

**approaching architecture**

Thesis is submitted to the Faculty of the Virginia Polytechnic Institute and State University in fulfillment of the requirements for the degree of Master of Architecture

Roberto Gardoni, Blacksburg, Virginia, Day of Defence: February 10, 2000  
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**approaching architecture**

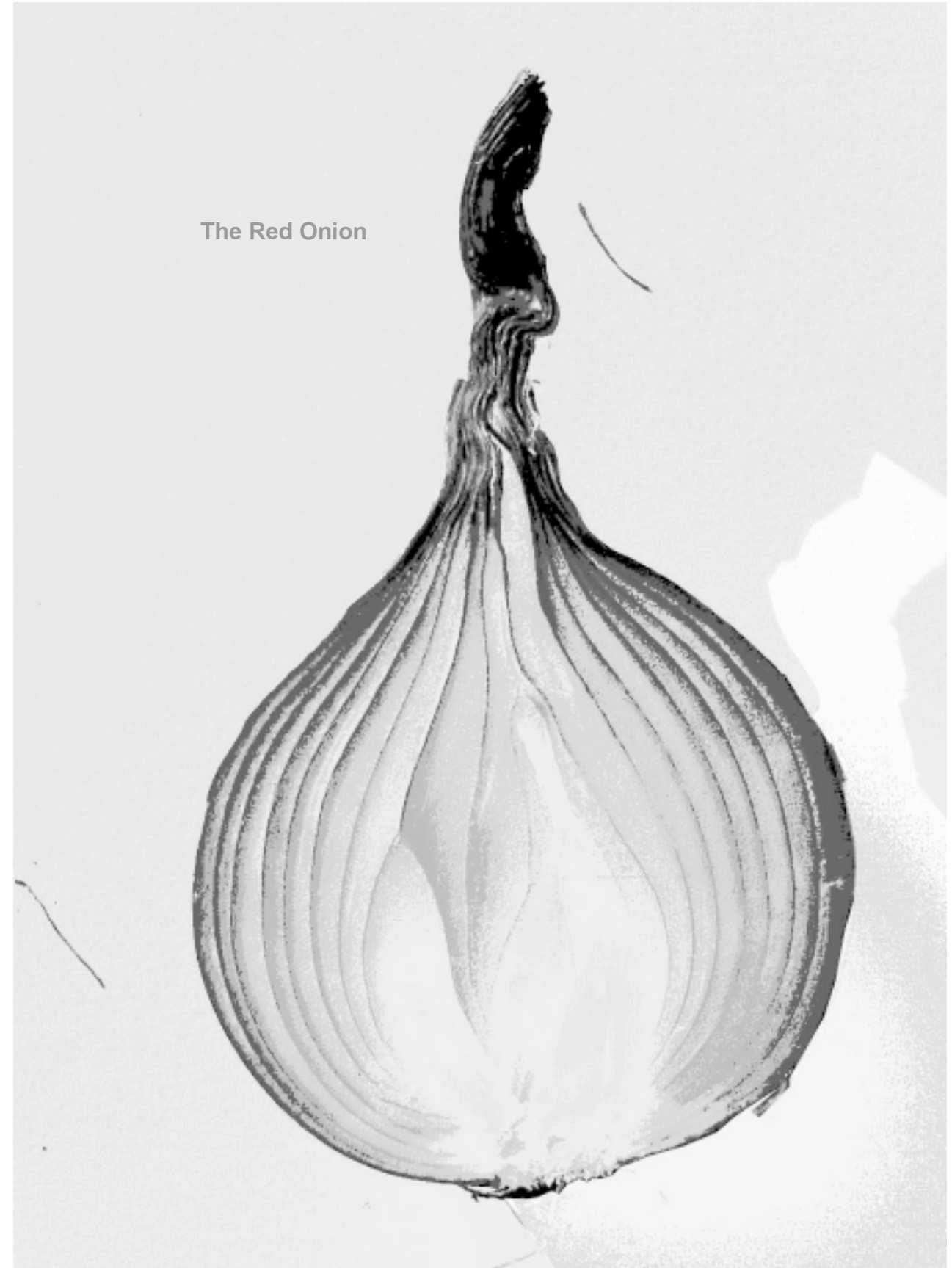
## Foreword

This book presents a project that celebrates a key event in the development of human technology, the first flight of the Wright Brothers in North Carolina. However, this book does not concentrate in a monument or in a building-monument to celebrate the episode but focuses on the process of designing a building. In fact, as the reader will see, this thesis distinguishes two basic stages of architecture. One, the most relevant in this case, is the process of achieving architecture; the second is the statement of a position in architecture.

Making a statement in architecture refers more to the concrete result of the design, which relies on technical details and precise plans that dissect the object. However, the process of achieving architecture goes beyond the concrete and intends to encompass the more elusive interaction between rational research and sensible exploration. In Roberto's work, sketches, photographs, computer images, rough color papers, and collages are the instruments to express the dynamic pursuit of an architecture that intends to go beyond the evident.

Some could criticize its lack of concretion and its ethereal character; nonetheless it is necessary to understand the final result of February 2000 in relationship with the competition project of May 1999. Both designs, the very exploratory and the very precise, are evidence of concern about the complexity and comprehensiveness of architecture. Moreover, this study of exploration and concretion in architecture seems to be a good transition as the author leaves the university and enters the realm of professional life. From this fact results the name of this book "Approaching Architecture" that in some sort reminds the patient, gentle, and short yet significant flight that occurred in North Carolina almost one hundred years ago.

## The Red Onion



The Red Onion

The perception of an onion is a single, compact, vegetable or object. And yet the onion is more complex if one cuts the onion into two pieces. From the outside one does not imagine that the onion consists of many various layers. These layers are perceived and experienced in terms of smell, weight, water content, colors, differing surface and differing thicknesses.

The ideas of the design process are of a similar quality as the layers of the onion. As one looks behind the presence of a building, many complex thoughts and concepts can be discovered. The knowledge about these thoughts and concepts helps the architect to understand design decisions which were taken in the former design process. In this way one not only starts to understand the main idea of the design but also to learn about the consequences which led to the development of the design.

During the design process one should not stop with the primary idea, and one should know that this idea is not the only one to lead to the realization of a building.

Thinking in layers is an investigation to acquire knowledge. In the design process, it is often difficult to recognize good ideas which are valuable.

It seems almost impossible to look through many various thoughts in the thinking process. Layered thoughts are perhaps analogous to the layers of tracing paper which receive the projection. In their examination lies the potential to discover an idea which could materialize thoughts of an architect through architectural form.

These ideas, which are unknown to us at the beginning of the design process, have the potential to be the valuable during the entire design development. The design process is characterized as a model of many various and complex ideas which are realized in the project itself

The result of the investigation is the introduction of an order through which to understand and develop the design. This leads to the necessary decisions throughout the design process.

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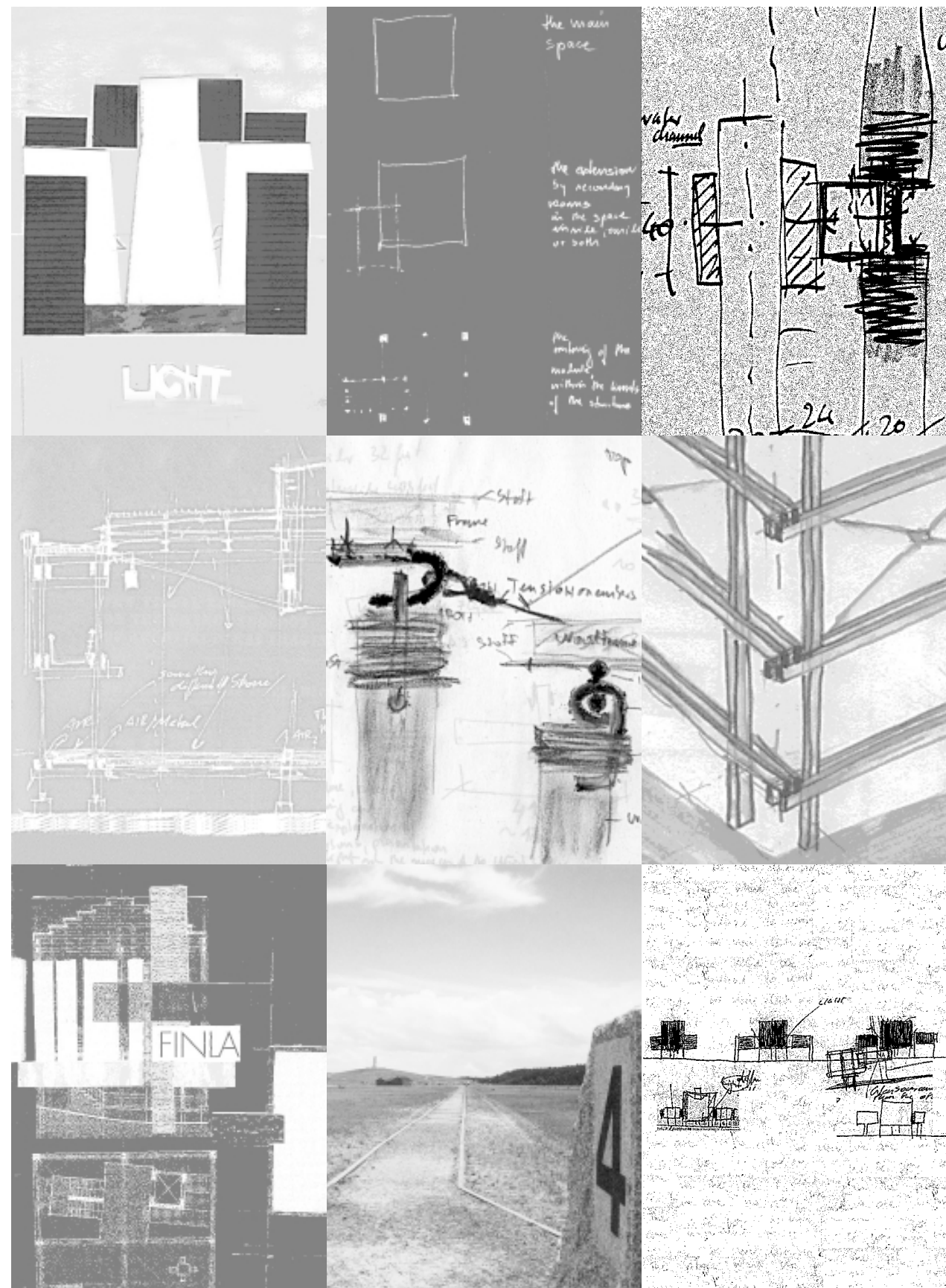
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approaching architecture



## Thesis Workshop



The Wright Brother Memorial at Kill Devil Hill on the Outer Banks of North Carolina Beach reminds us that this is the place where the first successful airplane flight occurred on Dec 17, 1903.

The monument situated on top of the hill is the most dominant structure of the site. Down the hill from the monument large stones mark the landing points of the first flight.

The purpose of the design is to create buildings for an additional Weather Research Center including library, auditorium, information center, research facilities, and apartments. Moreover, it is important to replace the existing and inadequate museum for the Wright Brother's airplane and its history.

The urban strategy involves the monuments of the past with the new buildings through a connecting path of flying bridges and ramps. These new buildings are creating a dialogue with the monuments of the past.

The new museum not only offers more light and space but also combines the museum with the proposed urban strategy.

The three important considerations for the design are:

**historical responsibility**

**extreme weather conditions**

**flexibility and compactness of the buildings**

The existing monument and stone marks are the essential elements that lead to an initial understanding of the history of the site. Linking the monument and the stone marks with a path allows visitors to experience the history of the events of this site. The path also allows for the introduction of new buildings along it's length. These buildings provide a place for the museum and the services of the Weather Research Center.

The extreme weather conditions caused by the nearby Atlantic Ocean has resulted in the design of buildings which are simple, compact and closed in character.

The main structure is proposed as a laminated wood frame which is enclosed by prefabricated panels. Secondary volumes are added to the main building. These added boxes are constructed in concrete, steel, and glass. The structure of these added elements works independently of the main structure of laminated wood. The enclosure of the main building encompasses these added boxes, and allows these added boxes to integrate and extend to the main building with. These boxes not only provide the building with additional light and air but also link the main space with the outside.

In order to achieve both identity and flexibility for each building, the added and integrated boxes modify and transform the building.

Design Intention

Recognition of the Site

There are two main ideas for an order of the site: a more radical interreaction and a contextual response to the existing fabric.

The radical concept, opposes the typical urban constraints. The radical interreaction design is independent of the site's characteristics. One of the most radical urban design in the history of architecture was the design of the Villa Radieuse in Paris, 1928 by Le Corbusier. Another case of the radical approach is the design of the Centre Pompidou in Paris, 1976 by the architects Renzo Piano and Richard Rogers. In order to make the design of the museum possible a whole quarter of the old urban fabric of Paris was demolished. The design concept is that of a technical box which does not directly correspond to the existing fabric.

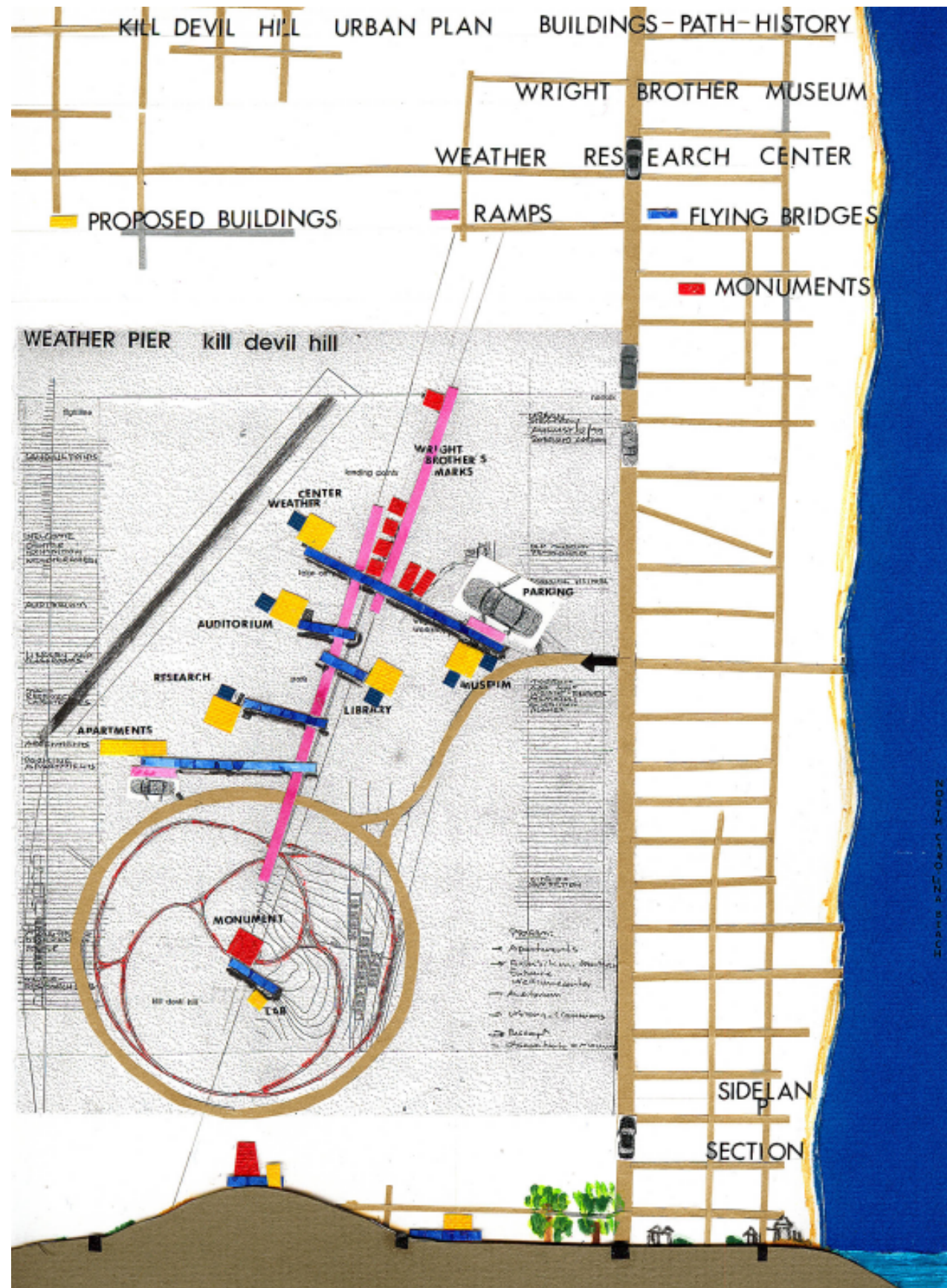
On the other hand the contextual draws directly from the site and its characteristic elements. Both the urban morphology and the urban context of the site are essential to the design. The first step is usually to visit and analyze the site. This site visit and additional research on social, economical, historical, and cultural aspects results in marking possible boundaries for the design.

The contextual urban design concept operates via the recognition of characteristic elements of the site exemplified by the works of French architect Christian de Portzamparc, or the Italian architect Aldo Rossi.

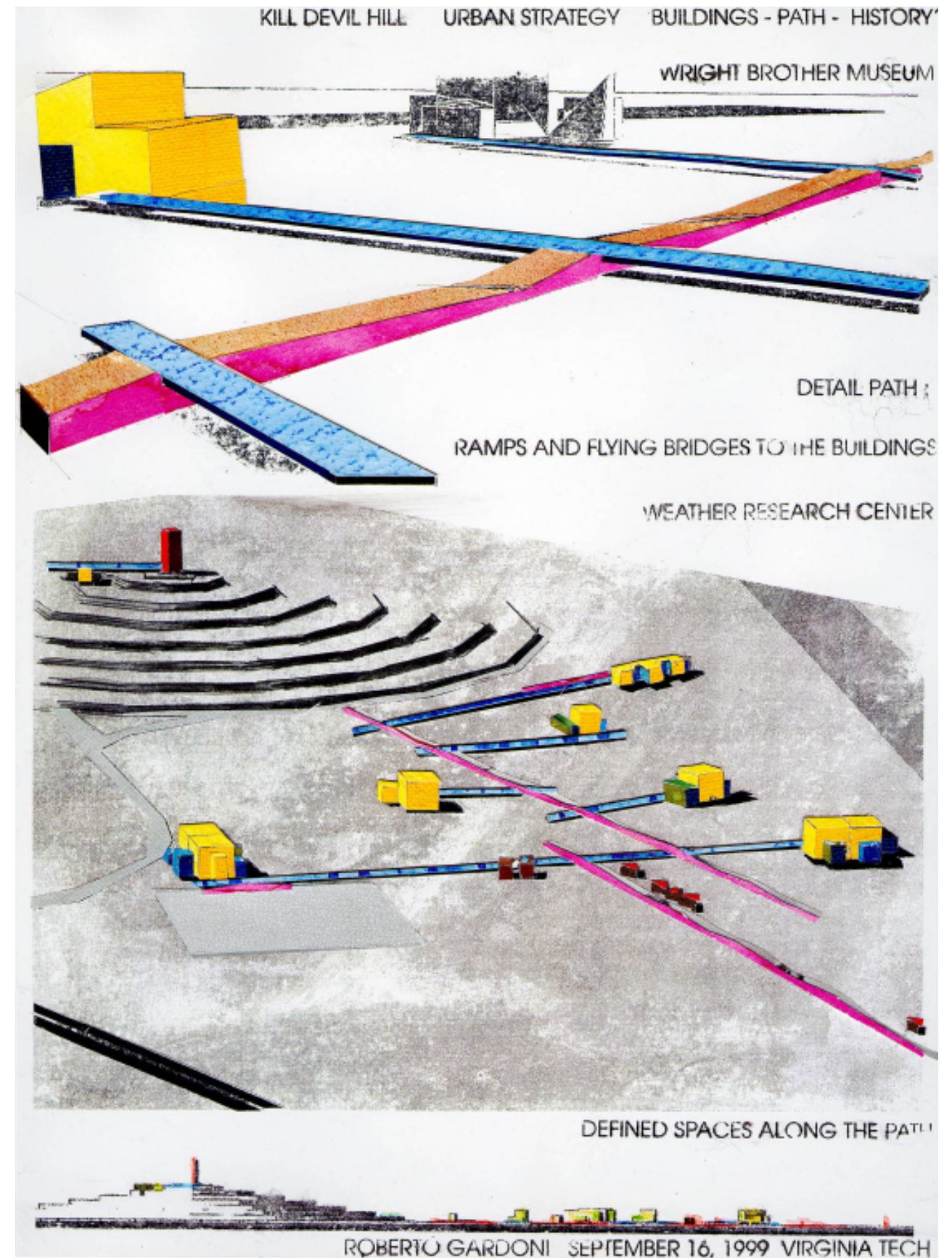
Christian de Portzamparc emphasizes characteristics of the site, that is the recognition of particular elements that describe the situation of the site. His approach also integrates the dimension of time to which the architect responds. (1)

Aldo Rossi recognizes key elements that links urban artifacts. The urban artifacts constitute the city. These urban artifacts possess a value in themselves which is dependent on their place in the city but also act as a generator of the city's form. The key elements, Urban monuments are fixed points in the urban dynamic. The city is constituted of parts, and each one of these parts is characteristic and a factor in the urban fabric. His approach is the understanding of the city's complexity which results in many interacting components. It guides the design from the very beginning to its completion. (2)



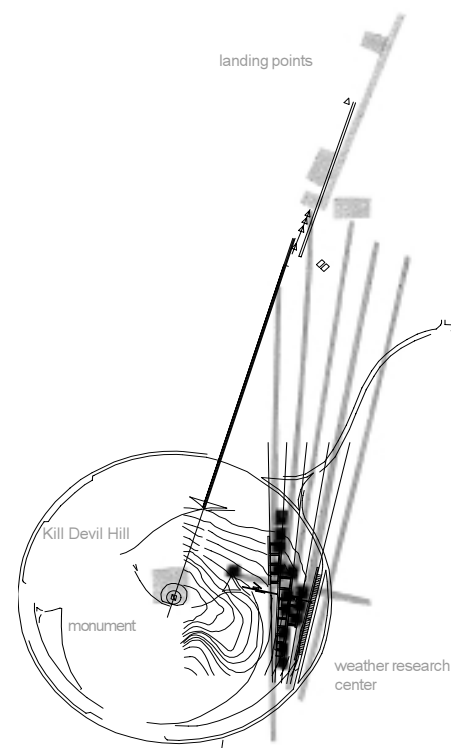


Weather Research Center and Wright Brothers' Museum Urban Development



Weather Research Center and Wright Brothers' Museum Urban Strategy

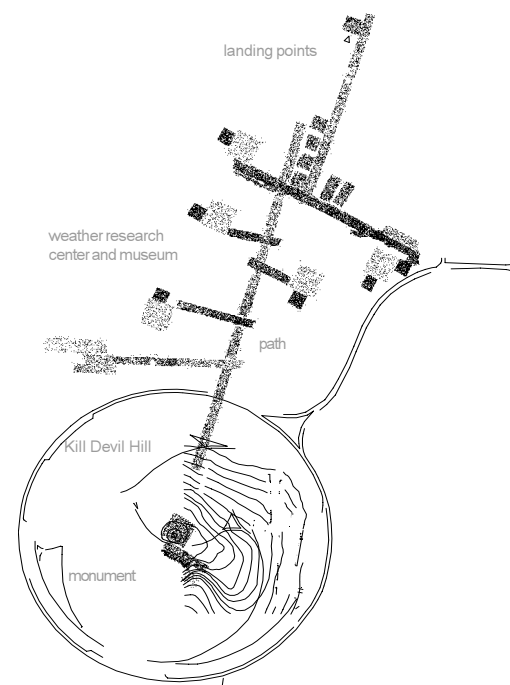




Urban Strategy May 1999  
for Wright Brother's Mu-  
seum, position:  
a dialogue with the past

The urban idea is to create a dialogue between historic elemts of the Wright Brothers' Monument and the weather research center. Putting the weather re-search center on the hill not only protects the buildings from seasonal floods caused by the hurricane but it also allows a visual connection between the build-ings and its visitors with the Atlantic Ocean.

## A Position in the Urban Strategy

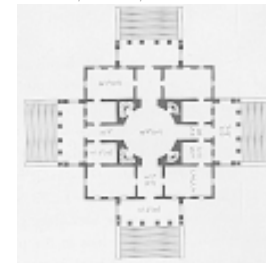


Urban Strategy September  
1999, position:  
linking history with a path

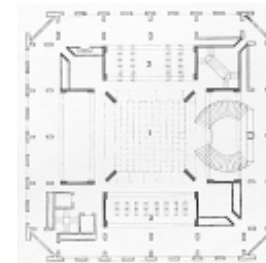
The urban strategy is to link urban elements such as the historical monuments, the buildings of the weather re-search center, and the Wright Brothers' Museum. The central idea focusses on this link through the path of flying bridges and ramps as a medium to connect these elements together. The path also addresses the direct axis that interact with all urban elements.



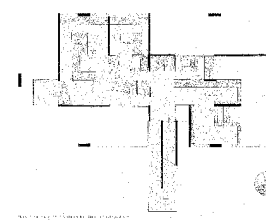
Andrea Palladio, Villa  
Rotonda, Vicenza, 1565



Louis Kahn, Exeter Library, NH.,  
1970



Le Corbusier Heidi Weber Pavilion,  
Zuerich 1965



## The Cube's Enclosure of the Magic Square

During the process of my thesis, I was confronted with the argument that the building was no longer recognized as a cubic volume, although the ground plan was developed from the simplicity of the square. The reasons for this confusion could be that the corners of the cube are not formed sharply.

What are the characteristics that leads one to recognize a building as a cube?

Some architects contributed outstanding proposals through the articulation of a cube.

There are three different approaches in dealing with the square and its volumetric perception as a cubical form to support the particularity of the site.

The first approach by Andrea Palladio, Vicenza 1565, is the Villa Rotonda with its corner condition. The palazzo is built on the summit of a hill where it seems absolutely right to have chosen the centralized plan and its cubical form.

Although the four porticos are emerging out of the cube, its powerful conception of a cube and a balanced building is emphasized by the sharp corners. The sharp corners mark a corner condition and are the elements that form the cube. The building is embedded in the beautiful hills and fields of the Venetian scenery.

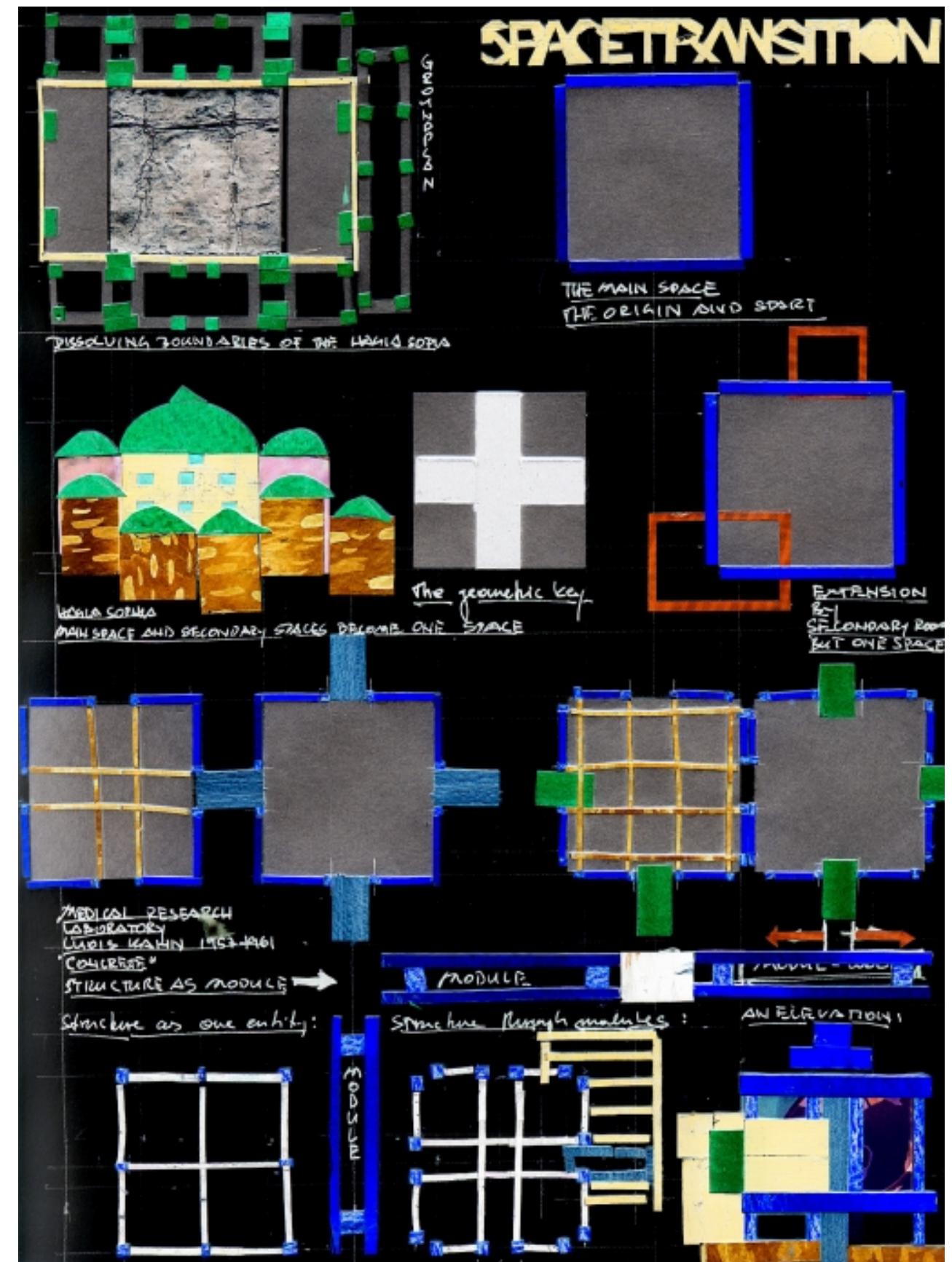
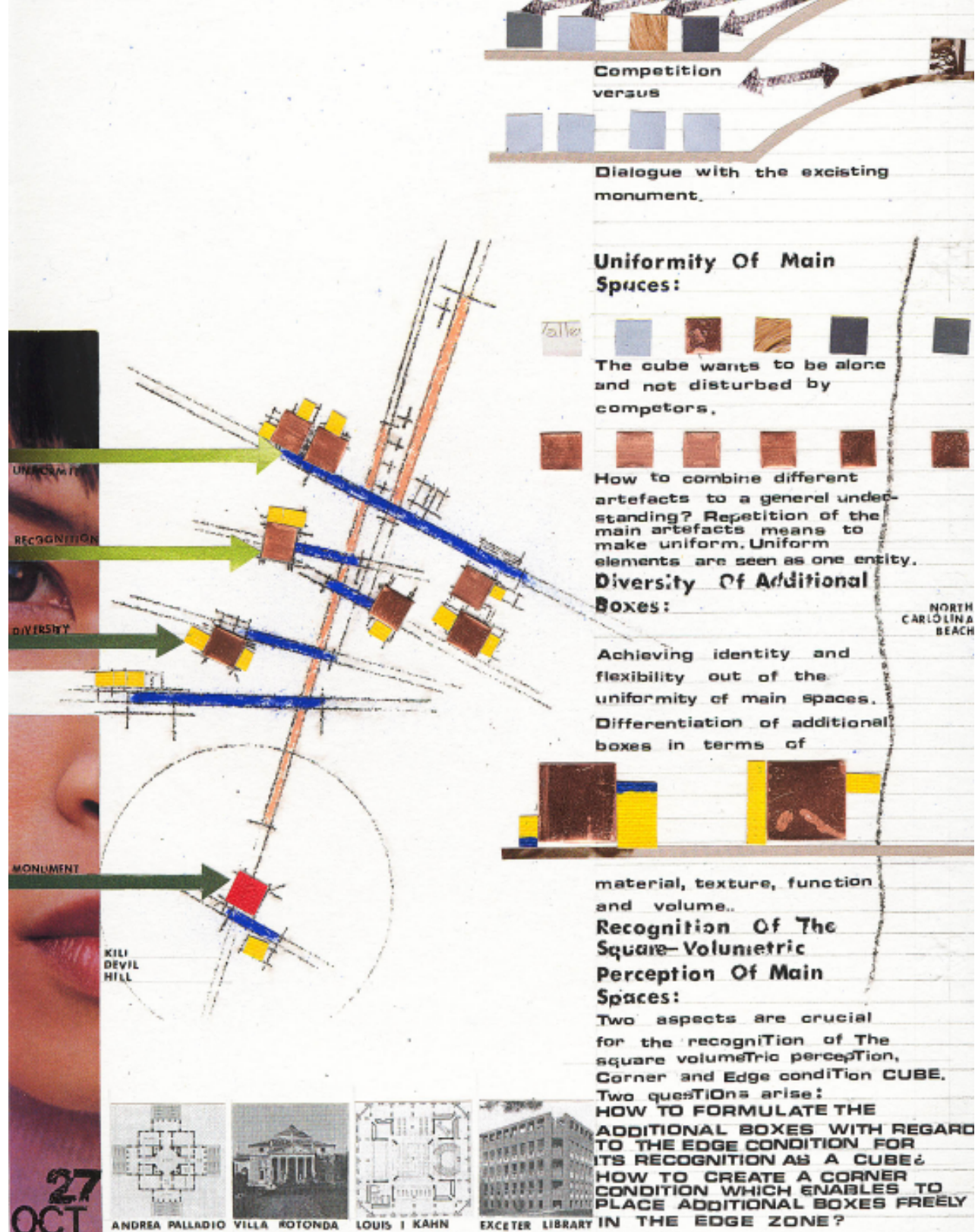
The second approach is found in Louis Kahn's masterpiece the Exeter Library in New Hampshire, 1970. In this building, Kahn created a cubic form by putting four simple planes together.

These planes and enclosure are part of the outer brick layer that frames the inner concrete core of the library. Kahn's philosophy was to keep the character of the brick wall as simple as possible. In this way the harmonic integration of windows, openings and wood infills contribute to the simplicity of these four planes. These four brick walls describe a edge condition which enabled the architect to free the corners. These corners are formed to link the inner core of the library with the outside garden of the academy. The edge condition is therefore crucial for the perception of the cube.

The third approach is found in the work of Le Corbusier, Heidi Weber Pavilion, Zuerich, 1965. The roof is perceived as an independent steel structure that emphasizes the volume of two cubes underneath it, similar to the idea of an umbrella. The **roof condition** of the Heidi Weber pavilion enabled the architect to build a detached volume underneath the described volume of the cubes. The cubes are recognized through the power of the roof construction, the detached buildings under the roof are organized independently from this roof.



# DESIGN STRATEGY OF THE CUBE'S UNIFORMITY





When Justinian, king of the East Roman Empire during the sixth century, gave the order to Authemis of Tralles and Isidore of Miletus to construct the unique church of Hagia Sophia at Byzanz he did not anticipate that Hagia Sophia would be the most remarkable and fascinating building of its time.

Twelve years after its dedication in 563 A.D. the contemporary historian Procopius wrote that Justinian's church subtly combines mass with harmony of proportions, having neither excess nor deficiency, in as much as it is both more pompous than the other buildings we are accustomed to and much more decorous than these which are huge beyond measure and abounds exceedingly in sunlight and gleaming refectations. Indeed one might say that its interior is lit not (only) by the sun from without but by a radiance generated within, such is the abundance of light that bathes this shine all round. (1)

The church of Hagia Sophia shows that the role of natural light is one of the animator of space. Light enriches the space with life. The colorful and warm light not only changes the properties of the materials, but also enables the visitor to experience and feel the room. The centralized plan culminates in the fulfillment of the splendid and magnificent inner cupola. This is a place which connects the faithful with heaven.

This is a place where the sun penetrates the inner main space.

This is a space where amount and intensity of light differentiate main and secondary spaces. This is the a place where reflections and color dematerializes.

This is a place that enriches the eyes.

This is a place.



Sketch of the Hagia Sophia by Edward Gibbon, 1781

Procopius, contemporary historian of Byzanz, 563 A.D. (1)

### Learning from Hagia Sophia

The architect Louis I. Kahn is one of the most influential architects of our time who clarified the meaning of institution in the field of architecture.

His idea of a library is that the reader takes the book to the light. In Kahn's masterpiece, the Exeter Library, the reader is connected and surrounded by the books, and the library truly becomes a house of books. The visitor has the opportunity to choose the place for reading. One takes the books from the dark shelves to the reading places of light, which is either a more public reading place or a more private and isolated reading place.

In my opinion his greatest achievement is the magnificent entrance hall, in which the books welcome the reader. This place becomes a circumstance of identification with the books. The library embodies an institution.

During the project I asked myself how the visitors could recognize the proposed building as the Wright Brothers' Museum?

How can the Wright Brothers' Museum become an institution?

In my point of view, a museum is an institution because it has the power to materialize as an important place where people meet history. In our society, the institutions of the past lost their power. Churches are not any longer the fixed points of our society; our attention is focussed on the houses of money and power. The institution of a museum could fulfill a new role in our society, and become a center of knowledge and learning.

My question is, what is the generator that transforms a building to a museum and also transforms the museum into an institution?

The old concept that objects are choosen and placed in an existing building is no longer valid for the new museum. Objects have the power to dictate the measurements and the architecture of the building. The object is the generator for the museum which means the building is designed by the object itself.

"We were used to museums,(...) where the art was placed after the fact, (that is to say) after the building had been designed, This preconception has now been reversed. The art creates the architecture, defines the rooms and determines the wall dimensions" (1)

#### institution / to institutionalize

1a :  
a habit, custom, etc., which has been in existence for a long time:  
the institution of marriage

1b :  
a person who has been in the same place and or doing the same thing for a long time:  
That old man in the park is a regular institution.

2 :  
(a large building for) an organisation, usu. a long established or well-respected one:  
the big city institutions(= the banks and other companies in the city of London that deal with money).....

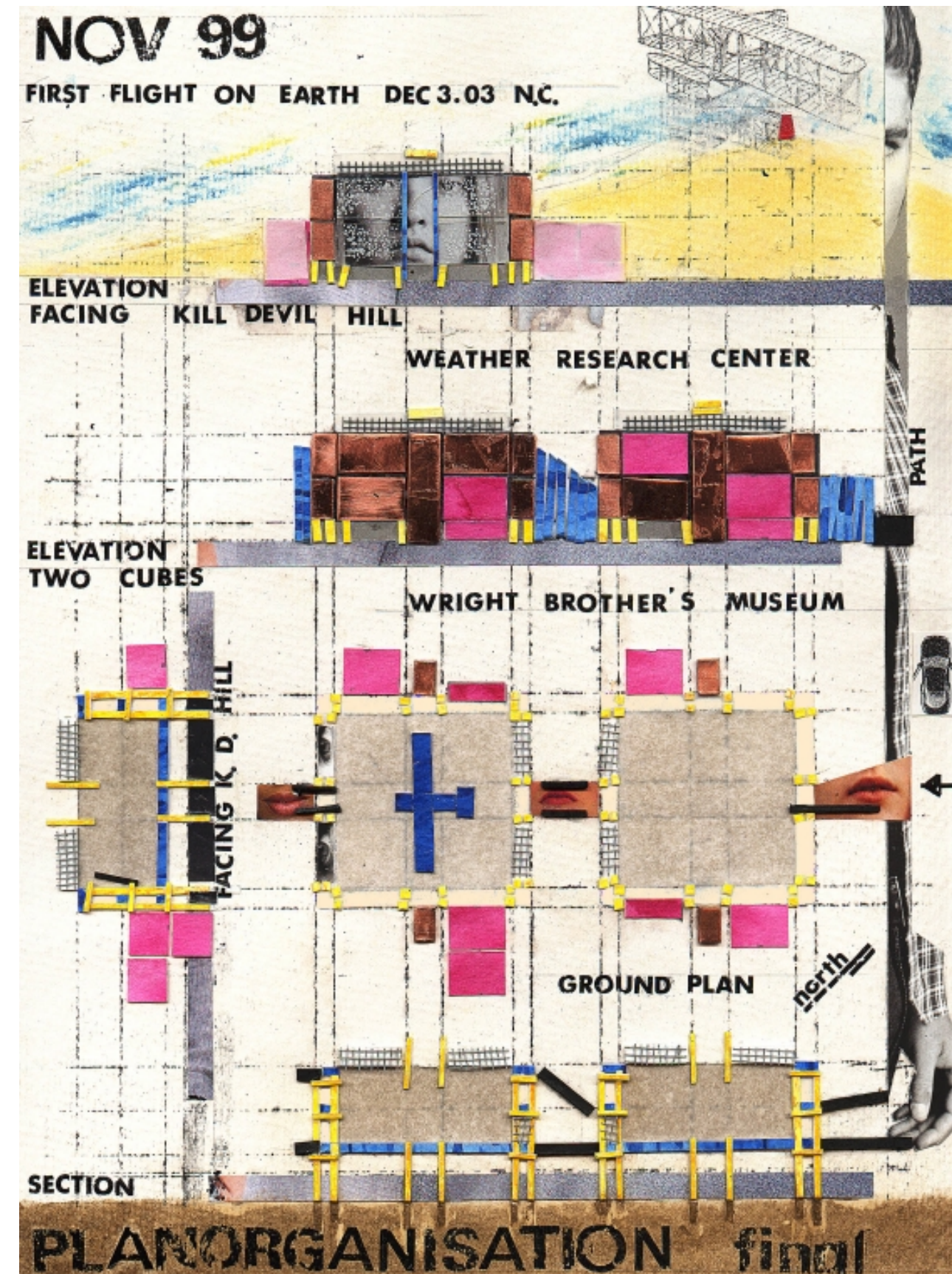
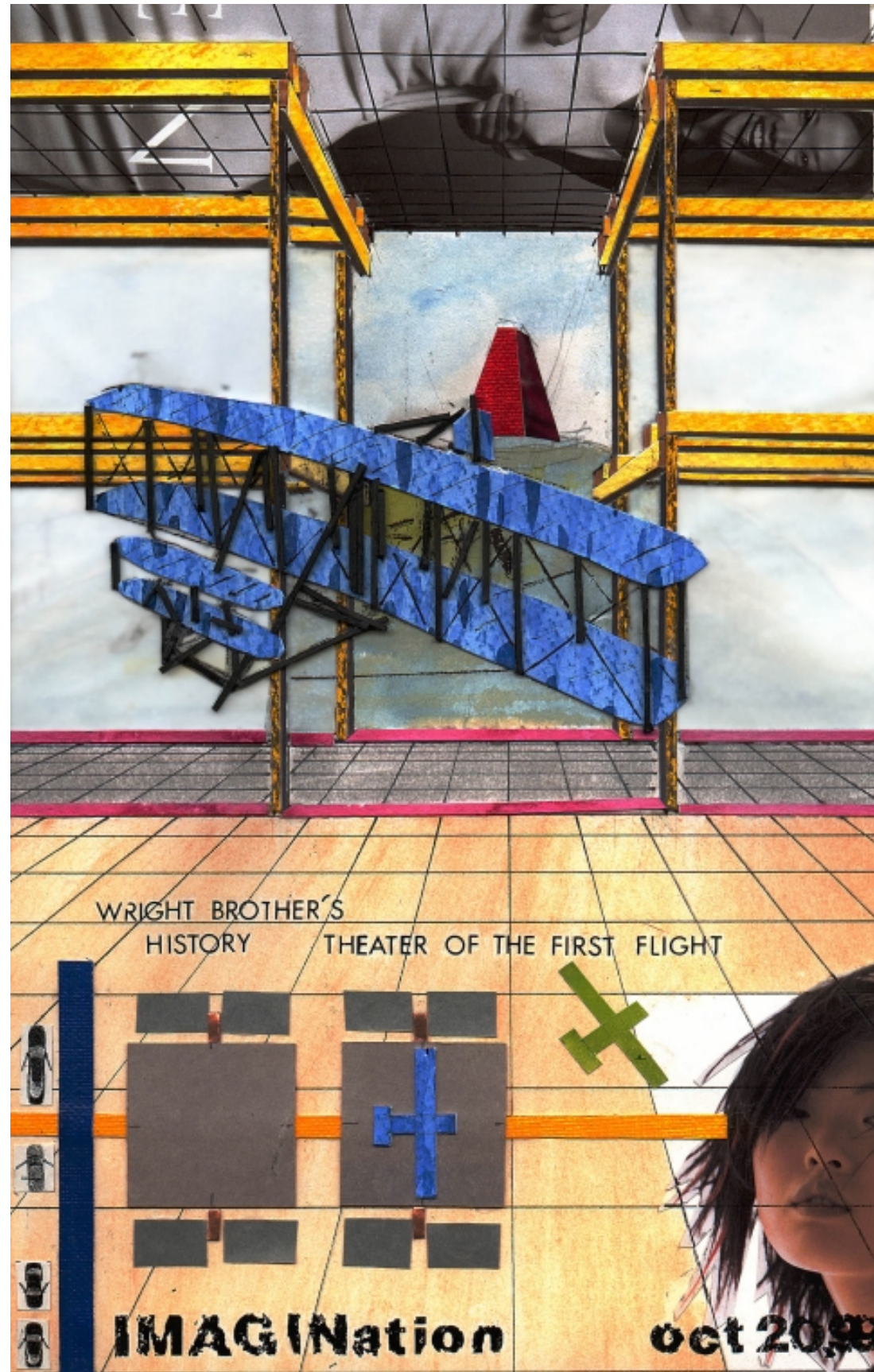
#### museum

a building or room where objects are kept and usually shown to the public because of their scientific, historical, and artistic interest. (2)

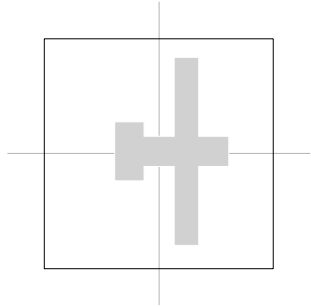
Longman Dictionary of Contemporay English (2)

Bruno Zevi quotes from Michael Braune: "Neue Museen", Stuttgart 1965, p30 (1)

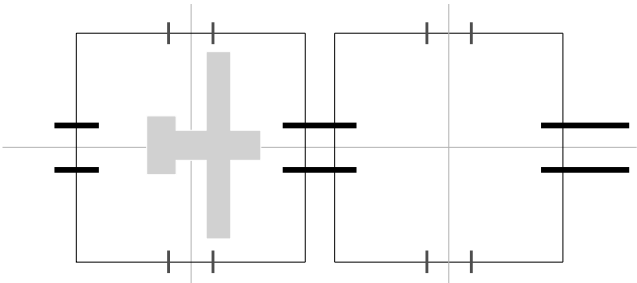




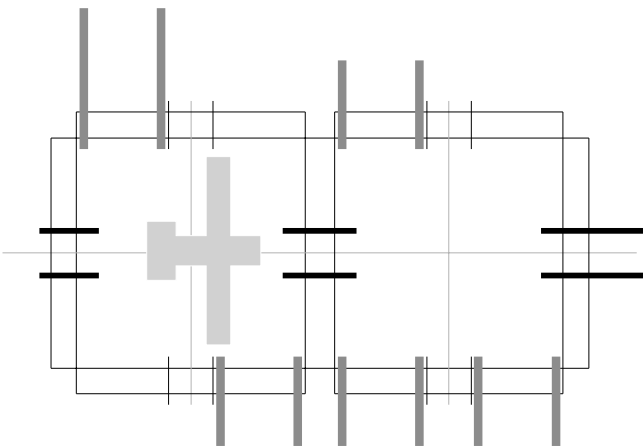




one main space:  
The core of the museum is the space needed and formed by the measurements and requirements of the Wright Brothers' airplane. This space is devoted to the exhibition of the airplane.  
One question could be how to embed the airplane into the space?



two main spaces:  
One main space is extended to two main spaces. Both spaces possess the same importance. The space that is as important as the exhibition space for the plane is the room in which the visitors are welcomed and introduced. This room has its origin in the ground halls of the pallazzi in Europe. The visitor is guided by the main axis through the spaces. The main axis is oriented by the entrance, the connection with both spaces, and the big window that links to the Wright Brothers' monument.



backpacks:  
The other consideration in the development of the ground plan was the introduction of secondary rooms. These rooms fulfill other necessary functions such as bookstore, rest rooms, special exhibition rooms and utility.  
The concept is to create volumes which are added to the main spaces. These volumes are like backpacks which are connected through a layer around from the main spaces. The layer's role is to differentiate the main space from the backpacks but also to enable the visitor to move from one room to the next room without doors.

see the chapter "the Development of the Plan"

Development of Plan, Section and Elevation

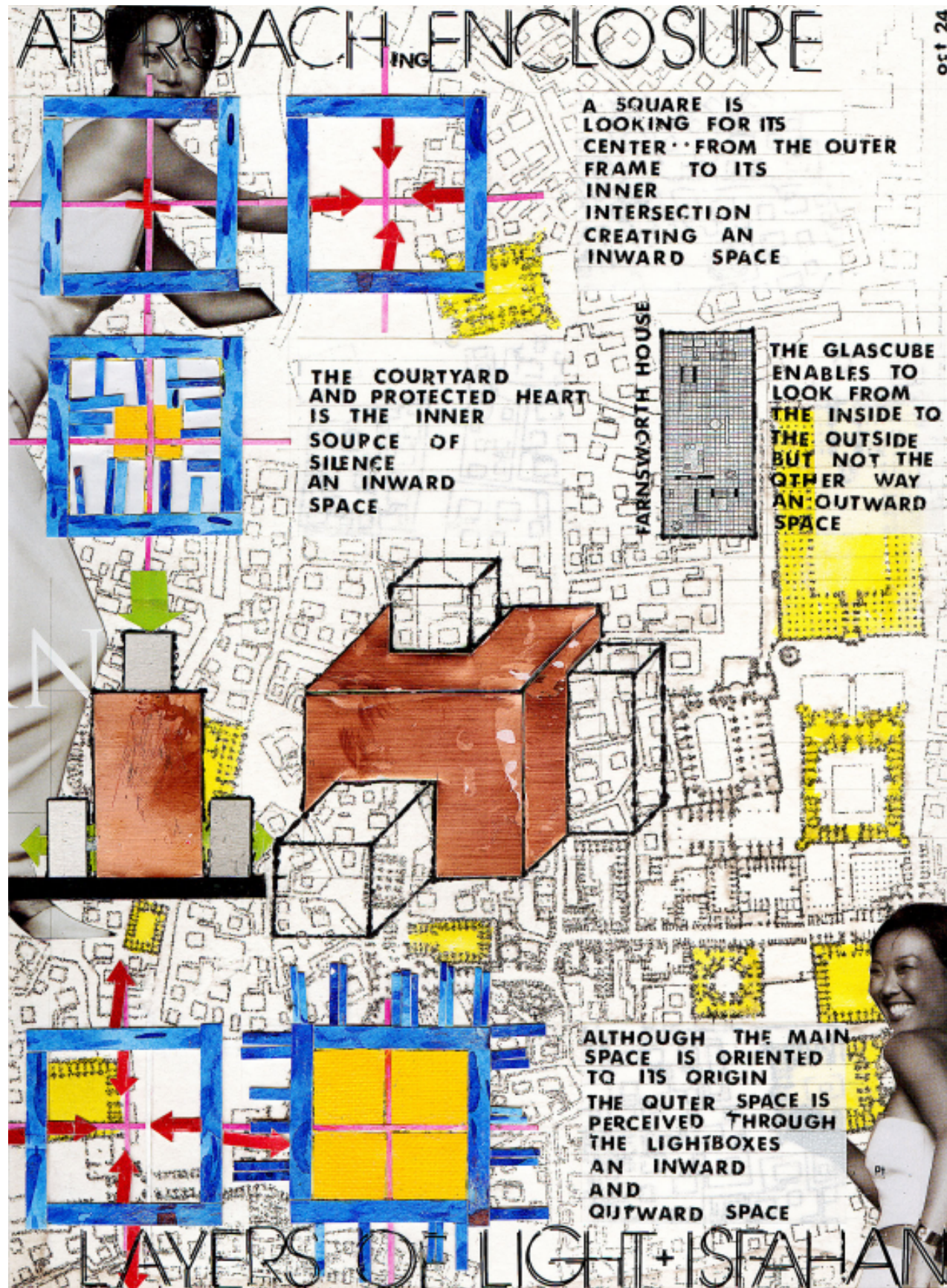


Layers of Light



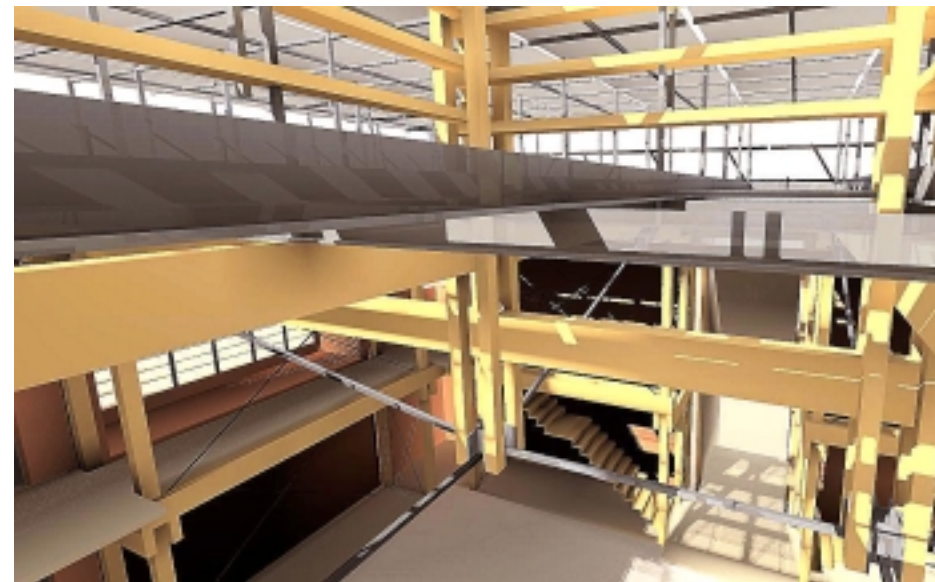
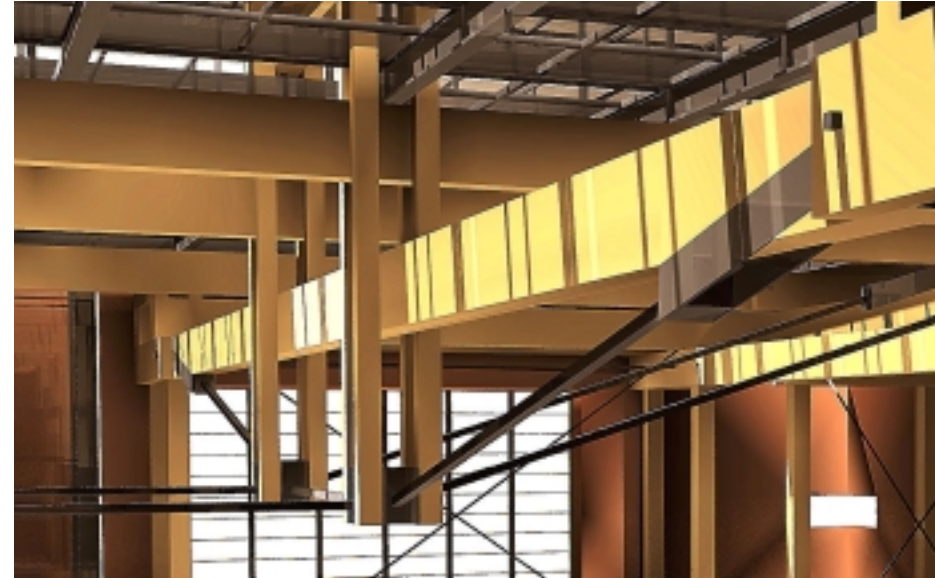
Mies van der Rohe, Farnsworth House    Klaus Herdeg and Nasser Albuhasan, Study of Isfahan



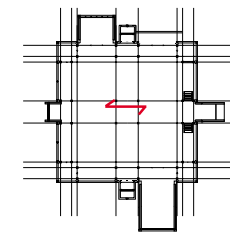


## Weather Station and Museum Wright Brother's Kill Devil Hill

View Detail Main Structure Roof



View Detail Roof



Dec 19,99



**modular wood frame:**

The concept for the main construction elements of laminated wood is clear and simple: modular, structural elements are placed around the main space. The structural elements are the outer layer of the main space that links the main space with the secondary spaces.

"As in music, where the space between the notes define the quality, here it was the space between the pieces which defined the scale." (1)

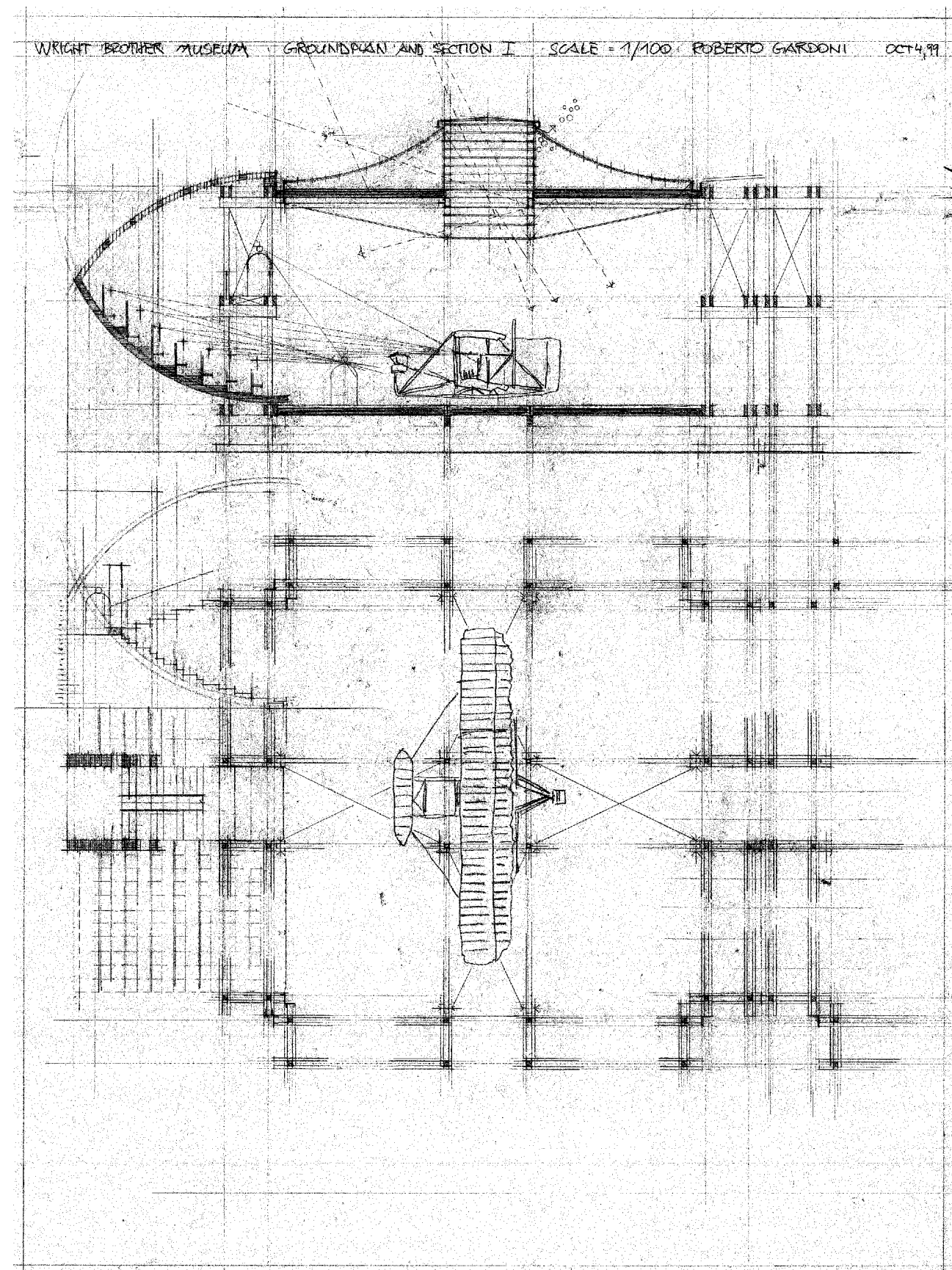
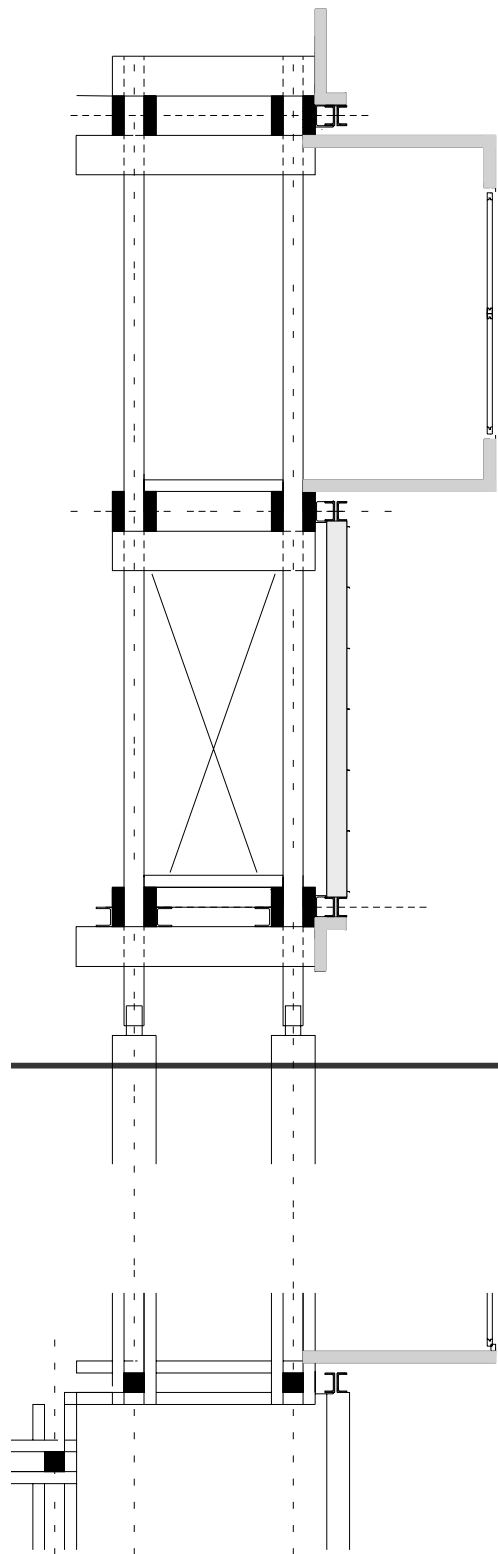
**structure and enclosure:**

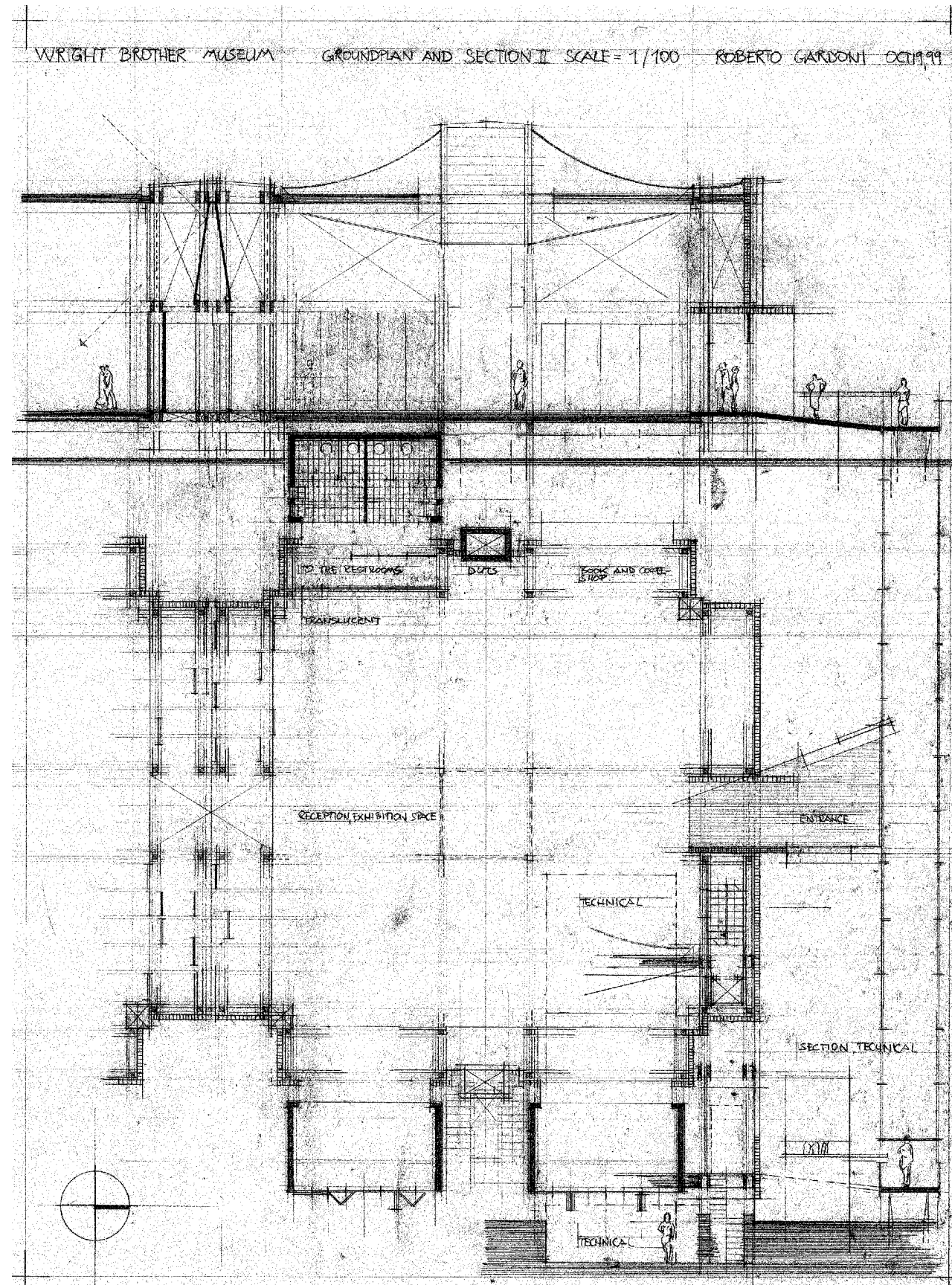
The main space is a single space constructed by a wood frame. The character of a free, vivid and gracious main room is given by the light wood structure which works as a smooth boundary to the fixed enclosure. Concrete, steel, and glass are used for the secondary rooms which interact with the main space. Compressed, tubelike rooms link the visitor with the outside.

**philosophy of materials:**

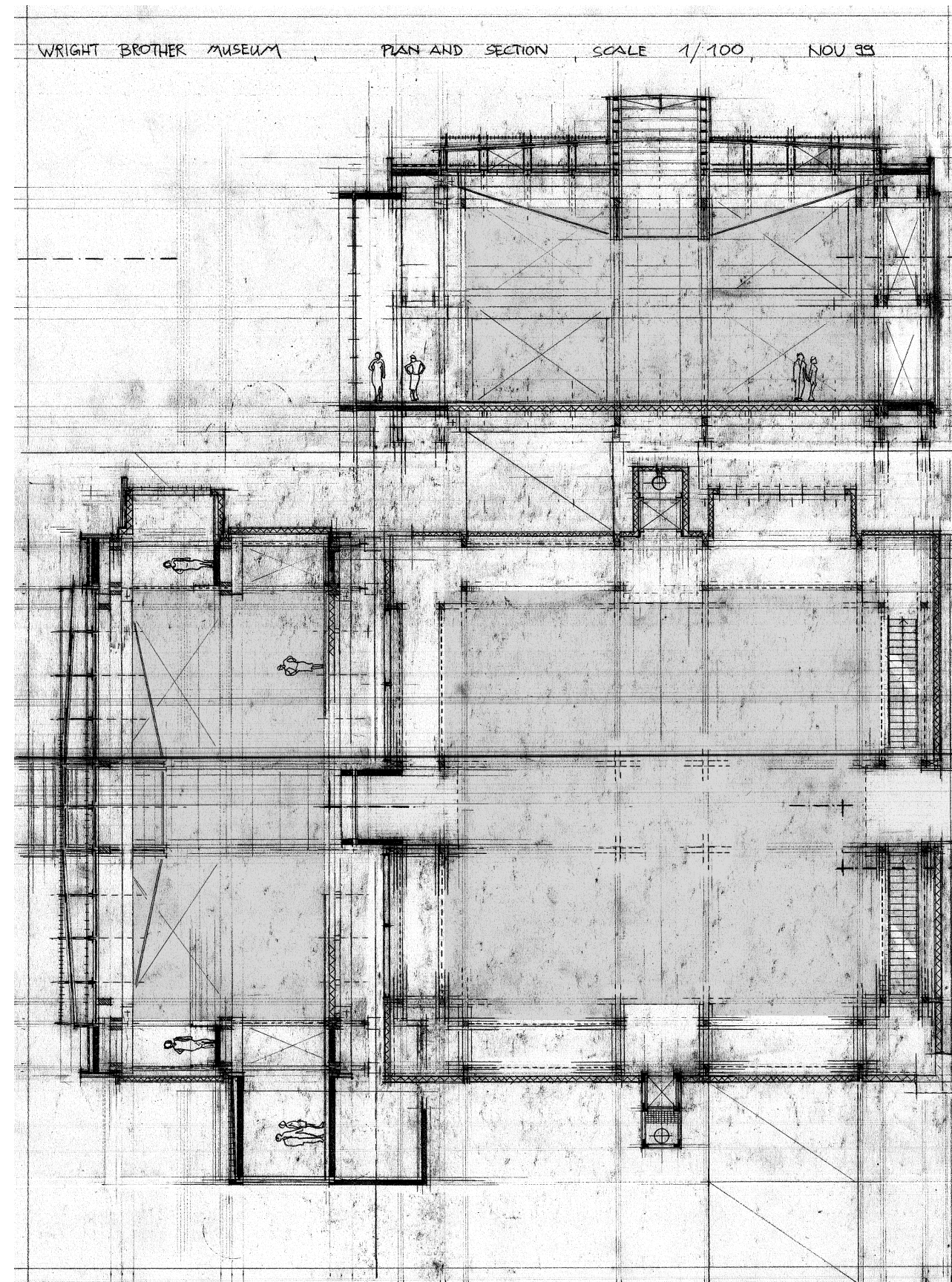
The main structure of laminated wood and the enclosure of prefabricated panels are held together by a secondary steel structure. This steel structure is pinned to the wood frame. The gap between the steel elements and the wood structure enables to recognize them as two parts: the steel elements frame and the placed prefabricated panels.

The enclosure can be seen as an independent element which appears as a metal wall both inside and outside. The prefabricated panels are in contrast to the rough, warm, natural wood structure. Inside, the panels are covered by sandblasted steel. From the outside, these same panels are covered with copper which shows its relationship to time by oxidizing into a green curtain.

**Approaching Structure**

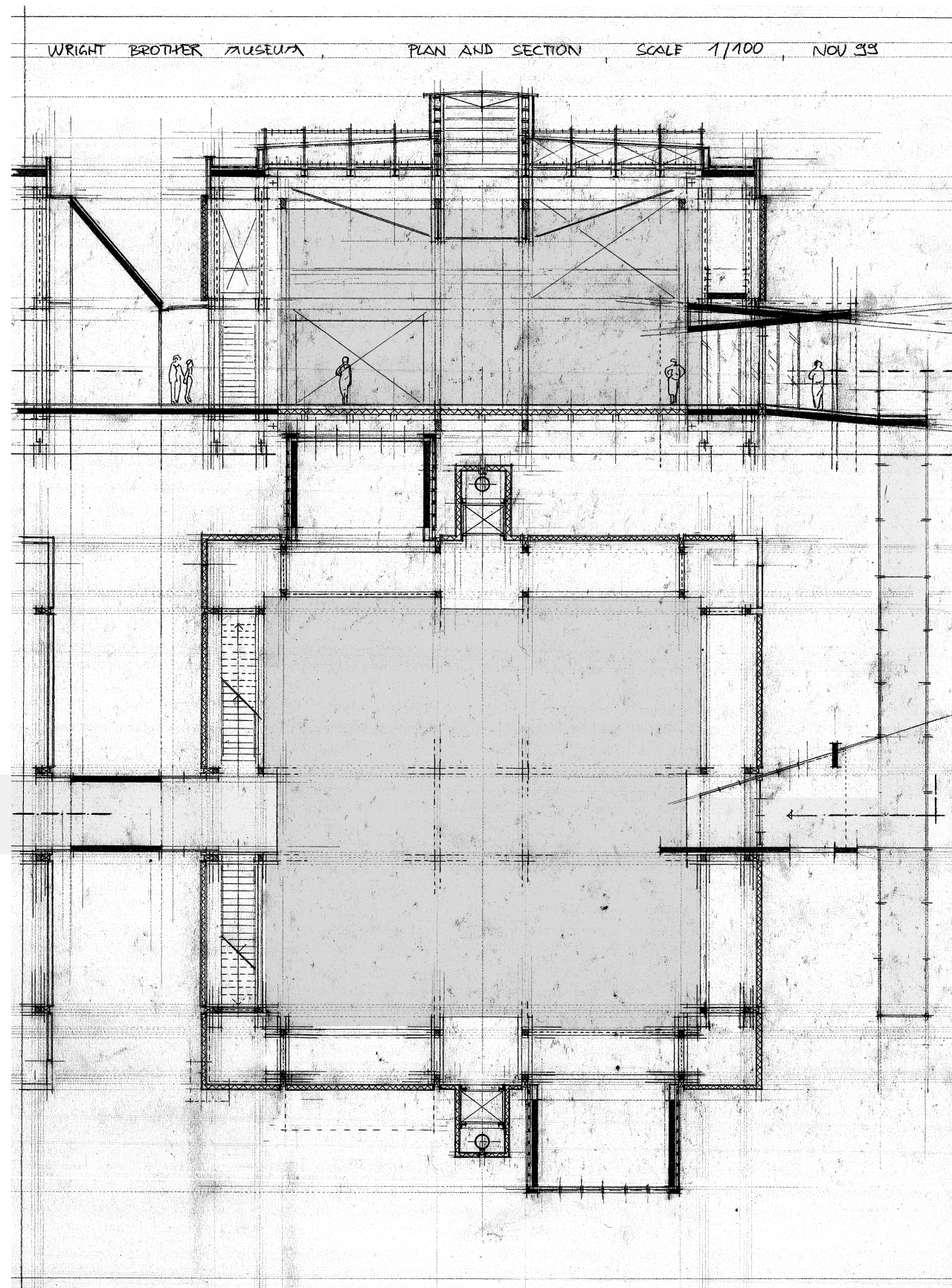


Weather Research Center and Wright Brothers' Museum Ground Plan and Section of the Initial Scheme



Weather Research Center and Wright Brothers' Museum Ground Plan and Section, Final Scheme





Weather Research Center and Wright Brothers' Museum Ground Plan and Section, Final Scheme

# Weather Station and Museum Wright Brother's Kill Devil Hill

## Detail Facade

### ROOF:

flat grid, diffuse light  
double glazing safety glass  
attic, service space  
line grid, light regulation  
artificial light  
translucent glass

### GALLERY:

exposed concrete surface,  
precast slab 120mm  
vapor barrier  
insulation 70mm  
OSB boards 18mm  
waterproof membrane >  
1.0mm sheet copper  
double locked seams

### FLOOR:

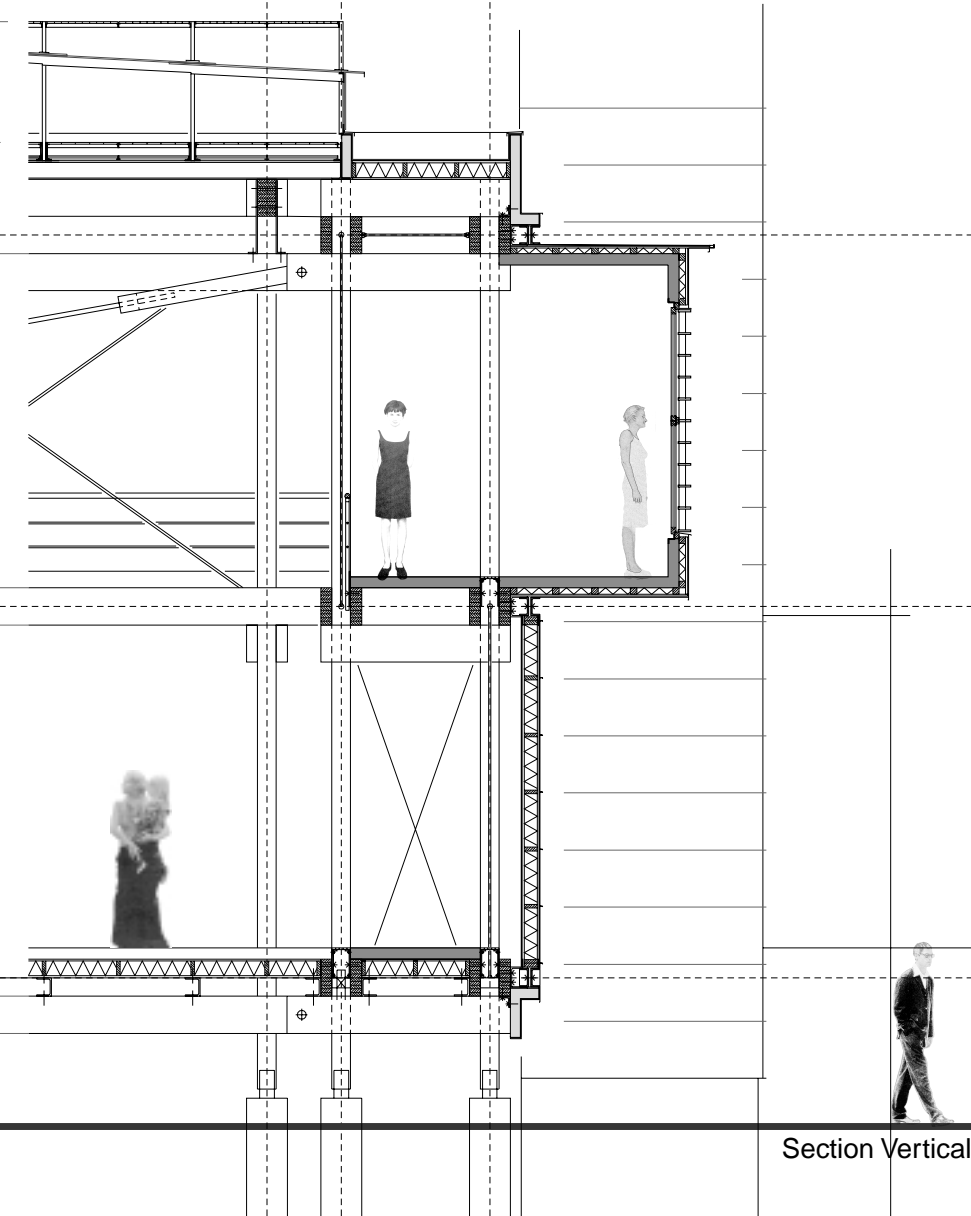
exposed concrete surface,  
precast slab 120mm  
and  
cross grain parquet maple  
resilient subfloor 120mm  
prefabricated panel:  
vapor barrier  
OSB board 18mm  
insulation 160mm  
OSB board 18mm  
waterproof membrane

### STRUCTURE:

laminated timber frame  
structure for enclosure:  
steel, concrete

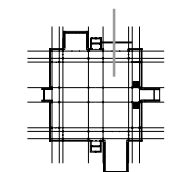
### ENCLOSURE:

0.8mm sheet steel,  
sandblasted  
prefabricated panel:  
vapor barrier  
OSB boards 18mm  
insulation 140mm  
OSB board 18mm  
waterproof membrane >  
1.0mm sheet copper double  
locked seams

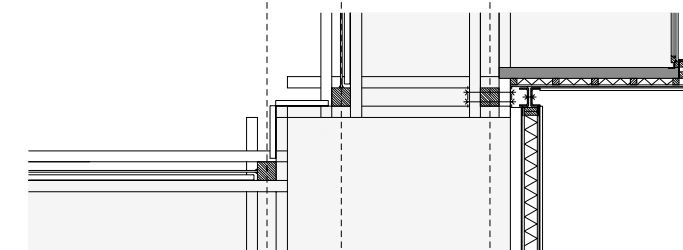


Section Vertical

## Ground Plan



Dec 15,99



Weather Research Center and Wright Brothers' Museum Detail and Materials

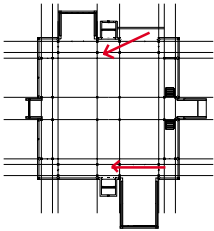


Weather Station and Museum Wright Brother's Kill Devil Hill

View Inside Gallery



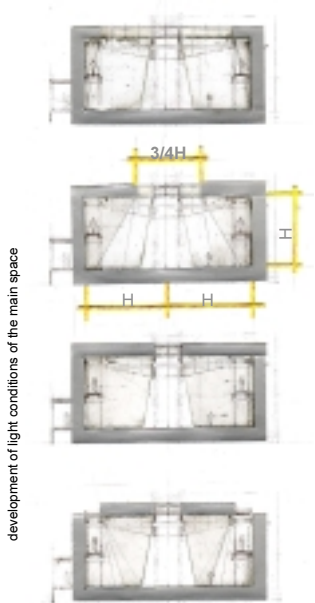
View Inside Gallery



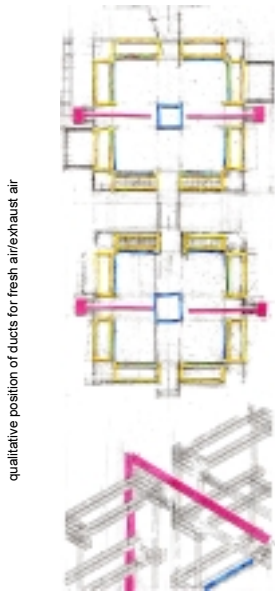
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Weather Research Center and Wright Brothers' Museum Detail Interior Study

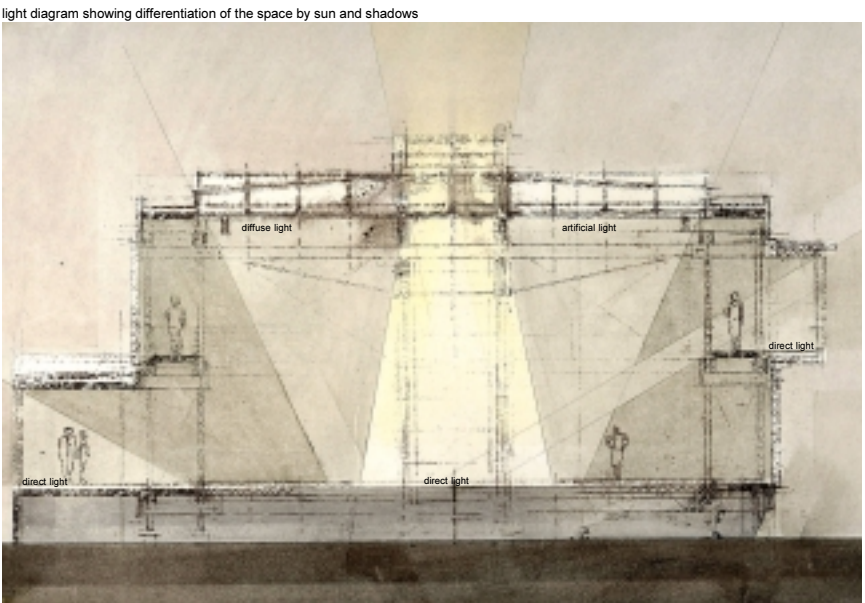
Wright Brother's Museum and Weather Station Kill Devil Hill NC. Light, Ducts Jan 2000



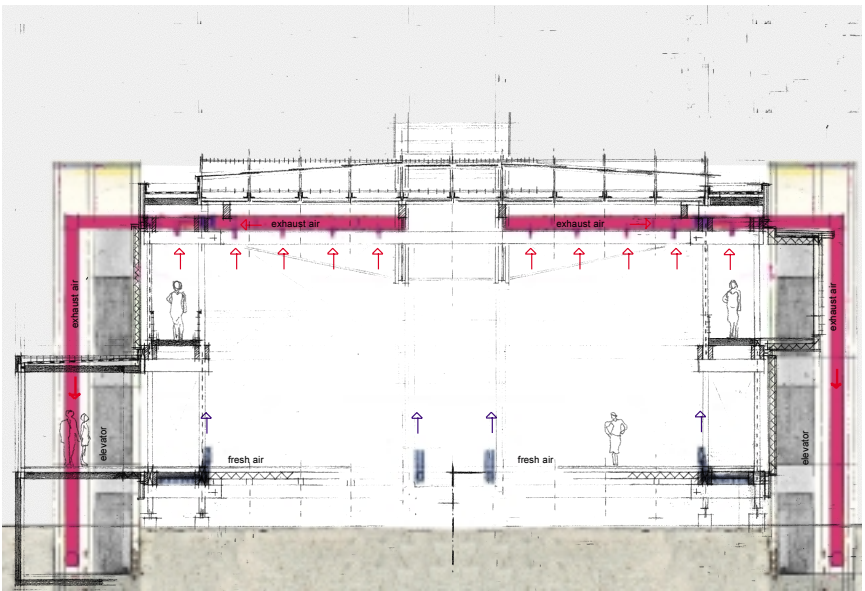
development of light conditions of the main space



qualitative position of ducts for fresh air/exhaust air



light diagram showing differentiation of the space by sun and shadows



technical diagram showing qualitative position of ducts

Weather Research Center and Wright Brothers' Museum Technical Equipment

the room's climate:

In order to ensure the building's performance with regard to its function, it is important to control its light condition and room climate. The room climate is comprised of temperature, air movement, and humidity whose combination ensures the preservation of the works of art.

The concept of the closed box is crucial to maintaining a low energy consumption. The main room is perceived as a box which is enclosed by high insulated prefabricated panels. Wooden piers elevate the building from the earth.

The secondary elements (saddlebags), which penetrate the closed box, are designed as buffer zones that separate the main space from the outside.

The roof is constructed in different layers which controls both light amount and light intensity. The layered roof construction also controls direct and indirect sunlight. In addition to the roof the backpacks are designed to gain energy from the sun during the cold season.

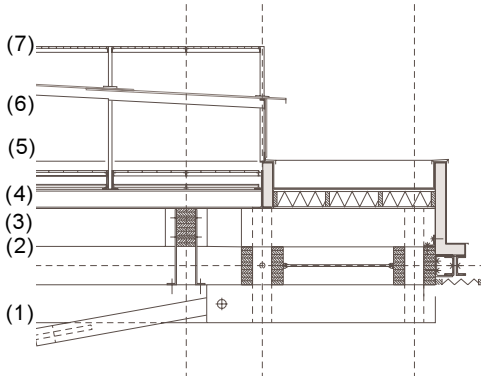
An air system controls air purity, velocity, and humidity. The air in the rooms is treated by displacement ventilation creating positive pressure, which protects the exhibition space and other rooms from dust particles and impurities. Treated fresh air and treated return air are blown into the room at the floor level through corrugated metal. The fresh air and return air are released through perforated metal plates which are integrated between the wooden main floor and the concrete floor. This marks the boundary between the main space and the attached boxes.

Exhaust ducts expel the warm air, and the ducts are placed within the main roof structure of laminated wood and the structure's modules.

The construction of the roof and the modules laminated of wood are creating a dialogue with the exposed steel tubes of the exhaust ducts.

The Roof of Light

The Roof of Light



the glass roof:

The glass roof provides indirect light for the airplane, the exhibition; it also provides protection from fluctuations in moisture and temperature.

The lantern in the middle of the glass roof links the main space with the blue sky. Light penetrates this opening and provides direct sun and shadows to the center of the main space.

(1) Upon the main structure of laminated wood, the roof's structure consists of a grid made of steel profiles. (2) On top of the grid there is a translucent layer of adjustable light diffusing panels. These panels are sandblasted on the under side. (3) Next above to the sandblasted panels there is the layer not only to control the amount of light but it is also the place to install the artificial light. (4) Stainless steel points are fixed on the supporting steel grid providing a service space within the glass roof. (5) Two layers are connected with these stainless steel points. One layer fastens an insulating and waterproof layer the other layer controls the light intensity of the direct sun.

The insulating and waterproof layer consists of insulating glass panels which are held by steel frames. These panels are designed to protect the inner core of the museum from rain, cold, and wind. (6)

The service space is designed so that enough space allows proper maintenances and cleaning. The service space acts as a year round thermal buffer between the inside and the external climate. (5)

The outer most layer of the roof protects the inside from overheating and destruction. Light that is too strong, especially ultraviolet radiation, bleaches the colors and causes certain materials to disintegrate.

This layer consists of corrugated metal panels which block direct sunlight and reflect diffused light into the main space. The corrugated metal panels, also allow the control the amount of diffusing light that penetrates to the inner space. (7)

The parts of each layer are adjustable by hand.

Diagram

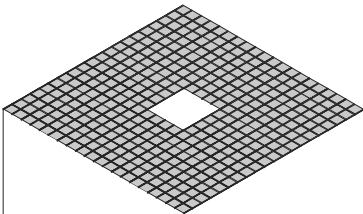
- (7) corrugated metal panels
- (6) insulating glass panels
- (5) service space
- (4) artificial light
- (3) light diffusing panels
- (2) secondary structure
- (1) main structure

roof diagram



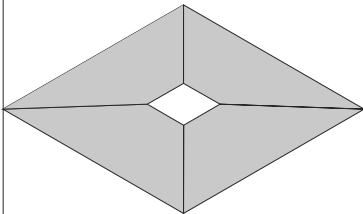
fixed flat grid, diffuse light

A



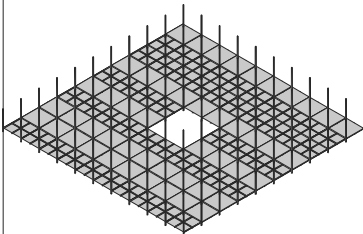
double glazing safety glass

B



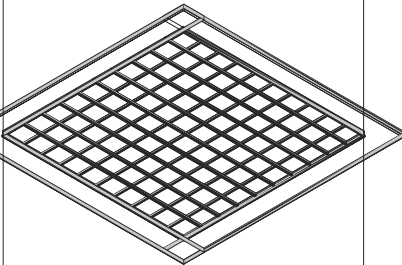
structure that supports flat grid and double glass  
adjustable panels to control light intensity  
place for artificial light  
light diffusing glass panels

C



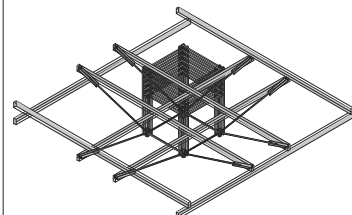
steel grid structure

D



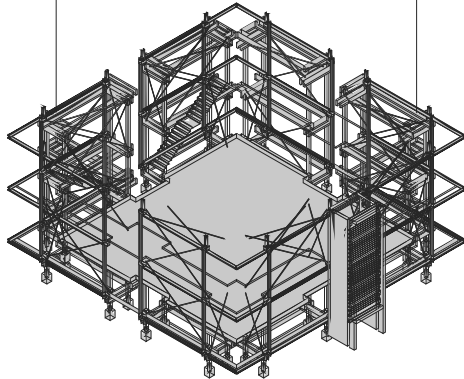
main structure in laminated wood  
steel tension members  
latern in laminated wood

E



exploded axonometric of roof and shading elements

1



Weather Research Center and Wright Brothers' Museum Axonometric exploded view of the roof

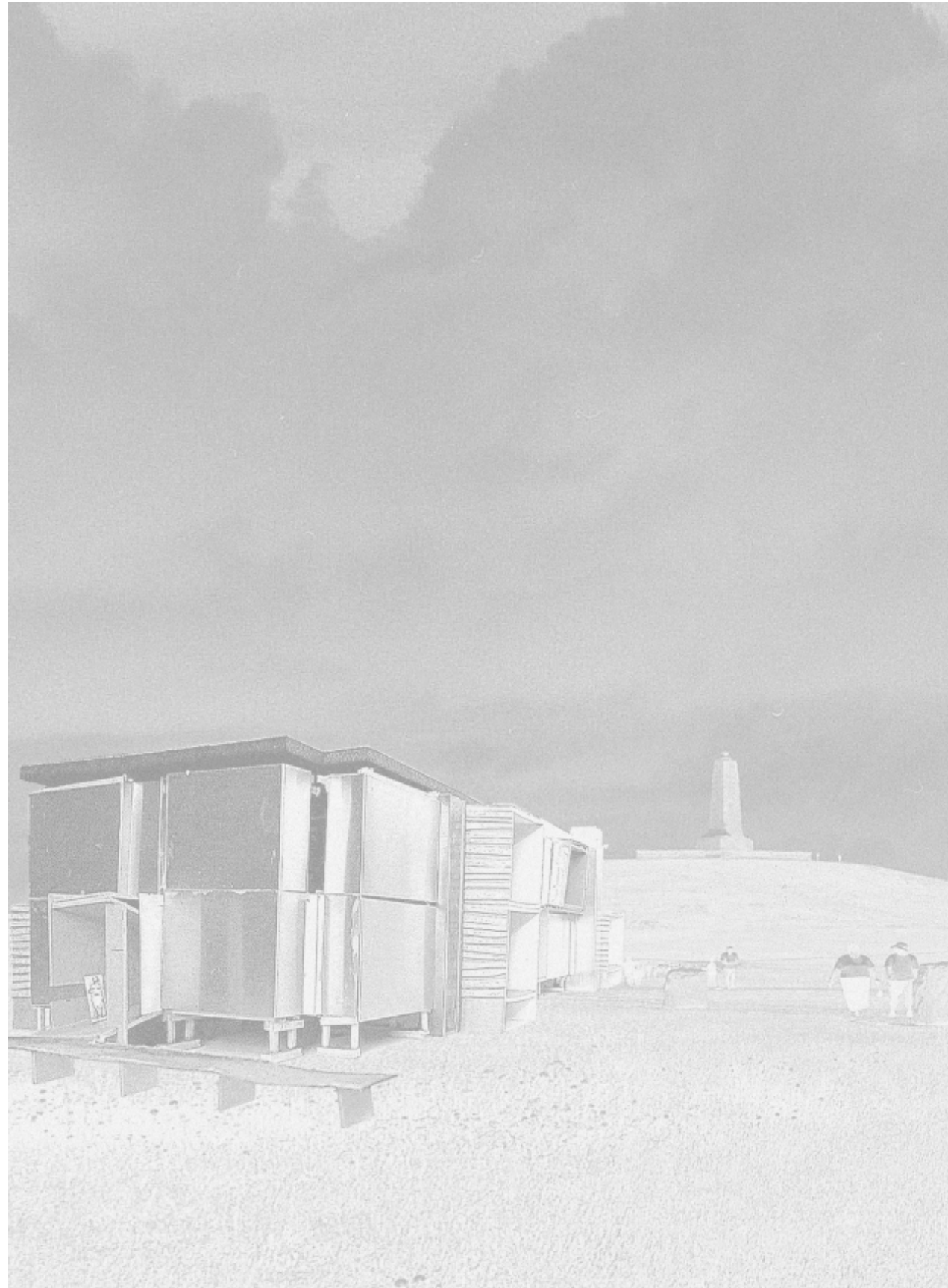
Wright Brother's Museum and Weather Station Kill Devil Hill NC. Roof Assembly Jan 2000

Elevation

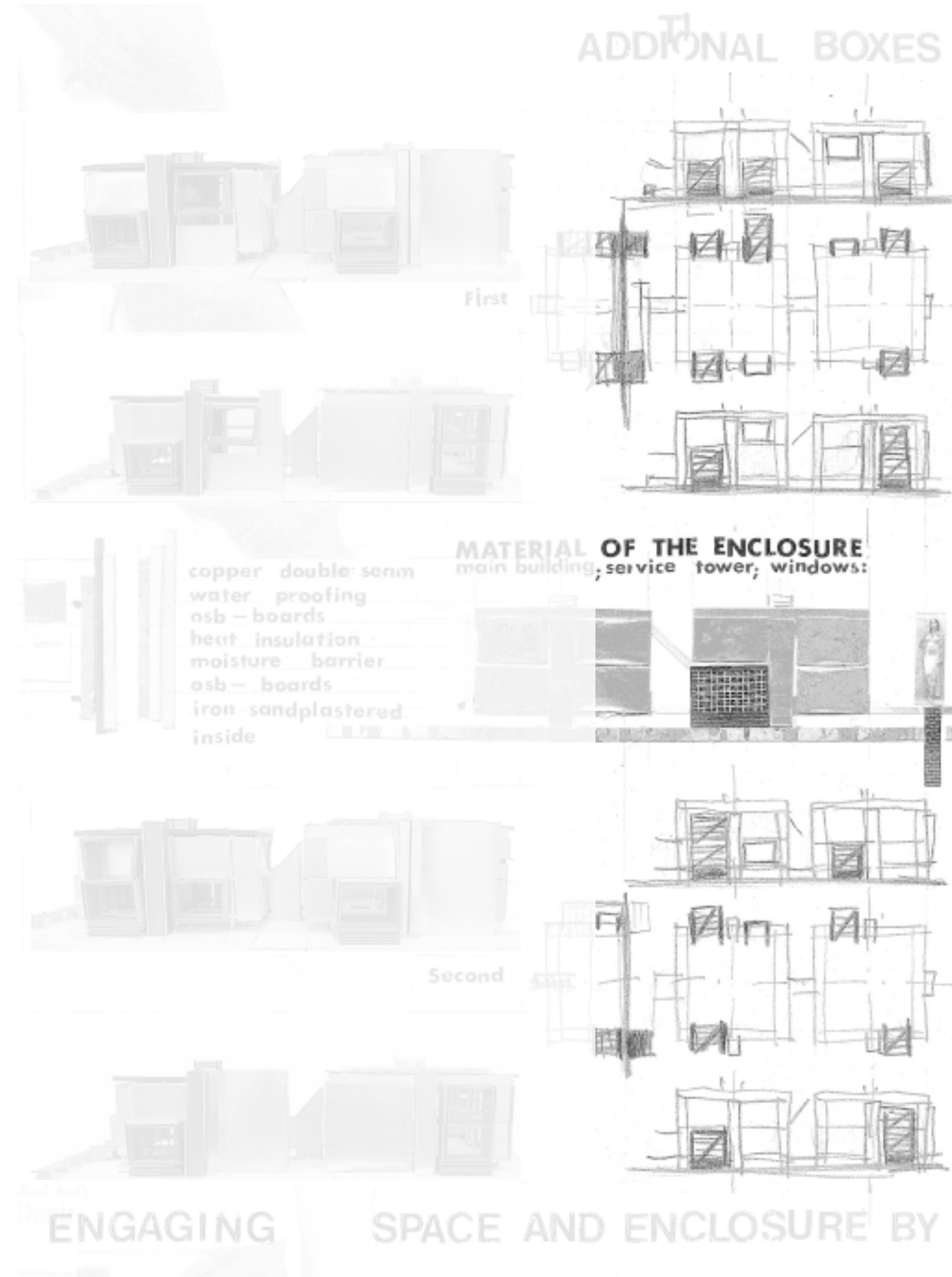


Weather Research Center and Wright Brothers' Museum Elevation



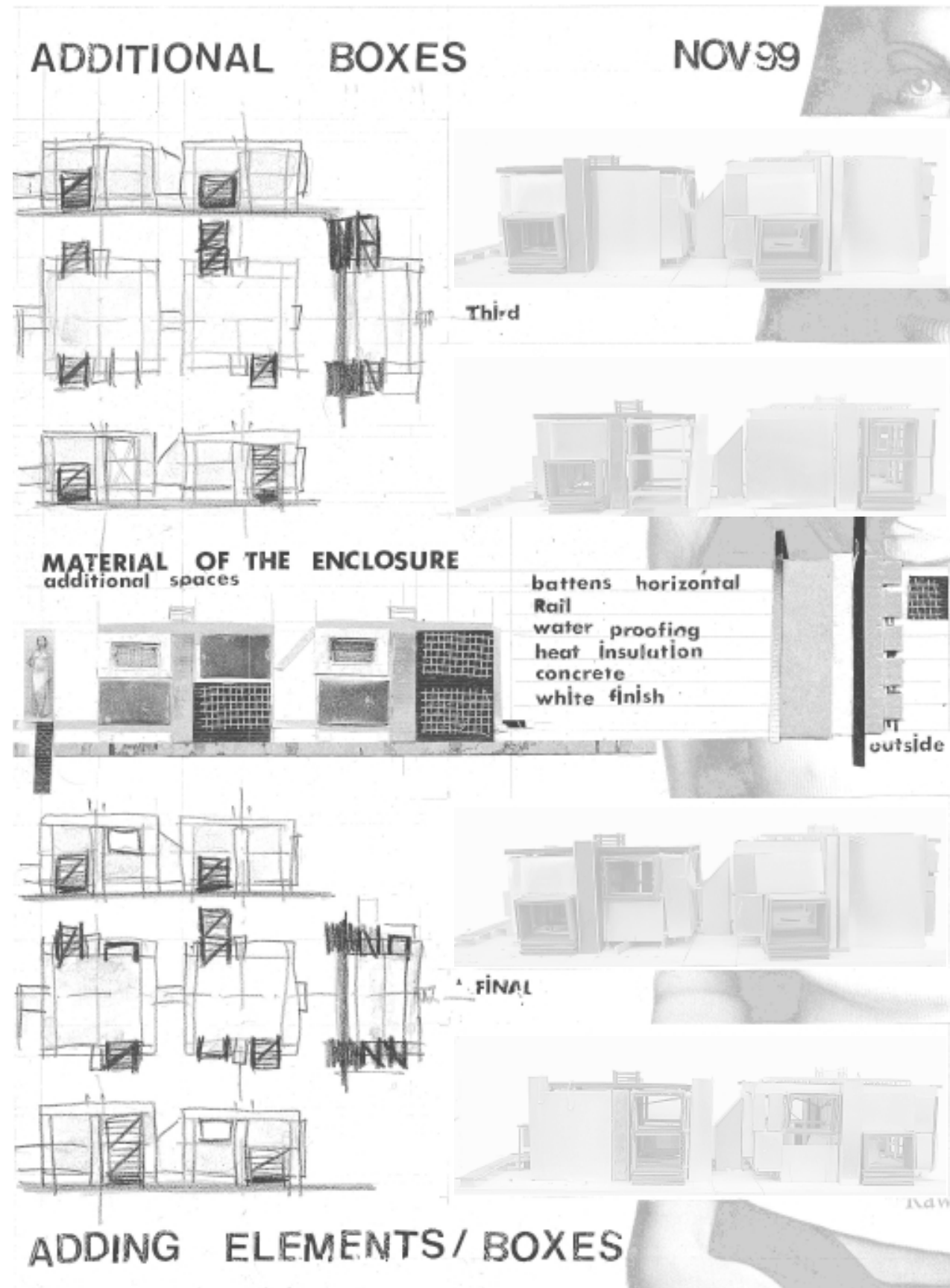


Weather Research Center and Wright Brothers' Museum Elevation

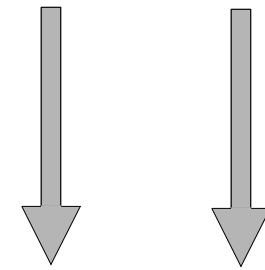


Weather Research Center and Wright Brothers' Museum Elevation Development

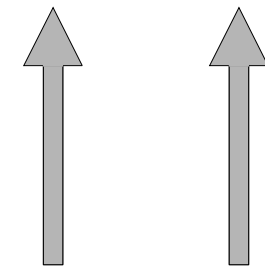




q u e s t i o n  
c o n s t r a i n t s  
c o n t e x t  
c o n c e p t



D E S I G N



d e t a i l  
t r a n s f o r m a t i o n  
m a t e r i a l  
p a s s i o n

## Approaching Design

### **Abstract :**

Very often one tries to explain architecture and one tries to mark his position in architecture. I do not feel mature enough to explain architecture.

I feel that architecture is a process of approaching and materializing all aspects that come into touch with every day life. It is not the position in architecture that counts but the way one approaches it.

In the work of the thesis I realized how important it is to go the more difficult and challenging way in the development of a design.

On the other page I tried to diagram the two main ways to approach architecture.

Both the conceptional way and the detailing way interact simultaneously in the design process.

## approaching architecture