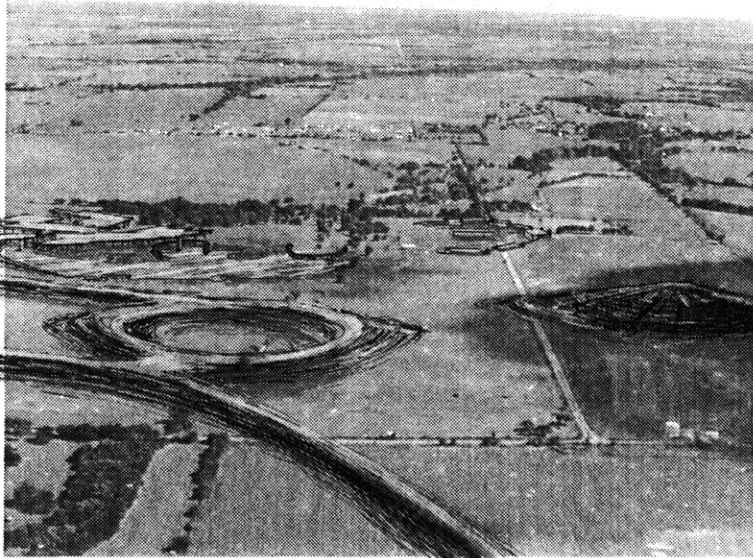


SETTLEMENT IN AN AMERICAN LANDSCAPE:

A Place of Work Amidst a Particle Accelerator's
Transformation of the Texas Prairie



By Christopher B. Falliers

Bachelor of Arts, English
University of Colorado, Boulder, 1986

Submitted to the Department of Architecture
in partial fulfillment of the requirements for the degree of
MASTER OF ARCHITECTURE at the
Massachusetts Institute of Technology.

February 1991

© Christopher B. Falliers, 1991. All rights reserved.
The author hereby grants to M.I.T. permission to reproduce
and to distribute publicly copies of this thesis document in
whole or in part.

Signature of the Author

Christopher B. Falliers
Department of Architecture
January 18 1991

Certified by.....

Thomas Chastain
Assistant Professor of Architecture
Thesis Supervisor

Accepted by.....

Thomas Chastain
Chairman
Departmental Committee for Graduate Students

MASSACHUSETTS INSTITUTE
OF TECHNOLOGY

FEB 07 1991

LIBRARIES
Ratch

SETTLEMENT IN AN AMERICAN LANDSCAPE:
A Place of Work Amidst a Particle Accelerator's
Transformation of the Texas Prairie

By Christopher B. Falliers

Thesis Supervisor: Thomas Chastain,
Assistant Professor of Architecture

Submitted to the Department of Architecture on January 18, 1991
in partial fulfillment of the requirements for the degree of Master of Architecture at the
Massachusetts Institute of Technology.

A B S T R A C T

This thesis considers the design of the research facility accompanying the Superconducting Super Collider, a large particle accelerator planned for central Texas. It will focus on this project as a form of human settlement in a prairie landscape altered by the presence of a technological intervention, the collider mechanism.

The thesis takes the stance that designing a built environment which interacts and incorporates its surroundings is accomplished by responding to the existing physical characteristics of the site. As such, it will distinguish the elements, both built and natural, that make up the existing landscape and an environment for human activity. The experience of a place is defined by the definition of space, size and scale, the quality of material and light, and the response to climate. An element, whether a tree or a column, is deployed taking into consideration its relationship to other things rather than as just a thing in itself. The settlement is designed as an accumulation of parts rather than a single entity, and, as such, has a multiple set of spatial and qualitative relationships both within and beyond it.

With the transformation of the landscape through a range of physical systems, the ability to take into consideration both the scale of the human and the surroundings is achieved.



My thanks

to my teachers,

to my friends,

and to my family,

for making the last three-and-one-half years

a period of enlightenment, happiness, and fulfillment;

and for showing me how that may continue.

CBF, January 17, 1991

TABLE OF CONTENTS

ABSTRACT	3
PROBLEM	6
THE PROJECT	7
SITE DESCRIPTION	11
THE MECHANISM	24
AN INSTITUTION	26
WORK - DRAWINGS	28
WORK - DESIGN STUDIES	50
ARGUMENT	64
THE PROJECT AS SETTLEMENT	65
LANDSCAPE	68
NATURE AND LANGUAGE	72
SETTLEMENT AS A PHYSICAL ACTION	74
LANDSCAPE WITH HUMAN INTERVENTION	84
RELATIONSHIP BETWEEN PHYSICAL ELEMENTS	102
THE INDIVIDUAL WITH THE ENVIRONMENT	110
CONFIGURATION OF THE INSTITUTION	118
A PLACE FOR SCIENCE	124
CONCLUSION	130
BIBLIOGRAPHY	132

P R O B L E M

THE PROJECT

The subject of this thesis is extracted from the particular project for a scientific research facility accompanying a particle accelerator. The issues of how one builds a settlement and a sense of place in a landscape, of how one responds to an intervention in the landscape before inhabitation, and of the workings of an institution as a scientific work place in that setting come up as the problem.

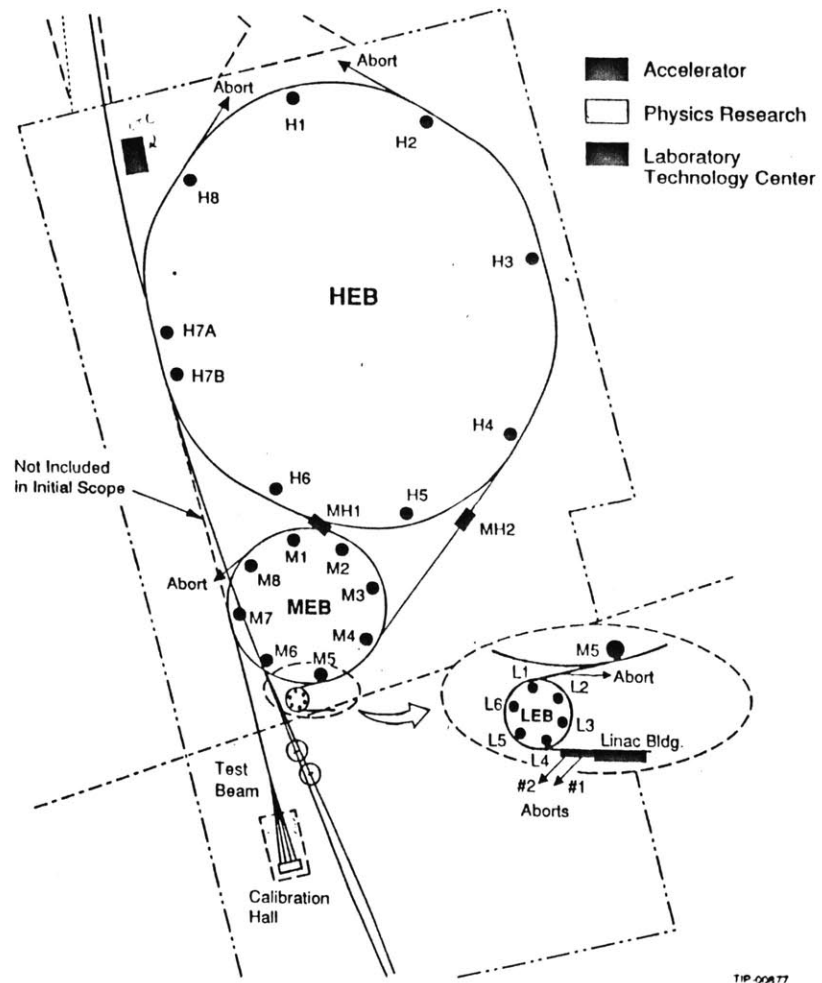
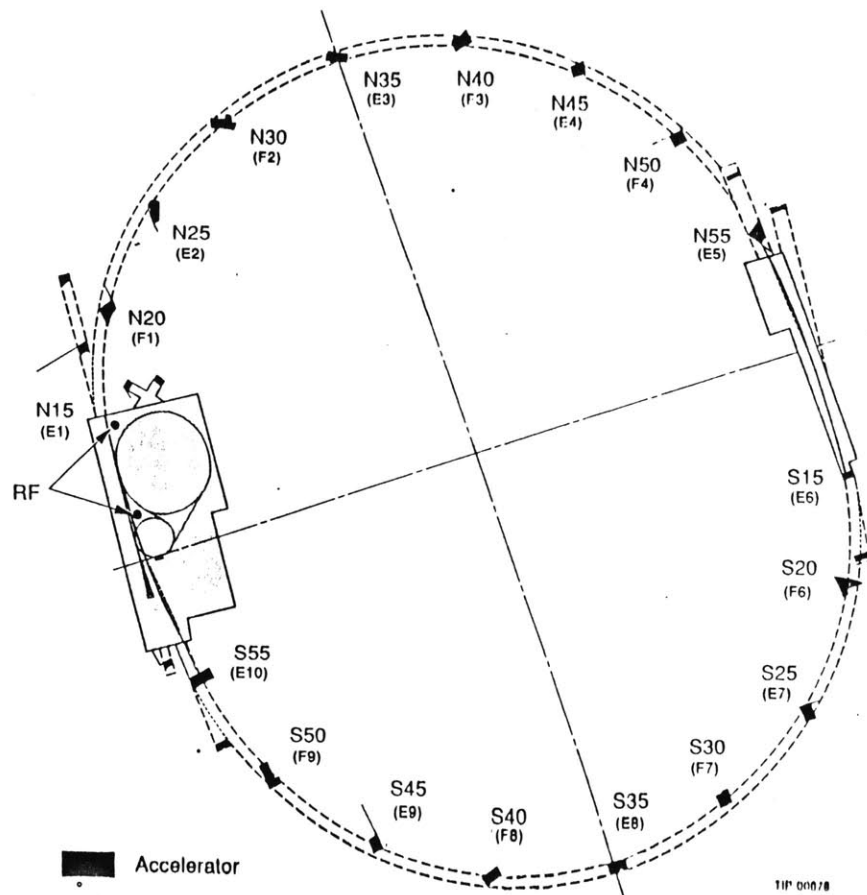
The Superconducting Super Collider is a project currently in progress on cattle-grazing prairie, thirty miles south of Dallas, Texas. As a proposal to build the latest and by far the largest particle accelerator in the world, it is near ground braking and is scheduled to begin operation in 1997 or 1998. The collider is a scientific tool in which atomic particles are accelerated and

smashed together to uncover and study their makeup. Among the goals of the experiments are to recreate the conditions of the Big Bang theory of the formation of the universe, and to discover the smallest particles that make up our physical world.

As an example of 'big science' in the area of particle physics, the project is sponsored by an association of universities, the United States Department of Energy, the State of Texas, and is currently attempting to encourage foreign, especially Japanese, involvement. It is very much involved in the ongoing international competition in scientific research.

The collider mechanism itself will be the largest of its kind. It is hoped that the higher energies produced by the larger system will uncover new information in the particle collisions. To approach the energies involved in the original conditions that formed our present universe, particles will be sent through a series of four accelerators and then collided together in large calibration halls. The sequence begins in an eleven hundred foot long linear accelerator, the Linac, through a series of three circle boosters increasing in size and energy, and finally into the large collider track which is 54 miles in circumference. Most of the mechanism is to be laid in tunnels below the prairie. The Linac, the low energy booster, and roughly one half of the medium energy booster are currently planned to be on the surface of the land and bermed over with tunnels spoils. There are points along the tracks for maintenance and access to the calibration halls. The bermed section of the collider is roughly one mile long and forty feet tall. Its presence on a landscape that is, from a person's perspective, predominantly horizontal, changes the character of that landscape.

The main working facilities for the SSC are planned to be adjacent to this bermed section for reasons of proximity to the Linac, the first calibration hall, or Interaction Region, and other functions of the mechanism. Amidst the presence of the collider and the required industrial buildings and equipment will be the 'main office complex' which the SSC people, especially Roy Schwitters, the project's director, term a 'campus.' The work conducted by these scientists, engineers, technicians, and support staff require the full range of personal interaction, from controlled lectures and meetings to casual discussions. They also require individual spaces with all



DIAGRAMS OF THE SUPERCONDUCTING SUPER COLLIDER
(Courtesy of SSC Laboratory)

of the electronic communication services that link them to the data collected by the experiments and to an international network of information.

As an institution, it not only must accommodate all of these specific working needs, but also services ranging from daily eating needs to having special conferences. The program will be stretched even further in the thesis to consider the research facilities not as a 'campus', but as a human settlement. The basic stance that the work will benefit when the environment offers a richer variety of physical and spatial definition and possibilities is taken to add gardens, recreation facilities, temporary resting/living spaces, and landscape elements to the architectural program.

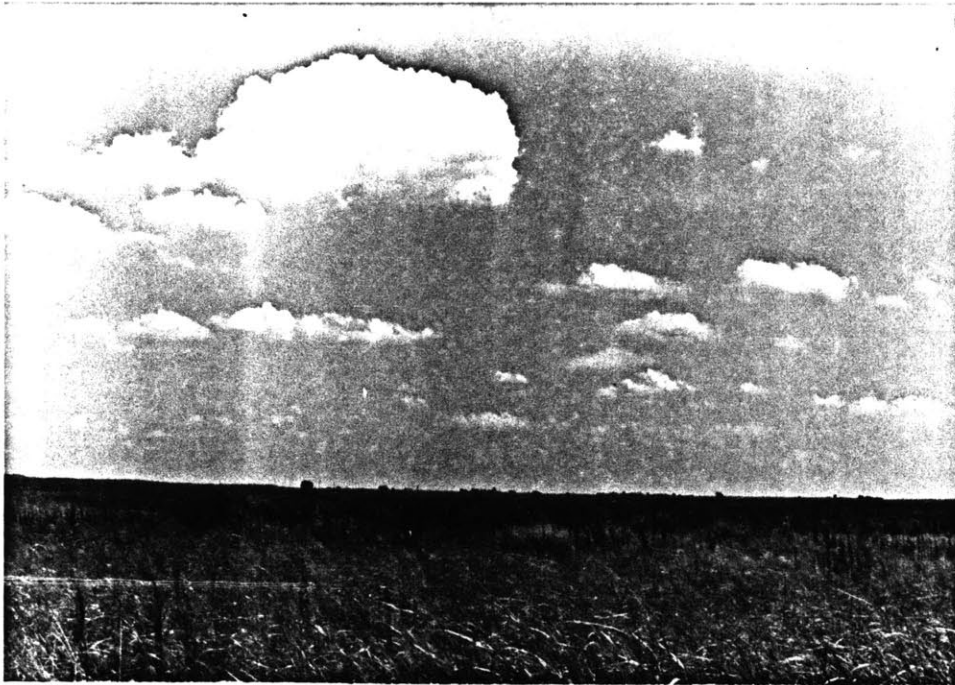
The remoteness of the project from other amenities, whether domestic, urban, or recreational, plus the nature of the institution, the long, intense work periods and need for interaction, allow this stance for an environment to provide more potential experiences.

After a competition among the states, Texas received the SSC project for reasons of proximity to an existing infrastructure, the Dallas-Fort Worth metropolitan area, a lack of inclement weather, and a local geology that is stable, both to hold the tunnels securely and the infrequency of seismic activity. The majority of transportation, communication, and domestic needs are provided by the Dallas area, Ellis County, and the nearby town of Waxahachie.

SITE DESCRIPTION

The Superconducting Super Collider is to be built roughly thirty miles south of Dallas, Texas, predominantly under grazing and farm land. The site for the work settlement is located about ten miles west of Waxahachie, formerly an important rail crossroads and center for cotton and cattle trade. The land was first cultivated from grasslands for growing cotton, then to corn, cattle, and other crops.

The first experience of the land is its extreme horizontality and the magnitude of the sky. Only later does one see that the land does roll, but at a scale almost too large to discern. The geography has a general slope to the southwest and many high points and depressions at this subtle level. More striking, and much less predominant are creek beds and gullies cut through the



low areas. These are found both dry and full with still water, during a July observation, and range in size from three to twenty feet.

Besides grasses and farm fields, trees are present in three different patterns. One observation of trees is in associations with the creek beds and gullies. These are dogwoods, cottonwoods and other common midwestern river bed trees. They are found singularly and in groves. A second observation is similar species of trees, though usually smaller, isolated in apparently random places on the prairie. A third configuration for trees is in lines planted by farmers for wind and shade protection.

Because of proximity to important parts of the collider mechanism, the site of the work settlement is in a depressed field where two creek beds from the north and northeast come into conjunction. At that point is a large grove of trees ranging in size from 60 to 120 feet tall. The



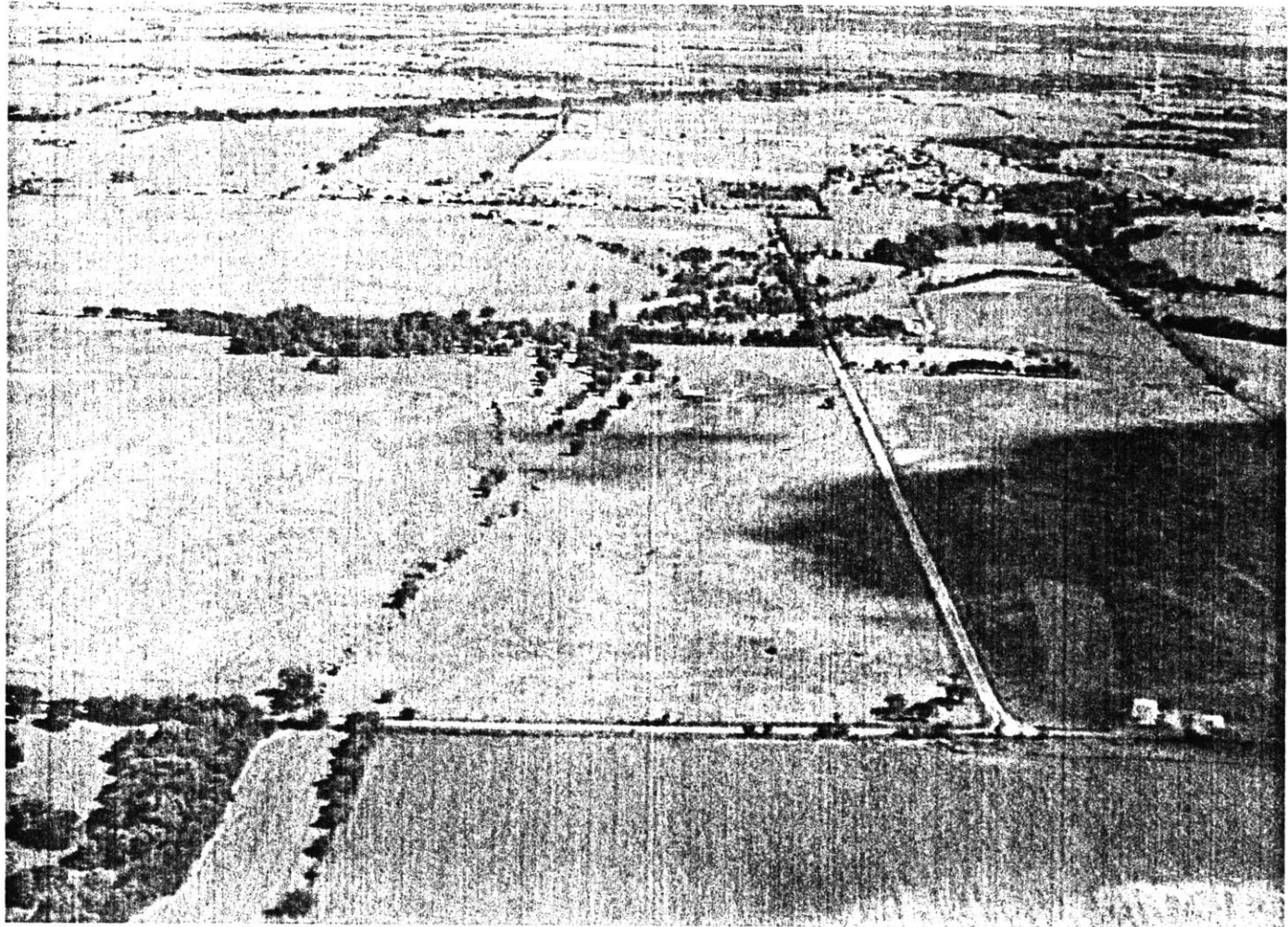
land rises to the southeast more noticeably. The berm of the Linac begins about 1000 feet north of the trees and is oriented in a predominantly east-west orientation. The berm of the low energy booster connects the Linac to the medium energy booster which curves away to the northeast and northwest.

Despite the gentle curves of the land and its impression of endless horizontality, the impression of the sky and clouds as immense, a smaller size is present in the other landscape elements. The small gullies, the grasses and crops growing up to six or seven feet, and space



under the trees provide a human scale and shelter from the immensity. The textures, colors, and groupings of elements give the impression of either an infinite field or a minute isolated thing. One tends to look at either one cloud or the whole sky, one tree or the horizon dotted with trees, one corn stalk or the wave of an entire field.

After this initial reaction, one realizes that it is neither the infinite field or the isolated object that make up the impression of this landscape. Rather, it is the juxtaposition of extremes. The single tree appears isolated because of the size of its context. With the volume of the tree up, the ground continues underneath, only interrupted by the trunk. The horizon, land and sky, can be seen under the tree. Textures and colors are observed within the field of grasses. The gullies are merely a break in the continuity of the plain. The understanding of the elements in terms of their relationship to the other elements provide both the overall and local perception of the landscape.



Ariel view of the site, looking south
(Photo courtesy of SSC Laboratory)

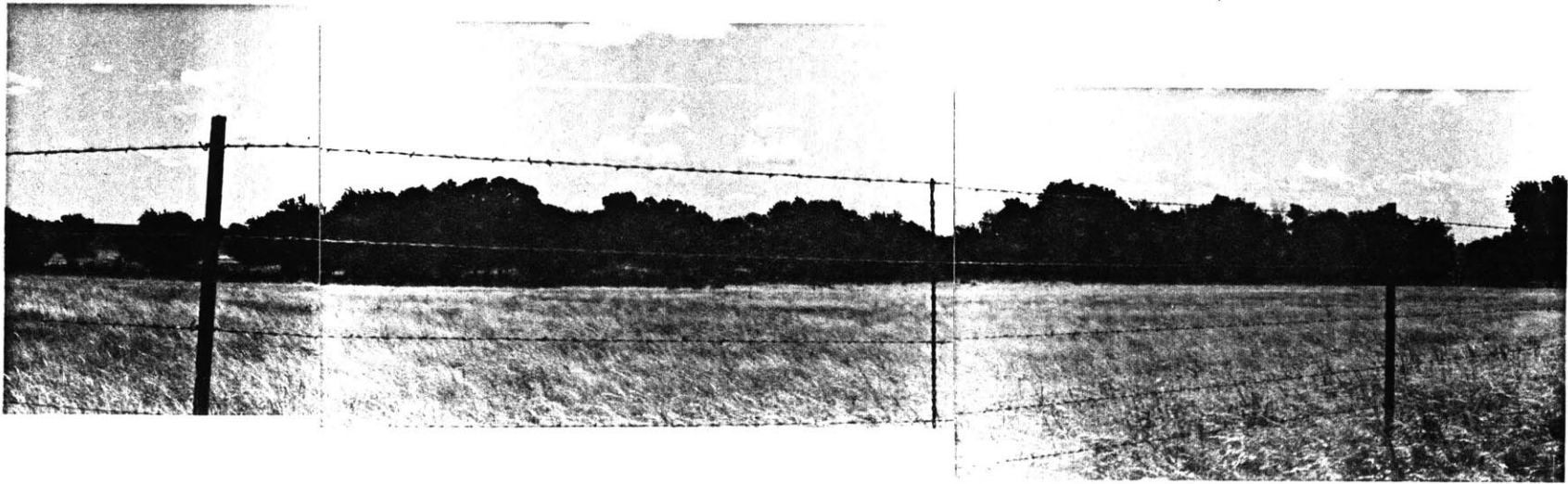


The site looking south.



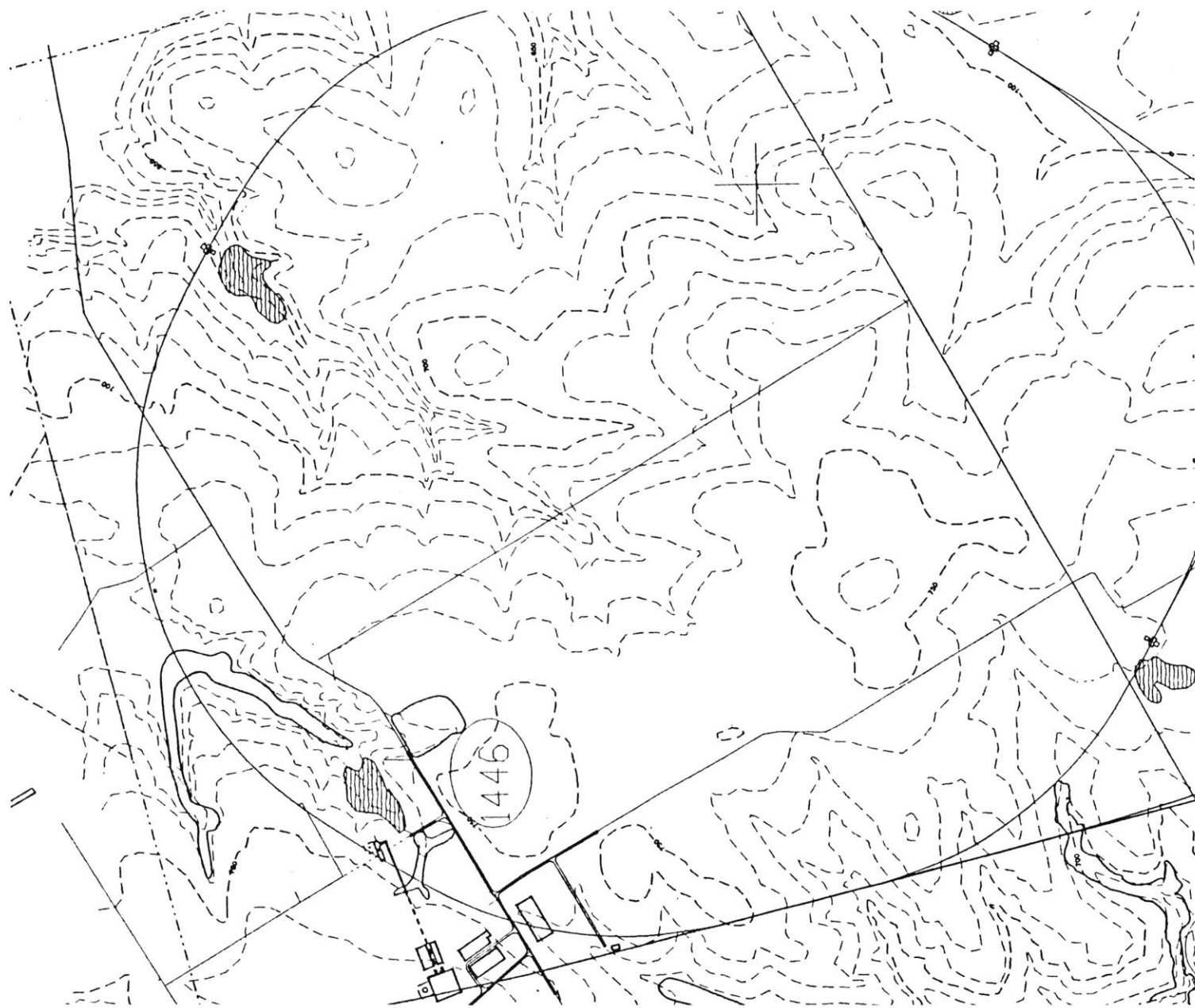
The site looking west.

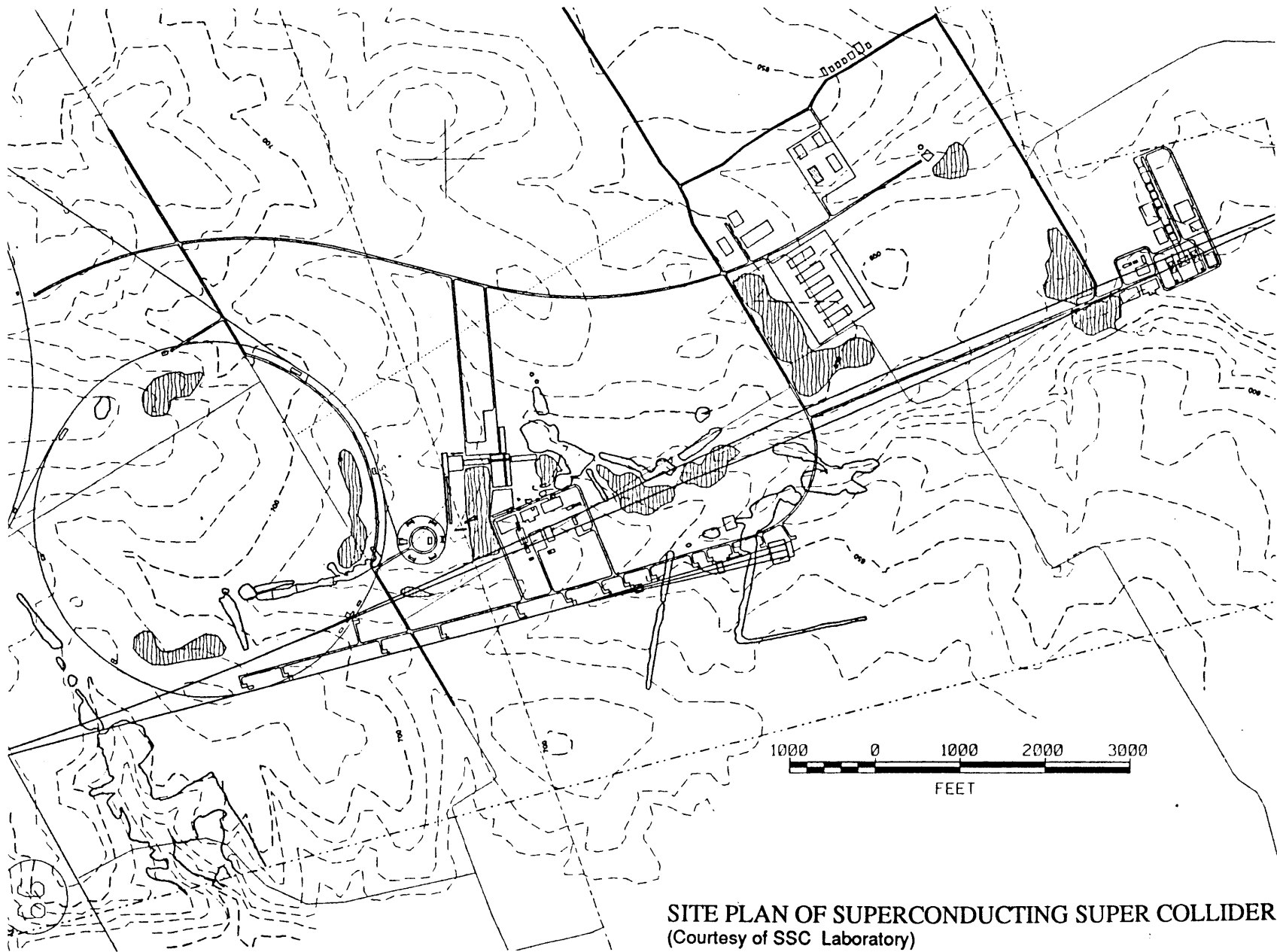


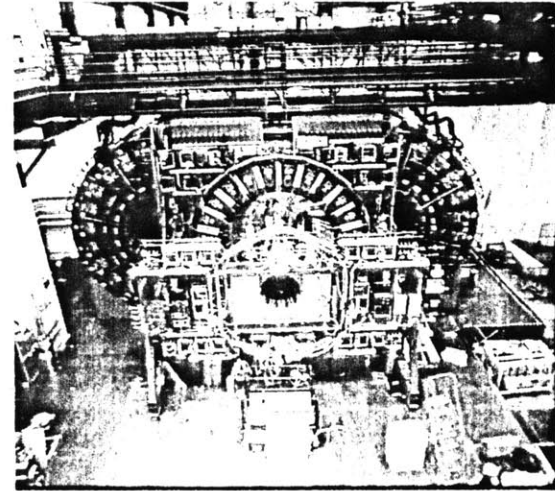








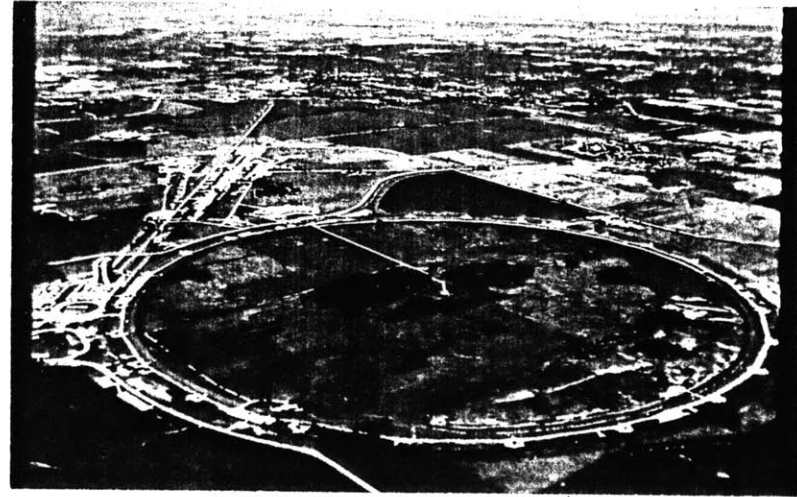
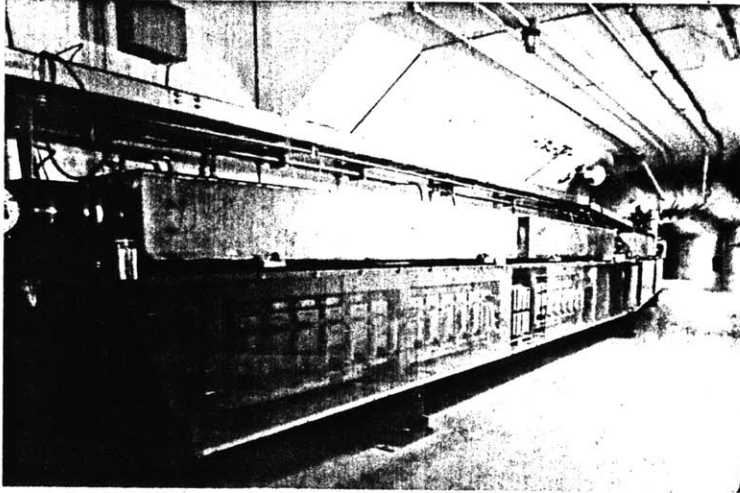




THE MECHANISM

The system of particle accelerators that make up the Superconducting Super Collider are both types that have been built in other locations and the largest track which is introducing an unprecedented size and new technologies. It is a tool to the scientists, most of which will rarely have any physical contact with it. Experiments will be run from a control room that needs no physical contact with the mechanism. Construction of parts and equipment are to be conducted at various laboratories, plants, and heavyworks facilities in the vicinity. Crews will also be present at the Interaction Regions and other vital points within the mechanism.

The majority of the accelerator tracks run inside of twelve foot concrete tubes, large enough for the tubes carrying the particles and a service car. At various locations are calibration



halls, or Interaction Regions, in which the collisions occur. These large underground halls can be up to 60-80 feet high, a similar width, and lengths of up to 120 feet. These halls contain large filter-like detectors which record the information from the collisions.

Above ground, the presence of the collider was mentioned previously. Besides the sections of accelerator that are bermed over, the only marks of the collider will be the access holes and roads at certain points along the path, and buildings above the Interaction regions and test beam area. Despite its size, the collider system will have a minimum impact on the surface.

Photographs of a calibration hall, an accelerator tunnel, and an ariel view of the accelerator at Fermi National Accelerator Laboratory. (Courtesy of Fermi National Accelerator Laboratory)

AN INSTITUTION

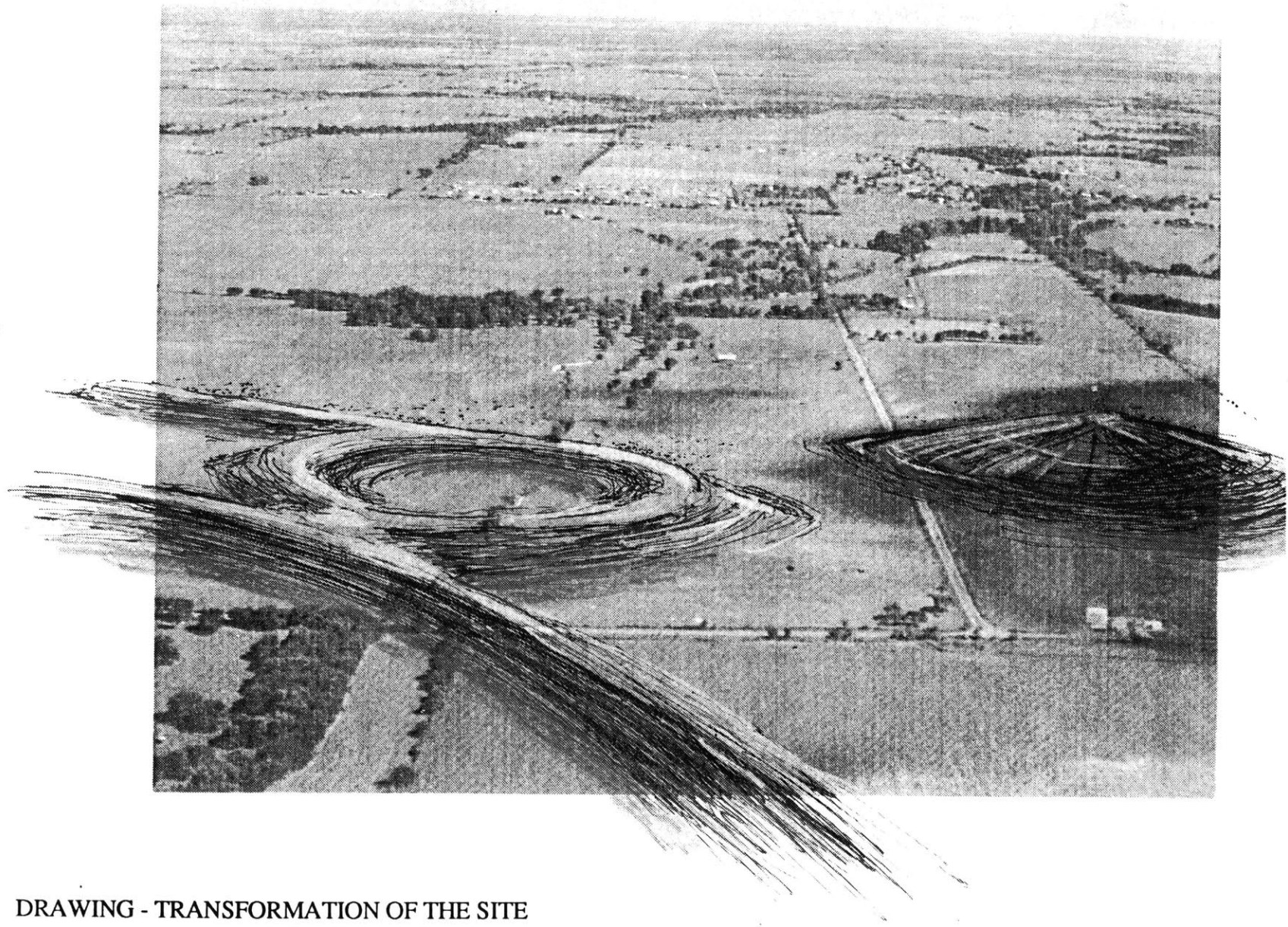
The Superconducting Super Collider working facilities are thought of as an institution in two main ways. The existence and focus of the settlement is committed to the specific work to be undertaken. The concept and image of those involved with the project is that of a 'campus.' The implications of this address the needs of the working environment to assist the scientist to interact and communicate directly, as well as well-situated individual working areas. Although much of the work is done through computers and electronic information and communication, those interviewed refer to particle physics as a 'team sport.' The daily needs of the institution call for a wider range of spaces than a conventional office building. The communication aspects of the problem can be addressed with the form and the spatial definition of the work.



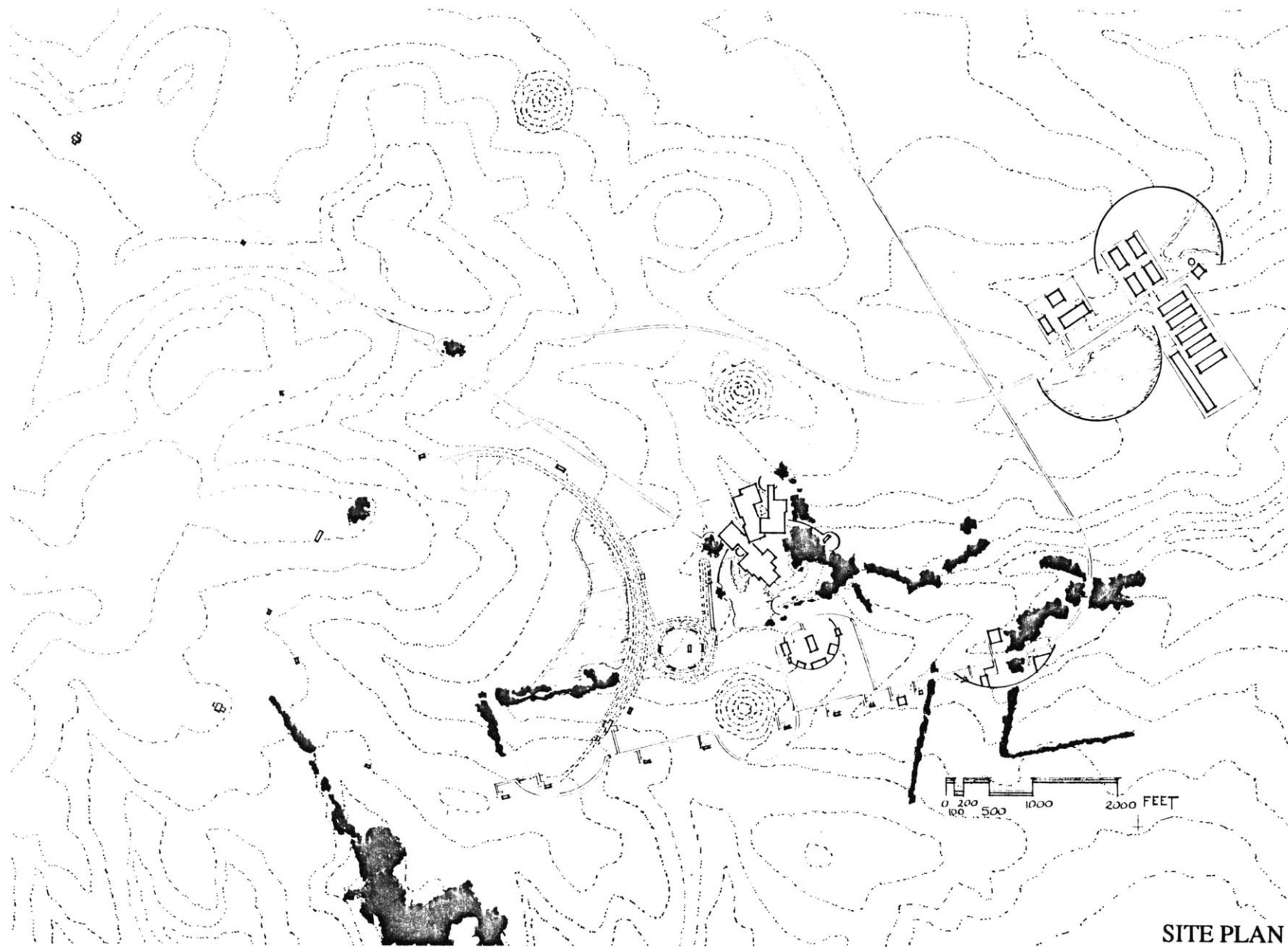
The settlement also functions as an institution at a more public level. Both for communication to the field at large and public relations outside the field, the SSC has a high profile. As a controversial and expensive 'big science' project, it must continually impress its progress on the general public and its sponsors. It is a place that will handle periodic, large conferences, have educational programs for teachers and youths, and possibly offer its conference and auditorium spaces for community use. It has a need and a desire to function as more than a place of work. It is also expected to exhibit itself to visitors much in the way of a place like the Kennedy Space Center or the National Center for Atmospheric Research.

A view of the facilities at Fermi National Accelerator Laboratory. (Courtesy of Fermi National Accelerator)

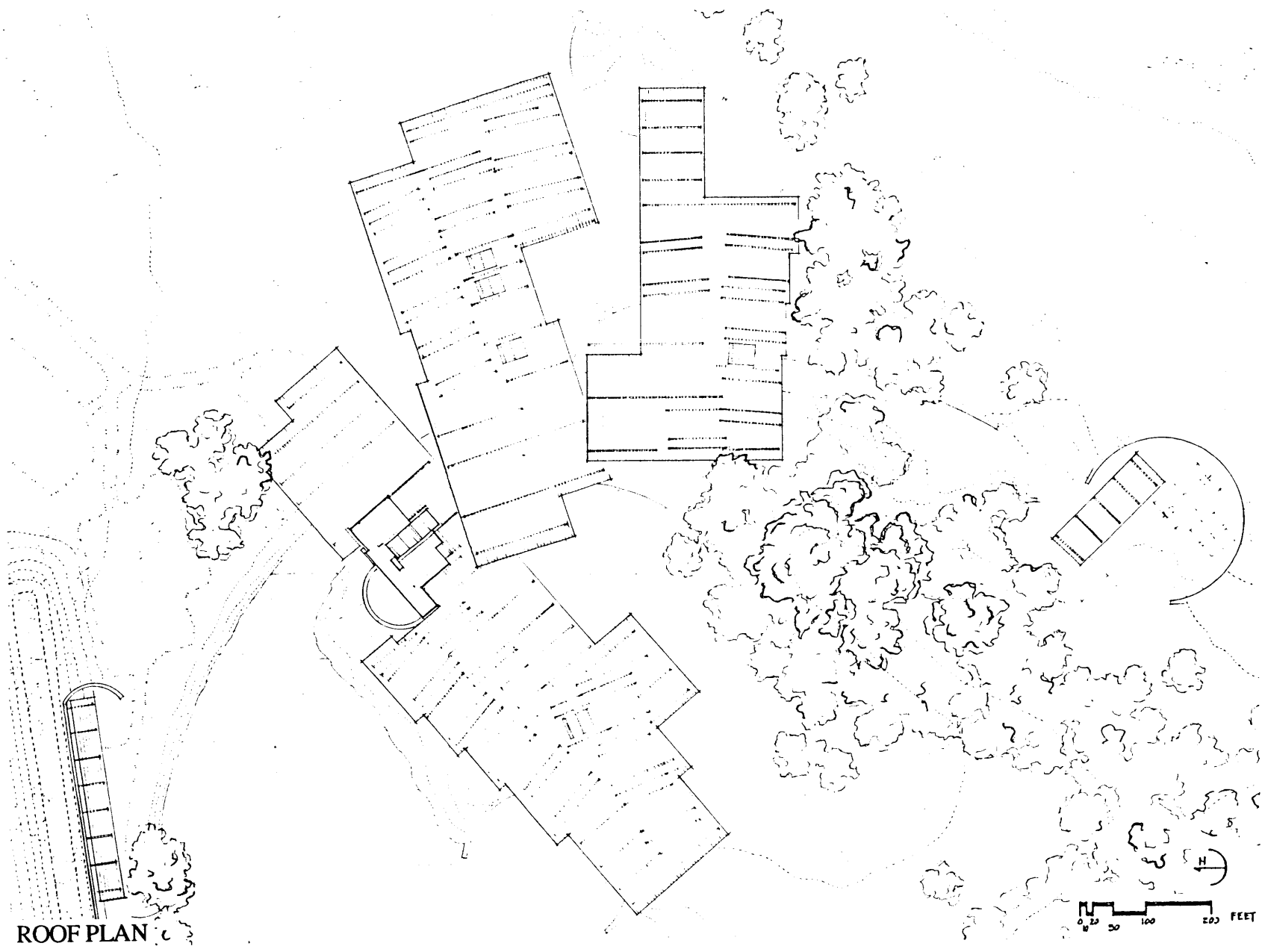
W O R K - D R A W I N G S



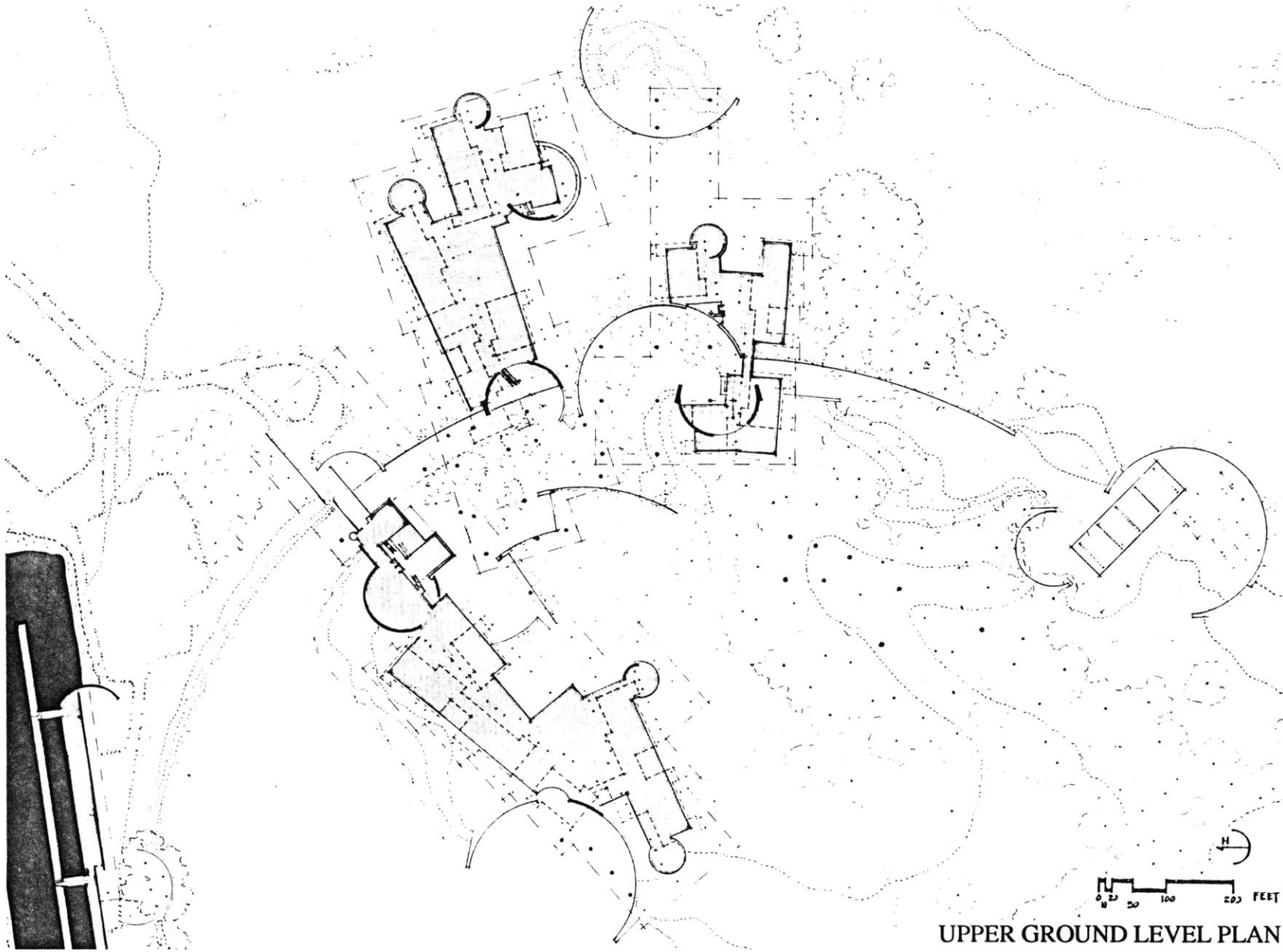
DRAWING - TRANSFORMATION OF THE SITE



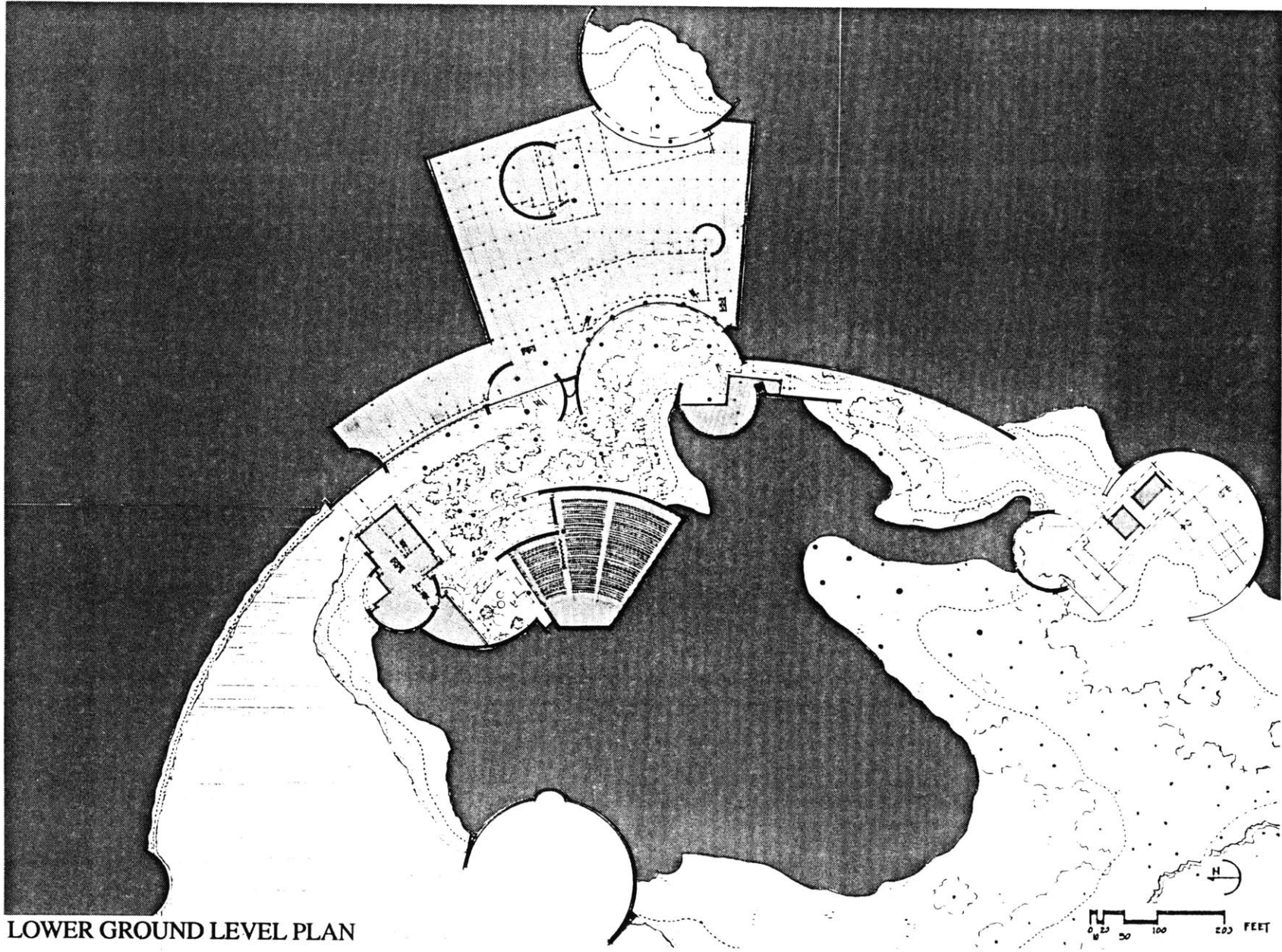
SITE PLAN



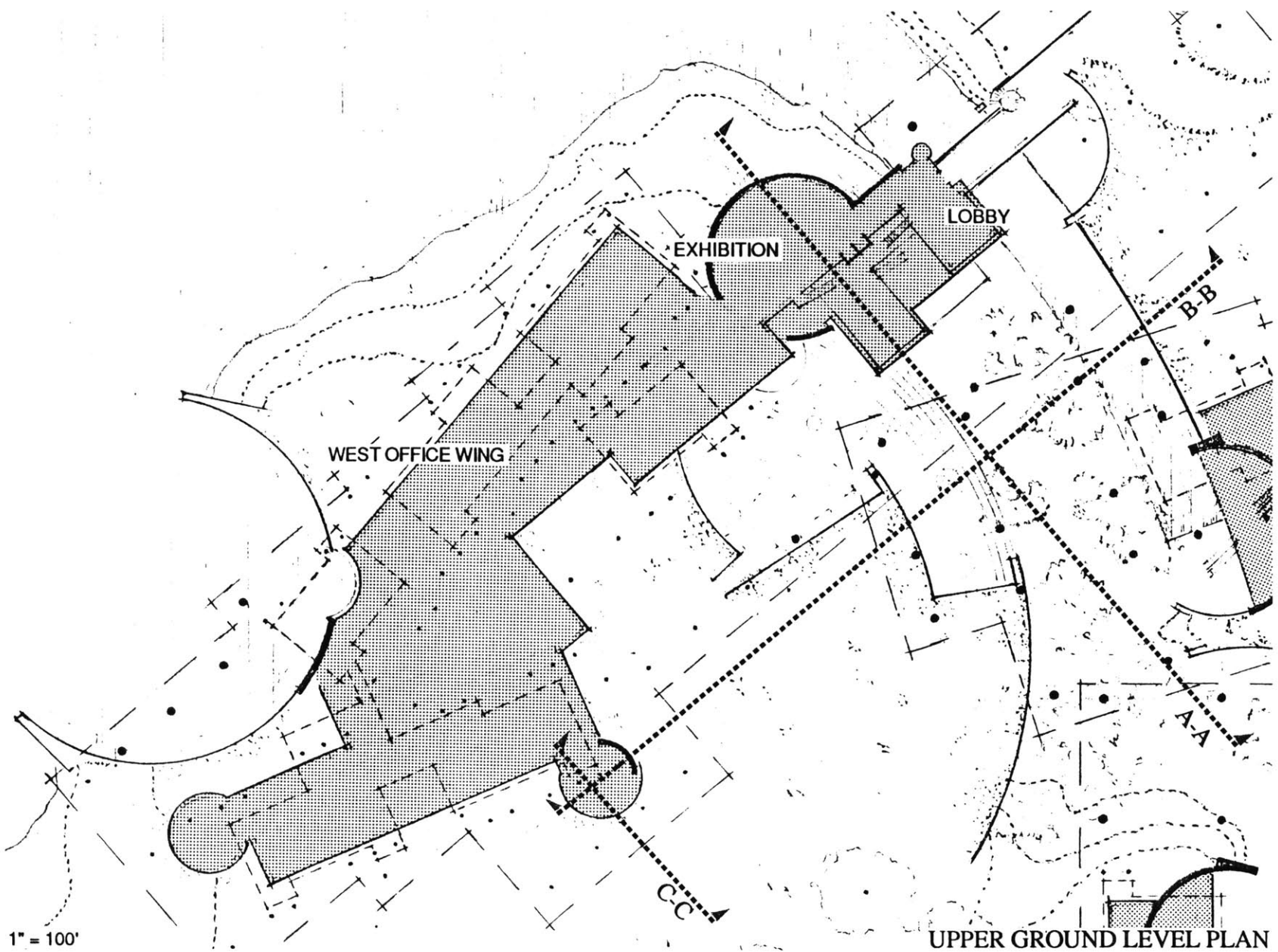
ROOF PLAN



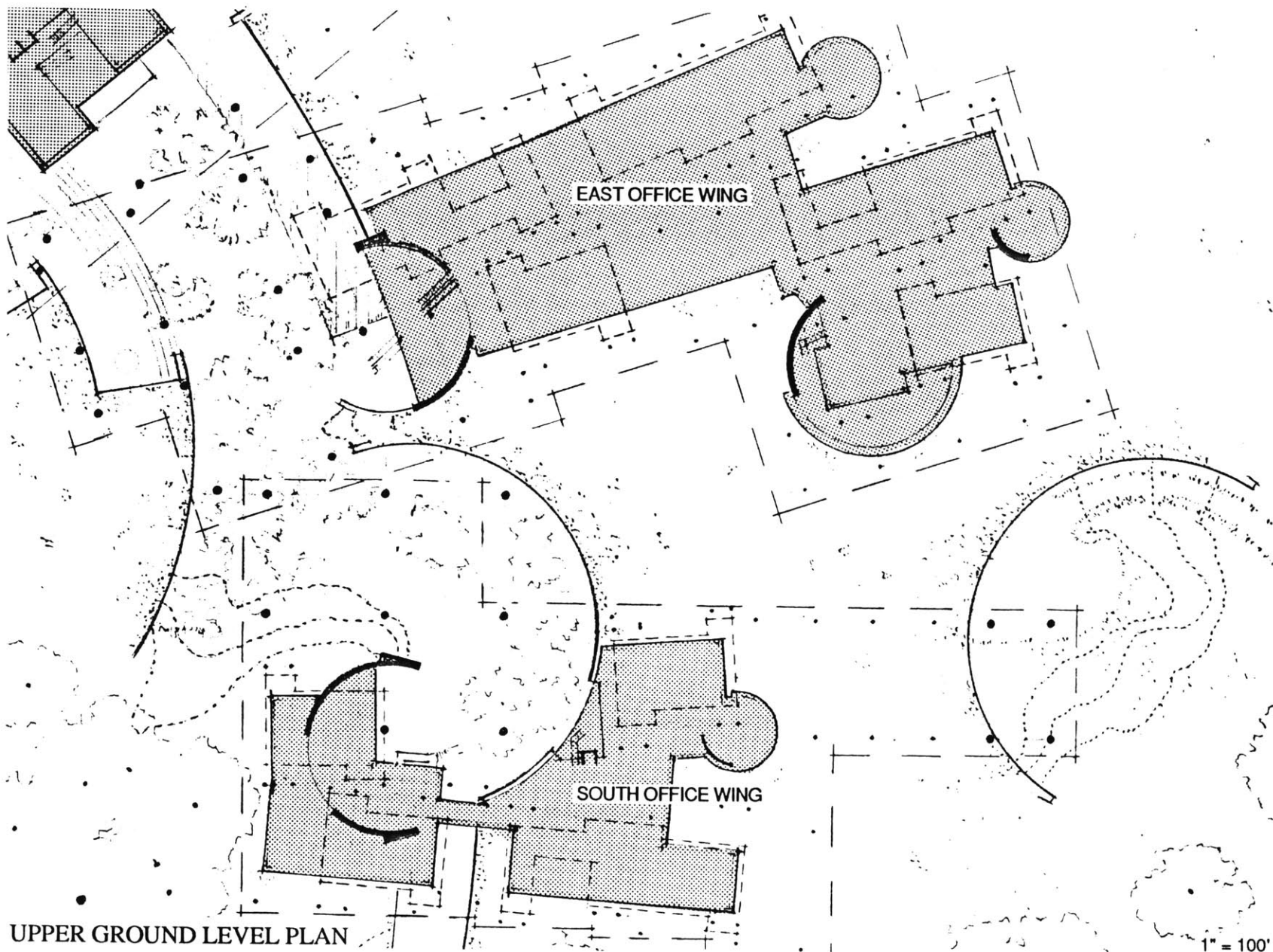
UPPER GROUND LEVEL PLAN



LOWER GROUND LEVEL PLAN

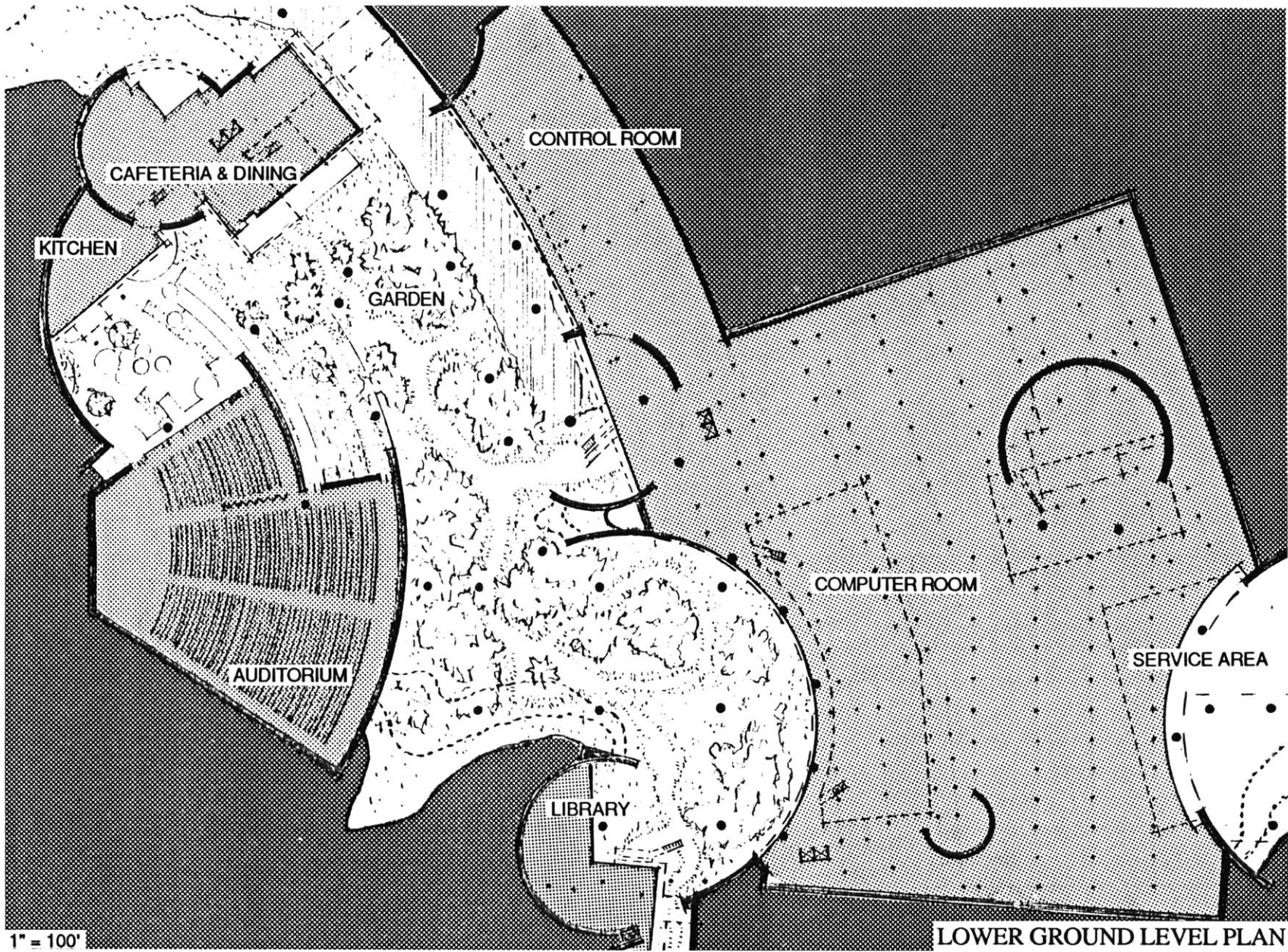


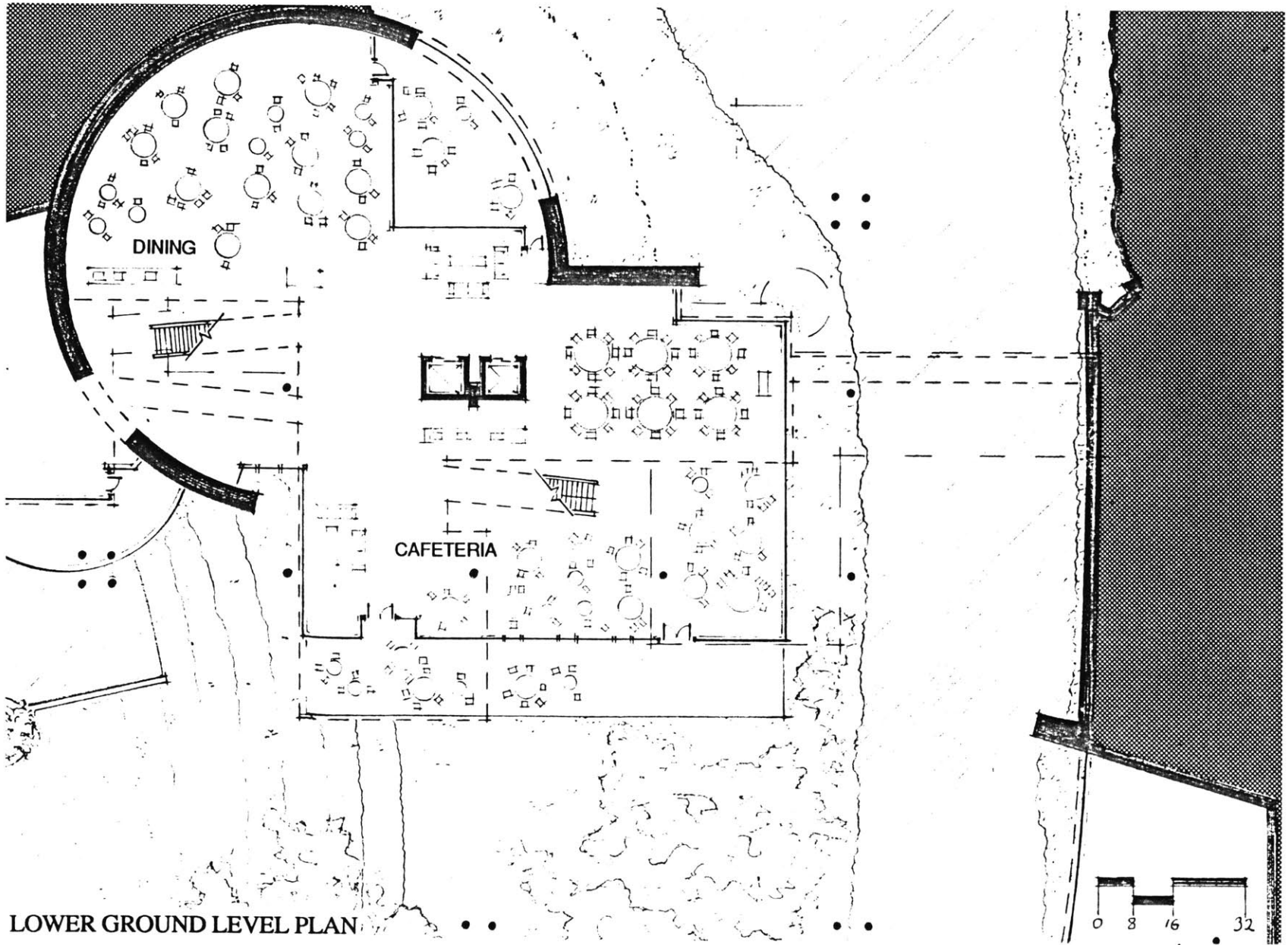
UPPER GROUND LEVEL PLAN



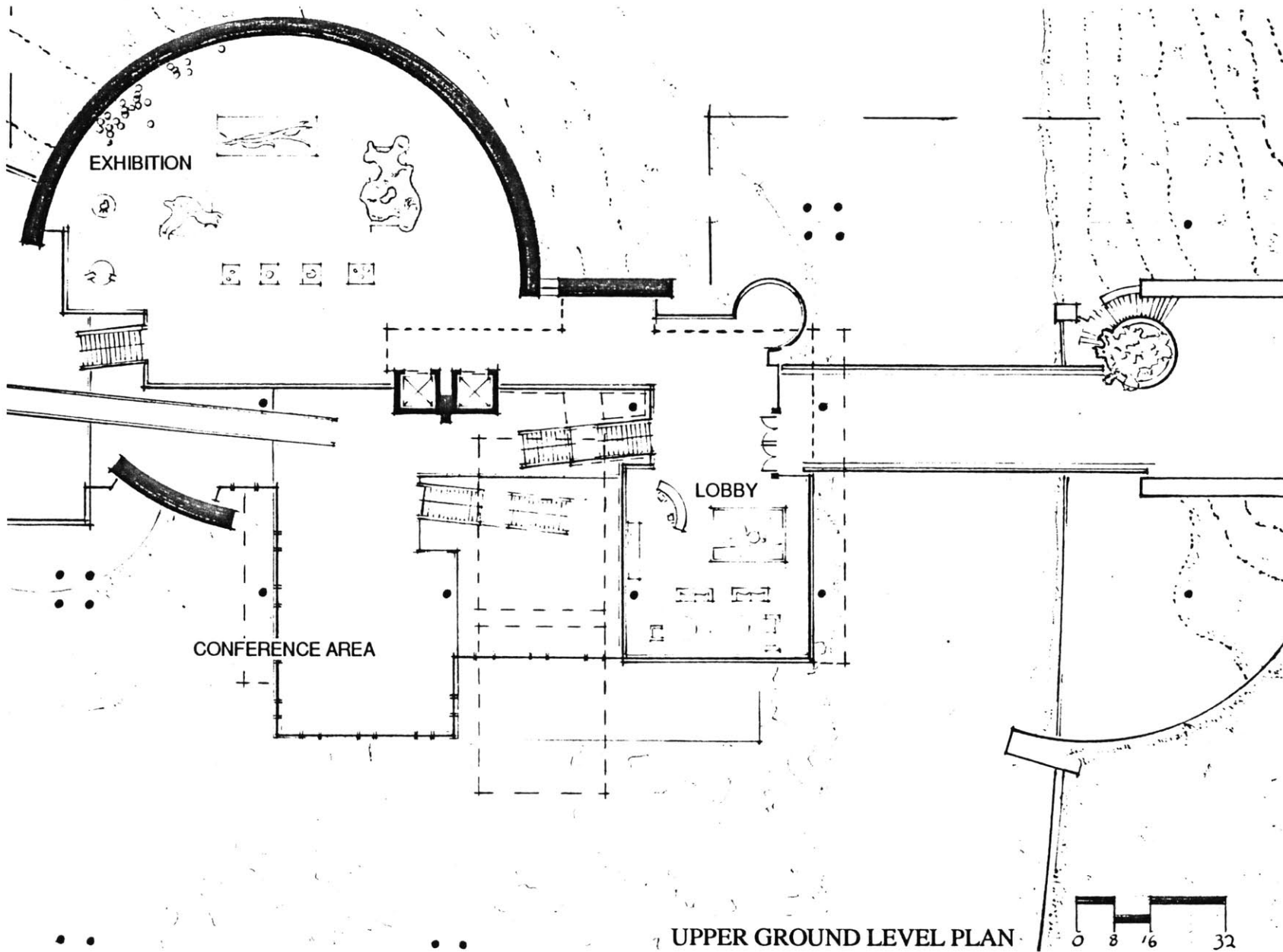
UPPER GROUND LEVEL PLAN

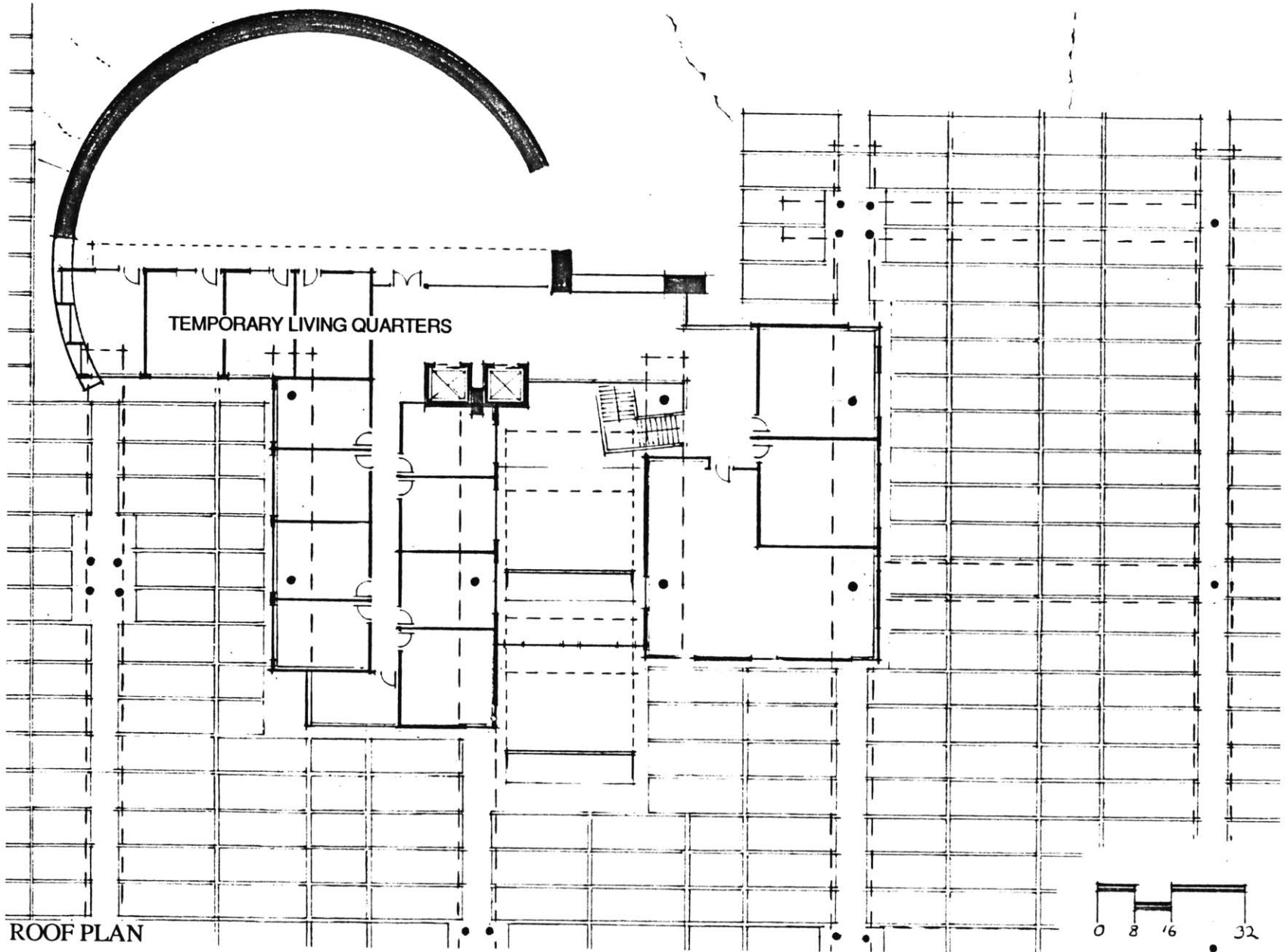
1" = 100'

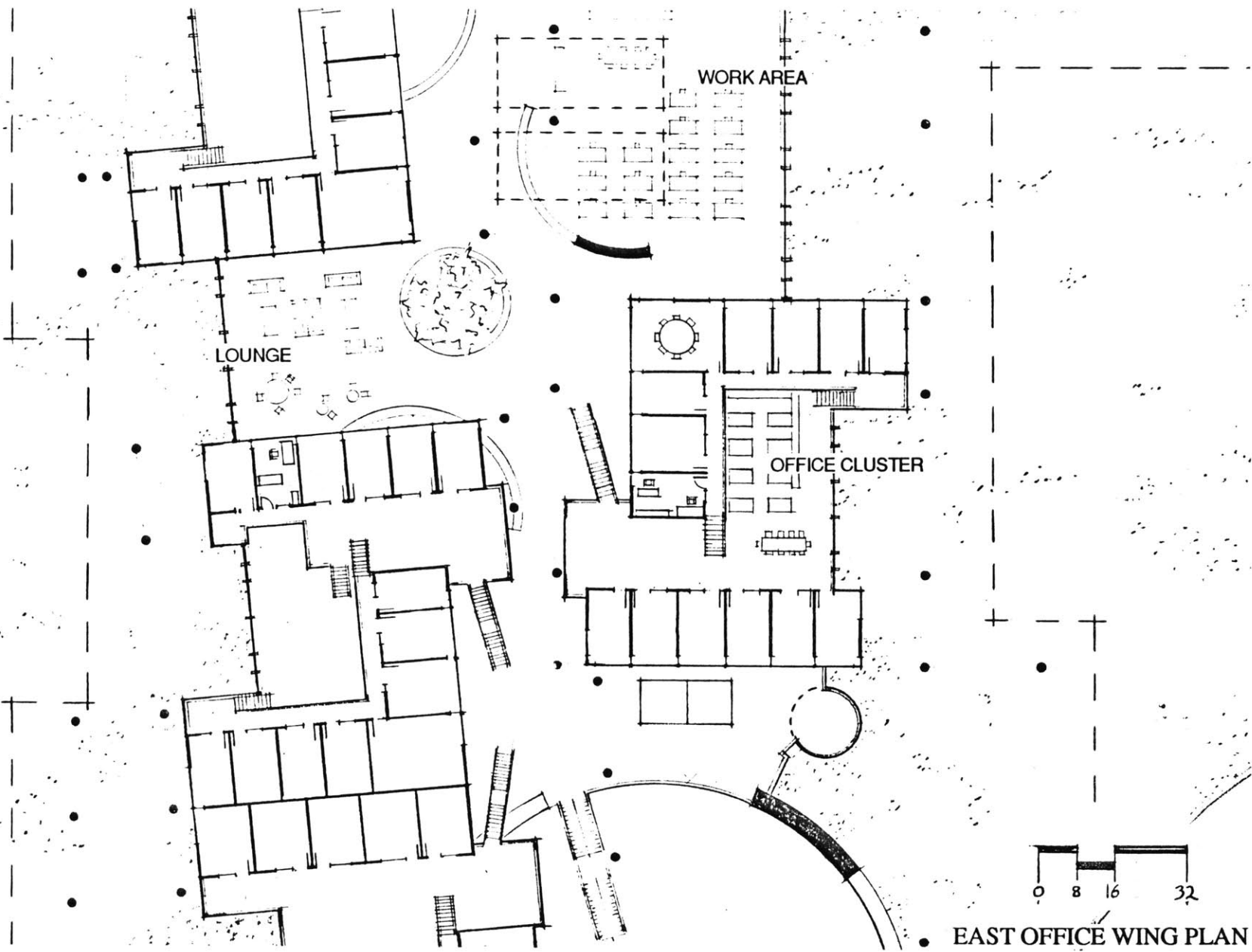




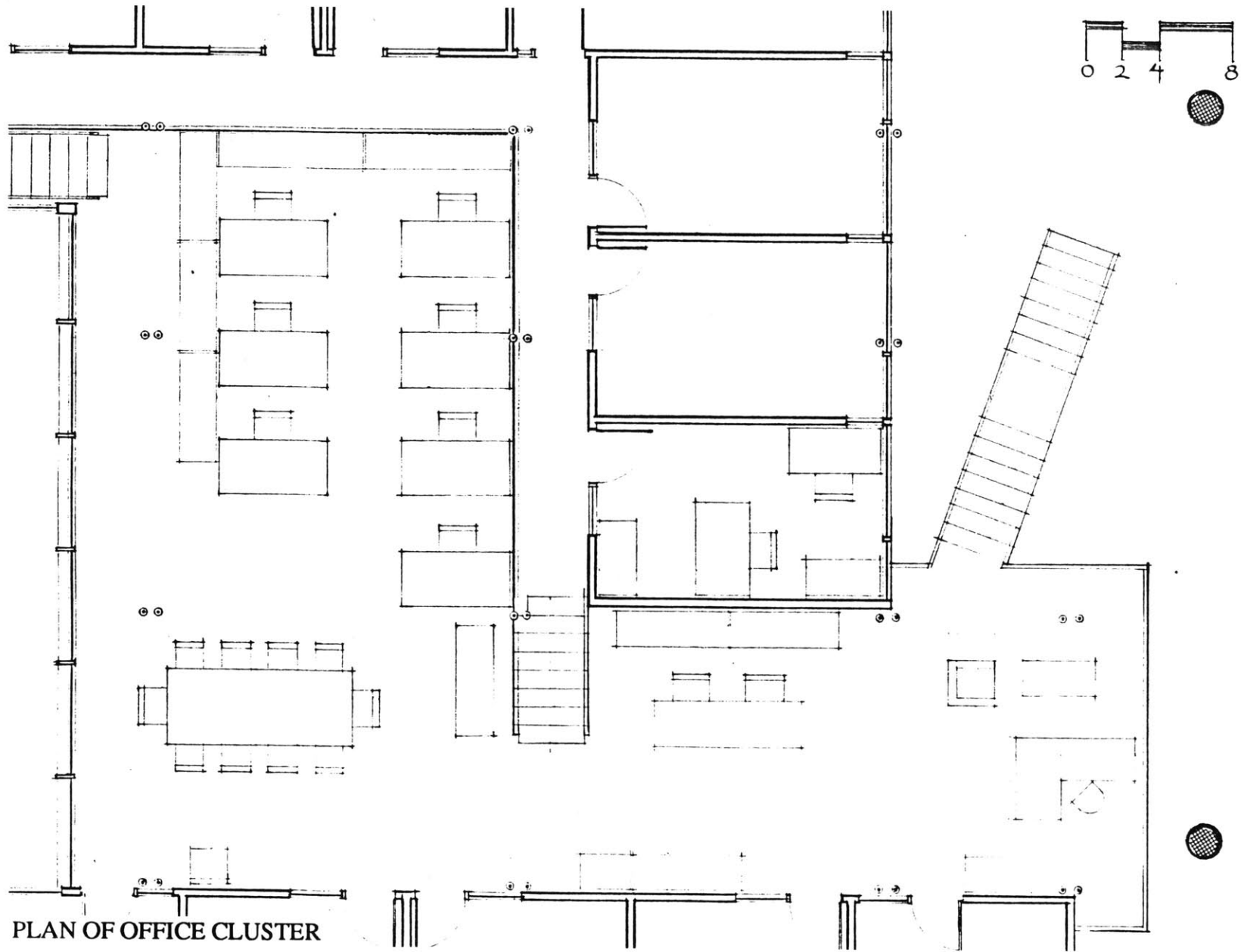
LOWER GROUND LEVEL PLAN



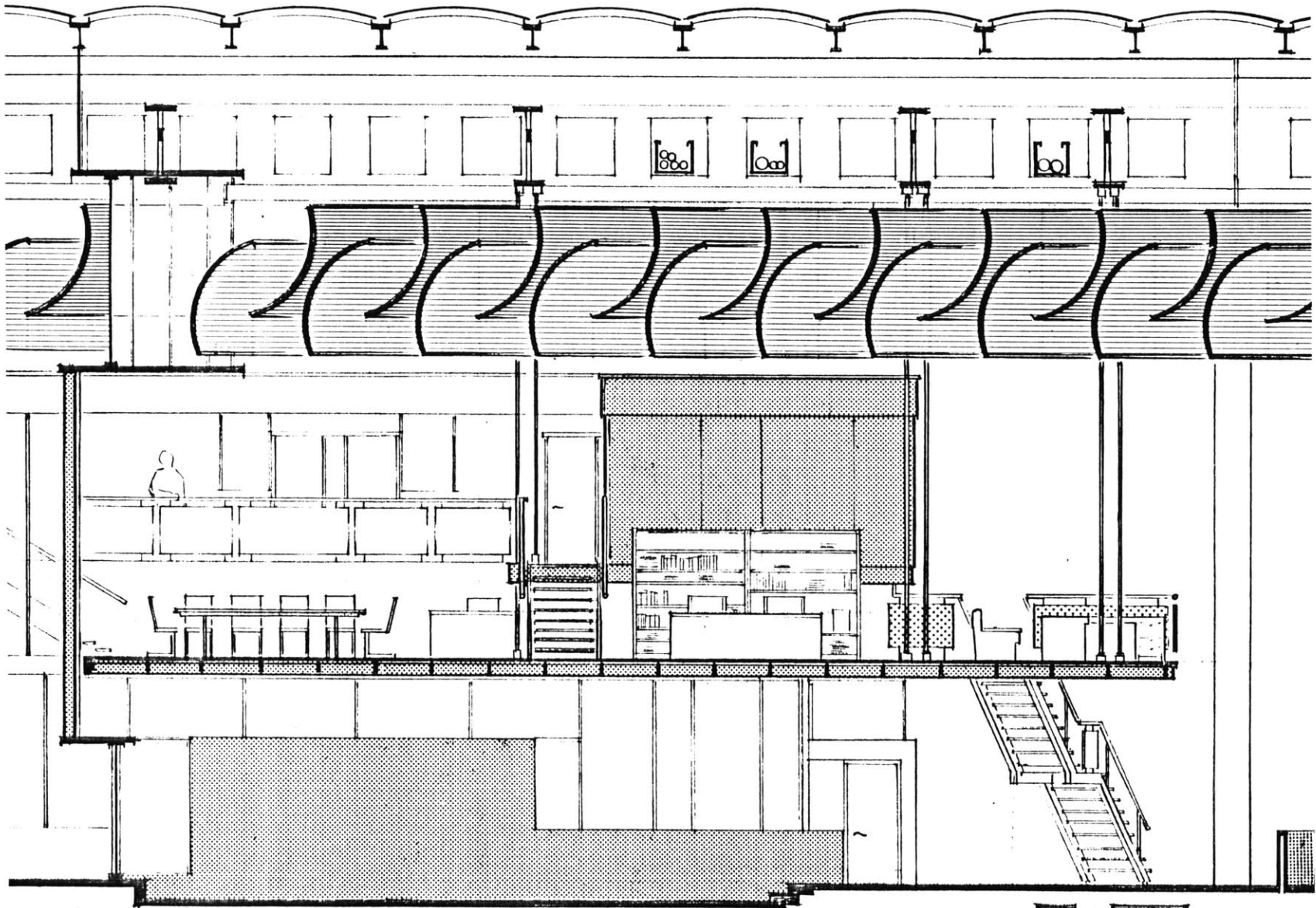




EAST OFFICE WING PLAN

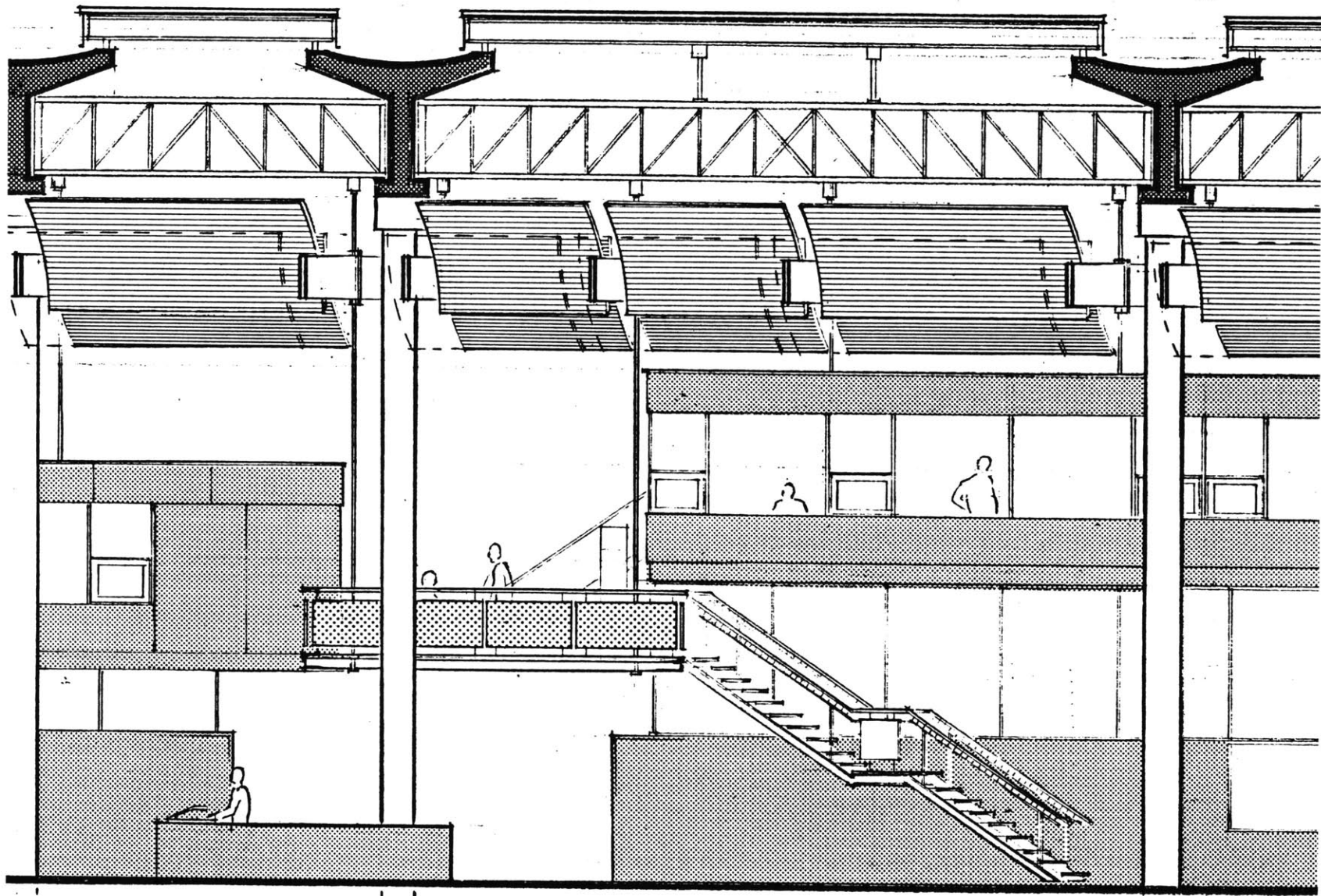


PLAN OF OFFICE CLUSTER

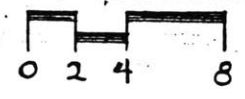


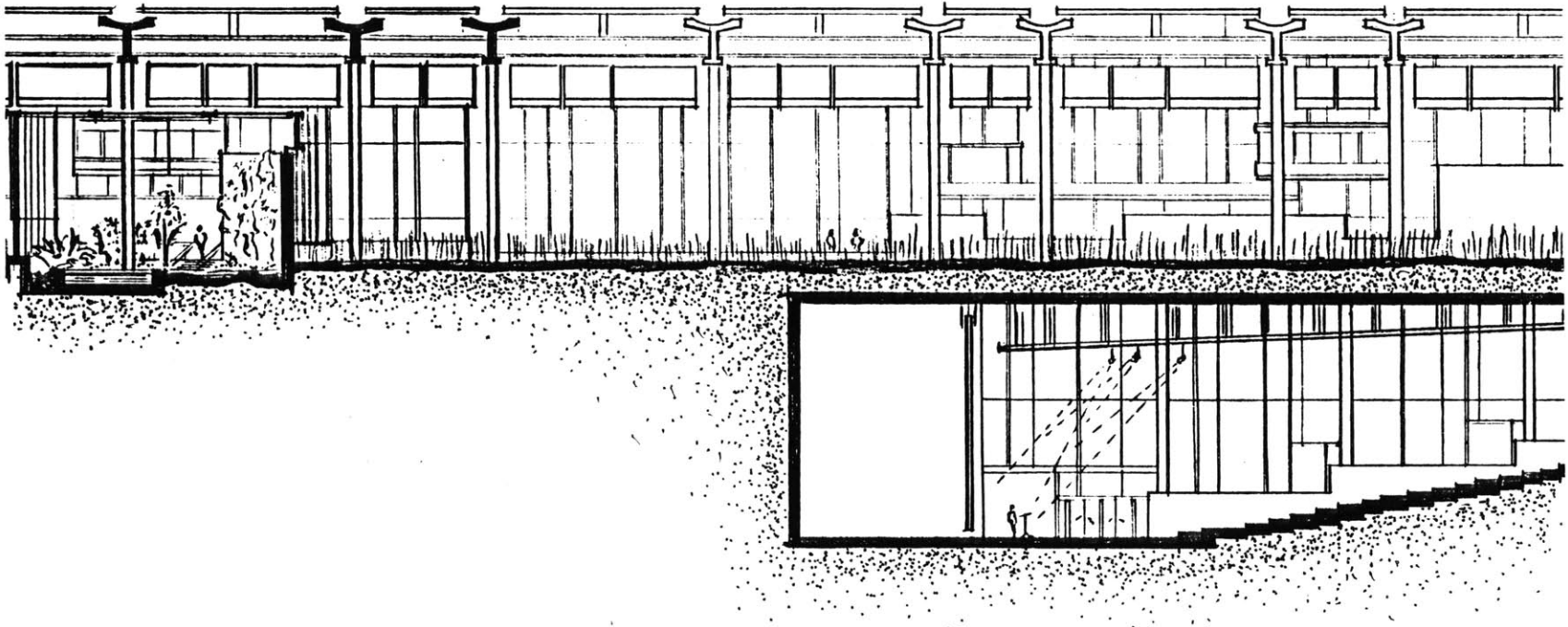
SECTION OF OFFICE CLUSTER



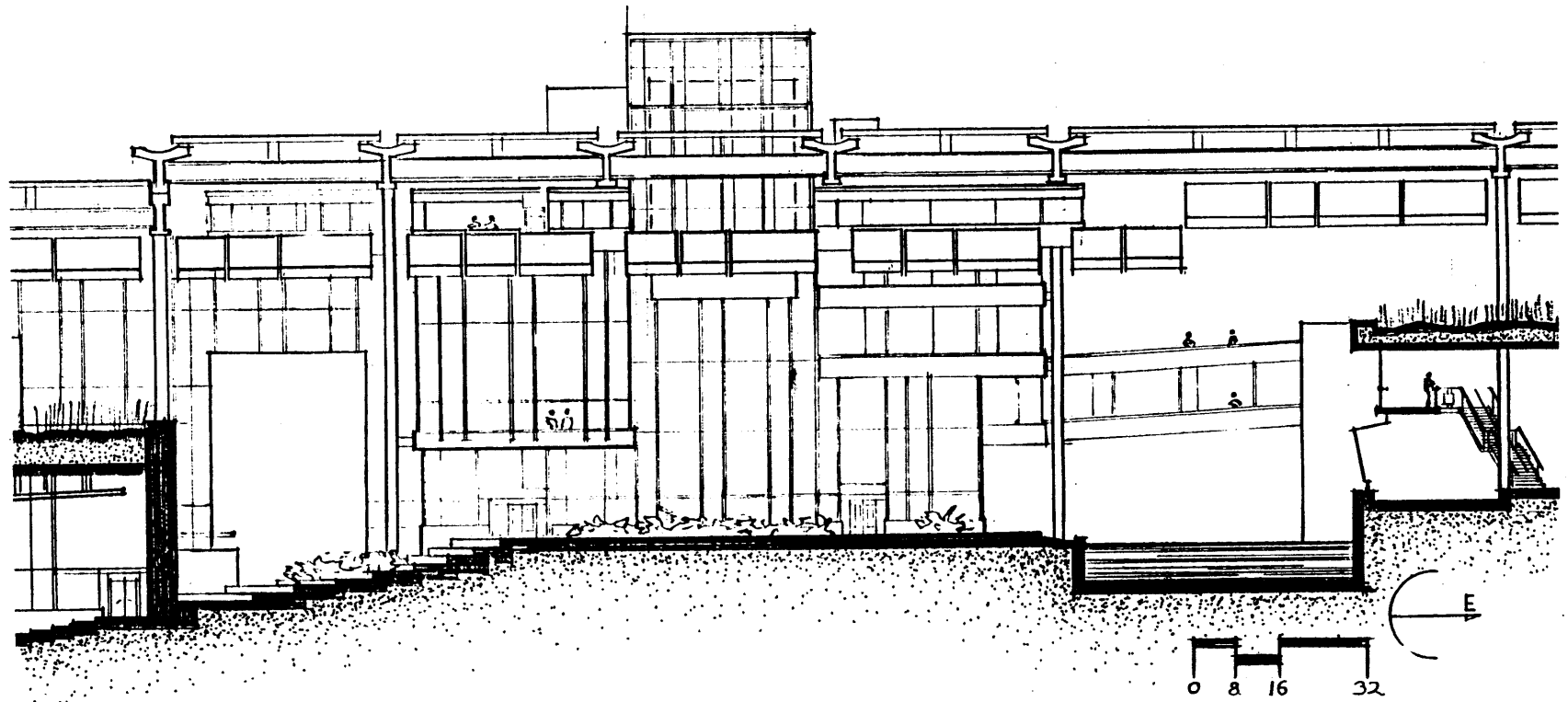


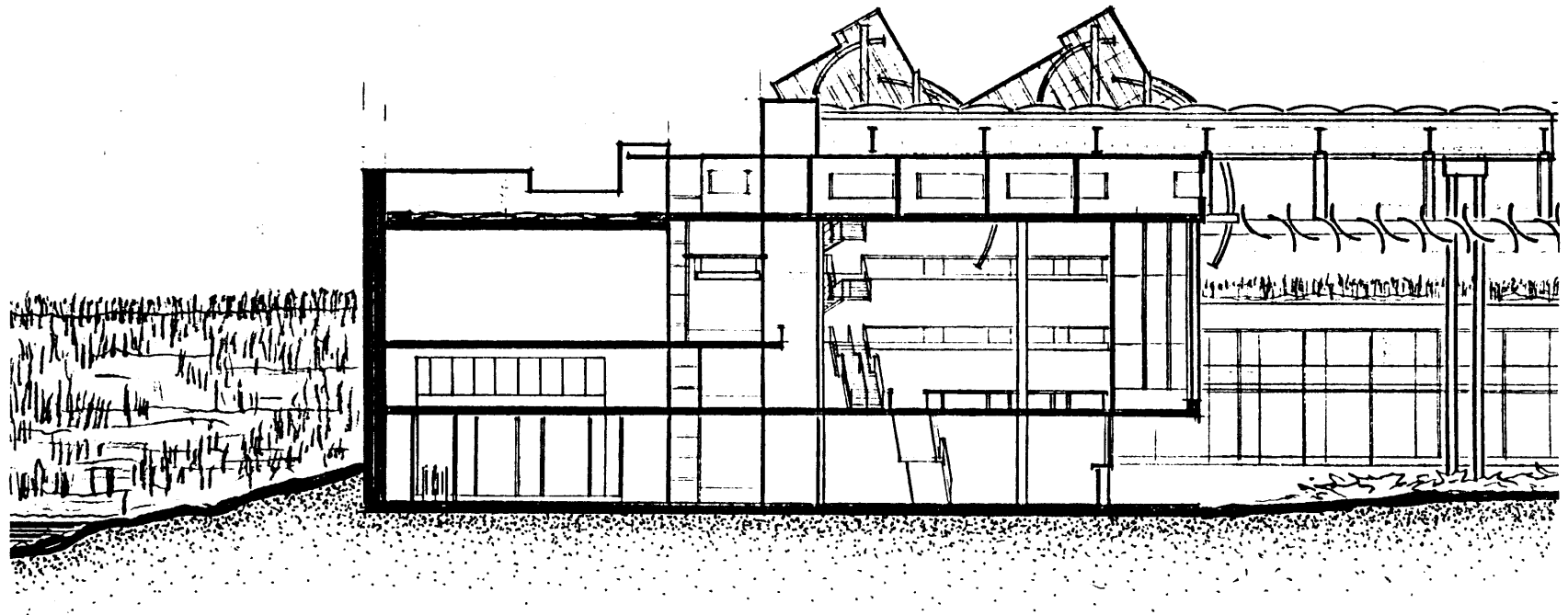
ELEVATION OF OFFICE CLUSTER

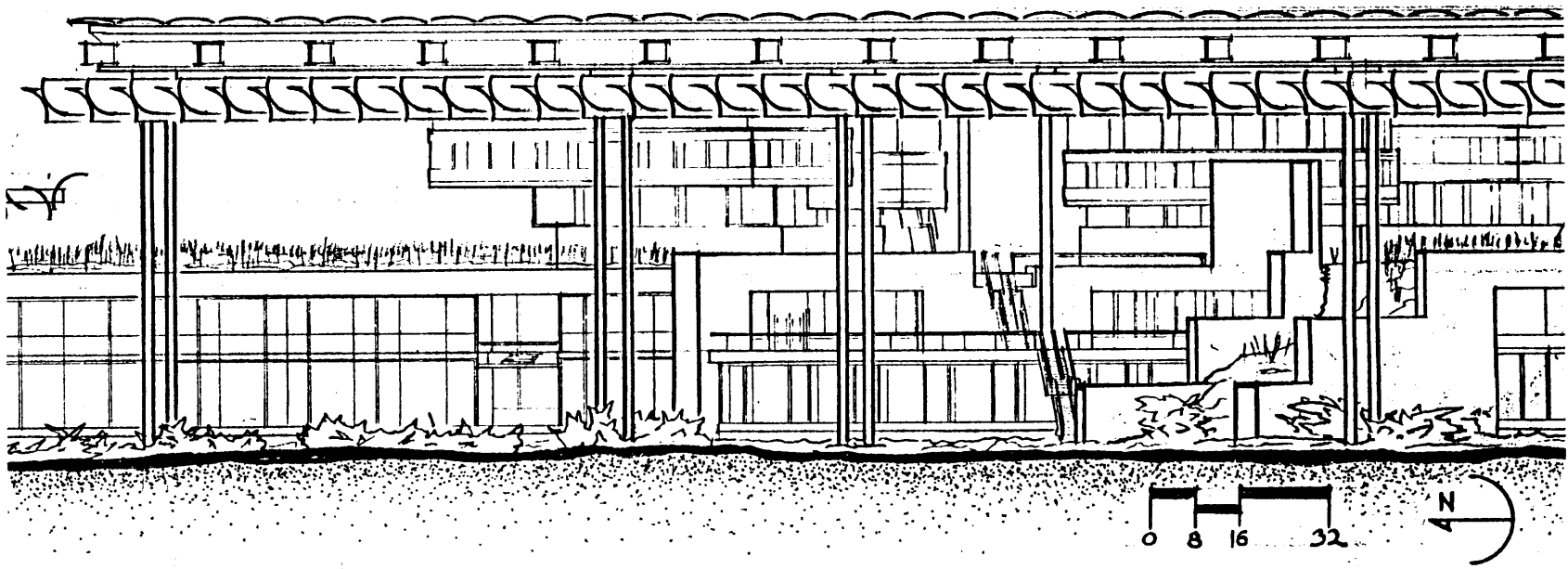


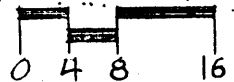
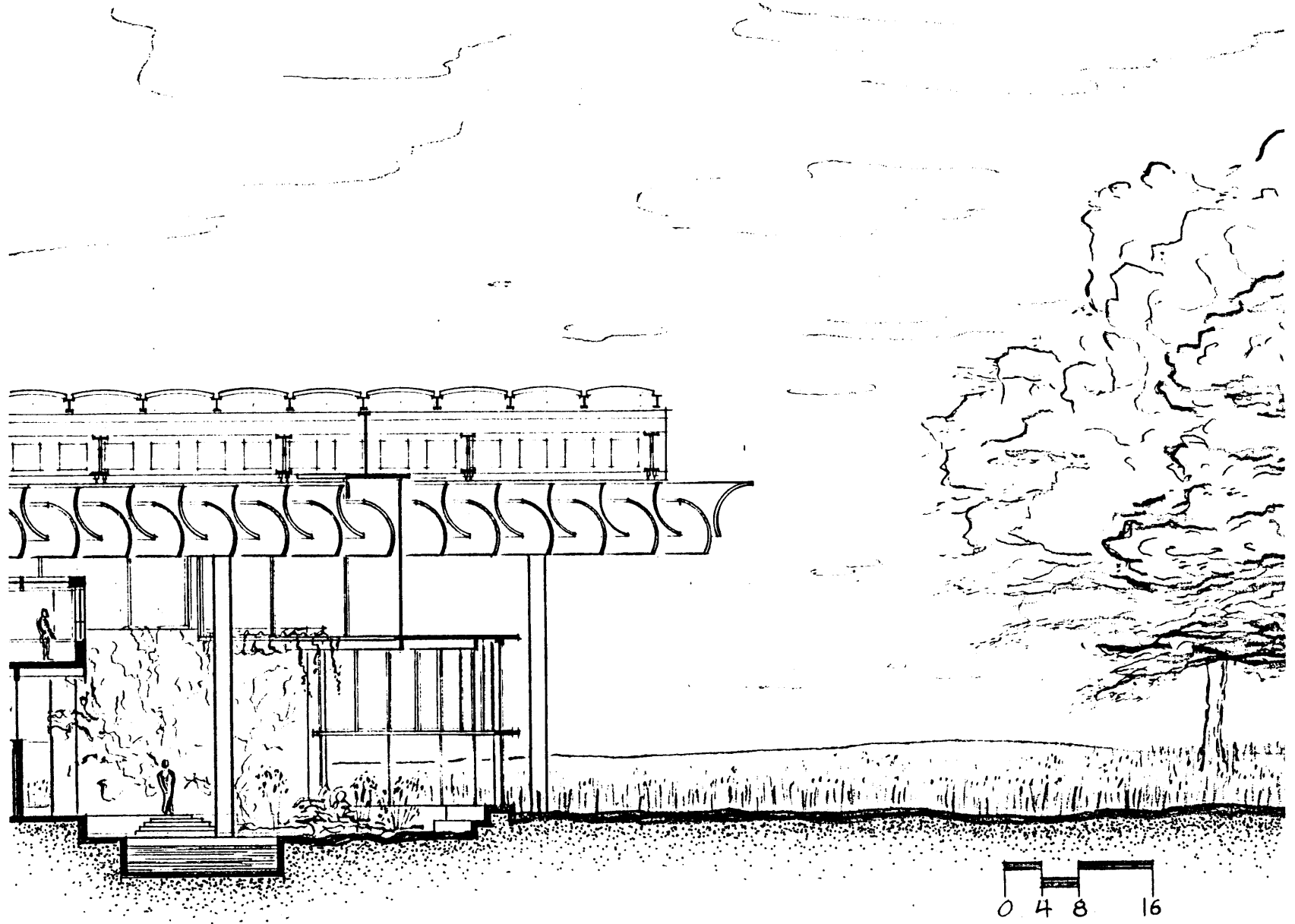


SITE SECTION A-A

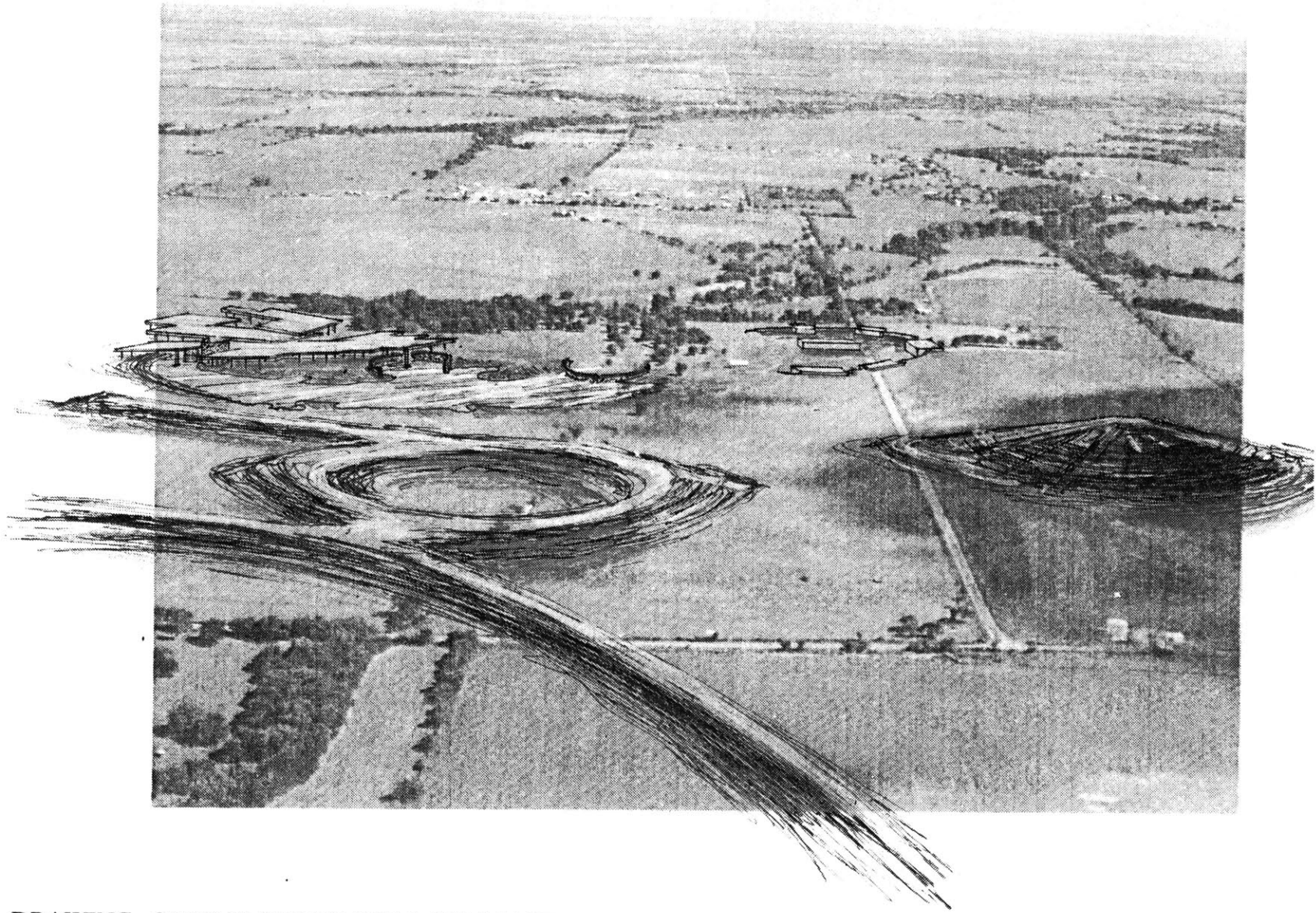






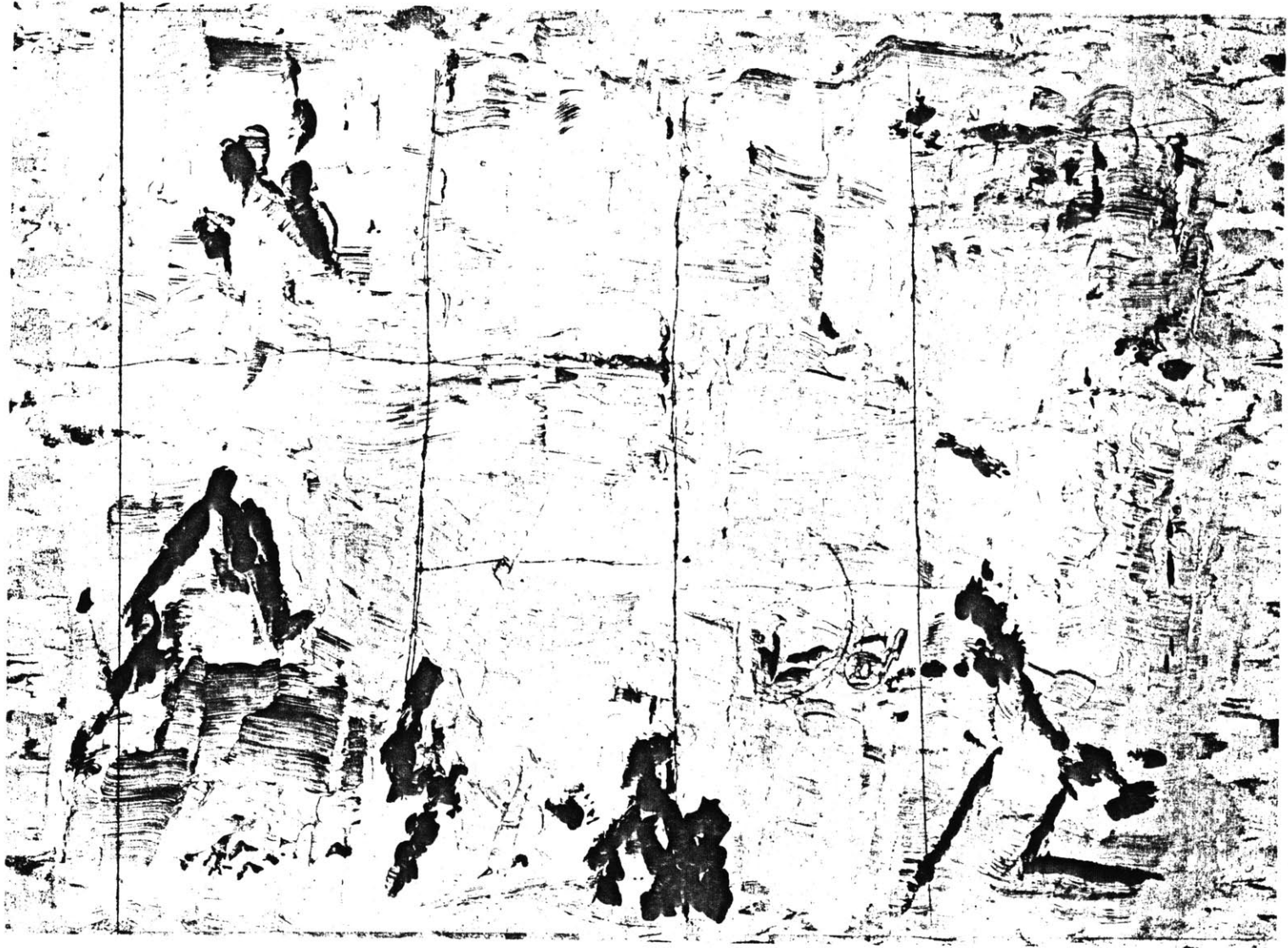


SECTION C-C

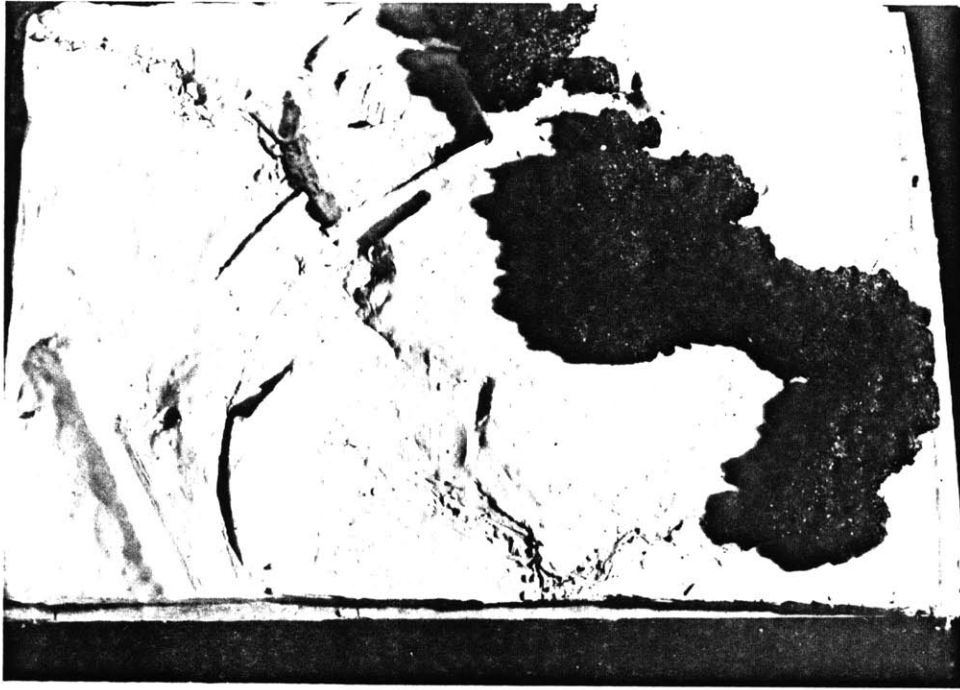


DRAWING - SETTLEMENT IN THE LANDSCAPE

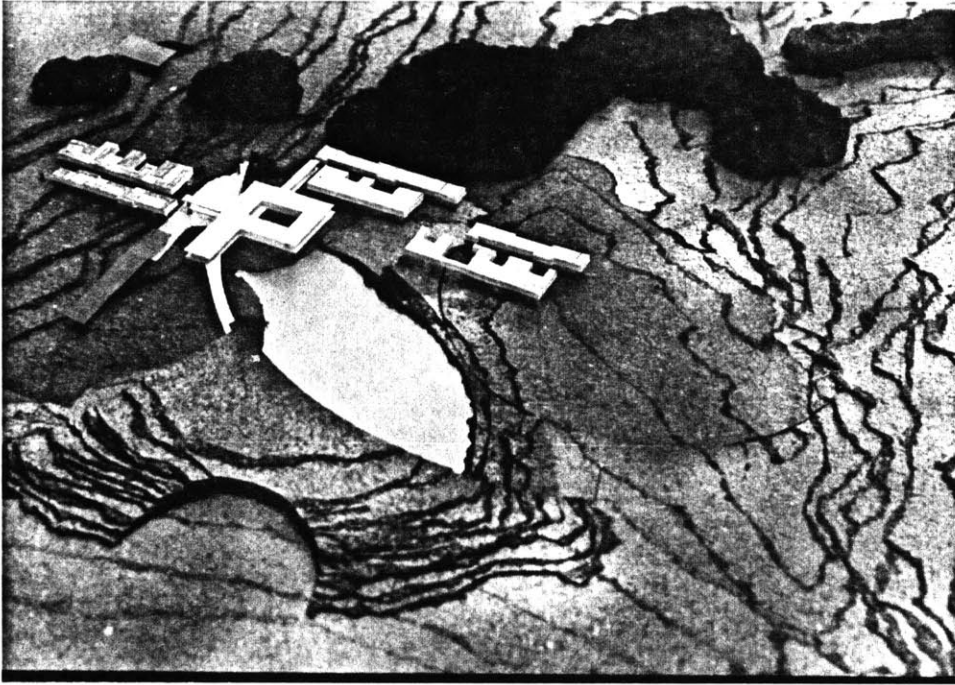
W O R K - D E S I G N S T U D I E S



LANDSCAPE PAINTING

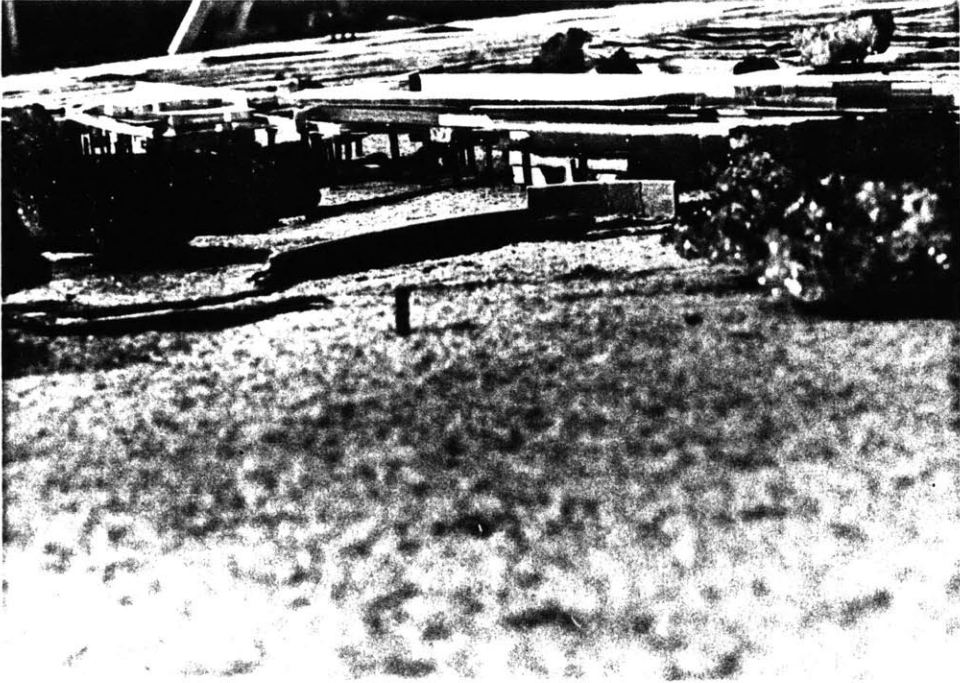


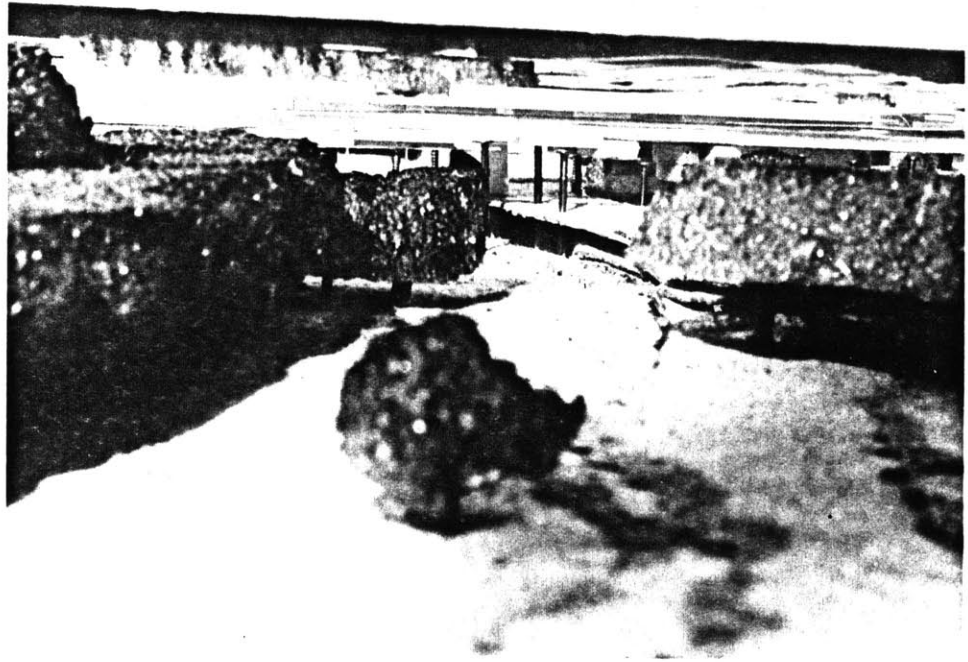


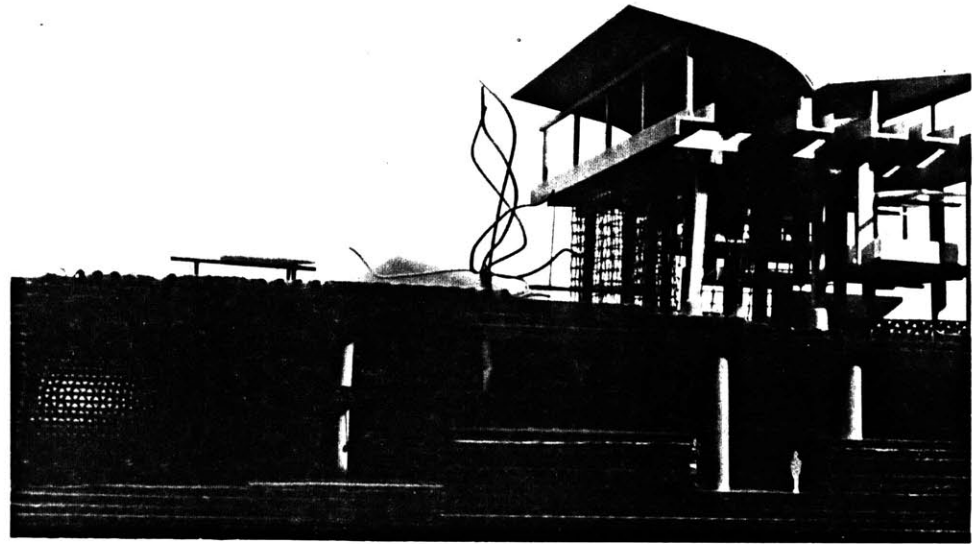
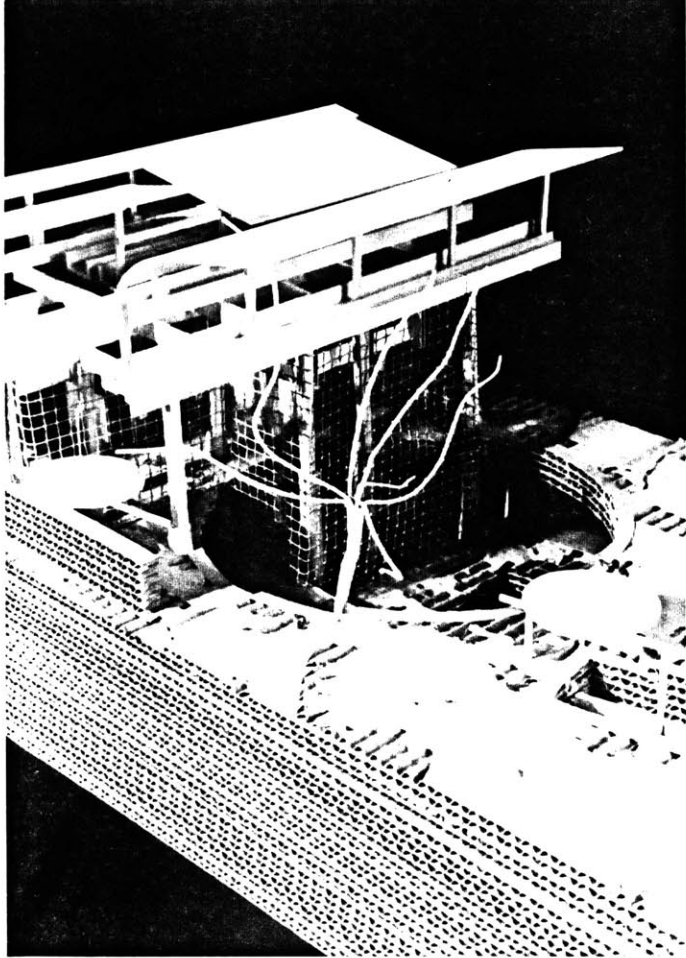


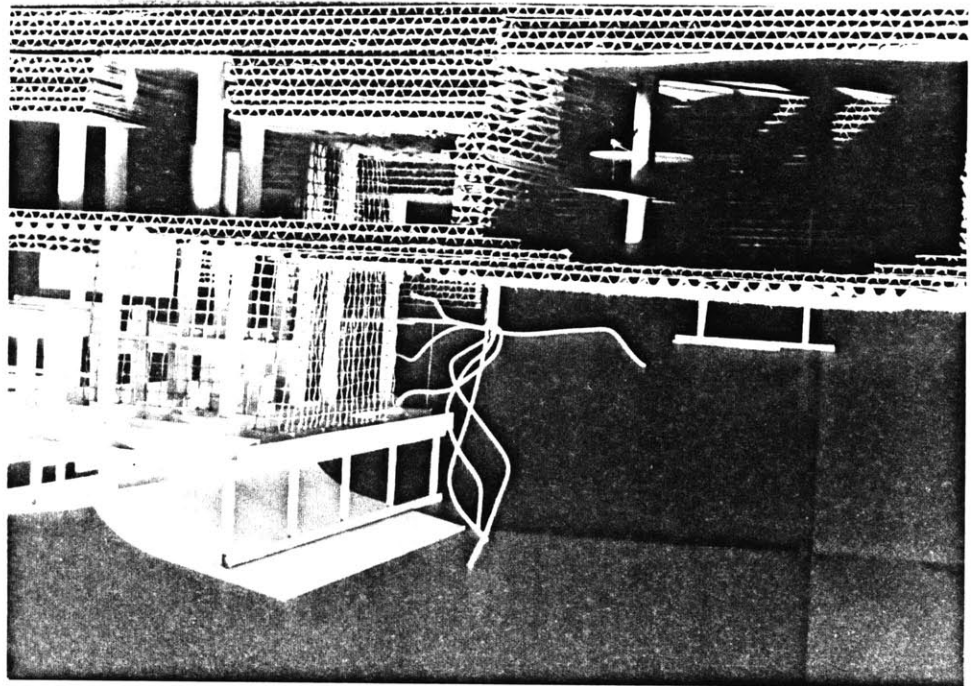
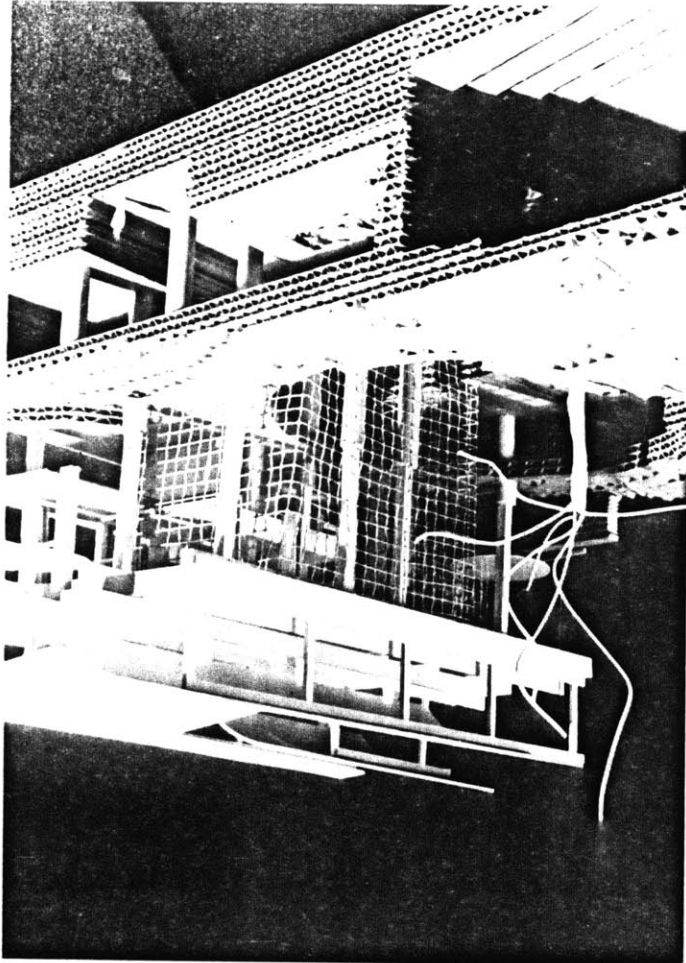


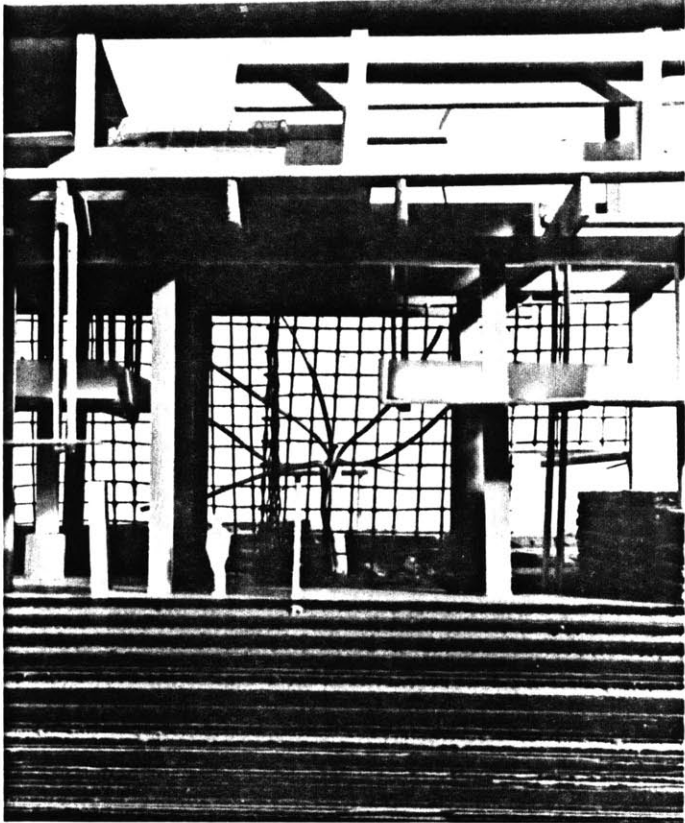
SITE MODEL - EARLY SCHEME

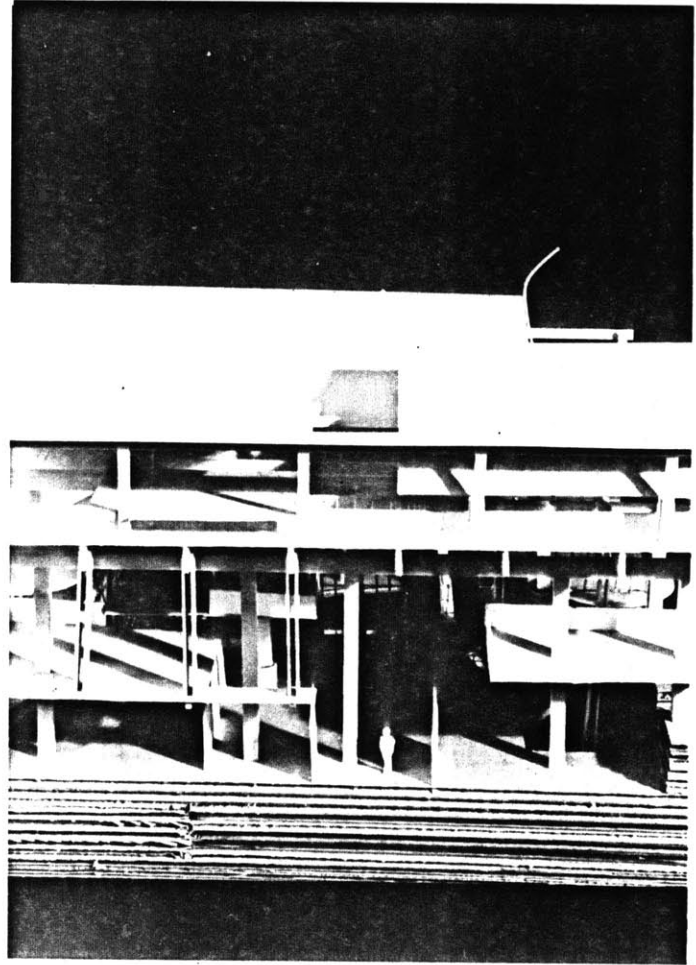


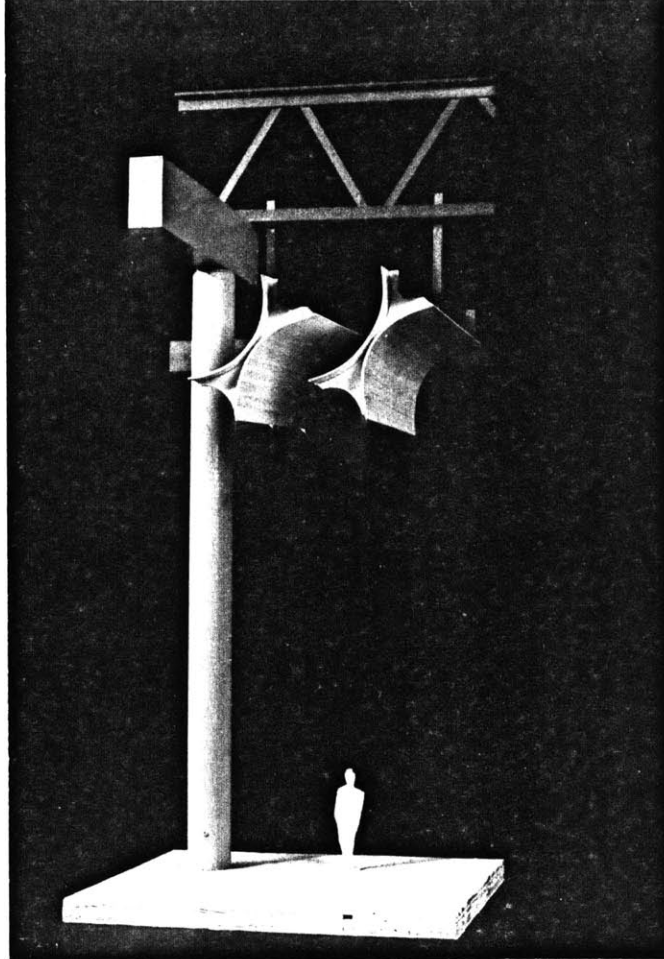
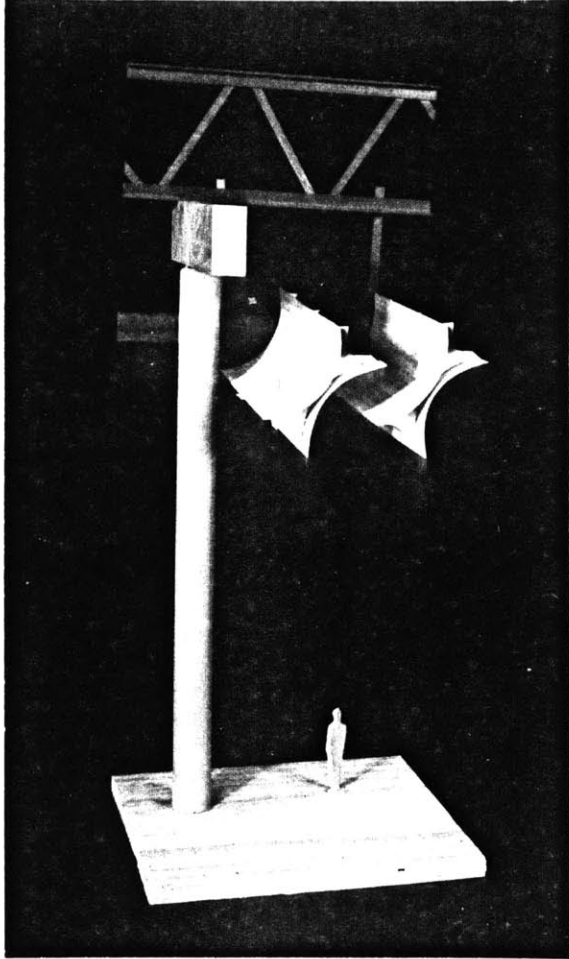












MODEL OF STRUCTURE AND LIGHT FINS

ARGUMENT

THE PROJECT AS SETTLEMENT

The design presented originates not only from the programmatic requirements of the SSC, but from a series of observations, values, and issues more personal and more general than the project itself. The design offers a proposition for the working facilities to encompass a larger set of activities than the program dictates. More than a building, a campus, or an object in the landscape, it is an exploration of how built form can interact with the landscape to form places of habitation. Its primary task is to form settlement, the establishment of an environment for human activity. The aspects that define a settlement range from the built form's intervention on its surroundings, to how it provides shelter for its inhabitants. Settlement simultaneously encompasses the individual and the collective, the built and natural elements, and what is beyond it

and within it. It implies the inclusion of a relatively large territory in which a variety of qualities and activities are possible.

An argument becomes a device to put forth "*a coherent series of reasons*" (Webster's Seventh New Collegiate Dictionary) regarding the issues uncovered in the thesis exploration. This section is intended to function at many levels. The exploration first introduces the issues brought forth by the work. These issues were initiated by responding to site and program. The act of observation and interpretation began the process. The search to uncover the broader implications and specific aspects of the problem become the main body of the argument.

The visual and written information comes from a wide range of sources and disciplines. The thesis acts as a collection of pieces of information related to the issues. Data is used for its aid in understanding the design issues. It makes reference to the sources and influences on the design, building a case for the proposal.

The argument is also establishing a position in itself. As a thesis, it acts as a lateral search to exhibit and explain some of the issue brought up by the particular problem through some intellectual, artistic, and habitation traditions. Bringing together these disparate sources is the method to discuss the many implications of what settlement can be.

Finally, the diagrams, sketches, and intermediate design work focus the argument toward designing. It establishes how the issues and information can be manipulated and transformed in the design process. This work and the text serve with the exterior information to emphasize that the argument is as much for a way to make or work as it is for some way for things to be.

As was introduced in the statement of the problem, the working facilities for the Superconducting Super Collider must accommodate a variety of programmatic functions. In the thesis this is expanded to be considered as a human settlement, in that a 'good' settlement offers a rich variety of places for its inhabitants to experience. In an intense working situation so remote from other communities, it becomes more important to offer spaces that could accommodate other human needs, such as relaxation and recreation. This is accomplished by connecting the

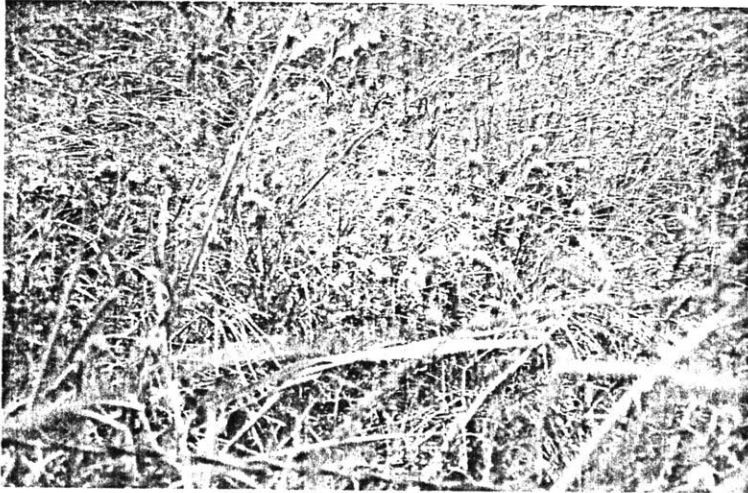


inhabitants, visually and physically, to the surrounding landscape.

The settlement is a place in the landscape where the built and natural environment are interconnected. The experience of one flows into the other. The interaction within the working environment should be as clear and strong as the workers' associations with nature. The elements that make up the settlement are the landscape, the mechanism, and the parts of the institution. To establish the life of the place, it is most important to understand the relationship between these elements at every size, and how they can be incorporated to promote habitation.

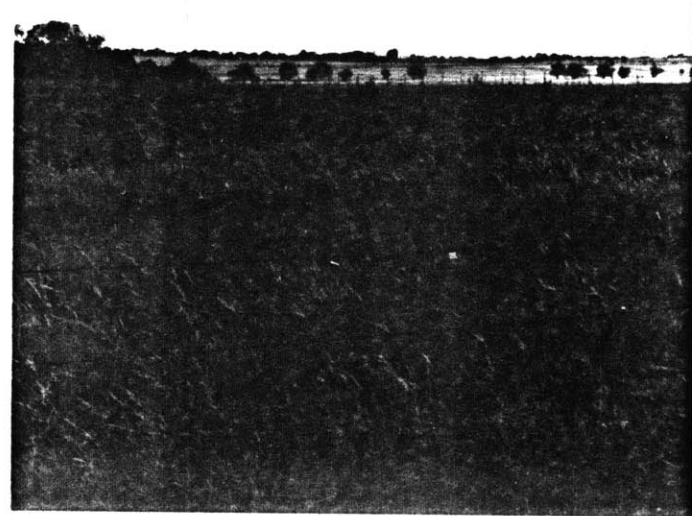
LANDSCAPE

If this development is to become more of a recognizable place within its surroundings, there must first be an understanding of the particular landscape in terms of its physical qualities. The Texas prairie where the SSC plans its facilities is dominated by the horizontality of the land surface and the 'dome' of the sky. Within these largest elements, one notices patterns of different grasses covering the plain, patterns and changes in the clouds crossing the sky. Various forms of vegetation become important in reducing the size of the landscape and in offering qualities.

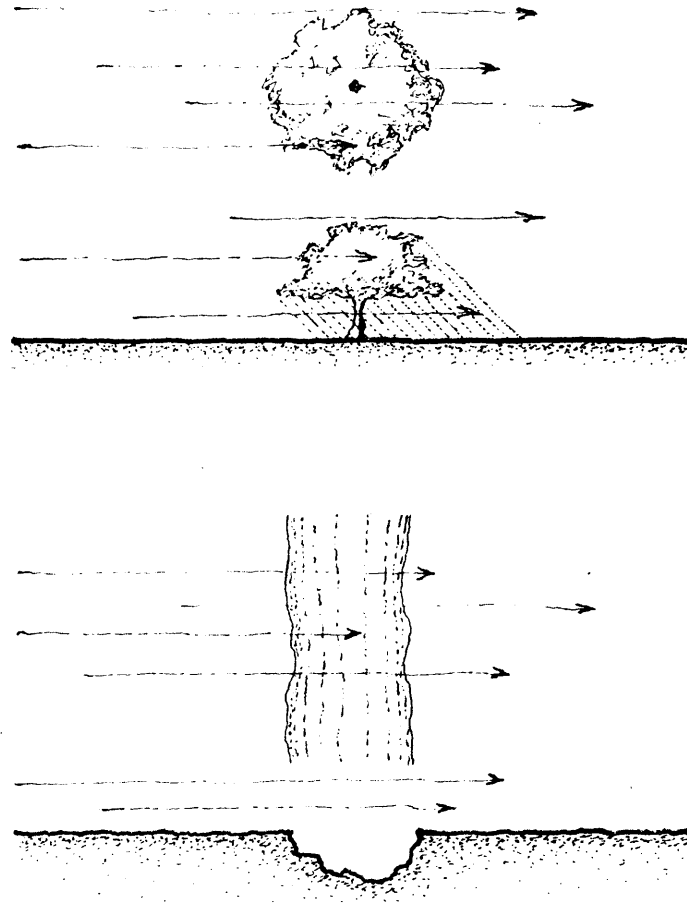
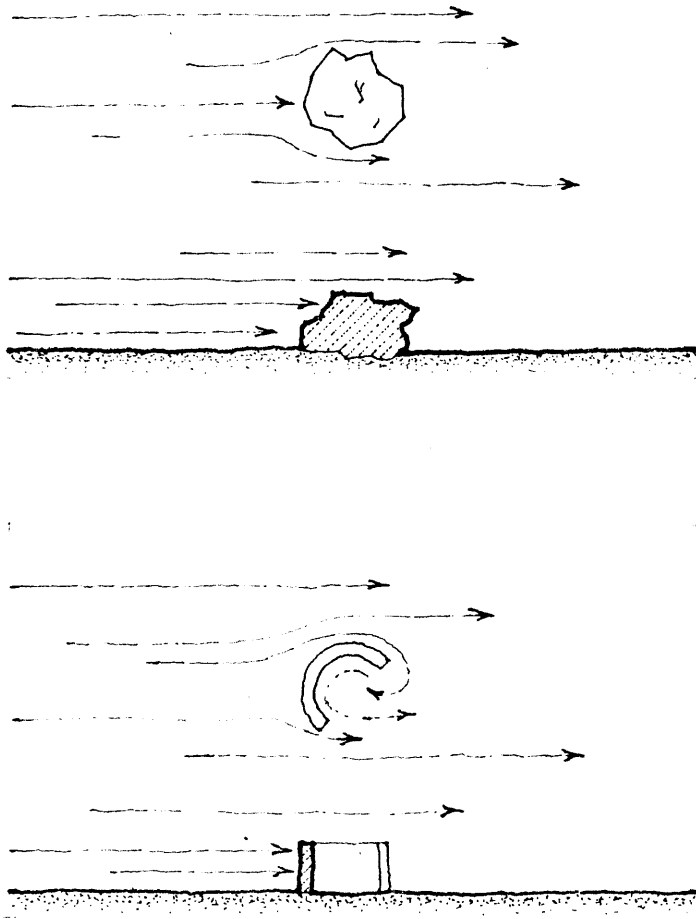


*nonetheless in many permanent locations
they form a fabric
and this fabric belongs to the world
as a layer of its foundation.*

(Francis Ponge, "Vegetation", Vegetation)

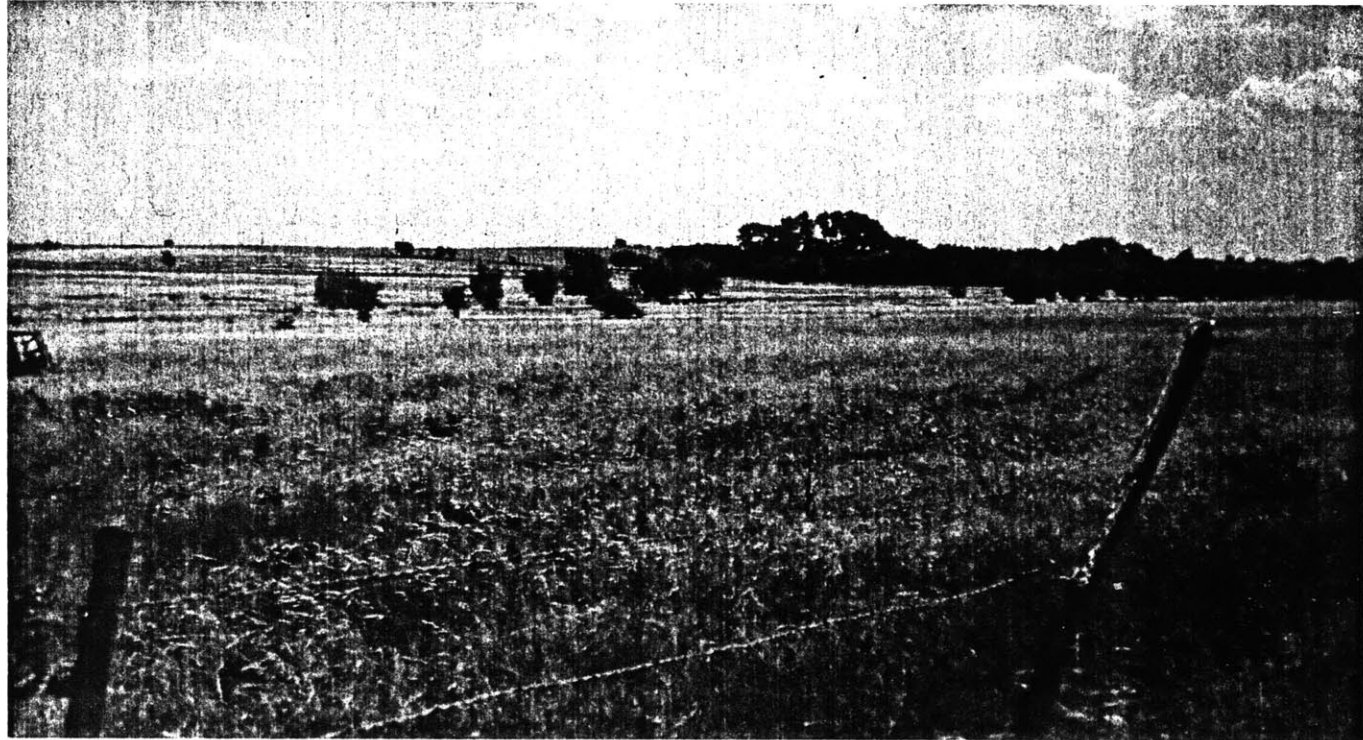


Other elements like the trees and the gullies mark the prairie but never take away from the dominance of its horizontal extension. However, within these other elements it is possible to shelter oneself, both from exposure and from the great expanse. The trees leave a zone of space under them while still allowing the continuation of the horizontal field. The gullies and depressions are discontinuities in the prairie surface and produce the beginnings of contained space



LANDSCAPE FEATURES

The elements of the landscape affect the flow of space around them. The rock, as an object sitting on the ground forces the flow around it. The C is a partial containment forcing the flow around on one side while containing space on the inside. The tree's volume is up, defining a zone below it and not breaking the continuity of the field. The gully breaks the continuity while defining a cavity of space.



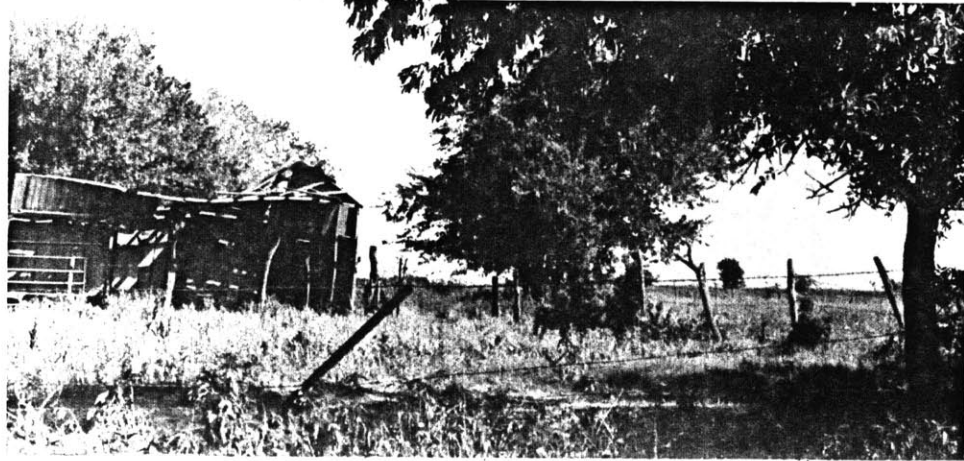
within the perceived infinite extension.

These spatial and physical effects are important to the beginnings of inhabitation and as definition of the landscape type.

Three main physical characteristics of the site begin to have the effect on it of a more contained and constricted space relative to the surroundings. The ground surface is already a slight depression. Its location between the grouping of trees and the berms of the accelerators define vertical edges on both the north and south sides. Moving along the outside of the curved berm of the medium energy booster, one comes 'into' this defined area. The land expands out laterally and rises gently to both the east and west.

NATURE AND LANGUAGE

Ralph Waldo Emerson states, in his 1836 essay "Nature," that language is one of the main uses which Nature subserves to man. "*Nature is the vehicle of thought.*"(Ralph Waldo Emerson, Selected Essays, Viking Penguin Inc. 1982, p. 48) Breaking down its significance as "*words as signs of natural facts, particular natural facts are symbols of particular symbolic facts, and nature is the symbol of spirit,*"(Emerson, p. 48) he connects the present world, from the everyday to the spiritual, to nature. "*Right means straight; wrong means twisted. Spirit primarily means the wind; transgression, the crossing of a line... We say the heart to express emotion, the head to denote thought; and thought and emotion are words borrowed from sensible things, and now appropriated to spiritual nature. Most of the process by which this transformation is made, is*



hidden from us in the remote time when language was framed." (Emerson, p. 48-49)

Compared to this are contemporary languages, where specialized words like 'networking' and 'interfacing' seem to have their origins in business and technology and make their way into everyday communication. When talking to one another is analogous to machines working, there is a distancing from the natural world.

The world of drop ceilings, artificial lighting, climate control, and a planar distinction between outside and inside produces a disconnection from the natural world, which must be changed to introduce an association with the natural environment. The roof, which is often times seen only as interior ceiling, is more extensive than the building. As a canopy, it protects the surface from the sun and defines a territory for inhabitation. The architectural element transformed from nature can be illustrated in a change of words from roof, to canopy, to trees. Instead of facades, there is a focus on vertical definition as planes of glass allowing light in and views out, walls holding back earth and berms of earth containing space and defining places to be in connection to the experience of the physical world. Instead of lobbies and lounges there are gardens and pools cut into the earth and platforms overlooking the prairie.

SETTLEMENT AS A PHYSICAL ACTION

The action of settlement can be described and generalized in physical terms. Two initial actions will be focused on for how they can help to delimit the size and make spatial definition in the Texas landscape. The act of marking establishes the extent of the territory that is to be settled. Vertical elements which rise in elevation, such as stakes, trees, and mountains, have been used to mark the perimeter of a territory. Elements cut into the earth, such as river beds, hollows, and valleys work to make containers, edges, and are associated with source of water and shelter. These recognizable features provide orientation within a landscape, and allow the distances and sizes within the landscape to be perceived.

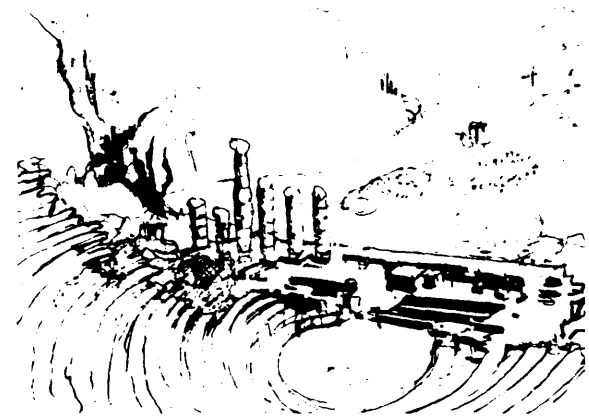
An initial action of settlement is the preparation of the surface. The base of the

Acropolis or the clearing and leveling of a piece of forest provide the horizontal area on which habitation will occur. This size is larger than the architecture and therefore mediates between the size of the landscape and human size. Although a common act in settlements was to build a platform and raise the human above and away from nature as a base (the Acropolis, Semper's primitive hut), the qualities of the Texas prairie lead to a different action. To counter the sensation of exposure and infinite extent of the site, the first action will be to cut and dig into the land. Instead of a platform or plateau that would dominate the surroundings, a hollow or depression would delimit and secure a smaller area within the continuity of the prairie. It acts like a container within which other elements will exist (built elements, gardens, water). Much like a valley or a hollow works as an archetypal landscape element, it would contain a certain size of space, while allowing other systems to continue through (the prairie surface and the roof system).

The initial site clues are intensified by the cut in the ground which establishes a zone of inhabitation and the introduction of water. The vertical definition, containing form, and delimitation of size promote the sense of containment and enclosure.

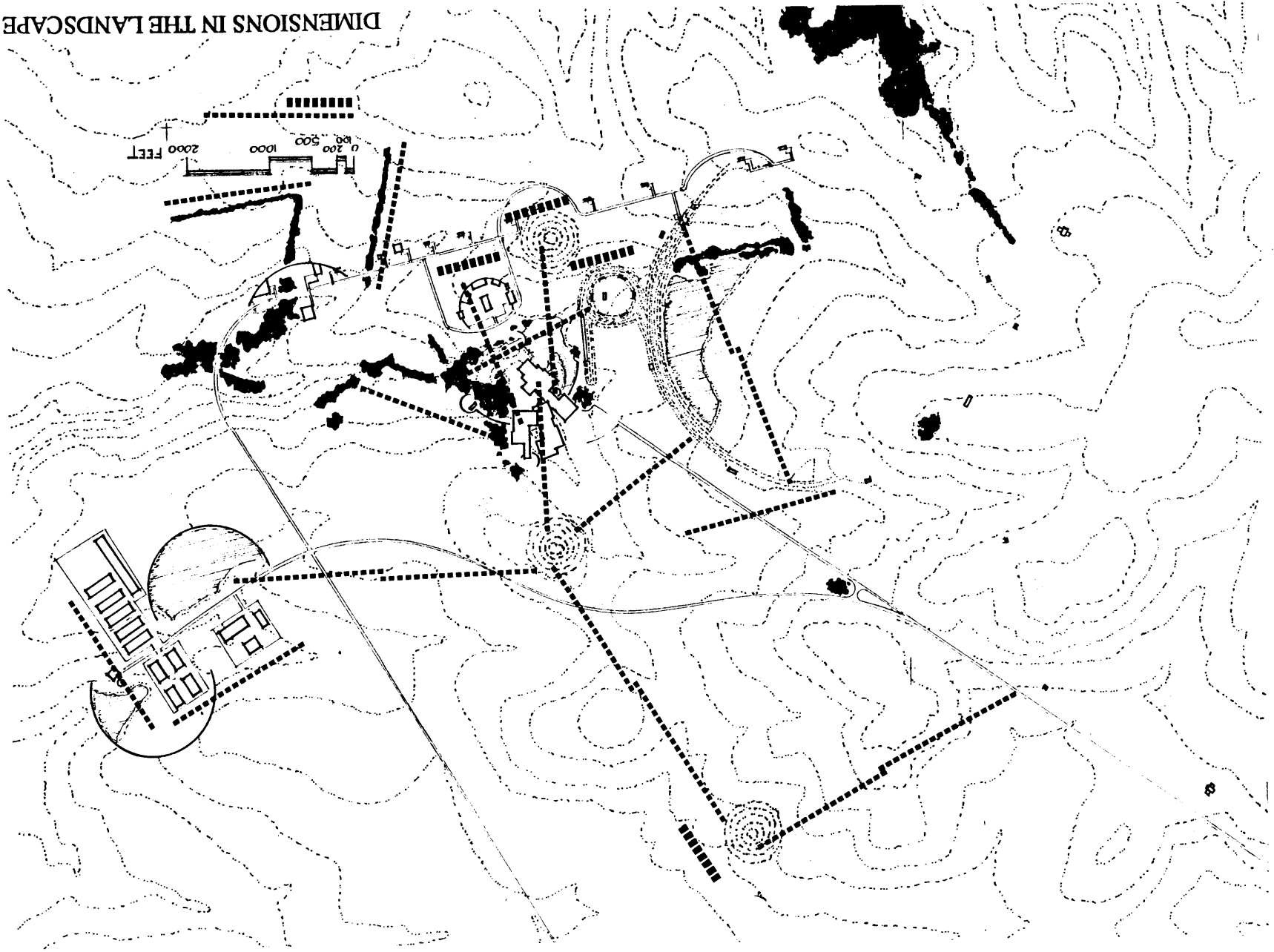
The landscape feature of this type are distinguishable as places within a larger context. They often exhibit other intensifications such as water and vegetation that either helped in their formation or are present because of the form.

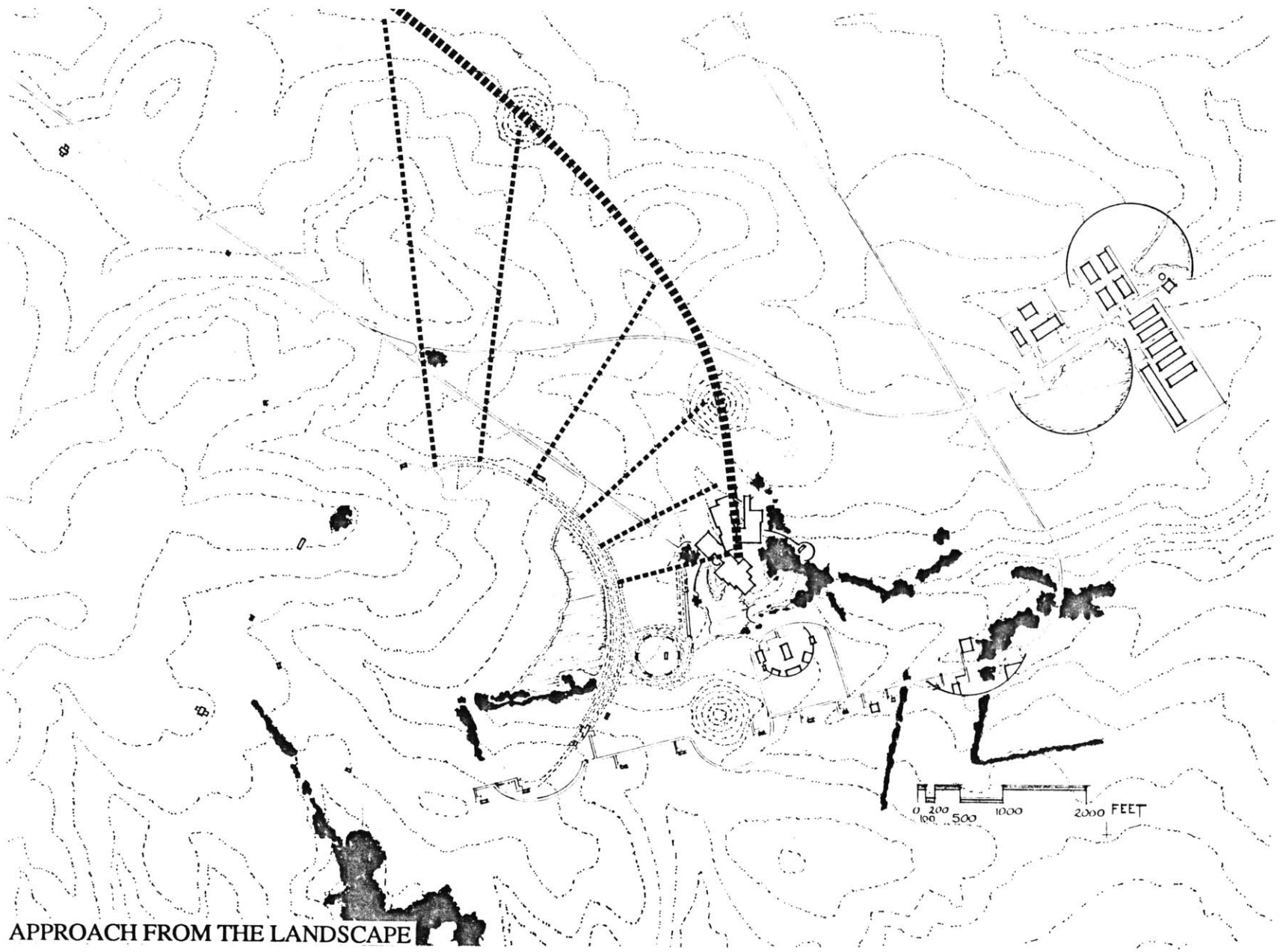
With the vast, horizontal character of the prairie, any vertical element is prominent. Another physical action of settlement is marking the extent of the territory with vertical markers. The use of two 50 foot mounds of spoils would be built in the fields at a dimension apart that would be comprehensible in that landscape (one thousand feet). This dimension is common in many of the existing elements around the site. They, with the curved berm of the medium energy booster would mark the territory within which the community would exist. This size would help to incorporate the other facilities that are to be built in that part of the site. In the sequence of arrival from the northeast, a third mound is added two thousand feet away from the collider ring and the east mound. One would move past this outer mound and along the medium energy booster



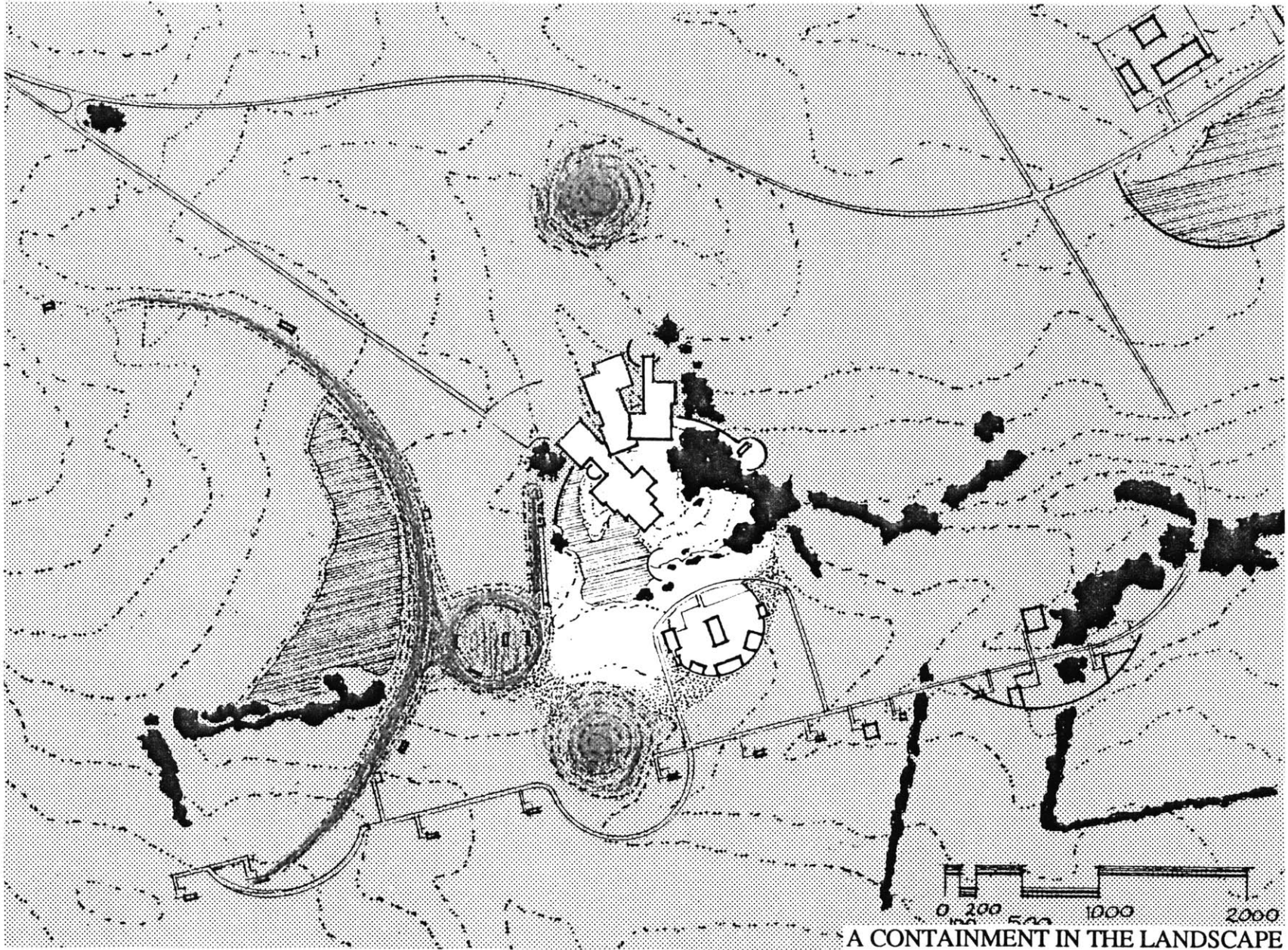
Sketch of Theater, Delphi, Alvar Aalto, 1953 (Schildt, Goran, Ed., Sketches by Alvar Aalto, M.I.T. Press, Cambridge, Massachusetts, 1978)

DIMENSIONS IN THE LANDSCAPE

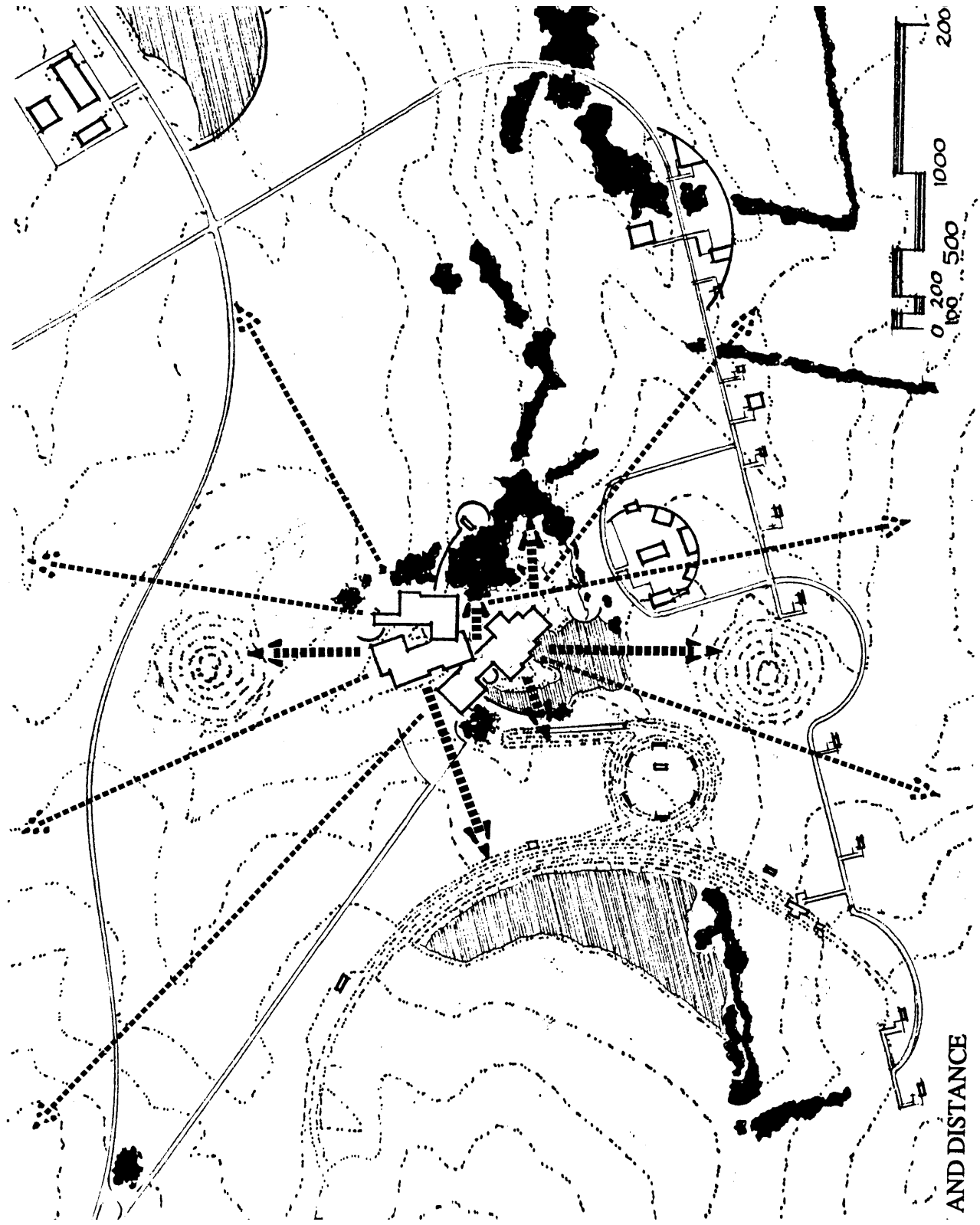




APPROACH FROM THE LANDSCAPE



A CONTAINMENT IN THE LANDSCAPE



AND DISTANCE

berm from the point it rises from under the surface, coming 'into' the site between the mounds. This is intended to mediate between the size of the larger landscape and the speed of movement by automobile.

The inner mounds would be deployed on an east-west axis through the main facilities providing orientation like a compass. An intensification of the mounds with cuts and/or walls could also allow the two to act as a simple time device.

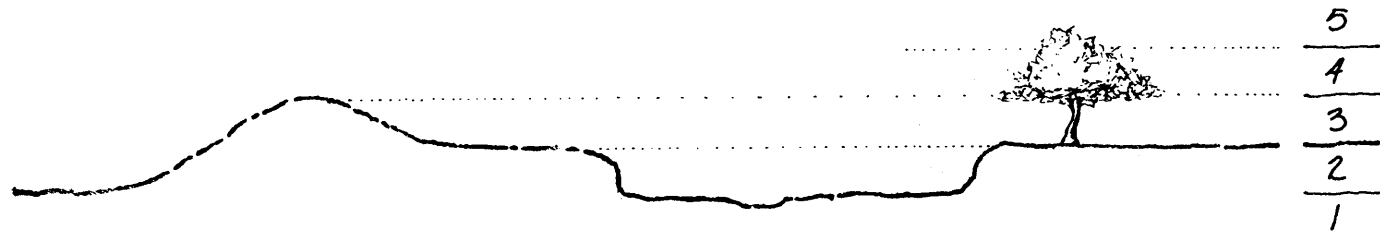
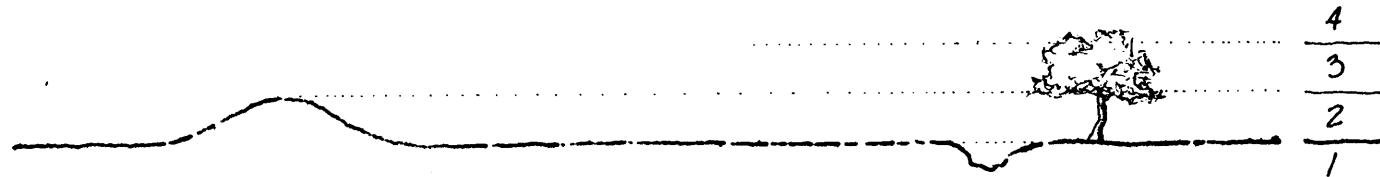
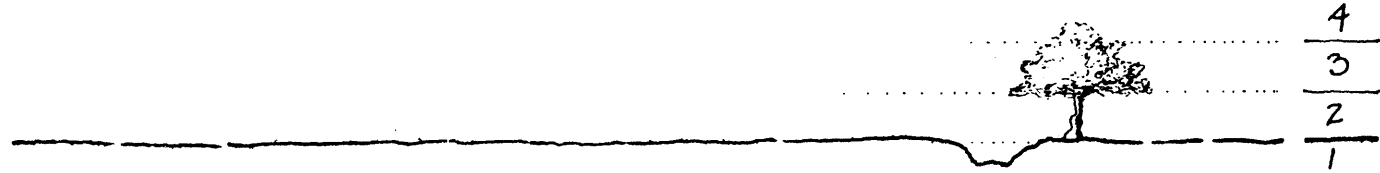
The introduction of the mounds to the east and west of the site should also be considered both on their effect as spatial definition and as landscape features. Not only would they help in establishing an 'inside' of the settlement, and provide some help in orientation within, they have a presence as landscape features.

The understanding of size in the Texas prairie is crucial to establish human scaled spaces in association within it. As some of the larger definitions begin to mediate between the extremes of size, other existing landscape elements can be observed to have these human scaled sizes with them.

The trees and the gullies establish zones of space in section. With the ground surface as an initial reference line, the majority of the trees rise enough so that the bottom of their volume make a second demarcation. A third would be the top of their volume, above which is only sky. The gullies establish one demarcation below the surface, below which is solid earth.

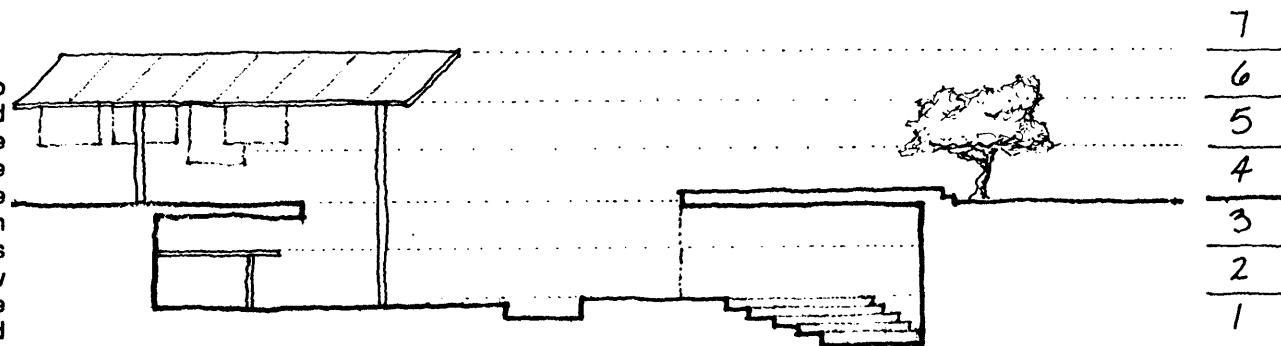
This as a clue, the major building systems mimic and intensify the zones and the quality of space from these natural elements.

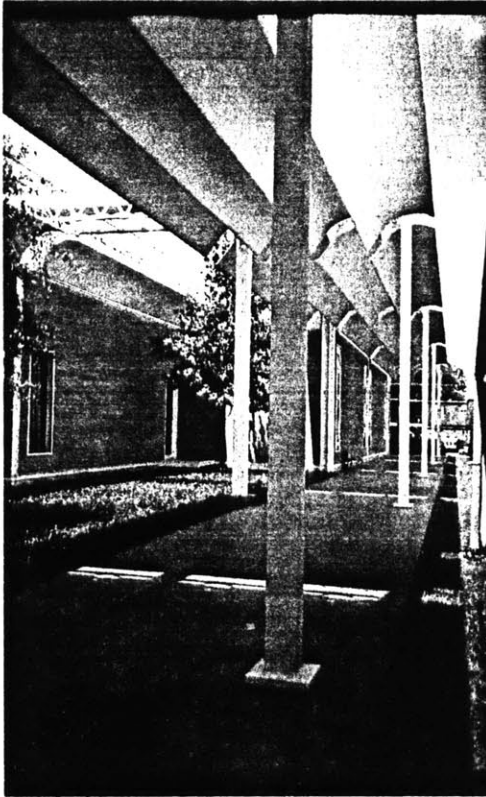
The extensive roof system is thought of as a canopy. In a situation where the sky and the horizontality of the land are overwhelming, and where heat is more of a problem than cold, the first action is to make shelter from the sun. It acts to cover above while still allowing light to filter through. It shelters locally while allowing views out to the horizon. Canopy, analogous to both the upper layer of trees and to the light fabric of tents, functions to secure a place underneath it and associate with the qualities of the sky itself. As a predominantly horizontal element, it



ZONES IN SECTION

The existing prairie is marked into four zones. One (1) is the ground itself; two (2) is the zone above the surface and under the trees; three (3) is marked as the volume of the tree; and four (4) is the sky. A fifth zone is added when excavations produce a human-sized zone below the surface. In the design, the zone below the roof, the ground and the excavated zone denote two levels each (2-3, 4-5).





Piano's Menil Collection Museum
(Photo by the author)

Kahn's Kimbell Museum
(Photo by the author)



establishes a large collective zone underneath it.

In both the Kimbell Museum (around 50-60 miles from the site) and the Menil Collection Museum, in Houston, the roof systems provide the dominant architectural element. They function as public-sized shelter both inside and outside the building, as the element that carries one through the access and gallery parts of each building, and, reflects the changing light into the space from above. In traditional tent structures and in Gunter Behnisch's and Frei Otto's Olympic Park, the canopy provides shelter from the elements to varying degree and still allows some light through due to the nature of the material, either through the actual fabric or at the end points of the structure. Tent canopies, because of their irregular structure, tend to extend out into the landscape, beyond the enclosure of 'inside.' Behnisch uses this fact to extend and connect the more solid, specific structures with movement systems and with the park, integrating and making



a more options for the user to experience.

These clues from two aspects of canopy are incorporated into the roof system for the project. It is the extensive element under which both interior and exterior places occur. Its predominant horizontality provides a reference for both the changes in ground form and the relationship between the individual work areas and more collective movement.

The cut in the earth produces a zone secure from the exposure of the larger landscape. It exaggerates the site as a 'hollow.' Its qualities are associated with solid earth elements, walls, steps, and cave-like spaces. It functions to provide a central public area connecting the various built elements. Into this central area would be introduced water and garden elements not indigenous to the area. Most of the planting would be low shrubs and bushes to keep the understanding of the new ground plane and the size of this sunken container. It acts as the exception in quality and space to the larger landscape and the area of dense tree cover.

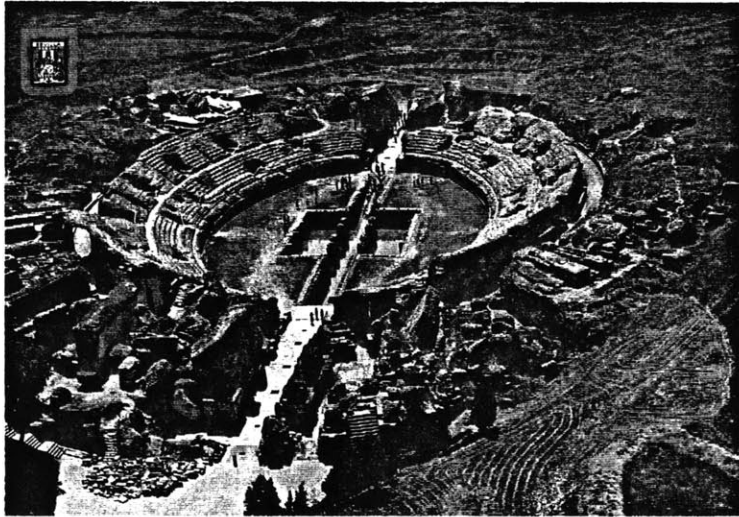
Not only a container, the depressed zone works to connect the various parts of the project. Movement along it connects the Linac structure to the main complex, and then to the recreational facilities. Along this sequence are the natural elements of the extended prairie, the water, the main garden area, and the large grove of trees. The main experiences and primary functions are fed off from this movement zone.

Tent Structures at Olympic Park in Munich, Gunter Behnisch.
(Behnisch & Partner Architects
Designs 1952-1987, Stuttgart: Ed.
Cantz, 1987)

LANDSCAPE WITH HUMAN INTERVENTION

The project brings up questions of how the landscape is associated with patterns of settlement and of the effect on the landscape by industrial, agricultural, and other types of transformations. The collider mechanism, an intervention of enormous magnitude, and the working settlement must coexist in the Texas prairie. After isolating the features and characteristics of the particular landscape, a focus on effects of settlement types and industrial interventions on the landscape helps to understand how the three could relate to each other.

Generalizing some of the physical and spatial attributes of a few main types of settlement patterns extracts information regarding their relationship with the landscape. The settlement as a single entity, as a configuration of objects, or as grid system have different relationships to their



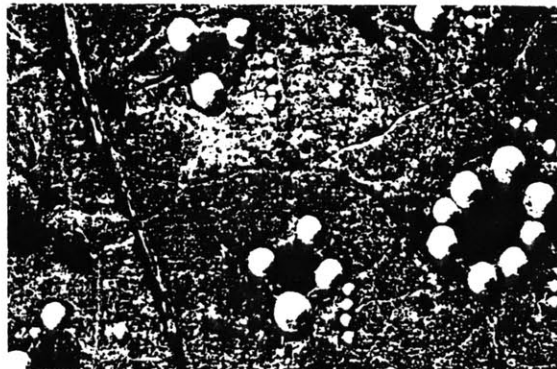
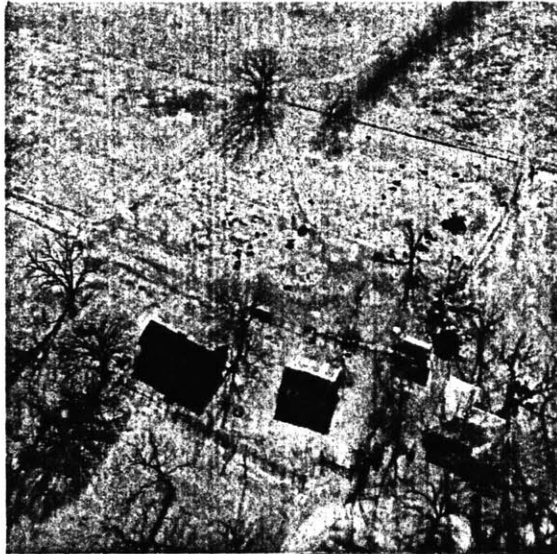
surroundings. Their formal and physical effect affects an inhabitant's association with the landscape.

Settlements as single entities, or compounds, tend to have strong formal characteristics and distinct barriers between inside and outside. Examples of walled cities and castles separate themselves from the landscape for defensive reasons. The vertical barrier is often increased by building on top of existing prominent natural features. This produces a complete break from the exterior.

The form of inclusive settlements often adds to the separation. Round or center controlled configurations offer their convex side to the exterior. These are found in the defensive, permanent fortifications as well as other forms. Wagon trains circled themselves to make a temporary, defensible camp. From nomadic tepees and yurts to Buckminster Fuller's Dymaxion

Ruins of Itálica, Seville
(Barcelona, Spain)

Frankfurt am Main, 1646.
(Saalman, Howard, Medieval Cities,
George Brazillier Inc., New York,
1968)



Houses and geodesic domes, the circular form repels. Like a rock in a river, the flow moves around the form and does not have a reciprocal exchange of space. These minimal and efficient forms formally close themselves off from the exterior.

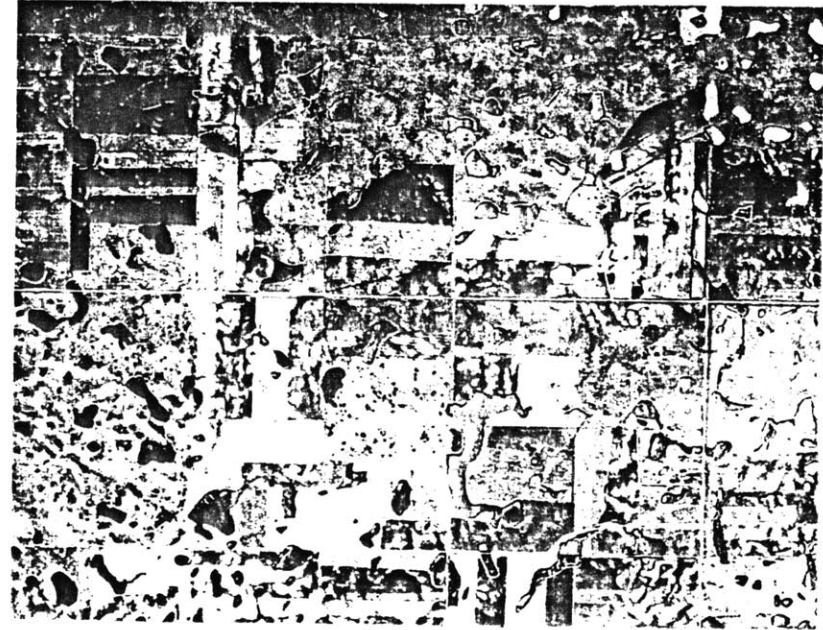
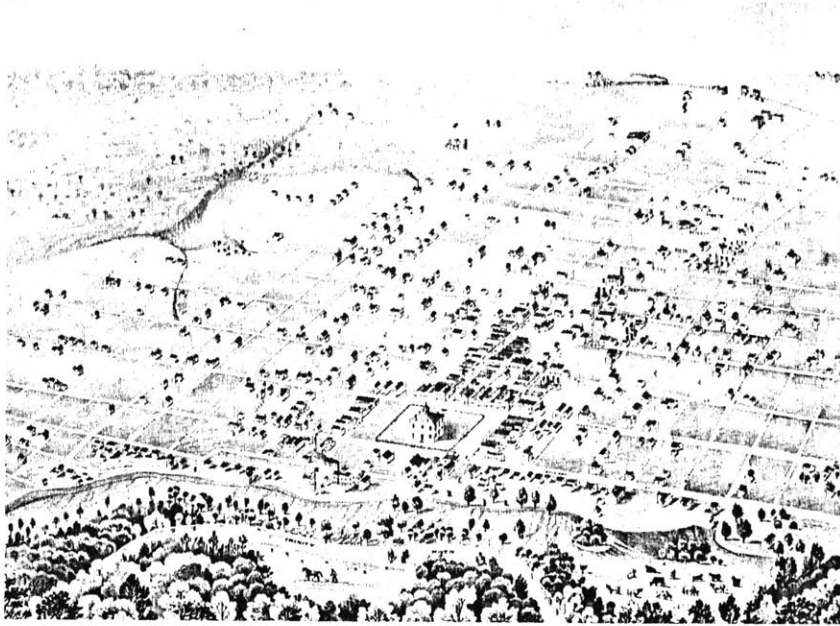
Many office and laboratory buildings have a similar planar envelope between outside and inside. Other than views, these distinct breaks in any built environment limit the potential association with the landscape. The settlement as a single entity separates itself from its surroundings at some size. The object quality and spatial behavior of a stadium is similar to a tepee in its internal focus.

Another form of settlement uses many single entities in a larger configuration. This can be thought of as a containment by physical elements. Examples of African villages, ranches, and farms define space between objects. The larger collective territories are defined by the configuration of smaller elements. The objects keep their autonomy while making an organization of the settlement that is not controlled by one element or a restricted form of movement. They can take on forms that are less loaded with meaning in our culture, as Hertzberger stated, in discussion of van Eyck's use of circles, and as influences for Picasso and Stravinsky, "*...forms and rhythms produced by primitive man, which, as polyvalent as they are, and apparently unfettered by worn meanings (from which one works to escape) opened the door onto a store of new associations and formal possibilities.*" (Herman Hertzberger, "The mechanism of the twentieth century and the architecture of Aldo van Eyck", Aldo van Eyck, Stichting Wonen, Amsterdam, 1982, p. 14)

The spatial relationship is key in that these type of configurations establish three or more sizes and types of spaces while incorporating the land. There is the size of the objects, the size made between objects in close proximity, and the size determined by the larger configuration. This allows this form of organization to mediate between the extended surroundings and the individual objects.

Aerial view: Ranch near Tulsa, OK, 1981 (Gohlke, Frank, Landscapes from the Middle of the World, The Friends of Photography, 1988)

African Villages
(Source unknown)

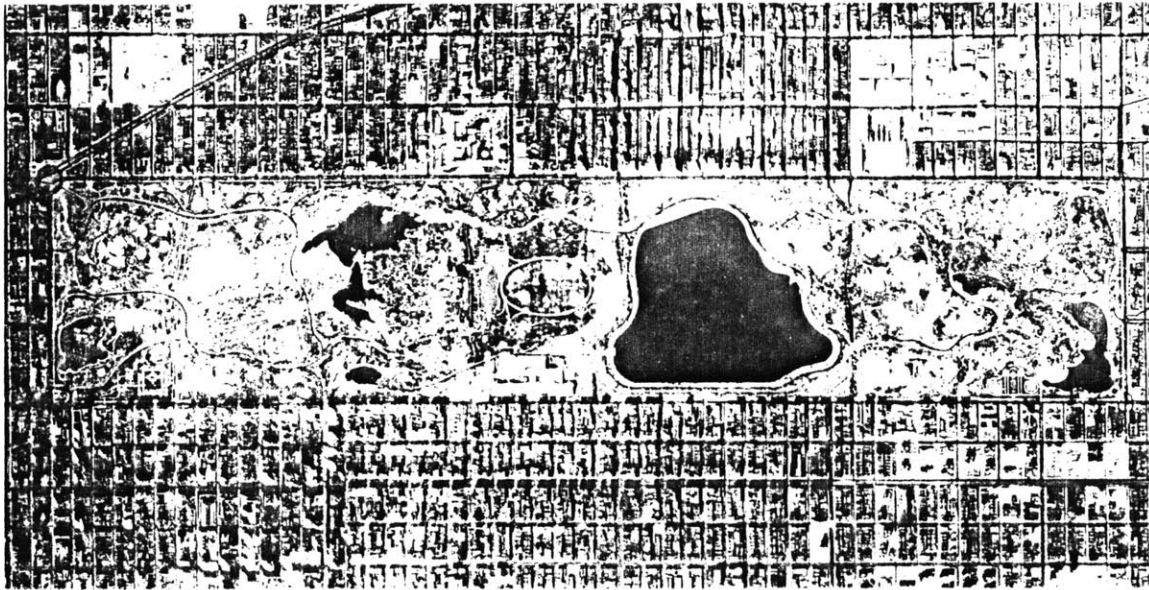


The grid, proliferated on this continent by the Spanish and Thomas Jefferson presented a settlement pattern with a clarity of organization, movement, orientation, and potential for growth. Its use was, and is, for establishing larger, new territories for inhabitation and for speculation. It appears at many levels, from the organization of a town to many counties, and, in Jefferson's plan, to establish a relationship between the urban and rural areas in a democratic manner.

The grid's formal and spatial consequences to the form of the landscape are strong. As a geometric overlay, it can disregard the qualities and features of the particular land formation. It

"Fort Worth Tarrant co. Texas
[1876]" (Morse, D. D., Amon Carter
Museum of Western Art, Fort Worth,
Texas)

Aerial view of farmland
(Source unknown)



usually accommodates special feature at a local scale. The definition of a range of sizes in response to a particular landscape is contrary to the grid's uniform division of space within its own geometry. A range of sizes must be built into the grid, as in a tartan grid, or the grid must be deployed as a size that defines the larger territories. New York City's Central Park, an example of this type of planning, is confined within a grid system.

The configuration of the settlement for the SSC working facilities is determined by a response to the conditions of the site. The use of partial definitions and the organization of objects to define space add up to a settlement that is both inward and outward in orientation. The strategy of responding to the physical and spatial characteristics of the existing landscape, including the presence of the collider berms, allows for the deployment of physical elements to reinforce and counter the spatial and qualitative character of the site.

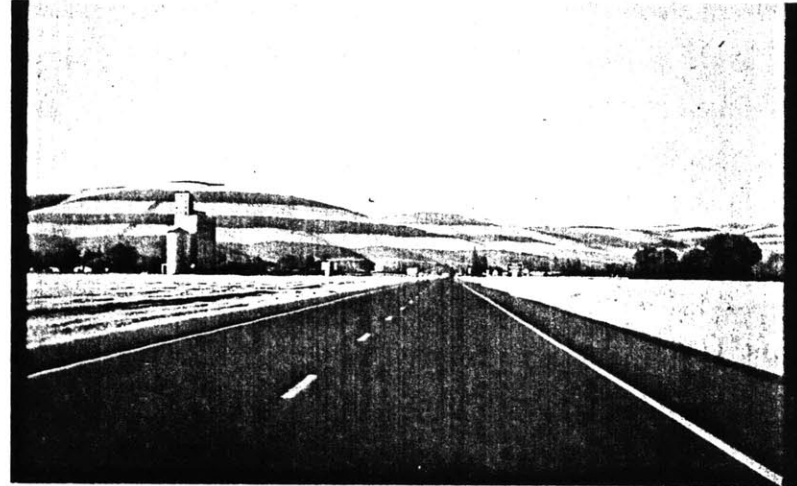
The collider berms introduce a new formal and spatial vocabulary. Both the use of curves and the manipulation of the ground in the settlement refer to the new order. The curve intensifies the depression in the land, defining an edge to the 'hollow.' This establishes an interior to the settlement that is not a closed form.

Despite its clarity of organization, a grid overlay, as an initial move, would be foreign to the vocabulary of the berms, gullies, and tree patterns. Instead, the curved cut into the earth works as a way to orient movement within the project. By encompassing the facilities, the trees, and the water, the primary form of movement also defines an area that includes landscape features.

A discussion of types and effects of human interventions on the landscape not having to do with settlement help to understand the existence of the collider in its surroundings. Their effect on the space and quality of their surroundings determine if, and how, habitation can occur in their proximity. One distinction that can be made is to identify the intervention's area of activity and its area of effect on the landscape. The area of activity is where the intervention is taking place. The area of effect is distinguished from the area of activity if the intervention affects an additional territory.

Dams, farms, and formal gardens exemplify, to different degrees, the transformation of the landscape in which habitation can still occur. Unlike the action of a strip mine, where the area of activity and effect continually alters the topography, the action on the land by these other forms of intervention may even allow habitation to occur where it otherwise might not.

A dam's physical presence is small and local relative to its effect on the landscape. Its construction is 'contextual' in a way, it must be located to function effectively in a given topography. The alteration of the landscape is done in majority by another natural element, water. This 'new' landscape is open to other human uses including inhabitation. Here, the area of activity is usually the dam structure itself, which can be working as a machine. The area of effect can be much greater, and becomes part of a new, passive landscape that is maintained by the

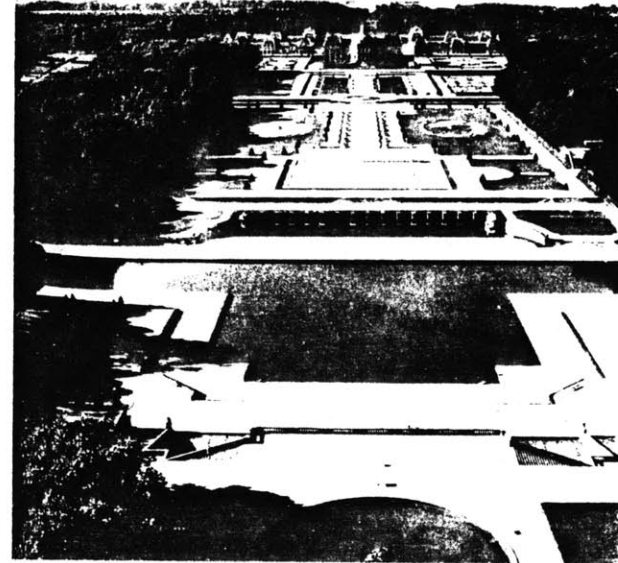


Aerial view of Hoover Dam and surrounding area (U.S. Department of the Interior, The Story of Hoover Dam, U.S. Government Printing Office, 1971)

Farmland in eastern Washington (Photo by author)

presence of the dam. The edge of the dam reservoir becomes the physical feature that initiates habitation. The water element produces new 'natural' places which need not be aware of the situation's dependence on a man-made structure.

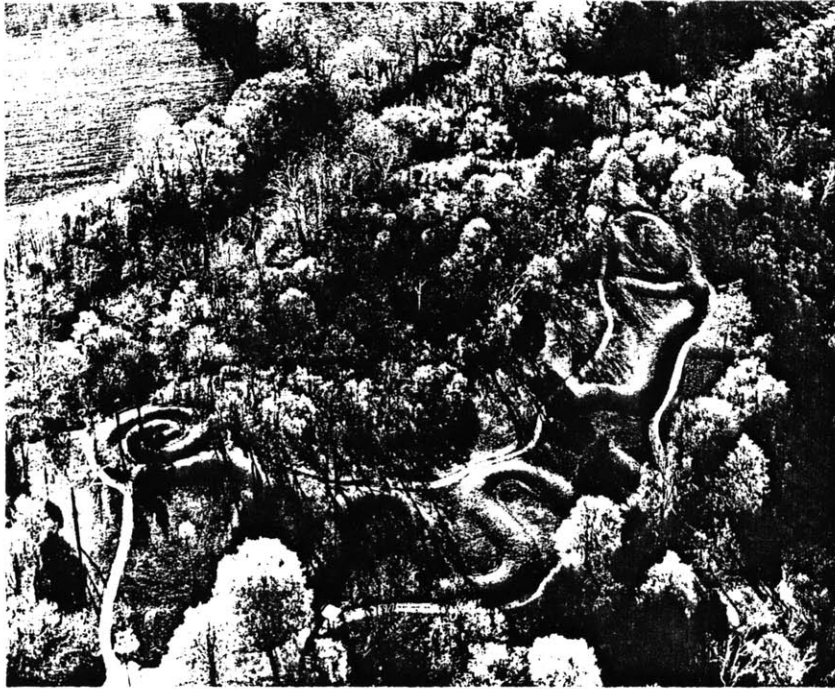
Farms seasonally manicure the land surface and, like the mine, is in a state of continuous transformation. The areas of activity and effect are again the same, but the surface is transformed in terms of a change in vegetation. Unlike the mine, the agricultural intervention can coexist with habitation.



The landscape made for recreational purposes can, to varying degrees, transform and interact with the existing landscape. Formal gardens are many times isolated geometric entities. The experience within these can be completely isolated from the 'natural' landscape. The definition of space makes the zones of activity and effect the same. Golf courses built in the desert are contemporary examples of landscapes completely altered by the introduction of water and vegetation for purposes of recreation. The limits of this action are defined by the context. In Central Park, one understands the extent of the park by the wall of buildings.

Although the purpose of the collider is not to harness or exploit natural resources beyond a sub-atomic size, the presence of it can be looked at in the same way as other interventions. The collider's impact on the the landscape is most like the dams, yet even more passive. Most of the collider is tunneled, leaving tons of earth spoils to be deposited. In the bermed sections of the

Vaux-le-Vicomte, designed by
Andre le Nostre, photo by
Interphototeque, Documentation
Francaise. (Museums and
Monuments series, The Man-Made
Landscape, UNESCO, Lausanne,
1977)



low energy booster, half of the medium energy booster, and the Linac, the physical presence of the mechanism will be understood by 35 to 45 foot earth berms in the geometry of the collider. Once this 'new landscape' is made it will be open to the return of farming and grazing cattle. Beyond the introduction of cooling ponds and the new verticality, the landscape remains very much as it was. Stations to access the collider and a road system connecting these are the further extent of the transformation. The area of activity above ground is in this area, and once it is completed, there should be little further effect.

Transformations of the landscape for ceremonial and artistic purposes exhibit other spatial and physical qualities. There is a large variety of prehistoric earthworks on this continent that have a similar effect on the landscape that the collider berms will. *"From Wisconsin to the Gulf of Mexico, From Mississippi to the Appalachians, but especially in Ohio, rise tens of thousands*

Serpent Mound (of Adena Culture, Locust Grove, OH, 1000 B.C. - A.D. 200)

Mound A (Mississippi Culture at Moundville State Monument in Moundville, Alabama)

of artificial hills. Many of them are so fantastically shapes that they defy description." (C.W. Ceram, The First Americans: A Story of North American Archeology) These earth mounds range in form from single mounds, to collections of mounds and linear berms, to recognizable figures such as snakes. Their effect is to add a smooth, especially when covered with vegetation, vertical change in usually gentle landscapes, but a change that has a more recognizable geometry than natural contours. When covered with grasses, these mounds will have the strange effect of being precise in their form and natural, or organic, in their texture. It is possible to treat these type of interventions as both a man-made artifact and a landscape feature.

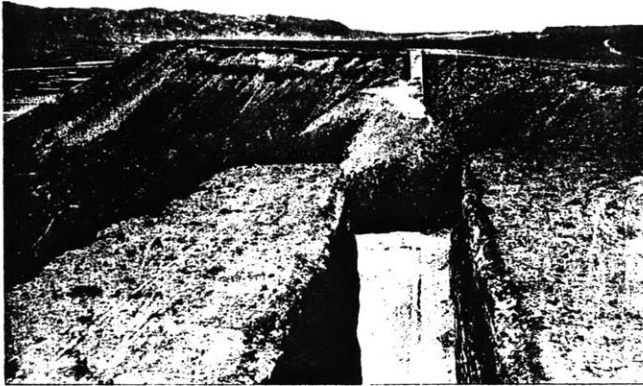
Environment artists of the last few decades have worked at the scale of the landscape, both transforming the existing natural elements and by adding new. Their projects seem to exhibit the qualitative differences between natural processes and man-made processes in terms of quality, delicacy and subtlety of action, and types of physical definition. These examples of works heighten or reveal the qualities of the actual landscape.

The artist Christo's *Surrounded Islands*, a project for Biscayne Bay, Greater Miami, Florida, is noted here for how it reveals the qualities of the existing landscape. Like all of Christo's projects, this temporary installation was not to be seen as something in itself. It is not the art object which is the single focus. Christo's material, what the material is wrapping or surrounding, the visual relationship of this new condition, and the relationship of this condition to the larger, unaltered context are all under consideration.

Christo's hot pink fabric floats on the water, revealing not only the water's flatness, but also the verticality of the trees is accentuated relative to the pink sheets, the water, and the extended landscape. The form of the installation continues the dominant characteristic of the particular landscape, but it also exposes a counter and smaller element. It relates to both sizes larger and smaller than its own presence. By reinforce the predominant quality of the horizontal surface, the islands and trees read as counterpoints to there surroundings.



Surrounded Islands (Christo, Project for Biscayne Bay, Greater Miami, Florida. *Nouvelles Images*, 1985)



A similar situation occurs in the project. A major architectural move of the settlement is the horizontal roof system. Like Christo's fabric, the roof reinforces, rather than counters, the predominant horizontality. Running parallel to the dominant plain, the canopy is intended to heighten or reveal the space and element for habitation underneath. Much like the trunks of the trees reading as vertical counterpoints between its volume and the horizon, the quality of the landscape is first intensified so that the focus falls on the exceptions, the smaller elements inside.

Michael Heizer's Double Negative reveals the landscape in a different way. Two cuts line up with each other across a canyon. This not only differentiates the difference between a precise man-made cut with the form of the eroding canyon walls, but it also reveals the size of the landscape. The troughs dug into the earth are the same size. From the perspective of one to another, the sizes of rest of the canyon are brought to one's attention.

Double Negative, Michael Heizer, (Heizer, Michael; Sculpture in Reverse, Julia Brown, Ed. Museum of Contemporary Art, Los Angeles, California, 1984)

Whether human interventions on the landscape can be beautifying elements, and not just scars, has long been debated. The artist Robert Smithson discusses this relationship in an essay on Fredrick Law Olmsted. He first quotes some of Olmsted's influences on the subject of the importance of the existence of the deformed and the picturesque.

The side of a smooth green hill, torn by floods, may at first very properly be called deformed; and on the same principle, though not with the same impression, as a gash on a living animal. When a rawness of such a gash in the ground is softened, and in part concealed and ornamented by the effects of time, and the progress of vegetation, deformity, by this usual process, is converted into picturesqueness; and this is the case with quarries, gravel pits, etc., which at first are deformities, and which in their most picturesque state, are often considered as such by a levelling improver.

-Unedale Price, "Three Essays on the Picturesque", 1810

("Fredrick Law Olmsted and the Dialectical Landscape", from The Writings of Robert Smithson, Nancy Holt, ed., New York University Press, 1979, p. 118)

The scar, or deformity, whether made by man or nature, is 'softened' by time. This can also be thought of as an transformation by later natural processes such as erosion and vegetation growth.

Smithson finds the existence of qualitative opposites in nature is also in Edmund Burke's "notion of 'beautiful' and 'sublime' functions as a thesis of smoothness, gentle curves, and delicacy of nature, and as an antithesis of terror, solitude, and vastness of nature, both of which are rooted in the real world." (Smithson, p. 119)

As the collider's presence introduces a new form of intervention on the prairie, the



continuation of working the ground with this vocabulary begins to produce the desired qualities of delimitation and containment within the vastness. The initial gesture of the cut in the earth's surface is intensified at varying degrees, ranging from an earth covered structure for the library and computer areas, to a berm connecting the main settlement to the Linac. The large deformity is given detail and delicacy by the return of vegetation and by built materials. Unlike the berm of the mechanism or the mounds of spoils as markers, once inside the settlement, the manipulation of the ground becomes part of the architectural definition, subject to the importance of the human scale and habitation.

Smithson calls Olmsted America's first "*earthwork artist*" (Smithson, p. 123), in that, instead of celebrating, idealizing, and abstracting nature, he is accepting that man alters his environment and proceeding to make his art for people to experience within. Smithson quotes Lewis Mumford, quoting Charles Elliott Norton, on Olmsted's importance.

When Charles Elliott Norton said of him (Olmsted), towards the close of his career, that of all American artists he stood "first in the production of great works which answer the needs and give expression to the life of our immense and miscellaneous democracy" he did not exaggerate Olmsted's influence.

-Lewis Mumford, "The Brown Decades" (Smithson, p. 126)

The position of Olmsted can also be the position of making a settlement in the landscape. The art is not the beauty of the objects themselves. Rather, it is how rich the human experience is within the work. Olmsted had his own interpretation of beauty and the experience of the landscape.

Beauty, grandeur, impressiveness in any way, from scenery, is not often to be found in a few prominent, distinguishable features, but in the manner and the unobserved materials with which these are connected and combined. Clouds, lights, states of the atmosphere, and circumstances that we cannot always detect, affect all landscape, and especially landscape in which the vicinity of a body of water is an element. (from Roland Hobbs, Robert Smithson: Sculpture, Cornell University Press, Ithaca and London, 1981, P. 54)

Transformation of the landscape with natural elements is going to alter not only the visual experience, but it can also change the climatic conditions. The shelter made by the cut in the prairie and the canopy overhead will affect more than just spatial definition. Both the natural and built systems deployed can affect light, temperature, wind, and sound. The cut brings water, needed for cooling of machinery and interior climate control in any event, into and under the main facilities. The large body of water contained to the west will bring cooler air into the settlement. The sunken, collective area will, at the same time, offer some shelter from stronger winds which

may pass above. The main climatic function of the canopy overhead is to control the intense Texas sun.

An initial action of settlement in this environment is to make shade. The extensive roof is intended to make an interior and exterior territory shaded from direct sunlight yet illuminated by a more diffuse light.

The importance on the effect and interaction of physical elements is complementary to the way Smithson views Olmsted's work. He relates it to theories of dialectics, calling Olmsted one of the "*forerunners of a dialectical materialism applied to the landscape. Dialectics of this type are a way of seeing things in a manifold of relations, not as isolated objects. Nature for the dialectician is indifferent to any formal ideal.*" (Smithson, p. 119)

In another essay, "Cultural Confinement," Smithson pursues this notion of the multiplicity of relationships in the way nature is experienced. "*Many parks and gardens are recreations of the lost paradise or Eden, and not the dialectical sites of the present.*" ("Cultural Confinement", from The Writings of Robert Smithson, p. 133) The park or garden, as an entity in itself, is not to be experienced as an isolated whole in these terms. There seems to be implicit a constant reference to a larger context and a set of multiple experiences.

I am talking about a dialectics of nature that interacts with the physical contradictions inherent in natural forces as they are - nature as both sunny and stormy. Parks are the idealizations of nature, but nature in fact is not a condition of the ideal. Nature does not proceed in a straight line.

(Smithson, "Cultural Confinement", p. 133)

Not only is this connected to the definition and quality of space being determined by the deployment of physical elements, but it also touches on a problem brought up by the opportunity to make new settlements.

The transformation of a landscape by landscaping can aid in controlling climate, defining space, and determining the quality of the environment. In the extreme, it can also be thought of as an importation of a different, alien environment on to an existing one. Much of the lush vegetation surrounding California coastal settlements is alien to the fields of gold grass that cover unaltered parts of the coast. Eastern and European trees were introduced to western towns to 'civilize' them in their early years of growth. Desert towns such as Palm Springs are examples of barren lands being completely altered by the introduction of water and vegetation.

Rene Dubos, a famous microbiologist, experimental pathologist, and author wrote an essay discussing the relationship between the physical transformation of a landscape and how the perception of its qualities can affect us.

Some of the landscapes that we most admire are the products of environmental degradation. The denuded islands of the Aegean Sea, the rocky shores of the Mediterranean basin, the semiarid area of the American Southwest are regions that appeal to countless people from all social and ethnic groups, as well as professional ecologists. Yet these landscapes derive much of their color and sculptural beauty from deforestation and erosion, two cardinal sins of ecology.

(Rene Debois, "A Family of Landscapes, The Wooing of Earth", taken from The McGraw Hill Reader, second edition, Gibert Muller, ed., p. 74)

Focusing the essay on a particular environment he states, "*what we now regard as the typical Greek landscape, often stark and treeless, is the result of human activities.*" (p. 75) The qualities we admire were not intended. They were a result of a different human process.

The humanization of the Greek wilderness has been achieved at great ecological loss. Writers of the classical, Hellenistic, and Roman periods were aware of the transformations



Delphi, theatre and temple of Apollo
(Norberg-Schultz, Christian, Genius
Loci: Towards A Phenomenology of
Architecture, Rizzoli International
Publications, Inc., New York, 1984)

brought about by deforestation in the Mediterranean world. In Critias, Plato compared the land of Attica to the "bones of a wasted body... the richer and softer parts of the soil having fallen away, and the mere skeleton being left. (p. 75)

Other observers see the Greek landscape as a symbol of its cultural achievements. "*The Greek poet Kostas Palamas sees in the stark eroded structures of the present landscape a symbol of the austerity and purity of the Greek genius; the landscape proclaims the 'divine nudity' of Greece.*"

(p. 76) *"Henry Miller... marvels at the quality given to the landscape by the rocks that 'have been lying for centuries exposed to this divine illumination... nestling amid dancing colored shrubs in a bloodstained soil.' In Miller's words, these rocks 'are symbols of life eternal.'"* (p. 76)

To what extent the nature of the Greek landscape determined the course of thought and culture is to be debated. What seems true is the fact that one can experience a landscape and have an interpretation of it on other levels. The desert or a forest affect different people in different ways. Dubos concludes his essay postulating that a range of qualities may promote rich experiential opportunities.

The full expression of the Mediterranean genius may require both the cool mysterious fountains in the sacred groves and the bright light shining on the sun-loving plants amid the denuded rocks. Ecology becomes a more complex but far more interesting science when human aspirations are regarded as an integral part of the landscape. (p. 76)

-Rene Debois, "A Family of Landscapes, from The Wooing of Earth" (taken from The McGraw Hill Reader, second edition, Gibert Muller, ed.

The attitude kept for the Texas project, and substantiated by Smithson, is to always keep the qualities of the existing landscape, and heighten the experience of those qualities. As in Christo and the other environmental artists, it seems possible to set up a relationship of both quality and space, when none of the elements deployed are considered the single object of focus. The qualities of the existing landscape will remain. The wide open, 'infinite' extension of space may promote a certain type of experience useful in the field of research. What is given is a place to view this quality with security.

Where the landscape is transformed, it is always done so in relation to another physical element. Never is the garden a single entity, although one may be 'in' the garden.

RELATIONSHIP BETWEEN PHYSICAL ELEMENTS

The same set of spatial and physical relationships that connect the settlement with its surroundings must also be present at other sizes to accommodate the individual. Relationships between the physical elements make the range of experiences within the settlement, and also produce a logical understanding of the new environment. The formation of settlement and place comes from an accumulation of dialectical relationships such as light-dark, light-heavy, movement-stasis, containment-extent, and large-small, a process related to Aldo Van Eyck's idea of twin phenomenon.

A dialectic based on reciprocity and equality is a nimble and penetrating one - because it makes cross-alliances between diverse twin phenomenon possible, which affects (alters without distortion) their assumed meanings, imparting an added - often unexpected - dimension. Only in each other's light are binary aspects rendered tangible, can they be assessed and the meaning within each dichotomy clarified.

(Aldo Van Eyck, Aldo Van Eyck, Stichting Wonen, Amsterdam, 1982, p. 45)

Like Olmsted, at the level of landscapes, Van Eyck reduces the importance of the object in favor of the spatial relationship that the elements can make. In both, this emphasis is for the service of the human experience within one of their works.

Examples from art show how this combination of elements affects not only their object quality and their physical and spatial relationship within a field, but can also question our preconceptions of their forms.

Marcel Duchamp's bicycle wheel attached upside down to a stool demonstrates this. The work consists of two recognizable objects placed in such a way that neither can be used in its conventional manner. This construction brings not only new attention to the physical characteristics of each of objects, but also to a third condition, the relationship between the two. Each is whole, yet interfered with. This questions what is an object and what are the possibilities when physical forms are combined or reconfigured. The stool can no longer be sat on. The wheel no longer rolls on the ground, but the physical qualities of each are not destroyed or abstracted. The stool still sits on the ground, is subject to gravity, and keeps its constructional integrity. The wheel, also not dismantled or distorted, keeps its kinetic potential as it would spin freely if spun.

Kazimir Malevich's "Red and Black Square" is an abstract, two-dimensional example of objects in a larger relationship. Although the two squares are shifted at angle from one another they are constructed with each other and the frame of the canvas edge with dimensions. Again the



Bicycle Wheel, 1913,
by Marcel Duchamp (ADAGP,
Paris/Cosmopress Genève,
Museum Ludwig, 1986)

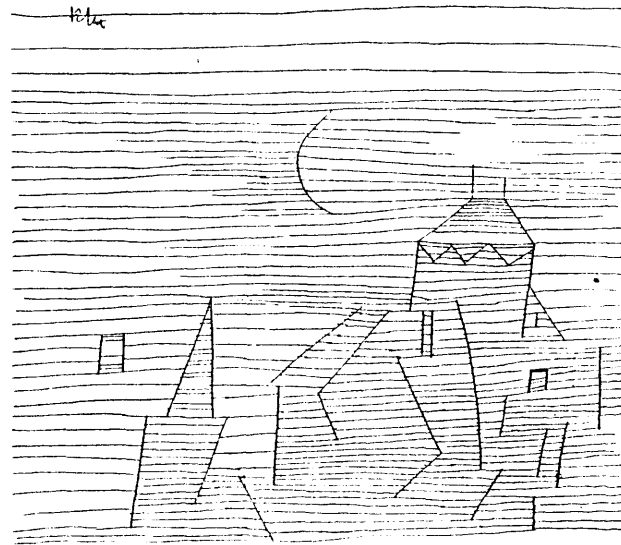
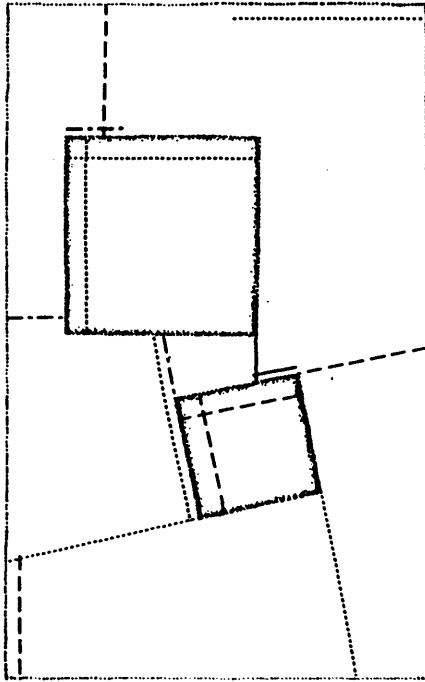


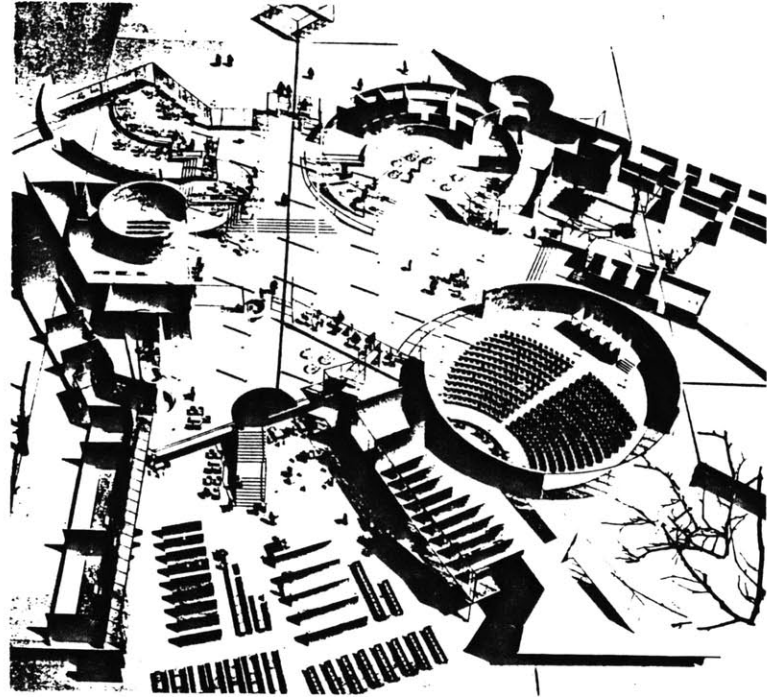
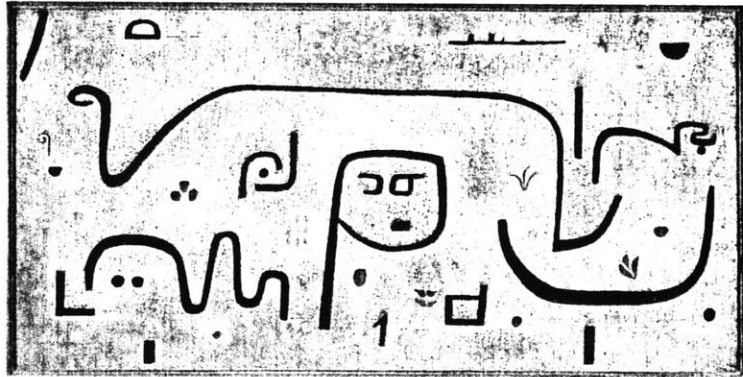
Diagram of Kasimir Malevich's **Red and Black Squares**, 1915. ("Dimensional Self-Stability and Displacement in Field-Ordered Directional Alternations", Smith, Maurice K., *Places* v.5, #2, pp.72-85.)

Castle of a Religious Order, (Paul Klee, 1929, Pen, 11-1/4 x 9--5/8 in.)

object is not the single focus. Instead, the object, the spatial relationship between the objects, and the context, or field, is also part of the consideration. The rigor of a dimensionally constructed composition does not result in the hierarchical formation of parts making up a single entity.

Paul Klee's constructed paintings demonstrate the coexistence of the object and the field. Entire 'landscapes' are composed by deploying marks, zones of color, and figural objects in a dimensionally constructed process. The more object-like parts of the painting can have the lines of the field be part of their make up, as exemplified in "Castle of a Religious Order". Or, as in "Insula Ducamara", the marks of the painting have a relationship to implied referential lines and dimensional relationships to each other and the edge of the painting.

This type of construction has a architectural counterpart in Gunter Behnisch's project the German National Library, in Frankfurt. Like the African village, the collective space is defined by



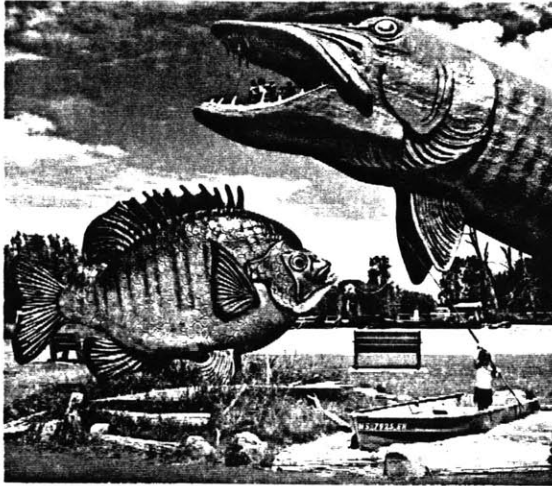
objects and partial definitions. Although a seemingly loose assemblage, the plan is constructed with dimensional relationships between the elements.

Another aspect of this type of handling of physical elements is the relative independence and understanding of each physical system. In Duchamp and Klee, the viewer can also focus on the individual qualities of the parts. One's ability to distinguish both the whole and the parts is based on the elements' being discrete and their retaining their qualitative integrity.

Our present physical environment is currently full of strange juxtapositions of elements of different magnitude and scale.

Insula Dulcamara, (Paul Klee, 1938, oil and black paste on newspaper mounted on burlap. 34-5/8x69-1/4 in. Kunstmuseum Bern, Paul Klee Stiftung, Photo by Gerhard Howlald, Bern.)

German National Library, Frankfurt am Main, Gunter Behnisch. (Behnisch & Partner Architects Designs 1952-1987, Stuttgart: Ed. Cantz, 1987)



"Expelled from the smaller friendlier world in which previous centuries of men moved with a confidence born of familiarity, we are today compelled to cope with an expanded scale of events in a big alien redefined world....We have not yet found our places in this redefined world."

(Gyorgy Kepes, Structure of Art and Science, George Braziller, New York, 1965)

This seems to be parallel to Smithson's attitude that it is necessary to acknowledge the reality of our current environment. Highways hover over houses, mini-malls and parking lots are built next to cemeteries in a way in which the extreme differences of magnitude and quality are not controlled within an integrated vision.

There exist places in the landscape that are not settlements in our traditional notion. Besides built environments devoted to industry are settlements geared toward entertainment and consumption, what Edward Relph terms '*other-directed places*.' For him this landscape of tourism is typified by what J. B. Jackson has called '*other-directed architecture*' - that is, architecture which is deliberately directed towards outsiders, spectators, passers-by, and, above all, consumers. The total effect of such architecture is the creation of other-directed places which suggest almost nothing of the people living and working in them. (Edward Relph, Place and Placelessness, Pion Limited, London, 1976, p. 93)

We stopped on the prairie at a place with huge white plaster dinosaurs standing around in a circle. There was no town. Just these dinosaurs with lights shining up at them from the ground.

...We weaved slowly in and out through the dinosaurs. Through their legs. Under their bellies. Circling the Brontosaurus. Staring up at the teeth of Tyranosaurus Rex. They had these little blue light for eyes.

(Sam Shepard, Motel Chronicles, p. 9)

"National Freshwater Fishing Hall of Fame, Hayward, WI," (Graham, David, 1984, Photo, Fotofolio, New York, New York)

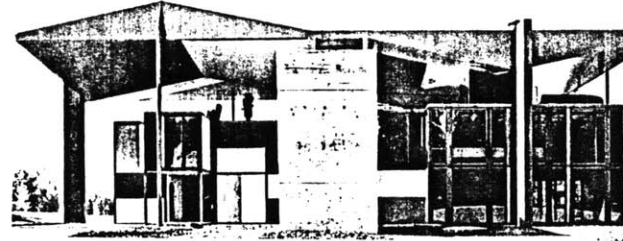
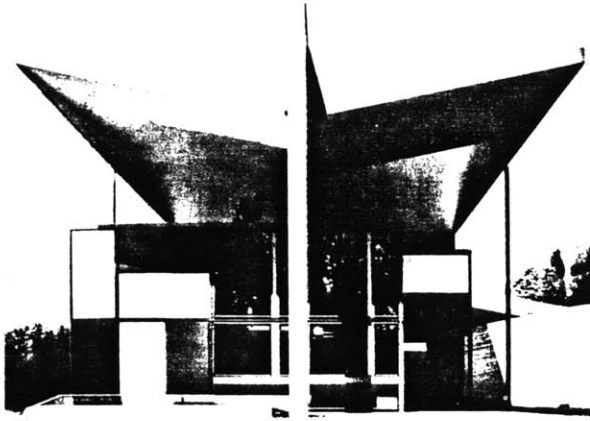
We now inhabit a world in which we are confronted with isolated places which were conceived with single, specific purposes. The challenge of Kepes' quote seems to require an engagement of the physical world at a range of sizes, with the intention of making places that are not monotonous or singular in their experience.

The problem of size and scale is especially evident when building next to the presence of the collider and within the scale of the prairie landscape. Kepes discusses the problem of working in an unconventional situation.

When unprecedented aspects of nature confront us, our world model inherited from the past becomes strained; the new territory does not belong to it. Disoriented, we become confused and shocked. We may even create monsters, using old outworn images and symbols in an inverted negative way. Manipulating them, amplifying them, we invent new Minotaurs and new mazes until we find new meanings and symbols growing from the new world." (Gyorgy Kepes, The New Landscape in Art and Science, Paul Theobald, Chicago, 1956, p. 18)

The proposed method of dealing with the incredible range in scale from the landscape and the mechanism to the individual and collective is by a positioning of a range of physical elements and systems. The elements establish sizes by repetition and by building common sizes between them. This ranges from the mounds marking similar distances from the collider to the settlement, or from the mounds to each other, to a relationship between the width of a collective work area to its extension out to unsheltered landscape.

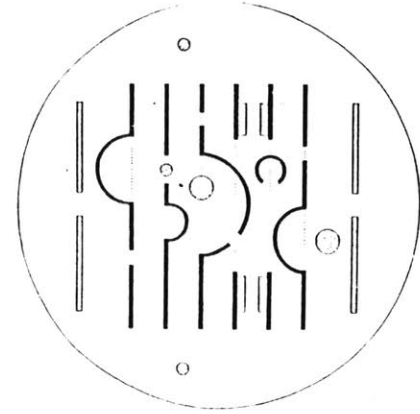
The use of many physical systems is also to avoid the parts of a built environment adding up to a single entity. This avoidance of completion is countered by partial definitions producing a multiplicity of associations. When a space is defined by more than one type of element there can be an understanding of both the particular location and the system's



continuation. The roof's size and the strong direction of the light-controlling fins define the top of a particular area, but also imply its continuation over the majority of the settlement. This dual understanding is a physical way of mediating between the different sizes.

The relative independence of building systems allows for each to have their own order, while their intensification and interaction with other systems make a full range of possibilities.

Two architectural examples set precedent for this method of building and defining space. In Le Corbusier's Heidi Weber Pavilion, 1963, and van Eyck's Sonsbeek Pavilion, 1966, are both assemblages of discrete architectural elements. The qualitative and spatial independence of the built systems, roof, wall, platform, ground form, add up to architecture whose experience within has a many conditions. The concrete walls in van Eyck's pavilion don't coincide with either the extent of the platform or the roof. They are understandable in themselves, and set up intermediate



relationships with the other elements.

Sometimes one is within the walls and sheltered above. Other times one is within the walls and the sky is open to view.

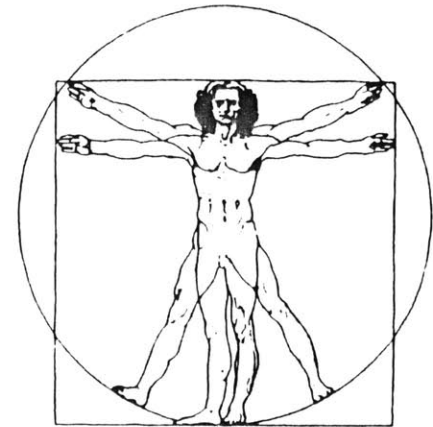
The large roof in Corbusier's pavilion is a separate element from the structure of enclosure. It defines the pavilion's territory, within which one may be inside or outside. The exterior stairs, separate in construction, quality, and space act as a counterpoint to the hovering roof.

The building and landscape systems in the SSC working settlement are positioned to define space with a range of experiential qualities. Relatively smaller spaces are often defined by the shifting or passing of larger elements. Columns define areas of vertical access and the extension of the built territory out into the landscape. This strategy is used from the landscape size, where the mounds and cut in the earth are placed in relation to existing elements to begin to delimit size and define place, to a small collective area within the working territory that is defined by the opening and shifting of larger work clusters.

Sonsbeek Pavillions, 1966, by Aldo Van Eyck (Aldo Van Eyck, Hertzberger, H., von Roijen-Wortmann, A., and Strauren, F., Stichting Wonen, Amsterdam, 1982)

THE INDIVIDUAL WITH THE ENVIRONMENT

The importance of the quality and definition of space is seen when the position of the individual in the environment is considered. The form of the surroundings can affect the way the space is experienced. The position of the human is linked to a dialectics of physical elements. The relationships between physical elements are only important in their effect on habitation. Through a generalized progression through some of the ways the human position is seen relative to the environment, it will be proposed that the individual's relationship to the landscape can be one of interconnectedness. The human figure, like the other physical elements, is not to be considered as the single focus, or as an isolated object. Instead, the individual is considered part of his or her surroundings. The progression leads to how individuals gather and to how one's surroundings can affect the settlement.



In many disciplines, and in many periods of history, the individual has been considered as his or her own center. This centrality ranges from Leonardo da Vinci's drawings with man centered in geometrical and proportional 'purity,' to Gaston Bachelard's discussion on being as essentially round. In the essay, "The Phenomenology of Roundness," Bachelard states that many aspects of being, especially mental functions like imagination, have been thought of as round, or centered. This would make the boundaries of being equal on all sides and potentially spherical. He observes that this form would be difficult form to describe being.

After Leonardo's da Vinci's Man
(Source unknown)



...when a geometrician speaks of volumes, he is only dealing with the surfaces that limit them. The geometrician's sphere is an empty one, essentially empty. Therefore it cannot be a good symbol for our phenomenological study of roundness.

(Gaston Bachelard, The Poetics of Space, Beacon Press, Boston, 1969, p. 235)

He states that "*images of full roundness help us to collect ourselves, and to confirm our being intimately, inside. For when it is experienced from the inside, devoid of all exterior features, being cannot be otherwise than round.*" (Bachelard, p. 234) This is then a process of separation. "*(The poet) knows that when a thing becomes isolated, it becomes round, assumes a figure of being that is concentrated upon itself.*" (Bachelard, p. 239) He uses a poet's example of a lone tree as the center of its surroundings.

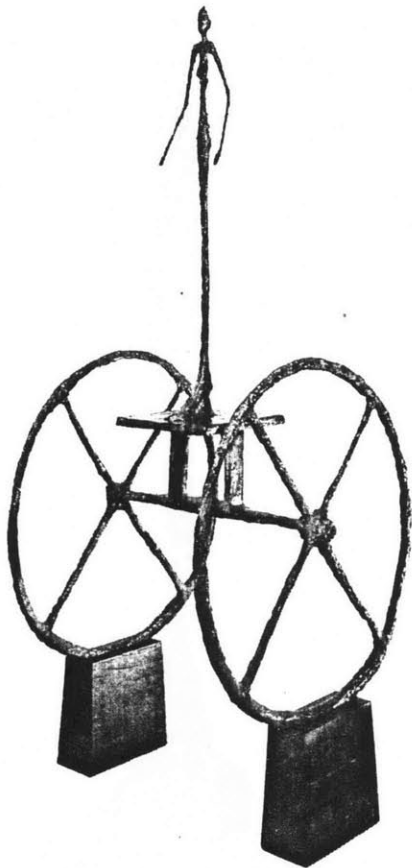
Landscape near Kinsley, KS, 1973
(Gohlke, Frank, Landscapes from
the Middle of the World, The Friends
of Photography, 1988)

Compared to a dialectical approach, this seems to be a mental process of isolation, abstraction, and separation. Both man as a center and things as single entities seem contrary to the observation of the physical world in terms of its manifold relationships. The isolated tree in the Texas prairie immediately reveals the vastness of the plain and the immensity of the sky. The eye naturally moves from element to element, the mind chooses how this information is processed.

The sculpture of Alberto Giacometti shows three potential relationships of the individual to his or her world. One, is the figure in isolation, simply a standing man or woman on a base.

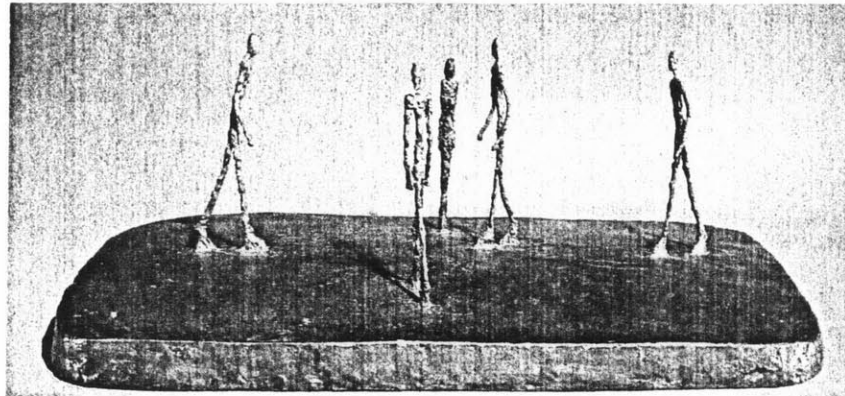


Woman of Venice VI (Alberto Giacometti, 1956, Bronze, 2/6, 52-3/4x6-1/4x12-3/4 in. Meadows museum, So. Methodist University, Dallas, photographer not credited)



The Chariot (Alberto Giacometti, 1950, Bronze on Wood base, 4/6, 64-5/8x27x26-3/8 in. National Gallery of Art, Washington D.C. photographer not credited)

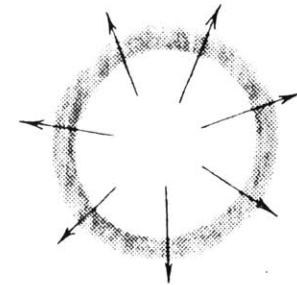
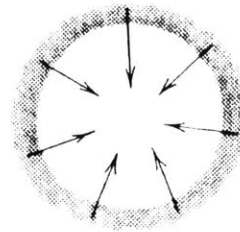
City Square II (Alberto Giacometti, 1948, cast 1949, Bronze, 1/6, Alexis Rudier Foundry, 9-1/2x25x17-3/8 in., Albert A. List Family collection, New York. Photo by Lee Stalsworth)



A second introduces the man-made object into the situation. The figure stands, separated from the ground, on a wheeled carrier. The man-made element sits on the base, or the ground. This work can represent the triangle of the individual, the products of his or her labor, and the environment. An intimate relationship between a person and the physical world is often buffered by something man-made.

A third Giacometti sculpture introduces gathering or place. Five figures moving toward and by one another are composed on a base. The potential for movement and interaction begins to bring up the importance of location and proximity in defining a place. The grouping of these figures on a flat, confined plate establish the minimum conditions for gathering.

Turning to the human position in terms of settlement, the extreme of the idea that only humans are necessary for gathering is seen in Super Studio's vision of life on a uniform grid.



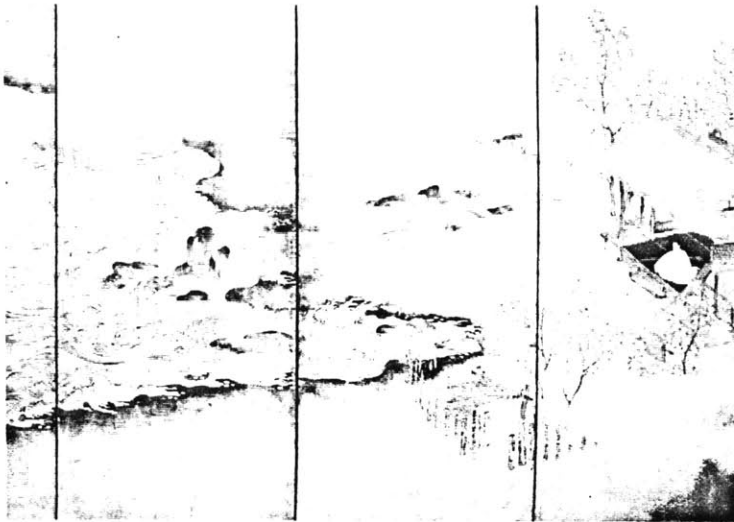
This takes the stance that physical definition is unimportant in affecting human activity. This can be compared rather dramatically to van Eyck's diagrams on centrality.

People seated concentrically in a hollow, gazing inwards towards the center, and people seated concentrically on a hill, gazing outwards towards the horizon. Two kinds of centrality. Two ways of being together - or alone. The images, of course, have ambivalent meanings - though the hill reveals what the hollow may conceal: that man is both center-bound and horizon-bound (the horizon and the shifting center - the center and the shifting horizon). Both hill and hollow, horizon and center, are shared by all seated concentrically either way; both link and both lure.

(Aldo van Eyck, Aldo van Eyck, p. 45)

"Superstudio promises us an infinite gridded platform for complete freedom from place" (Bloomer, Kent c. and Moore, Charles W., Body, Memory, and Architecture, Yale University Press, New Haven, Connecticut, 1977)

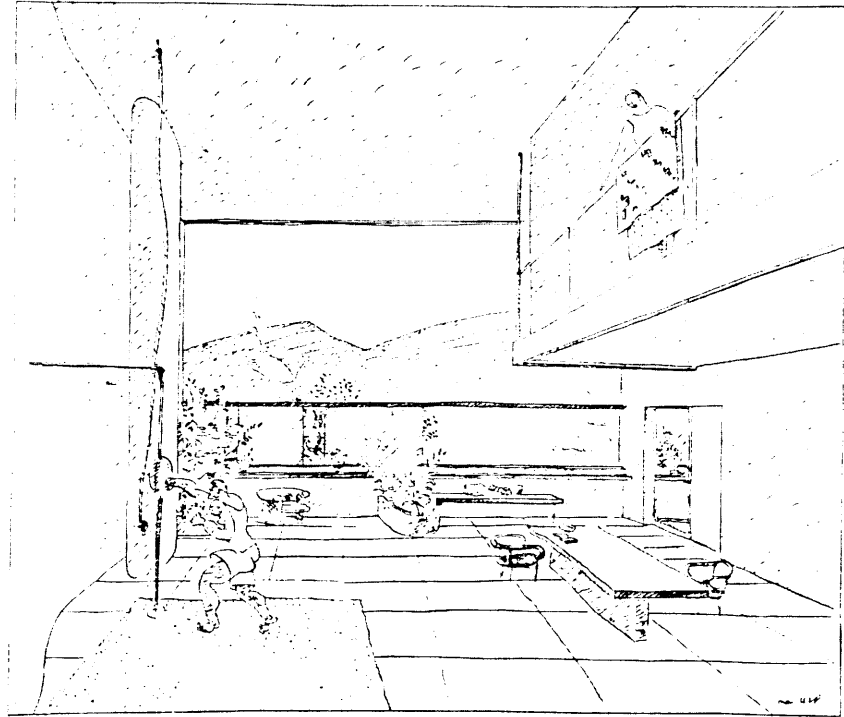
Concentricity, hollow vs. hill diagram (Hertzberger, Herman, von Roijen-Wortmann, Addie, and Strauren, Francis, Aldo Van Eyck, Stichting Wonen, Amsterdam, 1982)



"An Exiled Emperor on O Kinoshima
(detail)" (Mitsushige, Tosa, 1550,
Kimball Art Museum, Fort Worth,
Texas)

On the vast Texas prairie, the sensation of the Super Studio vision was not too dissimilar. There are, however, few signs of human habitation in the open landscape. Even the cows tend to concentrate in sheltered areas. There is a desire to establish definitions like van Eyck's hollow and hill within the extended landscape. These intensifications and definitions of space are intended to allow for the individual and the collective experience in dialectical relationships of shelter and exposure, confinement and extension.

A relationship in which the human has a visual and physical association with the



landscape is one of interconnection and equal significance. In many Japanese paintings, the individual is viewing the landscape from a sheltered area. Natural elements are both on the horizon and in close proximity. The asymmetrical composition reflects the importance of the relationship between the individual and his or her environment. In the sketches of Le Corbusier, the extending landscape is often an important element. Large views are framed for the inhabitants of the dwelling, but the spaces are not solely for the purpose of viewing. The natural world become a part of everyday life.

The Natural Man: from Le Corbusier Oeuvre Complete, 1910-1929.
(Rowe, Collin, and Koetter, Fred, Collage City, M.I.T. Press, Cambridge, Massachusetts, 1978)

CONFIGURATION OF THE INSTITUTION

The workings of the institution determine its organization. The setting for work is defined to provide for both the needs of the individual and the collective. The configuration of the research facilities is geared toward defining the variety of spaces required by the program and to offer places of other human needs. Three main aspects of the design describe the organization of the institution. A range of smaller elements are deployed within this framework.

The cut in the land is not only a vertical edge, but establishes a zone of space. It organizes the main movement of elements and people and opens up the main collective garden near its center. Changing along its course, the mark is first defined as a smooth drop of the earth where it provides the edge to the water and connection to the Linac. It then becomes the open edge

of the underground structures of the control room, computer room, and access between the three office wings. The mark then returns to being a depression of earth as it goes through the trees to the recreation area. It is possible to move entirely indoors throughout the main parts of the working facility along the edge of the curve. A second movement pattern is exterior, through the covered garden, then up into the various pieces of the complex or laterally into the theaters.

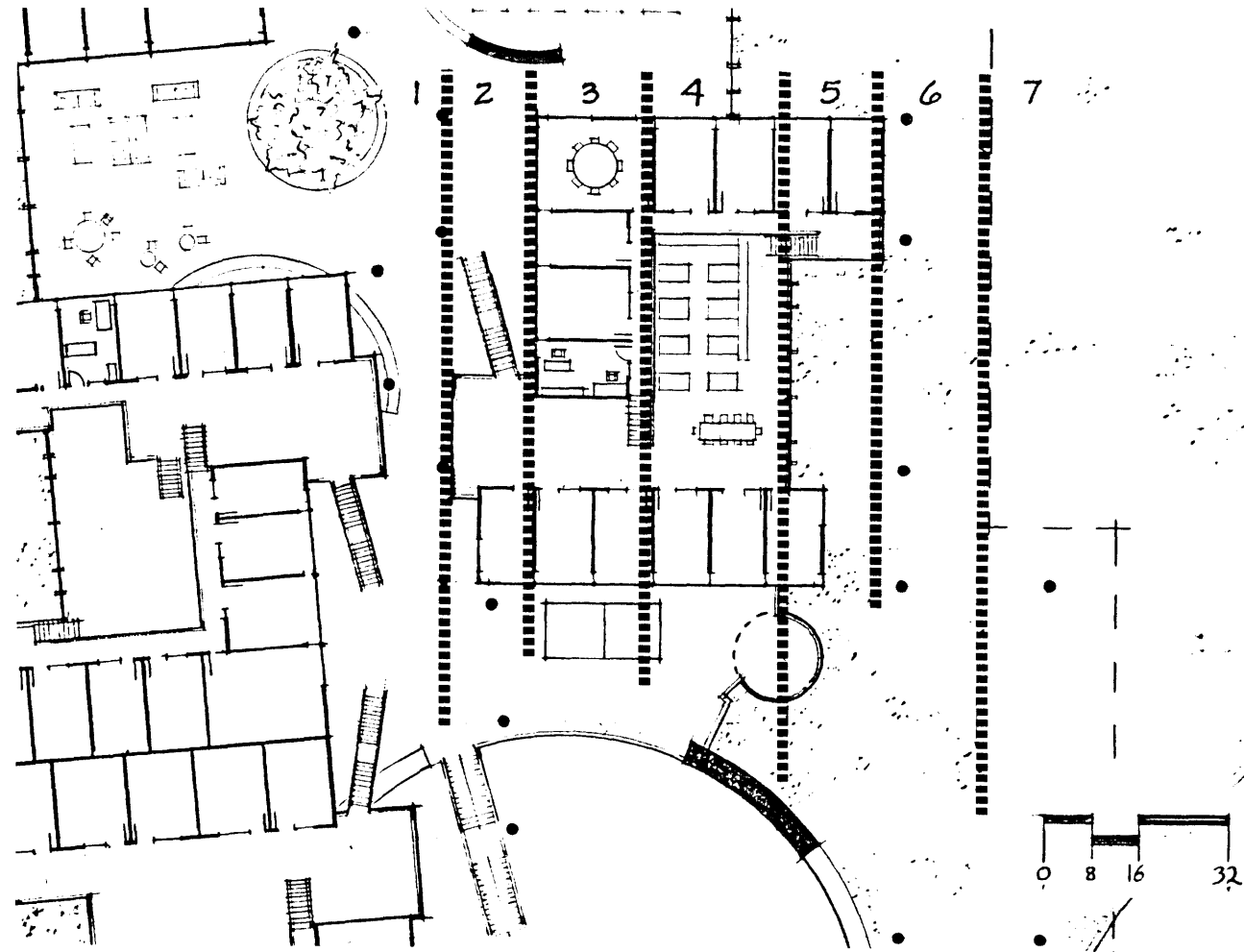
The roof structure defines the second aspect of the organizational scheme. Both the individual light fins and the three main roof sections run normal to the earth cut. This establishes the movement to and away from the central area. The extensions of the roof beyond the enclosure define the main entrance to the complex and the garden areas.

The institution requires working situations that allow for both individual and collective efforts. The concrete structure from which the roof hangs also establishes two working space conditions. A series of office clusters hang from the primary structure, defining collective areas between the individual offices. Below, the space, free of many structural elements, is more suited for laboratories and open office planning. When conducting interview at the National Center for Atmospheric Research in Boulder, Colorado, these two conditions were preferred by different types of workers. Laboratory scientists prefer spaces with long spans to be able to reorganize the space according to equipment and the particular experiment, while office workers tend to want a private office.

This third aspect organizes the office space in three wings. The clusters are developed as a transformation of conventional office configurations. The clusters are deployed to establish movement between them, and to define more open, double-height working areas along this access. The transformation of the office configuration allows for individual and small collective situations within the larger working environment. Instead of a double-loaded corridor, where the shared space among the offices is the size and form of the corridor, the offices take on a broken U-shape. This provides a collective area for the grouping of offices and a connection to the major access system. The exchange between the cluster and the access is accomplished by displacing one of the arms of

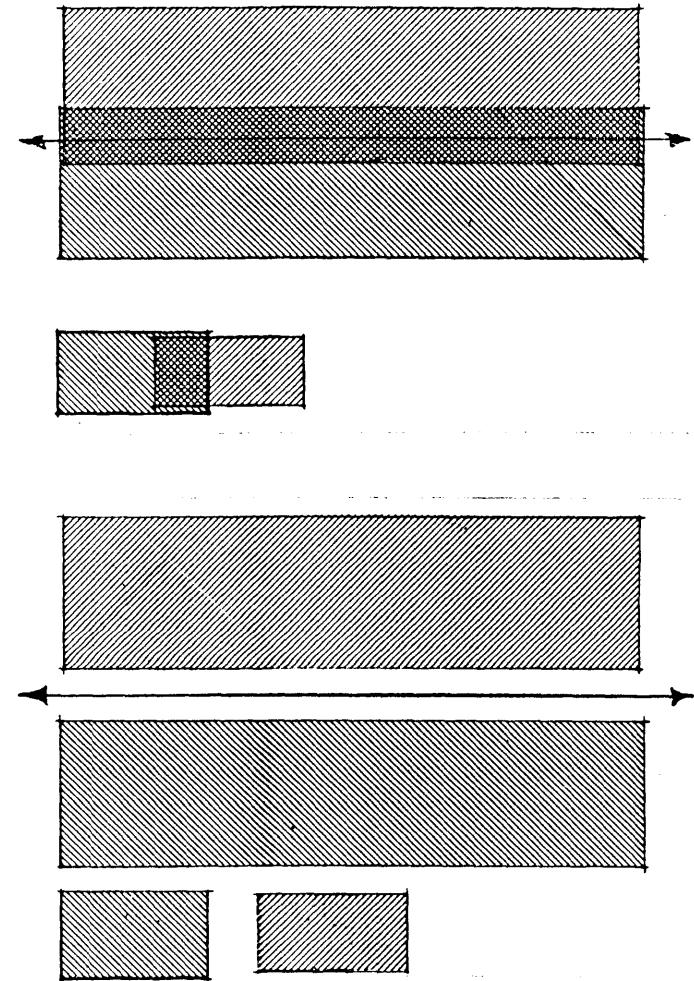
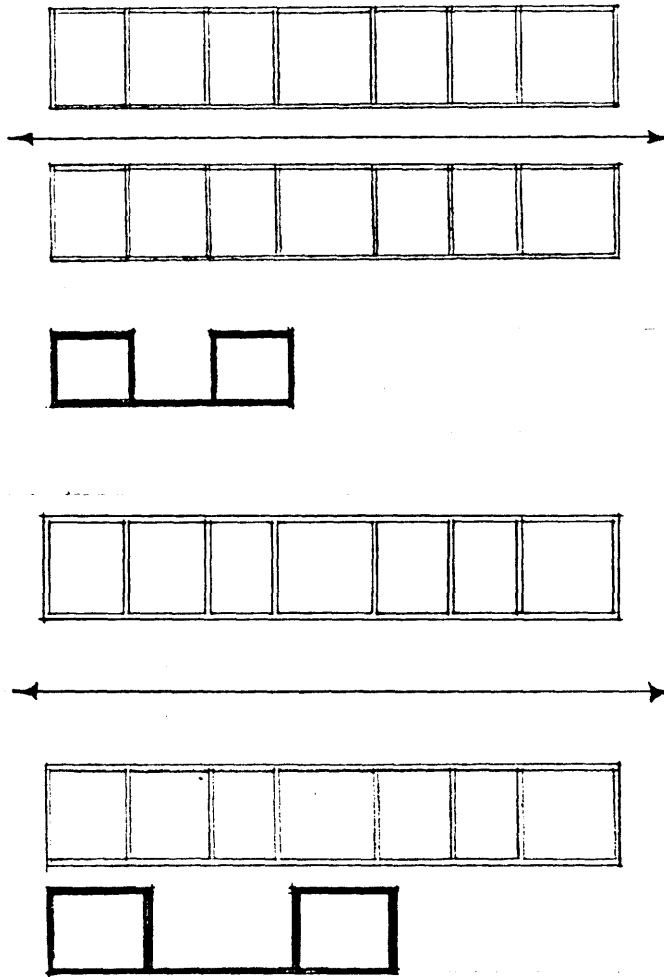
the 'U' out and down toward the access. Within the cluster, offices are grouped around small collective areas. These areas can contain more individual work stations, group areas, or be open to the floor below.

The workings of the institution determine its organization. The definition of form responds to the types of work situations and communication to be conducted. The configuration provides for both a clarity of movement and the possibility of interaction between the workers. Spaces for the individual and for gatherings of different sizes allow the institution to function.



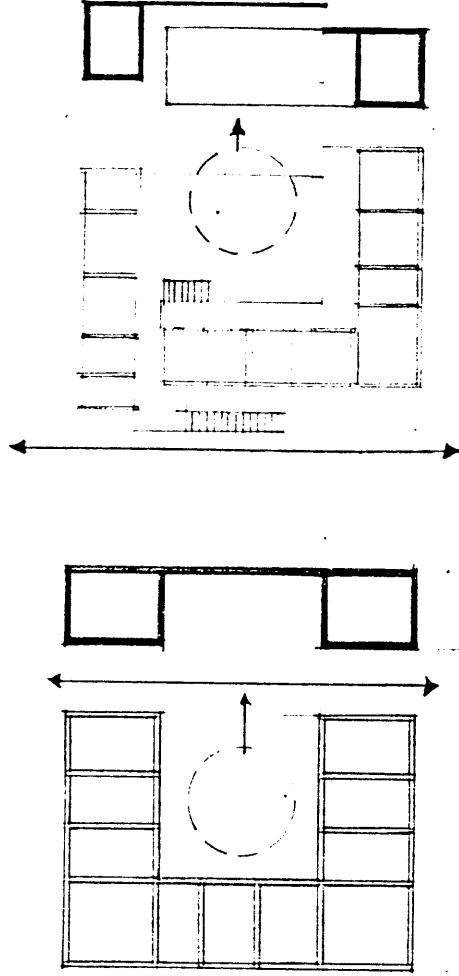
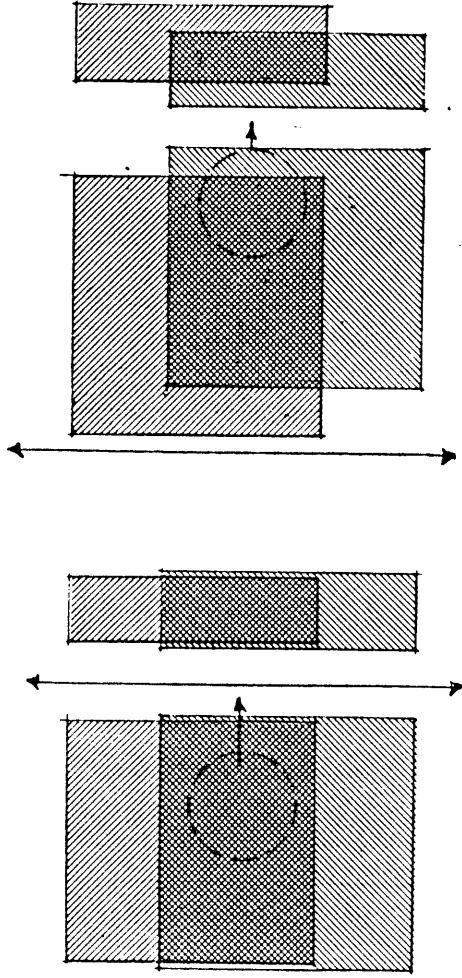
ZONES IN PLAN

The U-shaped office clusters are broken and one piece is displaced out and down toward the major access. This defines an exchange between the collective movement system and the office cluster. The shift also produces an exchange between the cluster and the exterior.



TRANSFORMATION OF THE OFFICE CONFIGURATION

In a double loaded corridor configuration, the shared space between offices is the dimension and form of the corridor. Even when widened, the form still defines movement. A U-shaped cluster forms a collective space off the major access. A displacement of one arm of the 'U' produces a connection between the access and collective space.



A PLACE FOR SCIENCE

The juxtaposition of the subtitle of this section introduces an interesting conflict in an understanding of a settlement for scientific research. As opposed to a design which symbolizes science, this proposal stresses the importance of settlement as a place to be. Martin Heidegger declared that "*'place' places man in such a way that it reveals the external bounds of his existence and at the same time the depths of his freedom and reality.*" ("An ontological consideration of place", *The Question of Being*, Twayne Publishers, New York, 1958, P. 19) The experience of the settlement is to be one of a place within the landscape. It is the experience of being within but always knowing what is beyond. The settlement is not inclusive, instead it is always trying to express one's interconnection and association to many things. The 'place for

science' becomes a place to do science.

The difference between using science as a metaphor and making a place that accommodates the potential needs of the scientists begins with the type of thought processes one uses to engage the problem. The danger of mimicking or expressing the ways of science for the purpose of designing for it can result in the abstraction or distortion of the architectural problem. Edward Relph states that "*place and sense of place do not lend themselves to scientific analysis for they are inextricably bound up with all the hopes, frustrations, and confusions of life.*" (Edward Relph, *Place and Placelessness*, preface)

This difficulty of using a scientific approach as a way of understanding a 'sense of place' can be significant. A 'scientific approach' is here generalized as a specialized thought process striving for specific information. Although there are many branches of science that study the interrelatedness of things, such as ecology, science, for argument's sake, is thought of as a process that perceives natural phenomenon in a limiting way. It is a focusing and narrowing process, and it produces its own specialized worlds. It is related to the previous discussion on nature and language. A person's perception of the world can be determined by knowledge, education, or personal and cultural values one has. The child and a biologist can extract different pieces of information from the same natural phenomenon.

The philosopher Maurice Merleau-Ponty comments on the dangers of a scientific way of thinking being incorporated to understand and experience our everyday world. In the essay, "Eye and Mind," he calls for science to know its position.

For all its fluency, science must nevertheless understand itself; it must see itself as a construction based on a brute, existent world and not claim for its blind operations that constituting value which "concepts of nature" were able to have in an idealist philosophy. To say that the world is, by nominal definition, the object x of our operations is to treat the scientist's knowledge as if it were absolute, as if everything that is and has been was

meant only to enter the laboratory. Thinking "operationally" has become a sort of absolute artificialism, such as we see in the ideology of cybernetics, where human creations are derived from a natural information process, itself conceived on the model of human machines. If this kind of thinking were to extend its reign to man and history; if, pretending to ignore that we know of them through our own situations, it were to set out to construct man and history on the basis of a few abstract indices (as a decadent psychoanalysis and a decadent culturalism have done in the United States) - then, since man really becomes the manipulandum he takes himself to be, we enter into a cultural regimen where there is neither truth nor falsity concerning man and history, into a sleep, or a nightmare, from which there is no awakening. (Maurice Merleau-Ponty, from the essay 'Eye and Mind', The Essential Writings of Merleau-Ponty, Alden L. Fisher ed., Harcourt, Brace & World, Inc., New York, 1969, p. 254)

Science, in regards to the thesis argument is a form of abstraction, taking us further away from the experience of phenomena. It makes models of nature, but never is nature. In its process of analysis and experimentation, science turns the natural world into a system of information. This continually isolates us from their natural situations. The ever-increasing specialization of scientific research would be difficult to take as a model for a place for scientists.

Science manipulates things and gives up living in them. It makes its own limited models of things; operating upon these indices or variables to effect whatever transformations are permitted by their definition, it comes face to face with the real world only at rare intervals. Science is and always has been that admirably active, ingenious, and bold way of thinking whose fundamental bias is to treat everything as though it were an object-in-general - as though it meant nothing to us and yet was predestined for our own use. (Merleau-Ponty, p. 252)

The focus on the 'object' in the scientific thought process is necessary to factor out influences that would impede understanding. This isolation is opposite to the stance of the thesis, where objects are thought of with their surroundings. Science is in a process of perpetually limiting, where the goal is to isolate single elements, or verifiable relationships.

The design of a settlement sets out to increase the number of potential relationships to experience. It does so by understanding the connection between things, of which the human body is but one of many. The observation of the tree is not just the tree. The magnitude of the landscape and the isolation of the tree are only understood after their relationship to each other is perceived.

Visible and mobile, my body is a thing among things; it is caught in the fabric of the world, and its cohesion is that of a thing. But because it moves itself and sees, it holds things in a circle around itself. Things are an annex or prolongation of itself; they are incrustated into the flesh, they are part of its full definition; the world is made of the same stuff as the body. (Merleau-Ponty, p. 256)

Merleau-Ponty connects the body to the physical world in such a way that, for the world we experience, things only are important in, and cannot escape from, their relationship to each



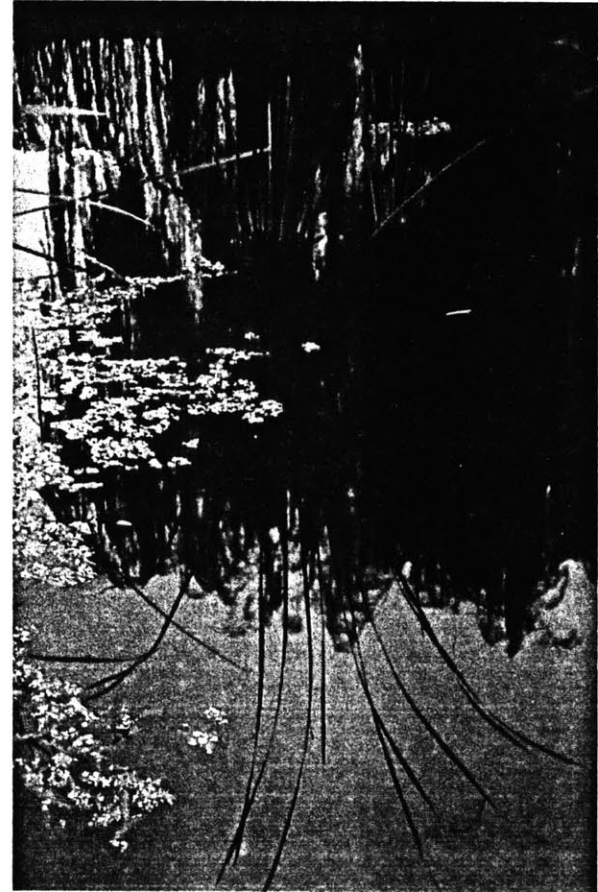
Computer generated image of data from a particle collision. (Courtesy of Fermi National Accelerator Laboratory.)

other. *The enigma is that my body simultaneously sees and is seen.* (Merleau-Ponty, p. 256)
The thinking process in which it would be possible to understand a sense of place is more closely akin to an artist's.

The painter "takes his body with him," says Valery. Indeed we cannot imagine how a mind could paint. It is by lending his body to the world that the artist changes the world into paintings. To understand these transubstantiations we must go back to the working,

actual body - not the body as a chunk of space or a bundle of functions but that body which is an intertwining of vision and movement.. (Merleau-Ponty, p. 255)

In opposition to his comments on the limitation of the role of scientific thought, Merleau-Ponty states that *"from the writer and the philosopher, in contrast we want opinions and advise. We will not allow them to hold the world suspended. We want them to take a stand."* (Merleau-Ponty, P. 254)



A park in Dallas Texas.
(Photo by the author)

C O N C L U S I O N

Merleau-Ponty's request turns the argument of the thesis back on to itself. In contrast to the potentially endless exploration process , of collection of more data, of observation of finer detail, and of analysis with increasing precision, there is the synthesis. It is the return from exploration, the momentary stop. The thesis becomes a collection of information for the purpose of rendering an opinion. This argument has attempted return to itself to point out the connection of all that has been discussed.

The relationship of the built form to the landscape, the position of the individual within both the built and natural environment, and the position of the thesis are one and the same. It is a position that states that settlement for human habitation is based on interrelatedness and directness.

Its goal, for the problem a settlement in the landscape, is to understand and propose a set of direct experiences of physical phenomenon for a particular situation. As a work, it fails in that to write about or draw physical definition and quality of space can only approach its potential manifestation because of the mediums' removal from the real thing. An argument for the experience of a settlement based of the experience of real sensations and qualities falls short in the absolute sense. What is argued for is the method or approach.

A model of a particular site cannot replace the site, but it tries to approach, as close as possible, the material and spatial qualities that exist. It becomes both personal and general in that the model becomes expressive and more 'real.' It conveys more of the information of the real site, but in terms of the maker's experience of the site. It attempts to be more phenomenological than abstract to offer an understanding of a setting for human experience.

The configuration of the settlement is proposed to be a construction from the position offered in the thesis. This position is based on providing the individual an experience exhibiting the interrelatedness and multiplicity of relationships between the built and natural environment. It poses to link the individual to the landscape with the architecture, and to set the built environment into the landscape in such a way as to reveal the qualities of both. Settlement, in these terms, is not thought of as a single entity. Rather, it is merely the extent of a gathering of many forces and conditions that constitute a place for human activity.

B I B L I O G R A P H Y

American Landscape Architecture: Designers and Places, The Preservation Press, Washington D.C., 1989.

Bachelard, Gaston, The Poetics of Space, Beacon Press, 1964.

Beardsley, John, Earthworks and Beyond, Abbeville Press, New York, 1984.

Behnisch & Partner Architects Designs 1952-1987, Stuttgart: Ed. Cantz, 1987.

Besset, Maurice, Le Corbusier: To live with Light, Rizzoli International Publications, New York, 1987.

Bloomer, Kent c. and Moore, Charles W., Body, Memory, and Architecture, Yale University Press, New Haven, Connecticut, 1977.

Bruno, Claudio, Le Corbusier, N. Zanichelli Editore S.p.A., Bologna, Italy, 1977.

Ceram, C.W. , The First Americans: A Story of North American Archeology

Emerson, Ralph Waldo, Selected Essays, Penguin Classics, New York, New York, 1982.

Fabos, Julius, Milde, Gordon T., and Weinmayr, V. Michael, Olmsted, Frederick Law Sr., University of Massachusetts Press, Massachusetts, 1988.

Fisher, Alden L., ed. The Essential Writings of Merleau-Ponty., Harcourt, Brace & World, Inc., New York, 1969,

Fletcher, Valerie J., Alberto Giacometti, 1901-1966, Smithsonian Institution, Washington D.C., 1988.

Gohlke, Frank, Landscapes from the Middle of the World, The Friends of Photography, 1988.

Gyorgy Kepes, Structure of Art and Science, George Braziller, New York, 1965

Heizer, Michael, Effigy Tumuli, text by Douglas C. McGill, Harry N, Abrams, Inc., New York, 1990.

Heizer, Michael, Sculpture in Reverse, Julia Brown, Ed., Museum of Contemporary Art, Los Angeles, California, 1984.

Hertzberger, Herman, von Roijen-Wortmann, Addie, and Strauren, Francis, Aldo Van Eyck, Stichting Wonen, Amsterdam, 1982.

Higuchi, Tadahiko, The Visual and Spatial Structure of Landscape, translated by Charles Teny, M. I. T. Press, Cambridge, Massachusetts., 1989.

Holt, Nancy, Ed., The Writings of Robert Smithson, New York University Press, New York, 1979.

Klee Drawings: 60 works by Paul Klee, Dover Publications Inc., New York, 1982.

Lanchner, Carolyn, Ed., Paul Klee, Museum of Modern Art, New York, 1982.

Le Corbusier, Journey to the East, M.I.T. Press, Cambridge, Massachusetts, 1987.

Moholy-Nagy, Sibyl, Native Genius in Anonymous Architecture in North America, Schocken Books, New York, 1976.

Morrison, Philip & Phyllis, and the Office of Charles and Ray Eames, Powers of Ten, Scientific American Books, distributed by W. H. Freeman and Co., New York, 1982.

Muller, Gilbert H., The McGraw-Hill Reader, McGraw-Hill Press.

Museums and Monuments series, The Man-Made Landscape, UNESCO, Lausanne, 1977.

Norberg-Schultz, Christian, Genius Loci: Towards A Phenomenology of Architecture, Rizzoli International Publications, Inc., New York, 1984.

Ponge, Francis, Vegetation, Red Dust, New York, 1976.

Porter, Eliot, American Places, with text by Wallace Stegner and Page Stegner, Greenwich House, Dist by. Crown Publishers, Inc., New York, 1987.

Ralph Waldo Emerson, Selected Essays, Viking Penguin Inc. 1982, p. 48

Relph, E., Place and Placelessness, Pion Limited, London, 1976.

Roland Hobbs, Robert Smithson: Sculpture, Cornell University Press, Ithaca and London, 1981

Rowe, Collin, and Koetter, Fred, Collage City, M.I.T. Press, Cambridge, Massachusetts, 1978.

Saalman, Howard, Medieval Cities, George Brazillier Inc., New York, 1968.

Schildt, Goran, Ed., Sketches by Alvar Aalto, M.I.T. Press, Cambridge, Massachusetts, 1978.

Shepard, Sam, Motel Chronicles, City Lights Books, San Francisco, 1982.

Smith, Maurice K., "Dimensional Self-Stability and Displacement in Field-Ordered Directional Alternations," *Places* v. 5, #2, pp. 72 - 85.

Sonfist, Alan, Ed., Art in the Land, E.P. Dutton, New York, 1983.

U.S. Department of the Interior, The Story of Hoover Dam, U.S. Government Printing Office, 1971.

Webster's Seventh New Collegiate Dictionary, Simon & Schuster, Inc., New York, 1974.

Zube, Ervin H., Ed., Landscapes, The University of Massachusetts Press, Massachusetts, 1970.