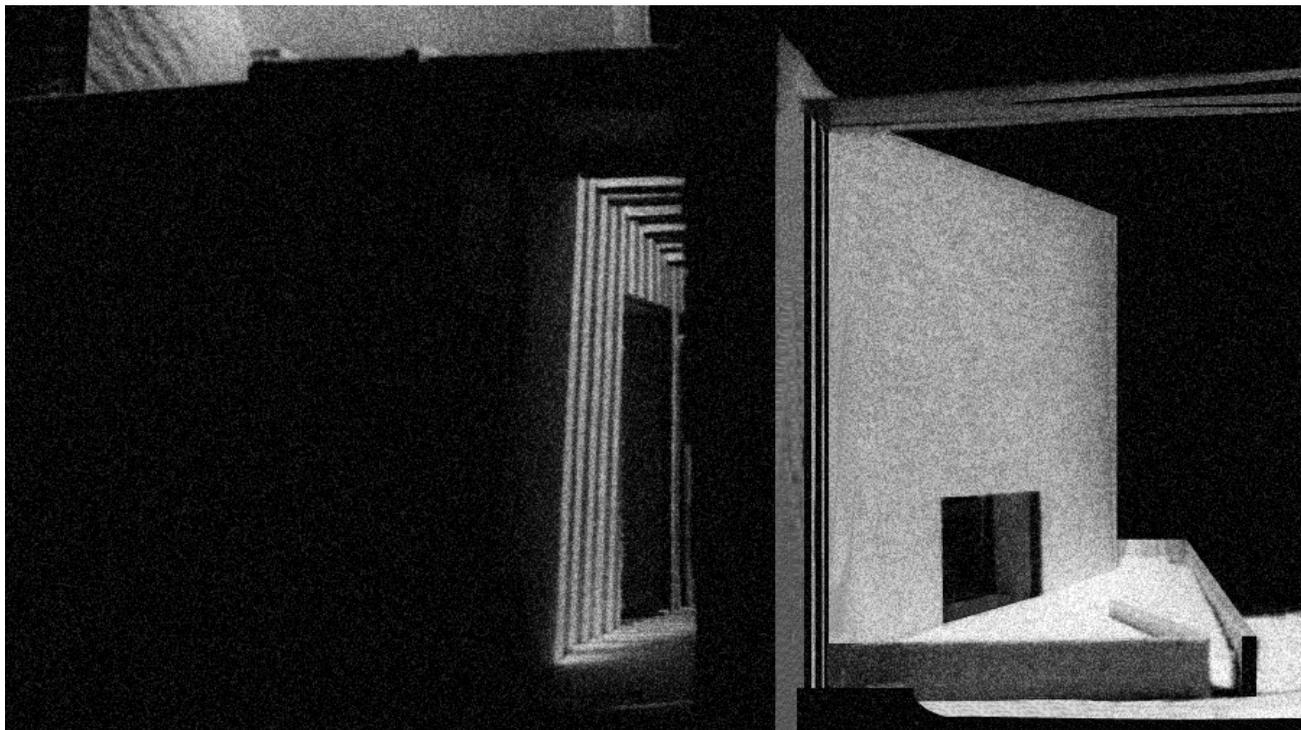


Top: Circular opening designed to allow natural light in large theater. Two metallic half-circles act as doors which announce the beginning of each film with an echoing sound, as they close.

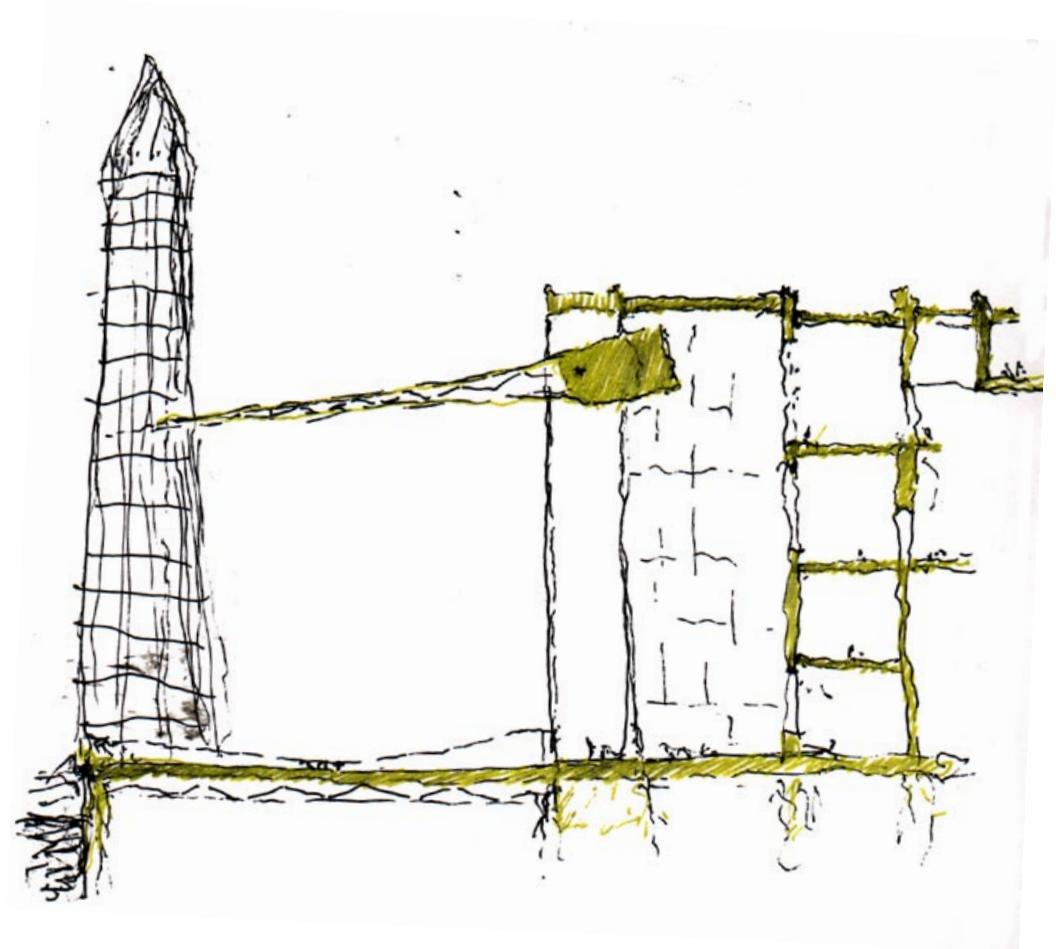
Middle and bottom: Final organization of building with film on left and photography on right. Photography portion shows section through beam-galleries which span between walls and work together in providing natural light to each other.



View of main entrance with three 85' pivoting metal doors. Conical skylight marks reading area in library.



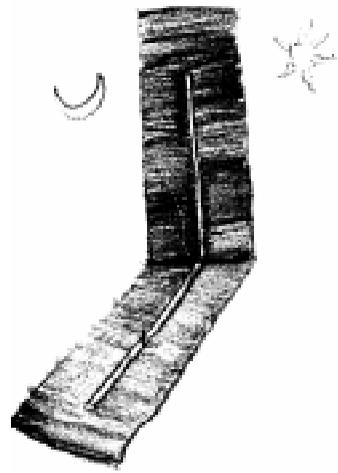
Interior view of lobby shows light filtering in from above; connection of lobby to south terrace through large scale opening on wall.



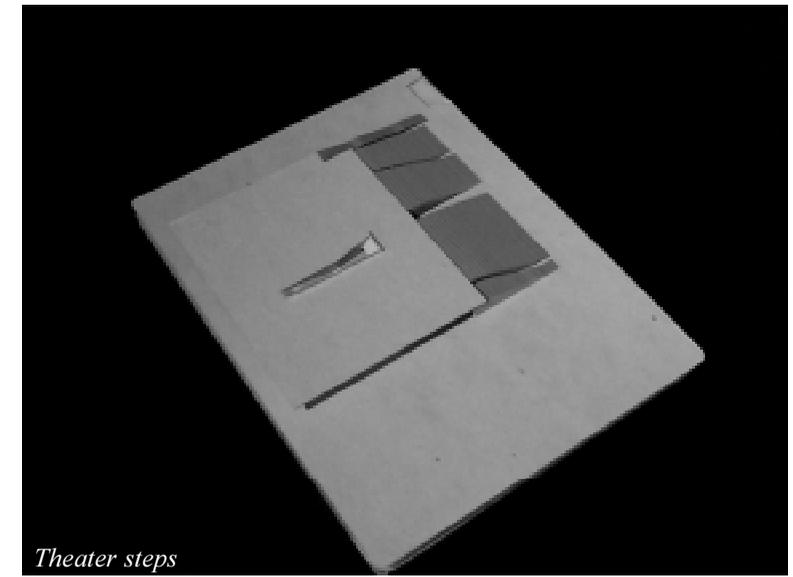
Sketch above: Section through entrance and metal door.

Because of the massive concentration of material on the shorter side and the lighter framework construction of the long cantilever, the doors would pivot virtually weightlessly. The doors would be opened every morning and remain in the open position throughout the day. The element of time comes into play, as the completion of this event would last a number of minutes.

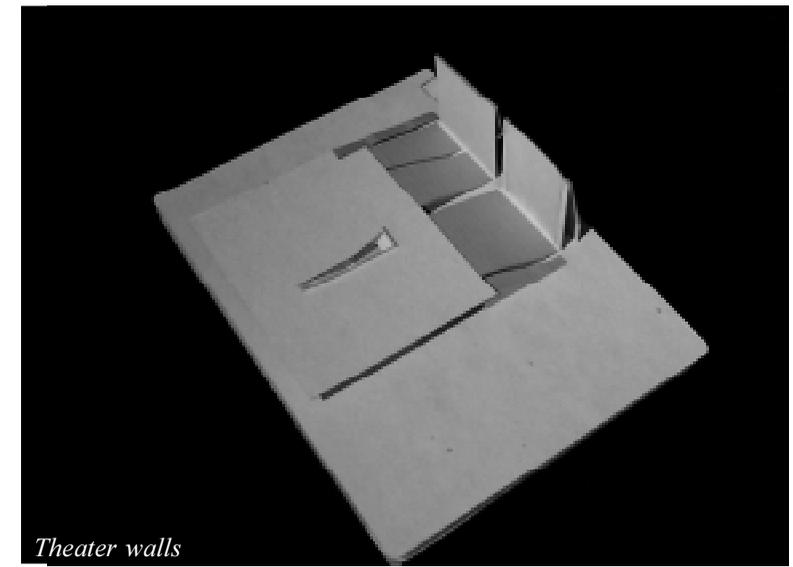
Views



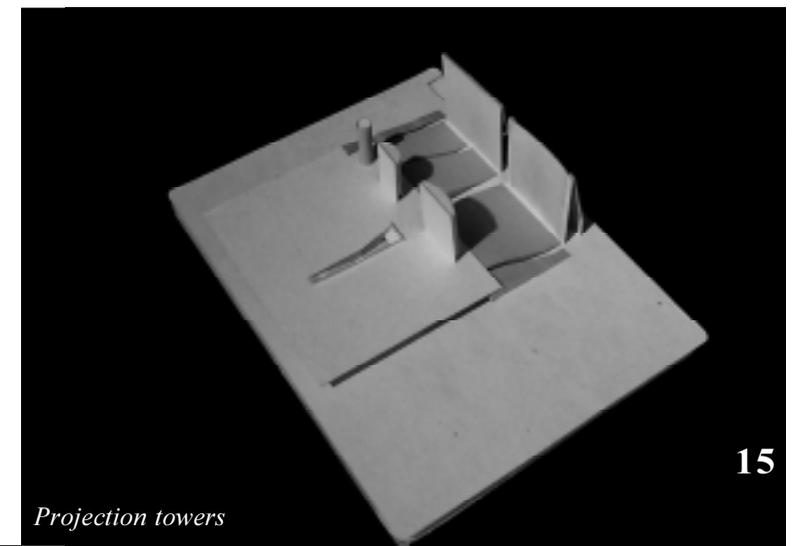
Sketch of day and night



Theater steps



Theater walls



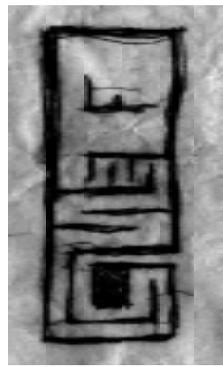
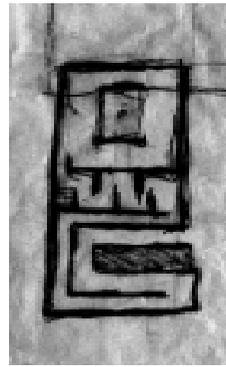
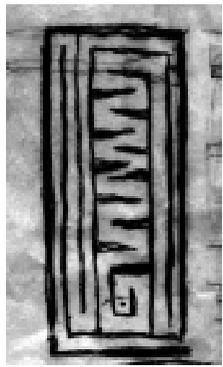
Projection towers



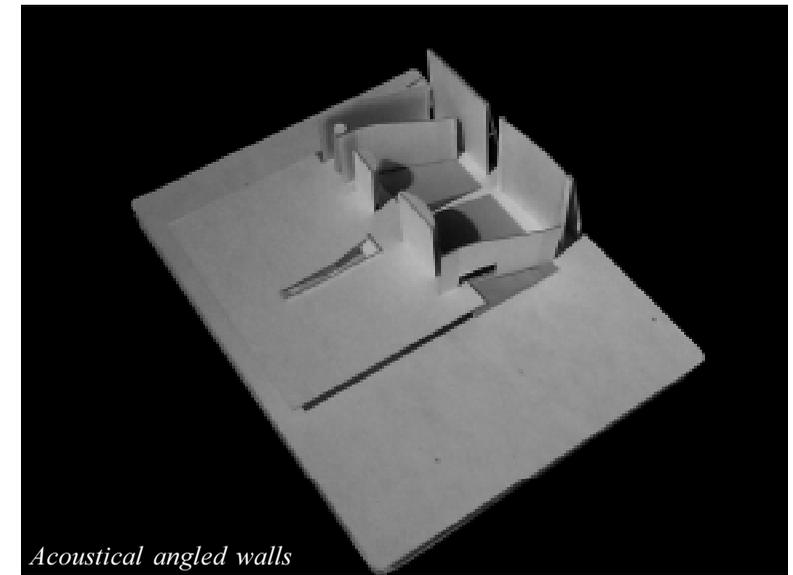
View of project from west. Approach to monument through stairs and tree covered ramps; ramped connection to metro seen to right of obelisk.

“When you have all the answers about a building before you start building it, your answers are not true. The building gives you answers as it grows and becomes itself.”

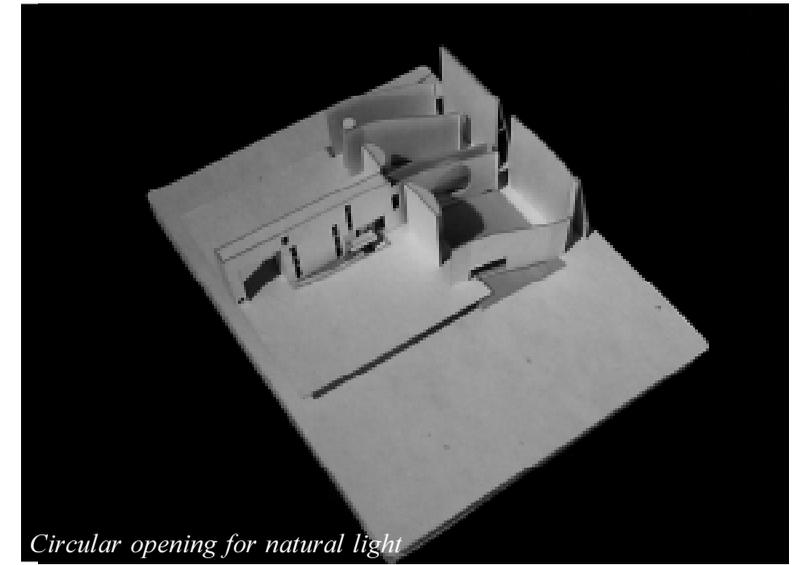
-Louis I. Kahn



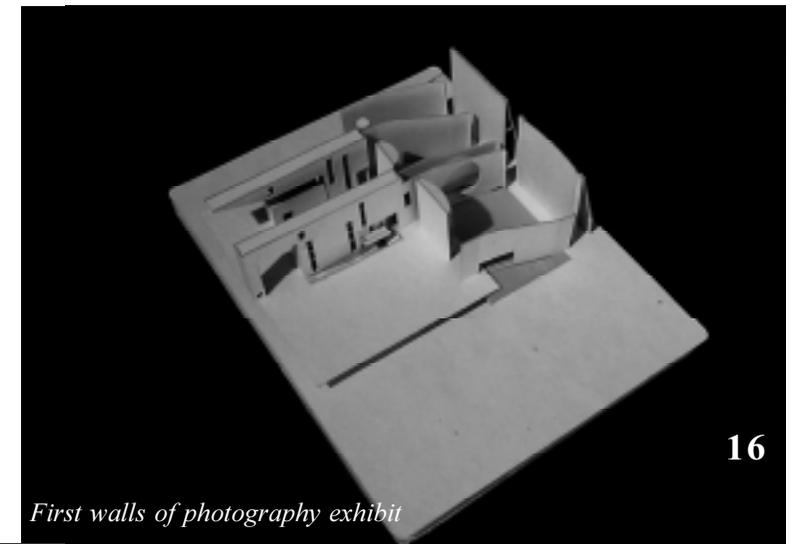
Studies of rooms with no light



Acoustical angled walls



Circular opening for natural light



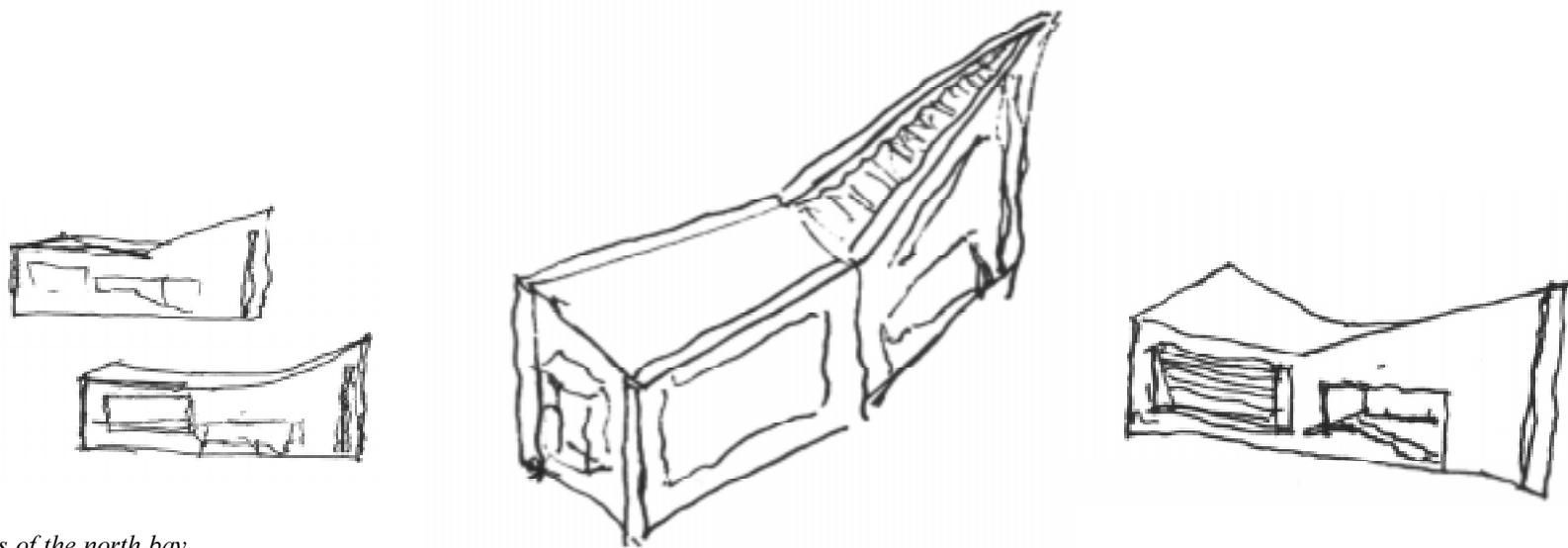
First walls of photography exhibit



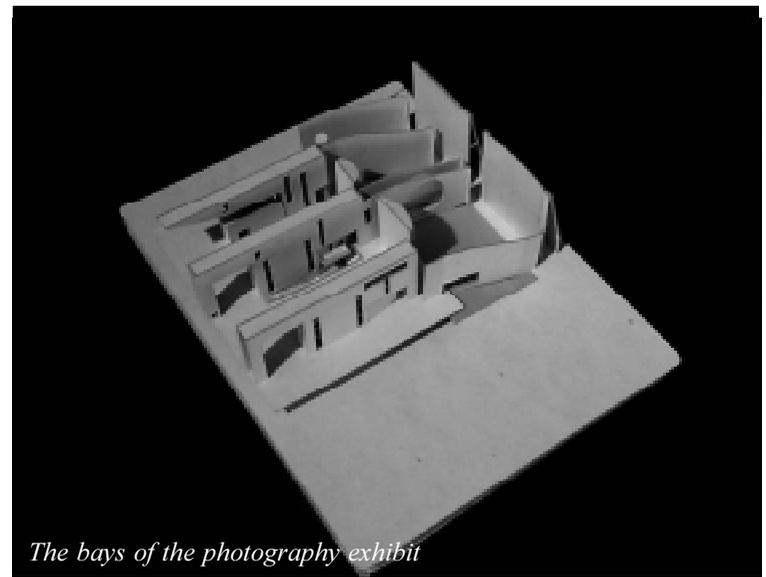
Overall view of project

“Integrity is the deepest quality in a building.”

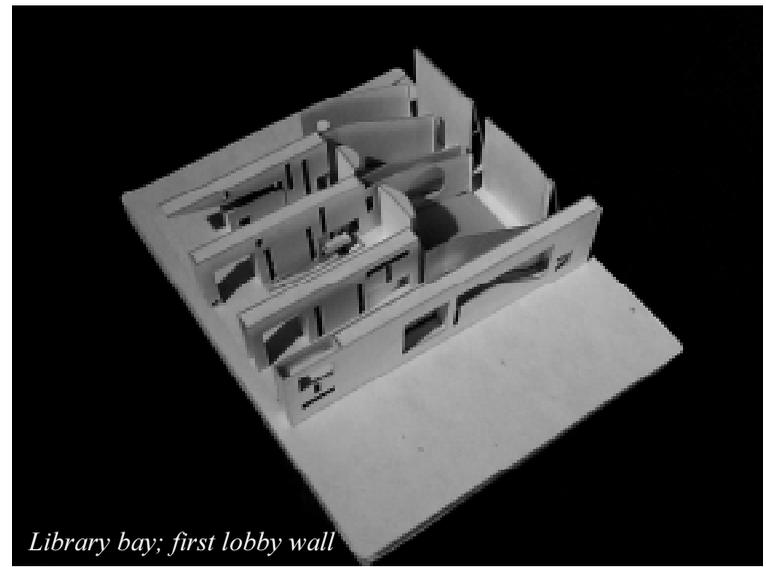
-Frank Lloyd Wright



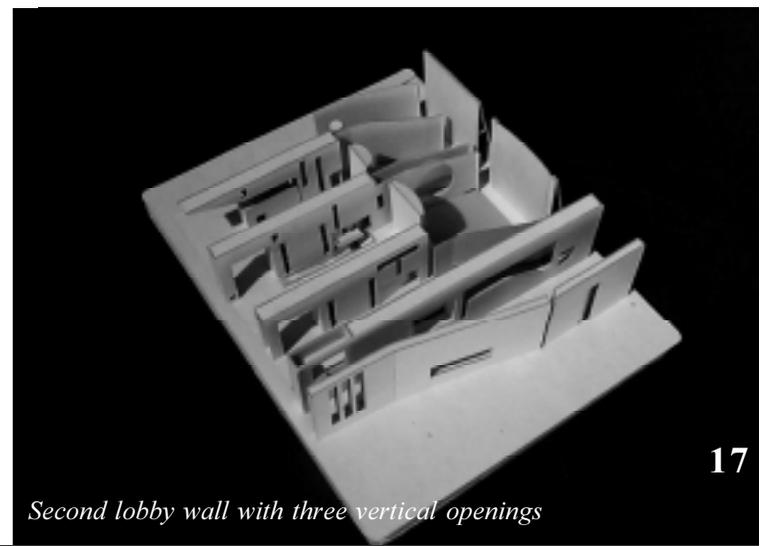
Studies of the north bay



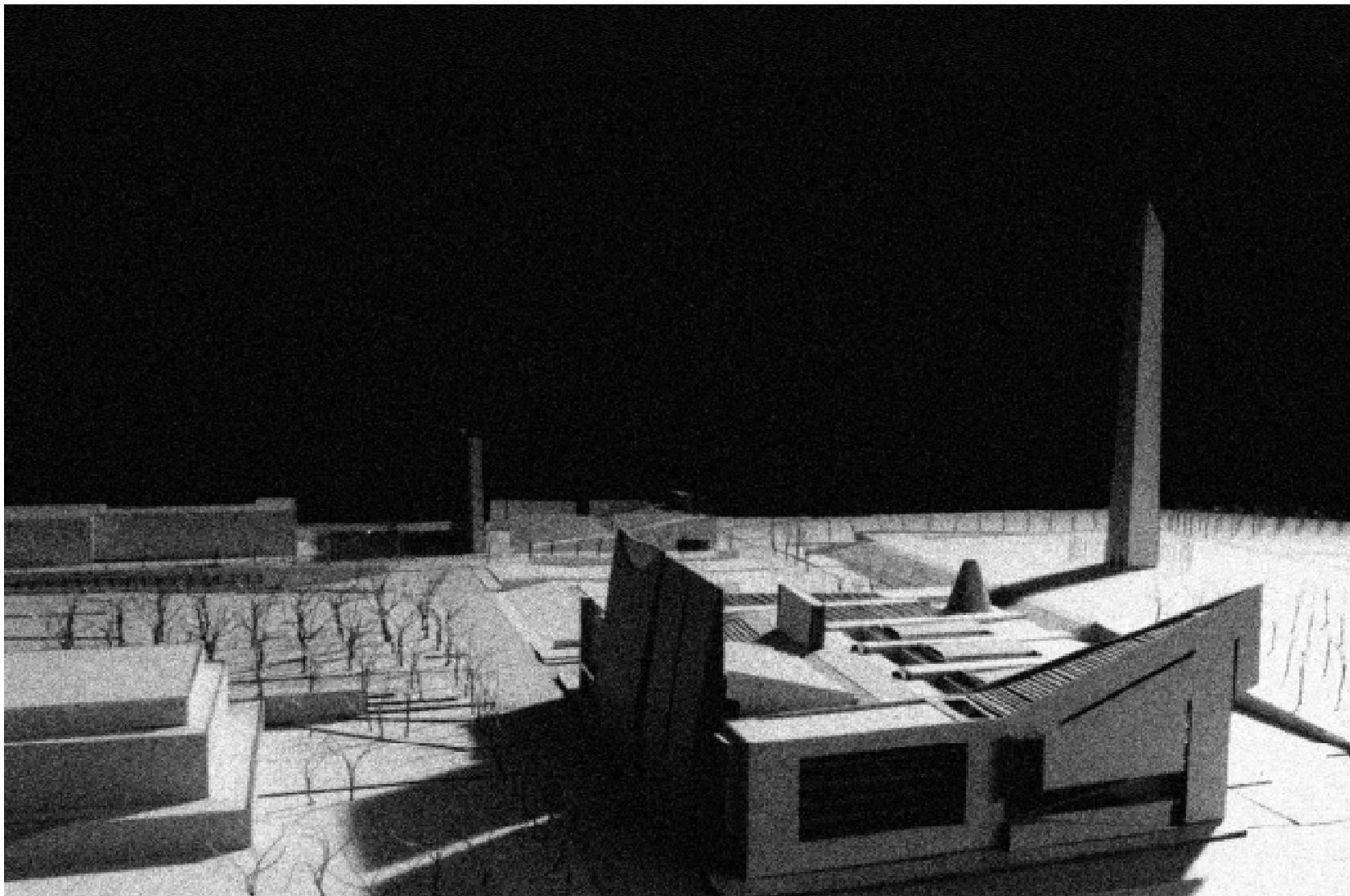
The bays of the photography exhibit



Library bay; first lobby wall



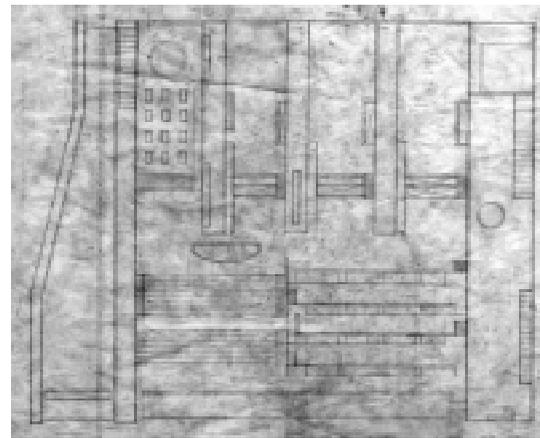
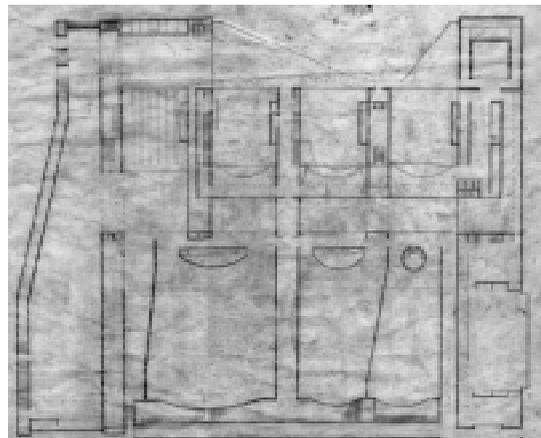
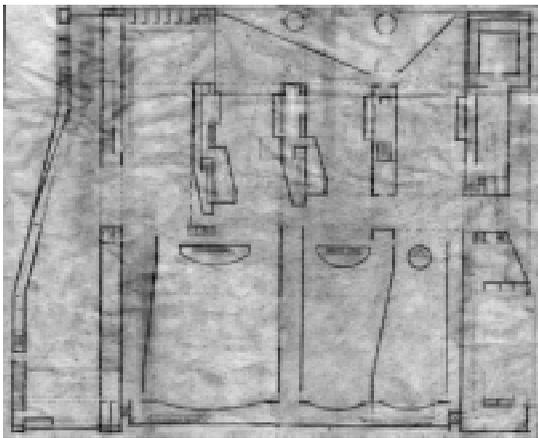
Second lobby wall with three vertical openings



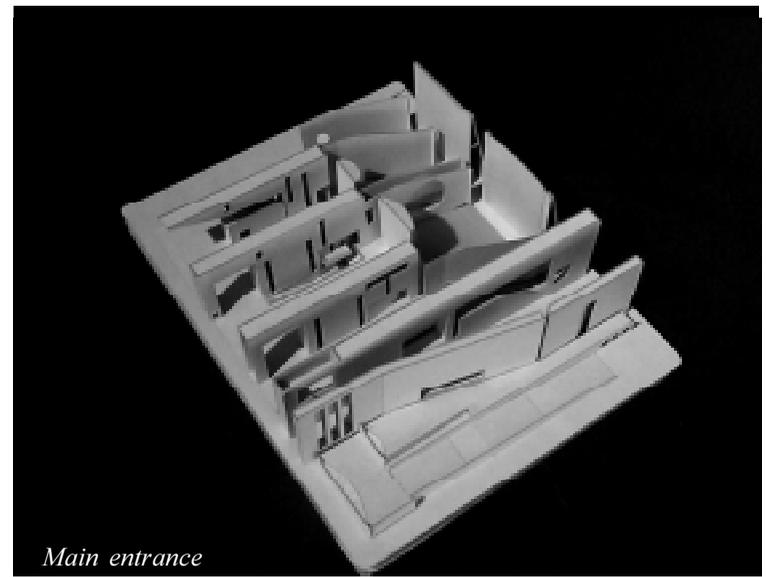
View of main building with final version of north bay

“A new building is given historical significance over and above its formal timeliness only if it brings to light the genuine history -human or natural- of its site and the circumstances of its construction. Significant buildings, real buildings, are achieved rather than provided.”

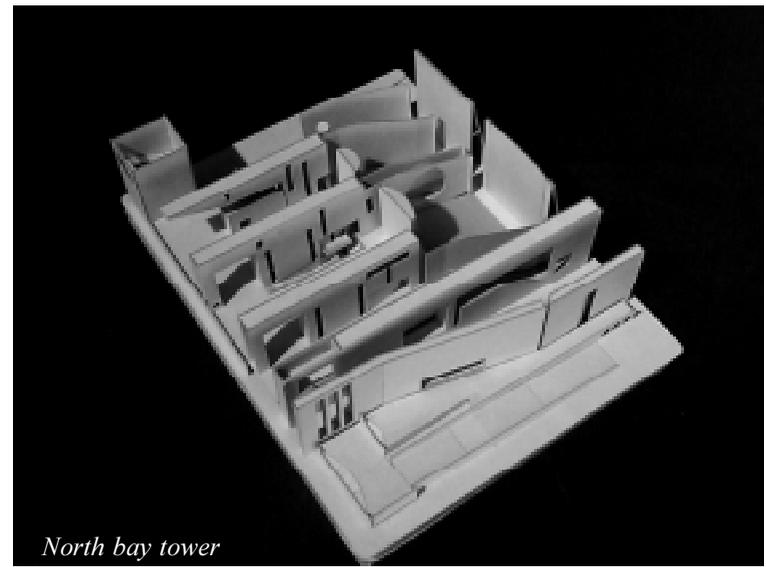
- M. Benedikt



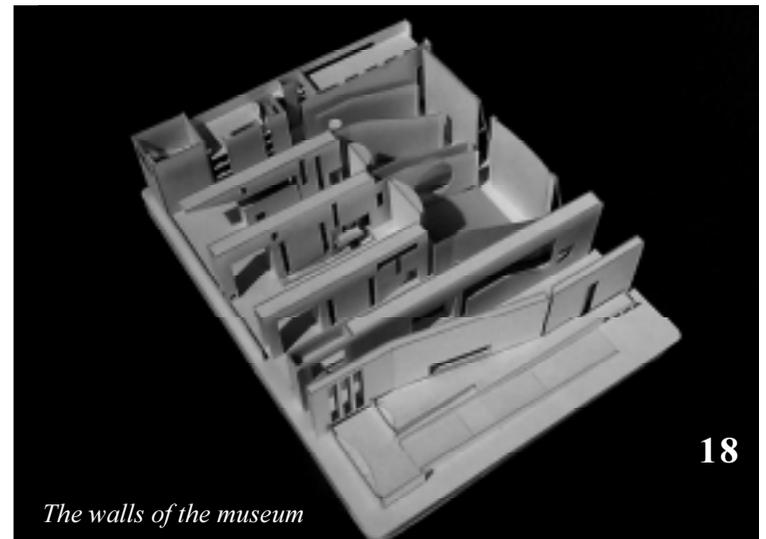
Levels 1,4, & roof plan studies



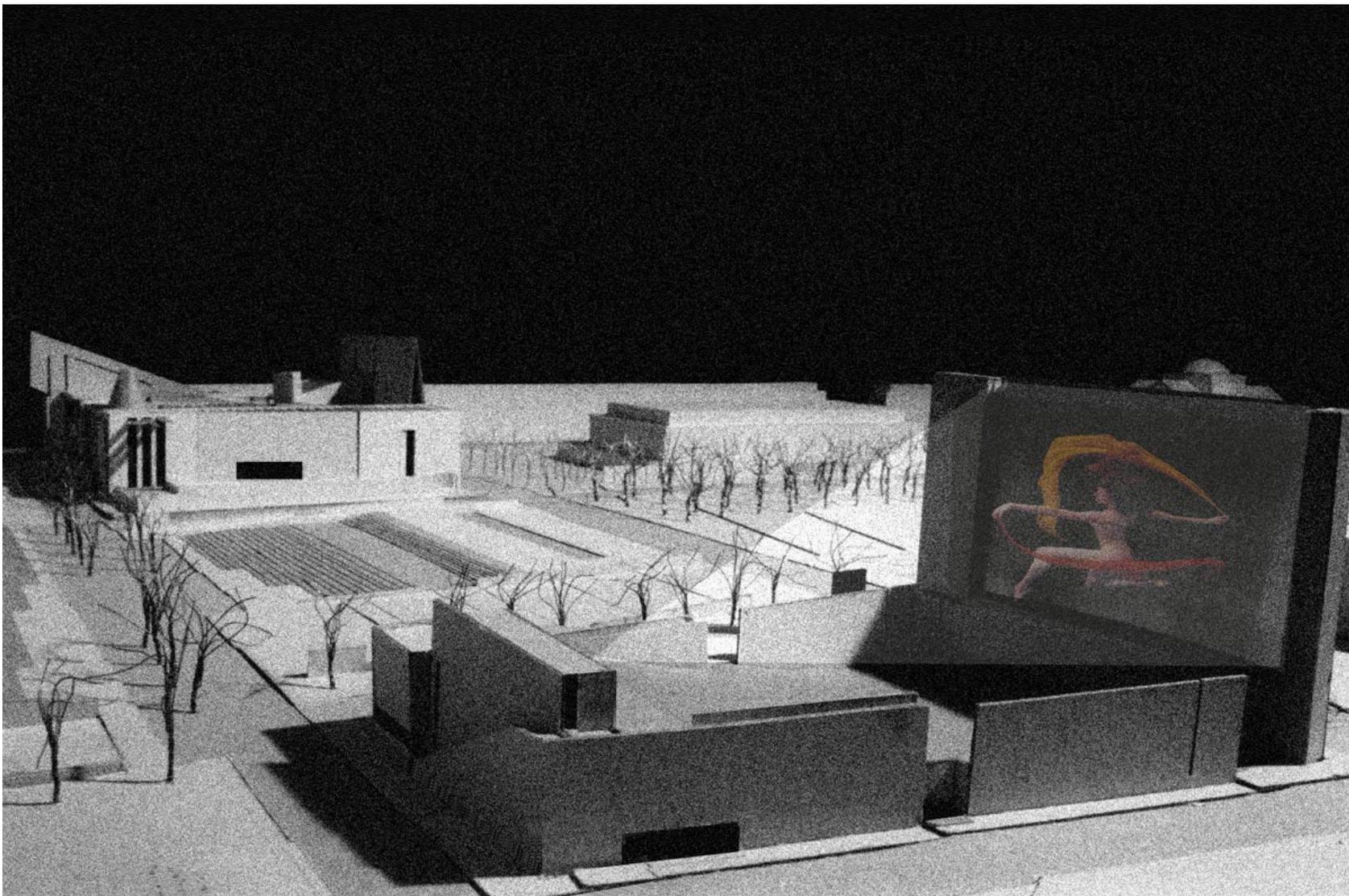
Main entrance



North bay tower



The walls of the museum

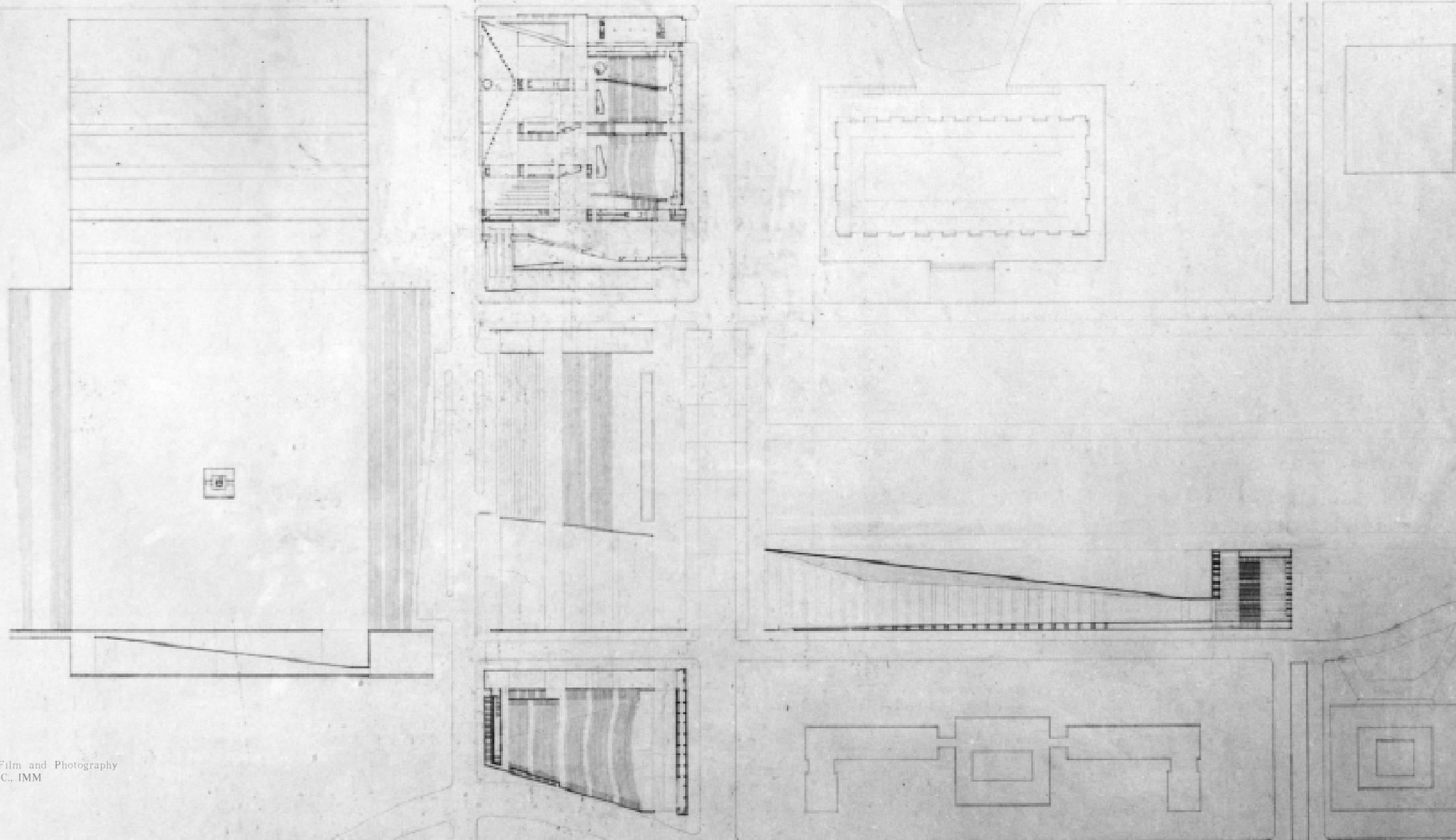


View of large open theater (South Site)

“Architecture is the masterly, correct and magnificent play of masses brought together in light.”

-Le Corbusier

National Museum of Film and Photography



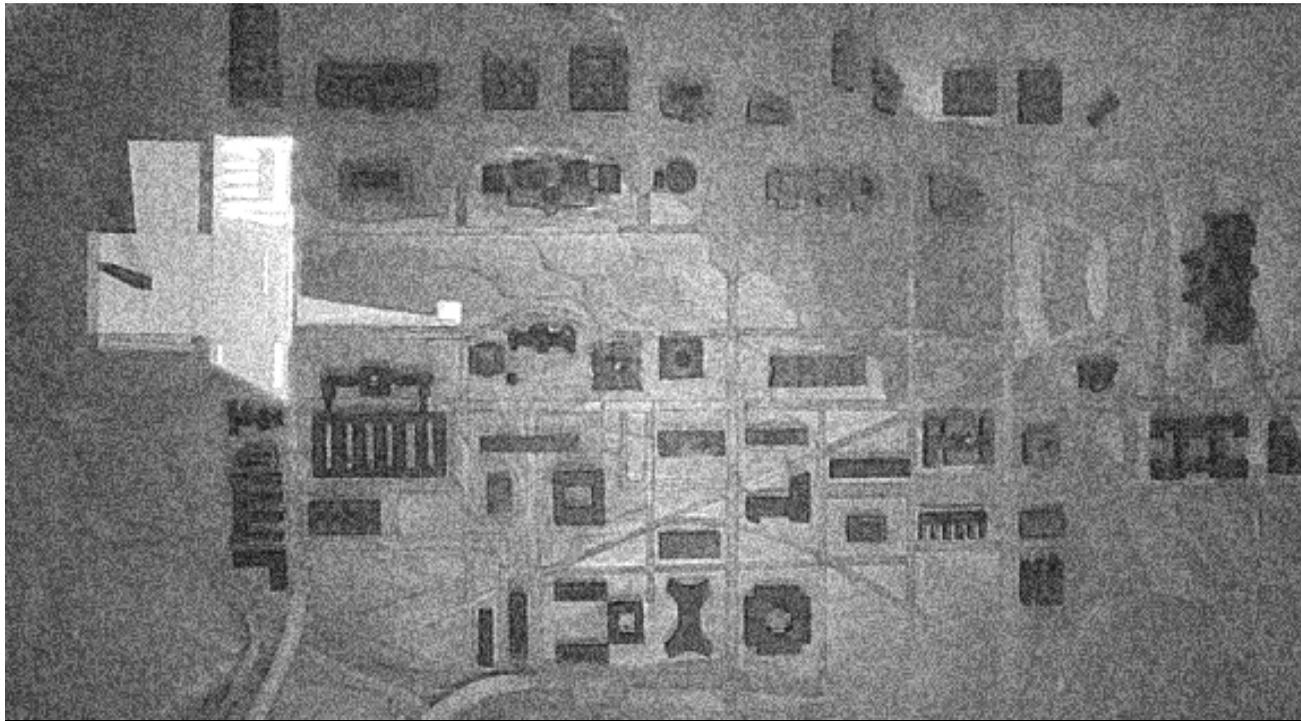
The National Museum of Film and Photography
Washington, D.C., IMM

Site plan

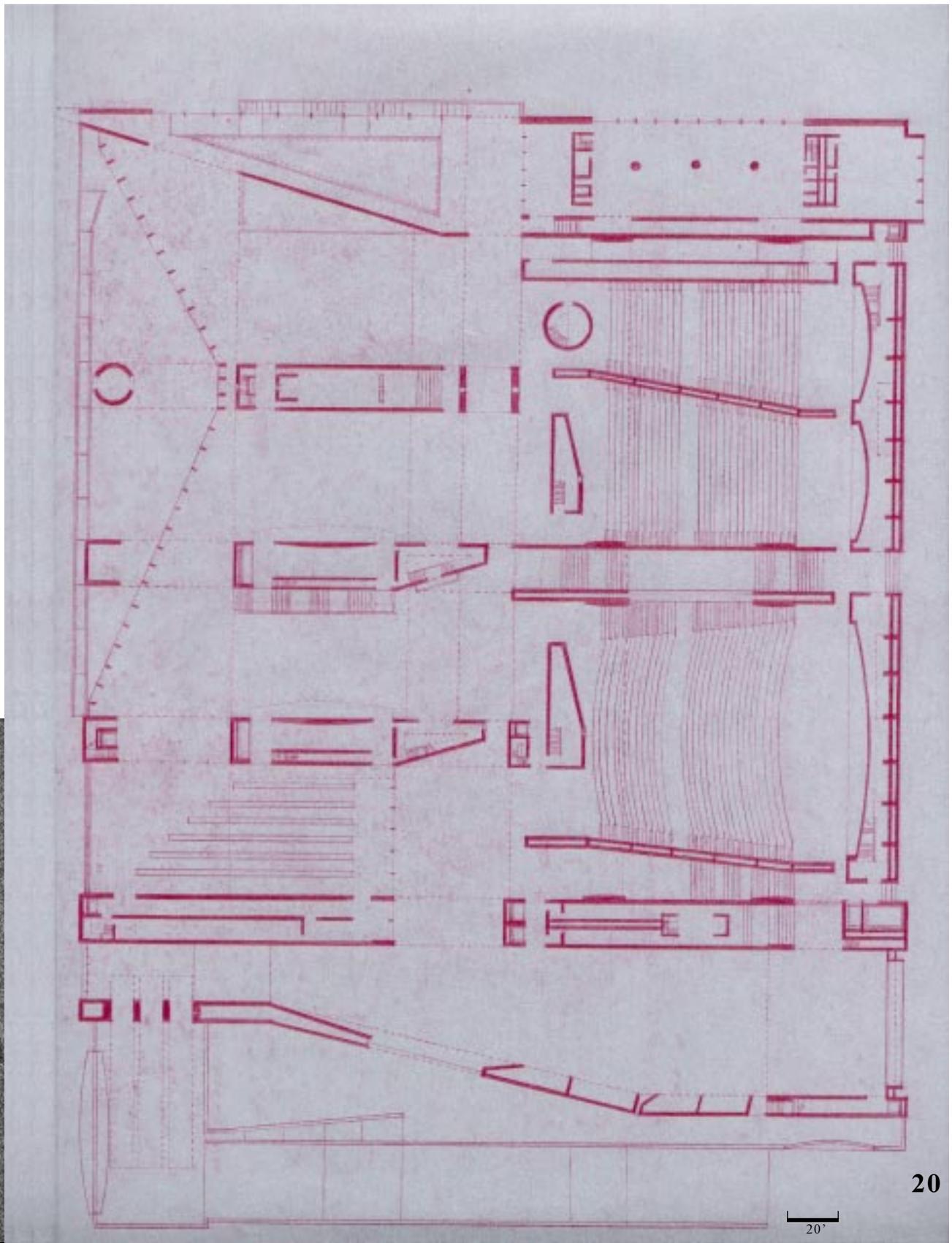
Ramp connecting to the Smithsonian Metro Station; South Site with the large open theater; Middle Site which became a plaza; and the North Site, on which the main building is located. The grounds around the George Washington Monument were developed into a series of steps and ramps. The obelisk itself is used as an 'Urban Timepiece' as it marks important yearly events with its shadow.

The Building

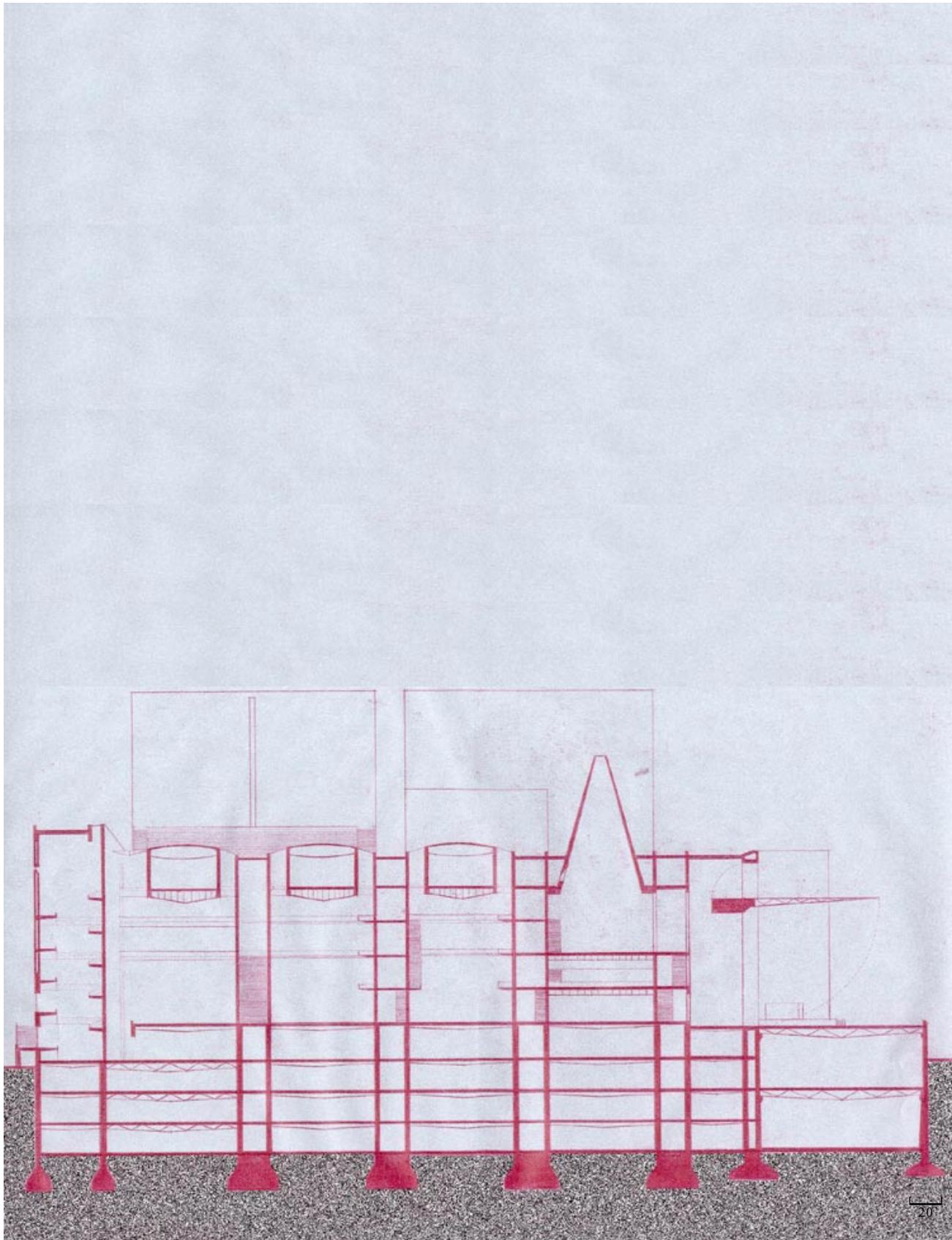
The approach to the building is through a gentle processional ramp. The ramp ends in a place conceived as a balcony for the city, from which the George Washington Monument is viewed. The balcony is further defined and given shade by the three large metal doors which hover above. The large balcony is designed to gently bring rain water down to street level through an elliptical articulation of its floor. Walking through any one of the three large openings where the metal doors are held one enters the building. The first large volume one walks through is the lobby. The lobby contains a cafe which spans between the two lobby walls, as well as the primary entrance to the second levels of the theaters. Both are located in the east end of the lobby. The roof of the lobby consists of a series of beams which increase in depth as their individual spans increase (see plan). Between the beams is glass, which makes the lobby a place full of light. Walking through the next large wall and facing north, on the left is the bay belonging to the library, and on the right are the entrance to the large theater, and circulation to the screen-walls. Inside the screen-walls is access to the roof of the building where the roof theater and roof restaurant are located. Walking through the following wall, on the left is the first bay of photography. In this bay, as in the other photography bays, are the vertical galleries, through which the beam-galleries, and finally the hollow-roof galleries are accessed. The first bay also contains access to the underground gallery. Through the next two walls are the second and third bays of photography to the left, and the medium and small theaters to the right. The north bay contains the ramped gallery, from which all levels of the museum are accessed. The museum offices, loading docks, and access to underground parking are located in the north bay as well.



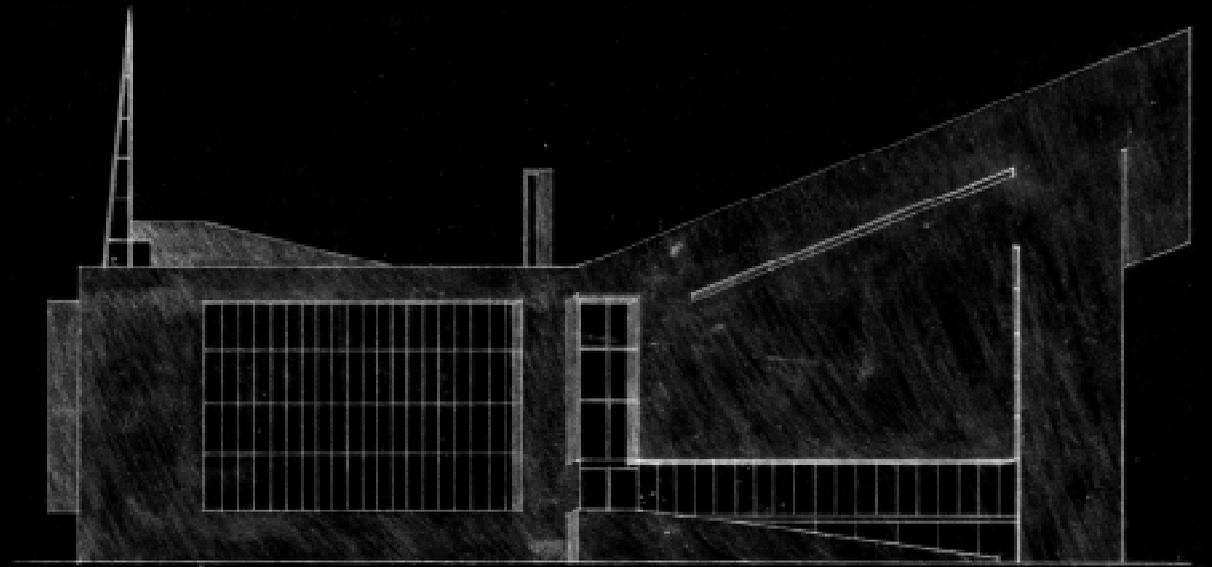
Site model (base contributed by J. Wheeler)



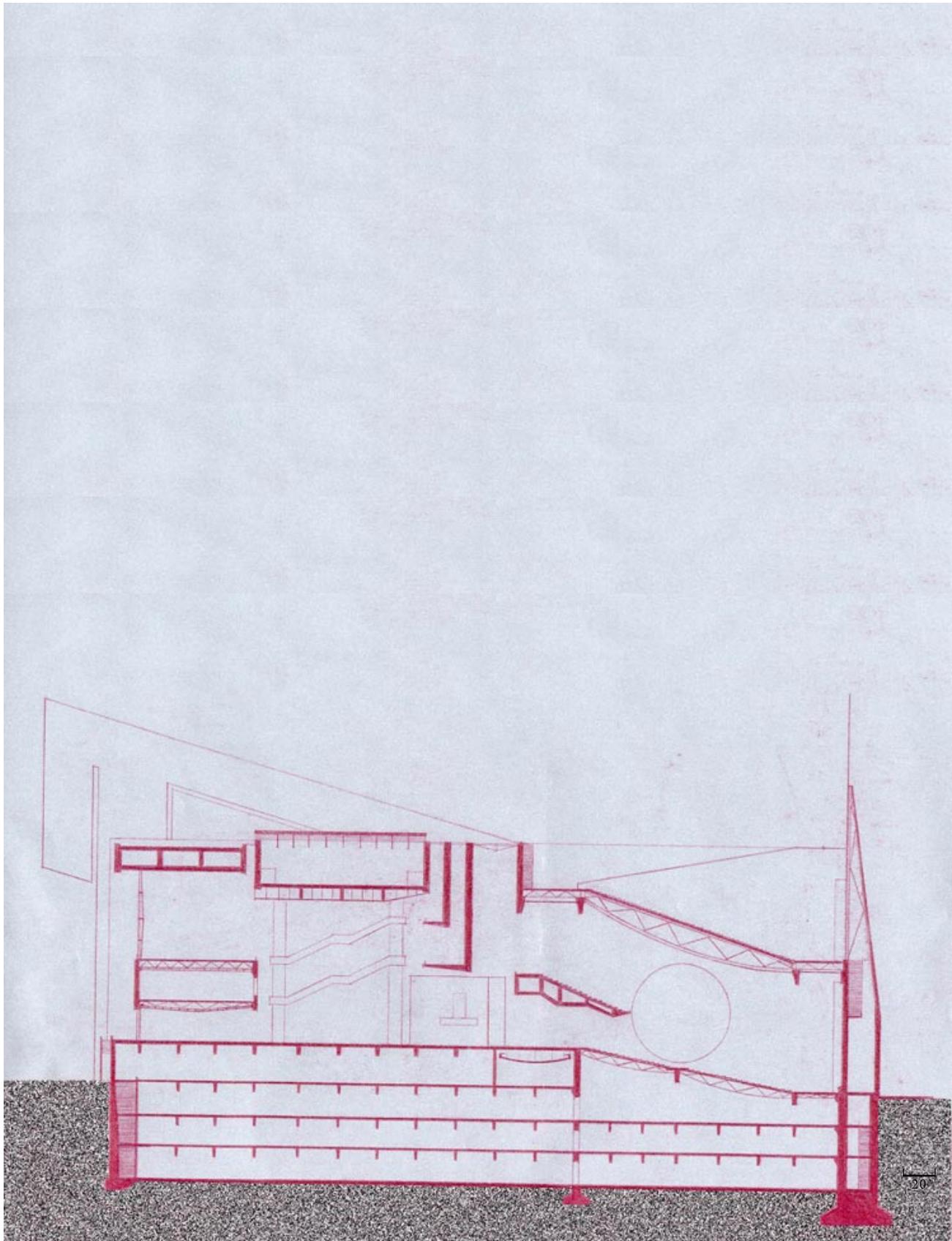
Main floor



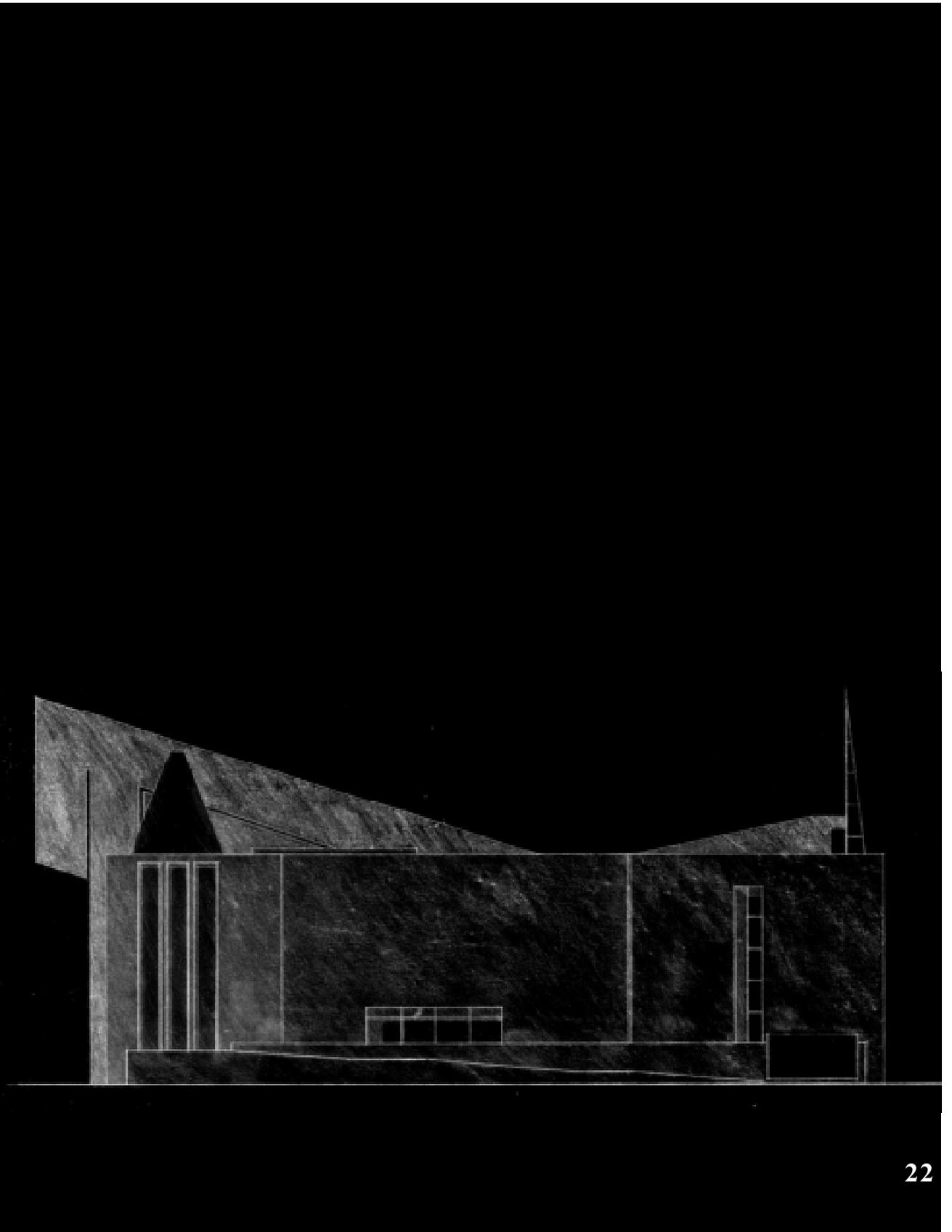
North-south section through photography bays



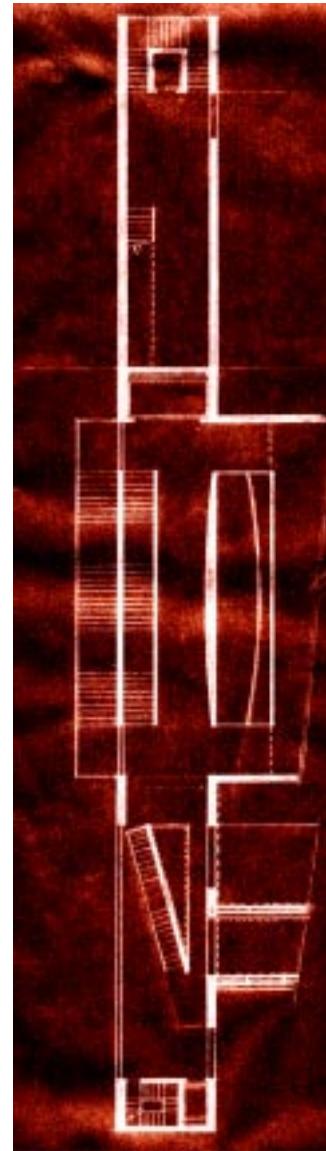
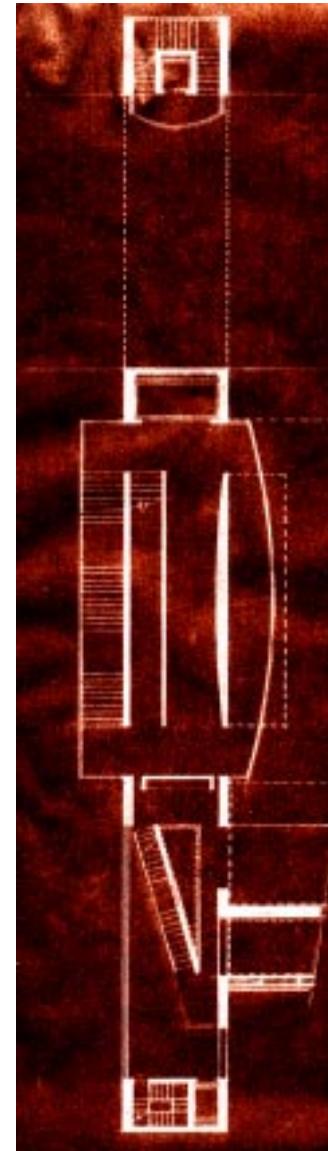
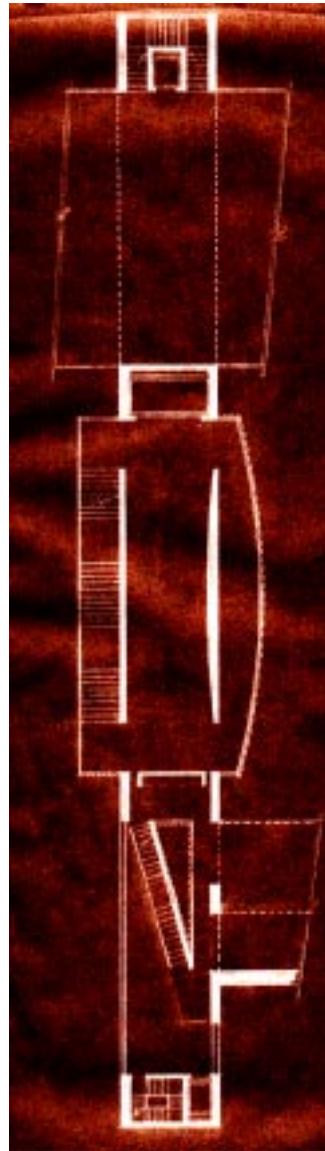
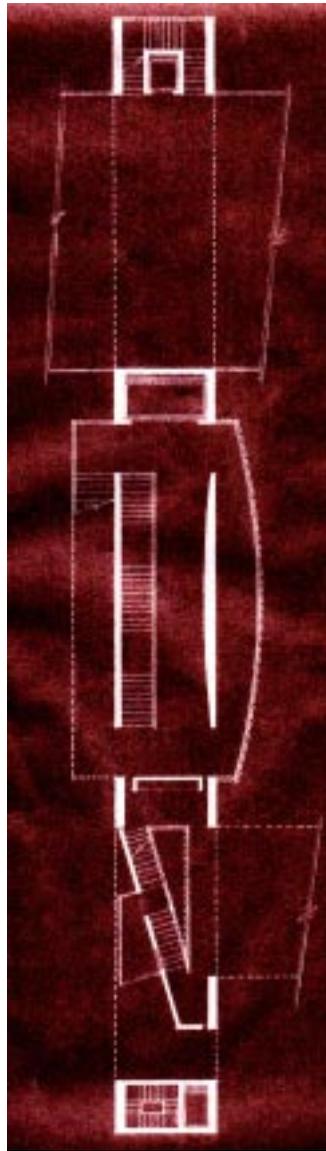
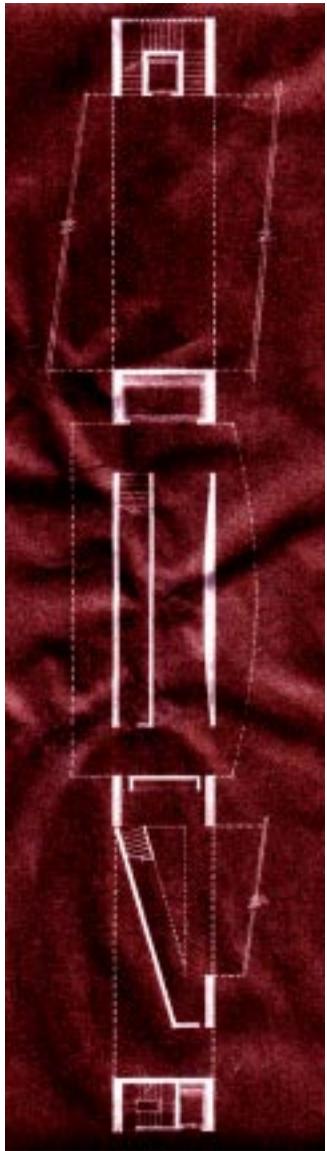
North elevation



West-east section through large theater



South elevation



20'

Ground

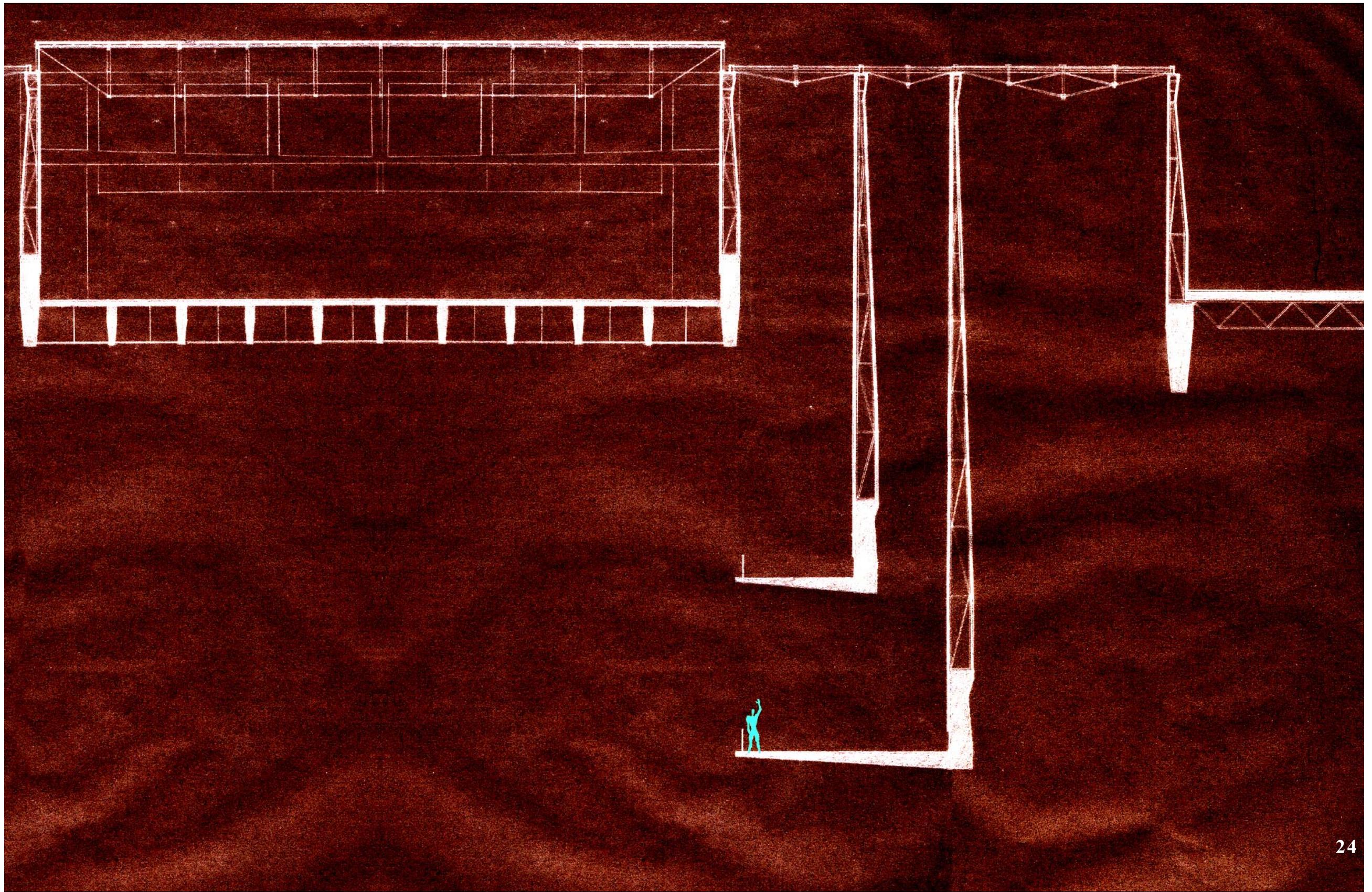
Level 1

Level 2

Level 3

Level 4

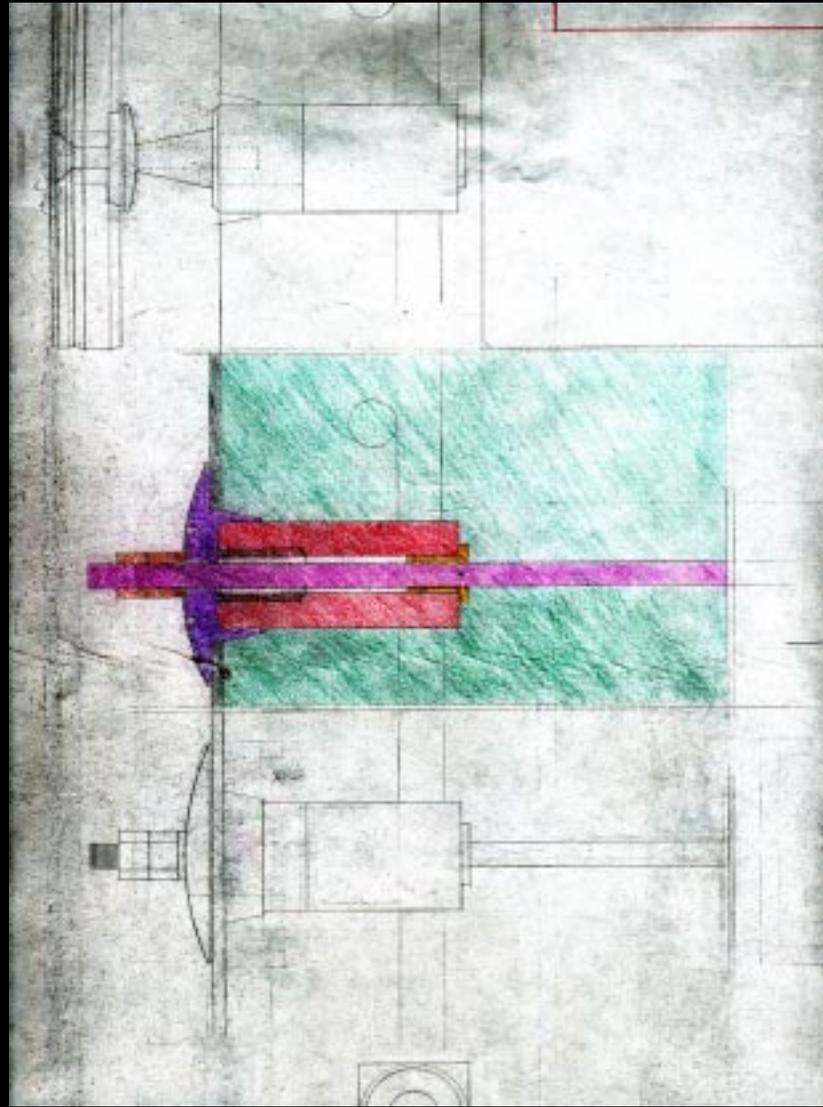
This series of plans shows the organization of the first wall in the photography exhibit as described in the previous page. The wall is entered at any of three points at ground level. Circulation occurs first inside the wall, then outside between levels 1 and 3, as the stair switches to the exterior and cantilevers over the large volumes of the photography exhibit. A series of large scale balconies are integrated as part of the circulation and exhibit. From levels 2 and 3 the beam-galleries are accessed. At level 4 the walls come together as the hollow-roof galleries are accessed.



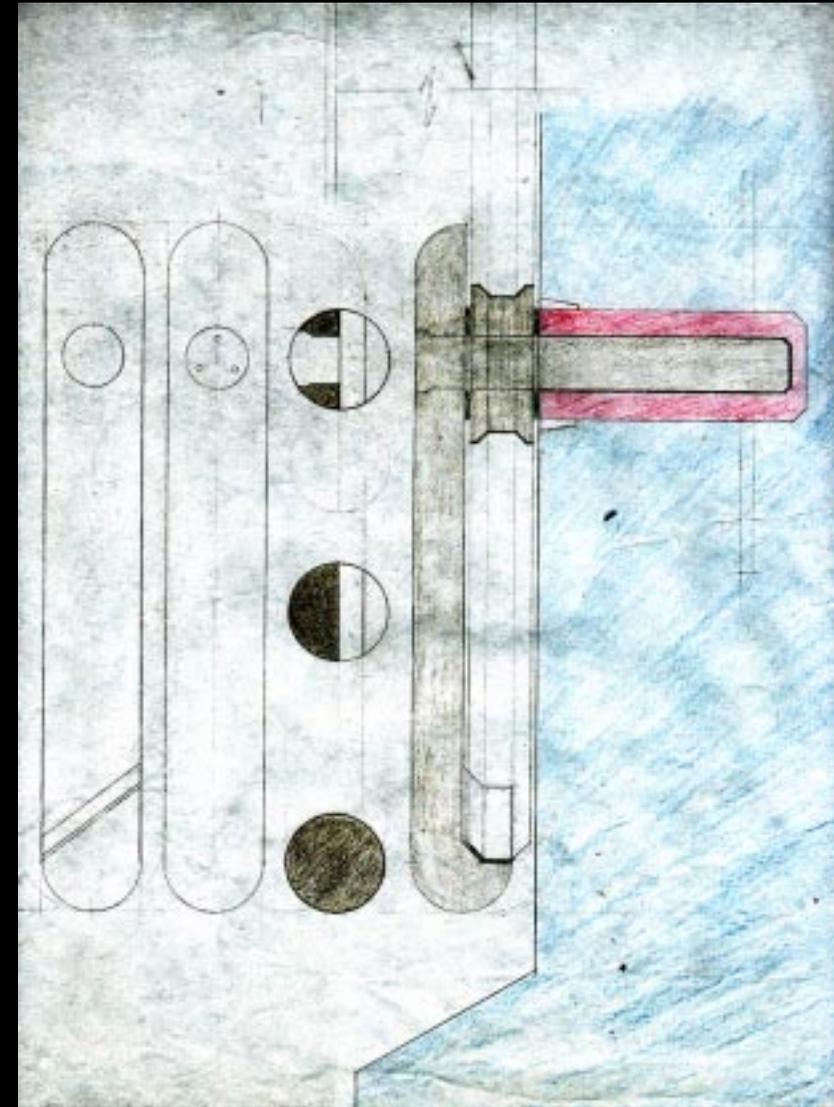
Section through beam-galleries and hollow-roofs

“...My expression....will tell you who I am and what I am.”

-Bernard Maybeck



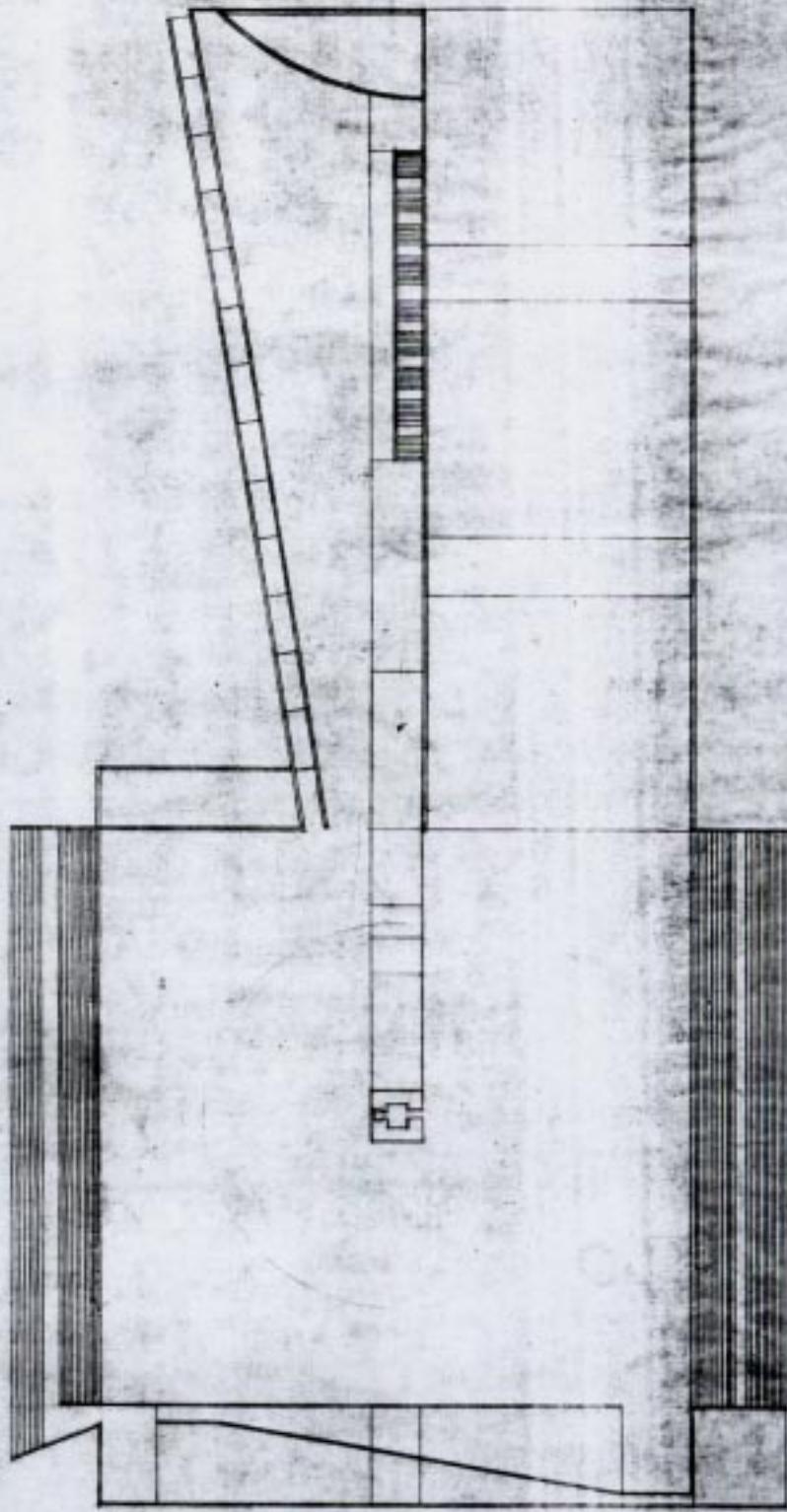
Metal castings in walls for supporting glass picture holders



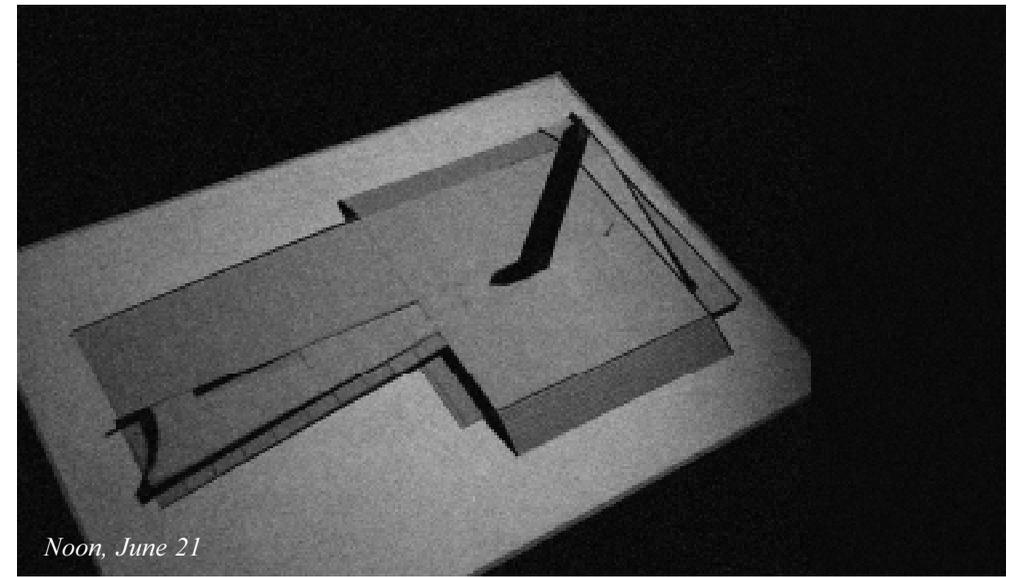
Metal holders for glass handrails

An Urban Timepiece

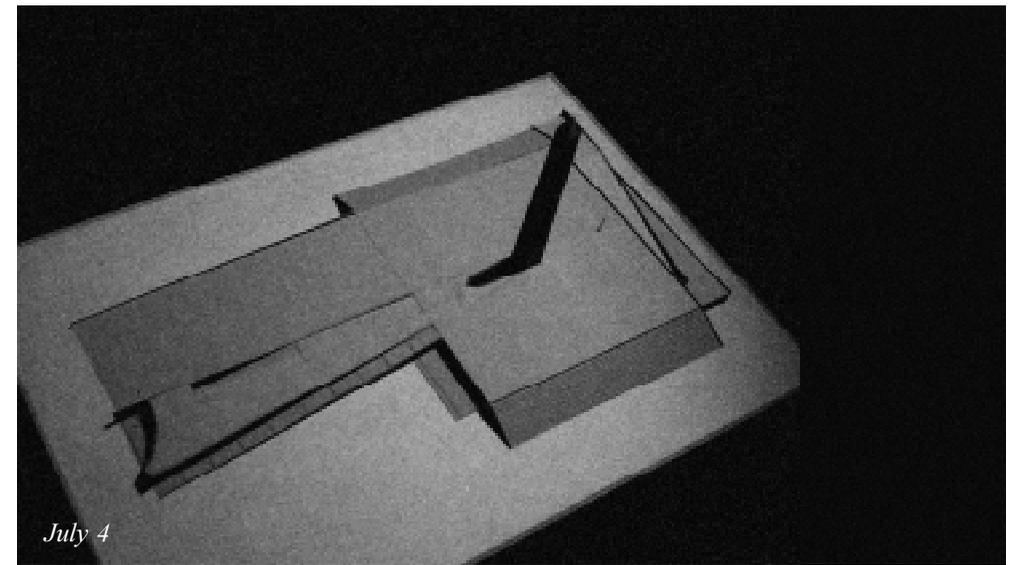
Taking advantage of our Capital's most prominent monument, significant yearly events are revealed by the obelisk's shadow, as it is cast on strategically placed lines and points. Independence Day, the equinoxes, the solstices, the year's longest and shortest shadows (at noon) are all given material reality as they become joints in concrete or golden pegs cast in the floor. The fifty steel flag poles remain a circle around the monument; a fifty-first golden post is added directly south from the obelisk. The fifty-first post tells the time of the day as it casts its shadow on the pattern of steel elliptical lines cast into the floor.



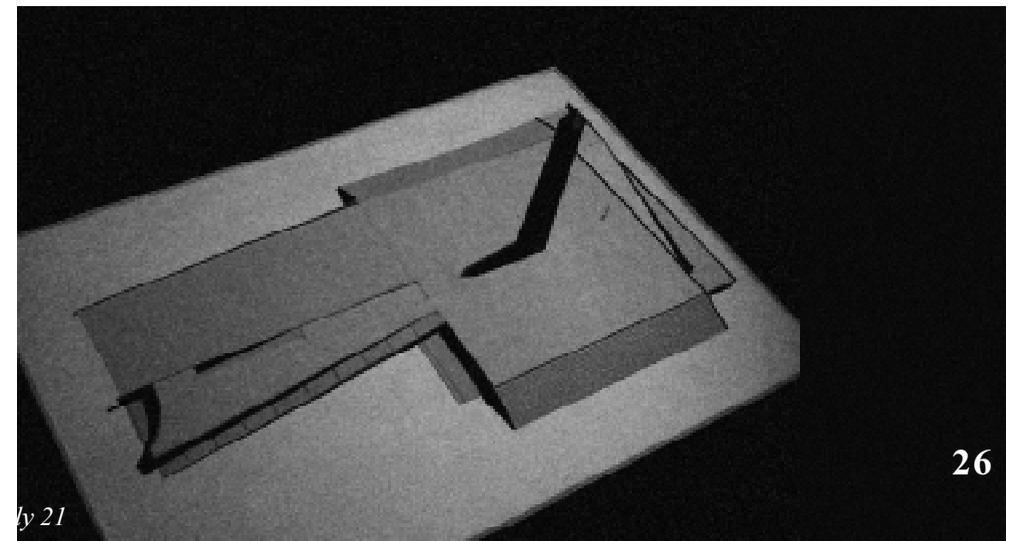
Plan of plaza and Washington Monument



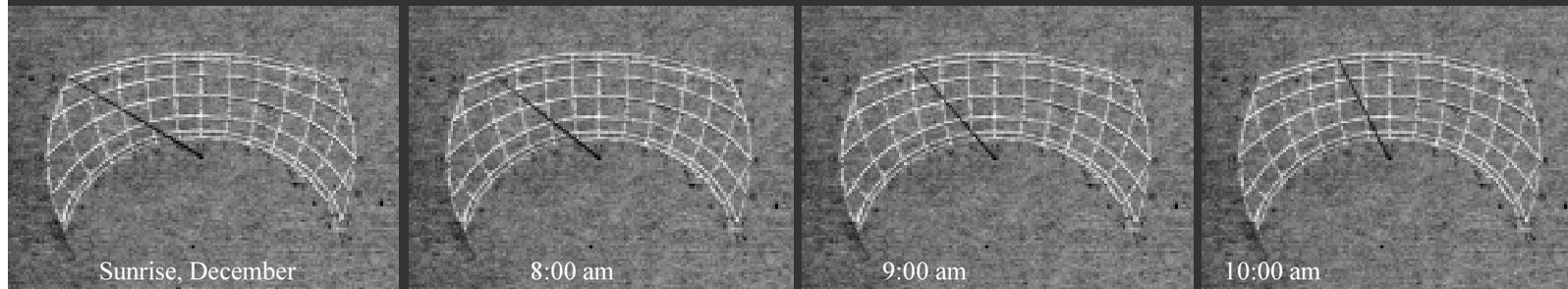
Noon, June 21



July 4



July 21

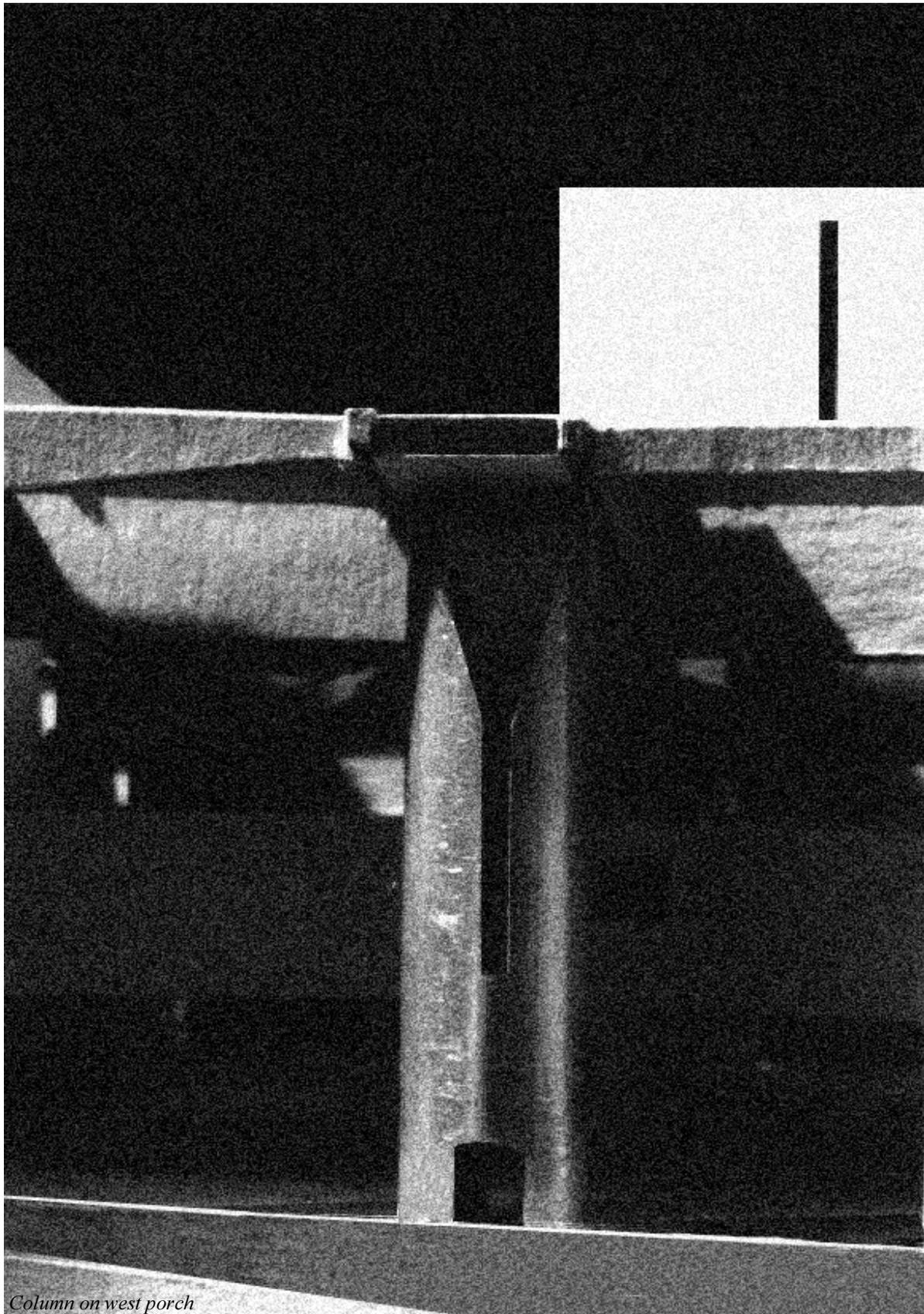


Sunrise, December

8:00 am

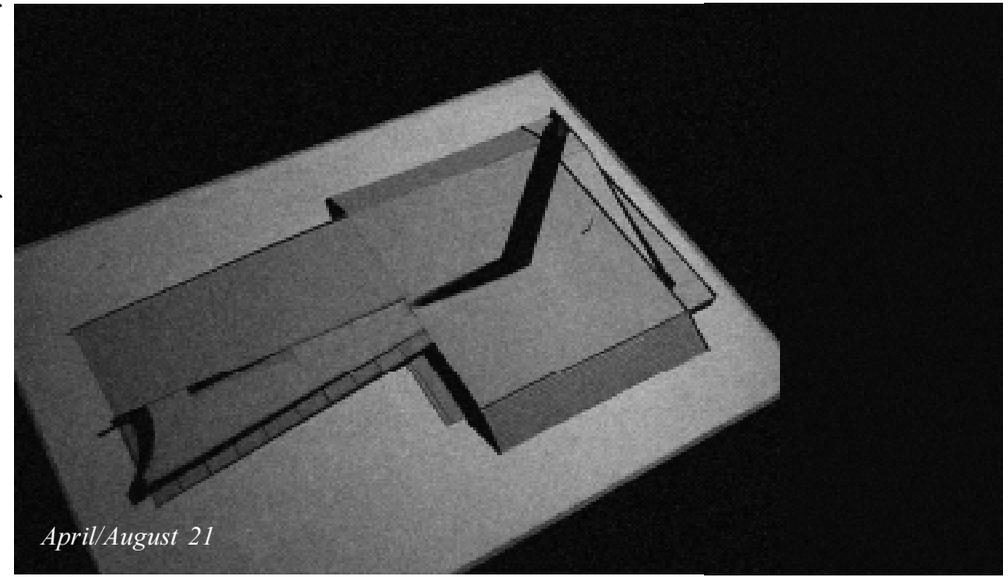
9:00 am

10:00 am

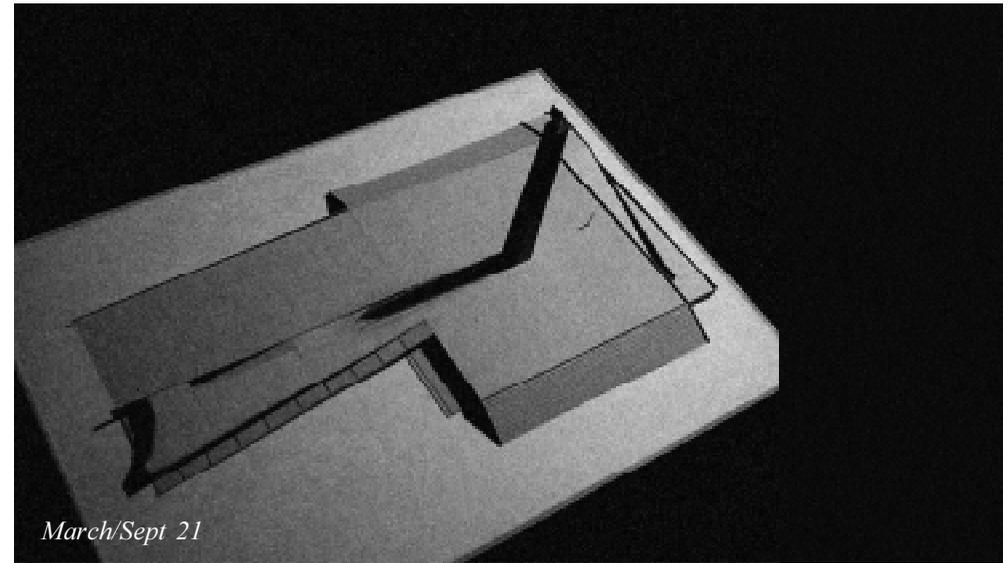


Column on west porch

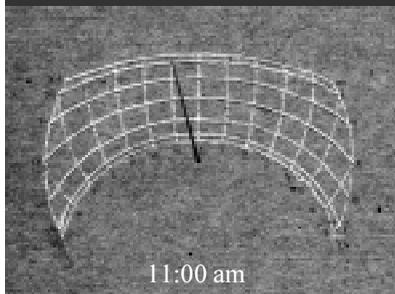
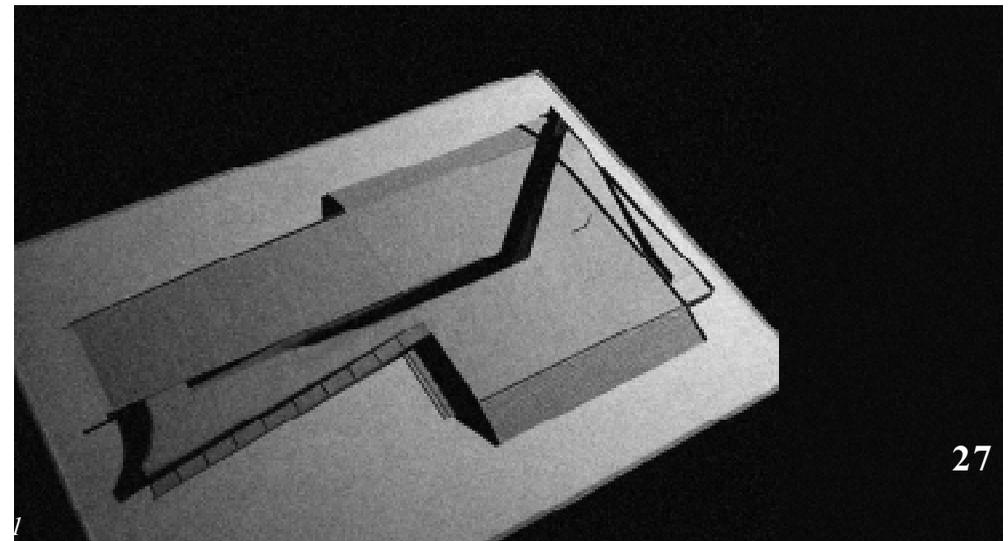
The opening towards the top of the column allows light from the setting sun to enter the building at the equinoxes. The light is then passed through a large lens that concentrates it in to a beam of light. The beam of light is then directed through a prism inside the building, where the light is defracted, and transformed into colored beams.



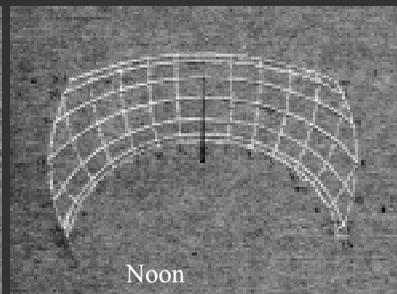
April/August 21



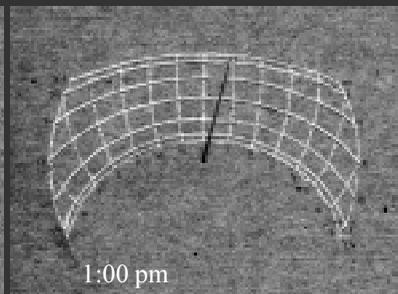
March/Sept 21



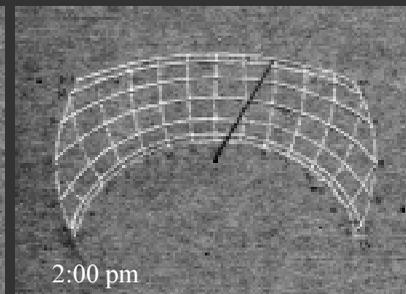
11:00 am



Noon



1:00 pm



2:00 pm

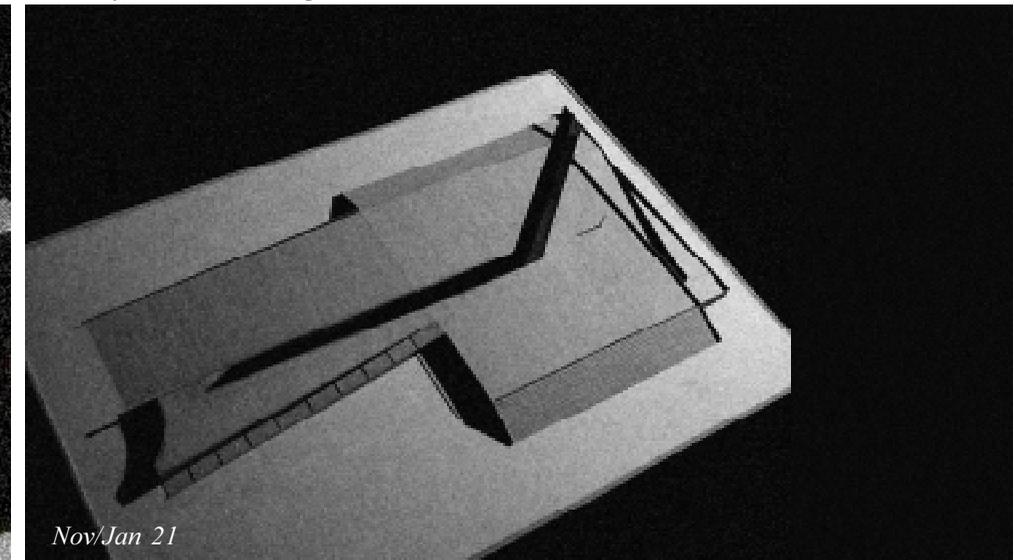
Architecture is a constructed thing which requires material in its making. Light, according to some, finds its highest expression when revealed by material in the form of architecture. It is evident that a work of architecture exists only if constructed, remaining an architectural idea or dream otherwise. The transformation of this dream into a reality immediately makes the dream vulnerable. Vulnerability in this case means accountability to things of this world: gravity, weather, the limitations of materials, construction. The revelation of a good idea occurs when the intention of the original dream remains as the thing becomes a constructed reality. This process of transformation and translation, involves among other things a choice of materials and structure. The choice of materials implies a certain type of structure, and vice versa. The nature of the selected material is revealed first by light; light enters the building as allowed by structure. Light, material, and structure all work together in the realization of architecture. The ways light enters a building, give the building its expression. The light is then given back as material, the character of the building coming from the material and the structure. In the end, the relationship that exists among light, material, structure, and space becomes inseparable, when they come together as a work of architecture.



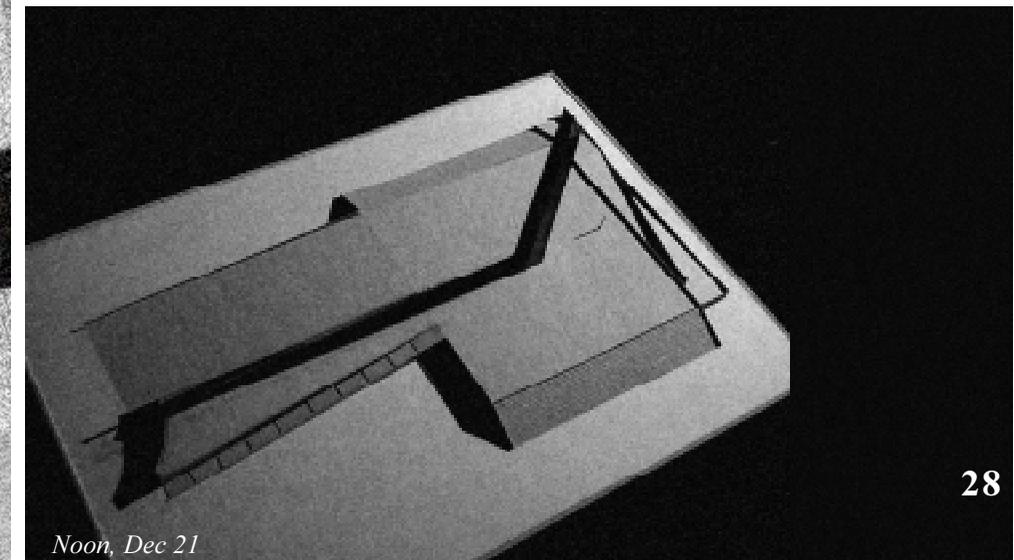
Sketch of column on west porch



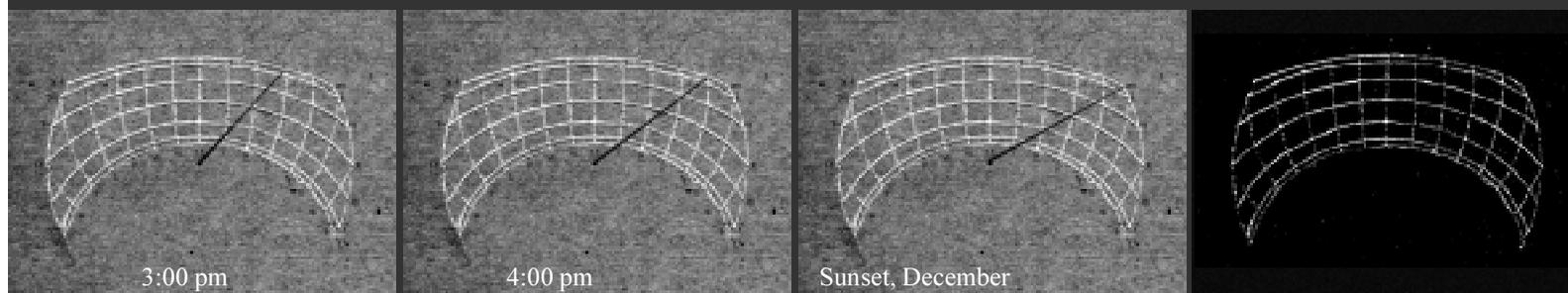
Sun light enters through prism



Nov/Jan 21



Noon, Dec 21



3:00 pm

4:00 pm

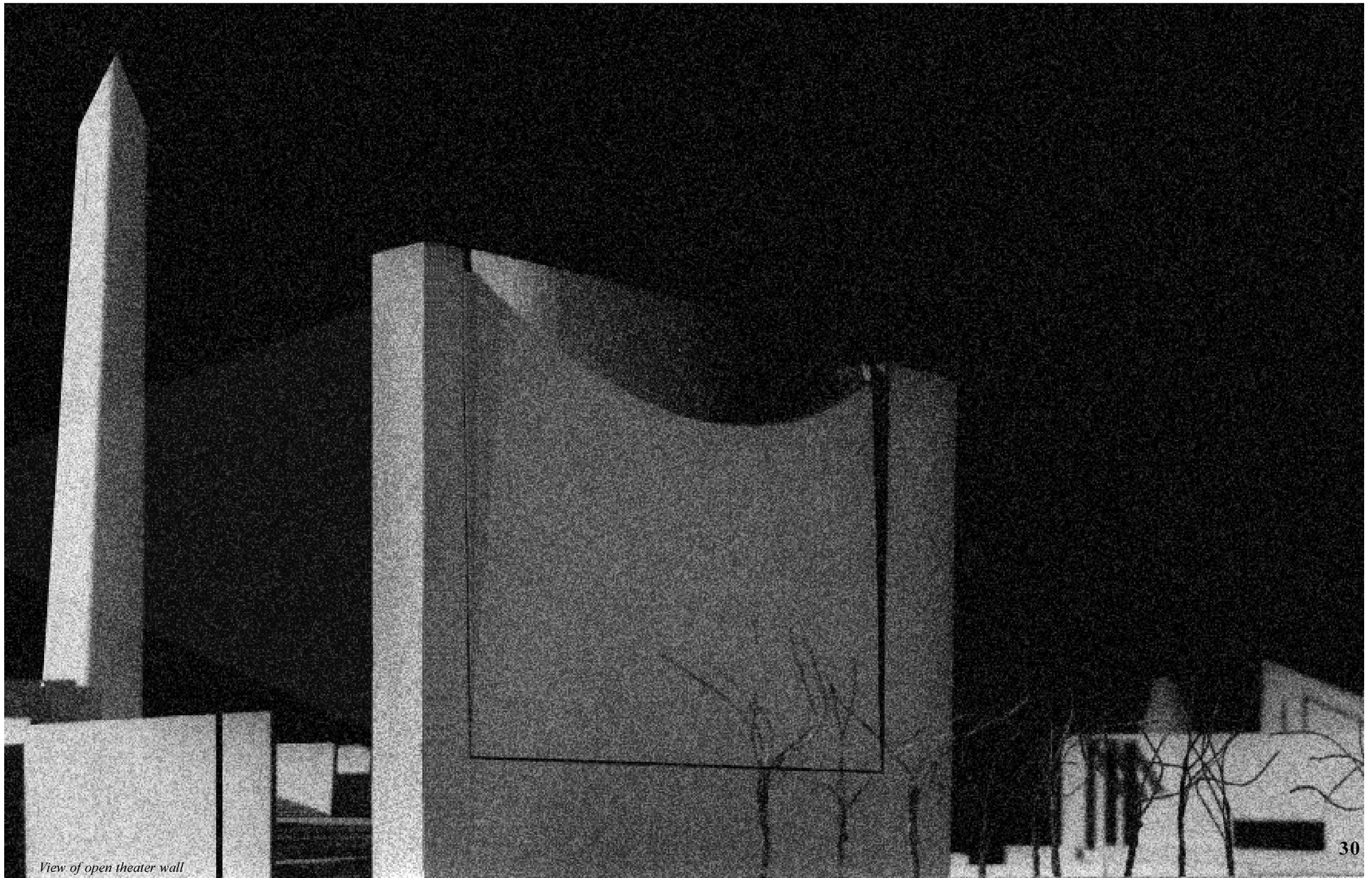
Sunset, December



View of open theater on South Site

“Architecture is the handwriting of man...When you enter his domain you know...his dreams.”

-Bernard Maybeck



View of open theater wall

“Architecture is a thing in itself...that you love to inhabit....”

-Jaan Holt

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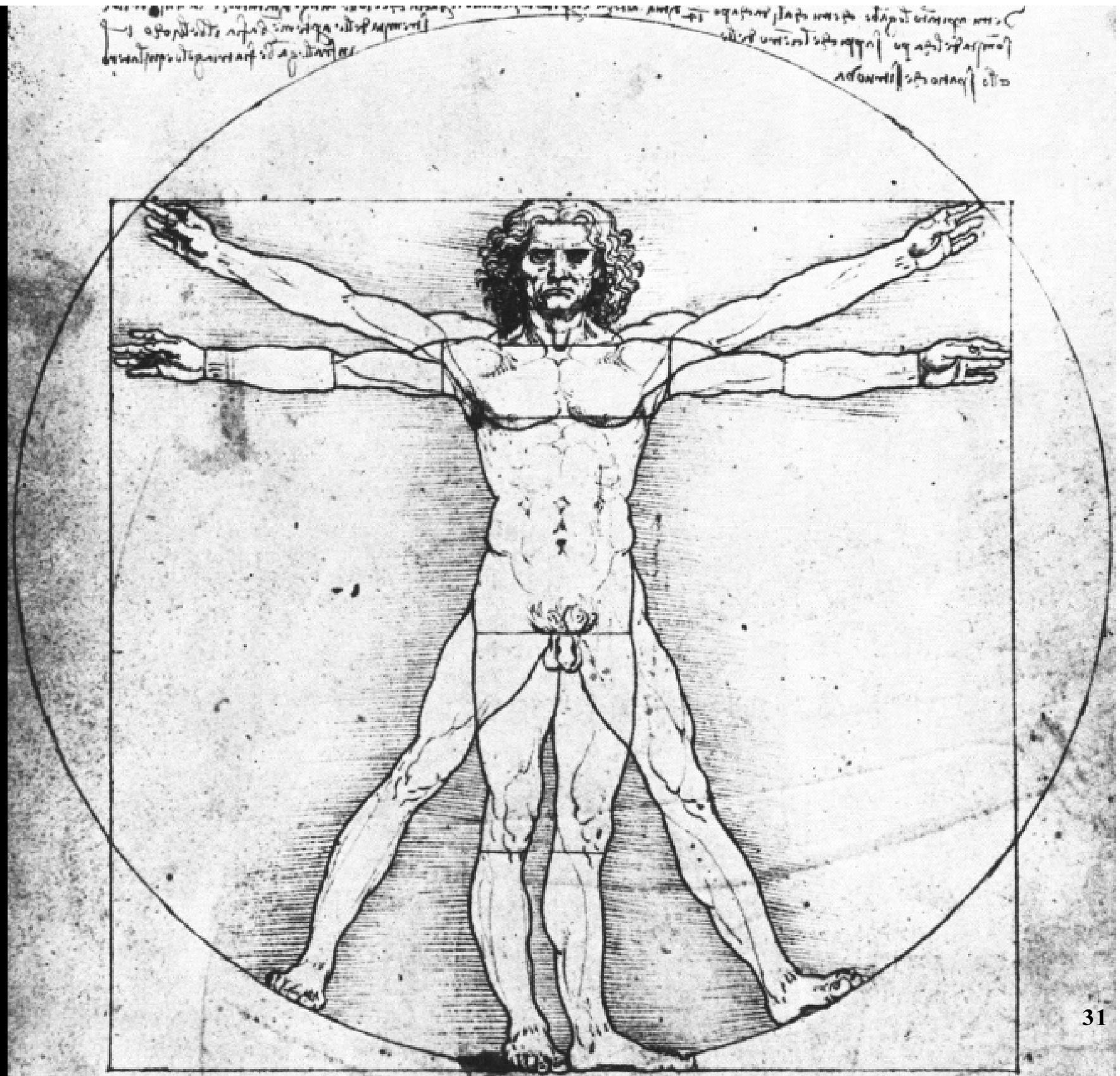
Wurman, Richard Saul. *What Will Be Has Always Been: The Words Of Louis I. Kahn*: New York, NY: Rizzoli, 1986.

Photo Credits

Pink Floyd. *Dark Side of the Moon* (CD Cover): Hollywood, Ca: EMI Records, 1994.

Schatz, Howard. *Waterdance*: New York, NY: Graphics Inc., 1998.

Watterson, Bill. *There's Treasure Everywhere: A Calvin And Hobbes Collection*: Kansas City, Missouri: Universal Press Syndicate Co., 1996.



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- 1995 Associates Degree in Architecture
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Davie, Florida

Awards

- 2000 Finalist, Virginia Society of the AIA, Virginia Schools of
Architecture Competition
- 1999 Thesis Project Award
- 1999 Director's Award
- 1999 Third Place, Washington Area Architecture Schools Competition
- 1998 Studio Project Award
- 1997 Finalist, Virginia Society of the AIA, Virginia Schools of
Architecture Competition

