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AN ARCHITECTURE OF INTERLOCKING ORDER

by

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fulfillment of the requirements for
the degree of

Master of Architecture

Approved:

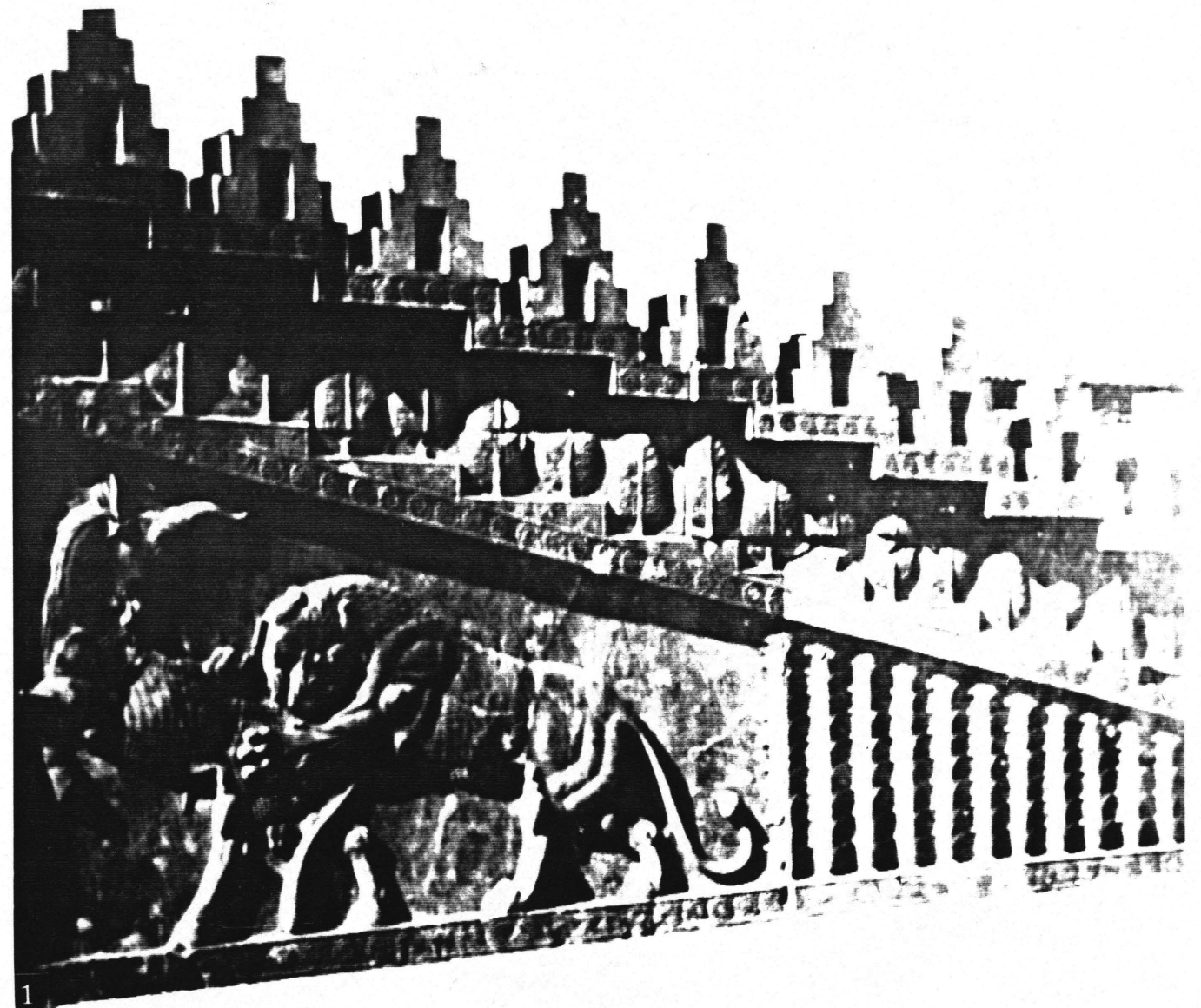
~~James C. Rott, Chairman~~

~~Dennis J. Kilper~~

~~Olivio C. Ferrari~~

May, 1991

Blacksburg, Virginia





*"Wake! For the sun behind your eastern height
Has chased the session of the stars from light
And, to the field of Heaven ascending, strikes
The Sultan's turret with a shaft of light."*

Omar Khayyam (twelfth century)

To

Iran, The Land of Aryans, The Persia,

My Parents, and ,

My Aunts, and ,

My Daughter and Son, and

GRADES 3-12
STAFF LINES

GRADES 3-12
STAFF LINES

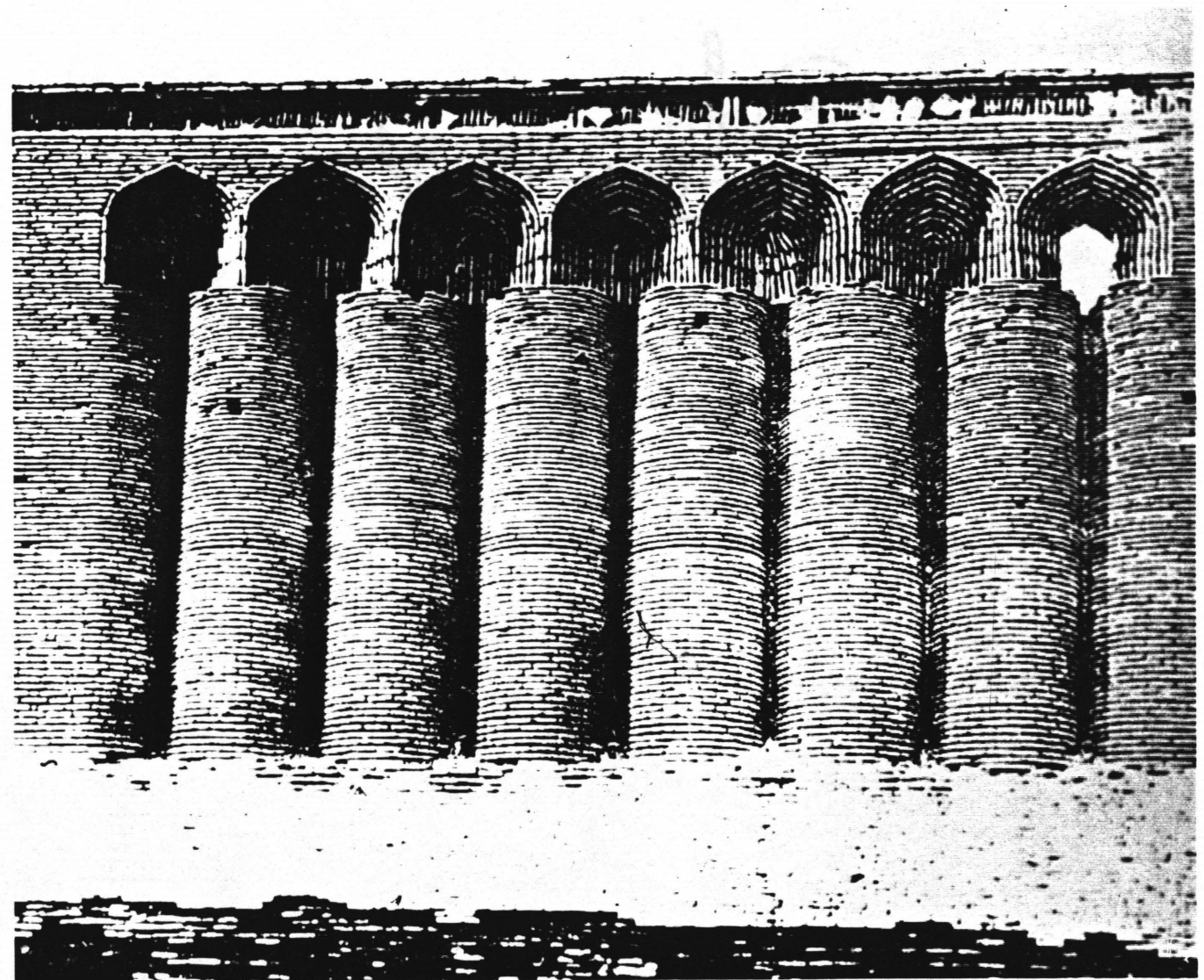
ABSTRACT

Ludwing Mies van der Rohe (1886-1969) was by consensus one of the twentieth century's most illustrious architects. He stated, "Things by themselves create no order. Order as the definition of meaning and measure of being is missing today; it must be worked toward, anew"¹.

Order is a visual effect of a cumulative sequence of views. Viewing a presence of order in a building is cause for good feeling and it is the speaker of existence and reason for being. The repetition of walls in a composition creates patterns, and patterns effect order in creation of space. Changing the presence of order in a relative fashion is the dance of the walls, pleasure of a great sense of interest, motive of thought and ambiguity.

Going from a broad expansion to a narrow slot, coming from a dark place to a bright place, moving from lower level to higher platform, going from inside to outside, using steps for positioning of better views of nature and stepping down to touching cold clear spring water, all are reasons for our being, sense of pleasure and great feelings. Any building which can give us a good feeling and sense of pleasure close to that of nature is Architecture.

This study is about *interlocking order* among architectural elements in the design of an architecture. For this study, the building which is designed to emulate an architecture of interlocking order is an Institute for Scholarly Studies.



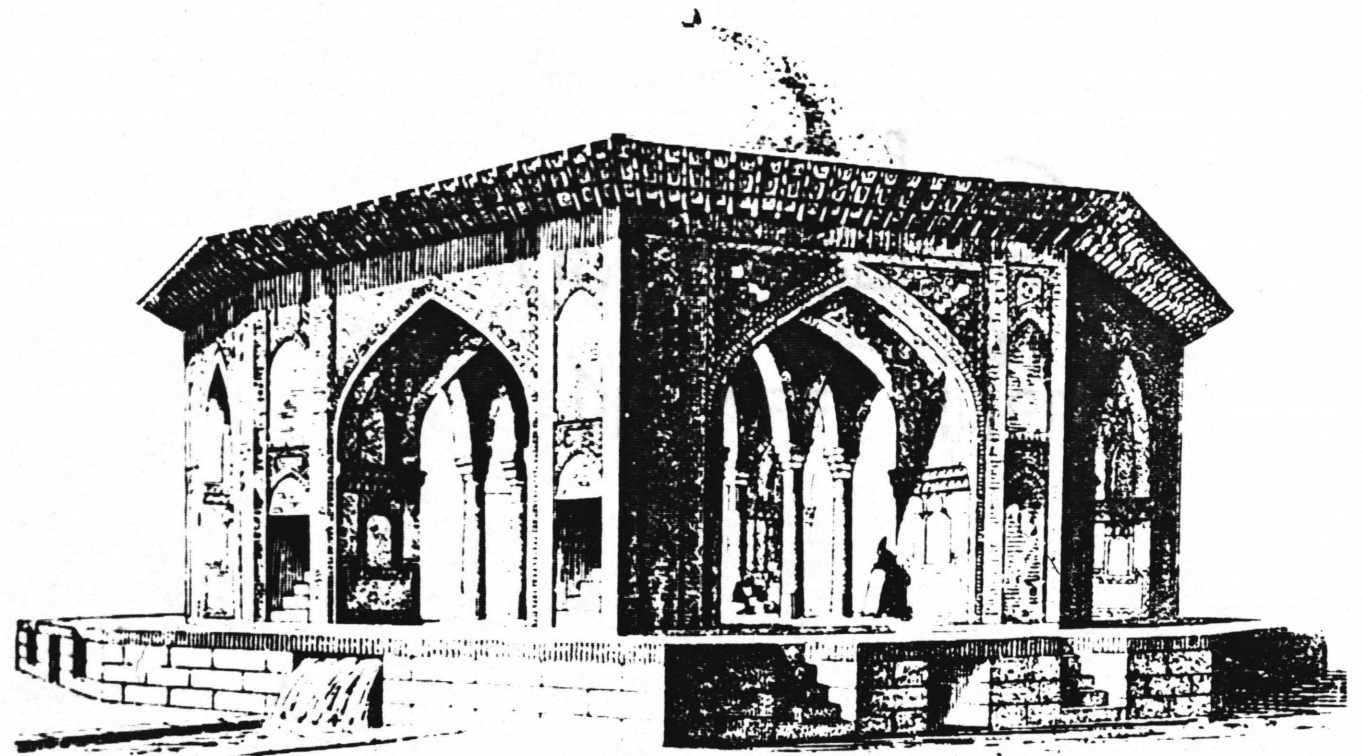
This building is designed for the thinker to come and be educated, to learn from, to teach others and to relax and enjoy the essence of a beautiful place. It is to be a place of meditation and a place of conversation for two people who desire privacy or for more people who wish to engage in conversation.

Program requirements dictate to provide facilities to serve the purpose of the organization and to give a sense and meaning that its existence enhance the feeling and sense of pleasure of the viewers and the users.

The design of this place is generated from repetition of a wall within a wall which has been gained by constantly reframing the problems and repeatedly searching for solutions. The problems occurring throughout the design have been resolved by learning, experiencing, and journeying in search of discovery through visual inspection and sensing through imagination of physical models and drawings which are made interactively.

The sense of experiencing a place; what we see, hear, smell, and feel, is very important in design of architecture. These factors were carried along and incorporated into design in order to improve the quality of the building. Also, it was very important to locate and determine where and what the center of focus of the building should be.

These were the subject matter and the motives of design. Some of these were captured in the preliminary sketches and have remained dominant themes throughout the design.



PREFACE

If form in architecture is created by repetitive elements and each element implies the other, then the form of an architecture faces a multitude of interlocking order possibilities.

The following study attempts to enlighten the concepts of application of order on basic elements of architecture, such as walls, columns, floors and roofs. The generation of a form with interlocking order results from the interlocking of these elements.

The creation of form in a building along with the study and application of order to these archetypical elements with meaningful interlocking order makes the building a very special phenomenon, which can contain the existential expressions.

Thomas Thiis-Evensen describes the existential expressions in an architectural form as: "... characteristics of a form which are at the base of symbolic meanings with their stylistic and regional variations". This means a description of what an architectural form 'does', in terms of motion, weight, and substance which is seen in relation to the function or the meaning, that the form has².

The wall, as the meager archetypical element in design of architecture, has an enormous effect. It influences the form of the building to be beautiful and meaningful. Louis I. Kahn, one of the great architects, philosopher and poet, gives a special attention to the wall. He had complex and mystical

ruminations on his search for an order in architecture that lay beyond simple geometry, structure, or function. For him it was the essence of what the building should be; hence, the question, What does the building want to be?³.

*Out of the wall grew the column.
The wall did well for man.
In its thickness and its strength
it protected him against destruction.
But soon, the will to look out
made man make a hole in the wall,
and the wall was very pained, and said,
'What are you doing to me?'
I protected you; I made you feel secure and now you put a hole through me!
And man said, 'But I will look out!
I see wonderful things,
and I want to look out.'
And the wall still felt very sad.
...
Such realizations come out of nothing in nature.
They come out of a mysterious
Kind of sense that man has
to express those wonders of the soul
which demand expression.*

Kahn's poetic musings on the walls.

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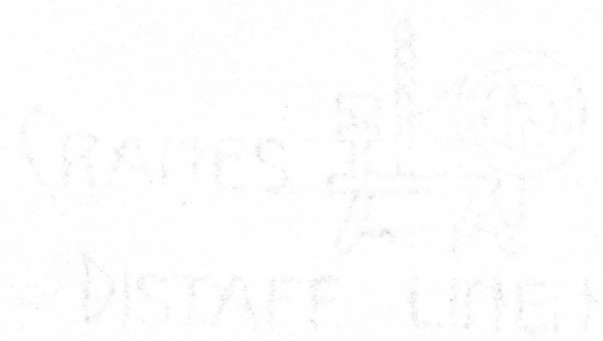
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INTRODUCTION

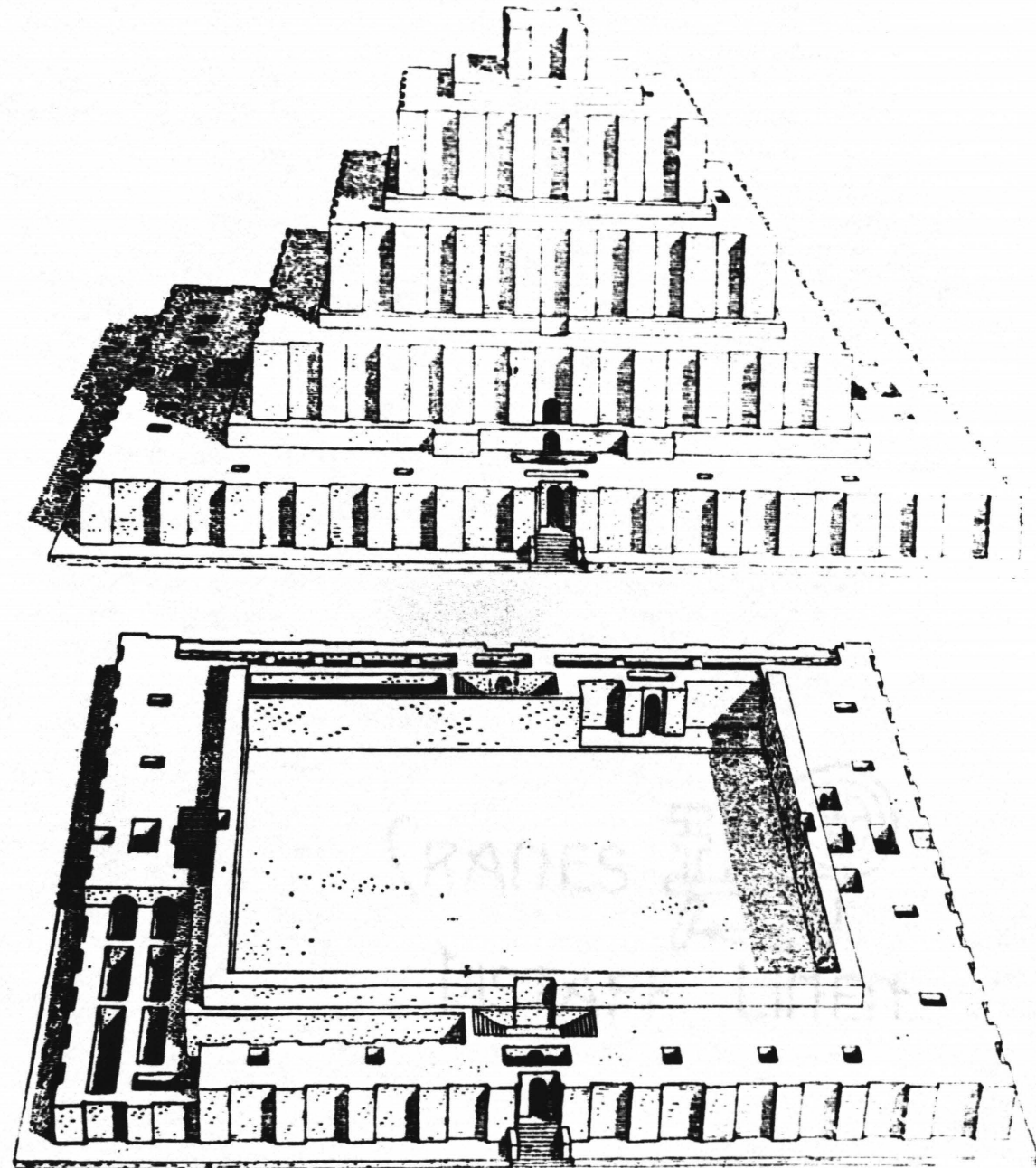
Kevin Lynch in his book "Site Planning", explores the issue of design: "There is mystery in design as there is in all human thought. Design is a process of envisioning and weighing possibilities, mindful of past experience". "Design is a dialectic of framing and making". "Design consist of imagining patterns of activity, circulation and physical form as they will occur in some particular place".

"Likeness and unlikeness are understanding that help to imagine and test possible solutions". The outcome of the design is what can be judged on, for the validity of the form, for the fulfillment of the program requirement and to be liked or disliked by the viewer and the user.

The clear understanding of Yin-Yang concept of negative versus positive, light versus dark, good versus evil, etc... enlightens this matter. It is very important to make the buildings represent designer's ideas. As he decides where his focus shall be and what shall be its context, what building materials shall be used, he has to be concern with overall form of his design, for creation of a grate artistic beauty.

In order to create a building with a sensible form, an ordering system can be used which can give special character and meaning to the building. Some architects use planar or one directional ordering system to improve the quality of the form. Here, an interlocking order is introduced, which adds to the complexity of the building.

If the order is applied sensitively to the archetypical element of the building, special care is given to the implementation of a program and selection and use of material, and details treated delicately, then the outcome resultes in a noble design and a good architectural phenomenon.



AN ARCHITECTURE OF INTERLOCKING ORDER

Architecture

"The essence of a work of architecture is an organic link between concept and form.... The intertwining of idea and phenomena occurs when a building is realized. Before beginning, architecture's metaphysical skeleton of time, light, space and matter remain unordered. Modes of composition are open: line, plane, volume and proportion await activation. When site, culture and program are given, an order, an idea may be formed. Yet the idea is only conception....The hope is to unite intellect and feeling, precision with soul" (Steven Hole, April 1990)⁵.

Architecture is not only making the form and space to a single essence to be visible and serve the purpose of the facility, but it is also an act of communicating the meaning and the purpose of being⁶.

In order to create architecture, it is necessary to establish a relationship between the floor, the wall and the roof. Also, there must be valid reasons for their presence at a particular location. The use of particular pattern, the presence of hierarchy and applying order to the archetypical elements can reinforce the nobility of the architecture. However, the arrangement of elements of the form and the space will determine how architecture promotes, endeavors, and communicates the meaning of our existence⁷.

Architecture as a visual art, deals specifically with the formation of

three-dimensional volumes of form and space. The art of architecture makes our existence not only visible but meaningful.

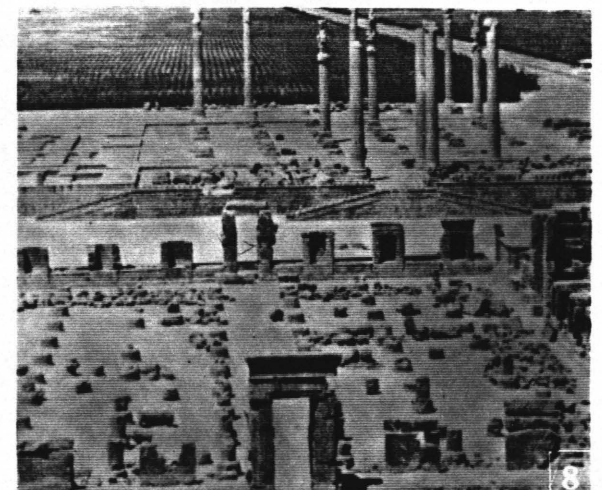
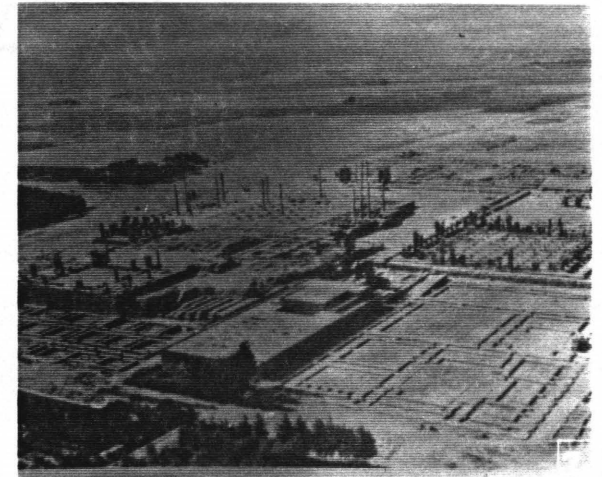
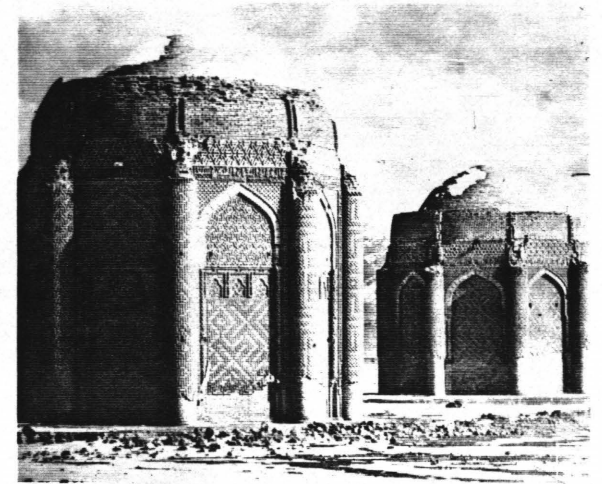
Nader Ardalan, the author of the 'Sense of Unity', defines architecture as, "The relationship between space and the form that determines and qualifies the space". Also he states that, "The concept of qualified space regulates architecture. It provides the means for architecture to achieve unity and synthesis, to create a building or city which helps man integrate his daily movements into the center"⁸.

The coming together of the wall and the roof and the floor establishes the orientation of the space and relation between the form and space.

Some of the quality of the space implies qualitative polarization of the space. Polarization of the space is directly dependent on the orientation of the space.

The channeled openings in the walls and direct or indirect openings resulted by interruption and punctuation of the walls and the roofs of a form where they control the qualitative and quantitative polarization of the space. This helps to magnify the beauty.

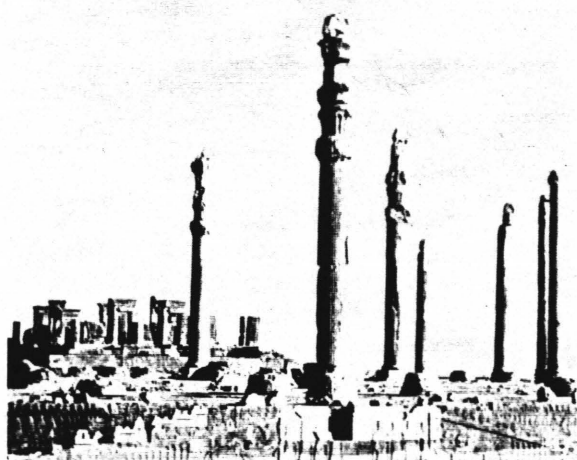
An enclosed space can be a room where the surroundings can affect our feeling and emotion. Rikard Kuller says: "Enclosedness implies a sense of enclosure-the very feeling in a room". A clear impression of the dynamics of the room, its center, its extent, and its boundaries dictate the quality of the room⁹.



The essence of repetition of a form is to generate a whole in unity and unity within the whole. "The degree of unity of an environment is a matter of how well all the various parts fit together into a coherent and functional unit".

Frank Lloyd Wright explains, "Unity is, of course, the ideal in your mind when you unite interior and exterior and having made that unity a reality then you proceed to preserve it by making everything in the house and everything around about it all tributary to the one central idea or effect and out of that unity comes a great repose always. Repose, in any sense anywhere, is due to unity of sometime, somewhere, and out of space comes the enjoyment of your environment, of your home as you live in it"¹⁰.

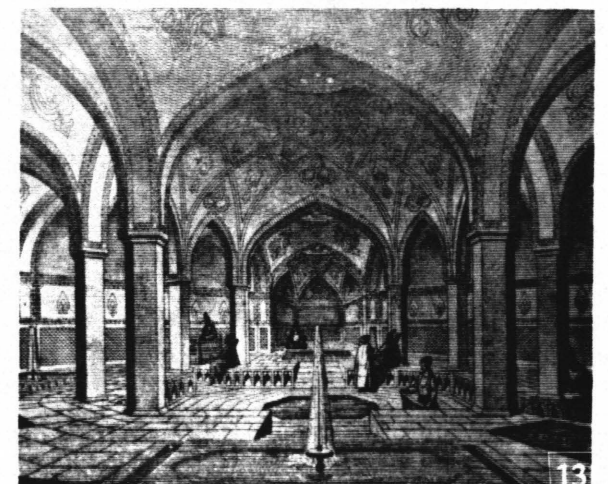
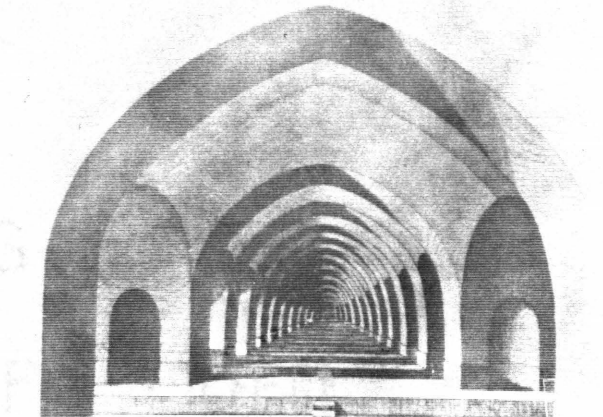
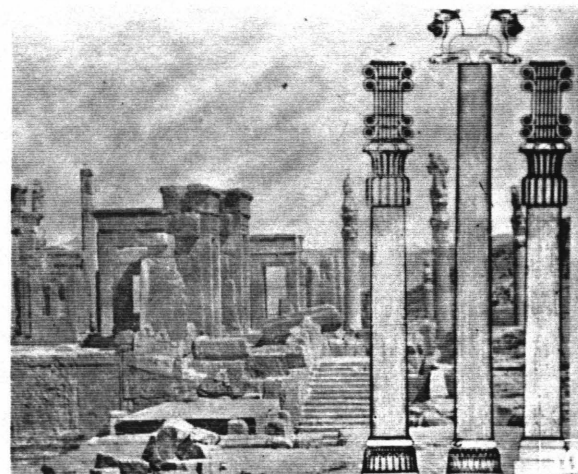
"The search for unity is an ancient preoccupation. Pythagoras, Plato and Vitruvius found it in harmonics and in proportions of the human body. The degree of unity in architectural space ought to be fairly high, it should not be permitted to be excessive. Complexity



might best be understood in terms of variation or, more specifically, intensity, contrast, and abundance"¹¹. If complexity far exceeds unity, the result may become monotonous and rigid, or, very charming and beautiful. If the scale tips the other way, the result may appear simple and tangible, or, chaotic. This totally depends on, how the complexity has been treated

Complexity requires special treatment and careful arrangement. Also, there should be accuracy in the process of implementation of architectural ideology. This is where the importance of the interlocking order and application of order in all directions becomes evident

In the following, some of the important architectural elements that make and greatly influence the architecture is described. These elements have been used and implemented throughout the design of this architecture.



Wall

The Wall Plane is one of the generic types of planes that are manipulated in Architectural Design. The wall plane becomes a key element in creation of space, and the vocabulary of architectural design.

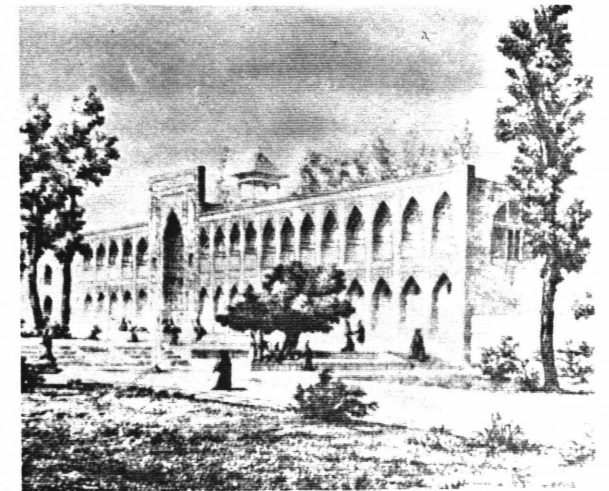
Nader Ardalan codes: "The hierarchy of vertical surfaces that define shapes begins with the simple primitive concept of a single material and simple proportions that literally express a two-dimensional plane. The wall symbolizes the transcending third dimension of the space where the vertical direction corresponds to the ontological axis. Synonymous with man himself, the wall becomes the locus of the soul of a divine space"¹².

Punctuation in walls conveys the feeling and meaning of life of past generation. When The wall receives the most pronounced light of the sun, it creates infinite patterns of shade, shadow, and light. That is a contrast which reveals and effects the emotion of the viewers.

The wall is a shield; it protects man, transfers heat, directs ventilation, and gives warmth and comfort. The wall is the best reminder of culture of the past generation. It represents strength, wealth, power, fear, technology, language, and the art of mankind.

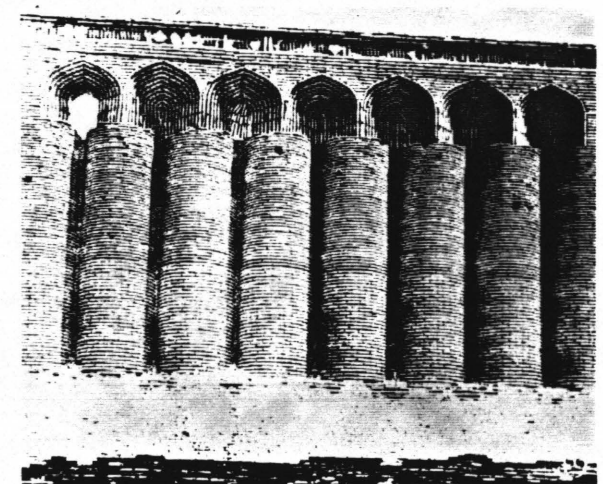
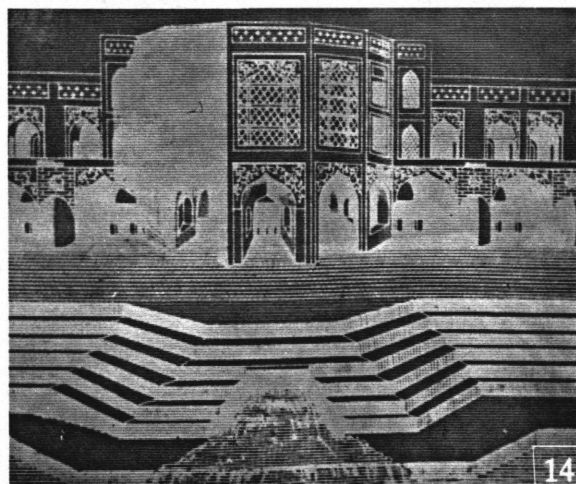
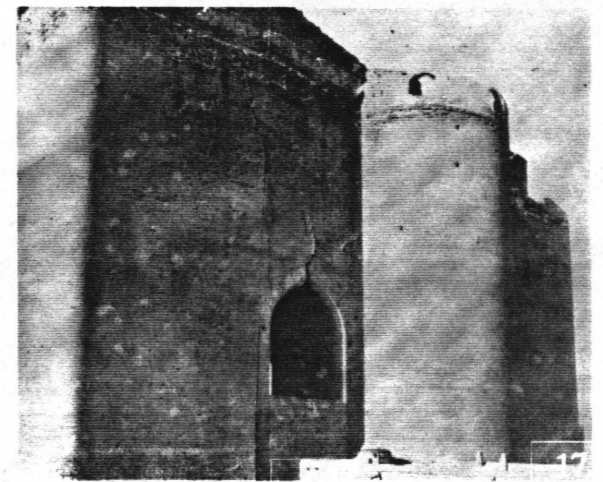
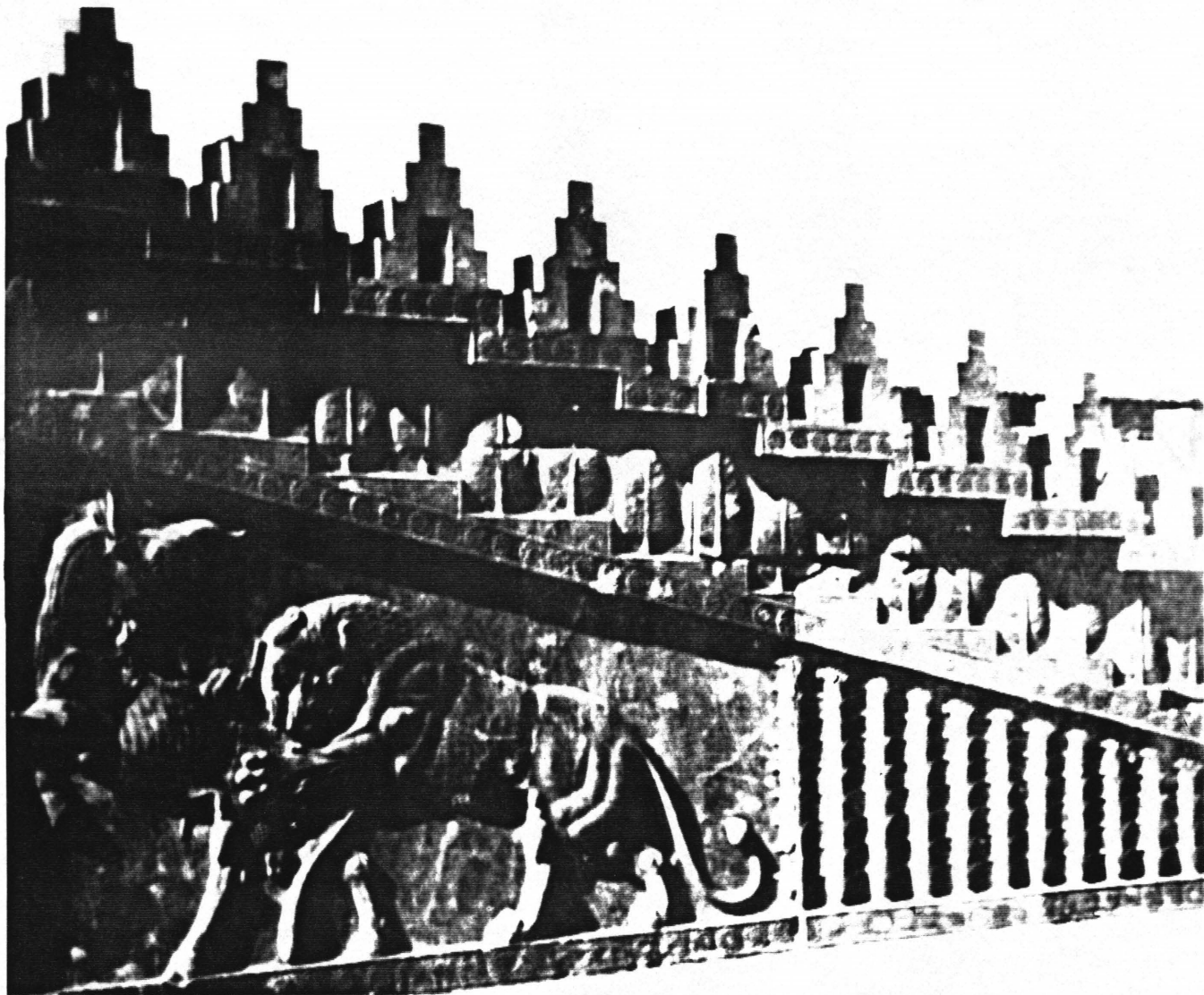
The form expression of walls may seem infinite, stretching out from main overall forms. Bearing walls define linear state of space with strong directional qualities. Walls diverse from the main form right down to details such as texture and structure¹³.

When the wall system comes together with the floor system and the roof system, and mutually reinforced, they can form an integrated whole within unity and unity within whole.



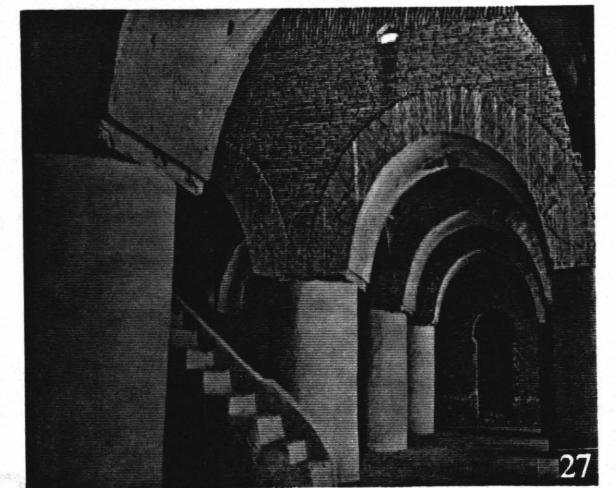
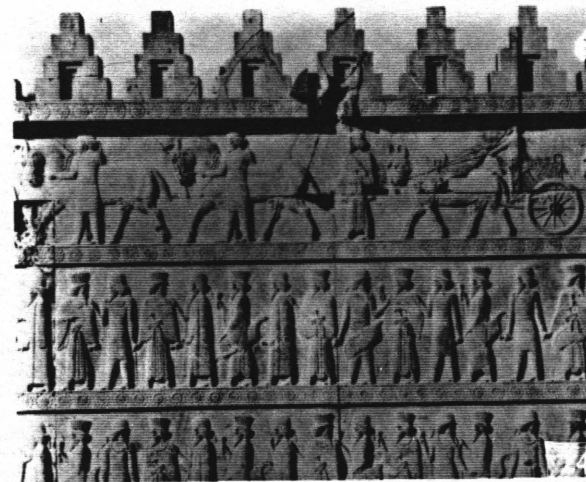
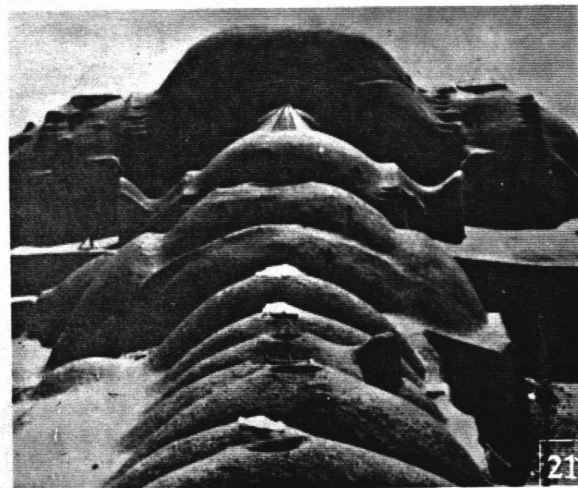
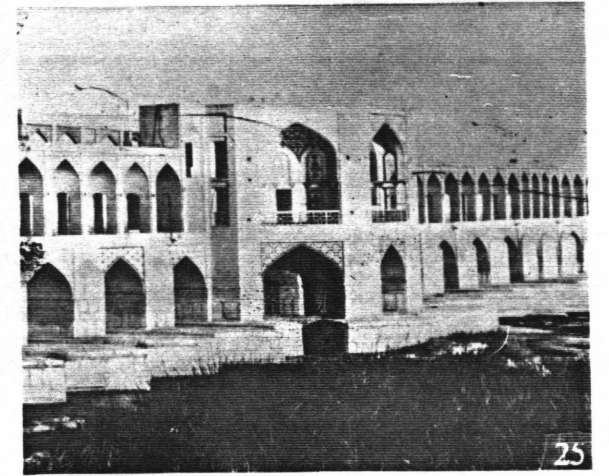
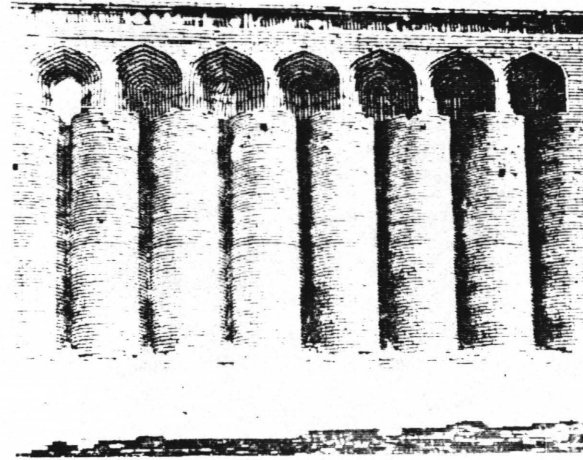
"Just there, where people imagine the world to be stable, just there its reality slips away instant by instant. Think of the shadow of a tree, which the traveler reaches at last, after miles of walking in the blazing sun. He desires only to rest in its shade, which to him seems permanent and immobile (after its motion cannot be perceived by the senses). But no sooner has he fallen asleep than the shadow moves on and passes over him, and he wakes to find himself in the heat of the sun".

Naser al-Din Tusi (thirteenth century)



Repetition

The principle of repetition of elements utilizes both the closeness or proximity to one another and visual characteristics that they have in common. The simplest form of the repetition is linear pattern of redundant elements. Redundant elements need not be identical. These elements may be grouped in a particular repetitive fashion, and share a common trait or common denominator of geometric shape. This would allow each element to be individually unique, yet belong to the same family¹⁴.



Order and Space

By taking the most fundamental principle of architecture, namely order and understanding of how the order can improve the form and the space, then we begin to feel and sense the quality of a good space. "Order and proportion are viewed as cosmic law whose processes man undertakes to comprehend through arithmetic, geometry, and harmony"¹⁵.

If the relationship among architectural elements creating an organization is perceived as contributing to the singular nature of the whole, then the conceptual order exists. One form can be constructed from one material. Through repetition and elaboration of that form an obvious unity can be achieved using basic geometry to formulate the relationship between space and the form.

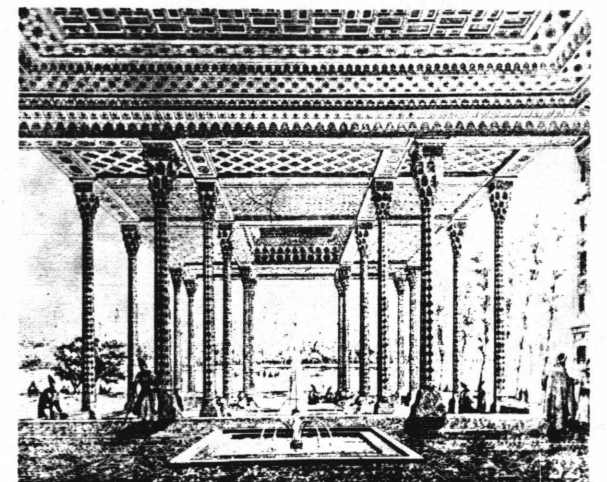
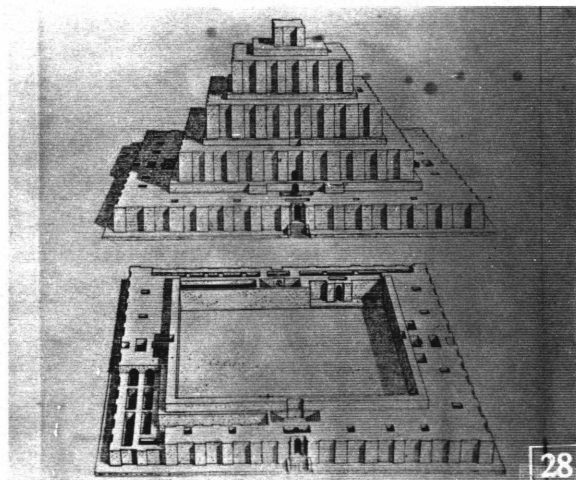
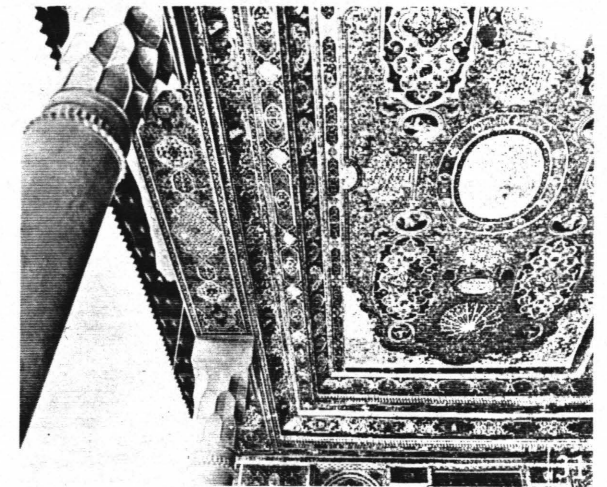
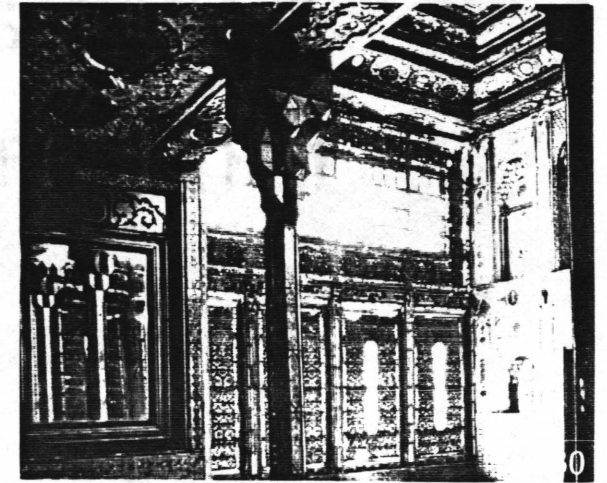
A linear form can result from proportional changes in the dimension of forms and arrangement of series of forms along a line. The changing of dimension in any direction among the repetitive architectural elements of a similar

geometry in a linear pattern results in a proportioning system among them.

Having all the repetitive elements of the same family of proportion in a composition unifies the multiplicity of the elements. Proportioning systems provide a sense of order and heighten the continuity of sequential spaces.

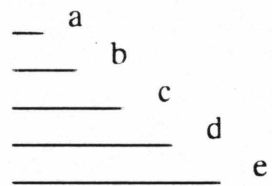
Nader Ardalan, state that: "Proportion to space is what rhythm is to time and harmony to sound"¹⁶. "The primary continuity results from the concept of positive space exalted through the profound use of symmetry and rhythm".

"By symmetrically repeating the forms in serial or circular order the moving architecture is created that reads like musical composition"¹⁷. Frank Lloyd Wright, explains the continuity as follows: "that's what's missing in our architecture today the ability to think through; to begin at the beginning and proceed according to nature to the end as it was desired to be or conceived to be."



A continuity, a continuous sense of what is happening. That's the basis of all good design. Without continuity, without consistency in other word, the design is merely "harimaze" as Japanese say "mixed-up" no beginning, no end, no order, no repose"¹⁸.

Architectural elements, by repeating themselves in different order generate various patterns. The repeating pattern of architectural elements, columns, walls, in one side, and the repetition of them in other side with respect to the center line and center point complete the axial symmetry and circular symmetry respectively. The following proportioning system illustrates a sense of order between elements and spaces.



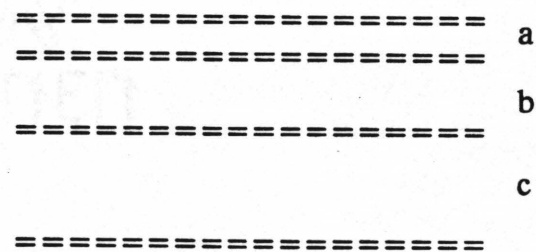
where

$$a + x = b$$

$$b + x = c$$

.....

space between walls as a, b, c:



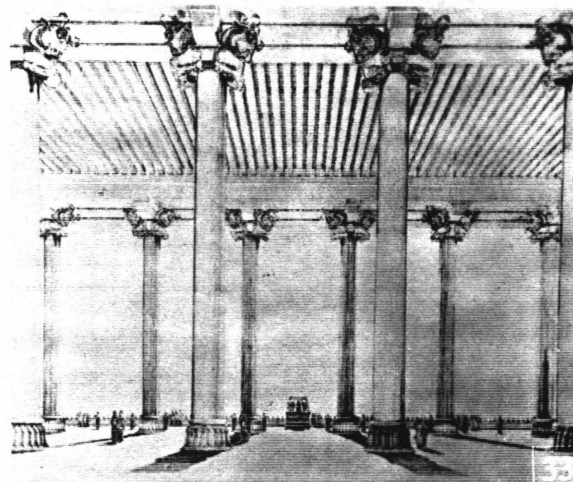
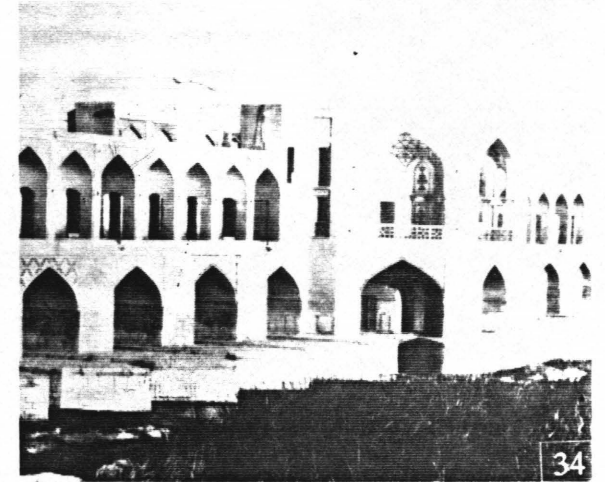
Other architectural elements such as the roof, and the floor by being elevated and

repeated can be of great significance in creating a tangible form and establishing coherent spaces.

Coming together, walls and/or columns with roofs and floors create spaces. If the walls were arranged in a particular pattern, being in an order, coming together with floors and roofs (which may carry an order), then, the created spaces will result in an order.

The interlocking order is perceived, if the order that the architectural elements present in a composition were interrelated and interlocked. As a result, they represent a specific relationship among archetypical elements.

To perceive interlocking order as a unifying composition of whole in unity in our visual field, the ordering of components of the form and the space must be related to one another in a coherent and close-kin manner.

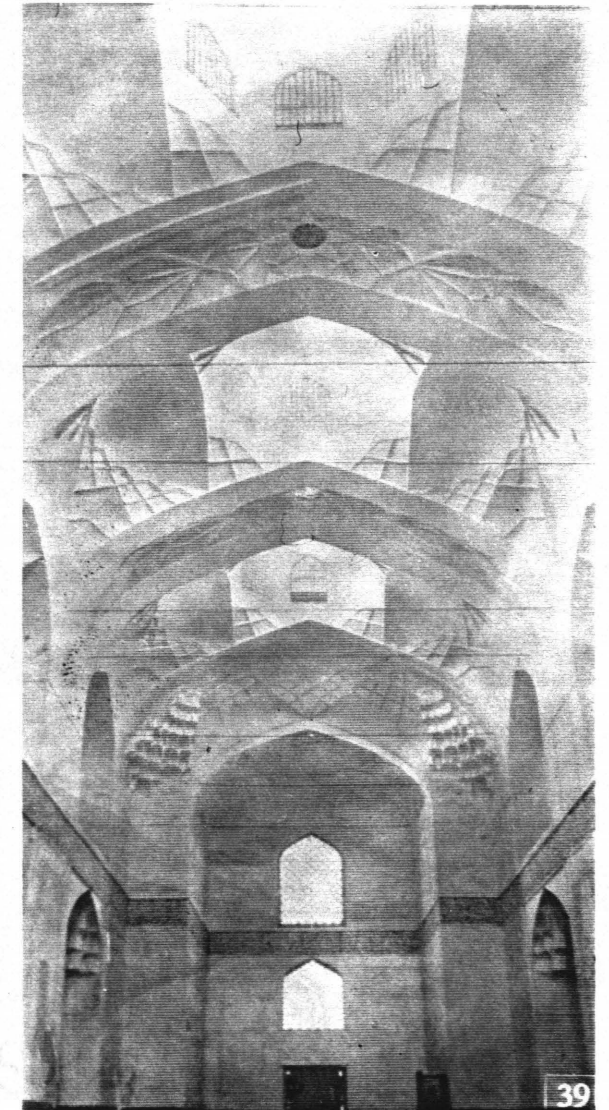
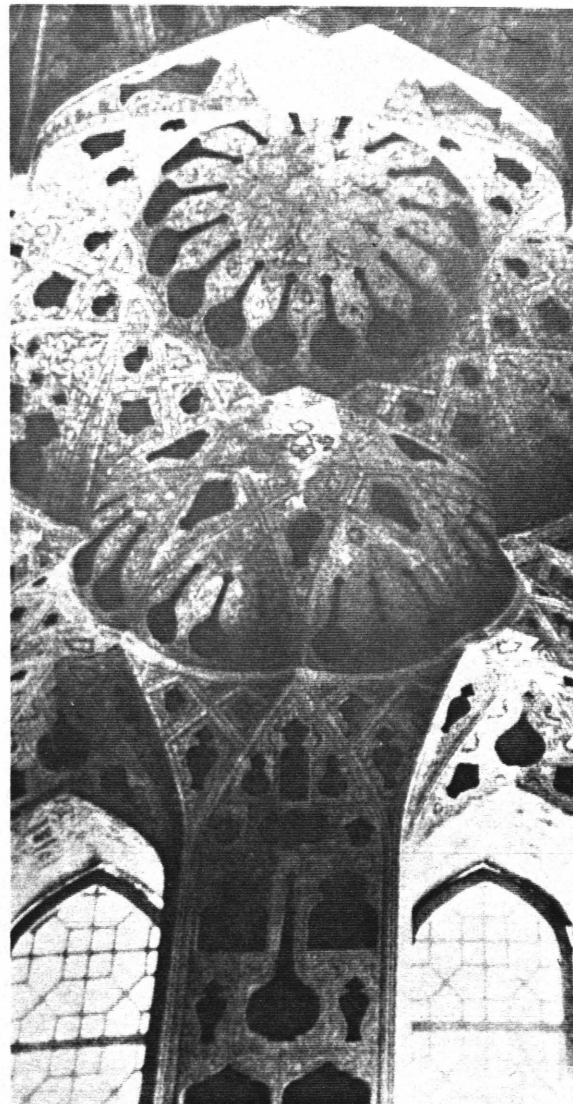
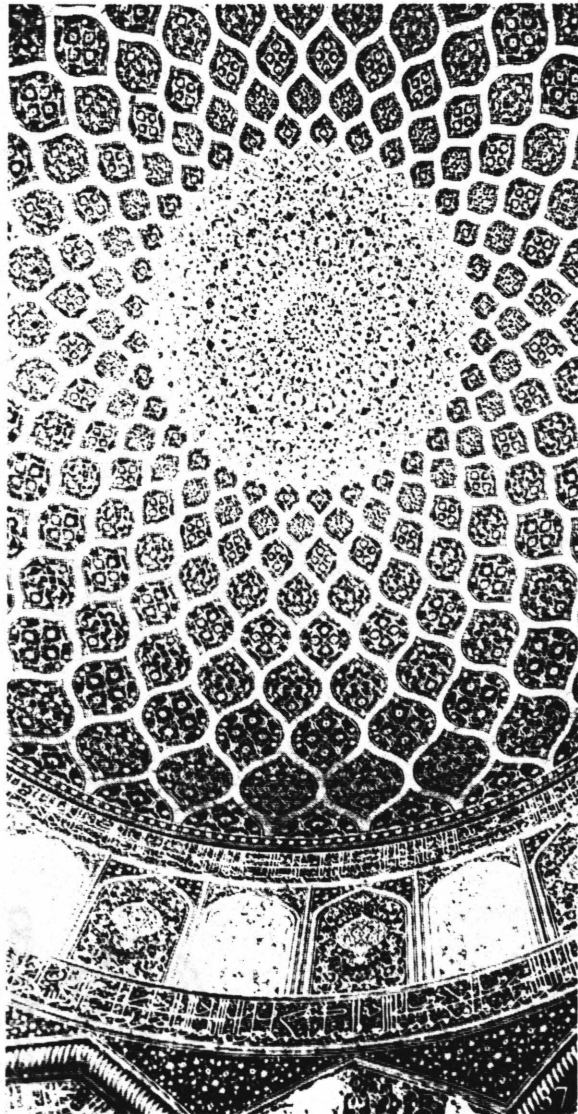


Pattern

Frank Lloyd Wright, talking to students says, "There is the modular that has been back of every design I ever made. Even a small house is made on nothing but a modular system and the module is taken from experience by what I would think would be the best pattern or spacing that would work best with the materials chosen for that work"¹⁹. Also he says, "The bone structure of the face is there

according to the pattern of the face. The face is not the result of the bone structure but the bone structure is the result of the pattern of the face. So structure can form just a pattern. Pattern is the idea of the form and it is so in nature all through as it is in architecture"²⁰. "... But it's everywhere in nature and you can't be familiar with the precedents of the nature without some level of understanding of pattern because everywhere and everything nature is

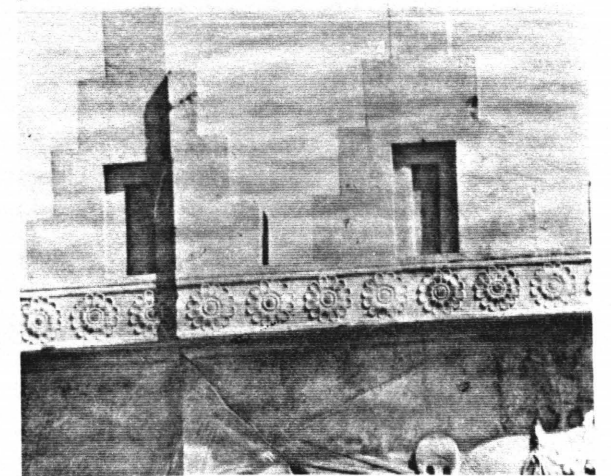
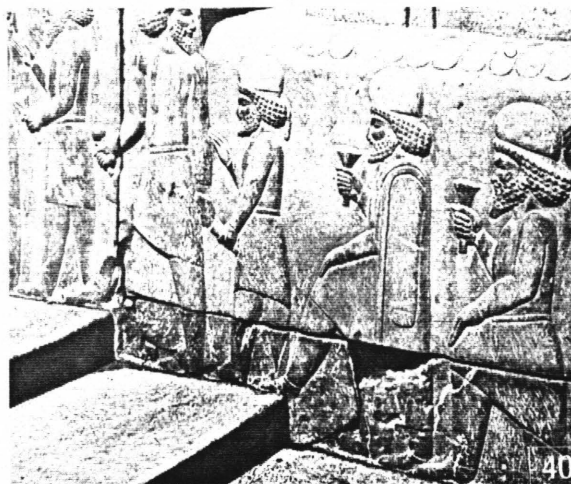
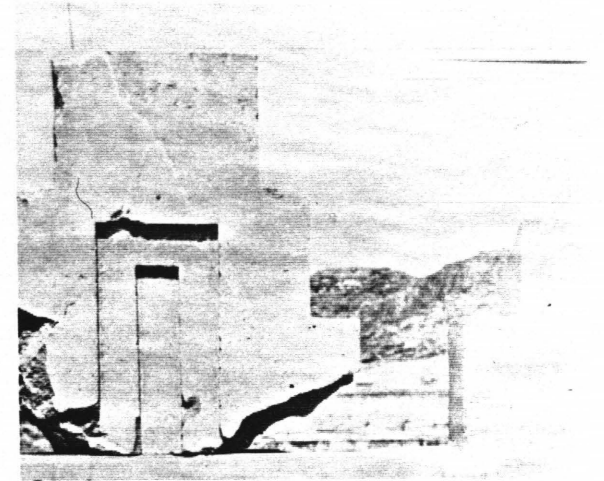
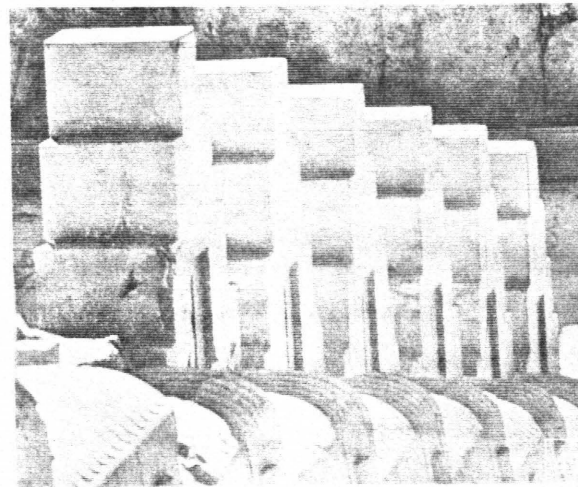
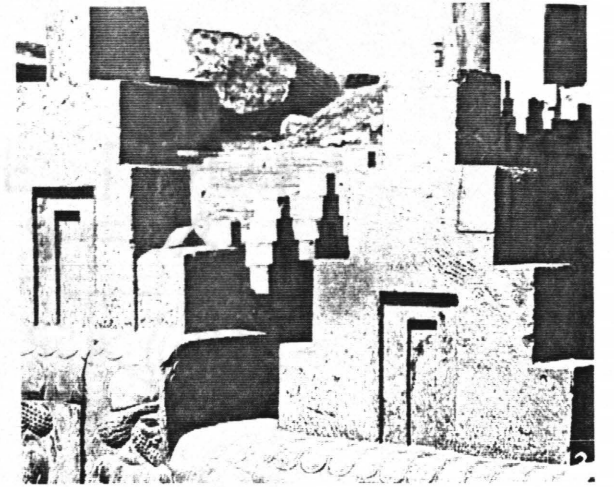
indulging in pattern. It seems that the geometry and the rhythm (interior rhythm) of nature manifest themselves in these various poetic forms that we see in the flowers, and trees, and everywhere as a matter of fact. I think no region of nature is exempt from pattern even our own. We have a pattern..."²¹.



Rhythm

Rhythm refers to the regular or harmonious recurrence of lines, shapes, forms, or colors. It is the notions and the patterns of repetition of recurrent element as a device to organize form and space in architecture²².

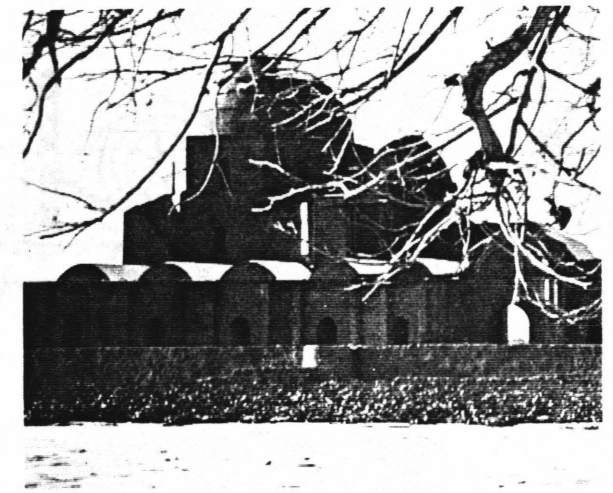
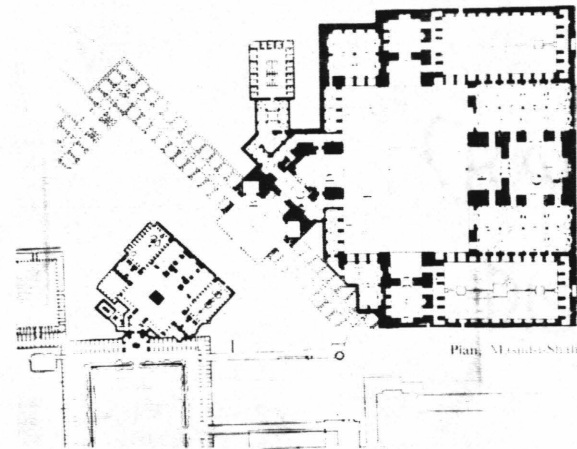
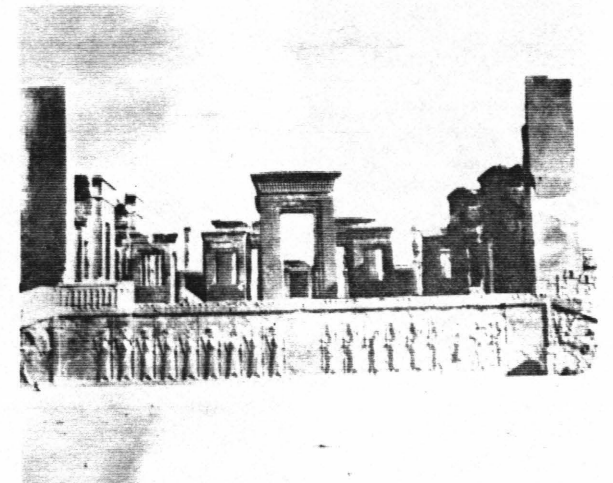
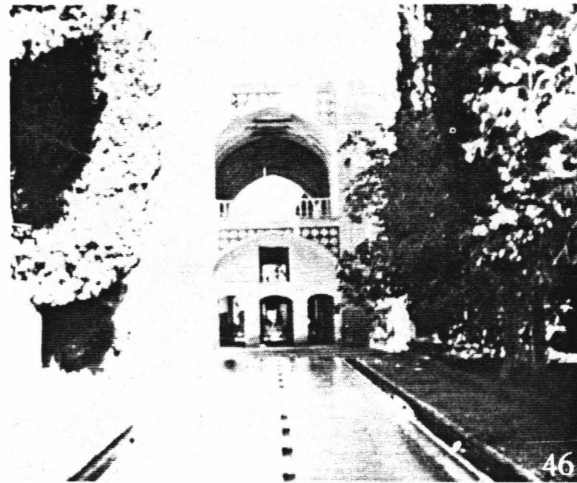
The rhythm relies on its impact on strict repetition. The brain derives particular pleasure from rhythmic presentations varying from the simple binary kind to the complex repeated sub-systems which are evident in architecture as well as in poetry and music. The rhythm-demand also has a routine advantage in terms of memory and recall. Rhythm can operate to bring order to a sense in much more subtle ways²³.



Axis and Symmetry

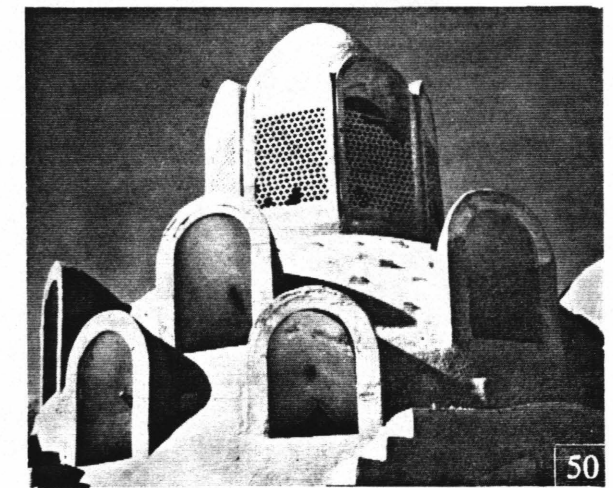
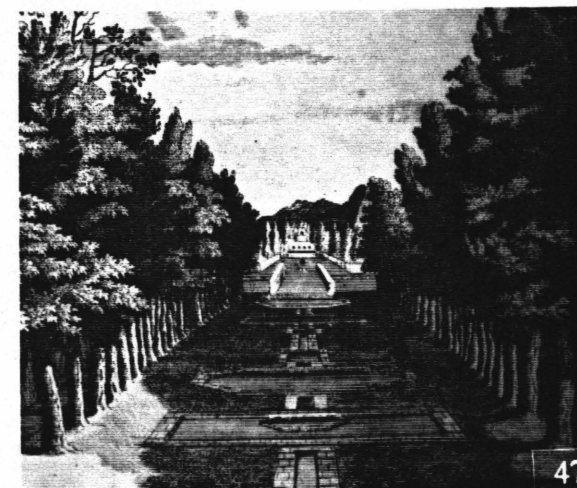
An axis is perhaps the most elementary means of organizing forms and spaces. Any axis is established by two points. It must be terminated and have definition for the validity of its end points. Also, axis can be established by a symmetrical arrangement of the forms and the spaces. According to Sven Hesselgren, symmetry is an image of fundamental order which we carry with us as a reference for all of our actions²⁴.

Purity and perfection is symbolized by geometric symmetry which is referenced to the line of symmetry: axis. A vertical surface, such as wall, or other axial organization can be used along its length to reinforce the existence of an axis. Using symmetrical shapes at end point of an axis would have the same effect for reinforcing the presence of an axis²⁵.



Hierarchy

In architectural composition, a hierarchy is the perceived sense of importance between different spaces and between different forms. These differences are the degree of importance of forms and spaces, which can be implied in the functionality or the formality in their organization. The roles that the particular forms and spaces play in their organization, based on size, shape and placement, is symbolized as the hierarchy among them²⁶.



Floor

The floor plane supports our activities within a building and becomes an important design element within a space. Considering what the floor 'does' Thomas Thiis-Evensen, finds three themes in floor architecture: the directing, the delimiting, and the support of floor themes, which is the manifestation of the natural floor characteristics, effects the expression of both the directing and the determining theme²⁷.

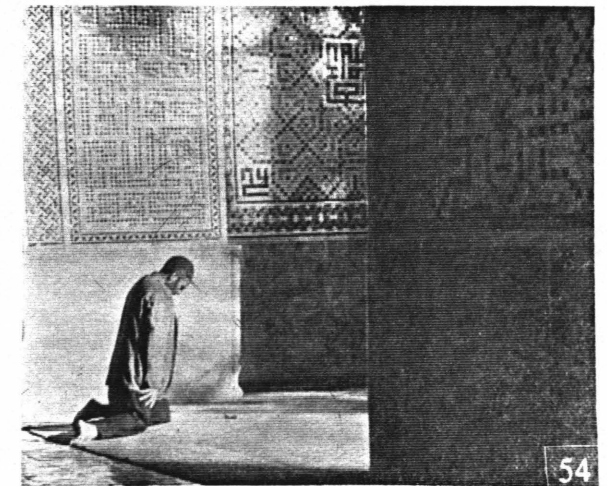
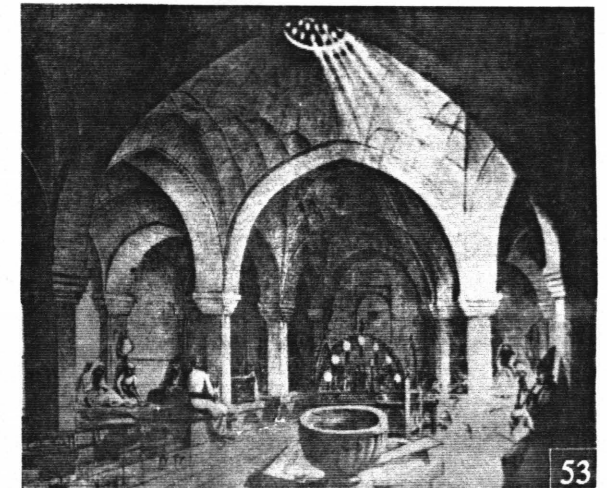
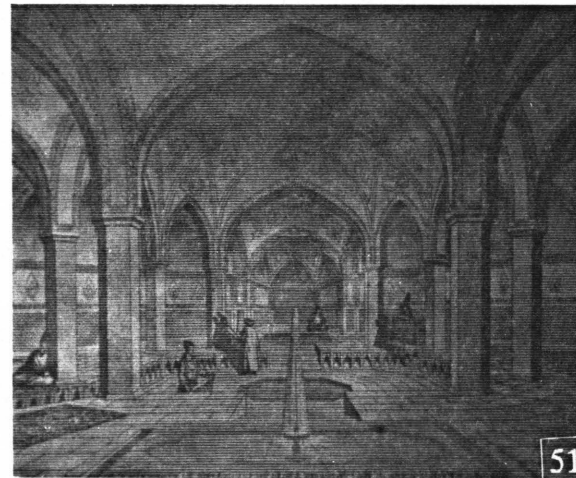
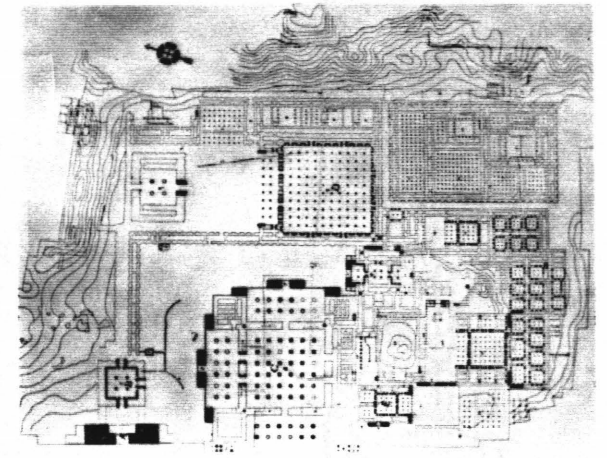
The horizontal dimension of floor in architecture according to Nader Ardalan, symbolizes the microcosm stands. The hierarchy of designs evolves, from the simply defined horizontal "place" to the most sacred symbolic uses the honorific place²⁸.

The floor plane can be manipulated to give direction and an alarm for different events, to make statement for beginning and ending the wall, and be incorporated with wall and roof to make a statement of hierarchy of the space. It can be stepped or terraced to break the scale of a place to human dimension and create platforms for setting, viewing, or performing. It can also be elevated to define a honorific or sacred place²⁹.

The raised floor is the manifestation of the hierarchy of horizontal surface in the space. The presence of order in the floor levels signifies the importance of the different levels. Also, by applying order to the floor levels, it is possible to give a sense of order to the hierarchy of the spaces.

*Everyone, drunk or sober
seeks the Beloved
And every place, mosque or church
is the House of Love.*

Hafez (fourteenth century)

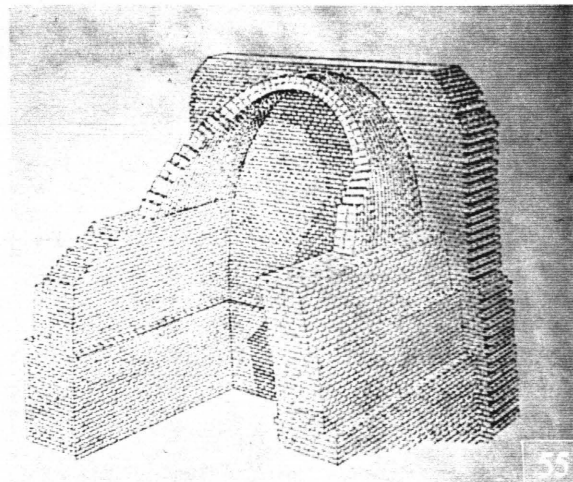


Roof and Ceiling

The roof is a recapitulation of the heavenly vault and the locus of the spirit. The form of the roofs or the ceilings, more than other dimensions is related to the concept of shape³⁰. Roofs are two dimensions with respect to our surrounding environment (vertical and horizontal). The space above is the vertical dimension, the sky, which guides a downward motion from above. On the other hand the roof which resist the sky guides upward motion.

In the interior space, the roof may direct the motion upward or downward (vertical), or, parallel to the surface (horizontal). Horizontal motion is directed toward the center or along a line³¹.

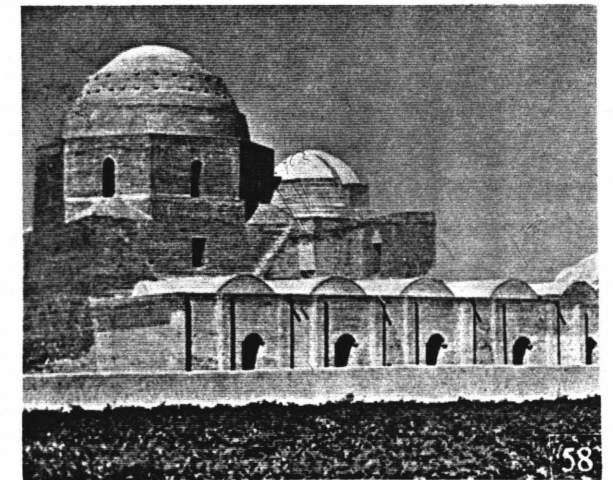
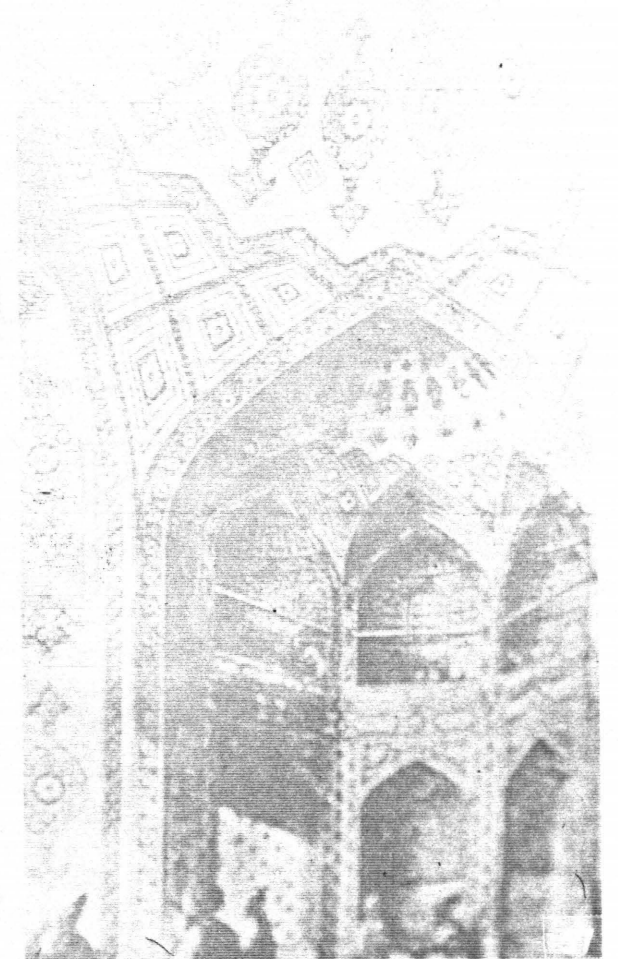
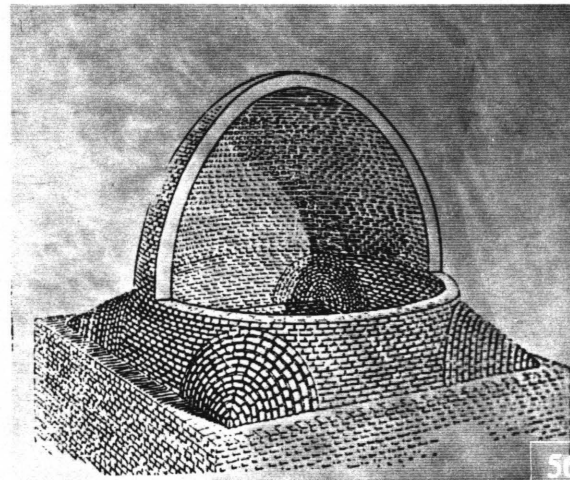
The vaulted ceiling has significant effects on the quality of light and the acoustics within the space. The vault form of the roof has a significant impact on the building form and its silhouette, which finishes the last statement of overall form of the building. The barrel vault gives the possibility of "motion" in three



dimensional spaces. The vaulted ceiling qualities are that of a linear space generating vertical movements and symmetrical lines, resulting in dependent spaces of heightened indeterminate qualities³².

According to Arthur Upham Pope, "the vault was absolutely vital to the development of Persia's great architectural achievements. From Sasanian or even late Parthian times, the vault in its various form was without doubt the most important element in Persian building".

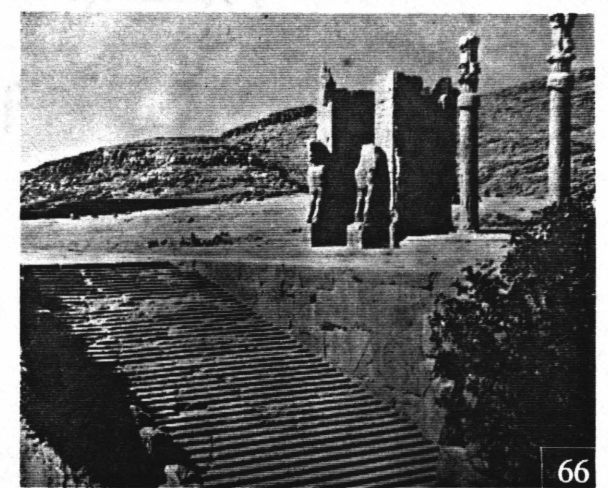
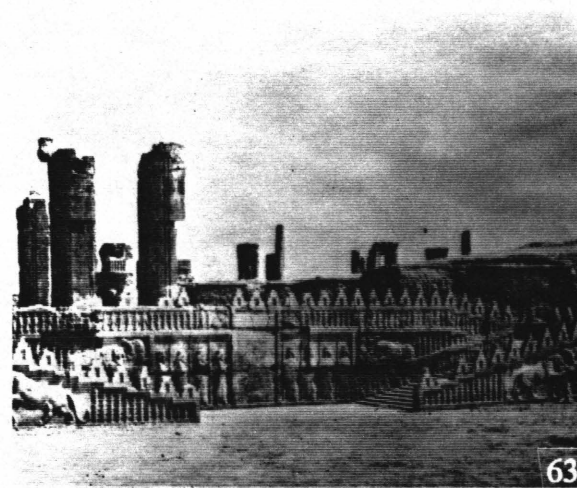
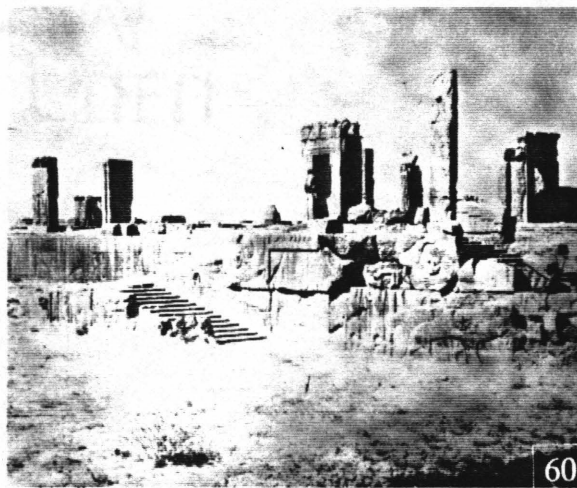
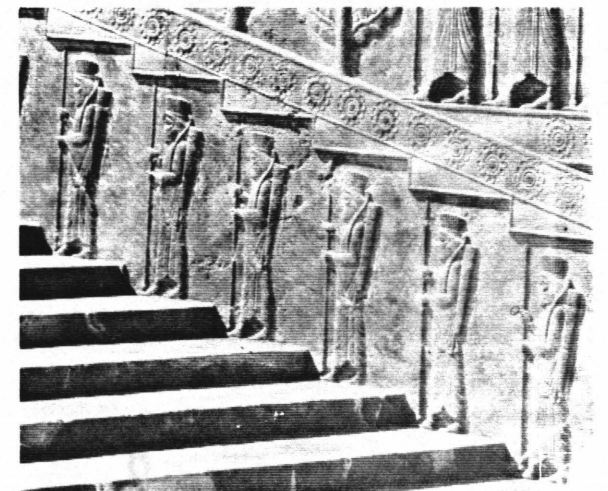
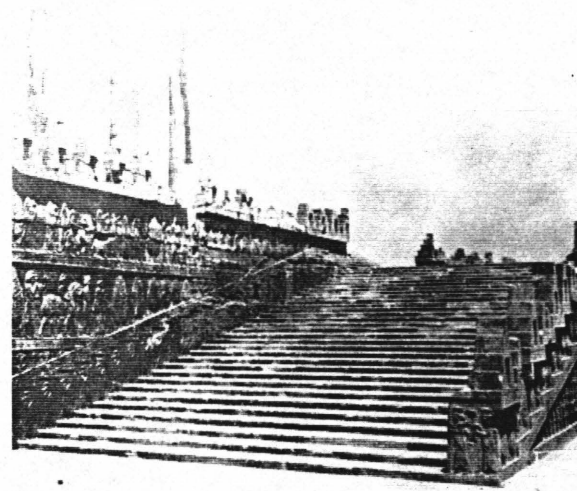
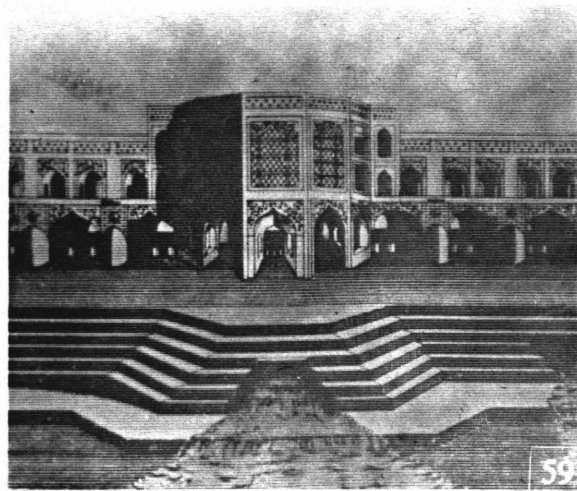
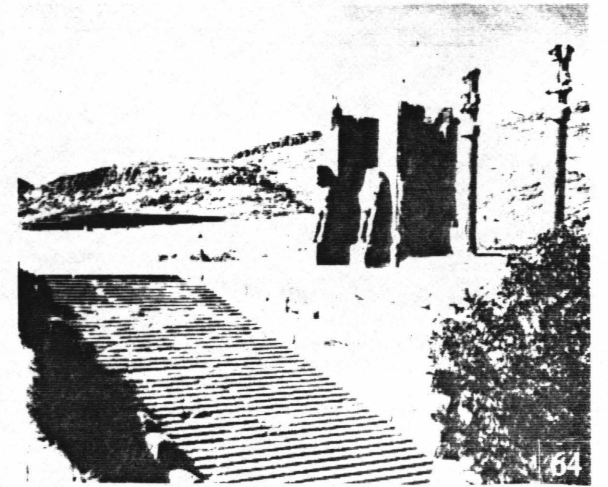
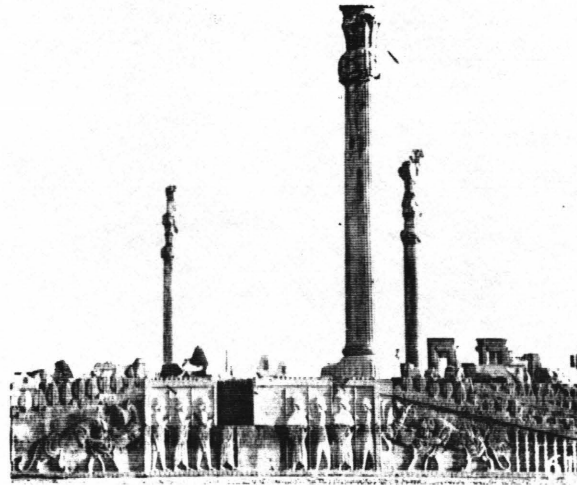
Vaults are derived from a single elemental component: the arch. When an arch is prolonged in depth, a barrel or tunnel vault is created, which is simplest of all. When two tunnel vaults intersect each other the diagonal vaults thus formed are called Cloister or Groined Vaults. And if the arch is rotated on itself to form a hemisphere's vault, it is, of course, a dome³³.



Stairs

The importance of stairs throughout the architectural history is that the stairs are considered as an intermediary in the relationship between outside and inside, and between home and its surrounding environment.

The purpose of stairs is to present the enclosed spaces to incoming people, and open spaces to departing people. The stairs are the statement for presentation of hierarchy of different levels through the floor levels and hierarchy of space and form within the composition.



Transformation

Transformation requires that the ordering system of prior or prototype model be perceived and understood so that, through a series of finite changes and permutations, the original design concept can be clarified, strengthened, and built upon, rather than weakened or destroyed³⁴.

Sometimes, there is a need for a sudden change in a linear element of a design due to program requirement, where the existing ordering of the elements might be appropriate and reasonable.

In such a situation, the significance of the transformation of the existing order through a series of discrete manipulations appears to respond to the conditions and context of the design. The important point is the transformation of the perceived ordering system from one part to another part of the design.

The transformation is conceived if the obstruction element shall become part of the whole to provide the continuity and transform the perceived ordering system from one part to another part of the design.

Circulation

Circulation has a great significance on architectural evaluation of a buildings. The ease of circulation and the movement of people in any building is a key element of the serviceability of that building. Providing logical access and sense of direction to the different spaces provided and elimination of unnecessary movement and confusion within the building are the qualities of circulation.

Water

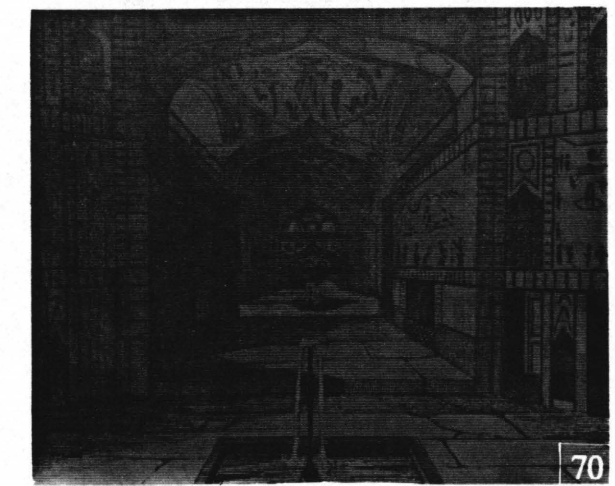
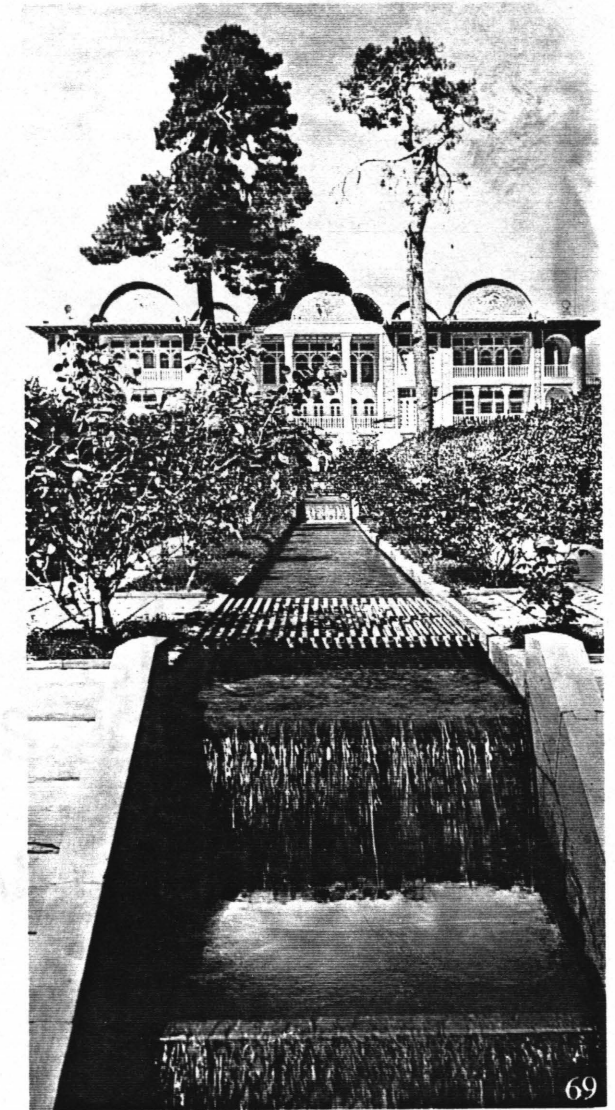
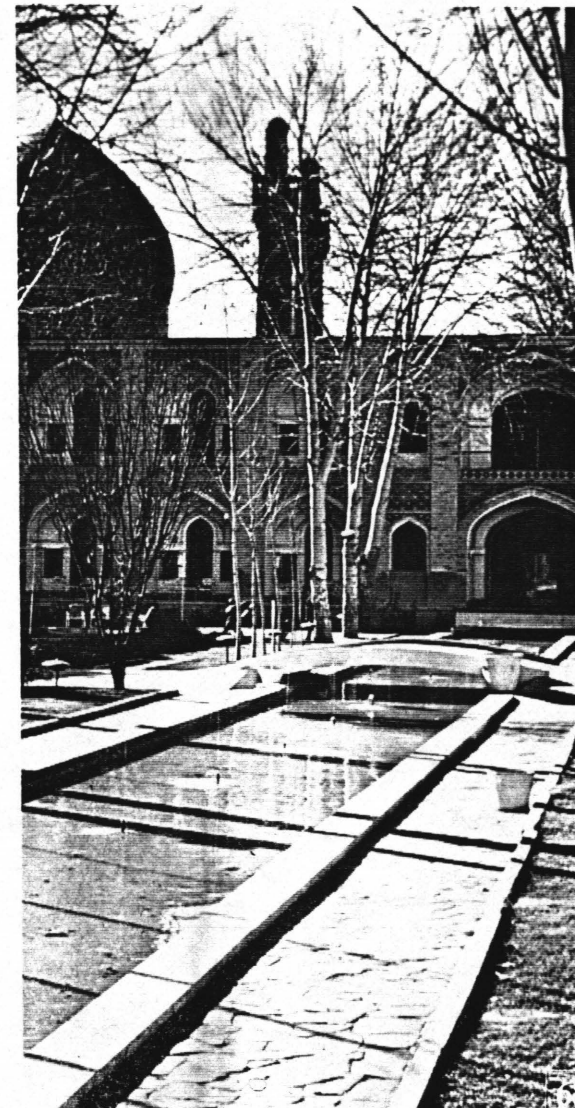
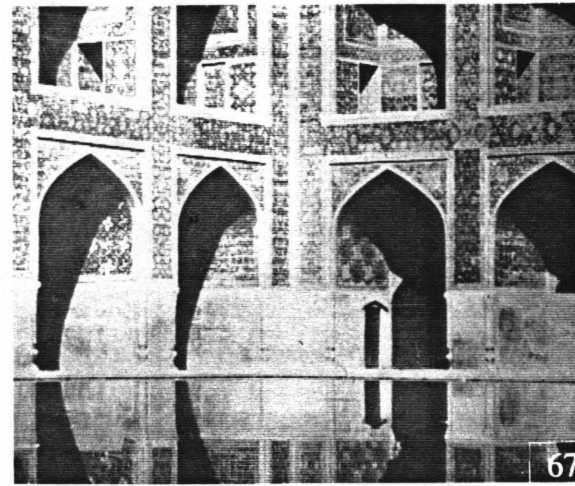
Water plays a vital role in attracting forms of life and people around it, thereby it becomes like a magnet which polarizes space³⁵. Water is an enhancement element of the environment. It is the element of equality and is extremely varied in its effect. The dependent spaces within a courtyard focus on the central pools, whose full brimming surfaces reflect the divine mercy³⁶.

The suggestion of coolness and delight, the play of light and sound as well as its intimate connection with life, all make the water superb material for outdoor and indoor use. It also enhances the quality of the space. Water affects the sound, smell and touch of the surrounding as well as the sight. While moving water gives a sense of life, still water conveys unity and rest³⁷.

Water, light and earth are the essential sources of life, the triangle of being. Water plays with light, its reflection dances on the walls, on the floors, on the ceilings and still can act as a mirror.

The form of its container and the way of falling and splashing of the running water can enhance the sound, the beauty and the play of the surrounding environment.

The sound of running, falling, water breaks the silence and adds delightfulness to the environment. The presence of water is an invitation for play and joy. The magnetic attraction of water demands water to be placed at the heart of the design.



Light

Throughout most of architectural history, daylight has been the primary source of light. Daylight has been symbolic for clearness, purity, knowledge, and heaven³⁸.

"Light is a spiritual presence which pierces the heaviness of matter and transforms it into a noble form worthy to be a dwelling place of the soul of man, whose substance is also rooted in the world of light which is none other than the world of the spirit"³⁹.

Windows and roof openings should be given special attention within the structure. As a result, there will be rather great changes in light levels within the space. Presence of openings and shape of opening correspondingly creates bright areas or spot lights. Light reflecting the shape of the openings create pattern of light and shades, that adds to the beauty of the place⁴⁰.

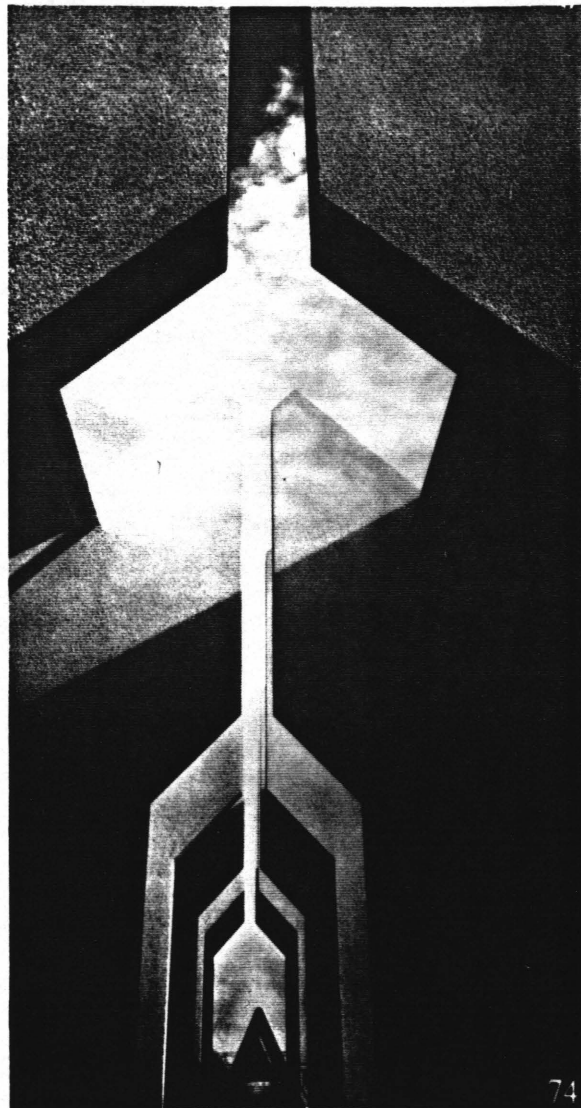
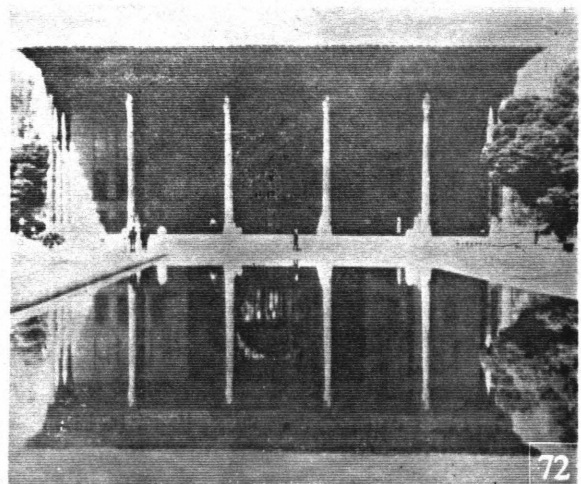
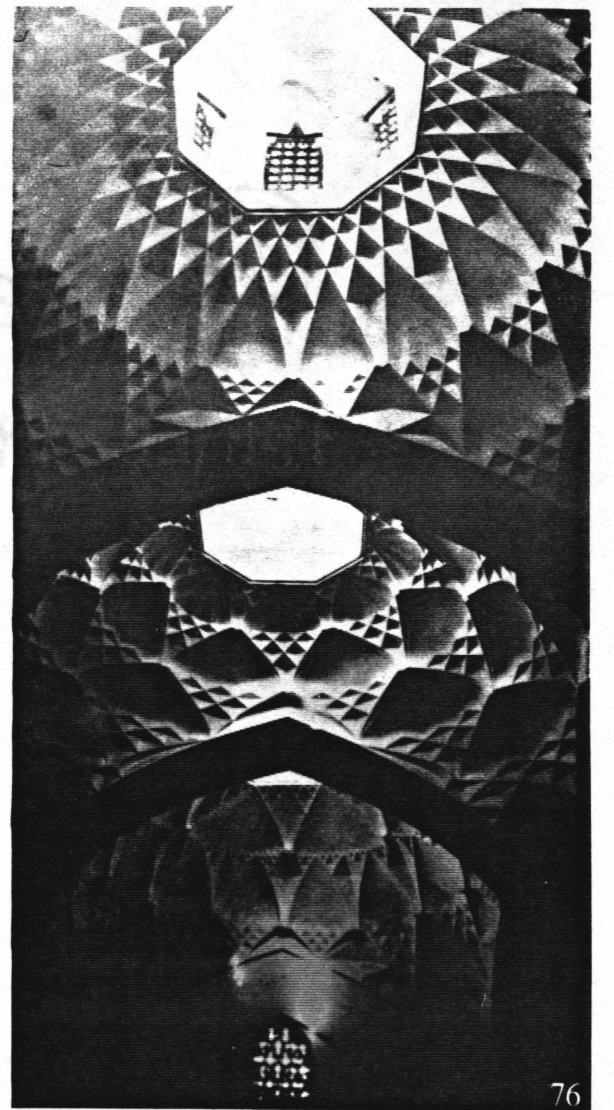
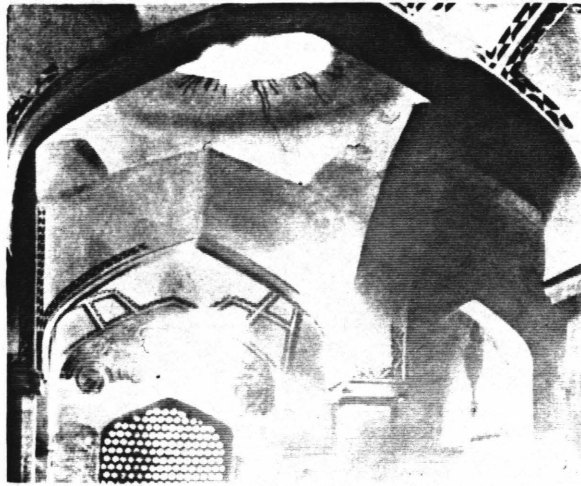
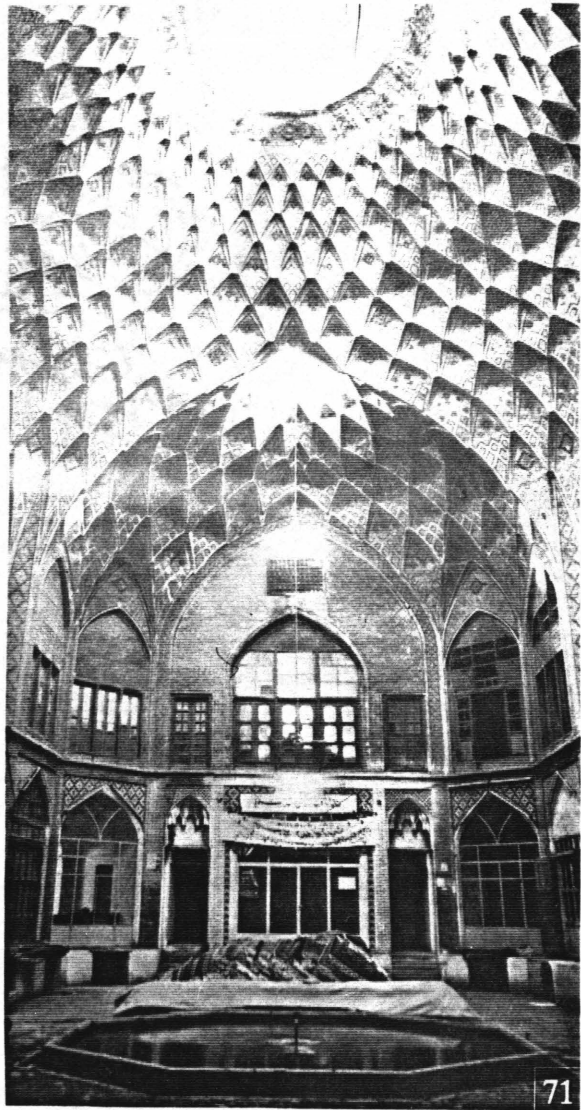
The experience of light and water and the need to provide sensitively lighted places has remained an integral part of Persian architecture throughout history⁴¹.

*This darkness you see
is the Light of the Essence
A darkness wherein is found
the Foundation of Life.*

Shabestari (fourteenth century)

"The essence of the First Absolute Light, God, gives constant Illumination, whereby it is manifested and it brings all things into existence, giving life to them by its rays, Everything in the world is derived from the Light of His Essence; all beauty and perfection are the gift of His Bounty; and to attain fully to this illumination is salvation."

Sohrawardi (twelfth century)



AN INSTITUTE FOR SCHOLARLY STUDIES

An Institute for Scholarly Studies

The Association of Collegiate Schools of Architecture announced the third annual American Wood Council Student Design Competition, ACSA/AWCSDC. This called for a design of an institute for scholarly studies for the campus of the competitor.

The design had to represent an attempt to bring together, on campus, some of society's greatest thinkers, creators and theorists. The design solutions had to allow for encouraging, small, intensive discussion groups without creating a sense of isolation.

Among the broad architectural issues, the conflict between the concern for a building which is suited to its campus context and the wish that it reflects the special, intellectual nature of the organization it houses had to be addressed. The designer had to find a balance between public and private, and between timeliness and timelessness.

Just as the program required, the design had to provide facilities in which scholars could meet, dine and work in an environment conducive to intellectual pursuits. Space had to be included for the institute's administrative and publication offices. This program required facilities to be provided as follows:

Conference/Group Facilities:

- Lecture Hall
- Large Conference Room
- Small Conference Room
- Living Area, Lounge
- Dining Area
- Kitchen
- Library
- Study
- Bar
- Reception/Lobby
- Cloakrooms
- Restrooms
- Storage Room

Caretaker's Quarters:

- Living
- Kitchenette
- Bedroom
- Bathroom

Executive and Editorial Offices:

- President
- Executive Director
- Two Secretarial Offices
- Administrative Assistant
- Assistant Director
- Building Manager
- Programming Office
- Business Office
- Two Conference Rooms
- File Room
- Managing Editor
- Two Copy Room Editor
- Copy Room
- Supply Room
- Six Visiting Scholars Offices
- Lounge
- Restrooms
- Reception/Waiting

Design

The form was generated from the repetition of a wall within a wall. This design was enriched and gained by constantly reframing the problems, and repeatedly searching for solutions.

The occurring problems were solved and learned by experience through visually experiencing and feeling the physical model of different parts. At the beginning, a number of ideas were developed and consequently a number of variables. As the design progressed, the number of design variables were reduced. The design became racine and the improvement on the design became more evident.

The final drawing and model appeared to be different in contrast to the beginning stage, with the exception that the concepts were more clear and the presence of order became more evident in every direction. Some of the subject matter of the preliminary sketches remained as dominant themes throughout the design. They were views captured through imagination of the interior spaces of the place.



Basic Element of the Design

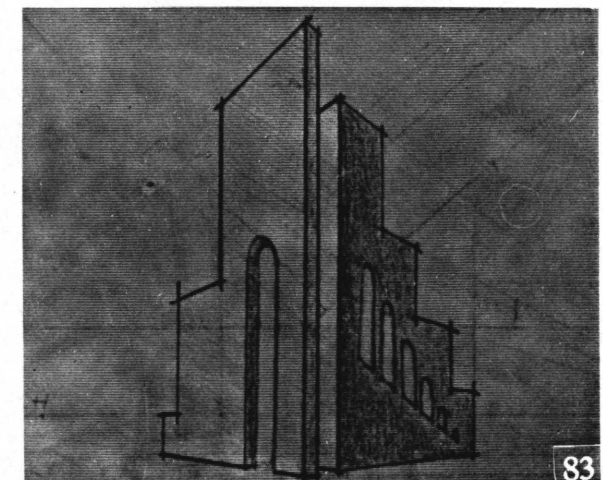
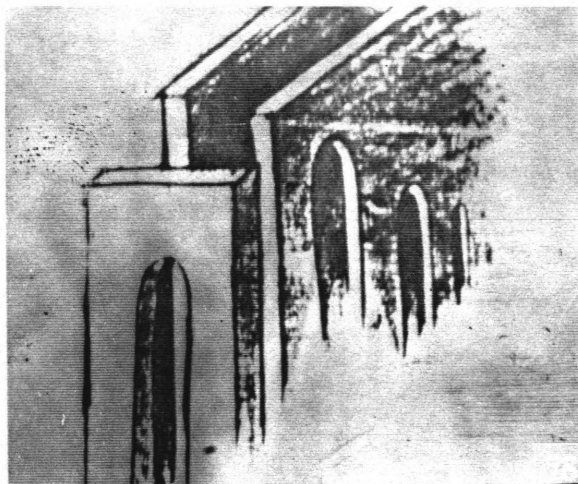
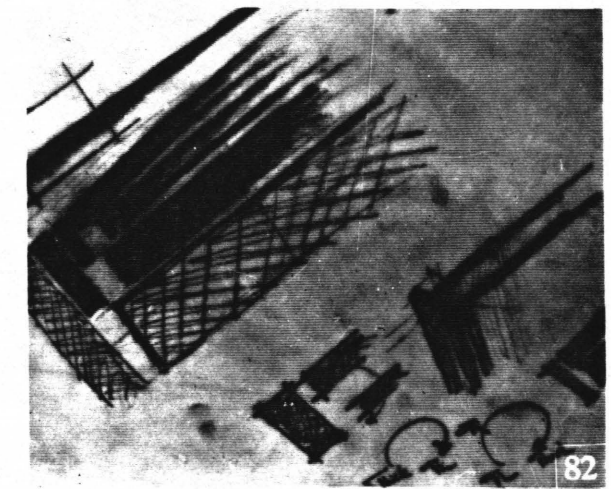
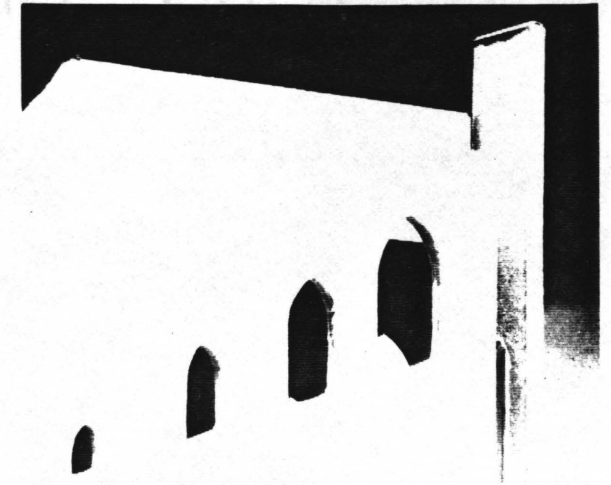
The basic element of the design of the building was the wall. The wall as a tangible architectural element, being strong, tall, narrow, short and wide was considered to be the primary element of generating this design.

The concept of this design was the wall within the wall. The idea of the wall within the wall and the exploration of the wall was conceived through the lecture conducted by Professor Hans C. Rott. At the beginning, it was difficult to transform the abstract ideas of form, space, structure and implementation of the program into the design which could be constructed to express the design ideas.

After struggling for some time, the solution was found in translating the abstract ideas into tangible form by arranging the bearing walls in a parallel series to define the zone of spaces. Then an architectural order was created by repetition of walls as constituent parts, creating a relationship among themselves

and other elements, such as the floor, the roof and the building as a whole.

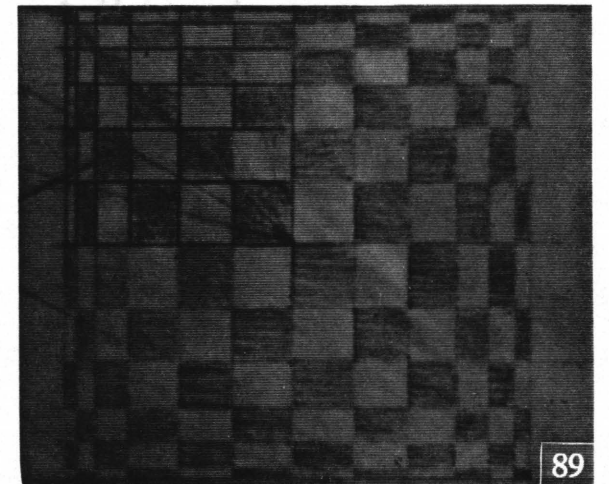
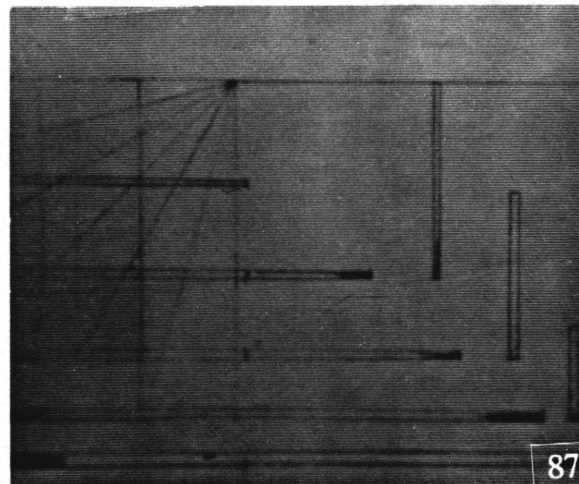
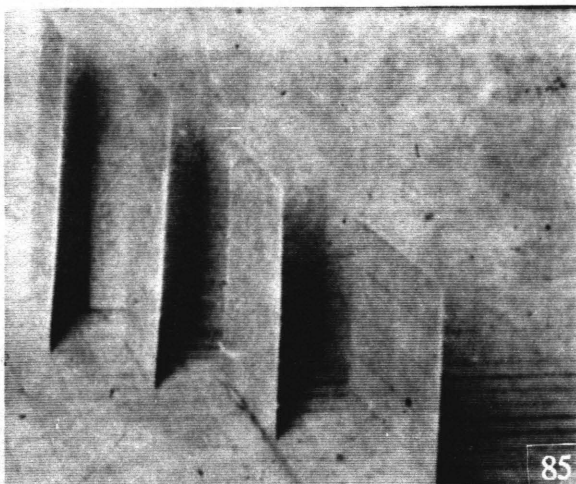
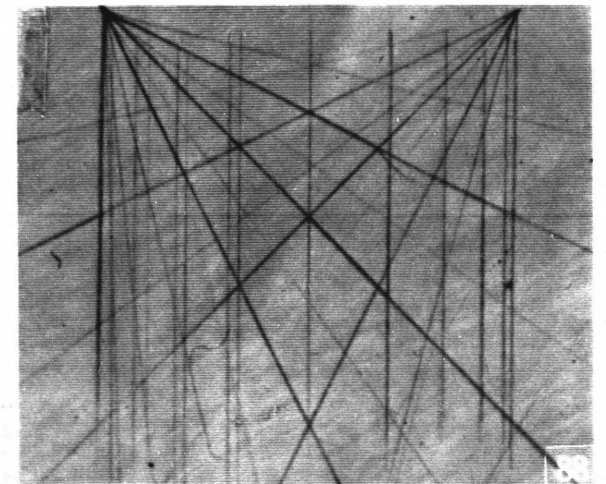
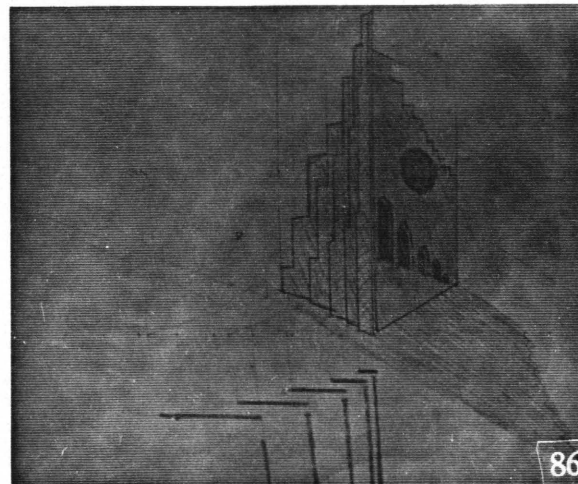
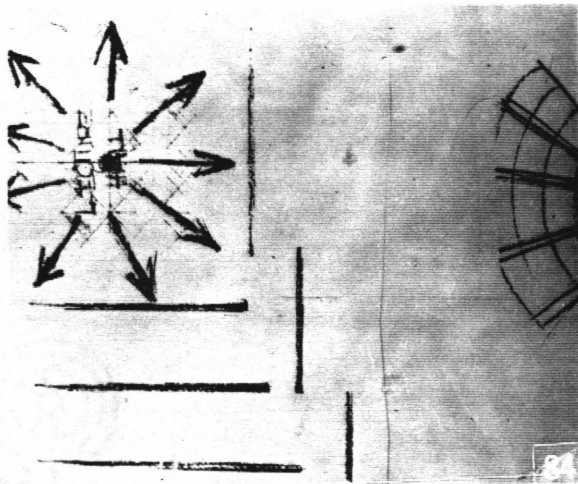
The preliminary resulted spaces related to one another by interrupting the bearing walls and bounding by the secondary walls. The secondary walls were perpendicular to the bearing walls in order to create a perpendicular zone of spaces. The walls, merged with floor plane and the roof plane to define the zone of space, and articulated themselves as an isolated planes.



It was important to place the auditorium at the center of the building to provide a center of focus for the building, and facilitate the use of the building for the public. This provided the building with a sense of direction and ease of circulation within the building. Subsequently the form of the building resulted in a symmetrical condition and a point for completion of the concept of the repetition of the walls generating the form of the building.

Axis of Symmetry

The main axis of this building was established as the line of symmetry in order to organize the symmetrical condition and balance the arrangement of equivalent patterns of form and space.



Repetition and Order

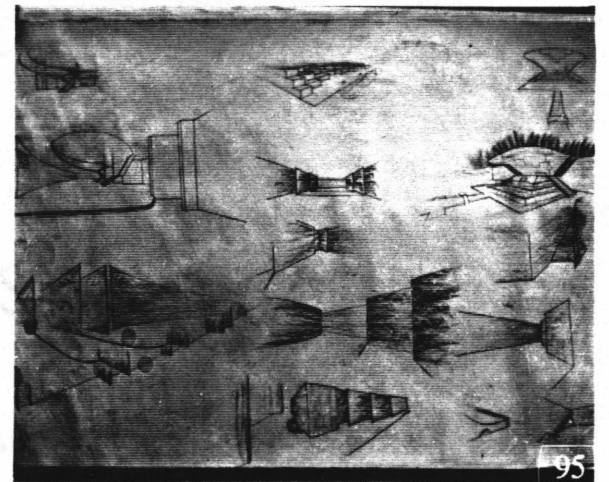
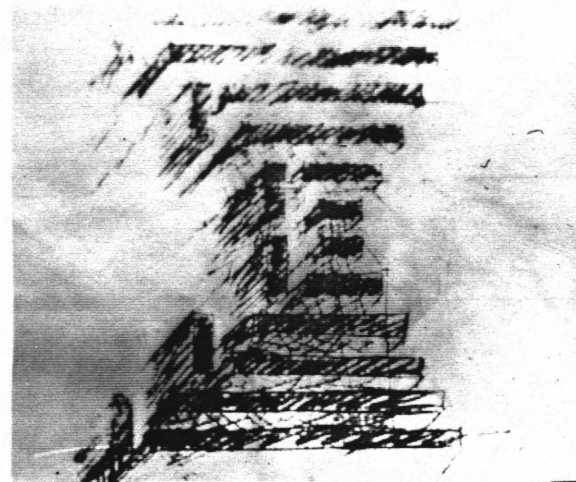
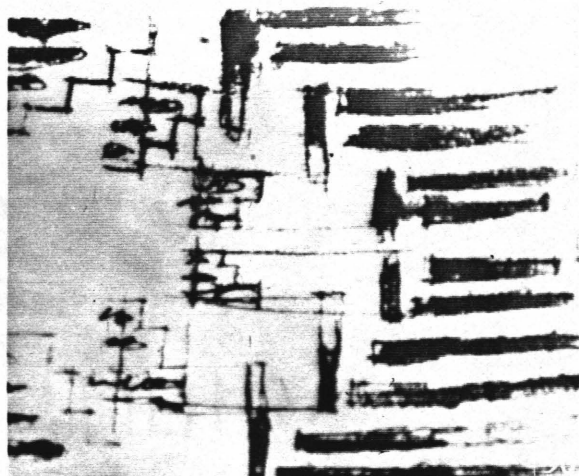
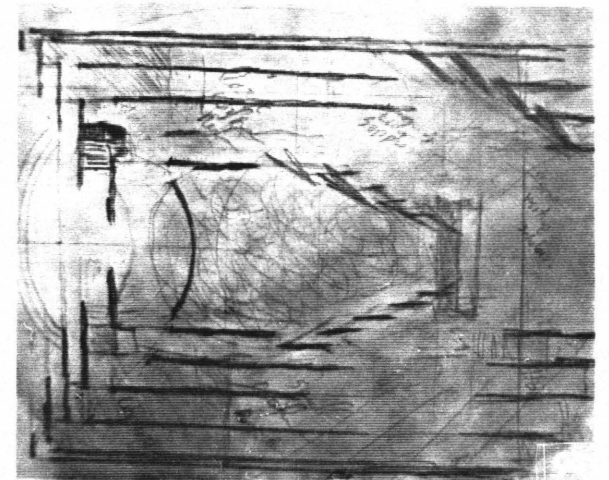
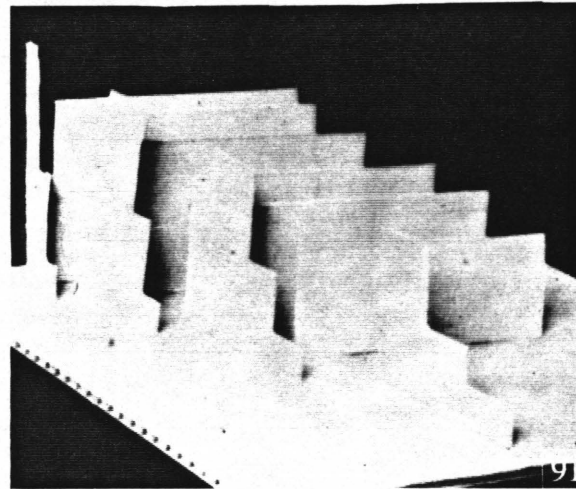
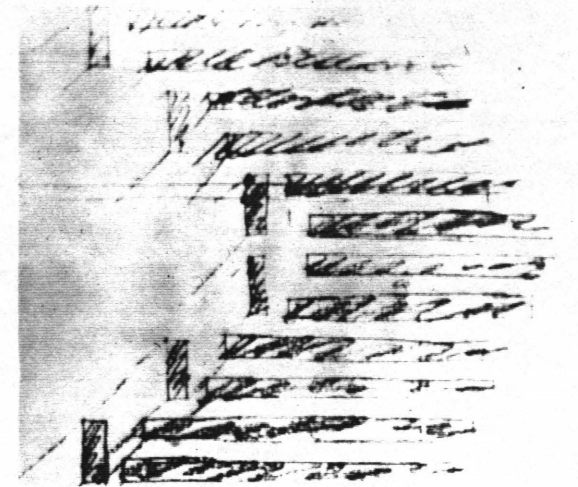
The repeating pattern of the wall in serial, and the repetition of them on one side with respect to the center line completed the symmetrical condition of the pattern of the building. The proportioning system of the pattern provided a sense of order and helped to lighten the continuity of sequence of the repetitive spaces within overall form.

The importance of the auditorium dictated that it be placed at the center of the building to serve, and be served by, the surrounding spaces. An obvious unity was achieved through repetition and elaboration of walls. Also, the issue of using basic geometry to formulate the relationship between space and form of the auditorium and the building as whole, helped to achieve the created unity.

The auditorium's form received the order totally within its volume. The form of the auditorium within its context generated a composite form which incorporated the contrasting geometries of the building into itself as a centralized organization.

The inner form and space of the auditorium expresses functional importance of the auditorium in overall form and space of the building.

The two forms differ in geometry. The overall linear form of the building and the created form of the auditorium collides and inter penetrates each others boundaries. Then, it incorporates into a single organization, as each one strives for supremacy and dominance.



Since the importance of the auditorium in the building was emphasized by being the center focus of the activity, the auditorium gained a unique shape and an exceptional size, in a strategic location, in the heart of the building. The form and space of the auditorium was articulated from the rest, by being the central focus of the building.

The following proportioning system was used to provide aesthetic rational for the dimension of the spaces evolved by repetition of the walls. The first space was taken as eight units due to the program requirements. Then, an additive increment of four units was used to proportion the space evolved by repetition.

_____ a = 8

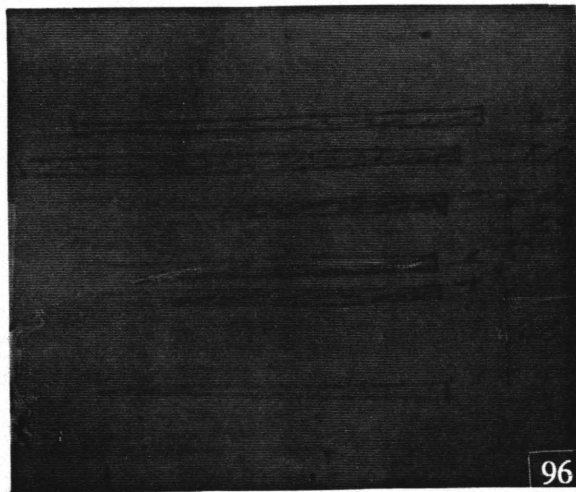
_____ b = 12

_____ c = 16

where:

b - a = 4

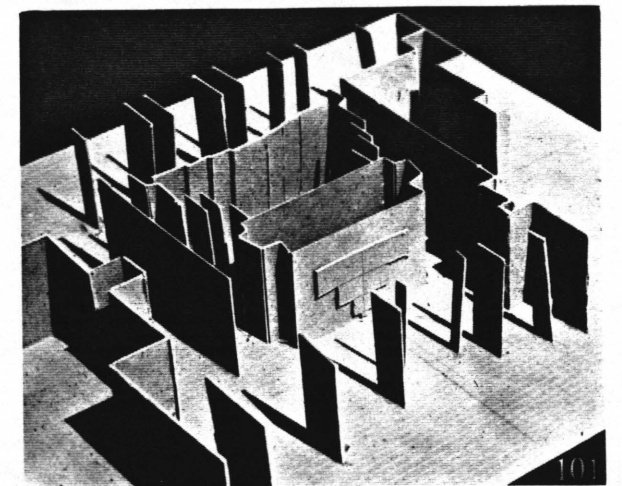
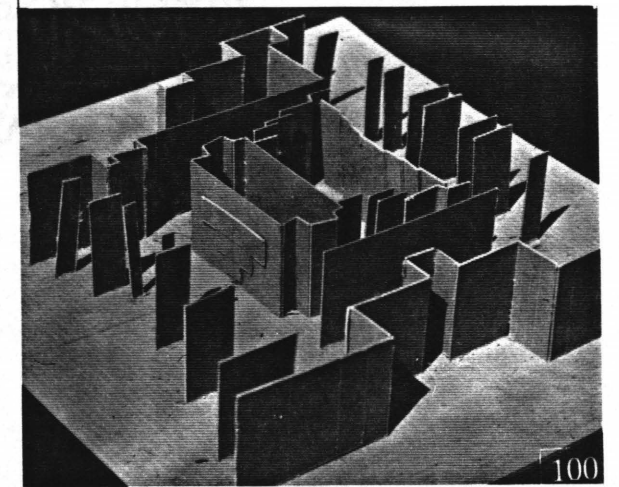
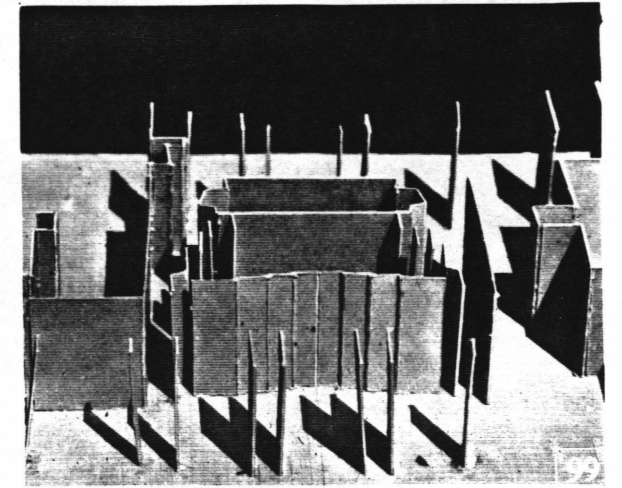
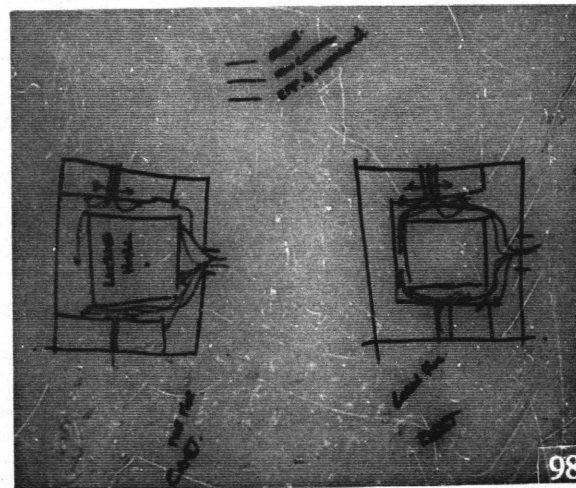
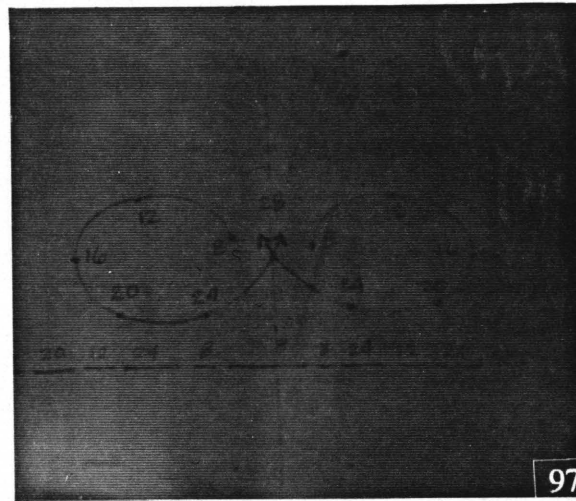
c - b = 4



applied order:

8 12 16 20 24 28

The order of the spaces reads as if the ordered dimensions were placed on a circle and projected on to a line and mirrored about the center line with respect to the inner wall of the first unit. Then the concept of taller and narrower versus shallower and wider is applied to

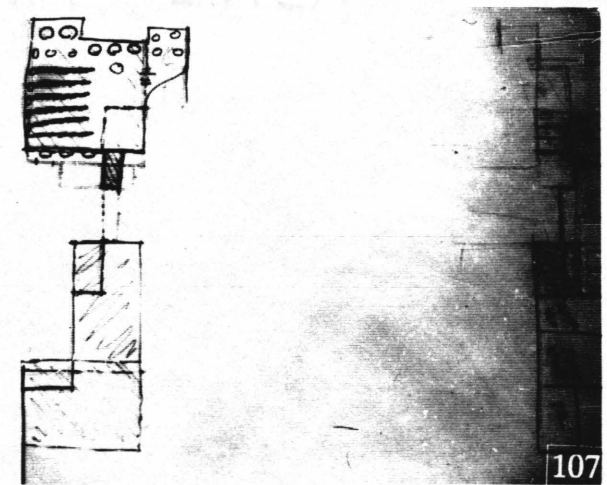
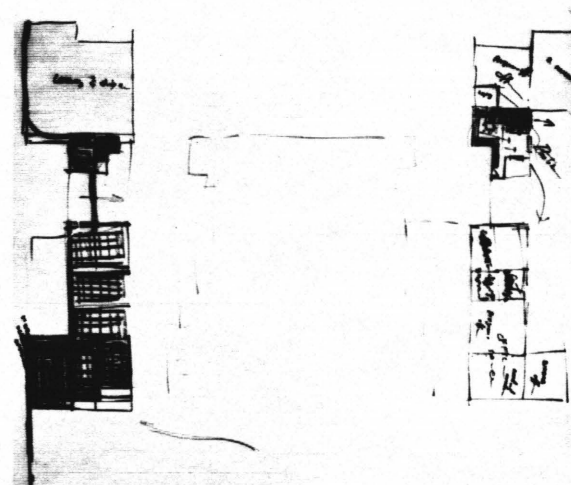
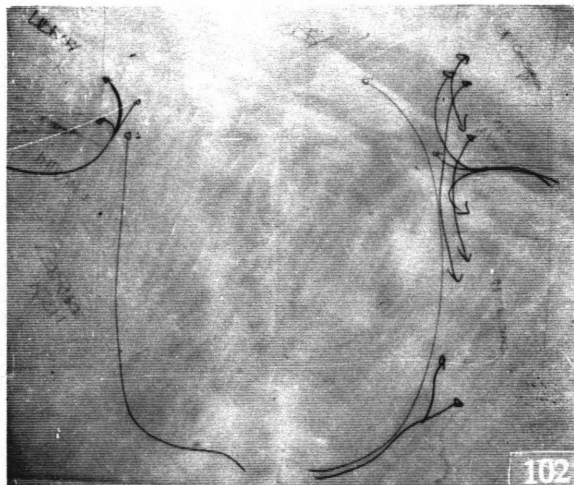
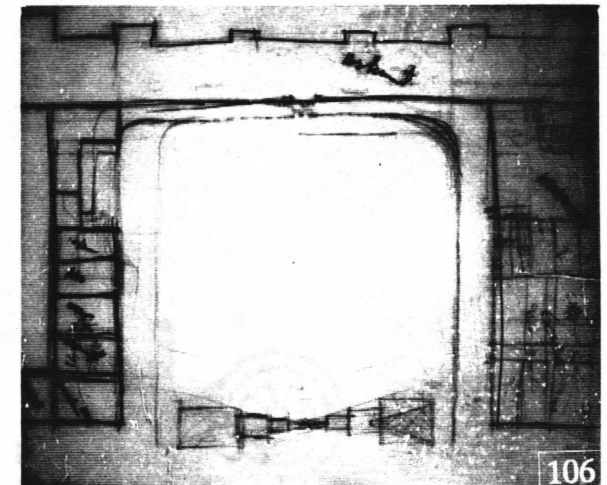
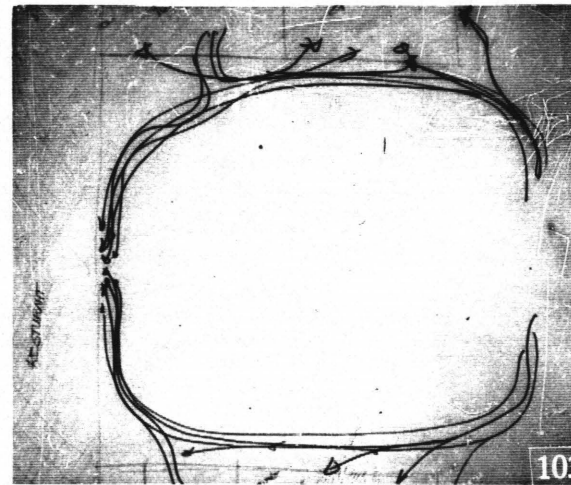
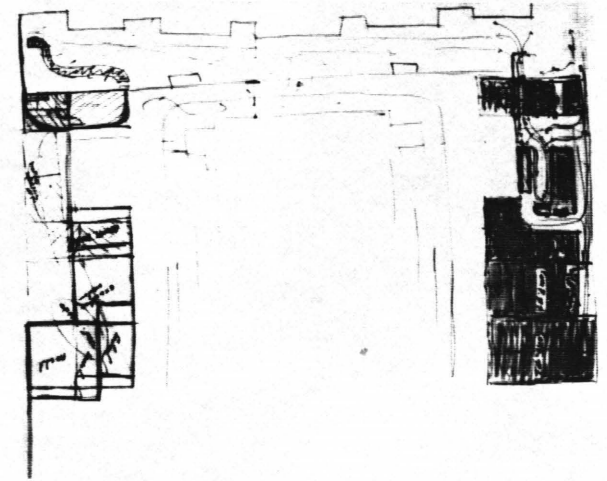


the vertical dimension of the spaces. As the roof and ceiling come together, the execution of this concept becomes more clear.

16	20	12	24	8	28
28	8	24	12	20	16

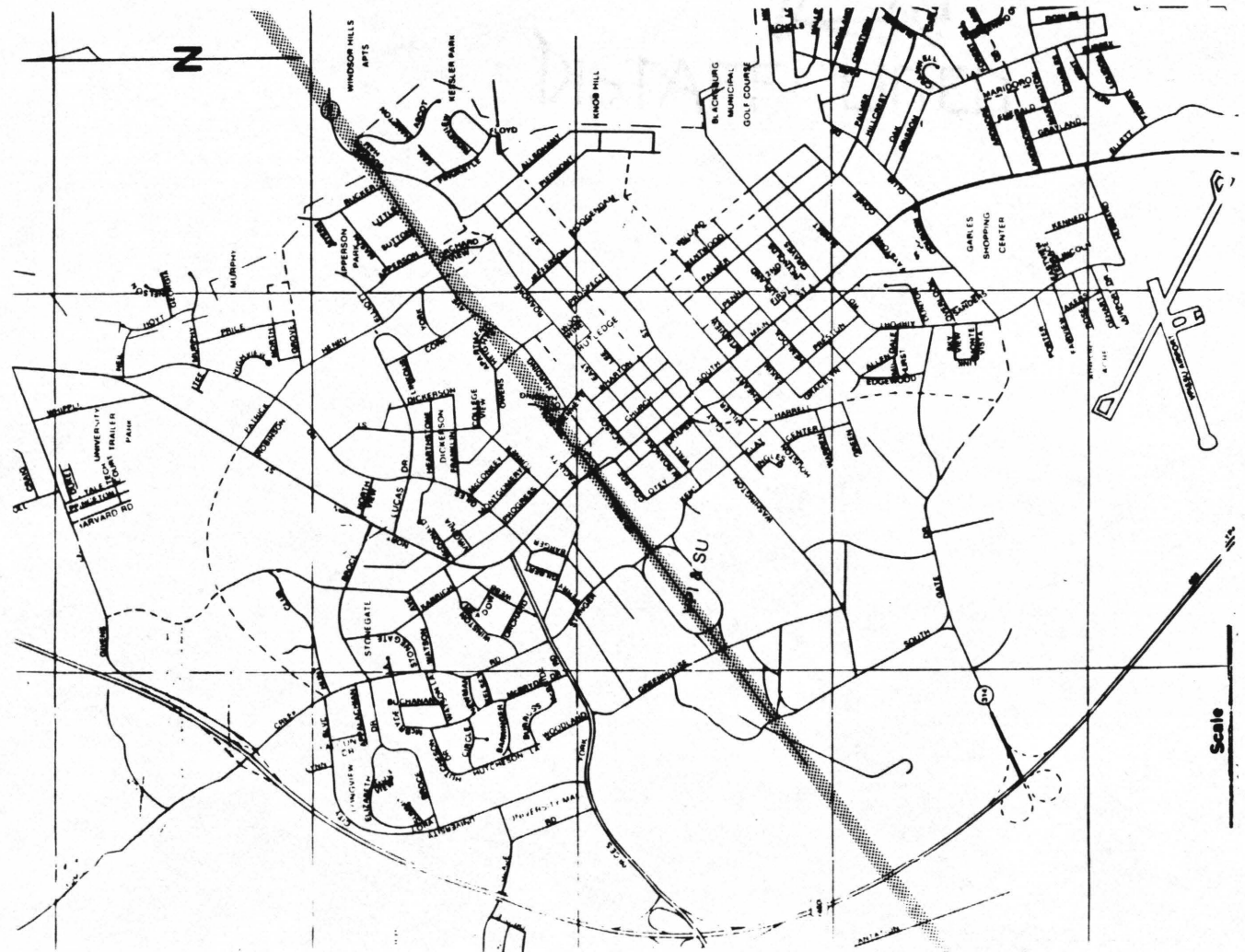
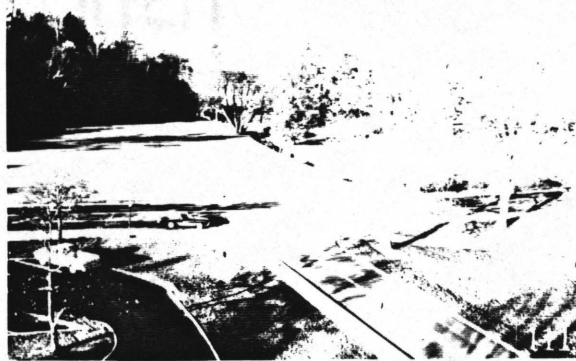
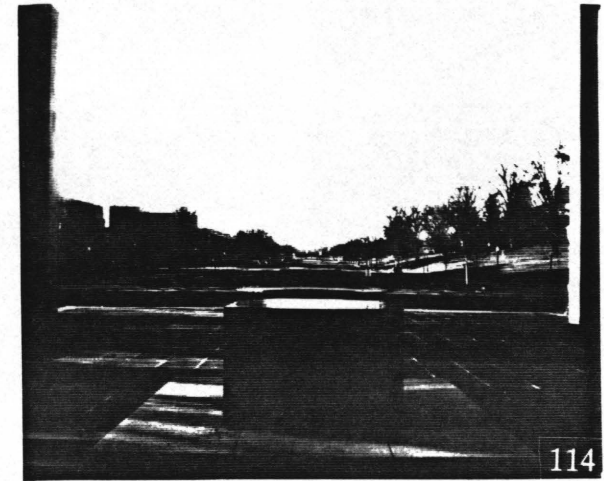
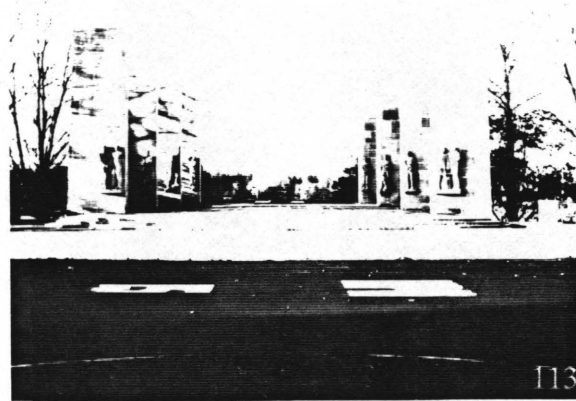
The physical manifestations of this architecture were to accommodate the students, faculty and visitors activities in order to support their needs. As a result, the floor plane was laid out based on the following patterns.

- a) The pattern of sensible form that would support the needs.
- b) The pattern of activity.
- c) The pattern of the circulation and the movement sensitive to the location of activities.



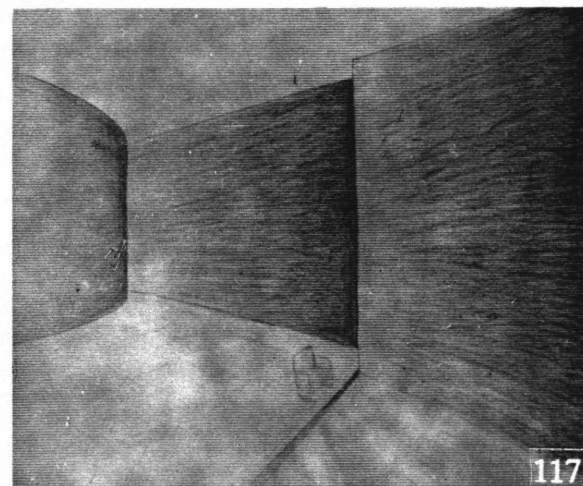
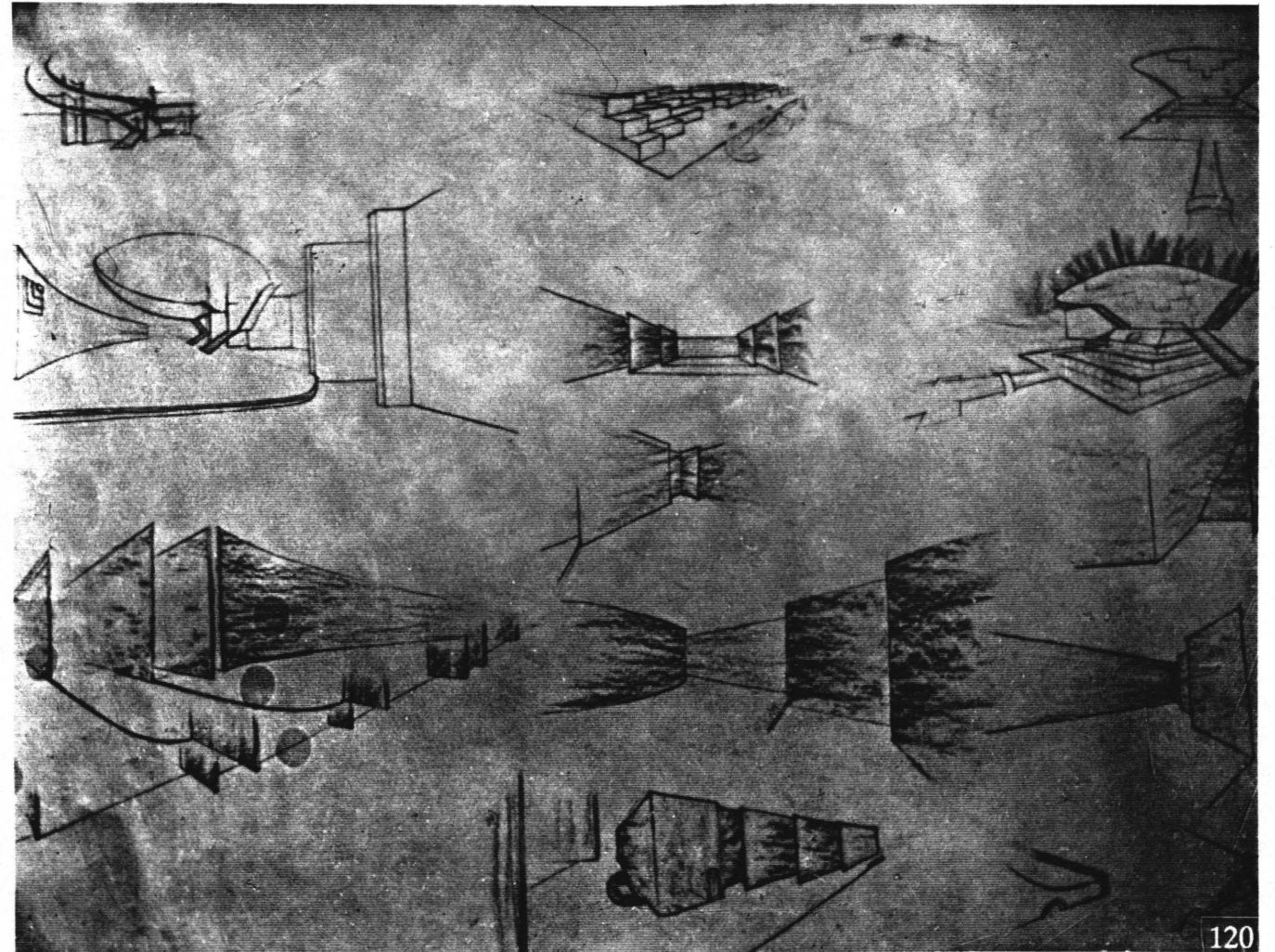
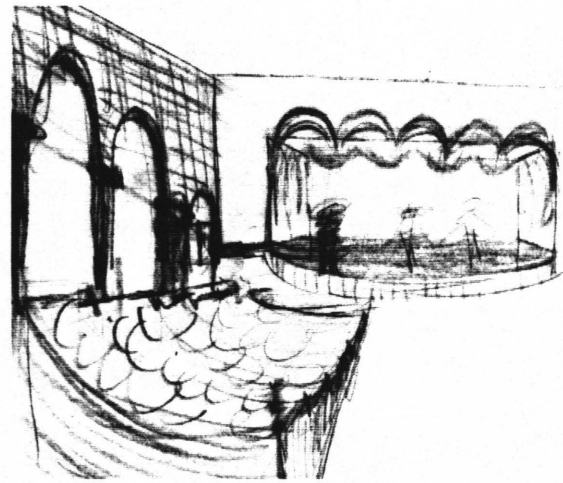
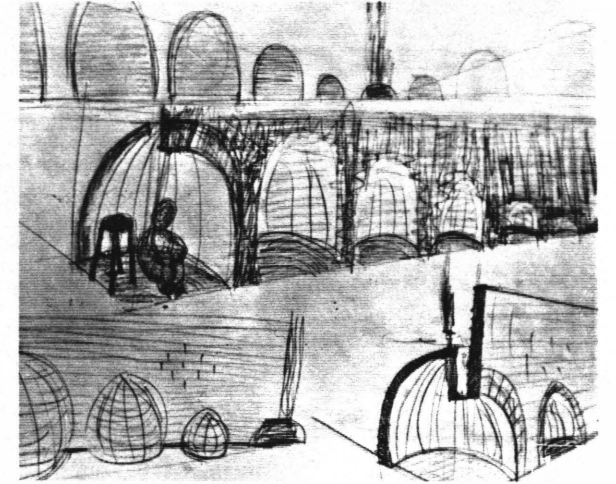
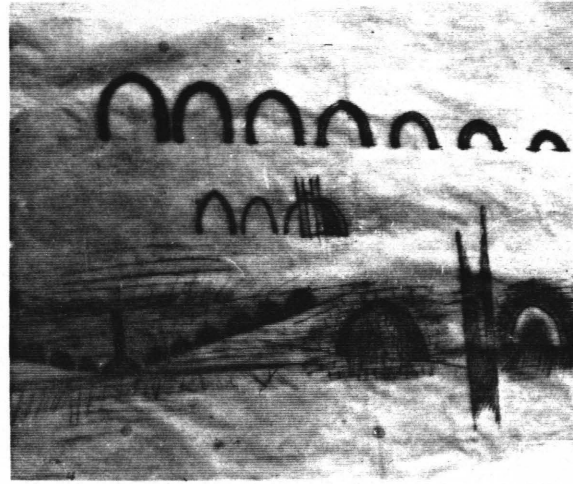
The magnetic attraction of the water, the course for the creation of delightful atmosphere, justifies that water pass through the center of the building. This adds to the beauty of the design.

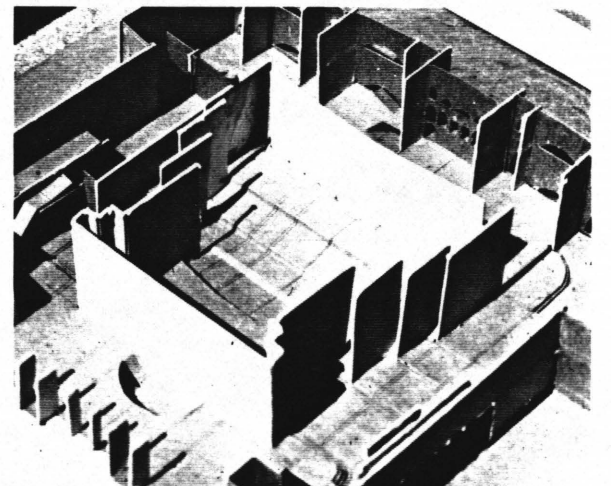
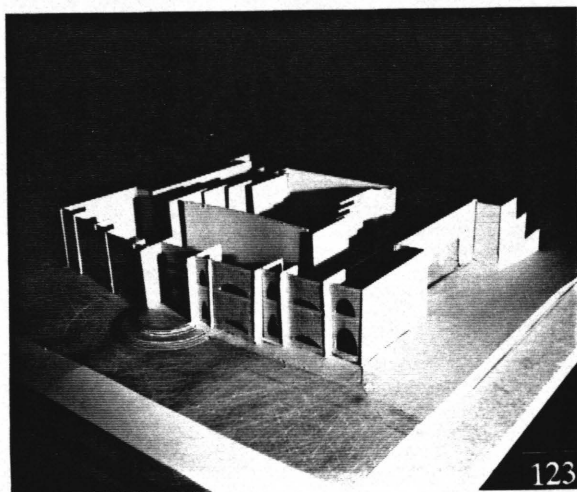
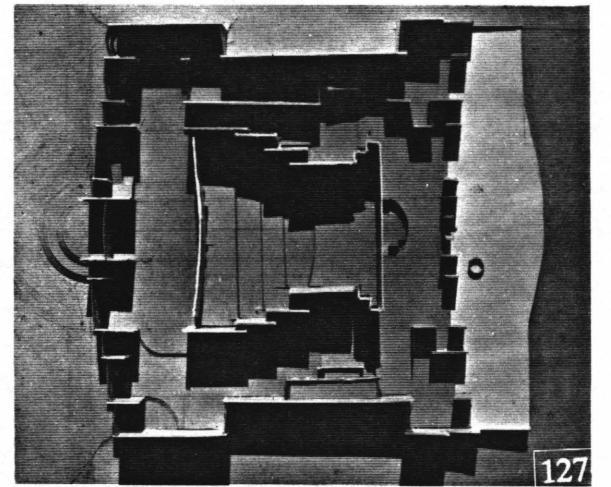
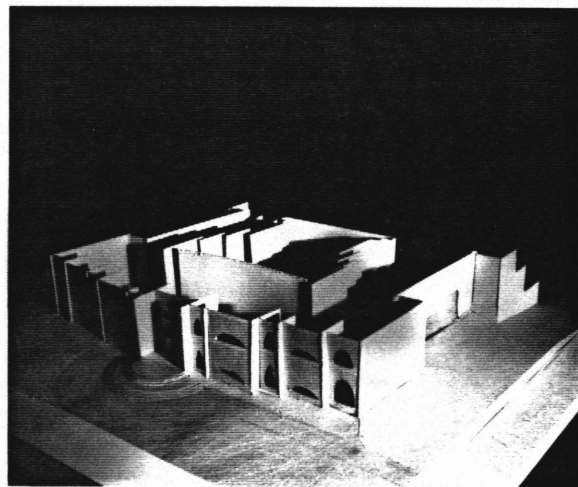
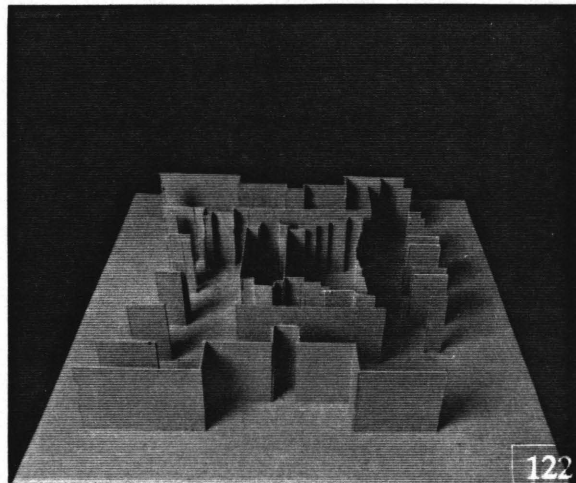
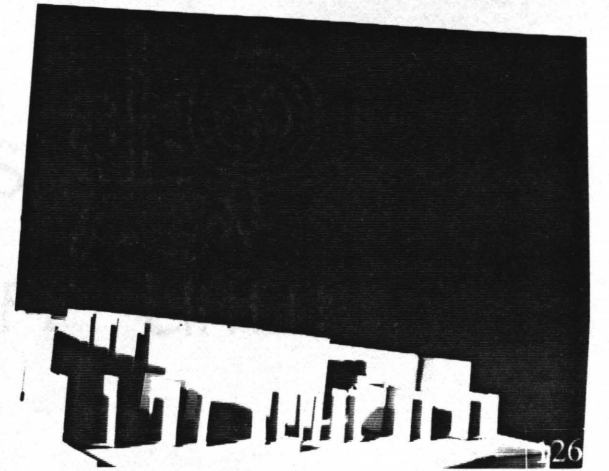
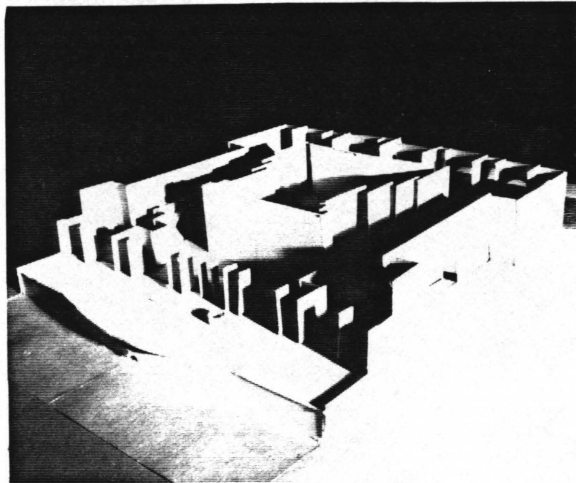
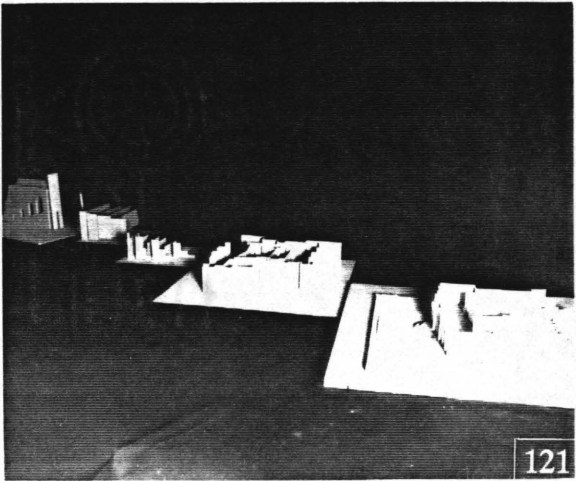
The presence of spring water which leaves the underground passage and presents itself at the site, magnifies the beauty of the site. This added to the importance of the design.



Preliminary Sketches and Models

After developing the preliminary pattern of the building and the pattern of activity, the circulation and movement was incorporated into the design. At this point, it was necessary to build an image of the building which would reflect the character of the building and satisfy the program requirements. Some of the images are captured in the following sketches. A number of models of the preliminary design were built to examine the desired characteristics of the building.



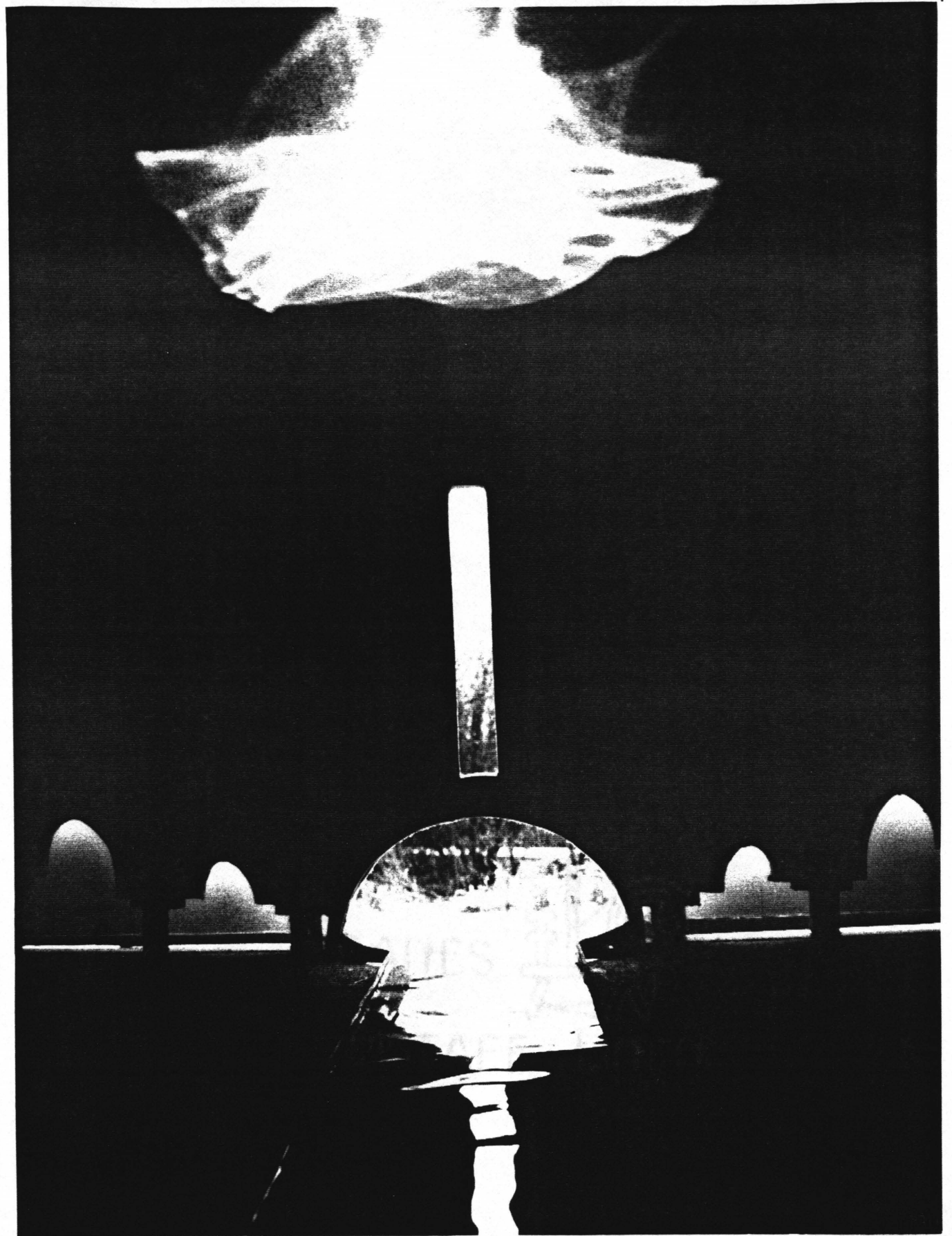
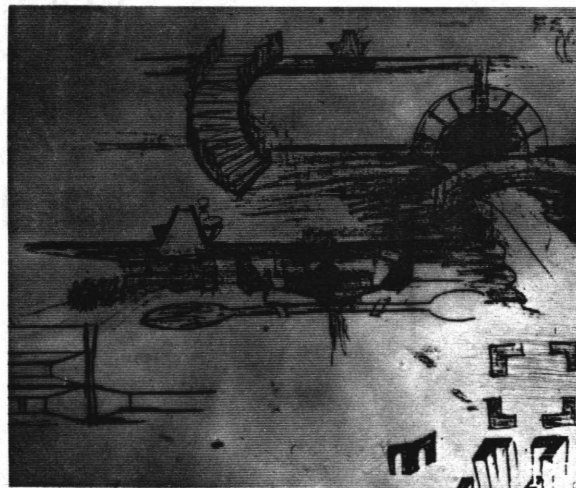


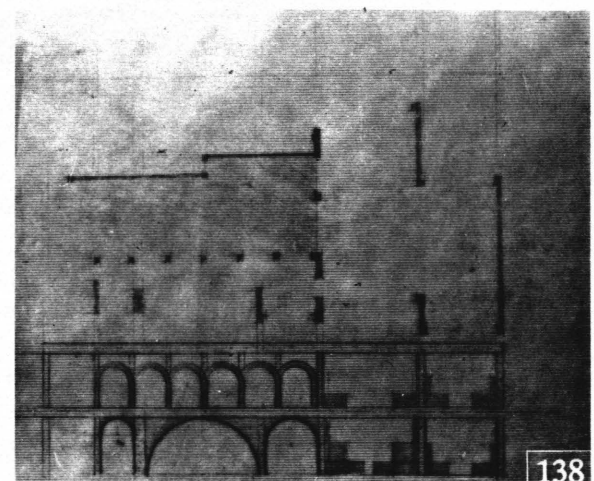
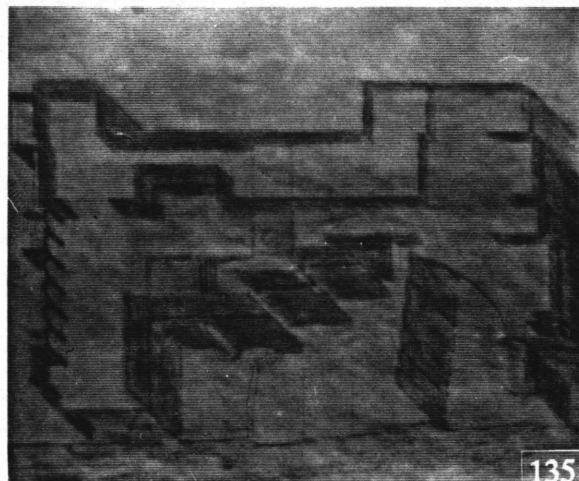
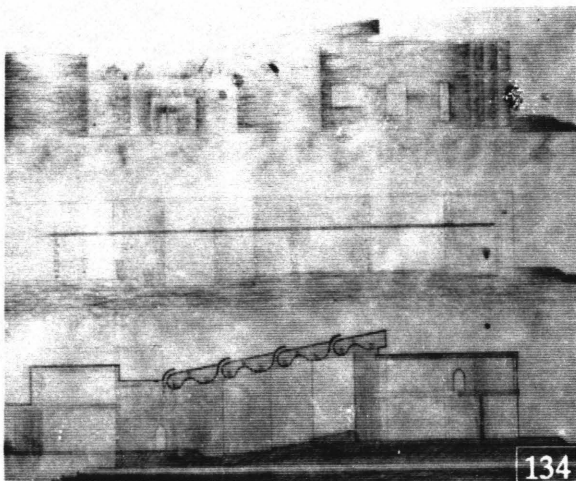
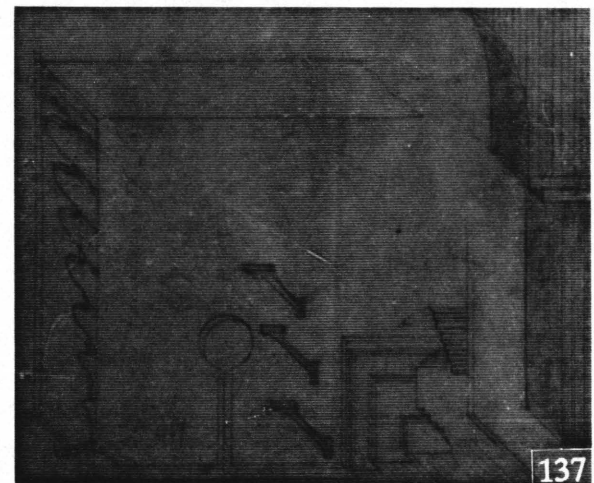
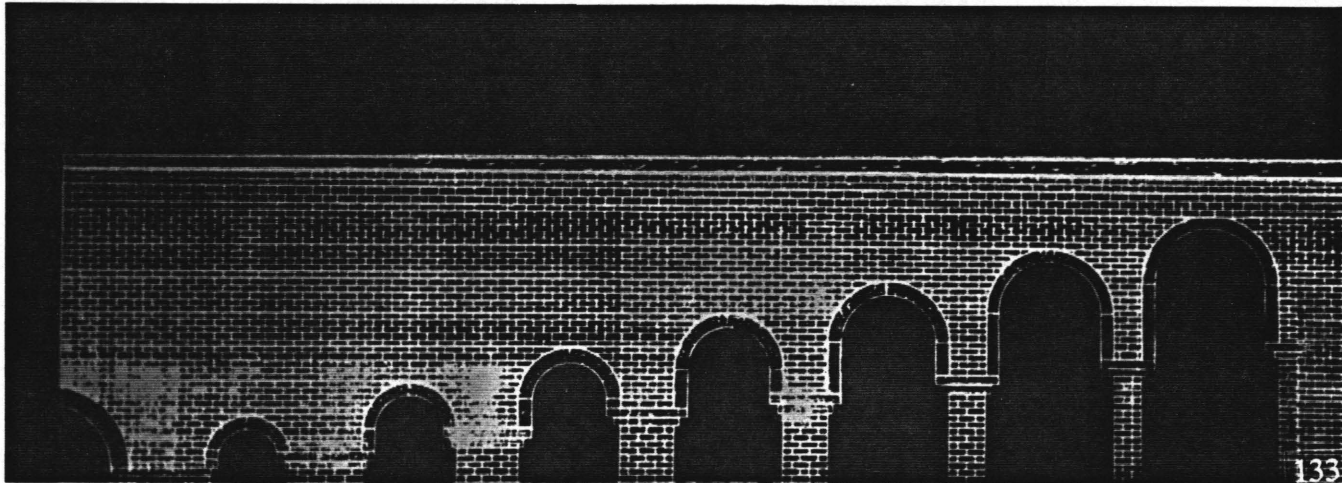
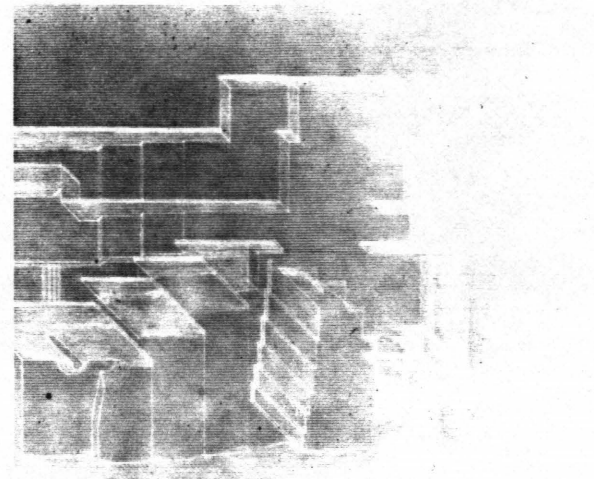
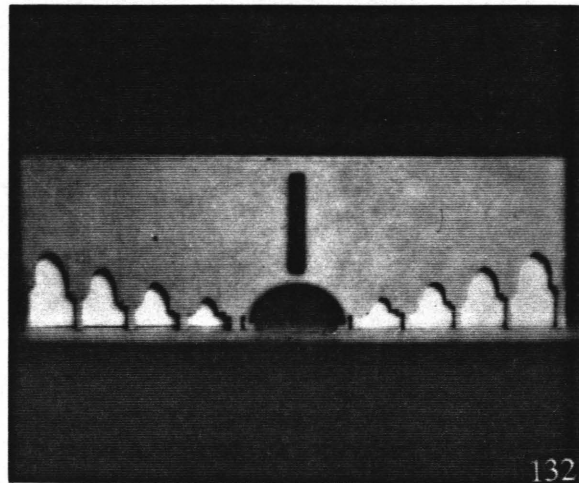
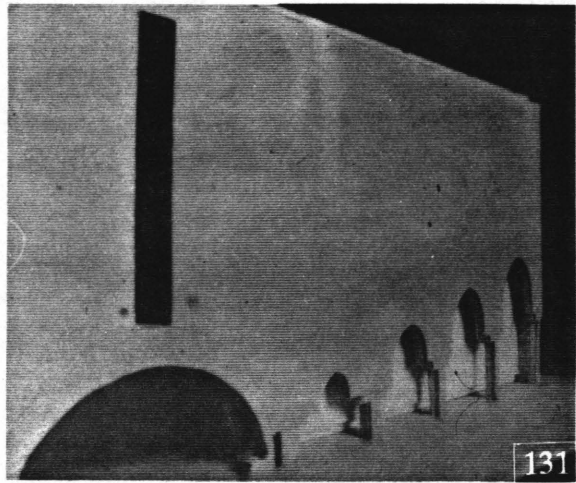
Water and Light

The receiving point of the spring water is located at the underground and the back of the back wall of the auditorium. This is where the main stairways direct the movement of people from the auditorium through the lobby to the underground lounge. The spring water, after being received in the building, falls into stepped pools, splashes and creates a musical sound. This enhancement adds to the beauty and delightfulness of the area.

The underground lounge is designed as a place for meditation, relaxation, and enjoyment. The underground design provides a view of the reflection of subdued light and dancing of the reflected light through water on the ceiling and the floor. This results from the shining of the sun's bright light through the openings between the walls and the vaulted ceilings creating subdued light in the ceiling.

The vertical opening provided above the wall bridging over the water, lets the sun shine through the opening to reach the water and reflect to the ceiling, adding to the beauty of the place.





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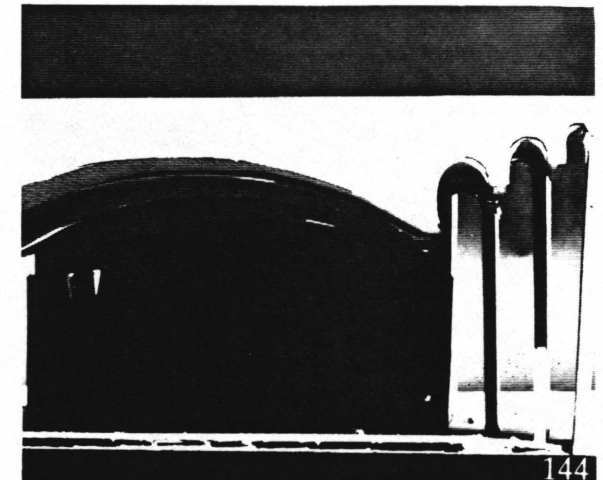
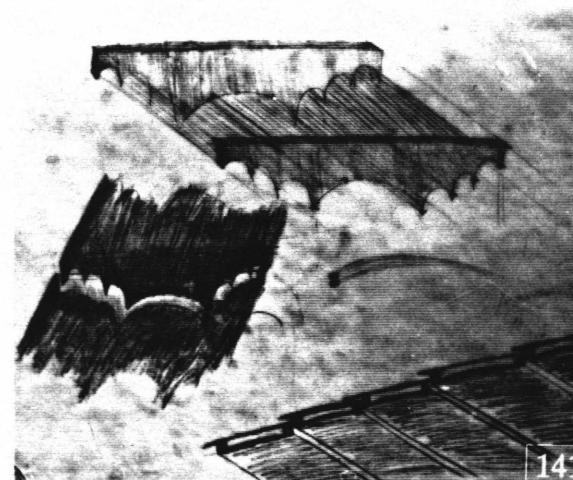
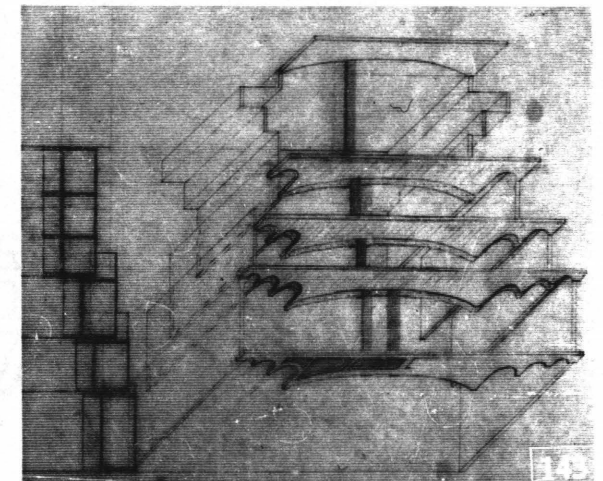
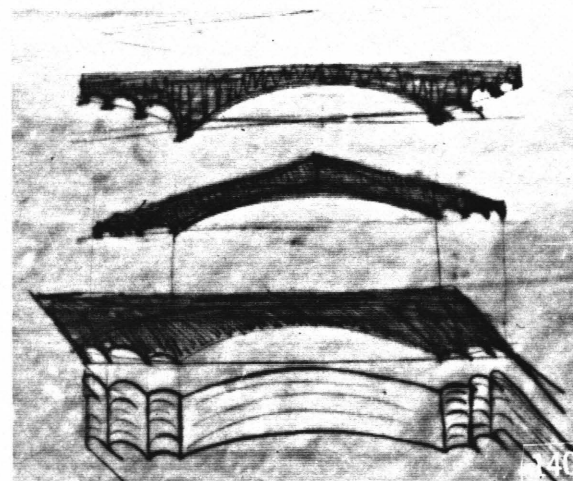
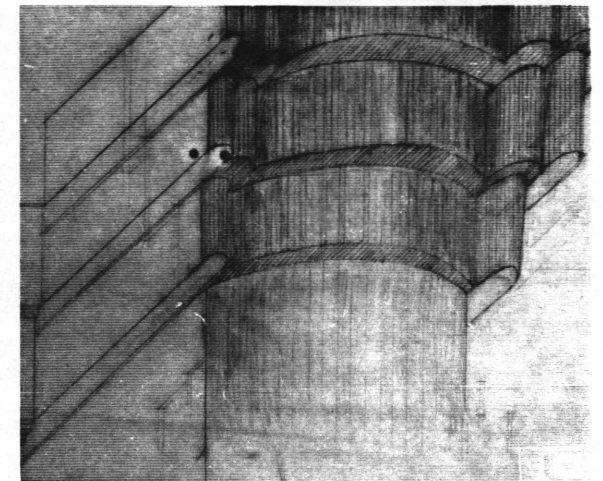
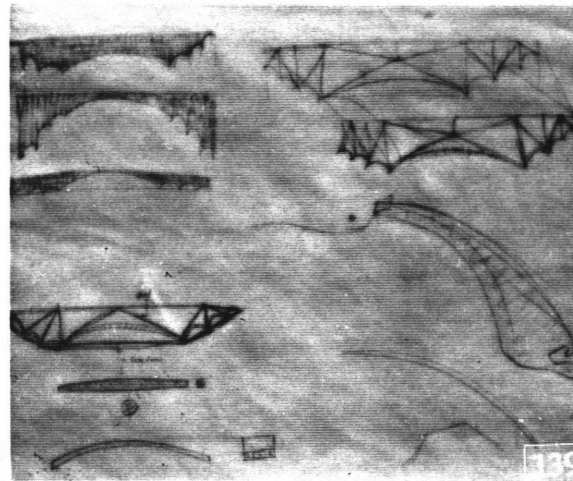
Roof Structure of The Auditorium

A number of different forms were given to the ceiling to reflect the pattern of the floor plane and to be responsive to the exits of the auditorium. At first, the form of the ceiling of the auditorium was reflecting the motion of the water, the existing spring water running underneath the building. Finally the roof structure, which was more responsive, was chosen.

The roof system consisted of four single monoliths. They were layout responsive to the pattern of the auditorium's floor plane. The three monoliths which were covering the audience area had an order of "one" "two" "three".

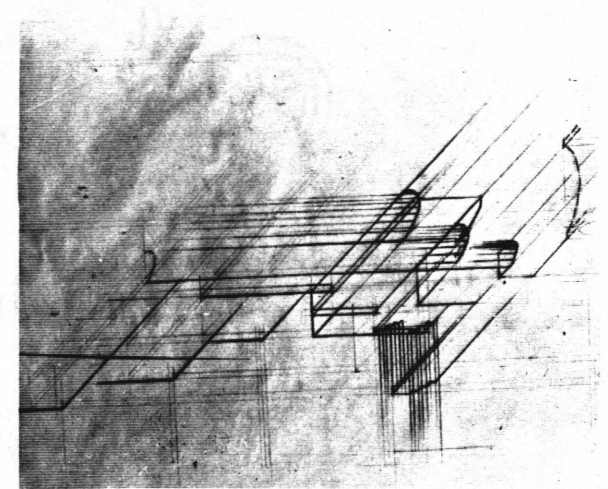
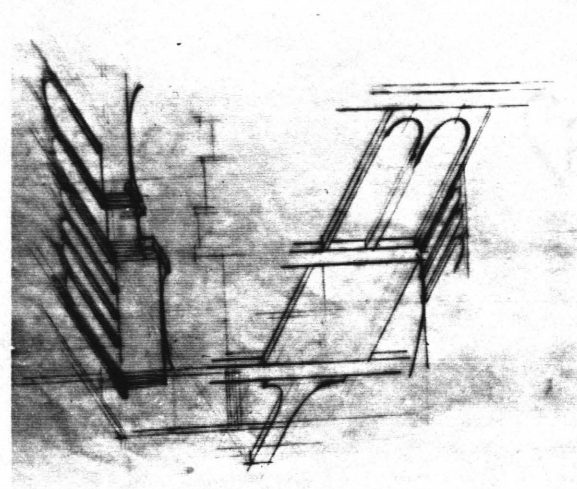
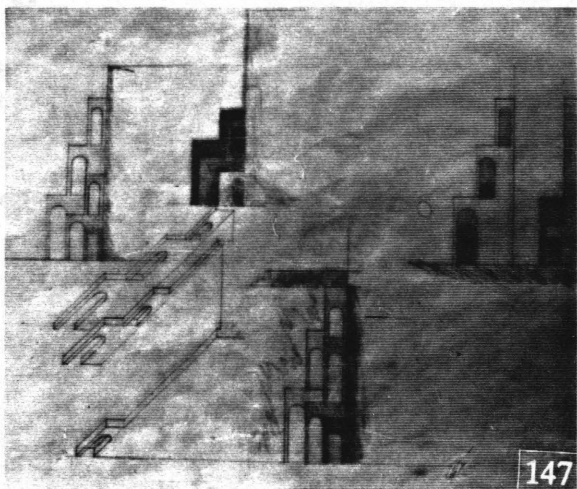
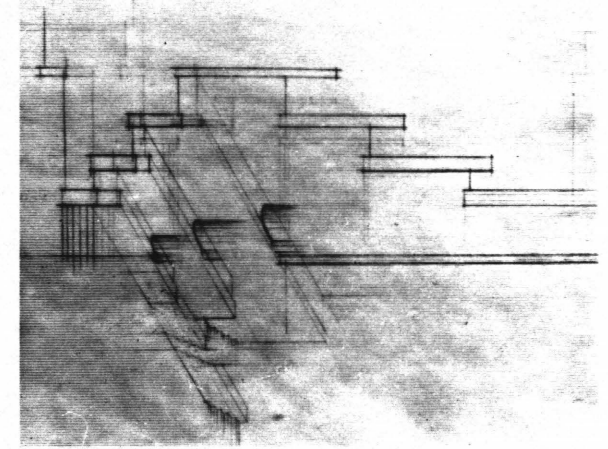
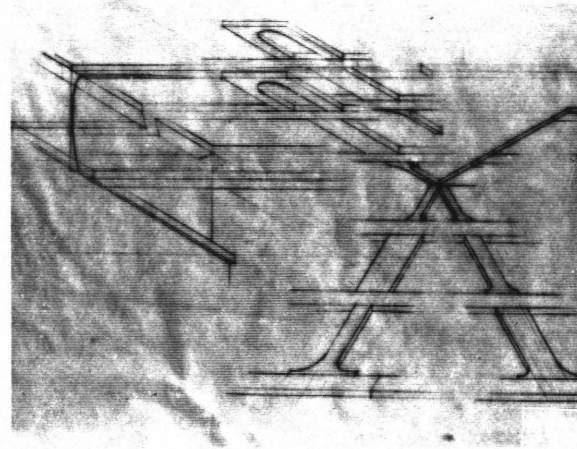
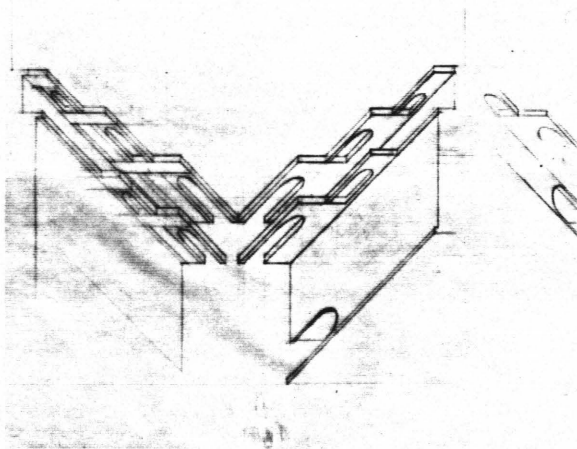
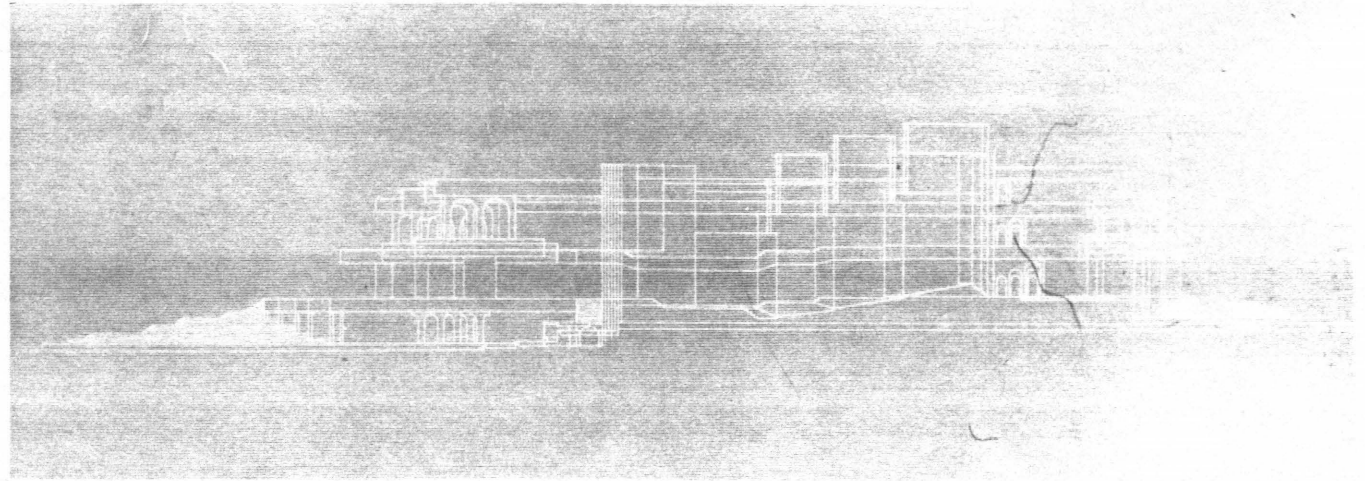
Order was applied to the strip of openings between the monoliths, to the size of the monoliths and to the drop in their elevation. These monoliths created a pattern of symmetrical arches, vanishing from one central arch to one, two and three small half circle arches (from small to large responding to the size of the exits) at each side of the central arch. One single central arch covers the performance stage.

The resultant monolithic roof-ceiling structure created beautiful patterns of strip of lights due to reflections of bright sunlight which passes through the openings provided between two adjacent monoliths. The auditorium became a good source of interlocking order as the elements and their applied order to them were interlocked, interrelated, and incorporated to generate the whole.

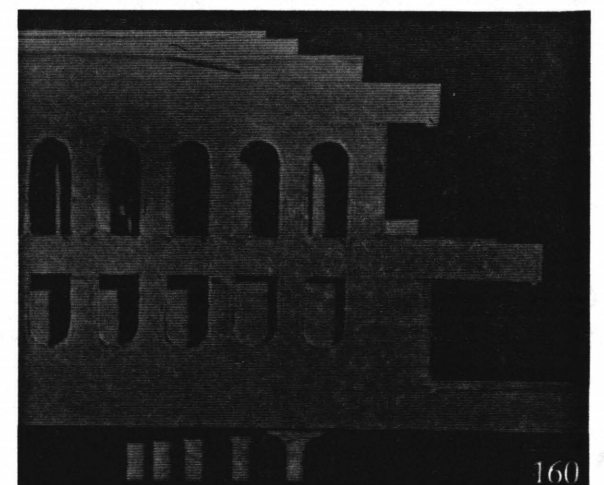
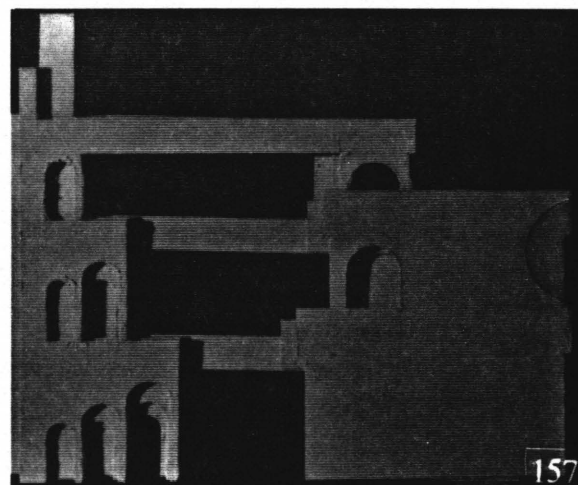
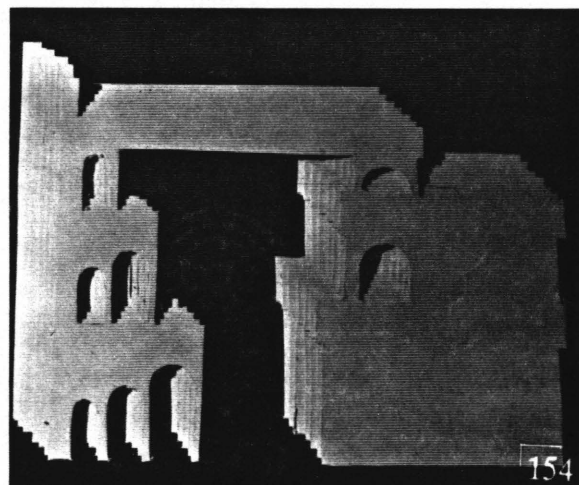
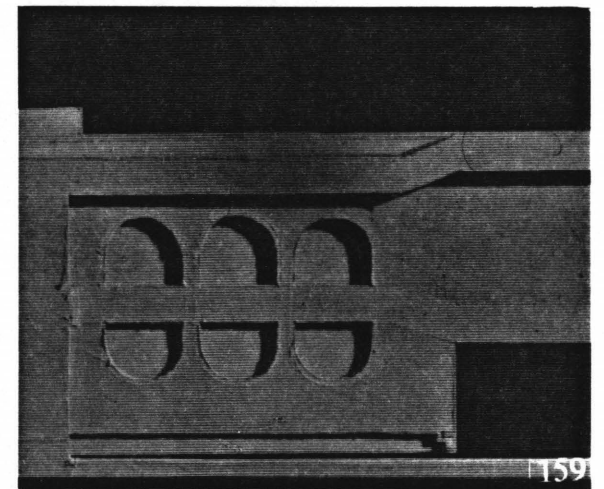
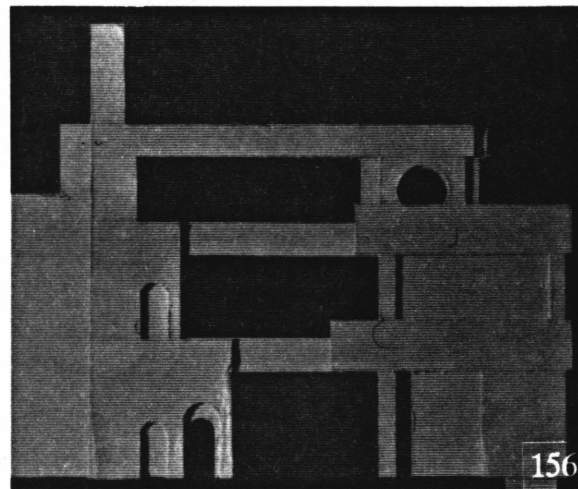
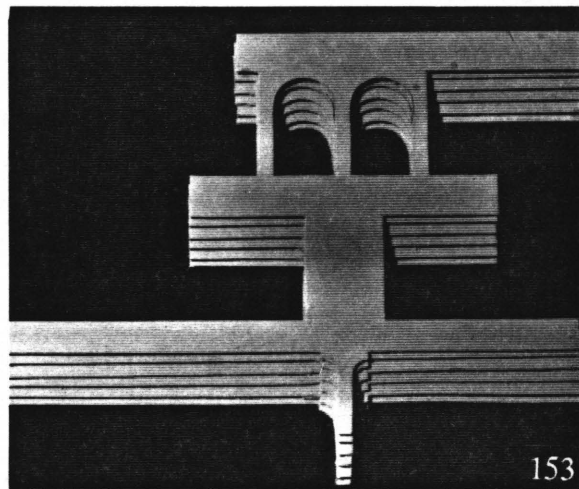
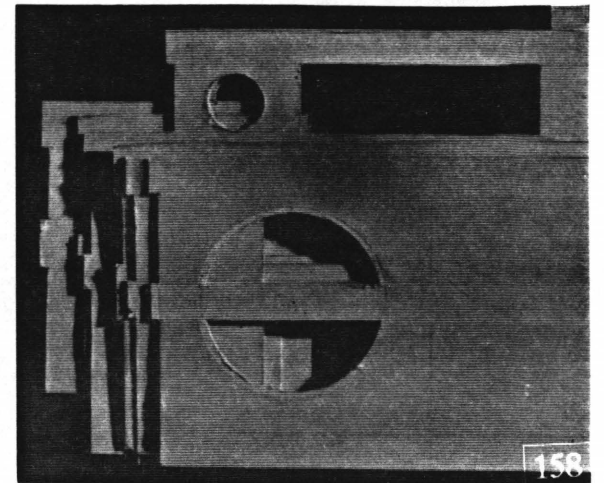
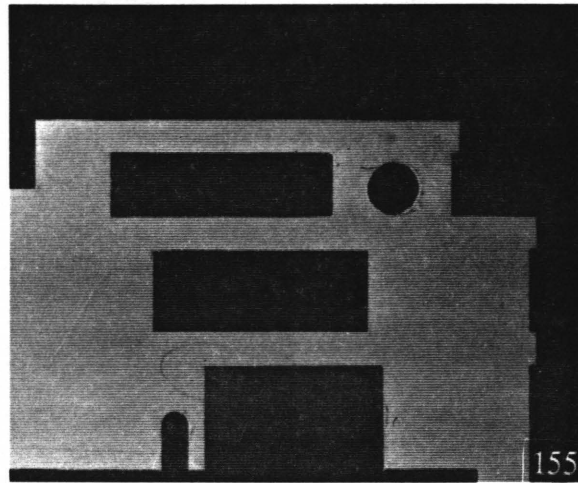


Transformation of Order

Wherever there was a need for a sudden change in a linear element of design due to the program requirements, the significance of the transformation of the existing order appeared. The need for treatment of the obstructions model and the implementation of the main ordering system (longer, narrower versus shallower, wider) became evident to maintain the continuity of the order within the whole.



A number of models of obstructions in transition areas were built and the smoothness of transformation of perceiving order from one part to another were tested. The treatment of the obstructions resulted in a smoothness of transformation of the order from one part to another. In this way, the elements became vital part of the whole.



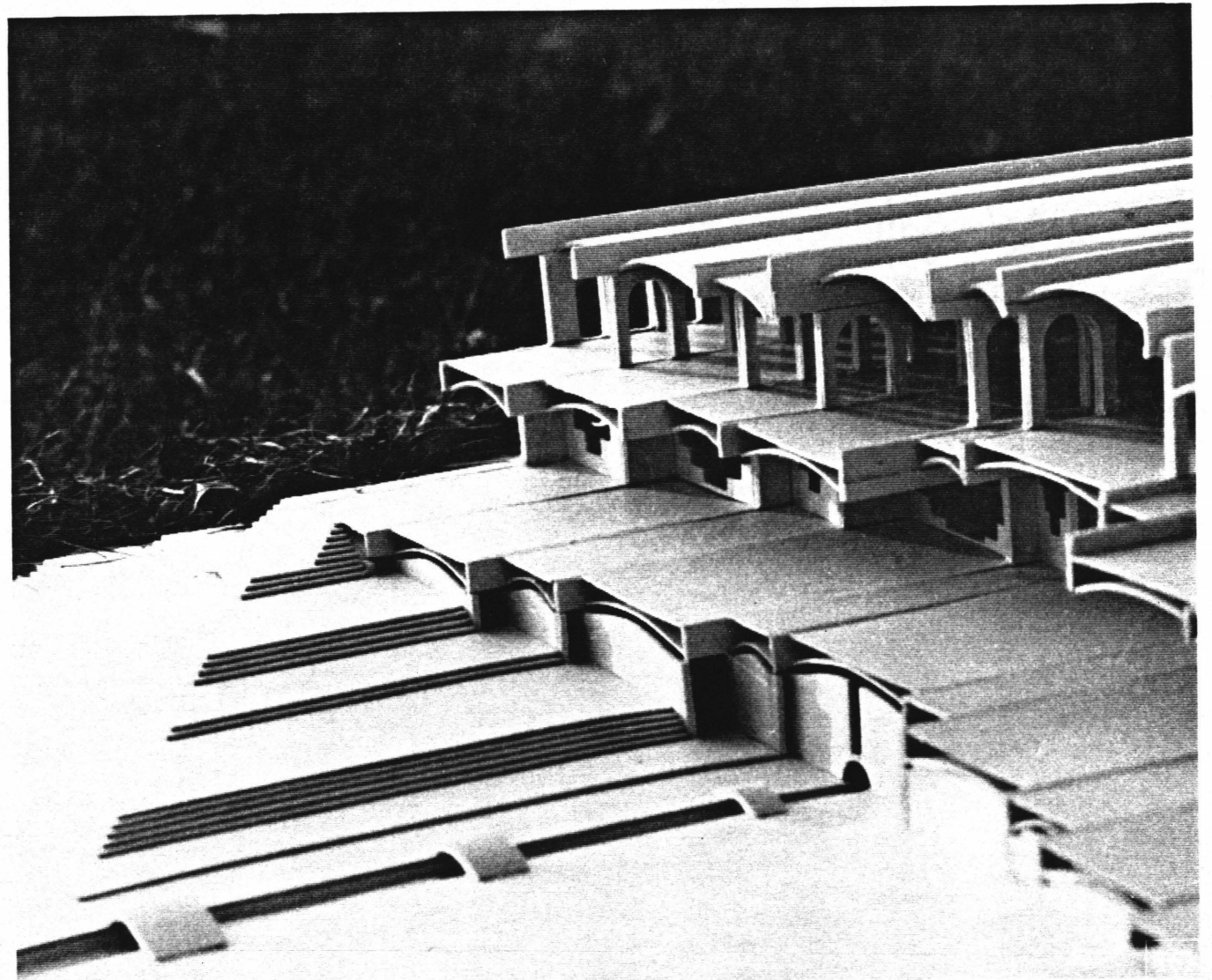
Floor Plane and Stairs

Each elevated floor plane signified the importance of the different level within the floor plane and gave the order to the hierarchy of the spaces provided. The floor plane was manipulated by using the stairs to indicate different levels to suggest different events. These were also incorporated with the wall and the roof to make a statement of hierarchy between spaces.

The exhibition area was placed in one level. Then, stepping down one, two, and three steps addressed the first exit of the auditorium and the second and the third respectively. Four steps up, you entered the lobby.

Stairs began and ended at the beginning and ending of the walls to state the beginning or ending of the walls, indicating the changing of the levels within the floor plane.

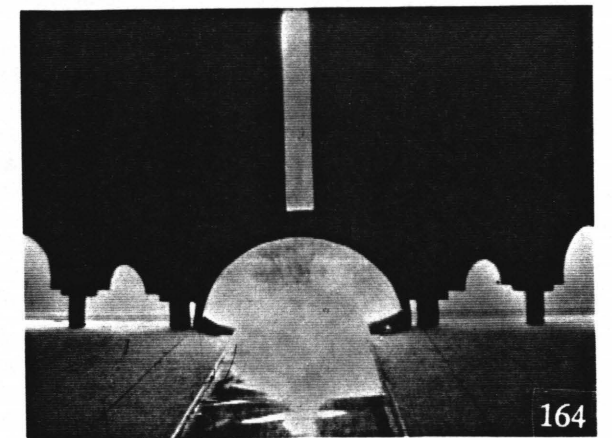
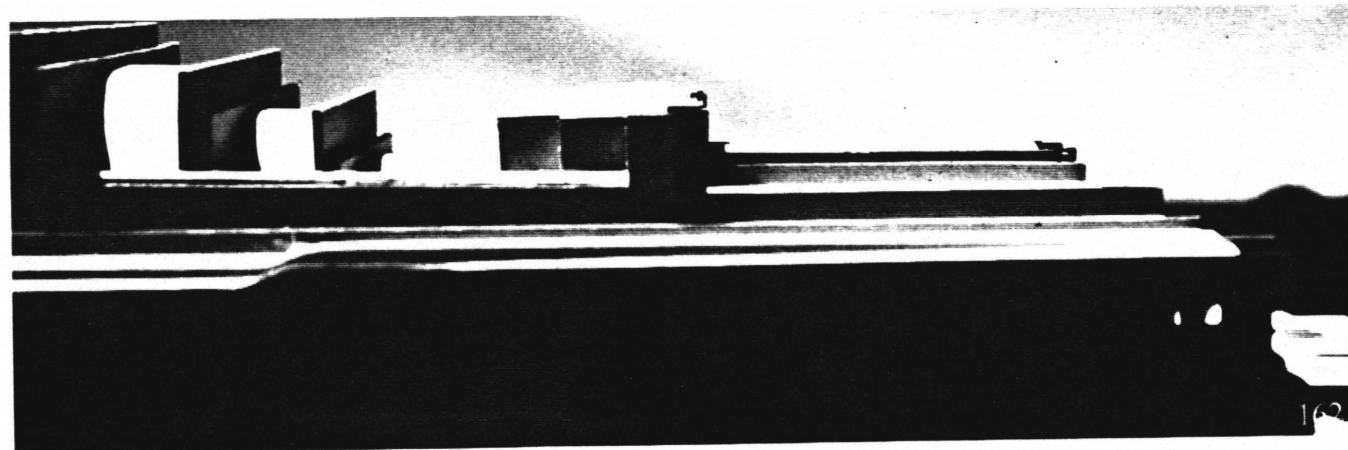
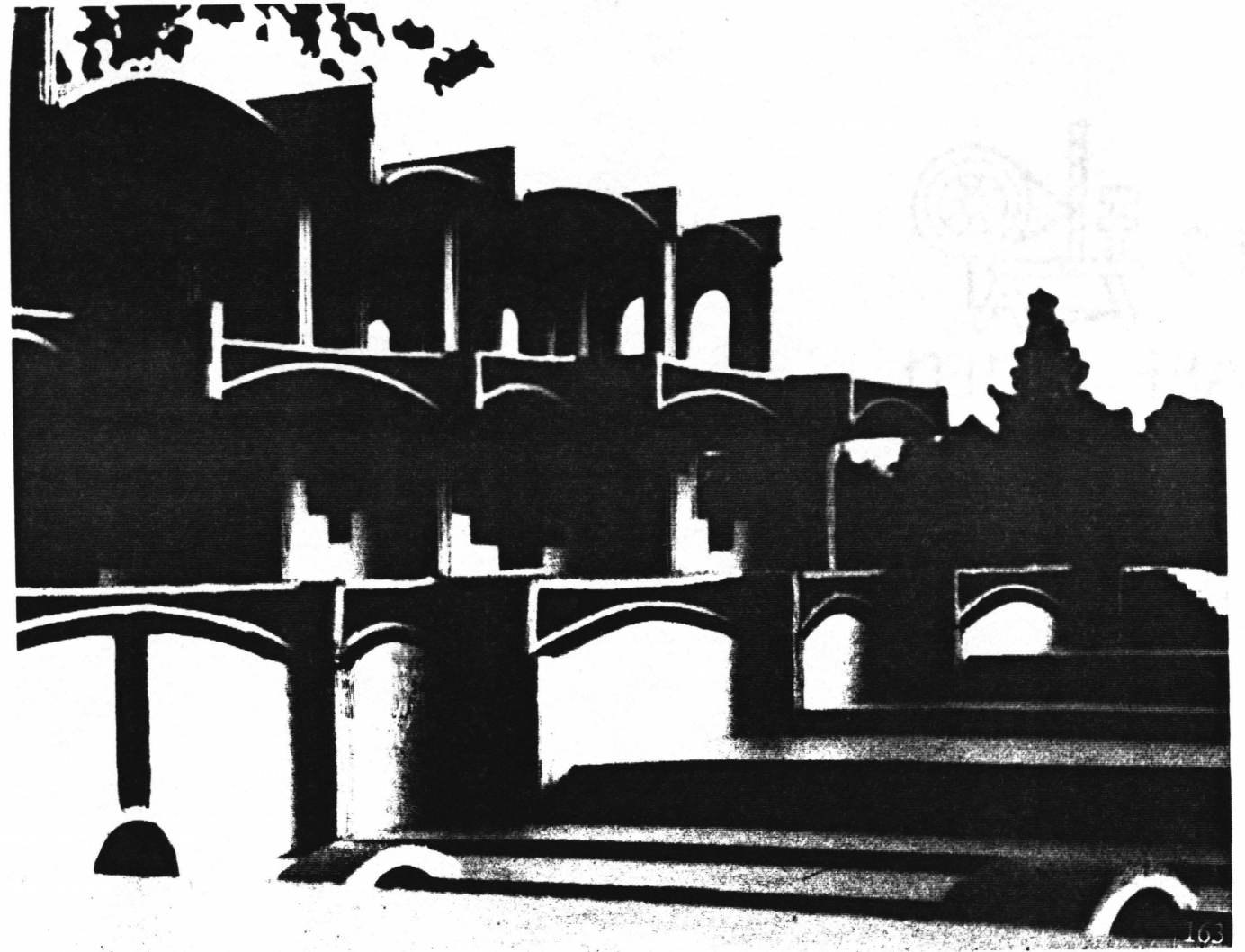
The outdoor stairways connecting the terrace to the landscape intensified the continuity of the overall form and provided an attachment between the inside and outside activities. It created platforms for setting, viewing and performing. It provided attention to the centralized passing spring water.

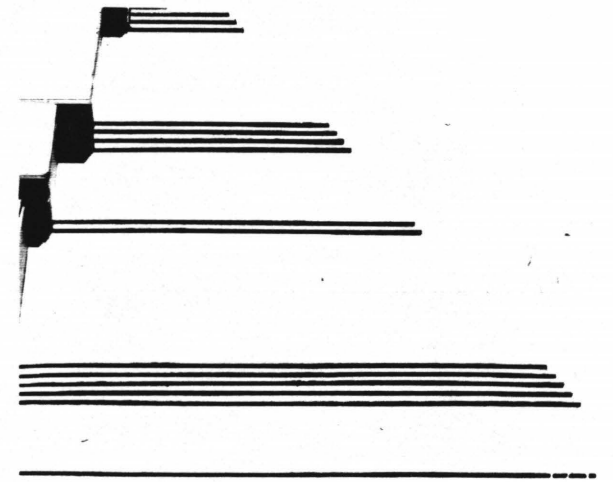
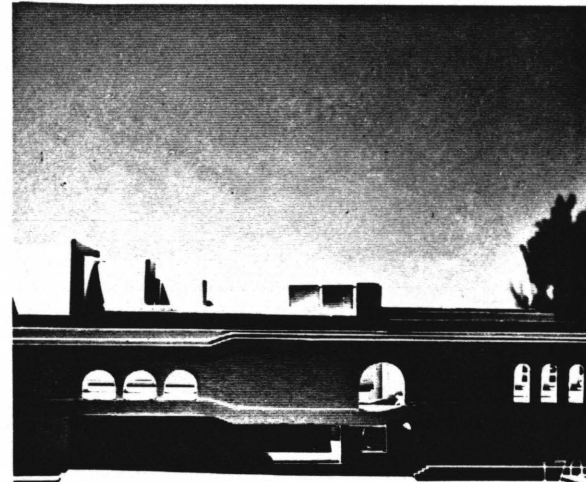
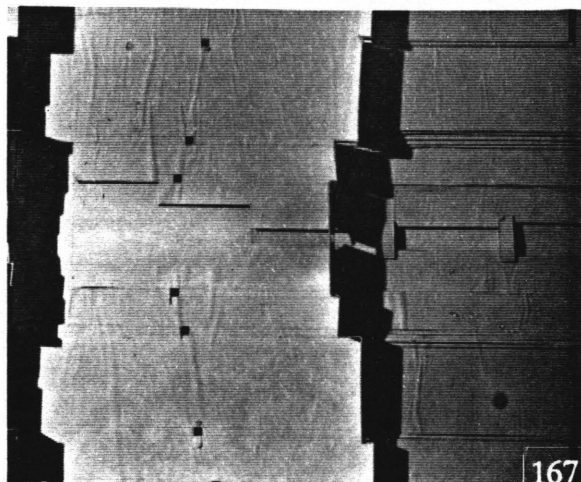
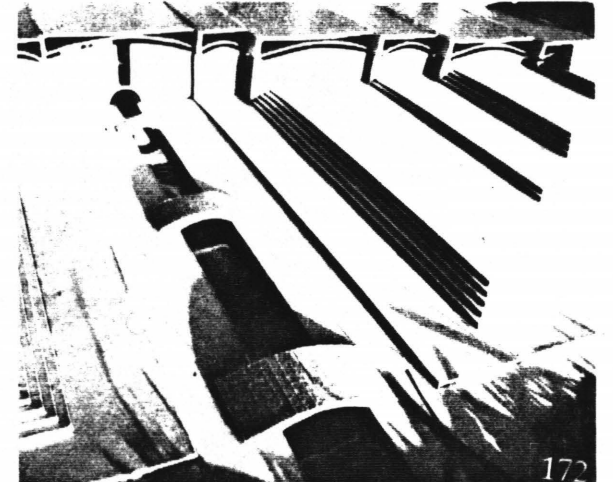
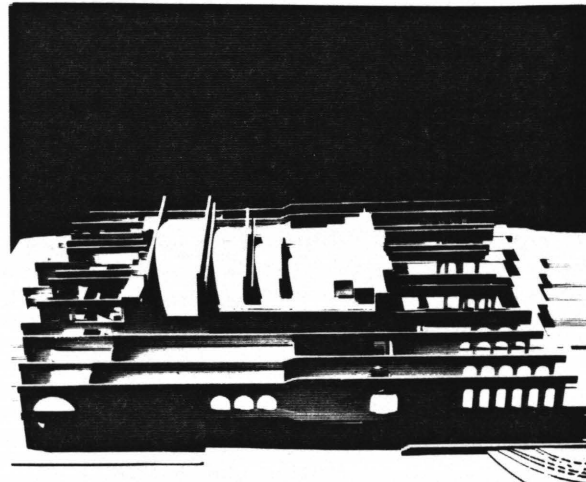
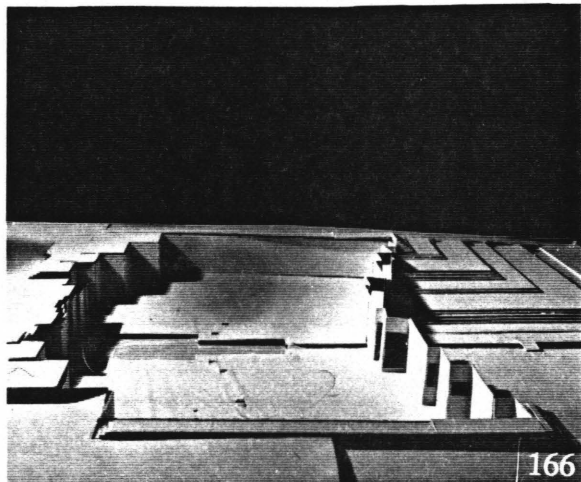
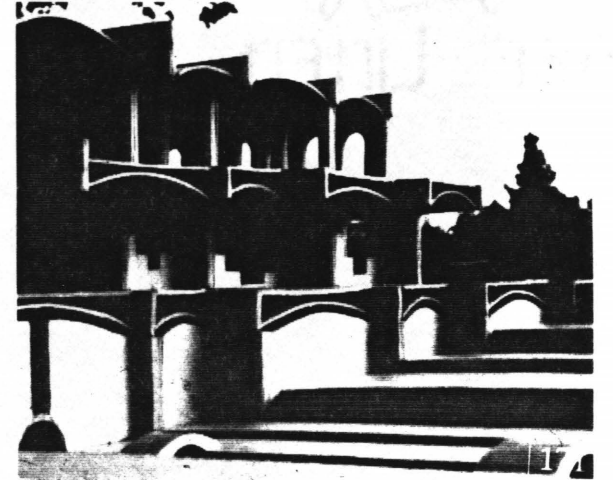
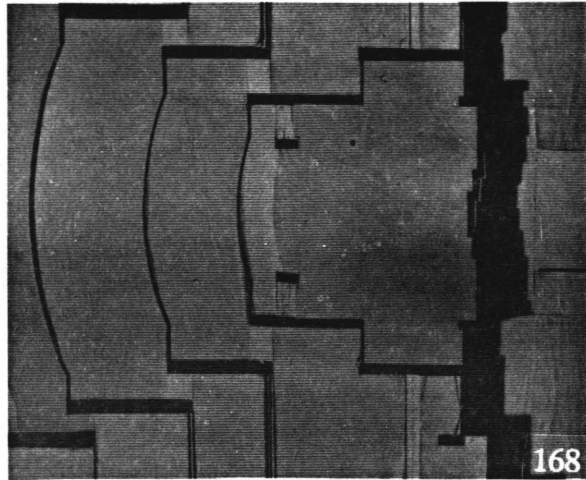
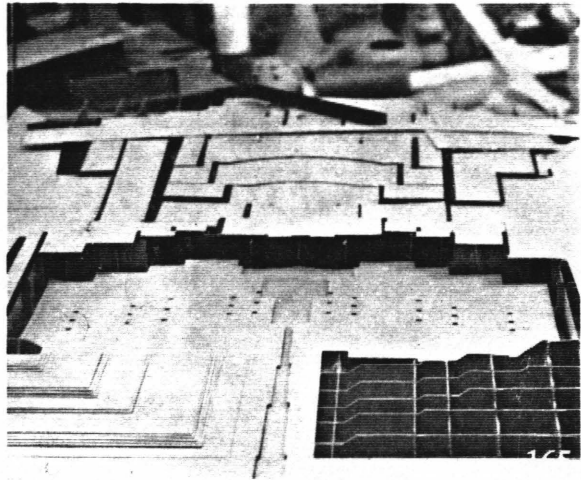


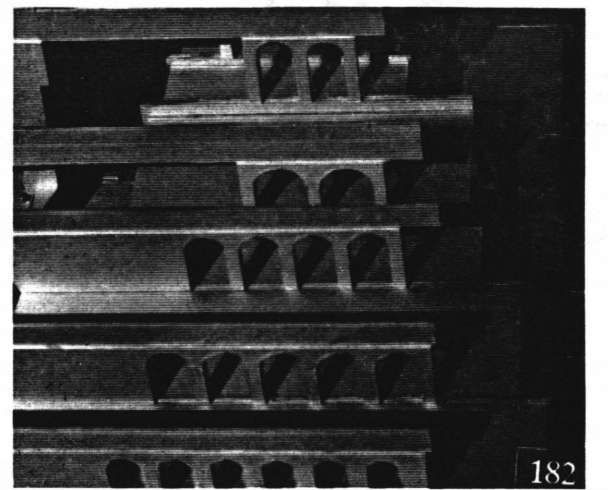
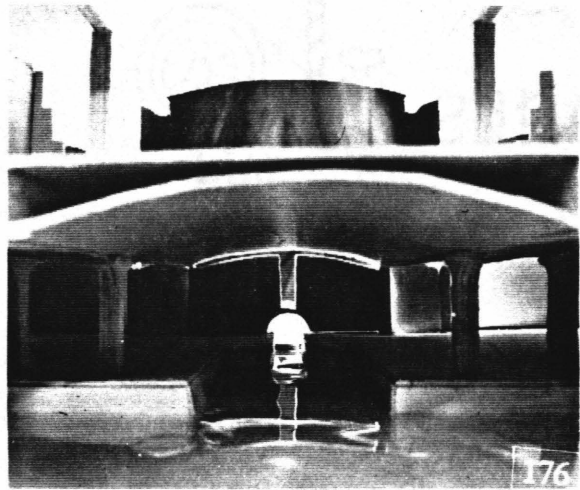
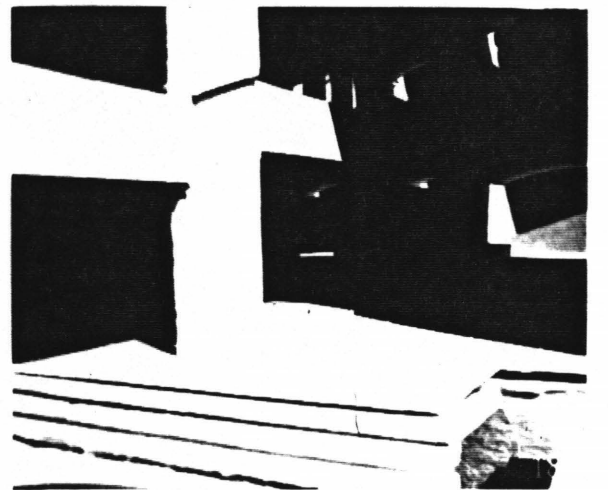
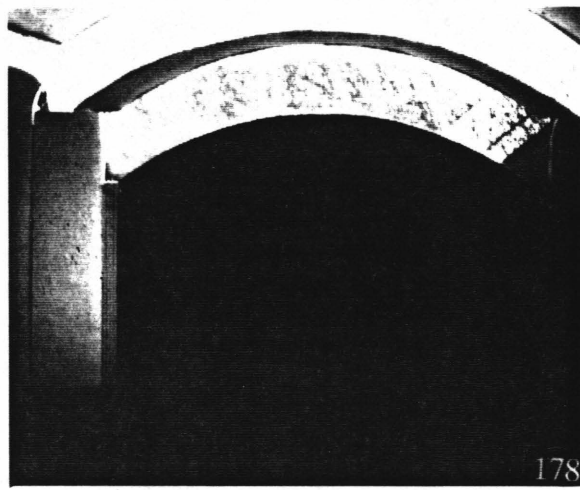
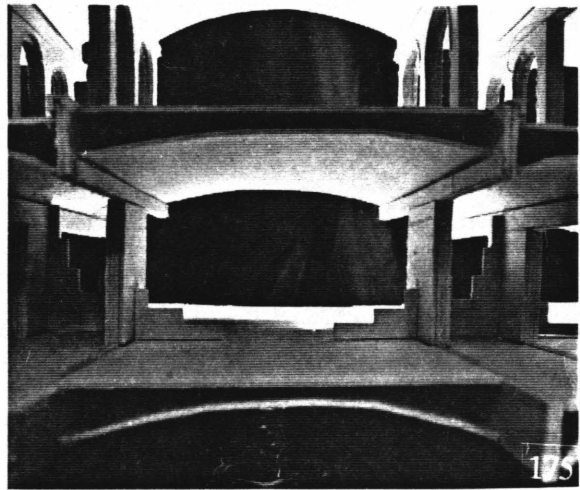
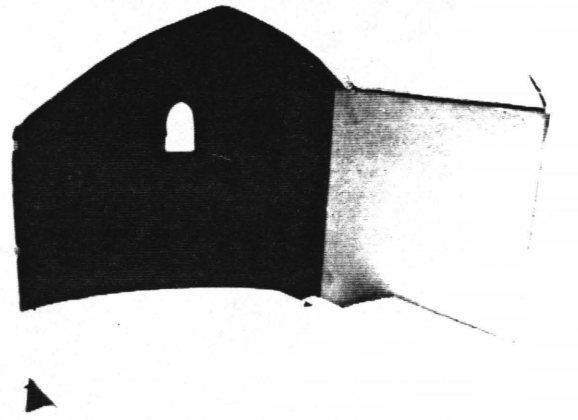
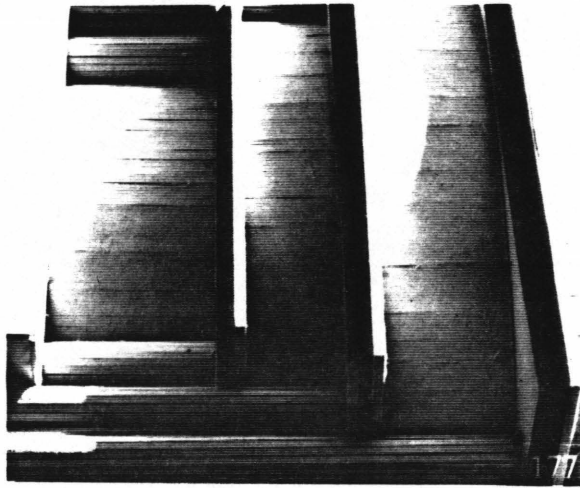
Roof, Ceiling and Skylight

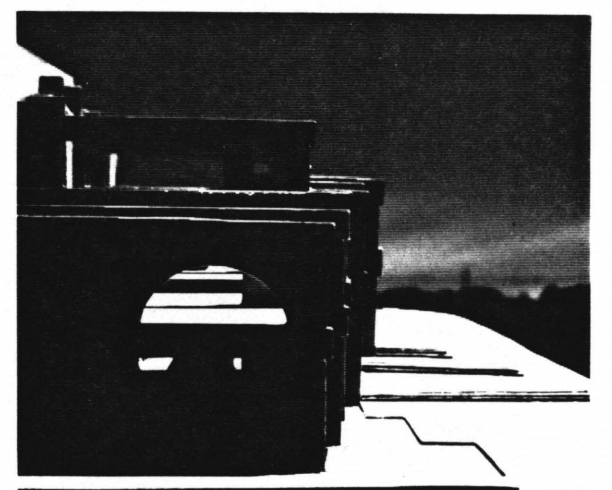
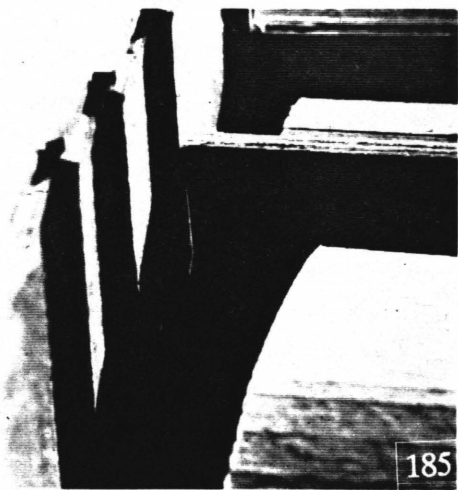
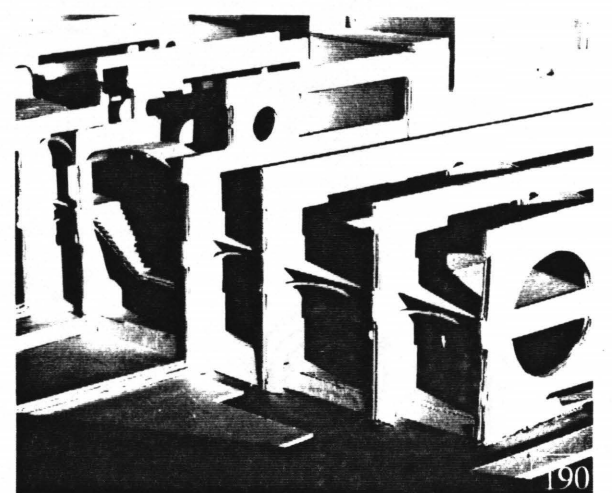
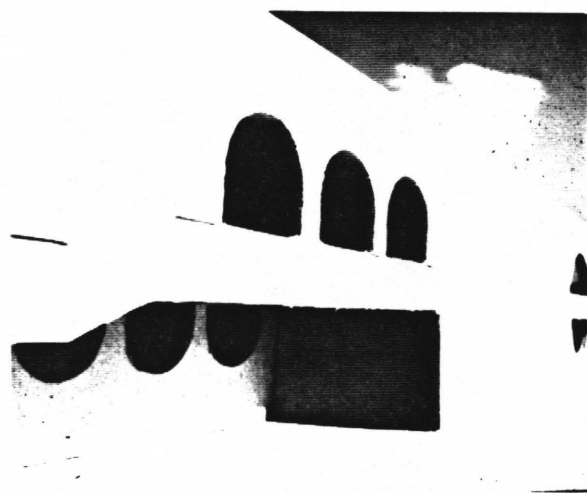
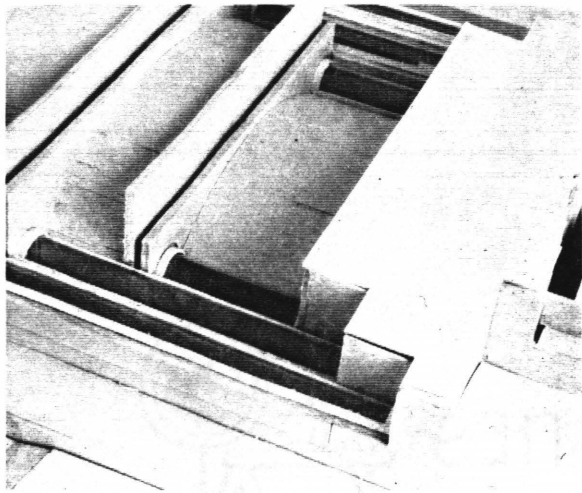
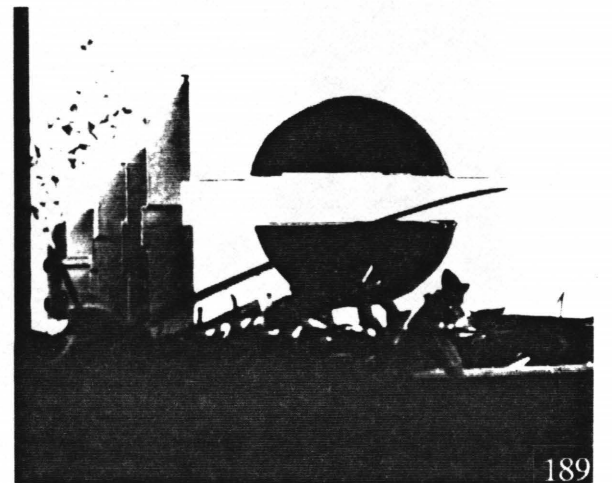
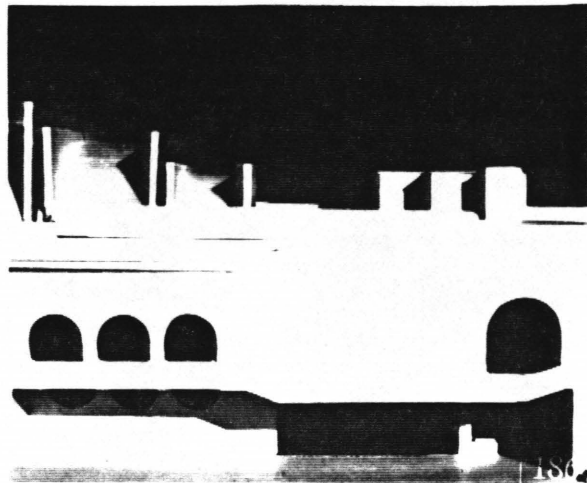
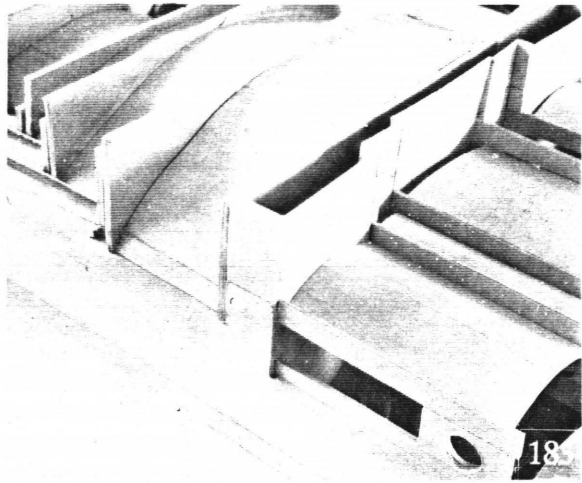
The ceiling planes were manipulated to symbolize the vaulted sky. The transition of bright daylight to dim daylight responding to the pattern of movement through the space, signified the hierarchy of important locations within the space. This was emphasized by providing a skylight at those locations.

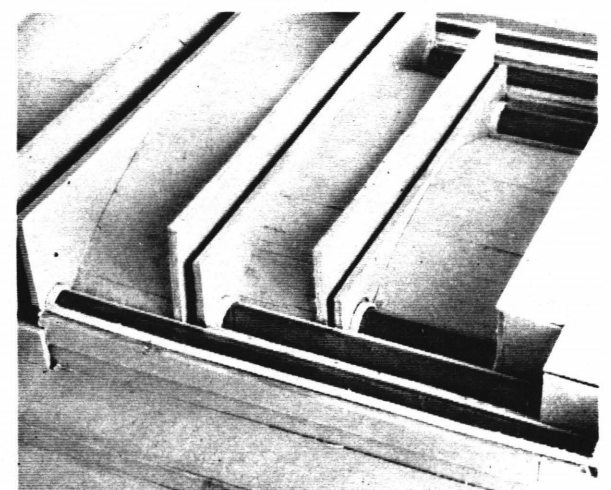
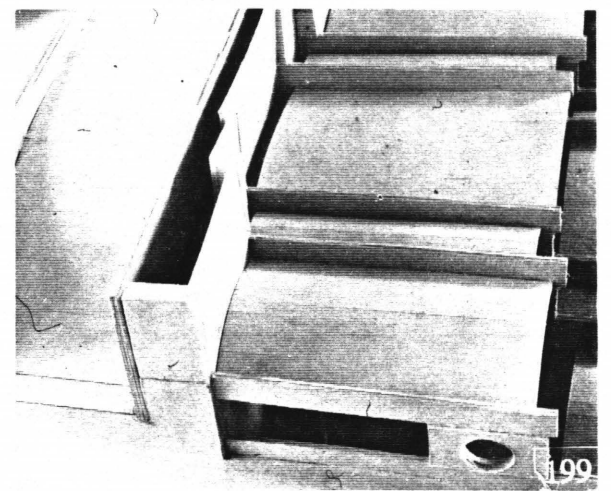
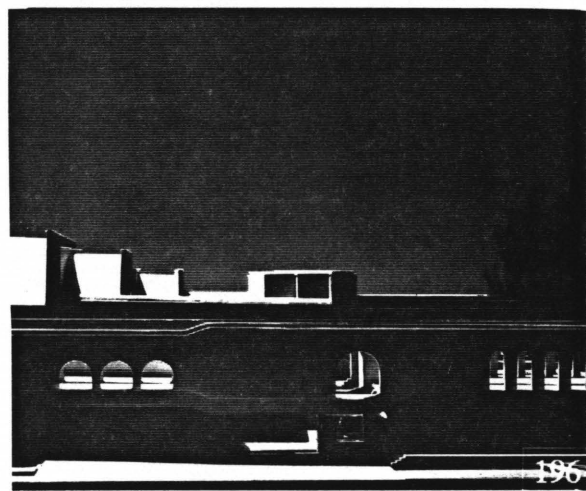
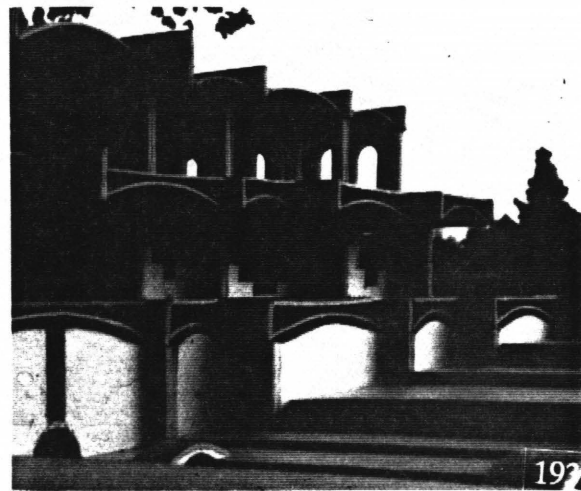
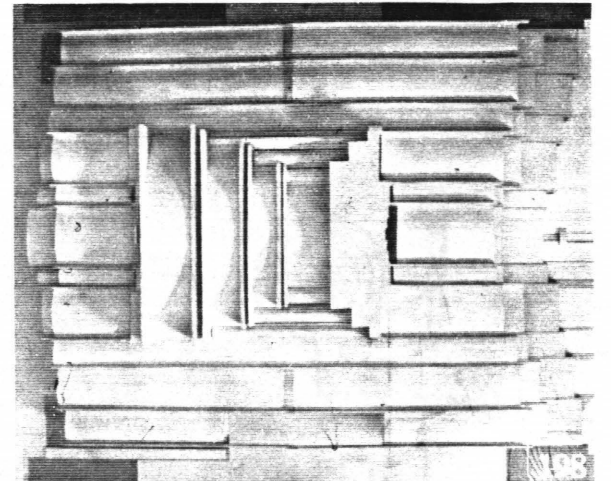
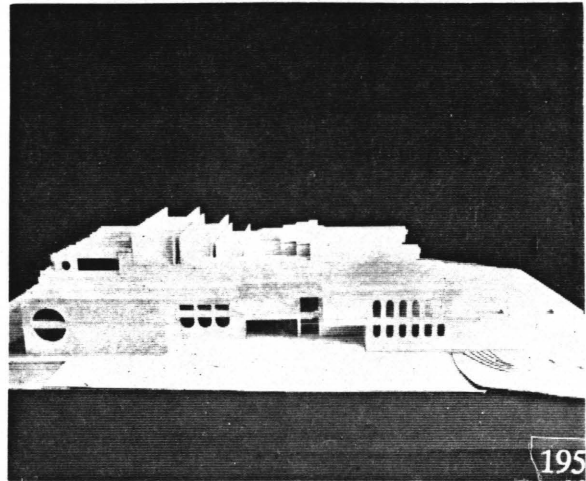
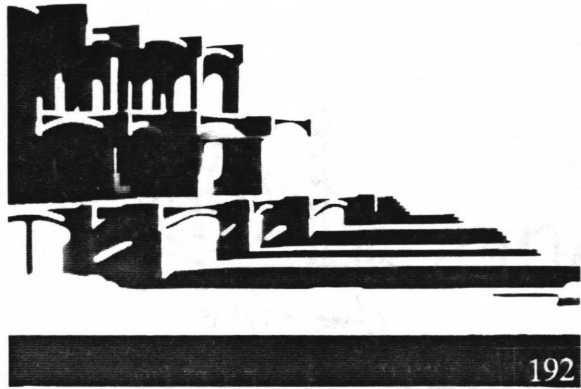
Skylights were located on four sides of the auditorium, above the exhibition area, above the stairways directing the movement to the underground, and at two sides of the auditorium above the exits. For penetration of the indirect lights, the opening were placed between the auditorium's roof segments, as well as, between the vaulted ceiling of the underground lounge and the walls facing out.

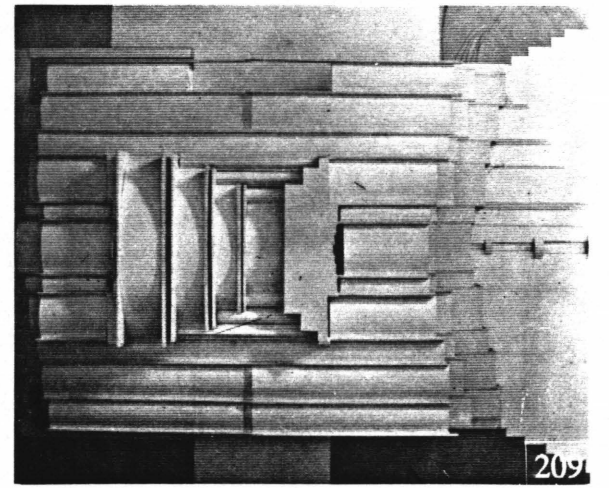
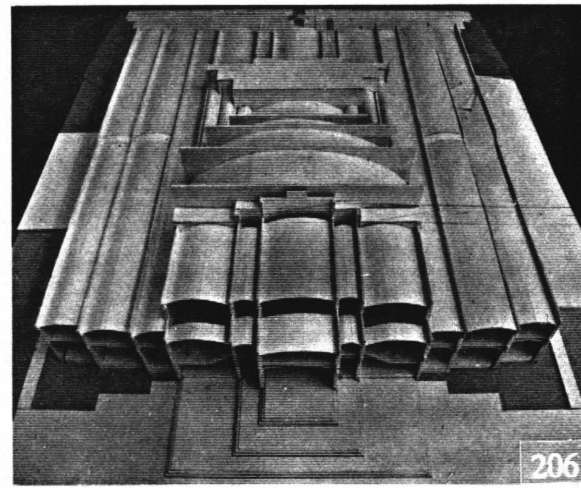
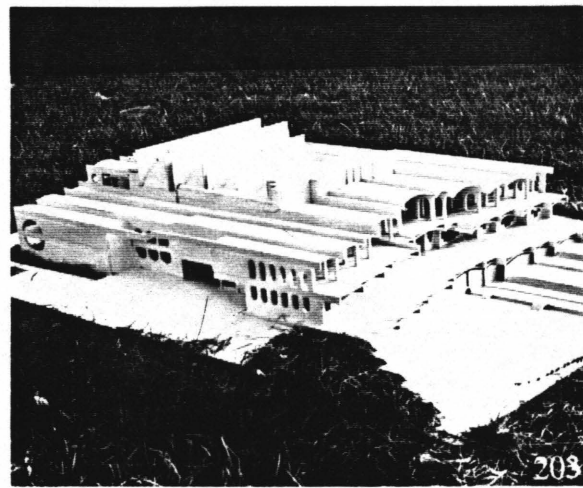
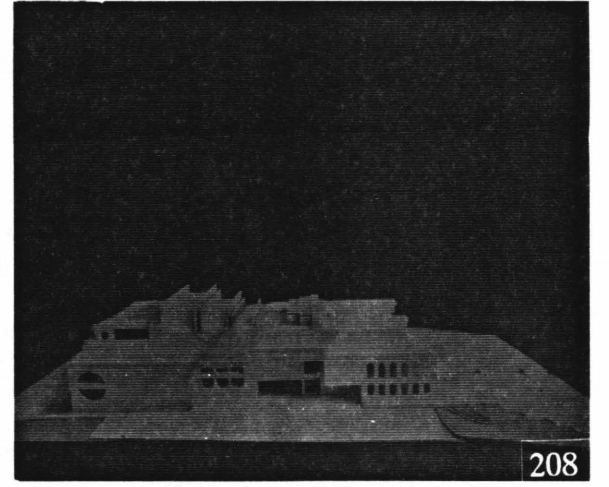
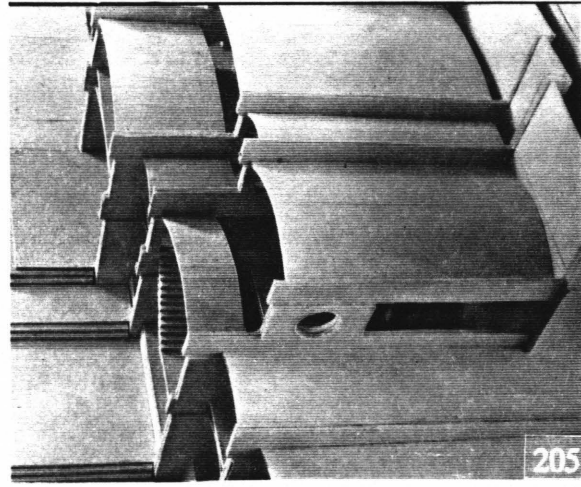
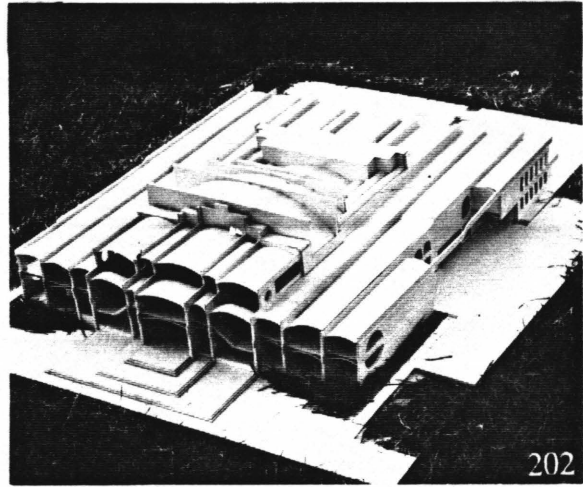
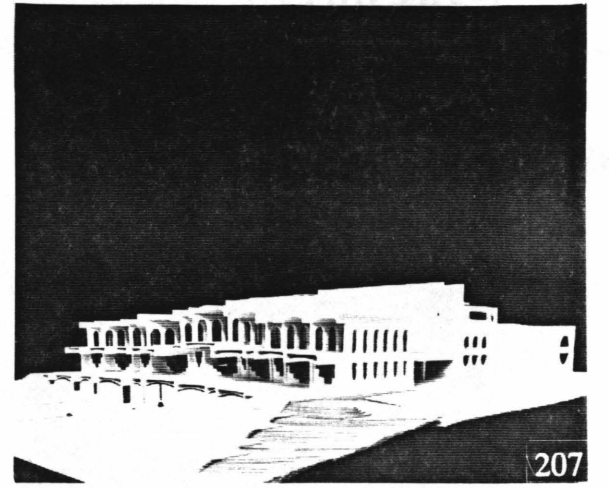
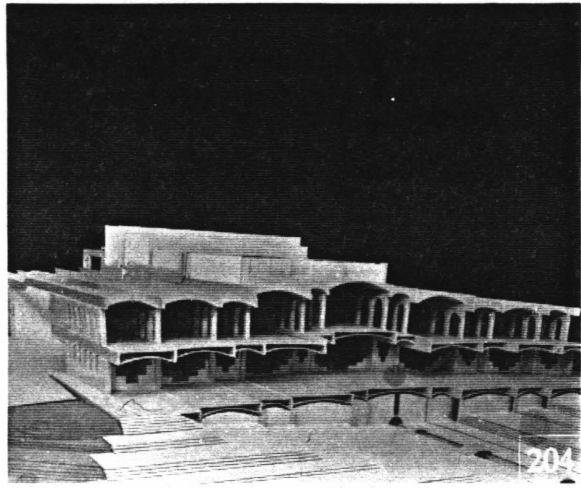
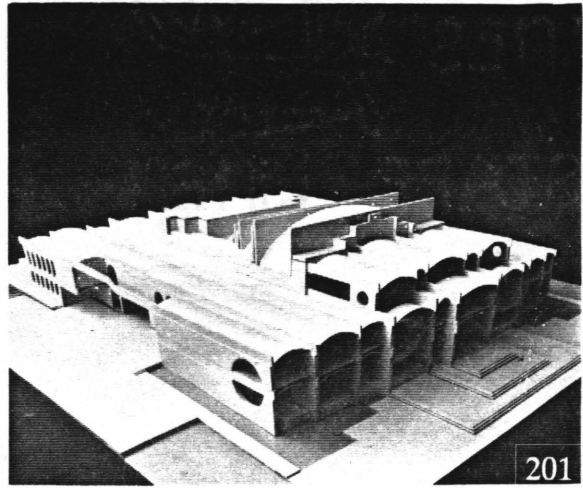


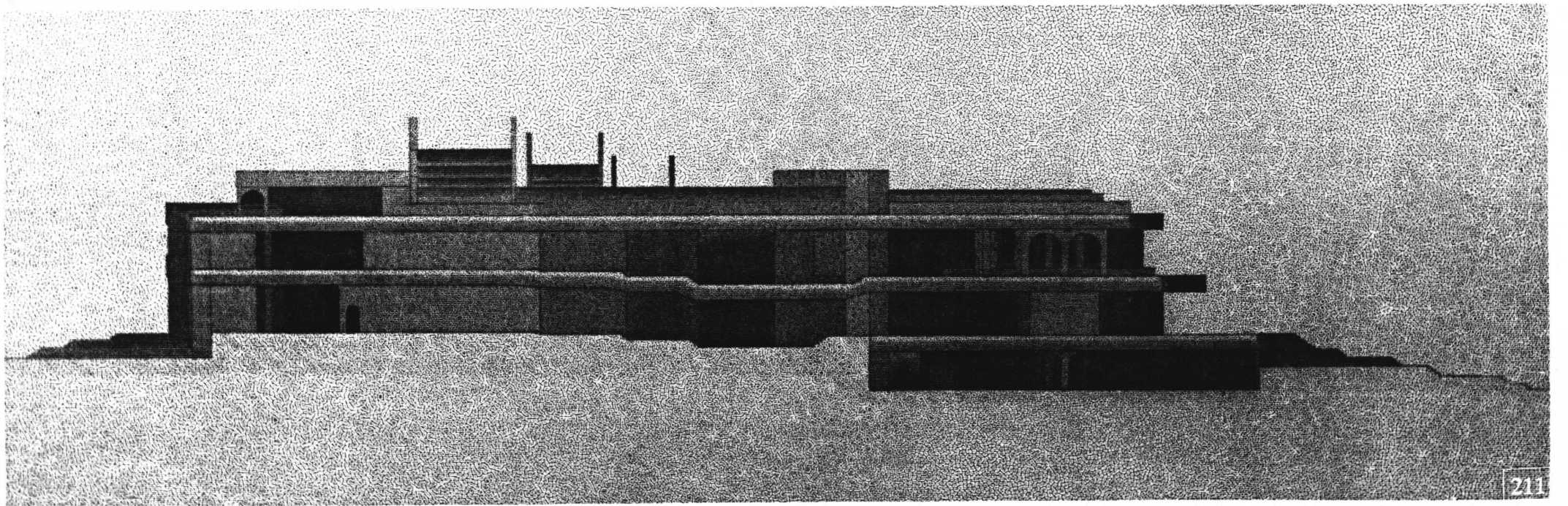
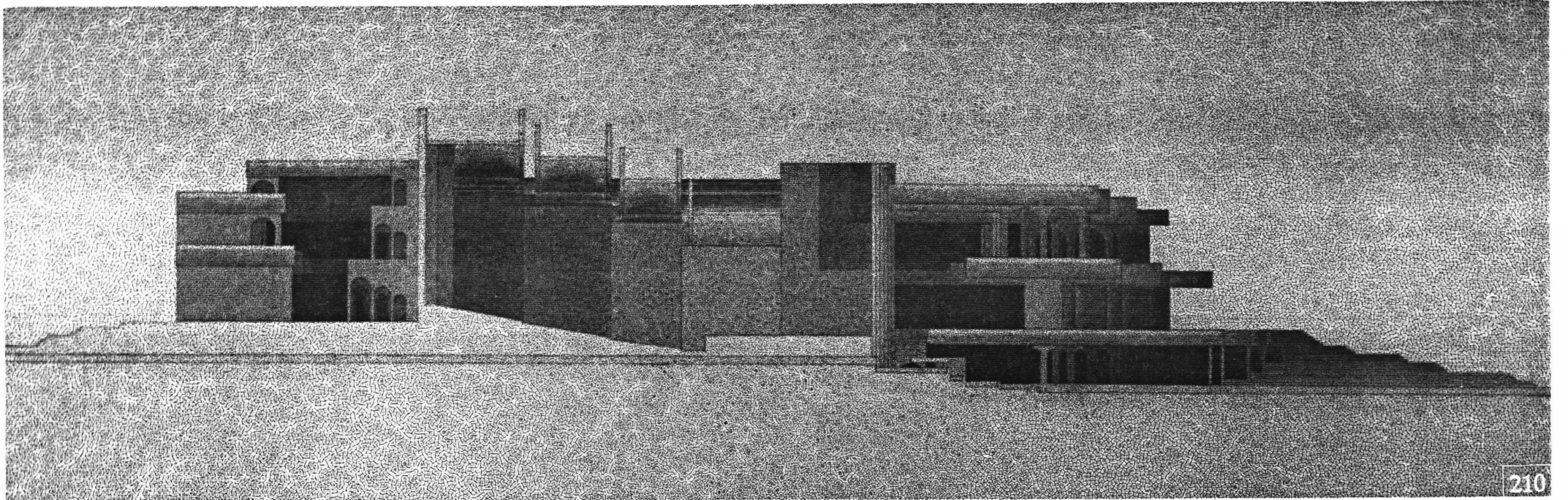


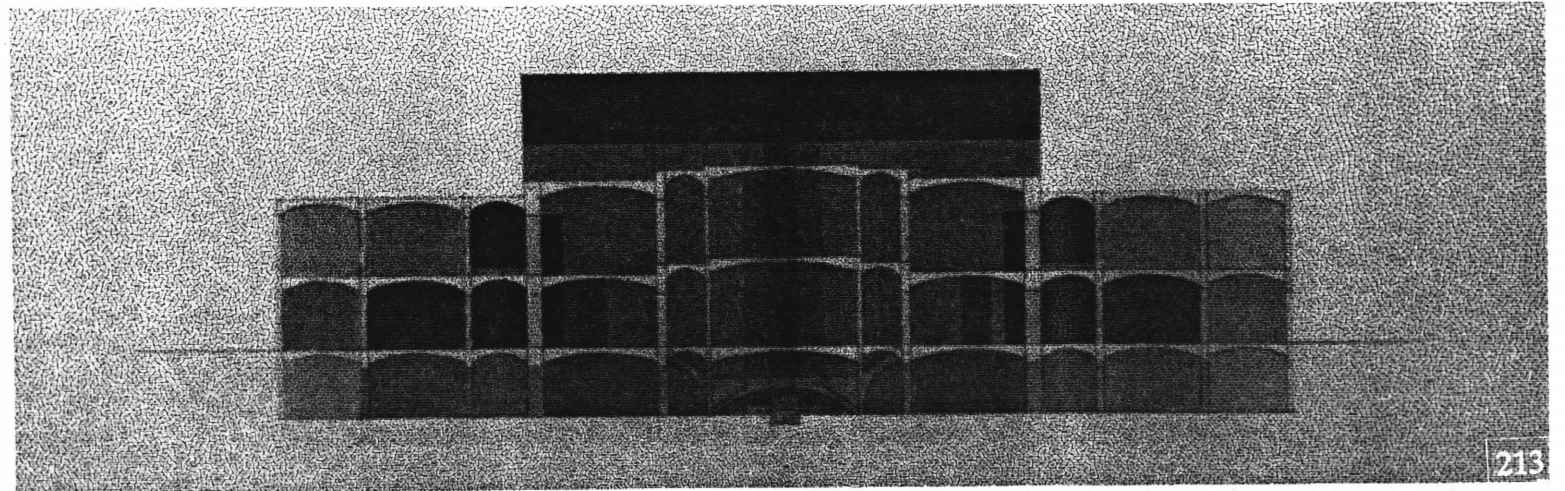
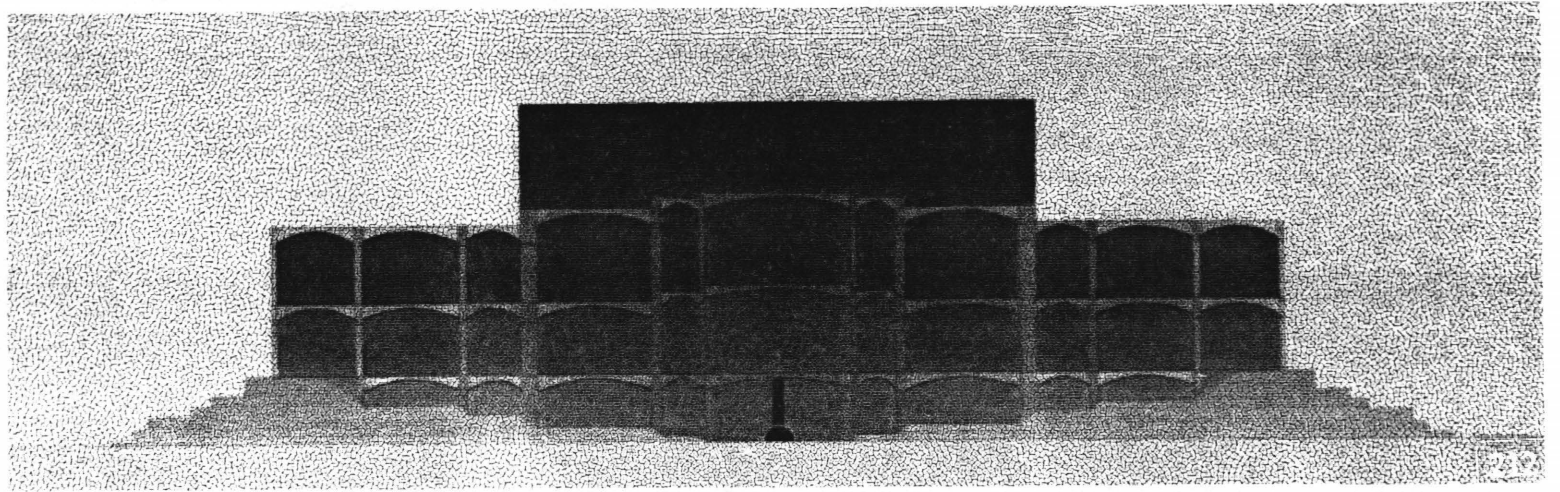




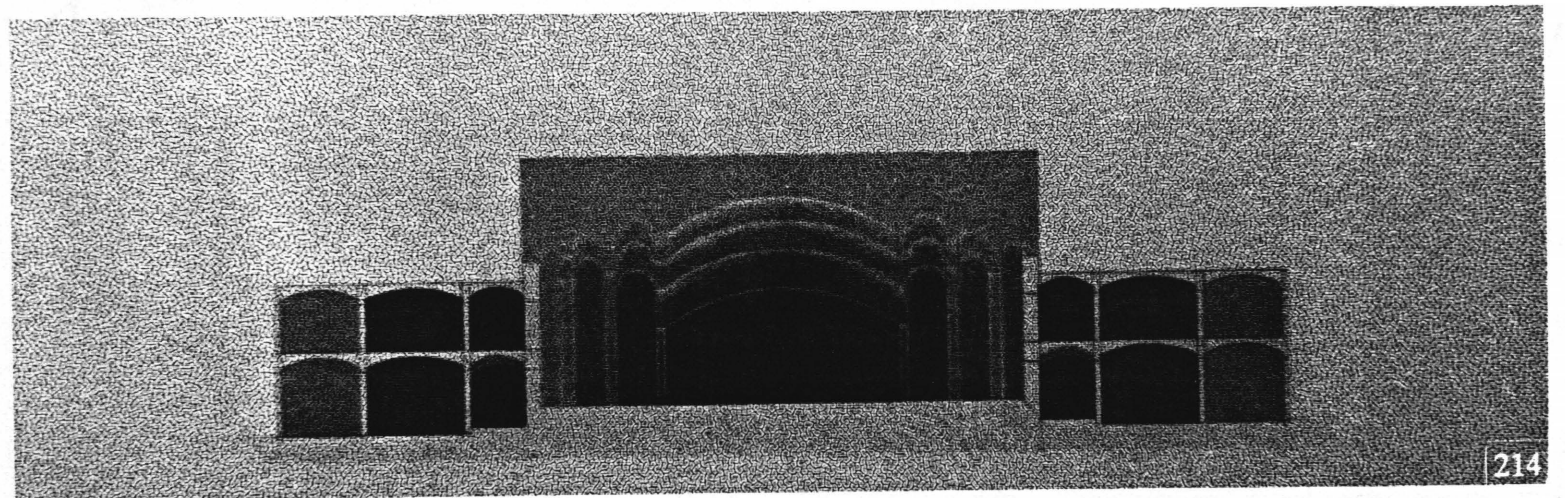




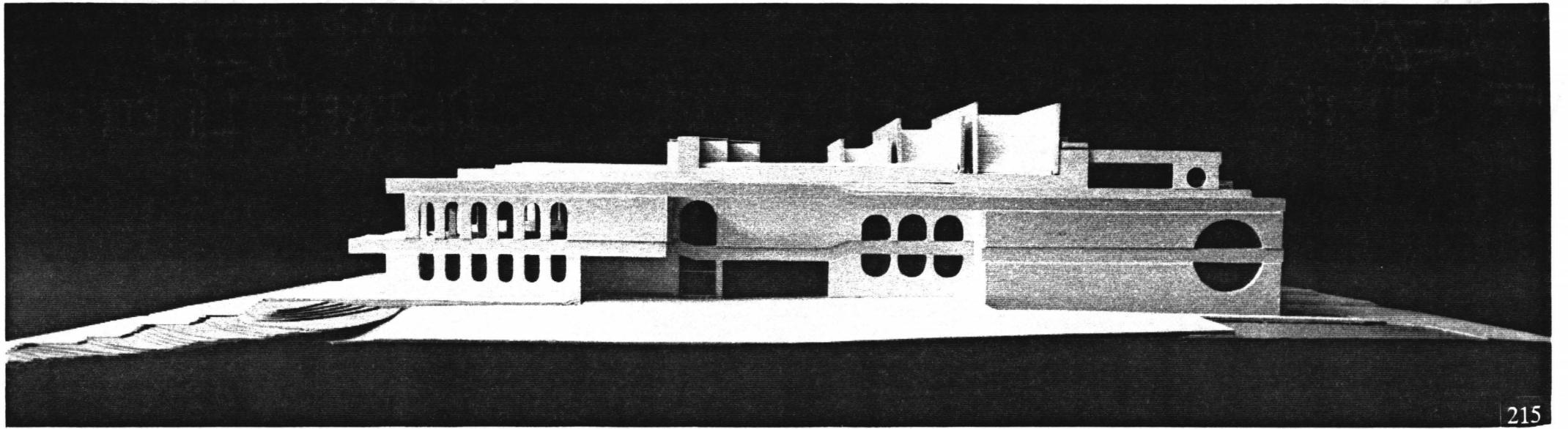




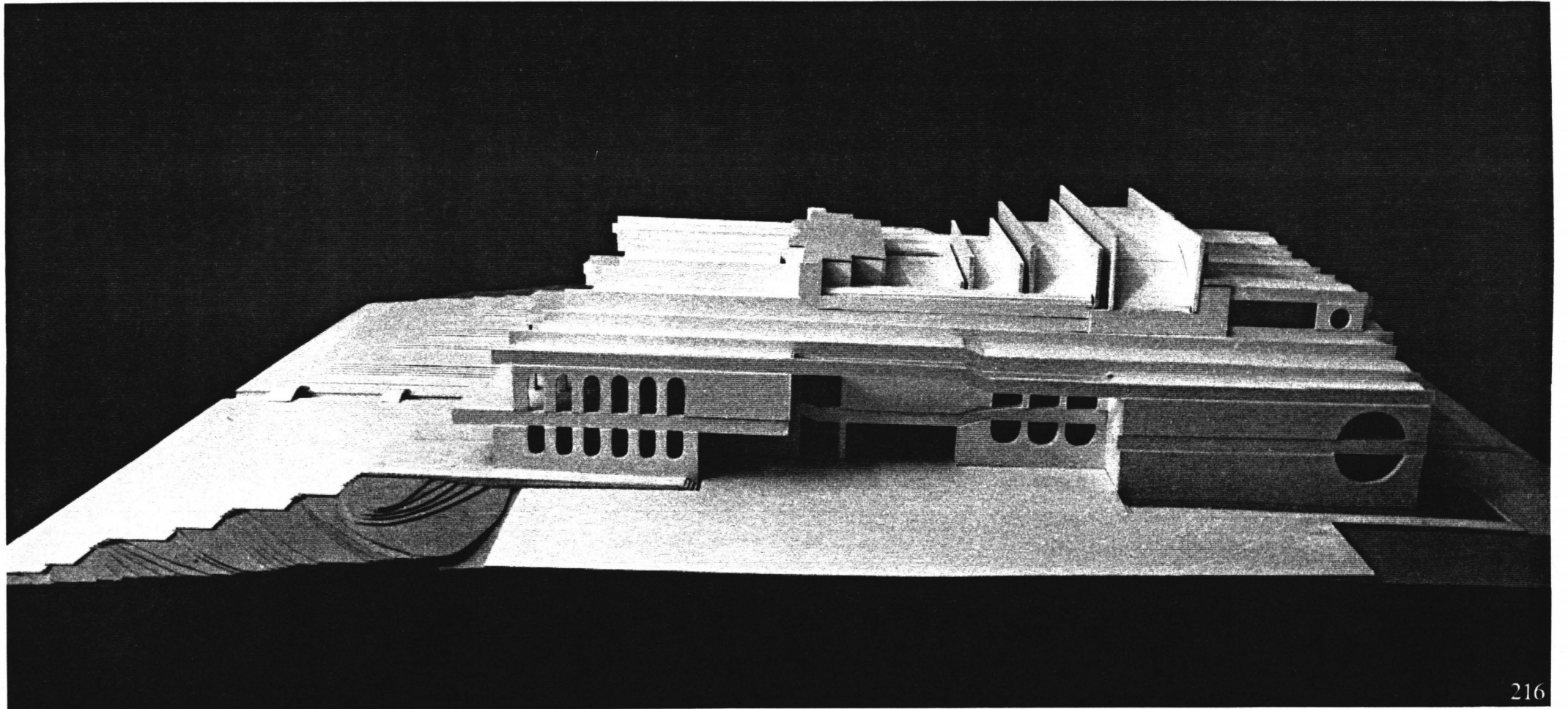
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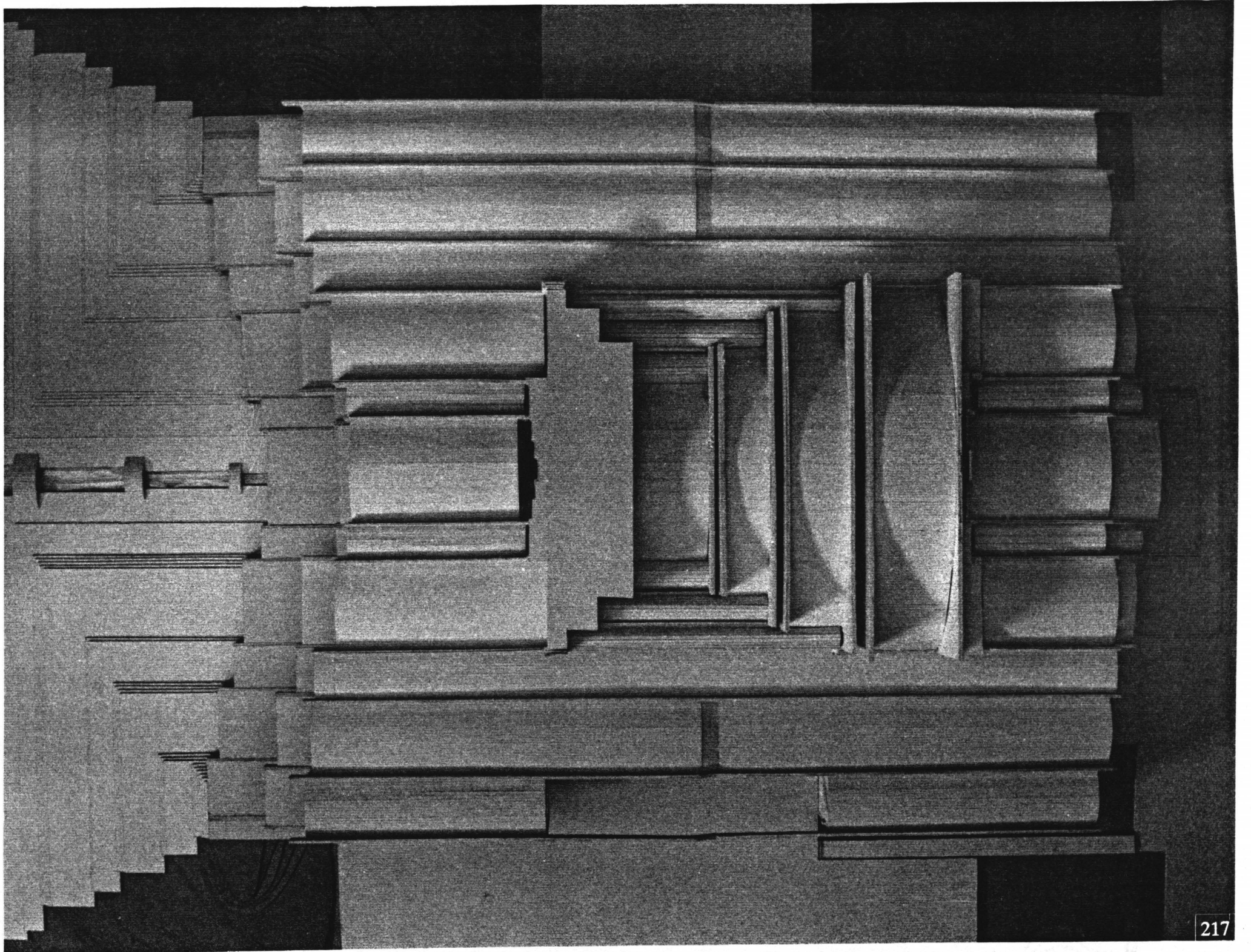
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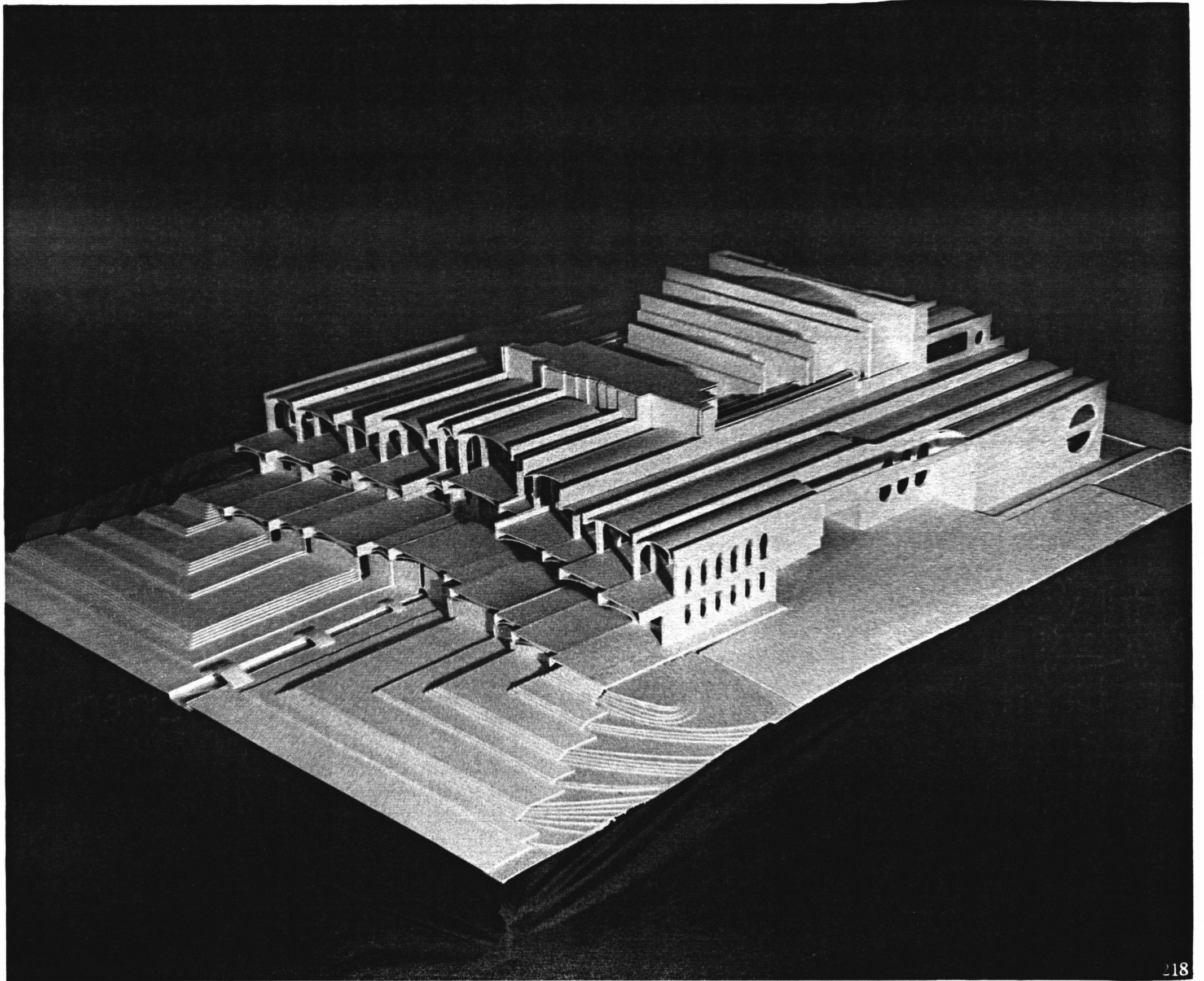


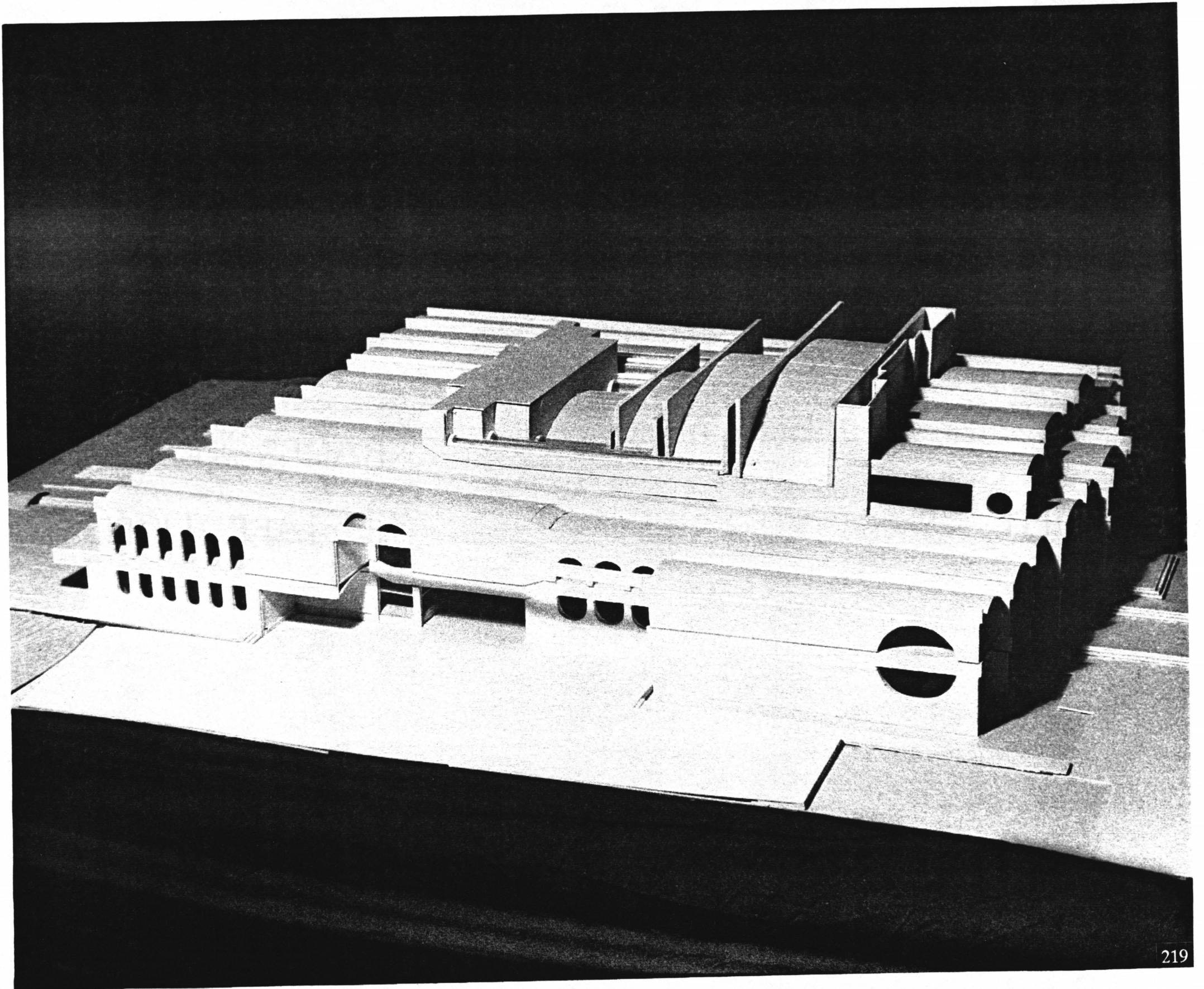
215

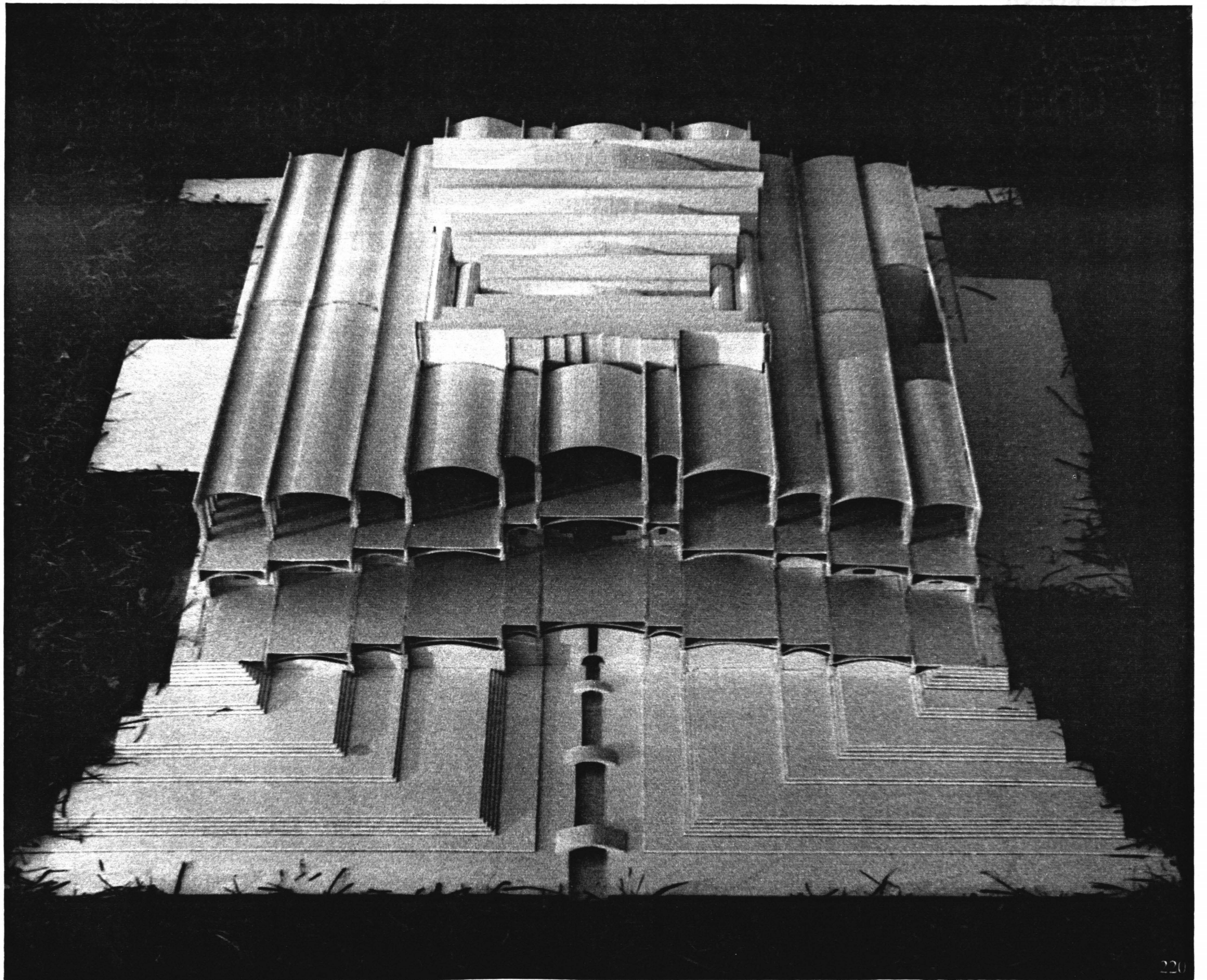


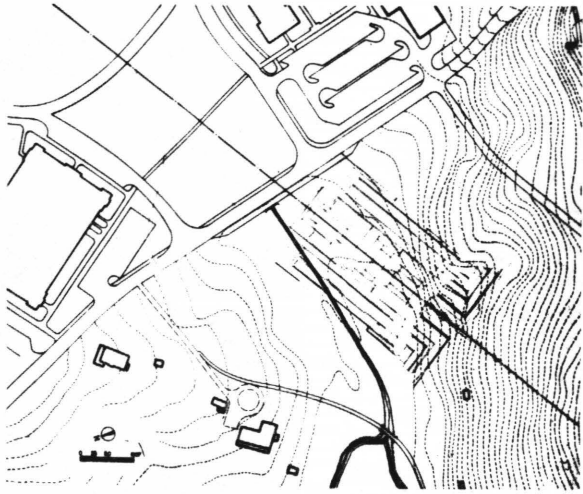
216











Conference/Group Facilities:

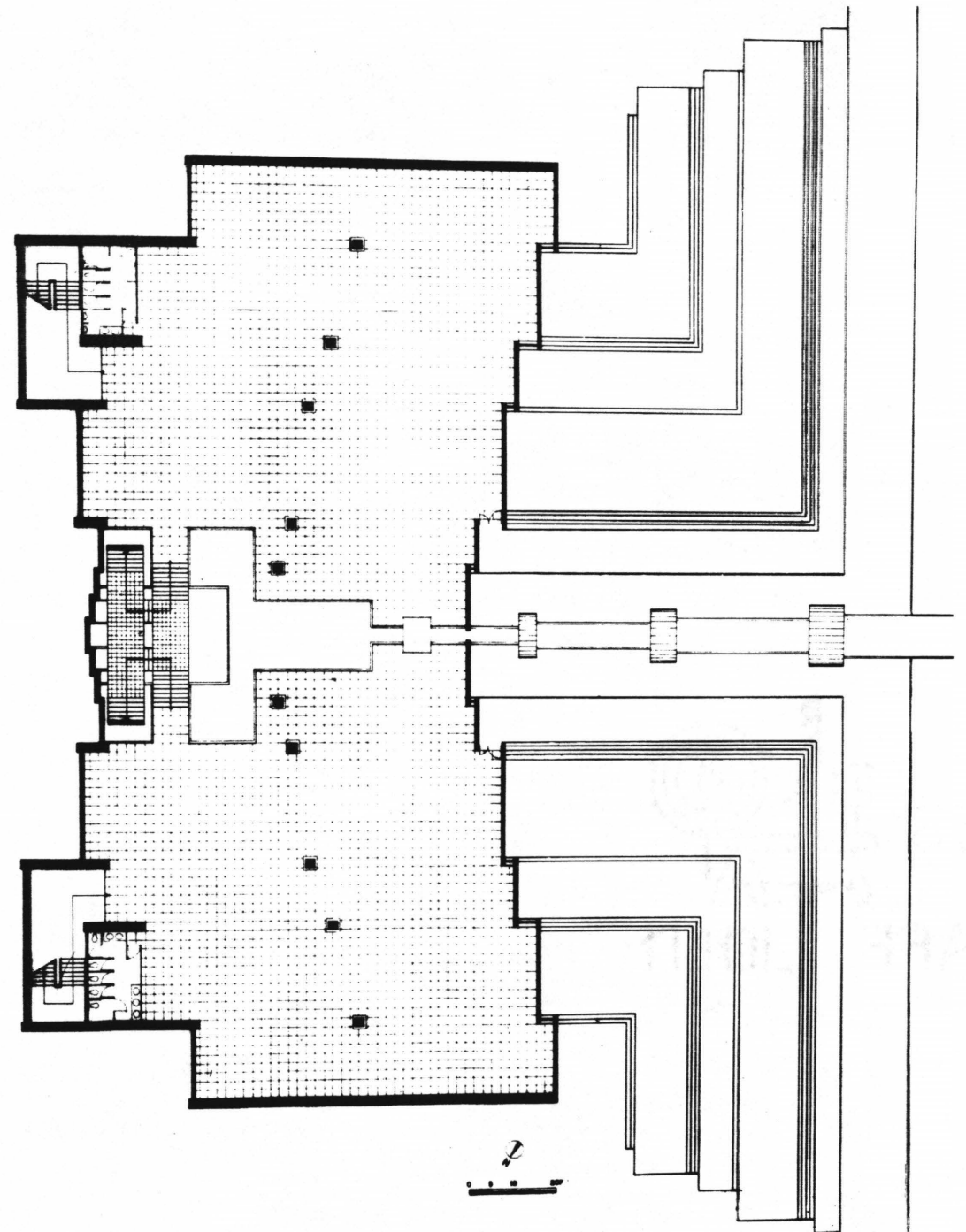
- 1 Lecture Hall
- 2 Large Conference Room
- 3 Small Conference Room
- 4 Living Area, Lounge
- 5 Dining Area
- 6 Kitchen
- 7 Library
- 8 Study
- 9 Bar
- 10 Reception/Lobby
- 11 Cloakrooms
- 12 Restroom
- 13 Storage Room

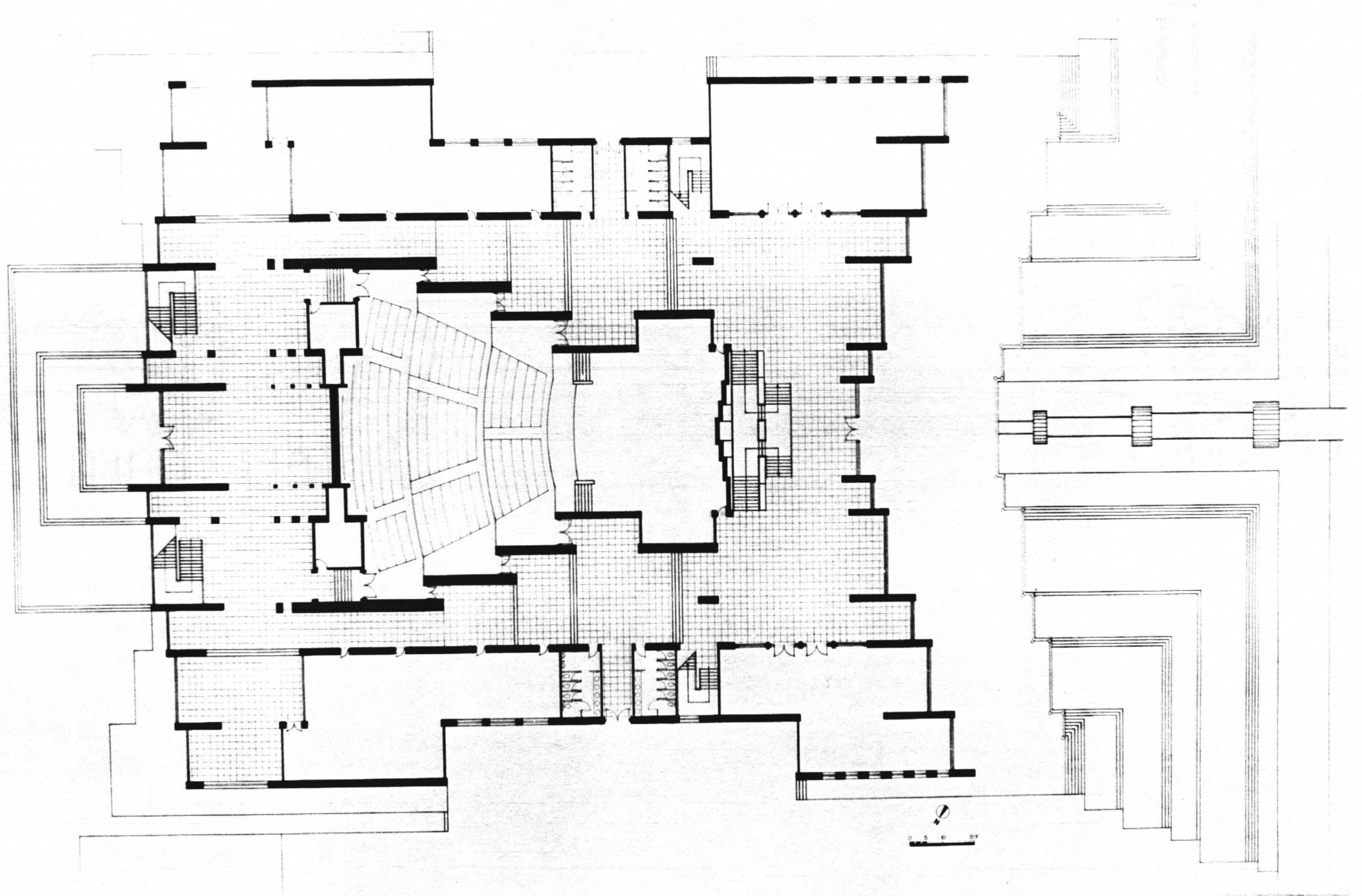
Caretaker's Quarters:

- 14 Living
- 15 Kitchenette
- 16 Bedroom
- 17 Bathroom

Executive and Editorial Offices:

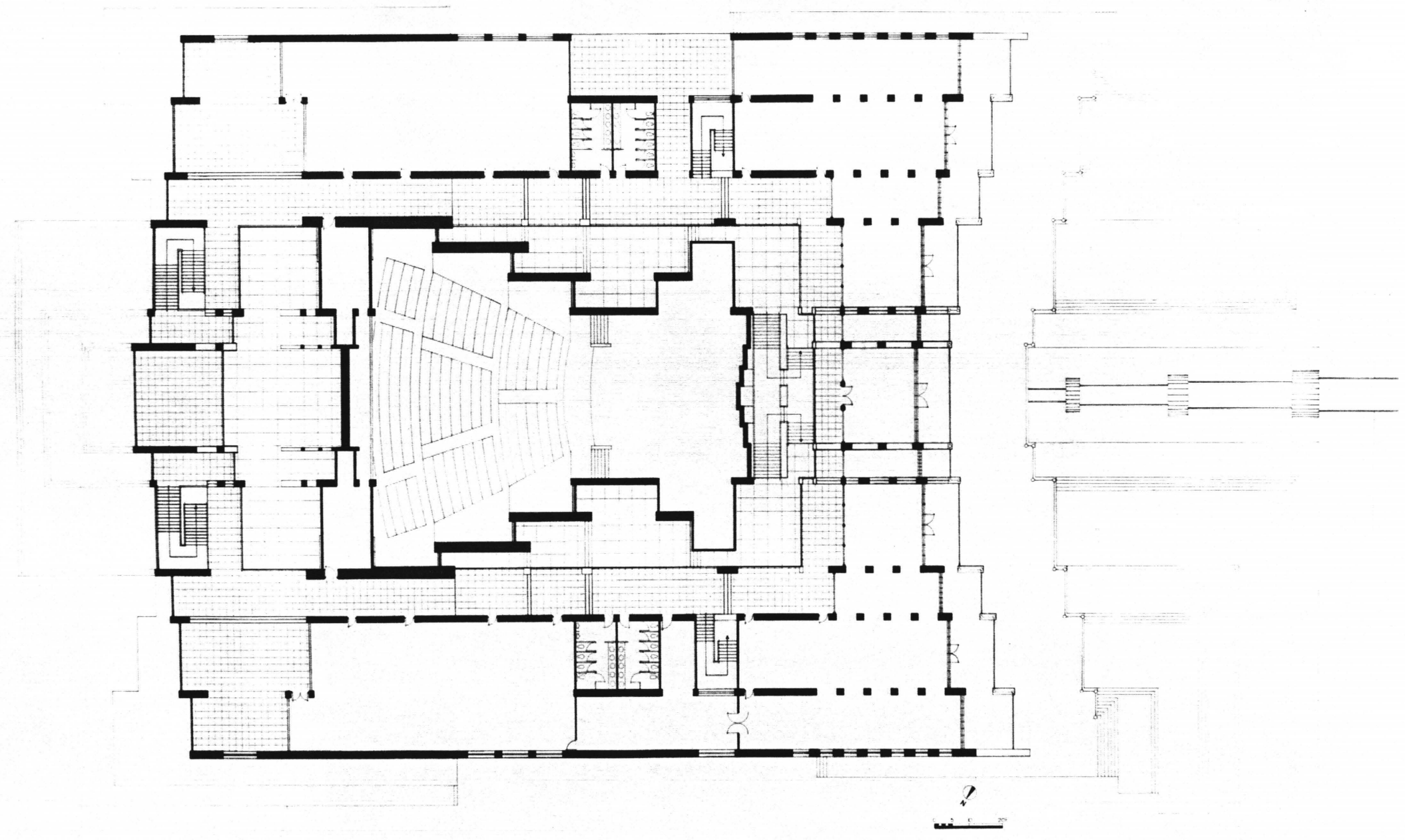
- 18 President
- 19 Executive Director
- 20 Two Secretarial Offices
- 21 Administrative Assistant
- 22 Assistant Director
- 23 Building Manager
- 24 Programming Office
- 25 Business Office
- 26 Two Conference Rooms
- 27 File Room
- 28 Managing Editor
- 29 Two Copy Room Editor
- 30 Copy Room
- 31 Supply Room
- 32 Six Visiting Scholars Offices
- 33 Lounge
- 34 Restroom
- 35 Reception/Waiting

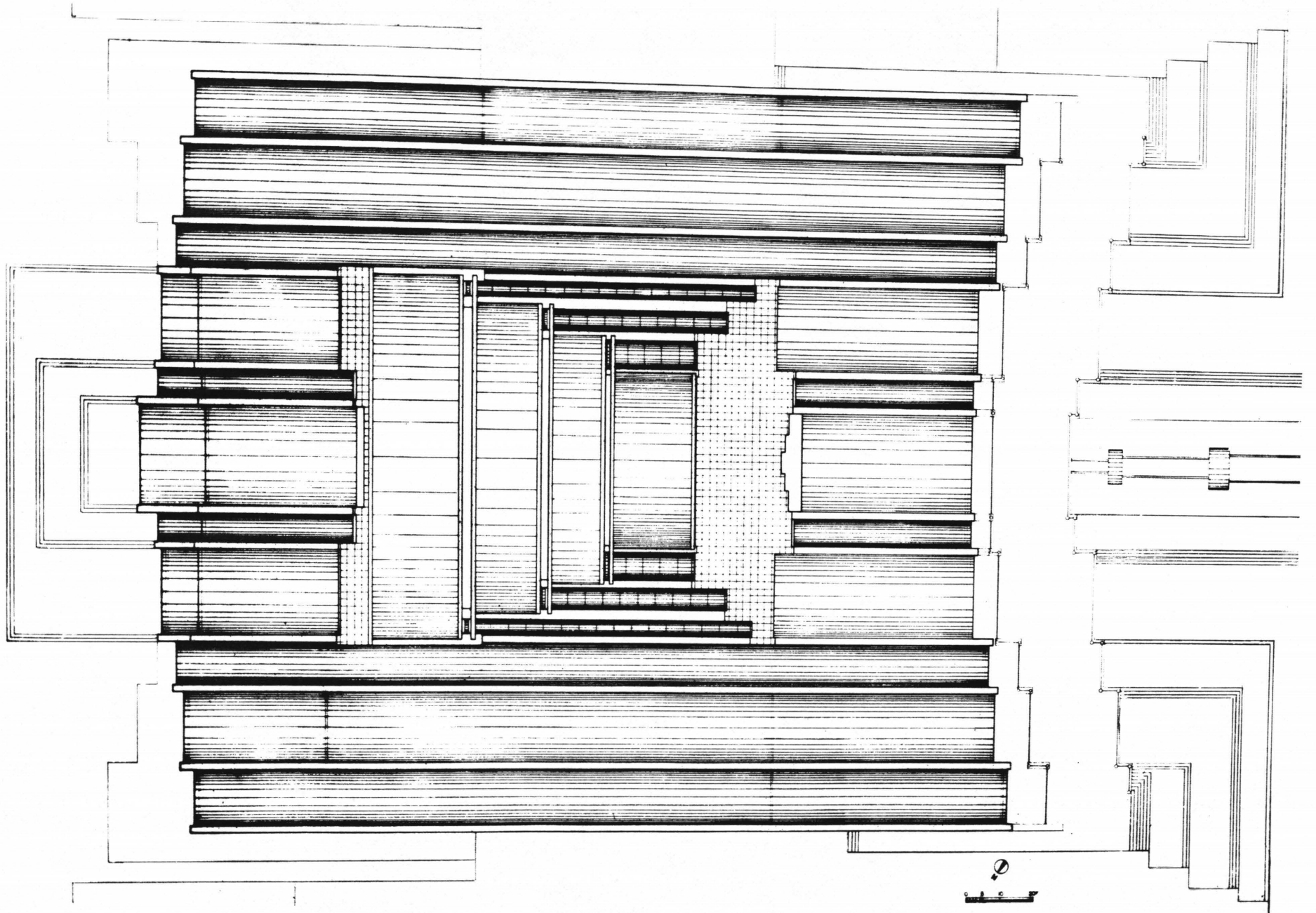


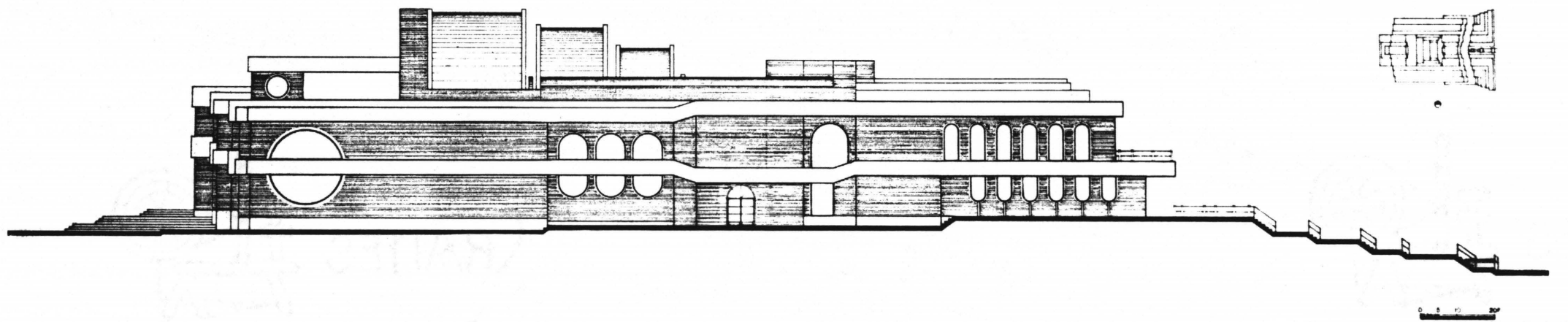


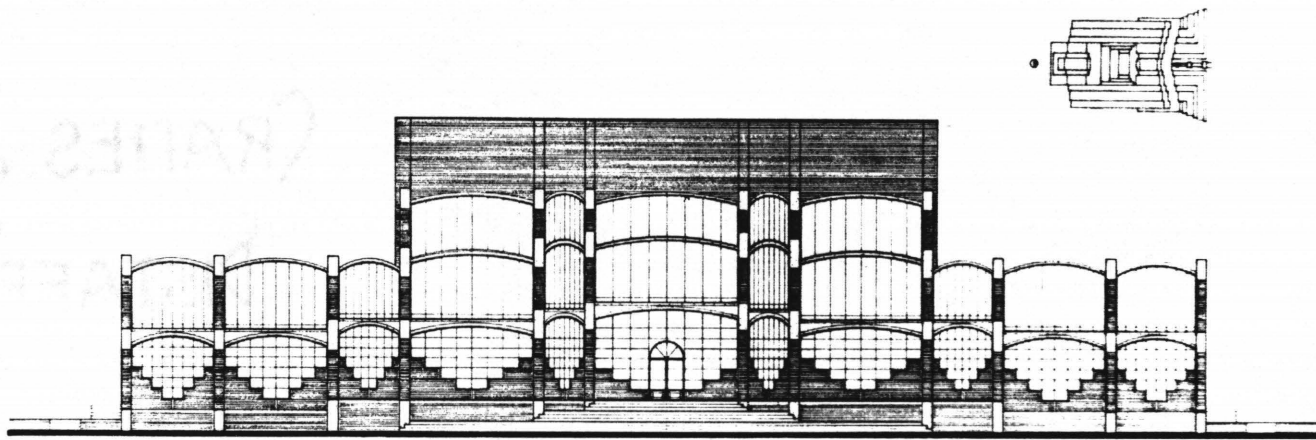
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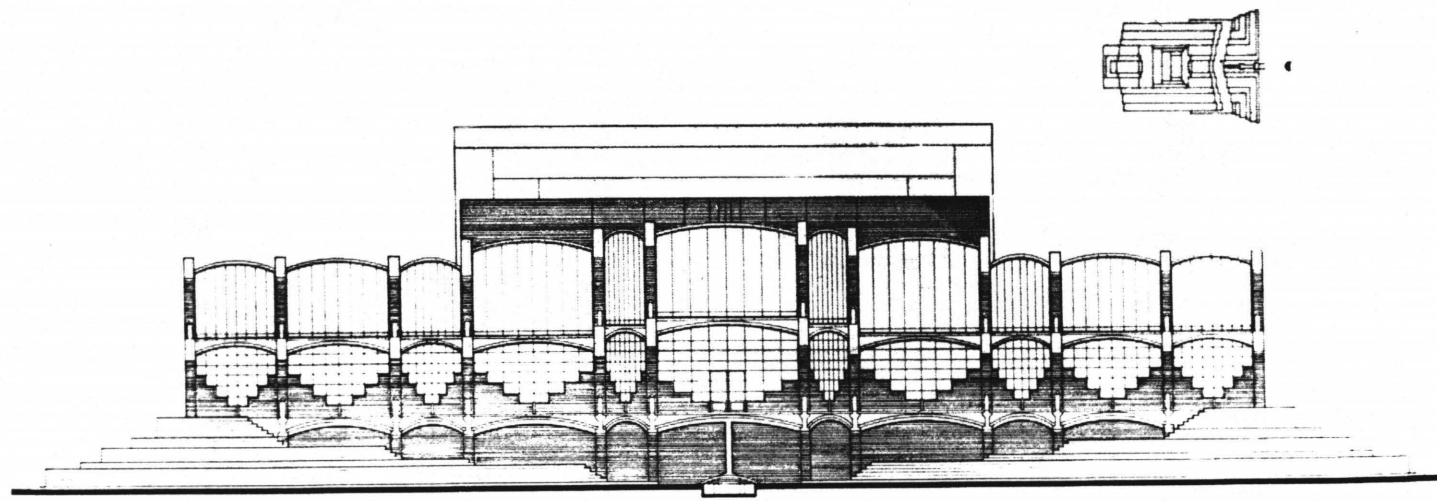




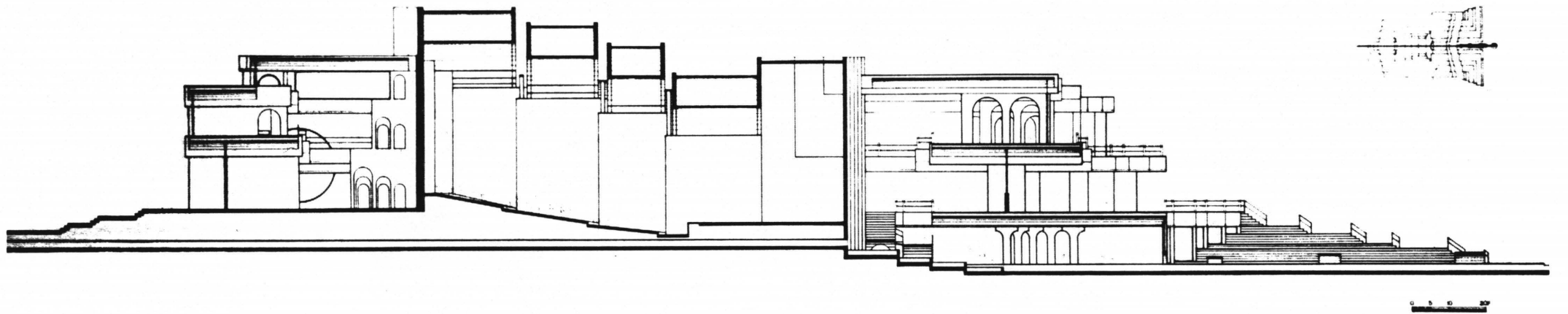


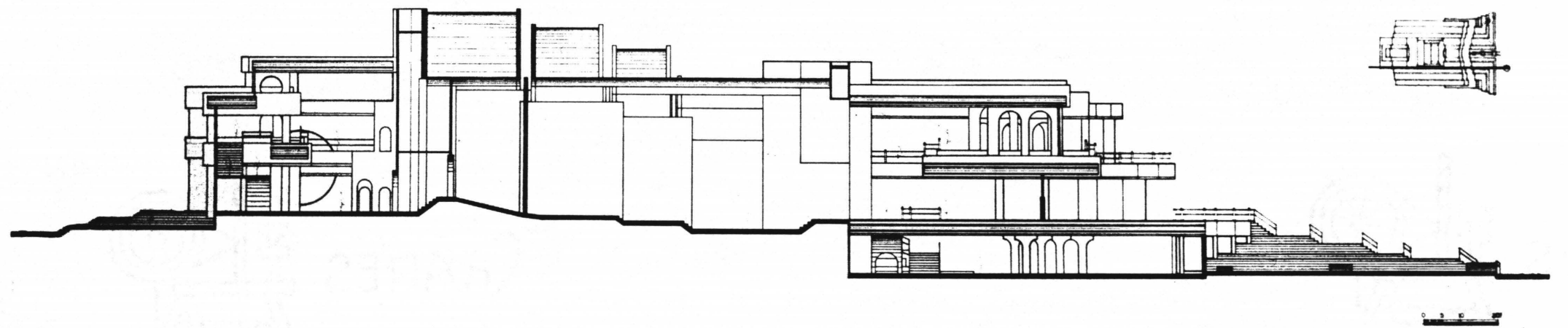


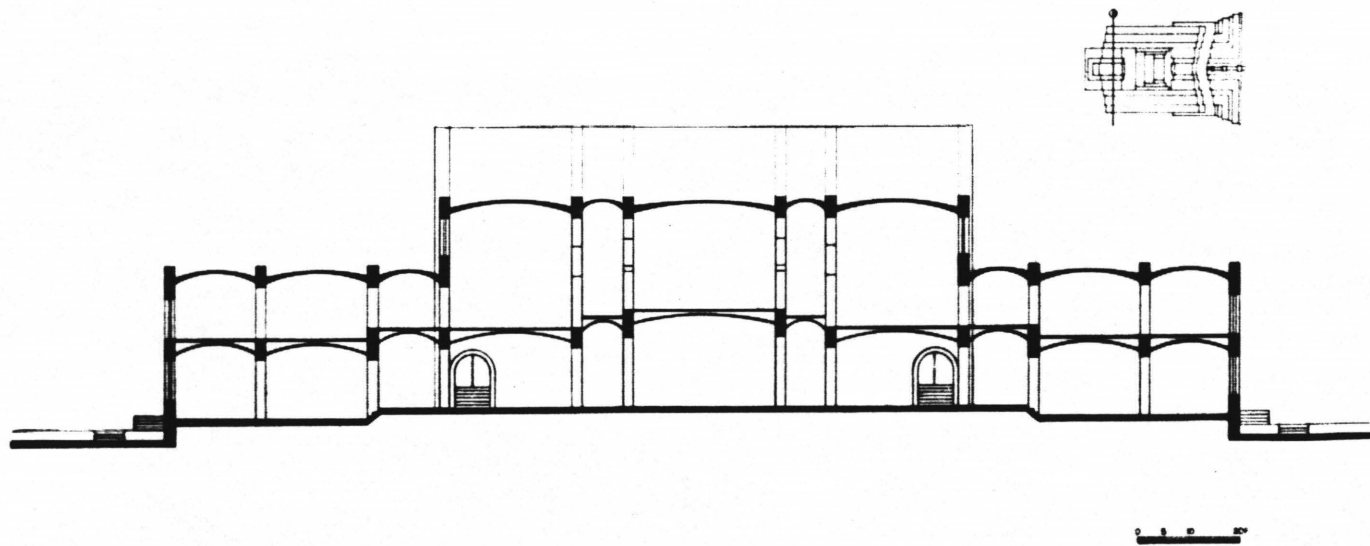
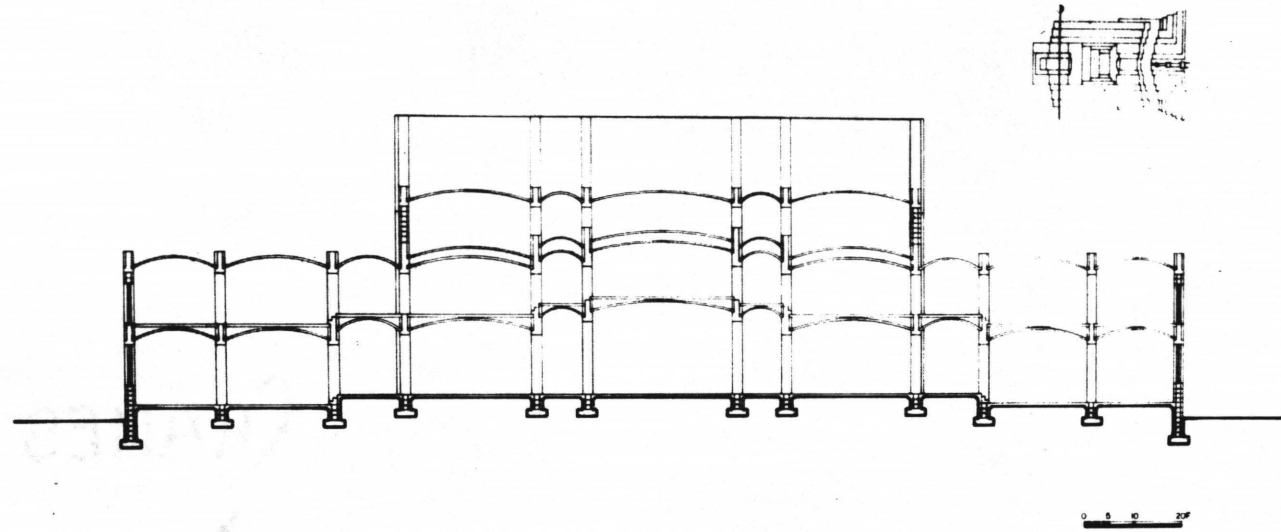
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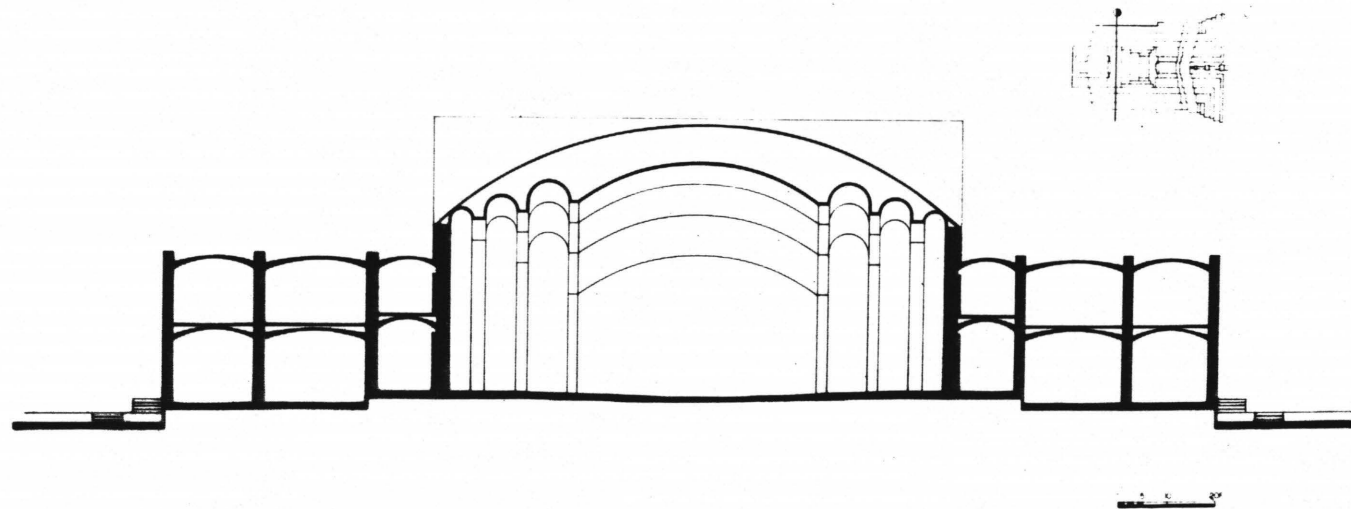


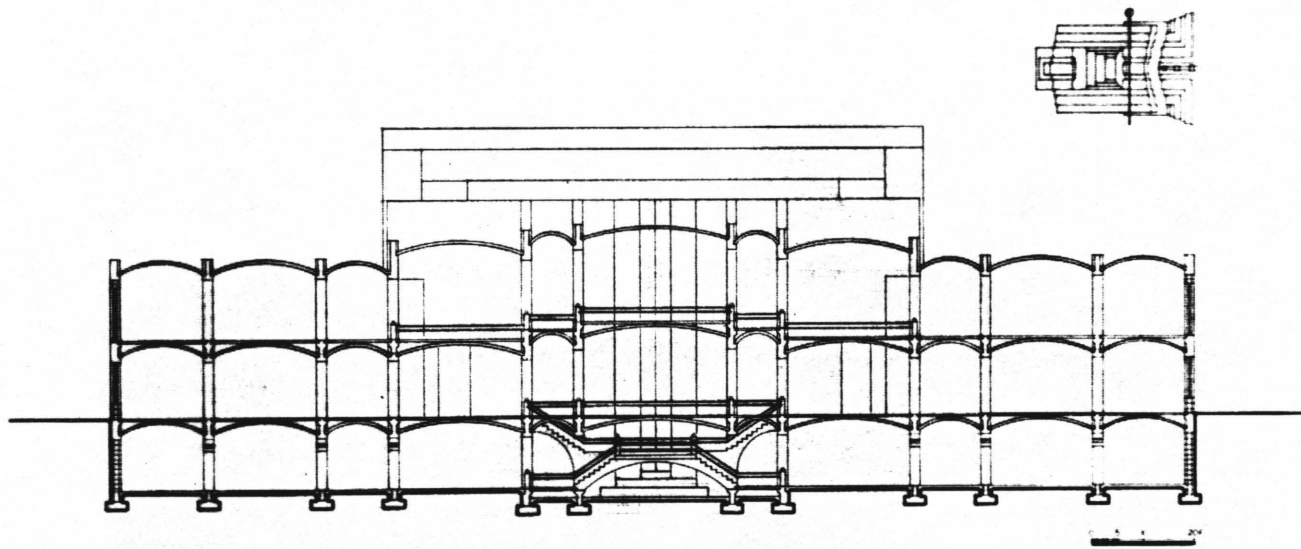
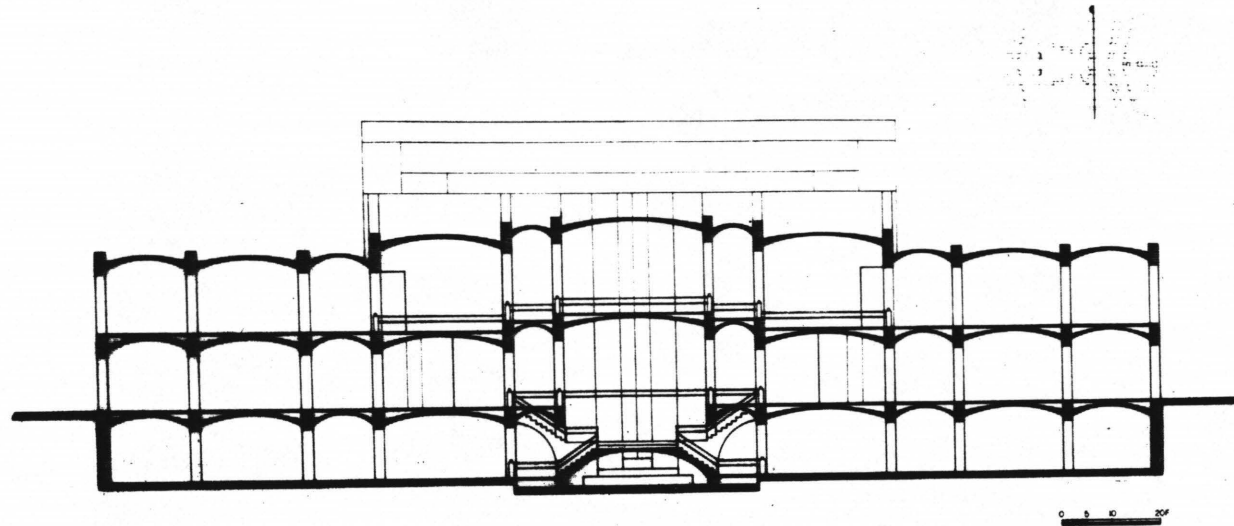
1 1/2 1/2 1/2

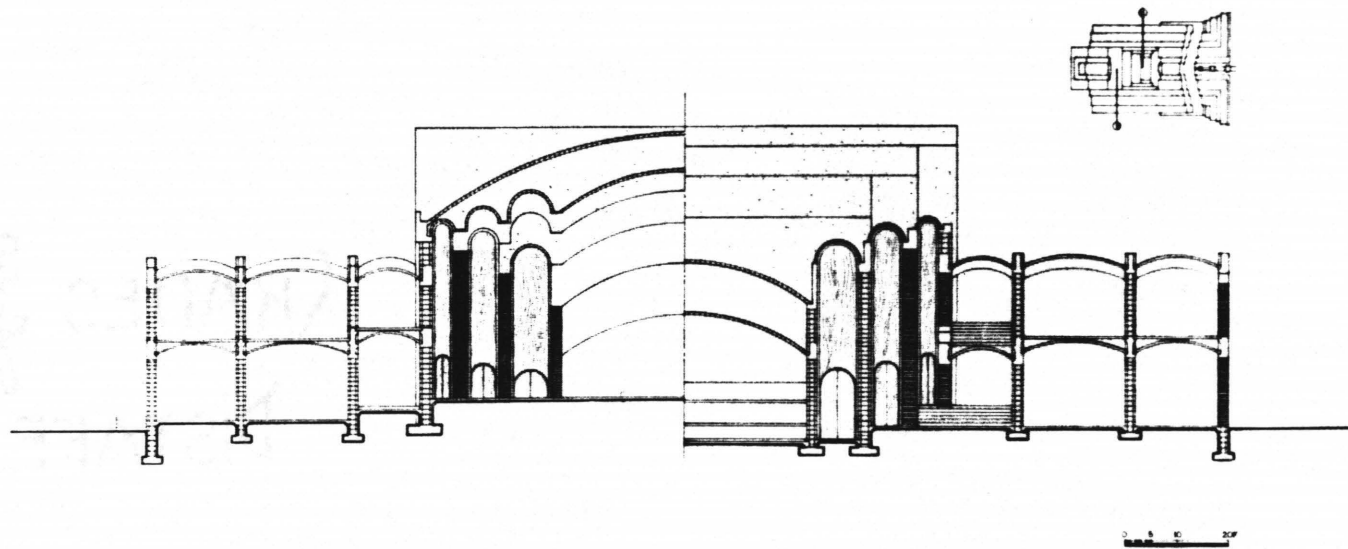


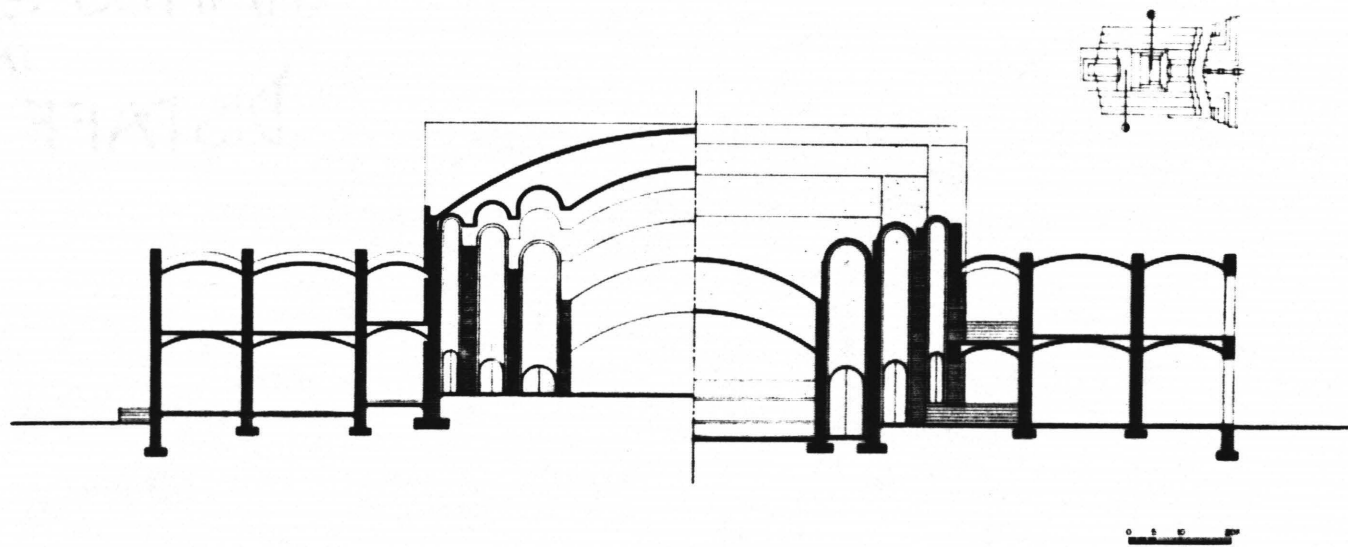


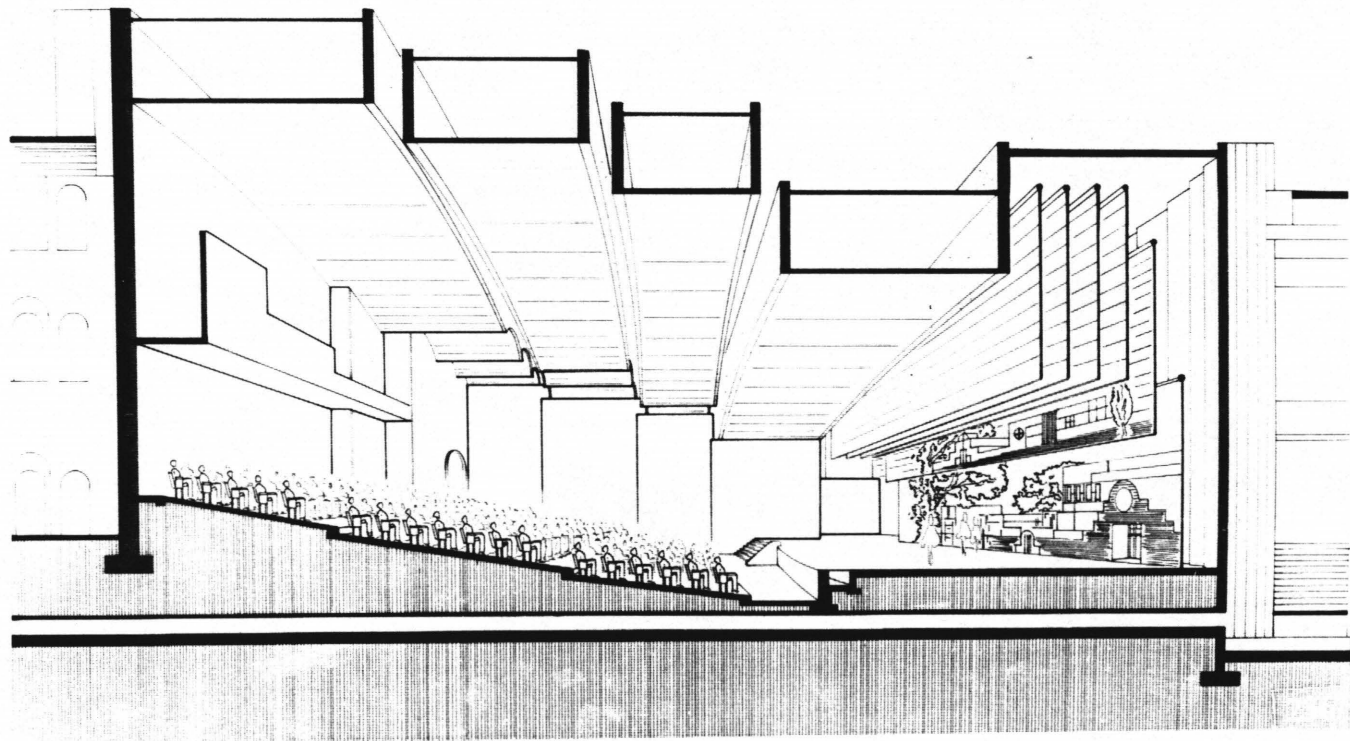


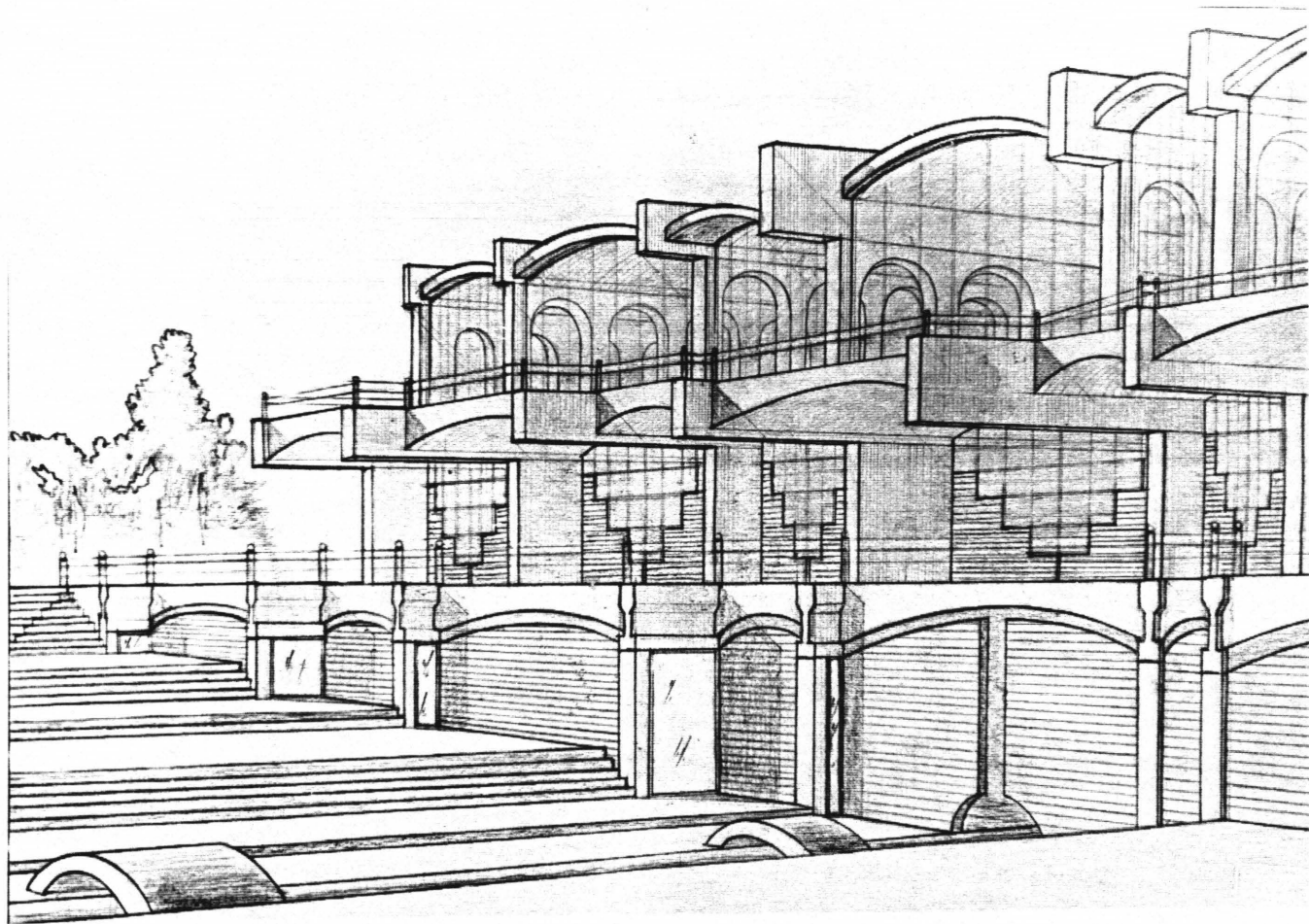












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NOTES

1. Mies van der Rohe, letter Adalbert Colzman, Langenburge, West Germany, Schulze Franz "Mise van der Rohe, A Critical Biography", The university of Chicago press, 1985. See ref. no. 14, page 214.
2. See ref. no. 17, page 19-23.
3. See ref. no. 5, page 135.
4. See ref. no. 9, page 127-143.
5. Opening lecture of Steven Hole at Baltimore A.I.A. Chapter, 1990 Spring Lecture Series, April 1990. See ref. no. 6, page 2.
6. See ref. no. 3, page 386.
7. See ref. no. 1, page 54.
8. See ref. no. 1, page xiii.
9. See ref. no. 11, page 93.
10. In late October 1958 Frank Lloyd Wright appeared twice in the WTTW-Chicago television series called Heritage. Conversation between Wright and William McDonald under title "The philosophy of an Architect" and "Organic Architecture". See ref. no. 10, page 97.
11. See ref. no. 11, page 90.
12. See ref. no. 1, page 37. .
13. See ref. no. 17, page 89.
14. See ref. no. 3, page 369.
15. See ref. no. 1, page 21.
16. See ref. no. 1, page 21.
17. See ref. no. 1, page 21.
18. See note no. 10 above, also ref. no. 10, page 99.
19. Frank Lloyd Wright with the student architect of the university of California-Berkeley as a guest Bernard Maybeck Lecture in architecture in april 1957. See ref. no. 10, page 217.
20. See note no. 10 above, also ref. no. 10, page 99.
21. See note no. 10 above, also ref. no. 10, page 97.
22. See ref. no. 3, page 368.
23. See ref. no. 11, page 74.
24. See ref. no. 17, page 120.
25. See ref. no. 3, page 334.
26. See ref. no. 3, page 351.
27. See ref. no. 17, page 41.
28. See ref. no. 1, page 35.
29. See ref. no. 1, page 35.
30. See ref. no. 1, page 37.
31. See ref. no. 17, page 301.
32. See ref. no. 1, page 21.
33. See ref. no. 18, page 103.
34. See ref. no. 3, page 382.
35. See ref. no. 1, page 59.
36. See ref. no. 1, page 60.
37. See ref. no. 9, page 176.
38. See ref. no. 12, page 3.
39. See ref. no. 1, page xiii.
40. See ref. no. 12, page 3.
41. See ref. no. 1, page xiii.

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