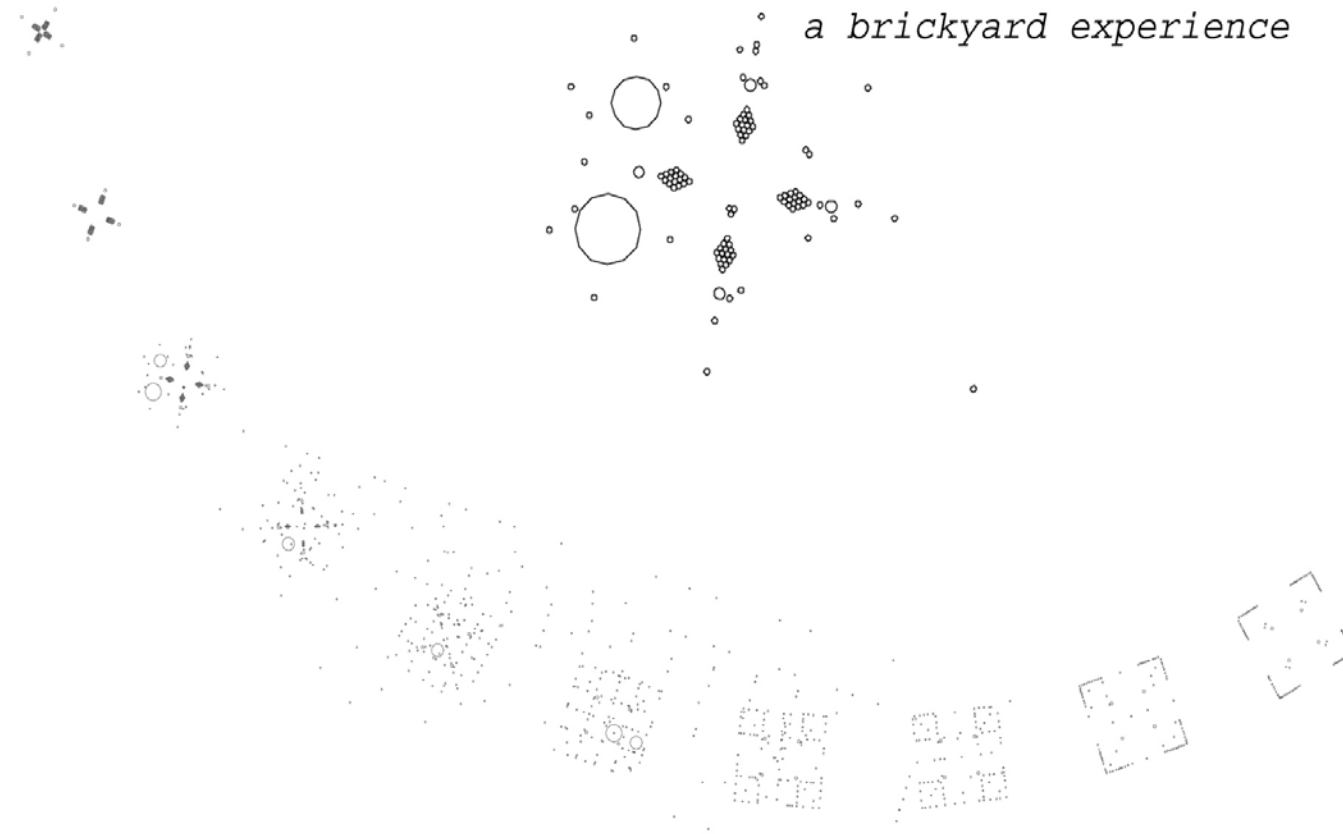


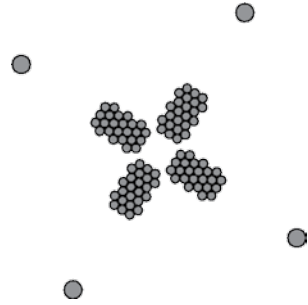
# Concentration and Dispersion

*a brickyard experience*



# Concentration and Dispersion:

*a brickyard experience*



This thesis submitted by Emily Freeland to the faculty of Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of:

## **MASTER OF ARCHITECTURE**

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Paul Emmons, Committee Chair

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Susan Piedmont-Palladino

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Ron M. Kagawa, ASLA

Keywords: Concentration, Dispersion, Brickyard  
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# Concentration and Dispersion:

*a brickyard experience*

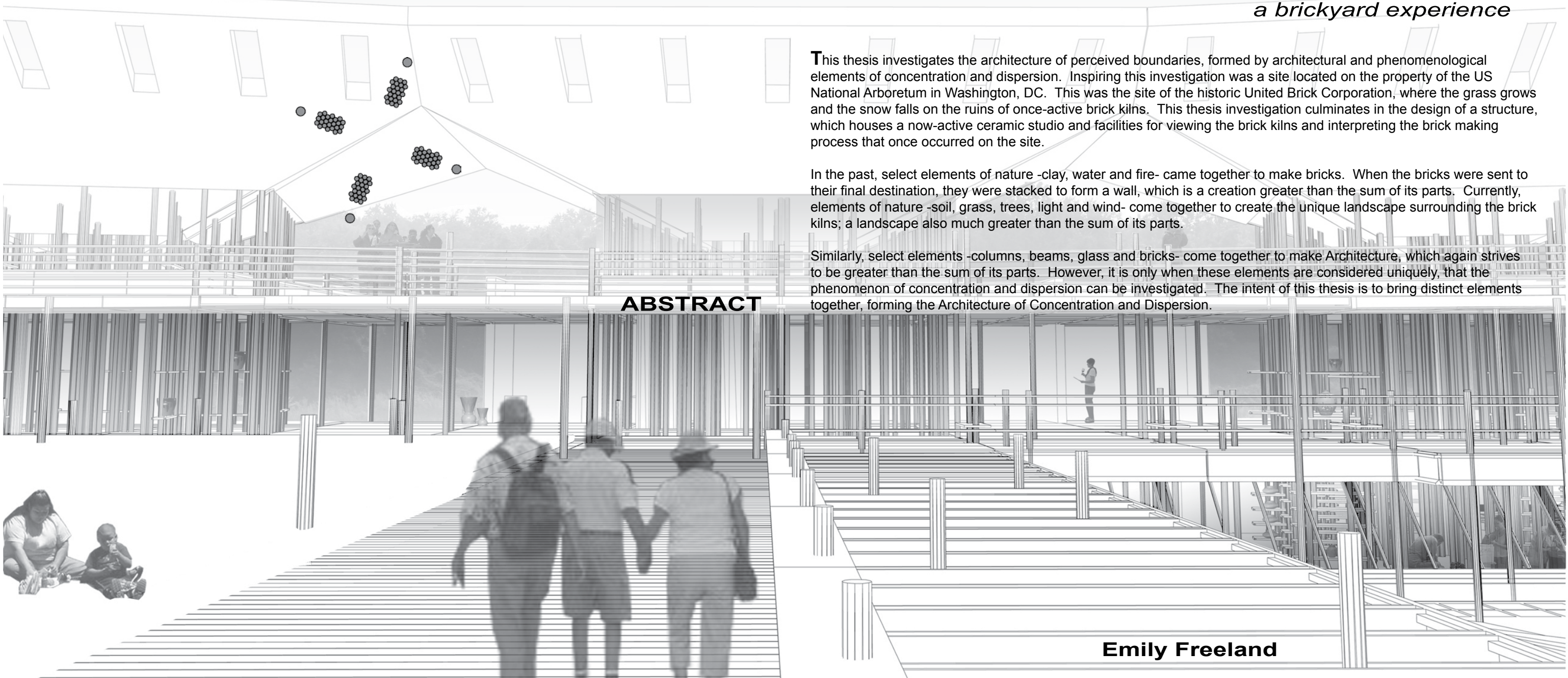
This thesis investigates the architecture of perceived boundaries, formed by architectural and phenomenological elements of concentration and dispersion. Inspiring this investigation was a site located on the property of the US National Arboretum in Washington, DC. This was the site of the historic United Brick Corporation, where the grass grows and the snow falls on the ruins of once-active brick kilns. This thesis investigation culminates in the design of a structure, which houses a now-active ceramic studio and facilities for viewing the brick kilns and interpreting the brick making process that once occurred on the site.

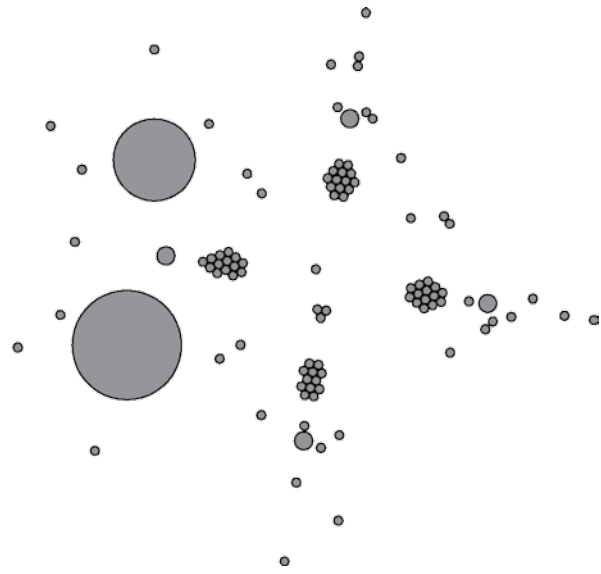
In the past, select elements of nature -clay, water and fire- came together to make bricks. When the bricks were sent to their final destination, they were stacked to form a wall, which is a creation greater than the sum of its parts. Currently, elements of nature -soil, grass, trees, light and wind- come together to create the unique landscape surrounding the brick kilns; a landscape also much greater than the sum of its parts.

Similarly, select elements -columns, beams, glass and bricks- come together to make Architecture, which again strives to be greater than the sum of its parts. However, it is only when these elements are considered uniquely, that the phenomenon of concentration and dispersion can be investigated. The intent of this thesis is to bring distinct elements together, forming the Architecture of Concentration and Dispersion.

**ABSTRACT**

**Emily Freeland**





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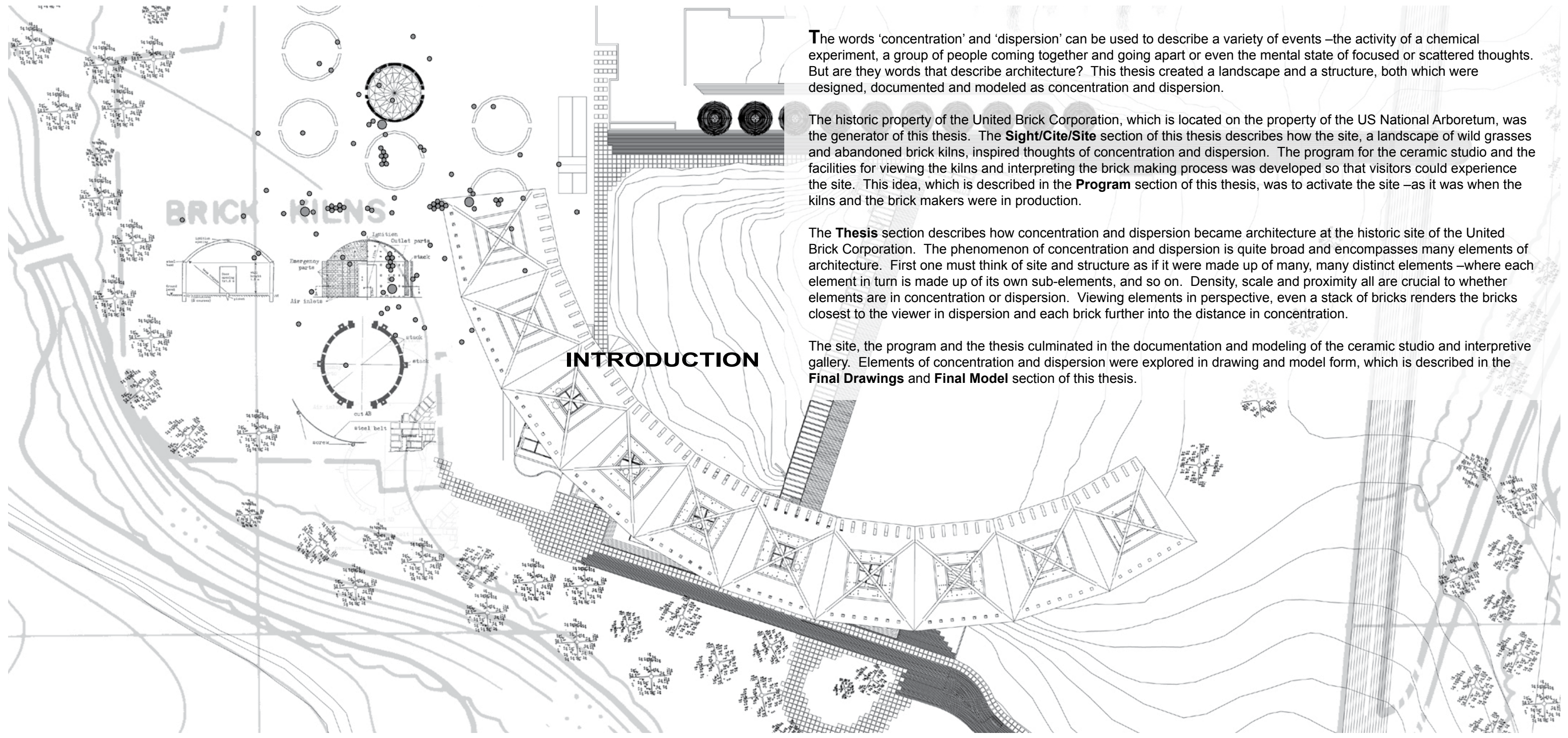
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# INTRODUCTION

The words 'concentration' and 'dispersion' can be used to describe a variety of events –the activity of a chemical experiment, a group of people coming together and going apart or even the mental state of focused or scattered thoughts. But are they words that describe architecture? This thesis created a landscape and a structure, both which were designed, documented and modeled as concentration and dispersion.

The historic property of the United Brick Corporation, which is located on the property of the US National Arboretum, was the generator of this thesis. The **Sight/Cite/Site** section of this thesis describes how the site, a landscape of wild grasses and abandoned brick kilns, inspired thoughts of concentration and dispersion. The program for the ceramic studio and the facilities for viewing the kilns and interpreting the brick making process was developed so that visitors could experience the site. This idea, which is described in the **Program** section of this thesis, was to activate the site –as it was when the kilns and the brick makers were in production.

The **Thesis** section describes how concentration and dispersion became architecture at the historic site of the United Brick Corporation. The phenomenon of concentration and dispersion is quite broad and encompasses many elements of architecture. First one must think of site and structure as if it were made up of many, many distinct elements –where each element in turn is made up of its own sub-elements, and so on. Density, scale and proximity all are crucial to whether elements are in concentration or dispersion. Viewing elements in perspective, even a stack of bricks renders the bricks closest to the viewer in dispersion and each brick further into the distance in concentration.

The site, the program and the thesis culminated in the documentation and modeling of the ceramic studio and interpretive gallery. Elements of concentration and dispersion were explored in drawing and model form, which is described in the **Final Drawings** and **Final Model** section of this thesis.

**SIGHT / CITE / SITE**  
**The U.S. National Arboretum, Washington DC**  
**United Brick Corporation**

**SIGHT**

What you see at the United Brick Corporation, on the property of the US National Arboretum would not be described as a place of beauty but more aptly as a place of curiosity. As you drive into Washington DC on New York Avenue, you catch a glimpse of the dome-shaped brick kilns and though you may not know what they are, you certainly strain your neck to piece together in your mind what they may have been.

You take a closer look. What you saw as a landscape and what you saw as a brick dome from the road becomes something more. The landscape becomes a sea of grass and the kilns become concentric layers of bricks. Edges are blurred. The grass has invaded the layers of bricks and fragments of bricks and walls extend into the grass. You listen, to hear the grasses and the workings of the brick kilns. You want to hear the sounds of brick making –the hiss of gas, the clanking of tools and the rattling of the rail carts. You hear the traffic on New York Avenue –more commuters, coming and going to our capital city. Do they know these brick kilns?



Photos taken at U.S. National Arboretum

## SIGHT OBSERVATIONS

During many visits to the site, I imagined the clay and water, collected from Hickey Run. The clay pressed into forms and dried in stacks –the water particles dispersing as the clay concentrated. The bricks, handled by hand, one by one, collected on carts. They were re-stacked in the kilns; the hot air, fueled by gas pushed the remaining water from the bricks. They cooled and again, were handled for removal. I imagined the bricks piled tightly on palettes and then in turn, the palettes piled high on rail cars and sent to market. They dispersed throughout the city and found themselves in another formation –a wall. Moving this process, was the brick makers –I imagined how they met in the morning, each arriving separately and walking through the gates to join their work team –and in the evening, how the teams dispersed.



As I stood in the field of grass, I tried to know the ruins of the kilns and how they were concentration and dispersion.

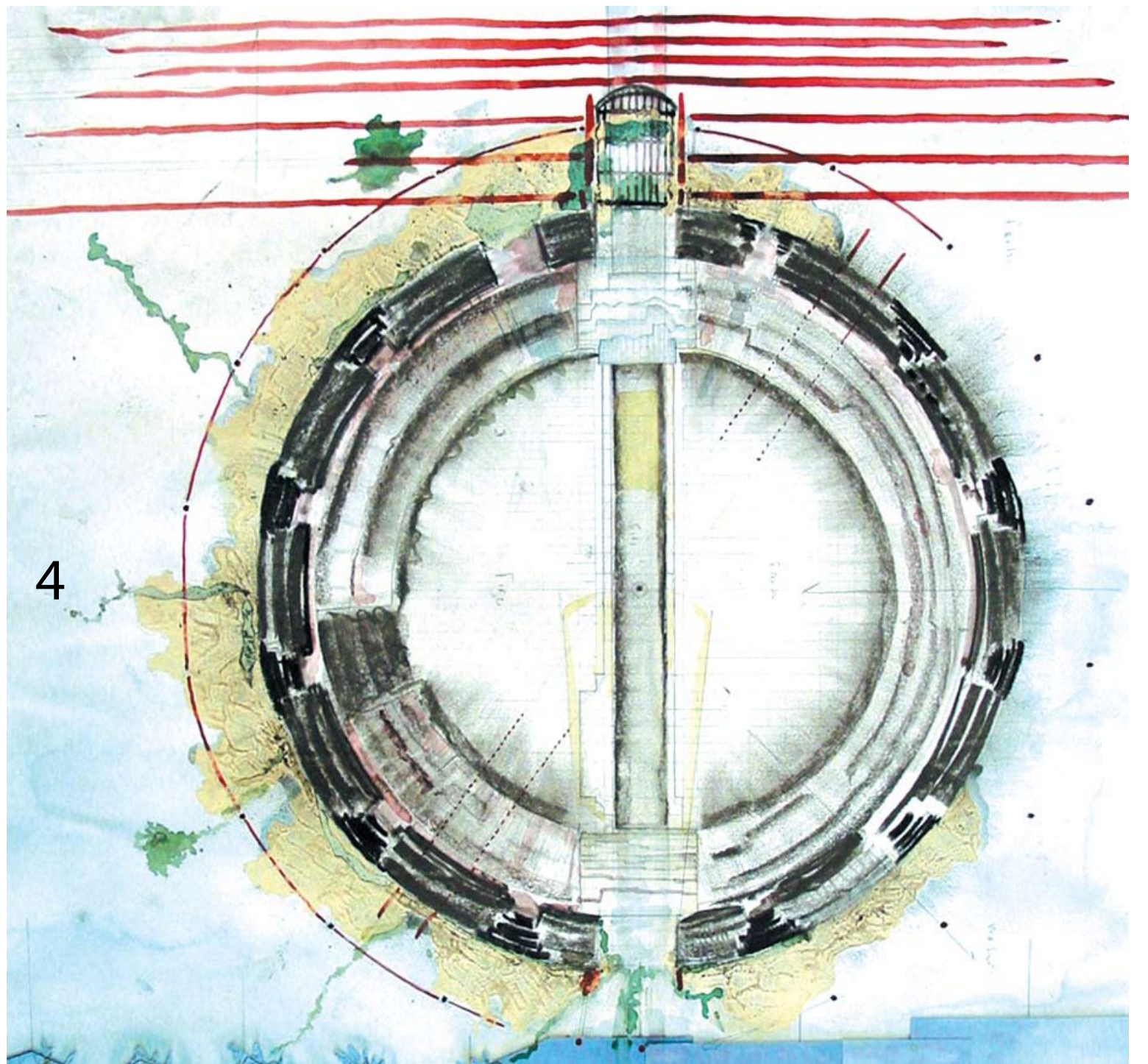
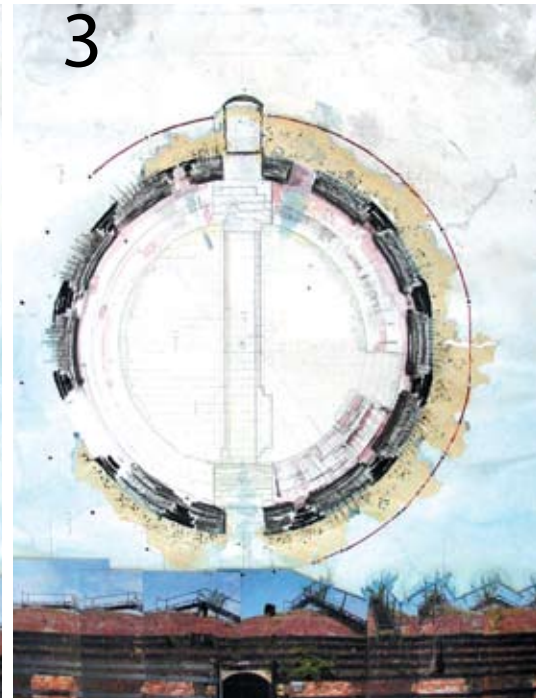
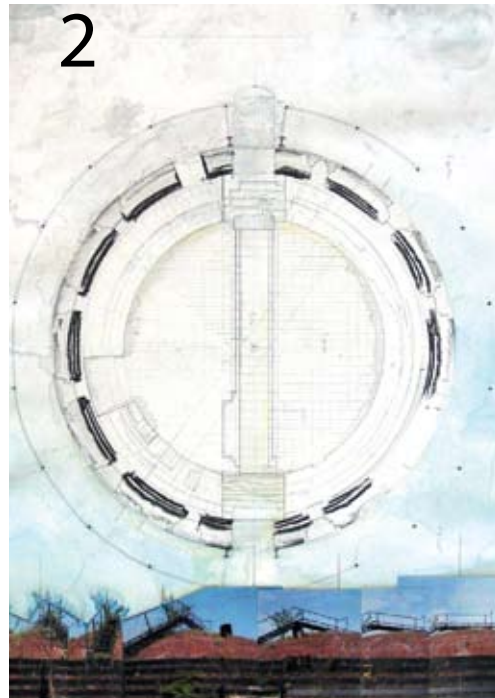
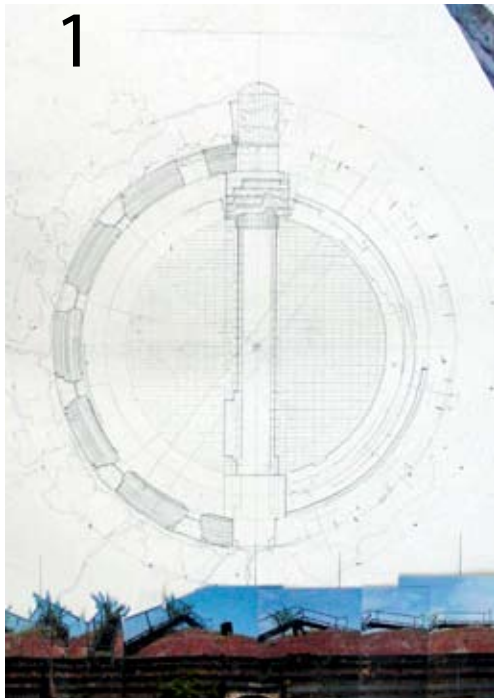
Both the landscape and the brick kilns were objects made of countless distinct objects. The landscape was a sea of grass –each blade, containing its own concentration of seeds, ready for dispersion. The brick kilns were concentrations of bricks –bound by steel straps which kept the bricks in compression during firings.

At the very top of each kiln, was an oculus, an opening to the sky.

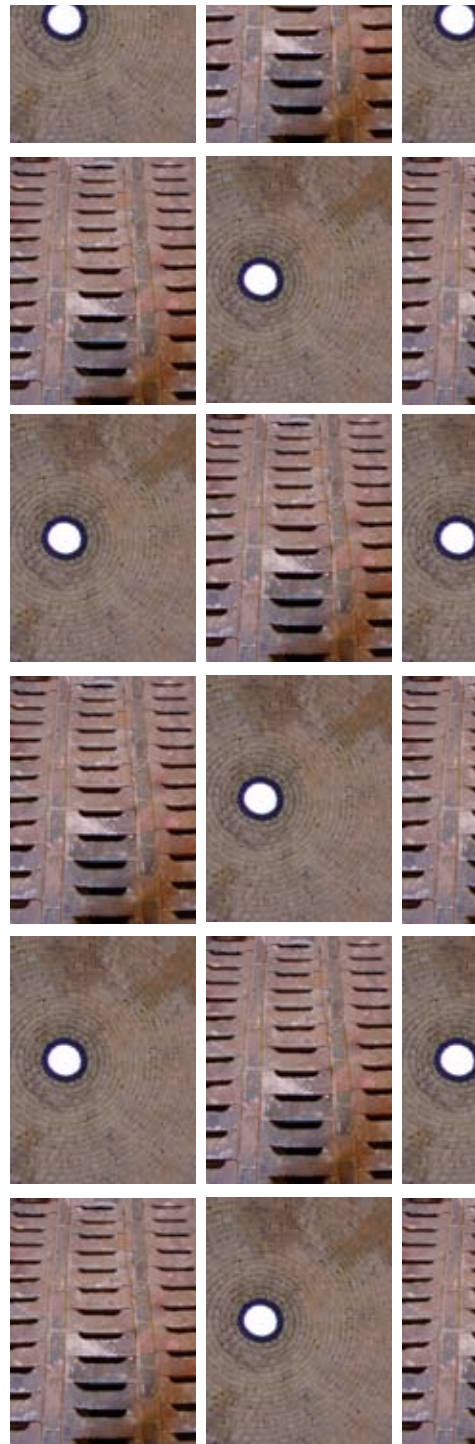


## SIGHT INTERPRETATION

By taking photographs and making a series of drawings, I began to understand the kilns and their construction. Starting with measurements from a survey, the construction in drawing began (Drawing 1.) As the drawing progressed, material was added and time passed. The kilns became more than their measured plan. The rail cars came in on red iron rails. The open brick arched openings on the exterior of the kilns were bricked back in and slowly vines grew. The drawings developed (Drawings 2 - 4), just as the kilns were once worked.







### SIGHT by scaling

By visiting and researching the site, I saw the brick kilns at many scales and always related the experience to the study of my thesis -Concentration and Dispersion. Concentration and dispersion relates to scale as well as the proximity of distinct objects. For example, imagine “zooming” in on a location. From a distance the city of Washington DC (image 1) is a concentration of streets, trees and buildings. When you “zoom in” to an image of the National Arboretum you see these elements disperse and new elements arise in concentration, such as cars, the grass and the details of the buildings. As you zoom onto a brick kiln of the United Brick Corporation, the buildings and landscape disperses and you are able to focus on the individual bricks and the patterns they form. While studying the site, it was important to keep “zooming” - concentrating on the impact of a brick, while also appreciating the magnitude of the site and city.

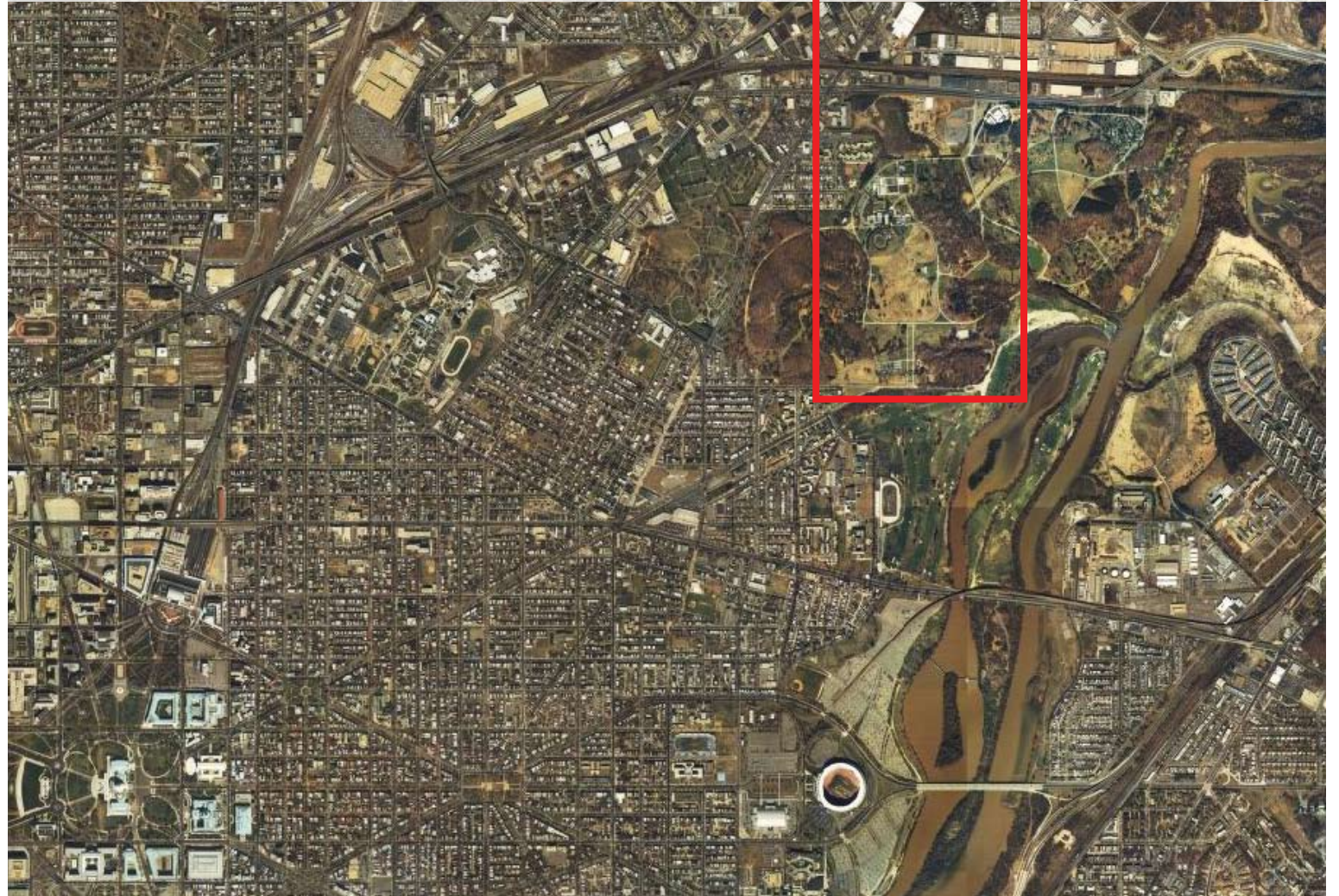
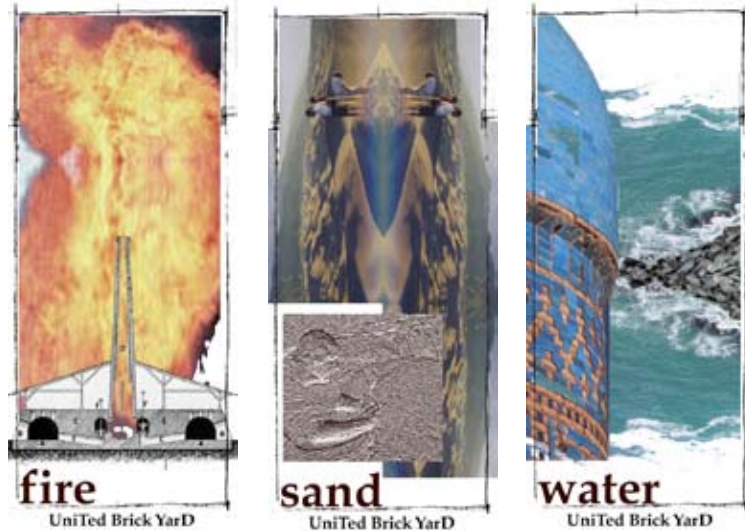
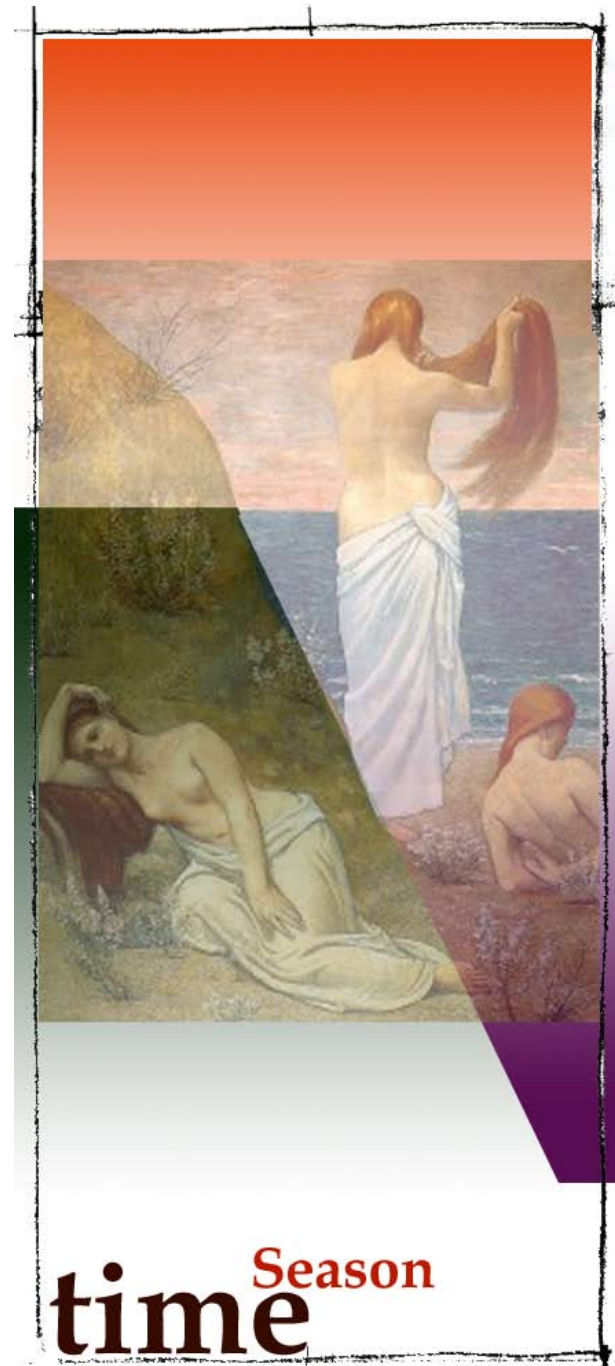


image 1: USGS Aerial Image

**CITE / SITE / SIGHT**



elements



UniTed Brick YarD

**CITE**

To cite the site is to summon its elements –to bring them forward for investigation. Under the instruction of Marco Frascari, I developed tarot cards for the site of the United Brick Corporation to cite the site. From my observations, the site could be described by its elements, its characters, its objects and a catalyst –Time.

The elements of the United Brick Corporation were fire, sand and water. Creating images of each helped to imagine the explosive nature of fire, the texture of sand and the coolness of water.

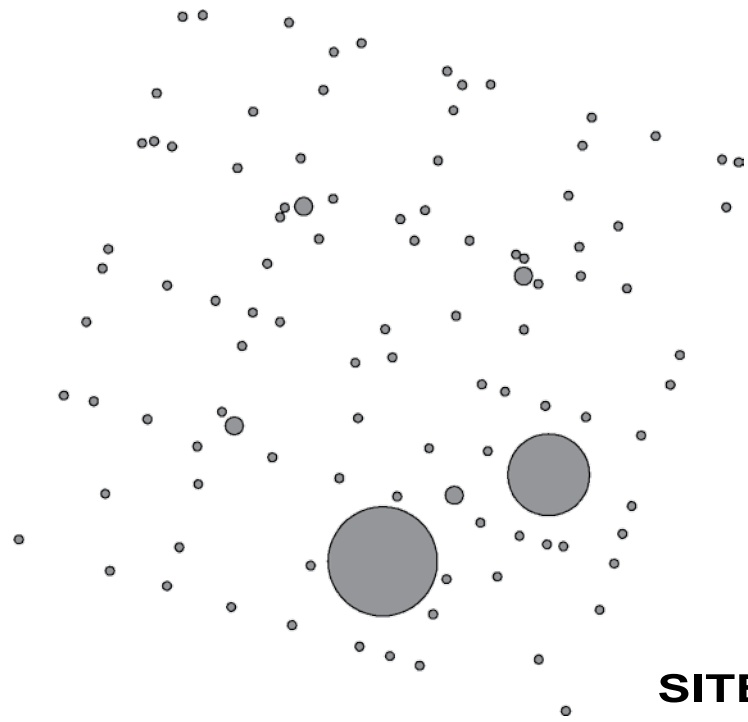
The principle characters of the site were the brick maker, the owner and the bricklayer. When you summon the characters of the site, you start to hear their voices and sense how their role was critical to the plot.

The characters used the objects of the site, which I identified as the hand, the tool and the rail. It was time, the governing body, which watched over the site and breathed life into the United Brick Corporation. Time regulated the brick making, time regulated the workday, time was the beginning of the brickworks and time was the end –and time keeps passing over the ruins of the kilns, season by season.



objects

characters



**SITE / SIGHT / CITE**

**SITE**

The United Brick Corporation by sight and citation is an extraordinary site. So, how should a new program, a new layer of elements interact with what I have already described?

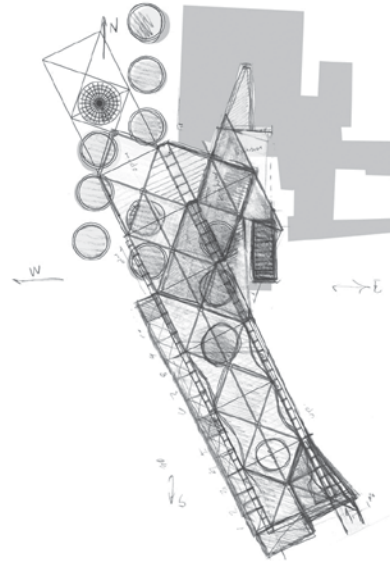
The siting of the structure, which was going to house an active ceramic studio and facilities for viewing the kilns and interpreting the brick making process, was a difficult task. The study of where the structure should be began by placing the structure over the kilns, protecting them. Looking at the site plan, there was a concentration of structures –new and old. As the project developed, the site plan dispersed. The structure slid, freeing the kilns from the burden (originally thought as the protection) of this superposition. Figures 1 through 5 show how the structure slid to disperse the elements on the site, in keeping with the investigation of concentration and dispersion.



1



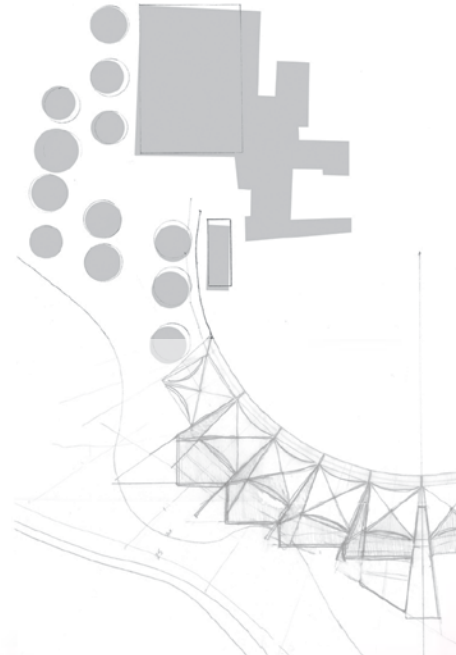
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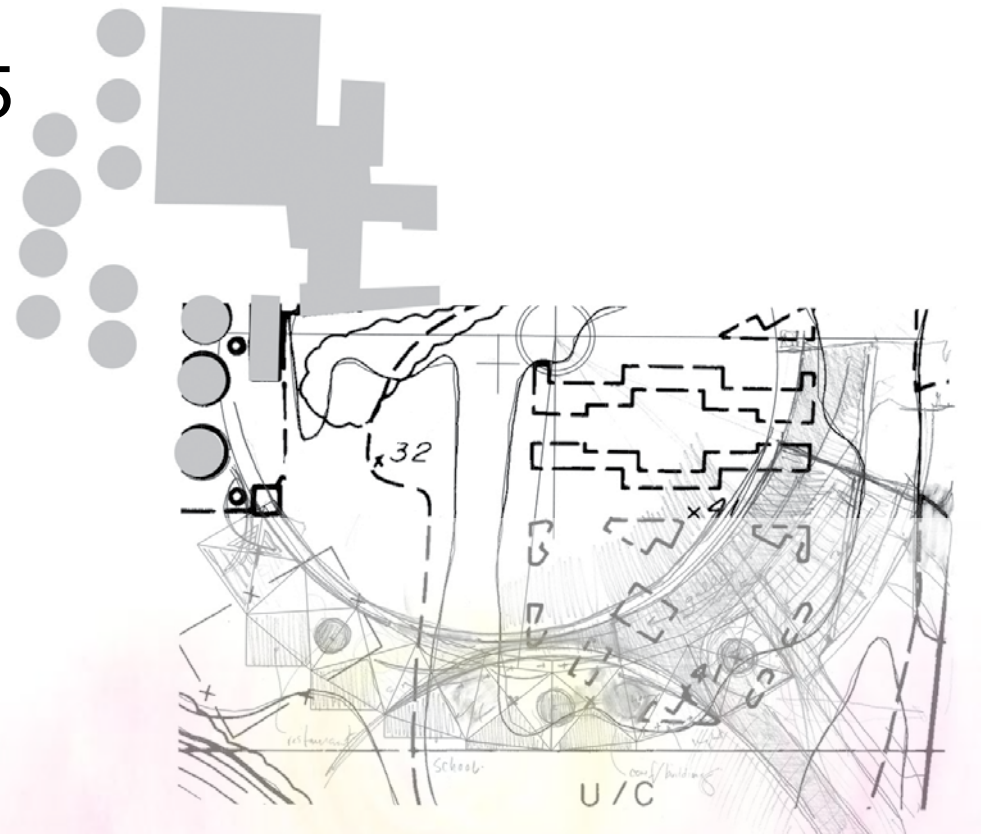
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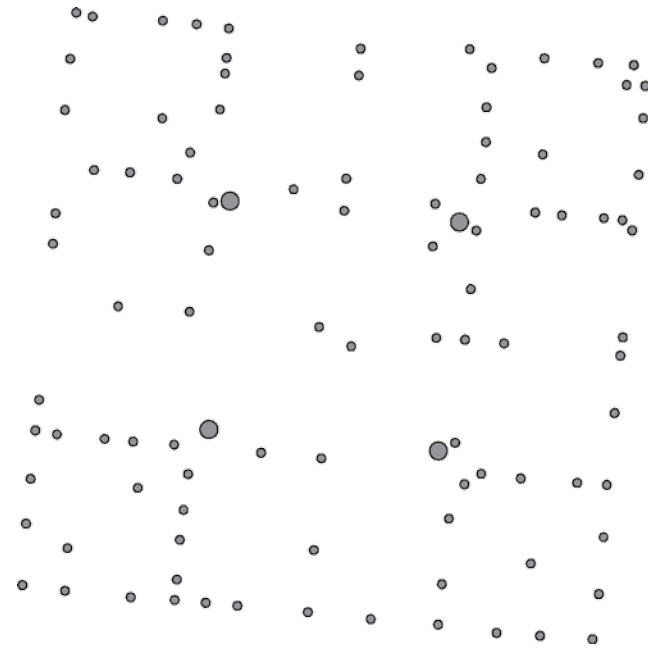


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5





**The U.S. National Arboretum, Washington DC**  
**United Brick Interpretive Gallery and Ceramic Collaborative**

**PROGRAM**

**PROGRAM**

The program was selected based on what was appropriate for the site and what would lend itself to the study of the thesis, concentration and dispersion. In many ways the program was intended to keep the citations of materiality (sand, fire and water), characters (brick maker, bricklayer and owner) and essential objects (hand, tool and rail) alive. The facilities for viewing the kilns and interpreting the brick making process were loosely programmed as viewing platforms, both interior and exterior.

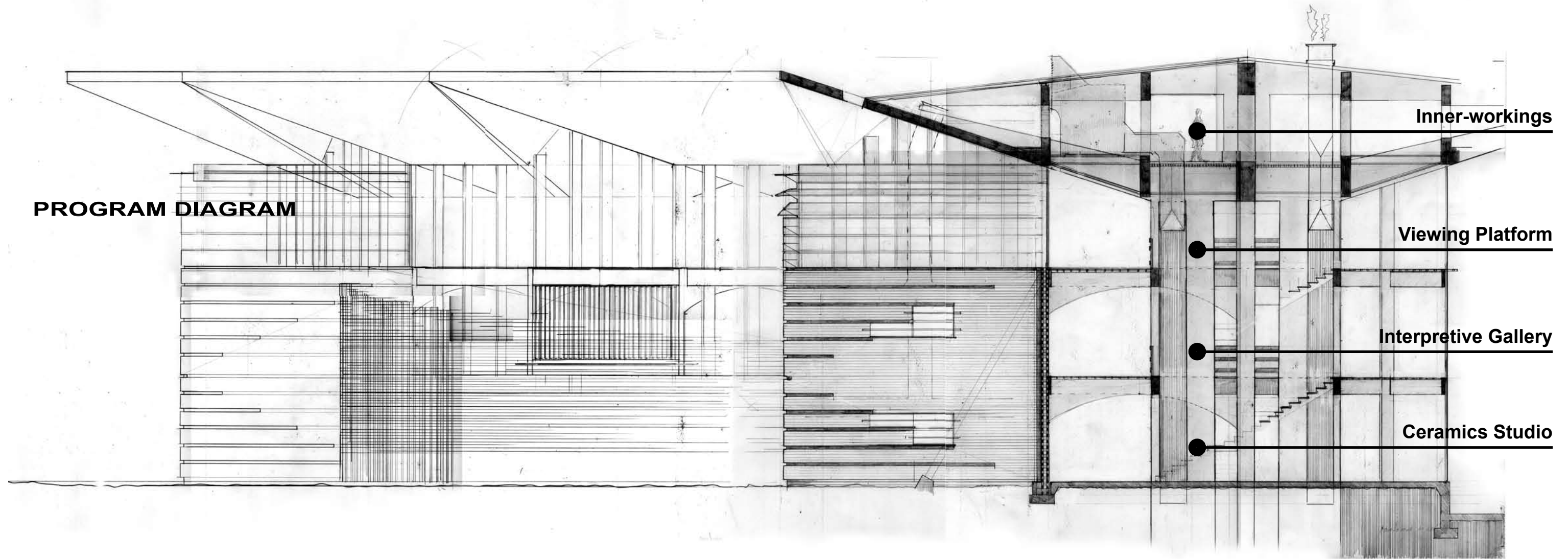
The ceramic studio was programmed to be on the ground level, closest to the earth and the material from which the ceramics are made. The floor of the ceramic studio was to be brick and the exhaust from the kilns was intended to travel up through the structure in a pronounced expression of the activity within.

The interpretive gallery and viewing platform was programmed for the upper levels, where the visitor was more removed from the site –an observer. The visitor was to have unobstructed views of the kilns and landscape as well as be able to observe the activity in the ceramic studios below.

The site was programmed to provide the visitors of the National Arboretum a new landscape –a viewing platform for the brick kilns. The earth was lifted to accommodate an underground parking structure, creating an edge, ideal for viewing the kilns. Additionally, an outdoor market was created at the entrance to the ruins of the United Brick Corporation, where the National Arboretum could hold its annual plant sale as well as other outdoor events.

In conclusion, the program set forth in this thesis was established to define the site as a bold new landscape, with a structure for providing facilities for the community.





**PROGRAM DIAGRAM**

**Inner-workings**

**Viewing Platform**

**Interpretive Gallery**

**Ceramics Studio**

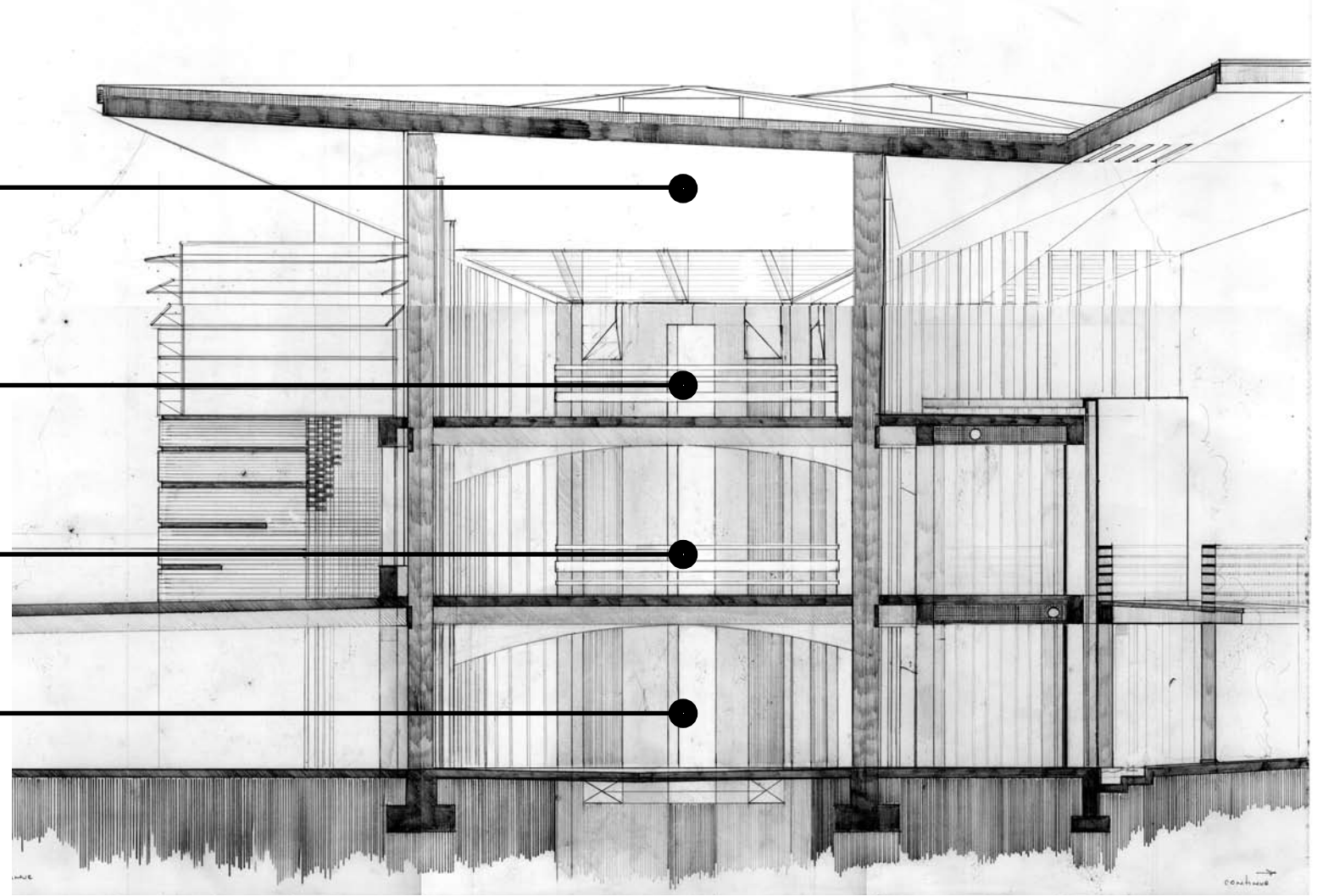
**MATERIAL DIAGRAM**

**Steel Framing and Metal Panel and Sky**

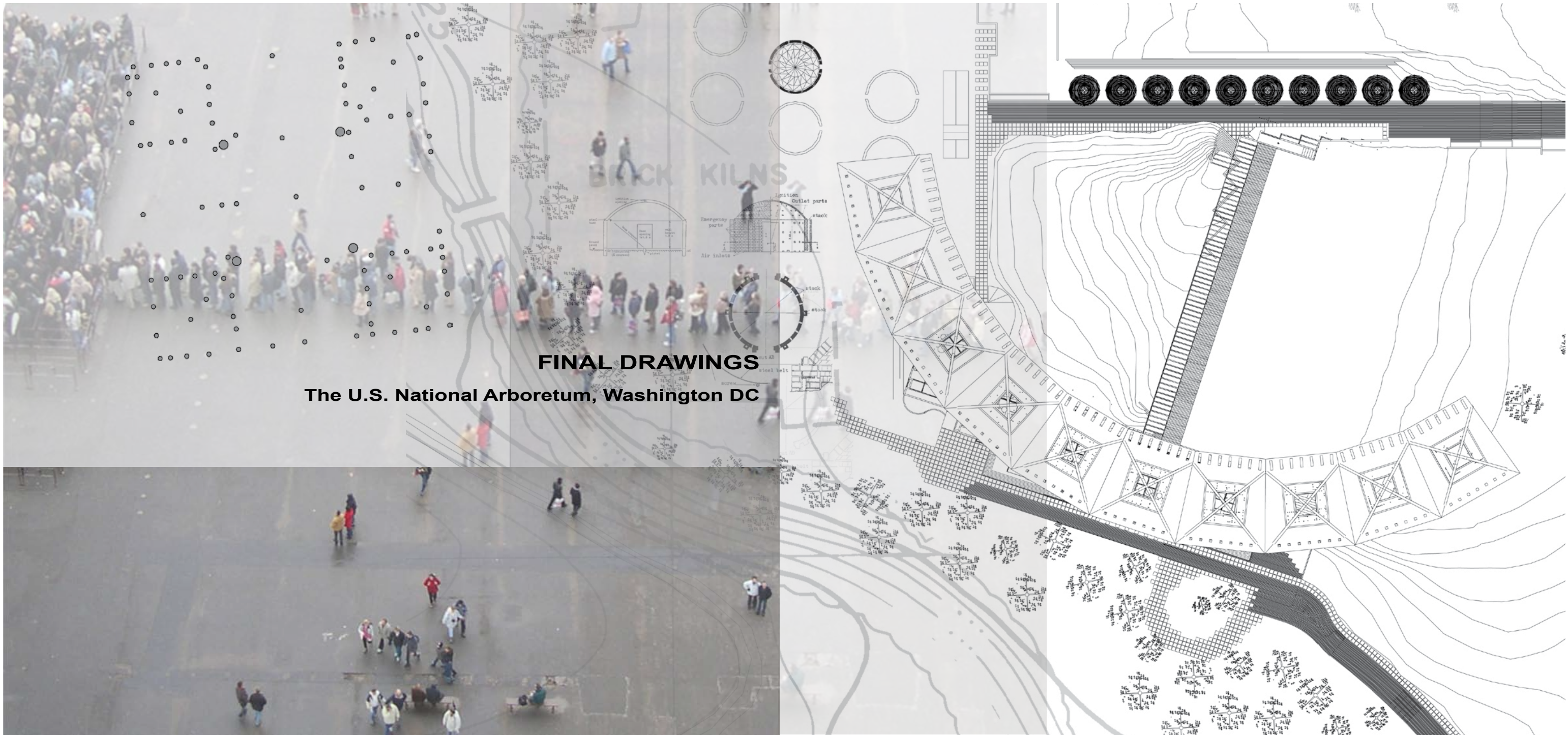
**Open Air**

**Cast Glass and Steel Framing**

**Brick and Clay and Earth**



**FINAL DRAWINGS**  
**The U.S. National Arboretum, Washington DC**





An architectural rendering of a large, modern facility. The main structure is a long, low-profile canopy supported by numerous slender columns. The canopy has a series of planar roofs that are slightly elevated and have large openings. In the background, there are brick kilns and other industrial buildings. A wide brick drive leads from the foreground towards the facility. The sky is a mix of pink and yellow, suggesting a sunrise or sunset. The overall style is a combination of line drawing and color wash.

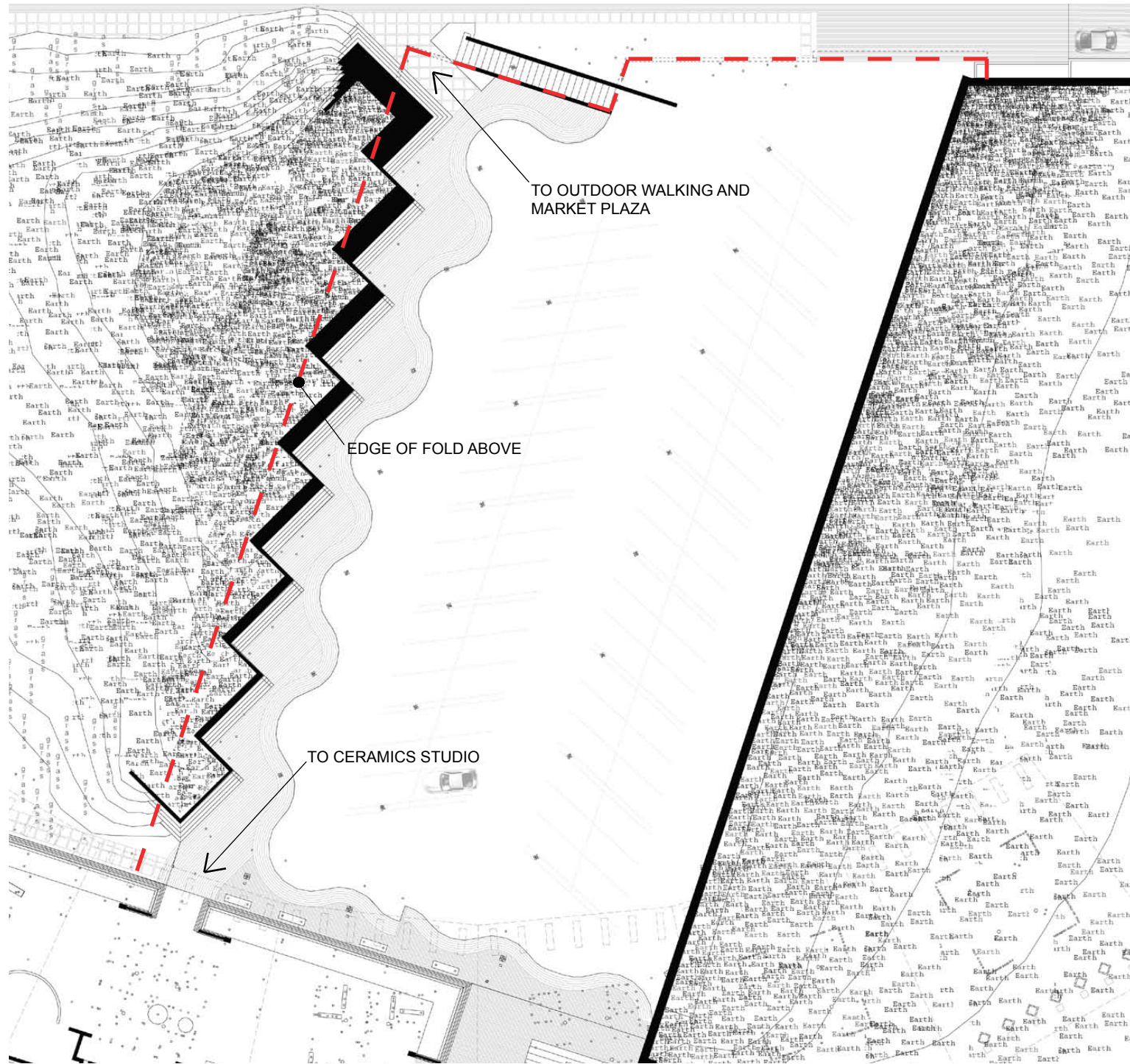
## FINAL DRAWINGS

### A VISITOR'S EXPERIENCE

Most visible, from New York Avenue is the canopy structure of the new facility, which is made up of thousands of columns supporting an arc of planar roofs. The canopy interacts with the brick kilns by covering the dome of one kiln. This gesture seems to make the kilns more important, as if the canopy is pointing in their direction. The edges of the planar roofs are cut by large openings, which allow the sunlight to come through. The light breaks the harsh edge of the structure, diffusing its otherwise crisp edge.

The columns are slender and even though there are so many, you can see through them to the trees beyond. This gives the structure a unique transparency –like the late summer grasses that fill the field of this site. The enclosed portion of the facility exists at the mid-section of the canopy, where the columns disperse to support the structure of the floors. The canopy and columns continue past this enclosed portion and create outdoor destinations for visitors to the U.S. National Arboretum.

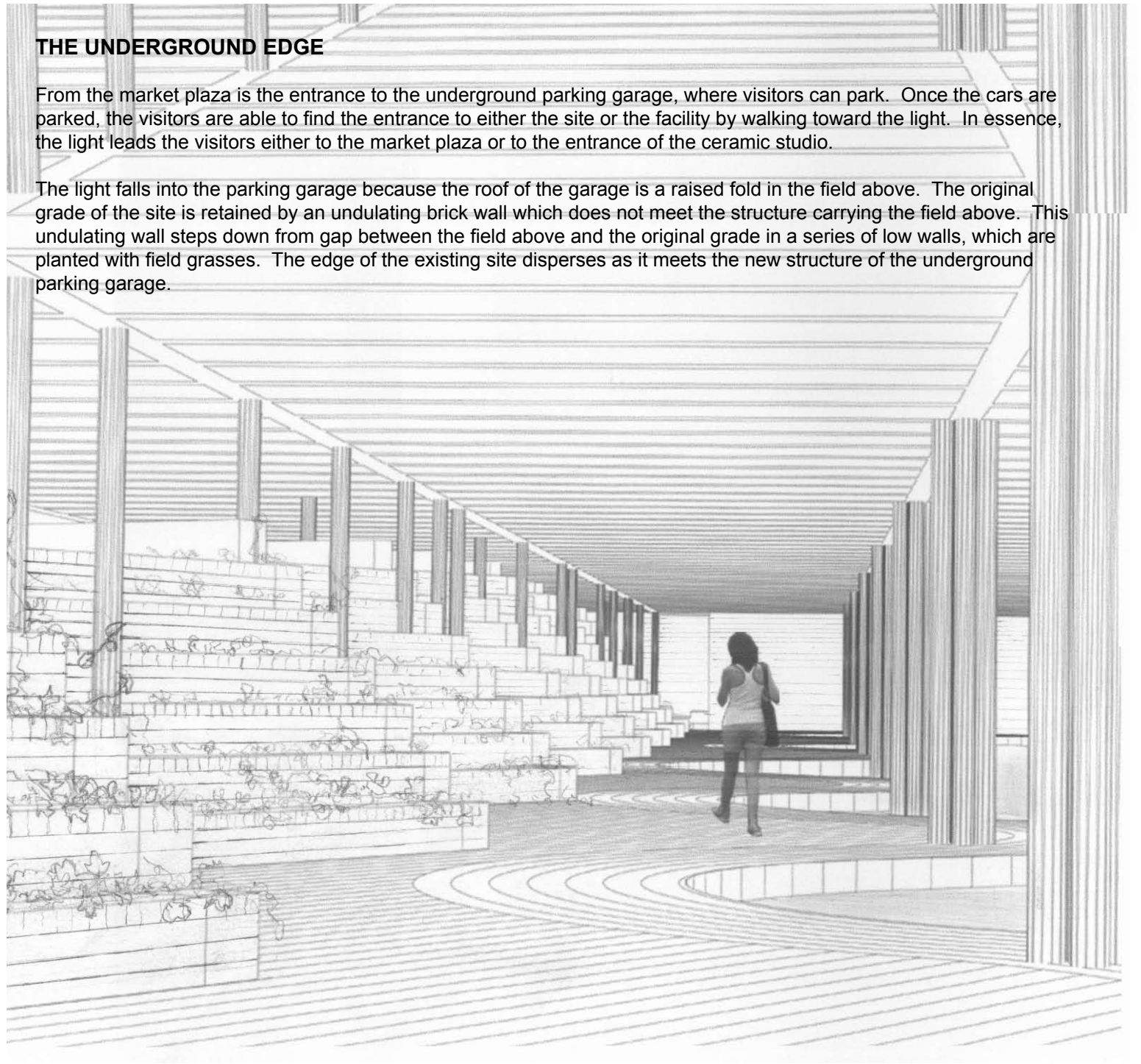
As visitors enter the U.S. National Arboretum, they turn into the grounds of the United Brick Corporation down a wide brick drive. The bricks are laid straight pointing to the formal administrative structure and the rectilinear tunnel kiln at the base of a gentle hill. The site walls, in ruin, reach out to you. On the right is a formation of aluminum trees, shading a small market plaza, where vendors can park and participate in the Arboretum plant sales. The rings of the aluminum trees cast shadows of concentric circles on to the surface below, which is crushed brick.

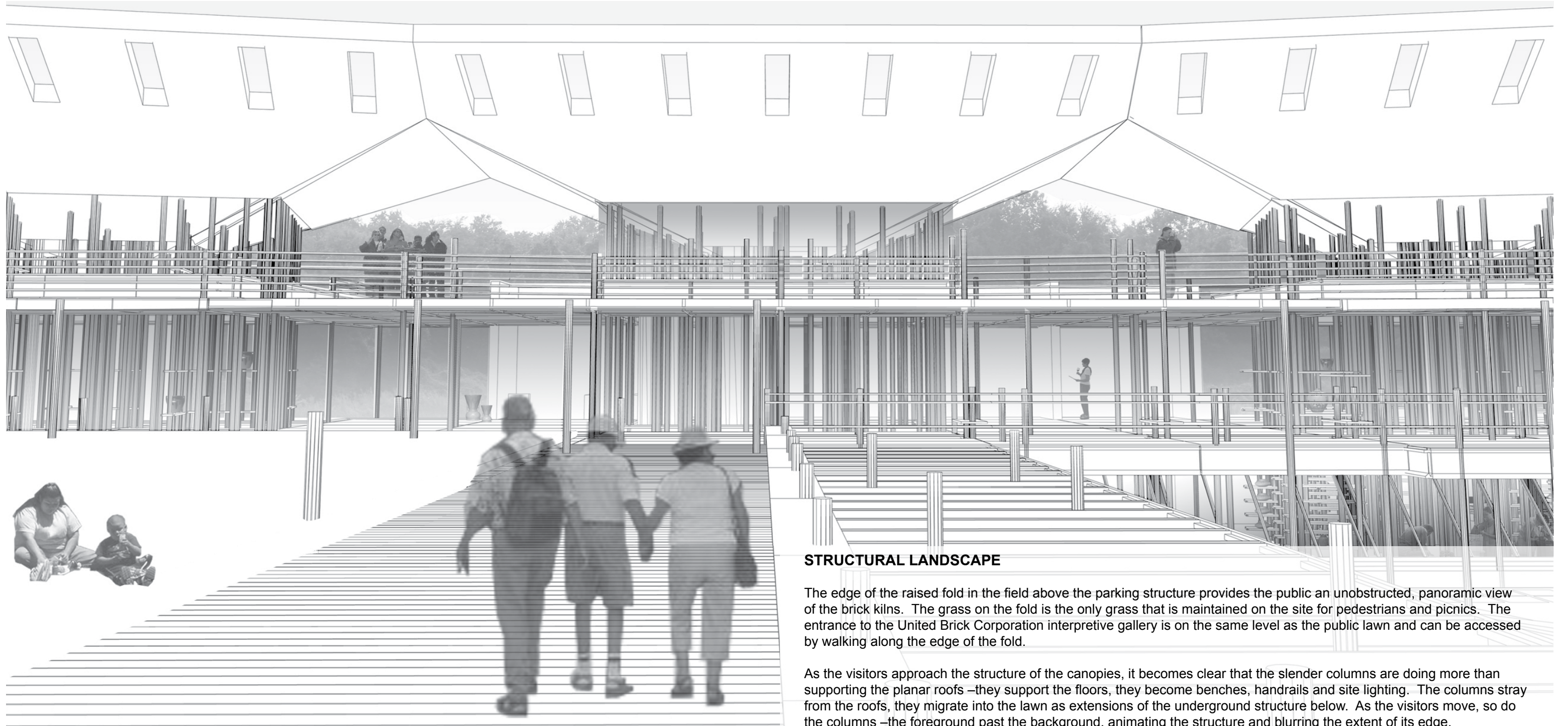


## THE UNDERGROUND EDGE

From the market plaza is the entrance to the underground parking garage, where visitors can park. Once the cars are parked, the visitors are able to find the entrance to either the site or the facility by walking toward the light. In essence, the light leads the visitors either to the market plaza or to the entrance of the ceramic studio.

The light falls into the parking garage because the roof of the garage is a raised fold in the field above. The original grade of the site is retained by an undulating brick wall which does not meet the structure carrying the field above. This undulating wall steps down from gap between the field above and the original grade in a series of low walls, which are planted with field grasses. The edge of the existing site disperses as it meets the new structure of the underground parking garage.

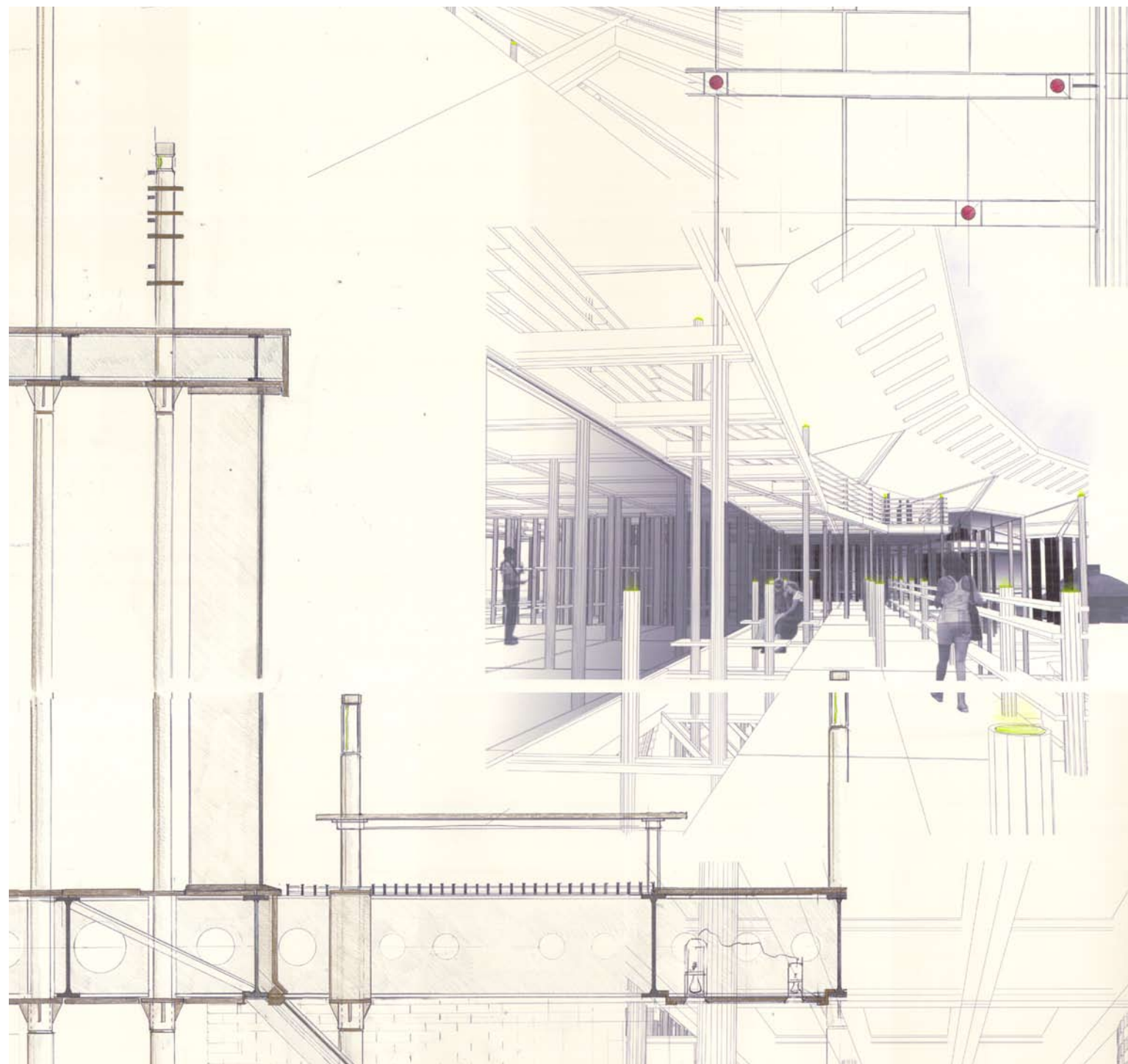




## STRUCTURAL LANDSCAPE

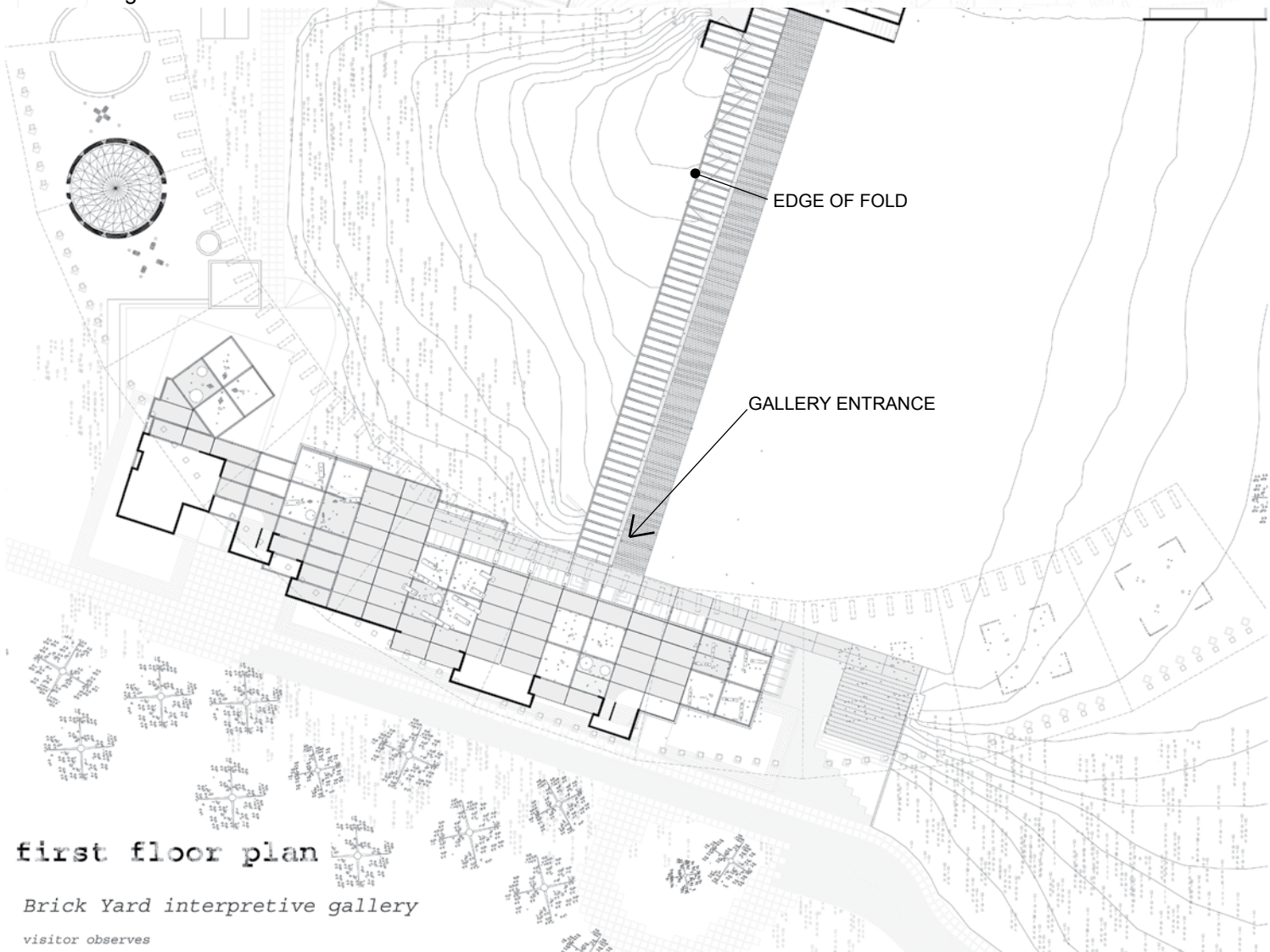
The edge of the raised fold in the field above the parking structure provides the public an unobstructed, panoramic view of the brick kilns. The grass on the fold is the only grass that is maintained on the site for pedestrians and picnics. The entrance to the United Brick Corporation interpretive gallery is on the same level as the public lawn and can be accessed by walking along the edge of the fold.

As the visitors approach the structure of the canopies, it becomes clear that the slender columns are doing more than supporting the planar roofs—they support the floors, they become benches, handrails and site lighting. The columns stray from the roofs, they migrate into the lawn as extensions of the underground structure below. As the visitors move, so do the columns—the foreground past the background, animating the structure and blurring the extent of its edge.

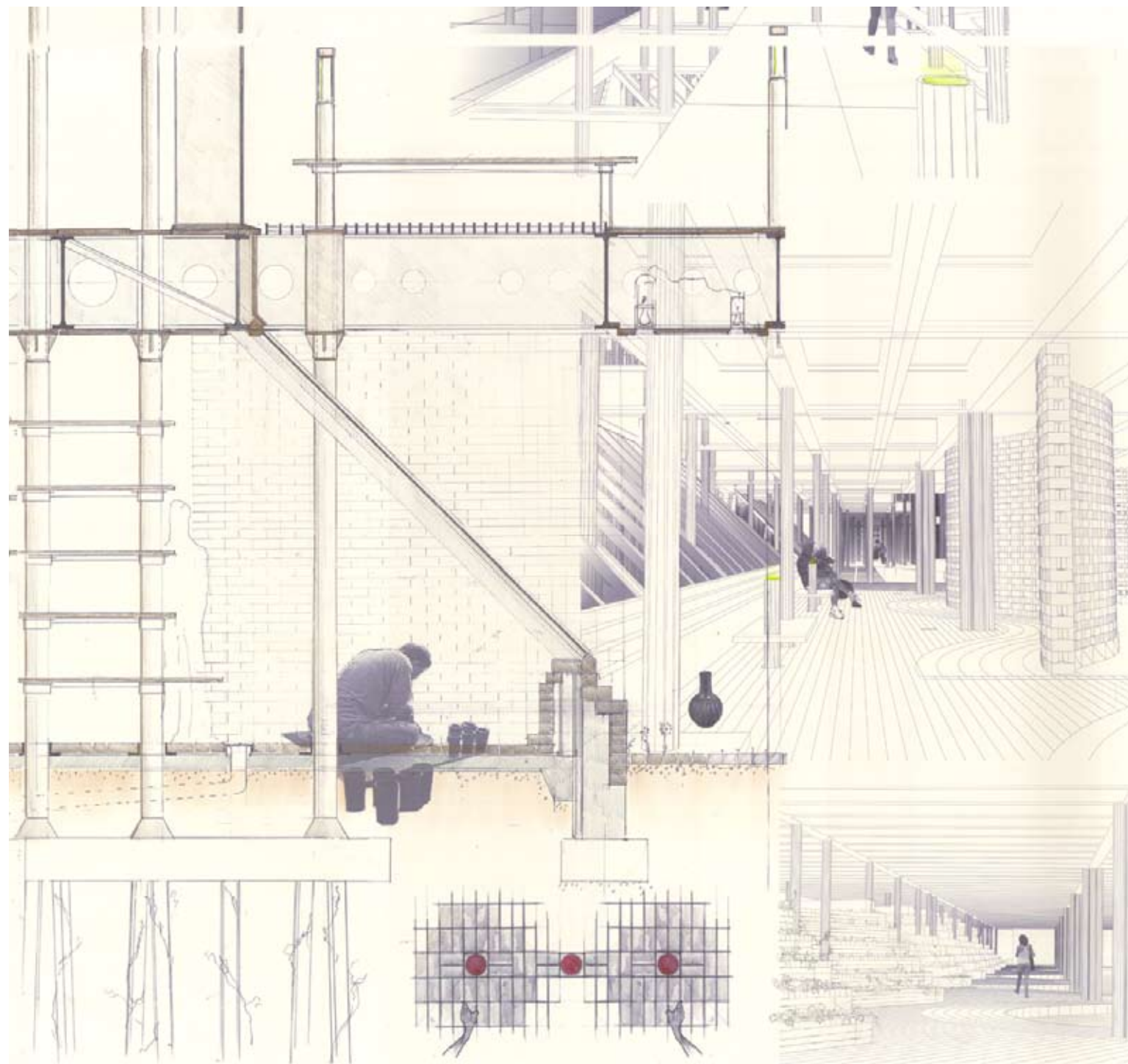


**ELEVATED OBSERVATIONS**

As the visitors enter the interpretive gallery of the United Brick Corporation and make their way through the exhibits they may notice that there are several locations where they can observe the activity in the ceramic studio below. In the layering of the interpretive gallery and the ceramic studio, a connection is made between the materiality, the workmanship, the firing and the distribution of the ceramic art and the brick making processes. The experience of the visitors and that of the ceramic artists are not the same. The visitors are elevated, so that they only *observe* the ceramic artist, the brick kilns and the landscape. The floor of the elevated gallery is made of cast glass, supported by the slender columns and a structural grid.



first floor plan  
 Brick Yard interpretive gallery  
 visitor observes



**ARTIST'S MATERIAL**

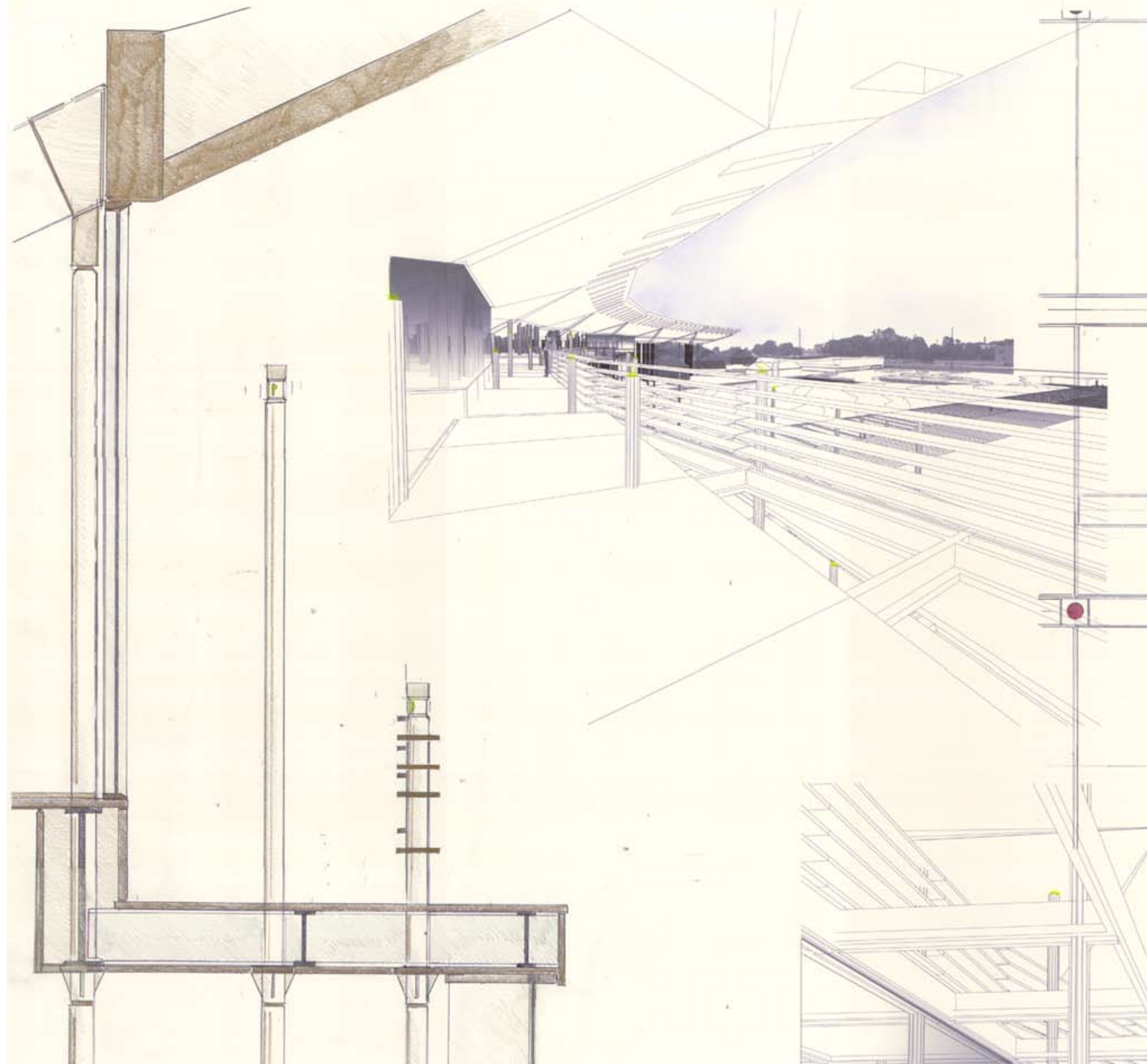
Meanwhile, the artists are on the ground level, involved in their work and unaware of the visitors observing them from above. They work in tune with the building systems and their material. In the ceramic studio, the floor is brick and rests on the earth. The kilns are active and exhaust up through the columns and canopies. The interior walls on the ground floor studio are made of brick, which are stacked in the same formation as the bricks that were originally dried on the site of the United Brick Corporation—with space in-between. Typically a brick wall is considered one the most “solid” walls—a dense concentration of elements. However, these brick walls expand to allow light and air to pass through—a dispersion of solid elements.



**ground plan**

gallery ■ retail ■ ceramic studio ■ cafe

visitor participates

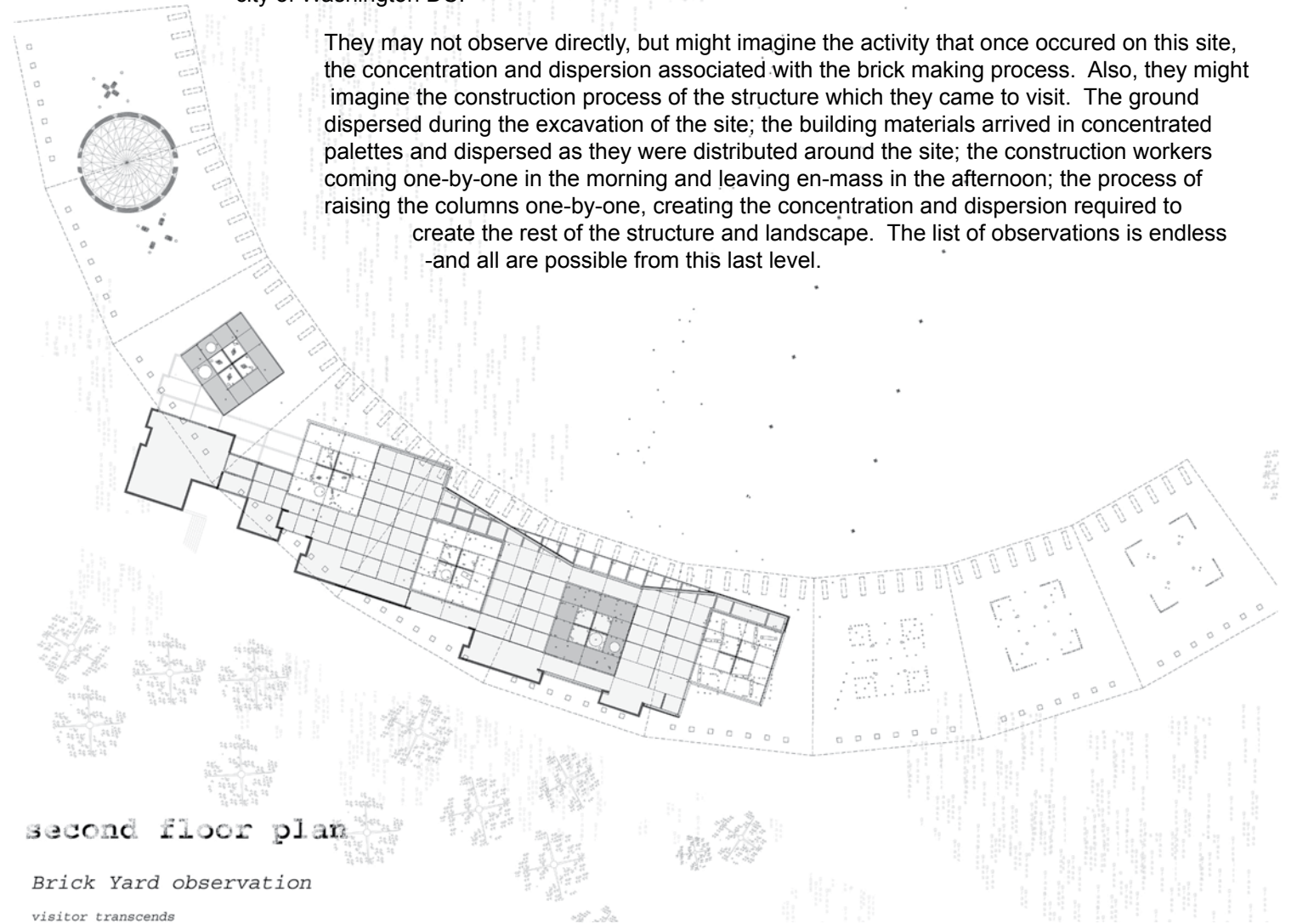


## OVER-ALL OBSERVATIONS

As the visitors make their way to the open observation deck directly below the large roof canopy structure, they have already observed the artists working and have been through the interpretive gallery, which describes the brick making process and the history of the United Brick Corporation. They have reached the level where they can observe the phenomenon of the site and its surroundings.

They observe the concentration and dispersion of all the other visitors moving around the site. They observe the concentration and dispersion of the slender columns, supporting the planar roof structures hovering just above the observation deck. They observe their surroundings and feel that they are a concentration within the dispersion of the city of Washington DC.

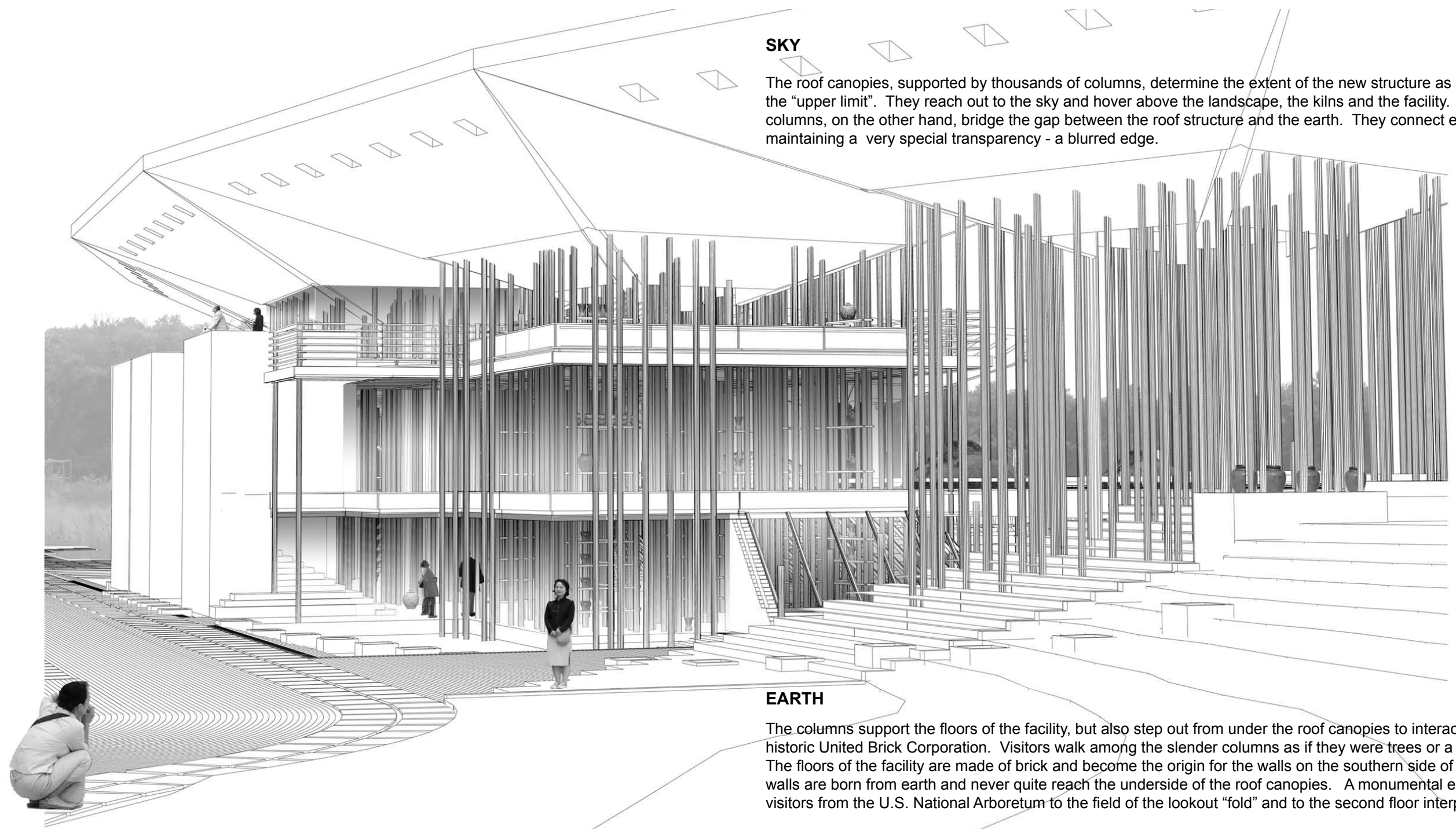
They may not observe directly, but might imagine the activity that once occurred on this site, the concentration and dispersion associated with the brick making process. Also, they might imagine the construction process of the structure which they came to visit. The ground dispersed during the excavation of the site; the building materials arrived in concentrated palettes and dispersed as they were distributed around the site; the construction workers coming one-by-one in the morning and leaving en-mass in the afternoon; the process of raising the columns one-by-one, creating the concentration and dispersion required to create the rest of the structure and landscape. The list of observations is endless -and all are possible from this last level.



second floor plan

*Brick Yard observation*

*visitor transcends*



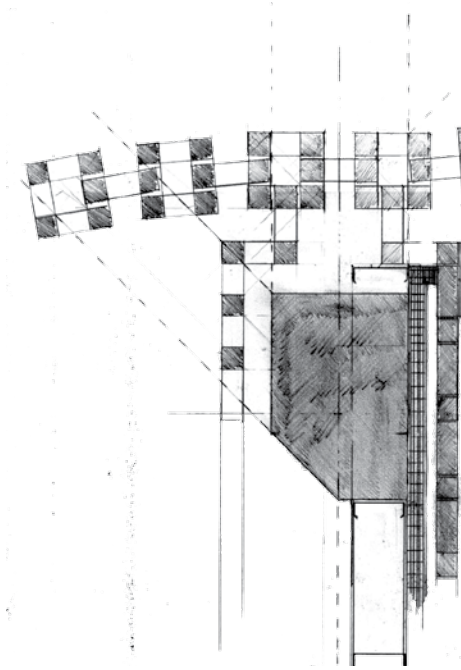
## SKY

The roof canopies, supported by thousands of columns, determine the extent of the new structure as if they were the “upper limit”. They reach out to the sky and hover above the landscape, the kilns and the facility. The slender columns, on the other hand, bridge the gap between the roof structure and the earth. They connect earth and sky, while maintaining a very special transparency - a blurred edge.

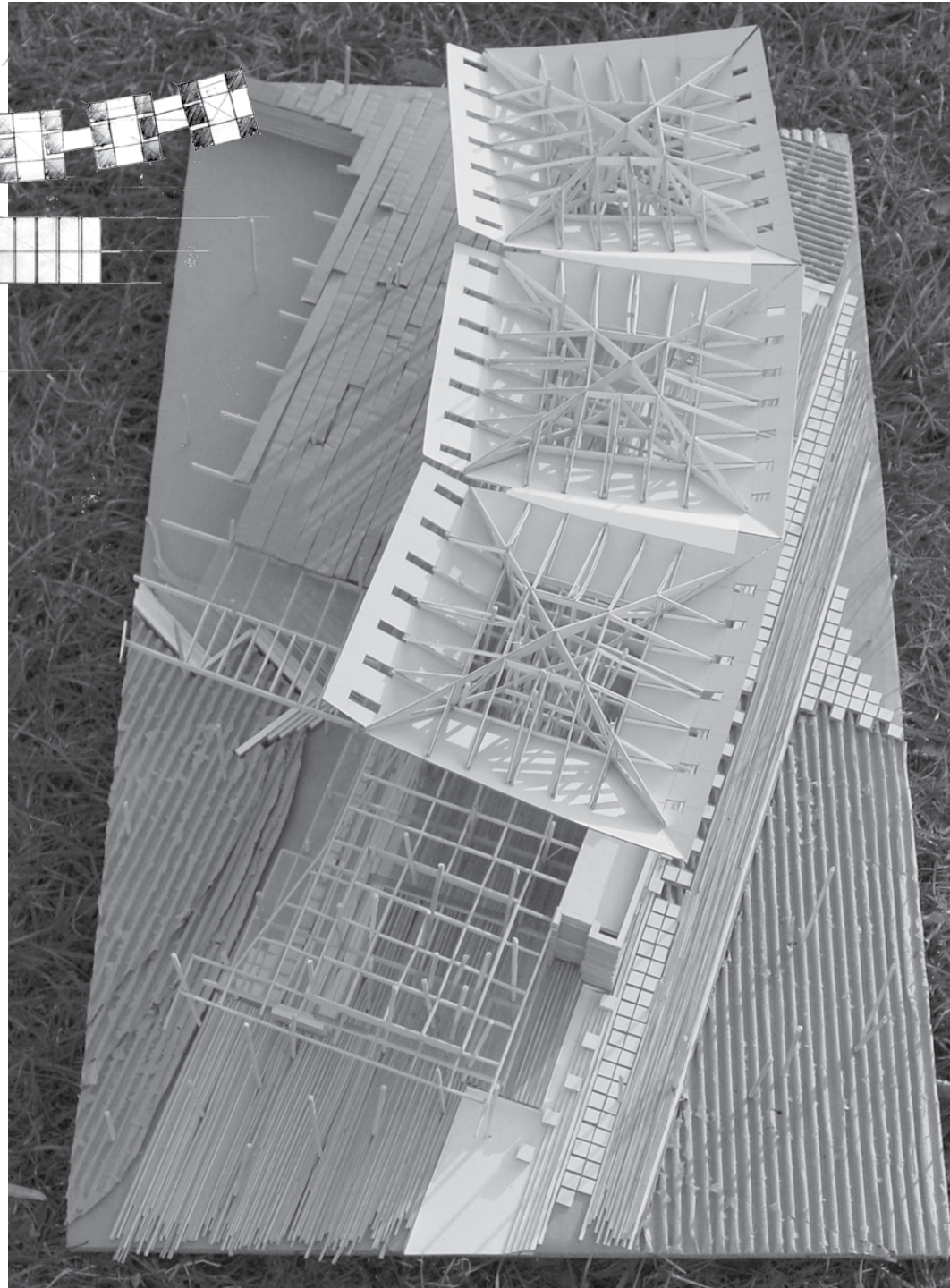
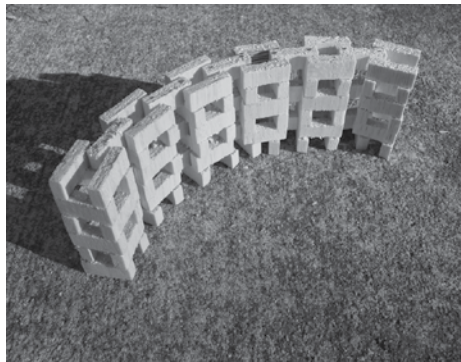
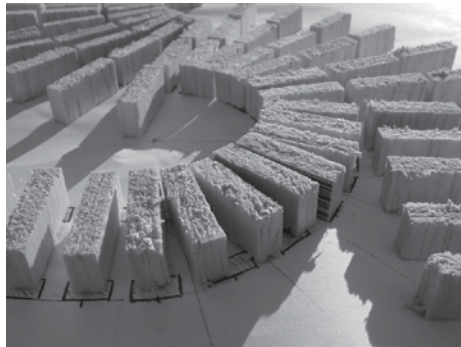
## EARTH

The columns support the floors of the facility, but also step out from under the roof canopies to interact with the site of the historic United Brick Corporation. Visitors walk among the slender columns as if they were trees or a massive grass field. The floors of the facility are made of brick and become the origin for the walls on the southern side of the facility. The walls are born from earth and never quite reach the underside of the roof canopies. A monumental exterior stair brings visitors from the U.S. National Arboretum to the field of the lookout “fold” and to the second floor interpretive gallery.

Visitors are encouraged to experience all levels of this structure - Earth, Sky and the space in-between.

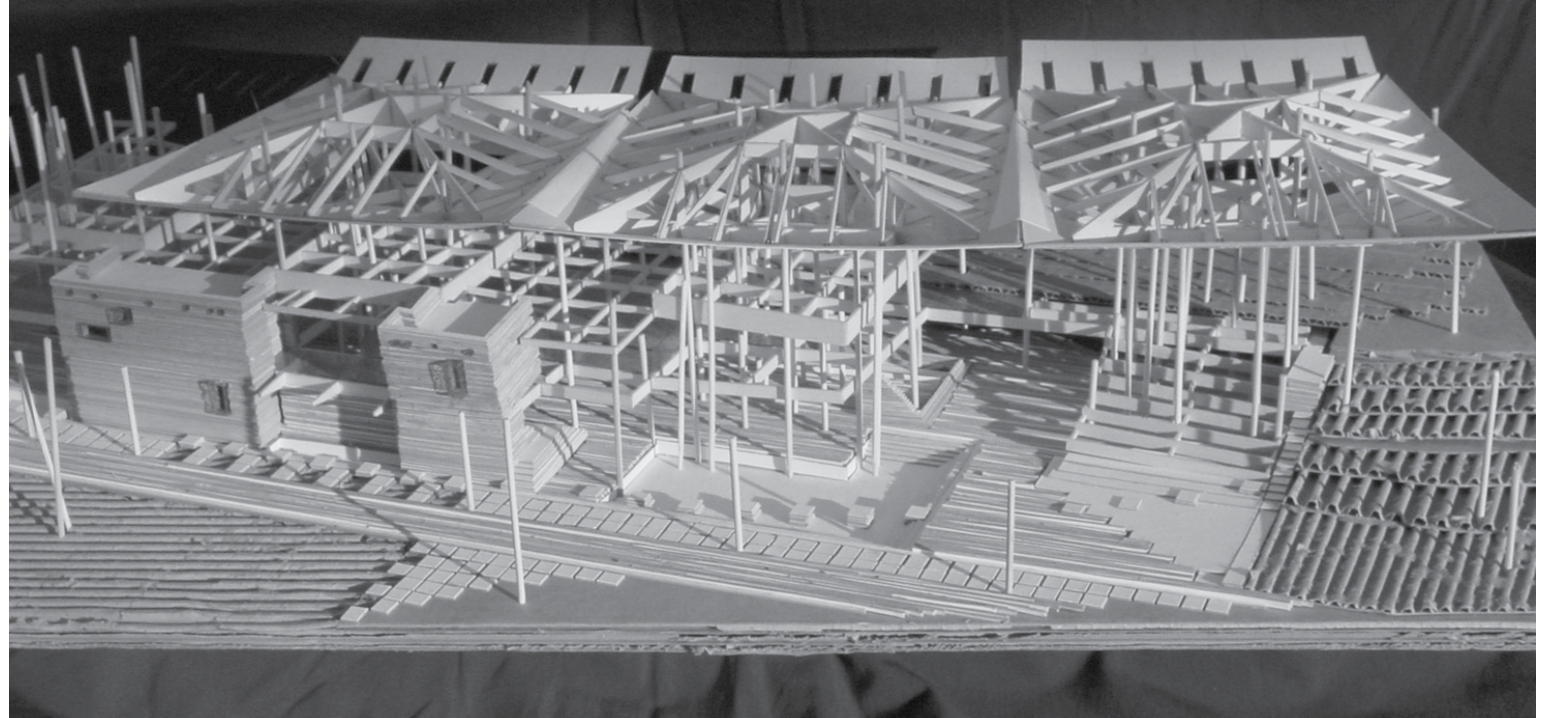
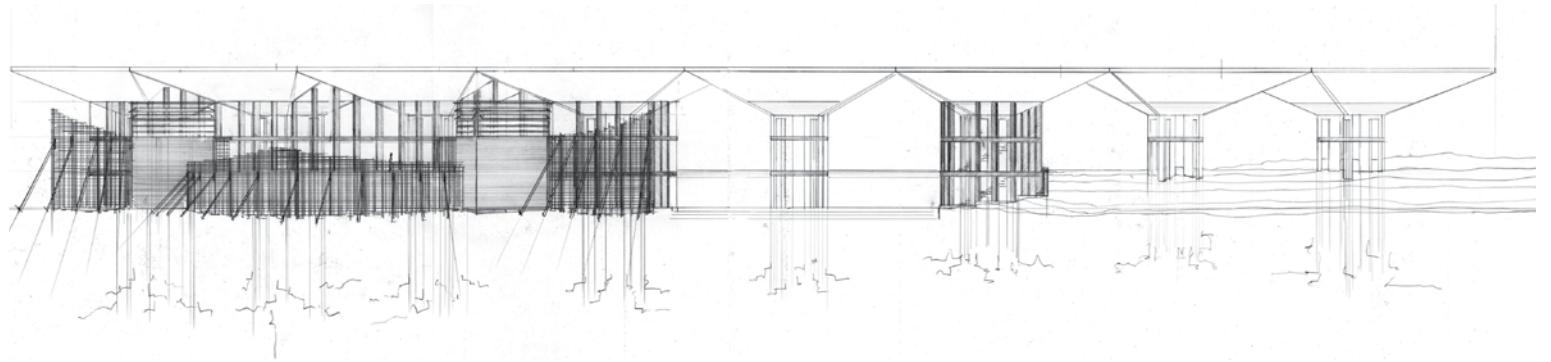


**FINAL MODEL**

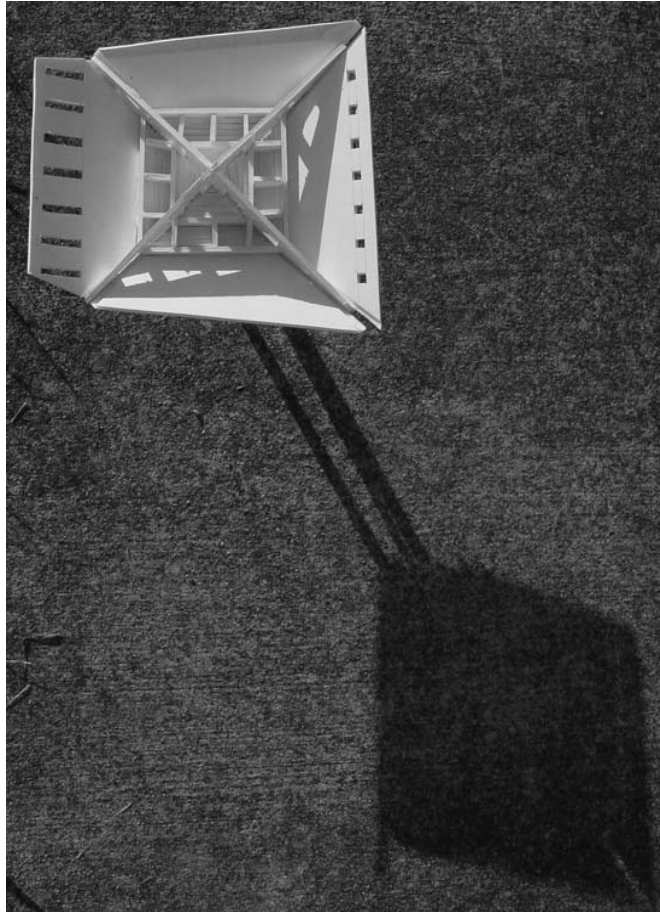
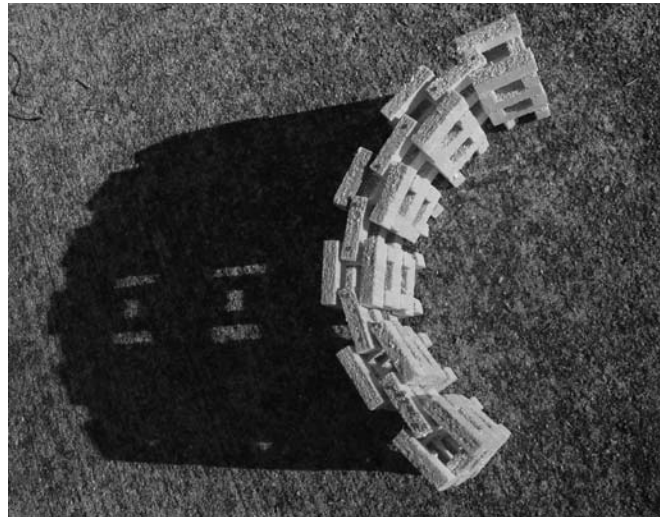
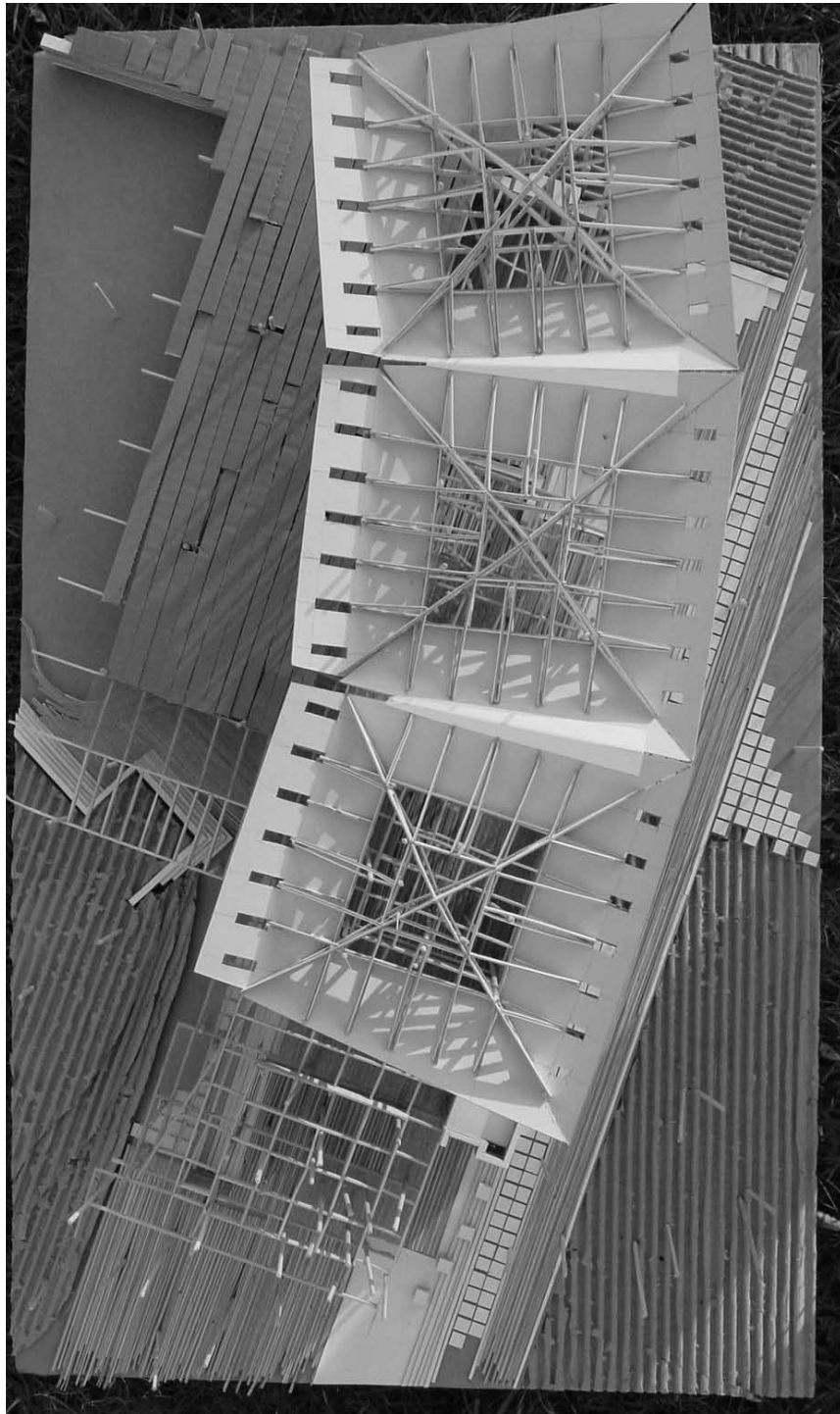


## A STRUCTURE

The previous section introduced the concentration and dispersion associated with the construction of the ceramic studio and interpretive gallery. A same phenomenon occurred as the model was built. The soil, now cardboard, once compact was disrupted and dispersed. The columns and piles, now wooden dowels, were brought to the site in concentration, dispersed and were pounded into place. The steel (wooden slats) and bricks (cardboard strips) were brought to the site in concentration then they, too, found their place in a new state of concentration and dispersion.

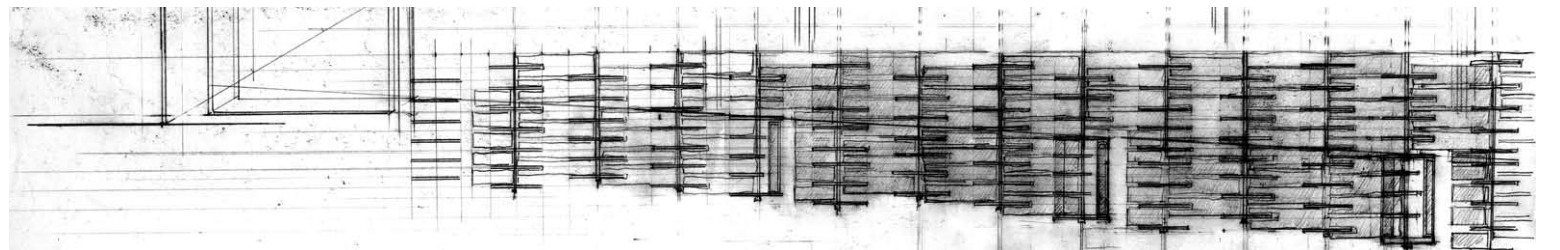


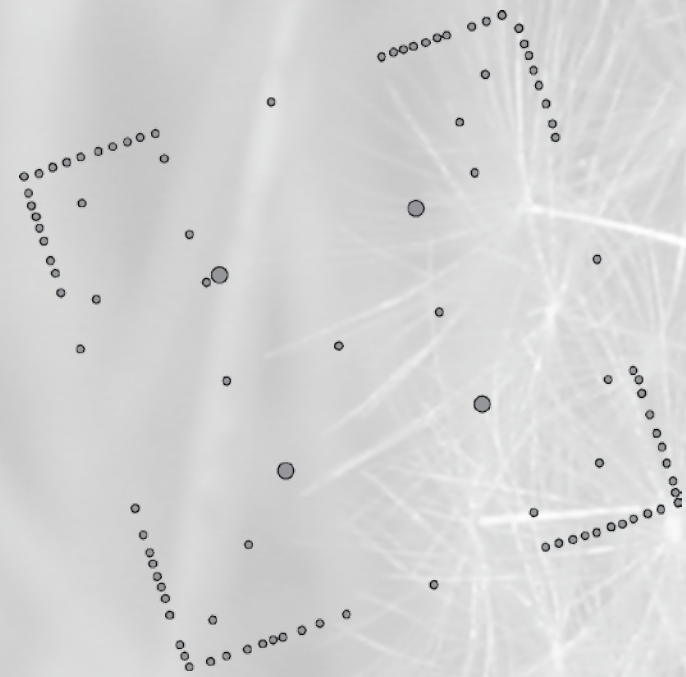




### A STRUCTURE (continued)

The model verified the presence that this structure would have on the landscape. It showed the slender columns touching the earth and supporting the roof canopies, creating the unique space in-between. All the material elements came together to form the model, which phenomenologically dispersed once it was complete. The structure became something greater than the sum of its parts.





## THESIS

The U.S. National Arboretum, Washington DC

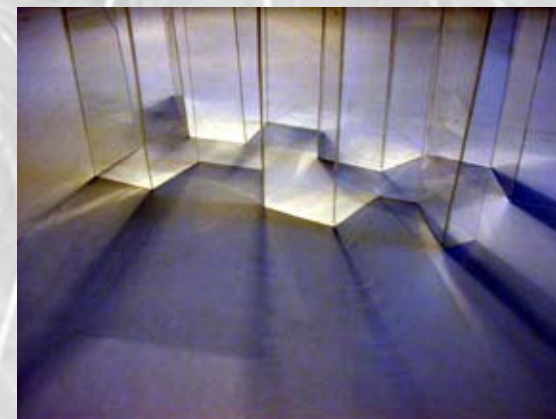
### CONCENTRATION AND DISPERSION

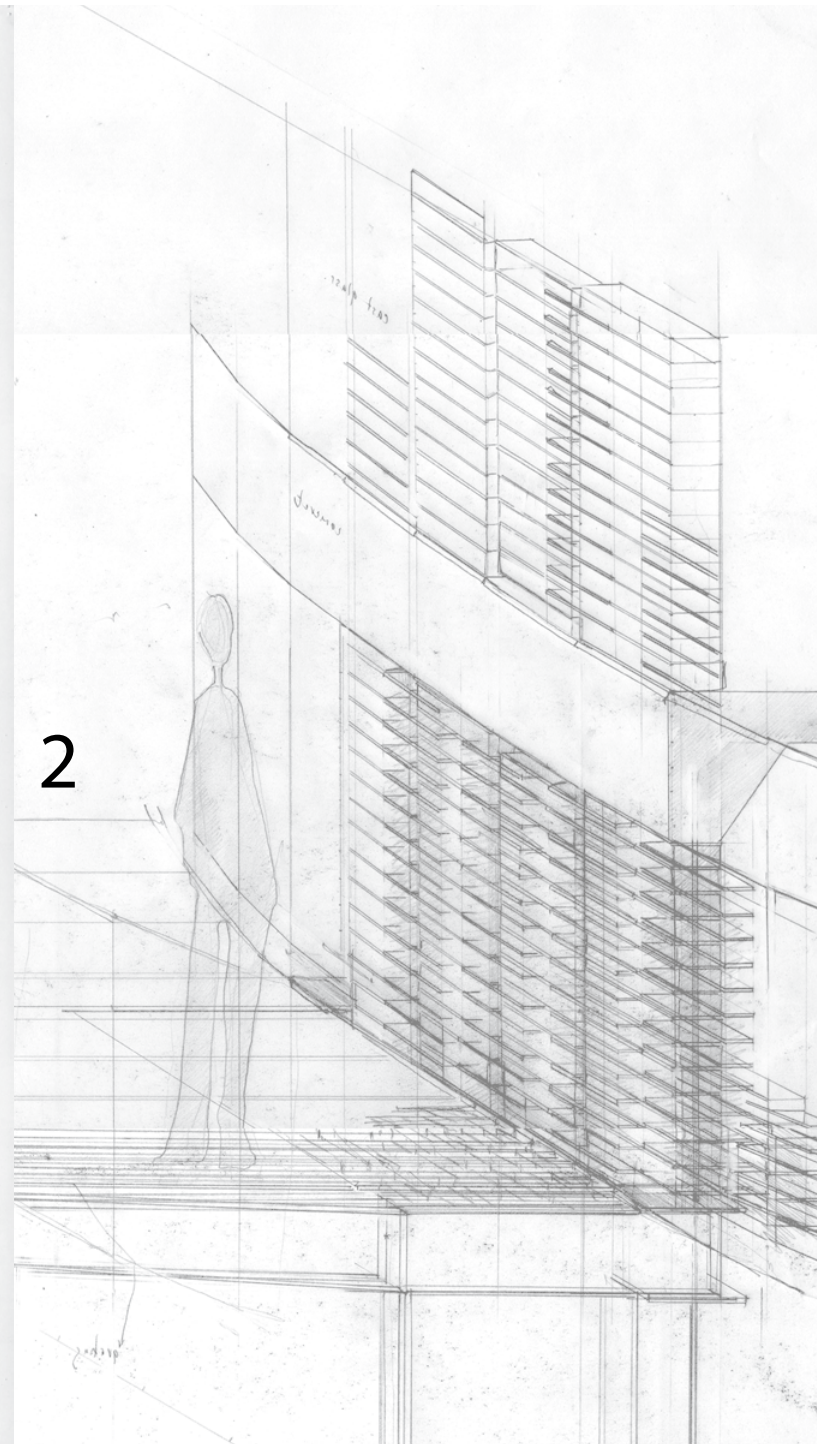
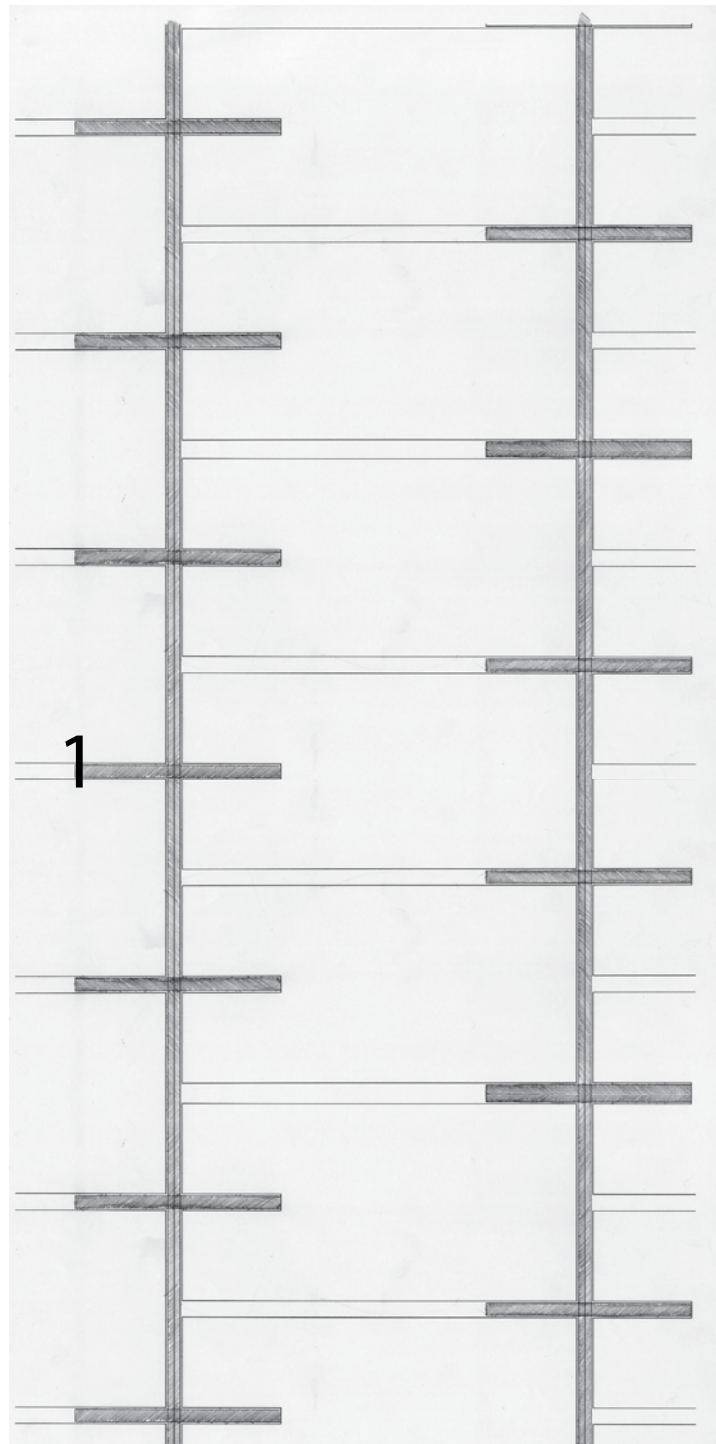
As described in the **Site Analysis** section, the concept for the thesis topic of concentration and dispersion was generated from observations while made at the site and in researching the brick making process. In trying to define the concept of concentration and dispersion, I reviewed photographs taken at the U.S. National Arboretum and photographs of many architectural precedents. Many elements of nature exhibit properties of concentration and dispersion, such as landscaped edges, specimen groupings and plant structure (see photograph of the dandelion below.)

In general, the images selected fell into one of two categories. The first category of images that concentrated and dispersed were those which exhibited strong, repetitive architectural elements which emphasized the effects of perspective. For example, the image of the arbor below shows structure in a very linear and repetitive layout, where the effects of perspective are quite noticeable. The elements in the foreground seem to disperse as the elements becoming the background seem to concentrate.

The second category was a collection of images where the edge of spaces or structure is blurred. For example, the image shown below shows an edge of light and shadow coming together. The edge of what is inside and what is outside is blurred. The image of the brick kiln below creates an experience of concentration and dispersion by varying the density of the structural edge. Partially due to the effect of perspective and partially due to the effect of having repetitive elements with space in-between, the structure of the kiln seems to concentrate at the focal point. At eye level you have wide bands of visibility to the outside and above eye level the visibility is gradually reduced to thin strips between wide bands of structure.

All of these categories exhibit structures and edges made of a repetition of distinct elements. It is perspective, density and often transparency that create concentration and dispersion.

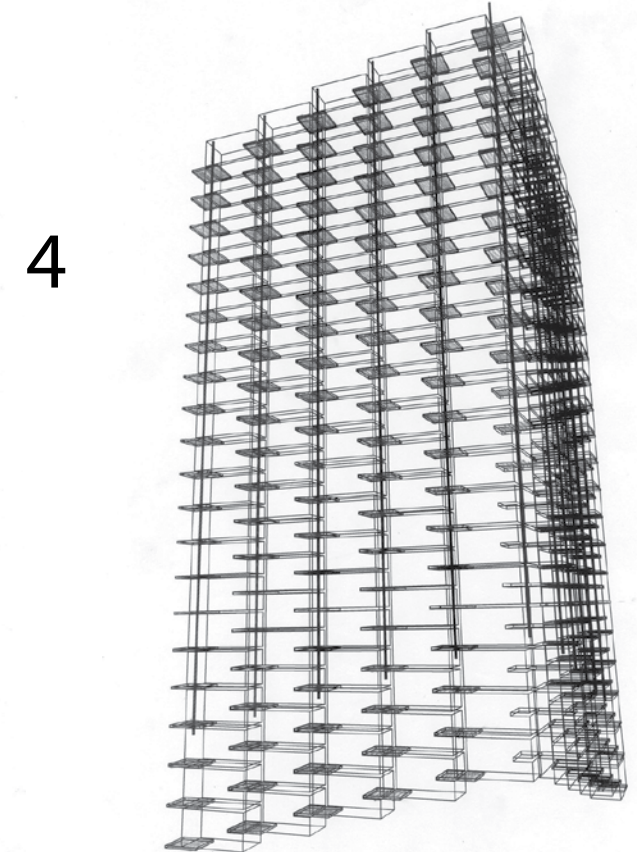
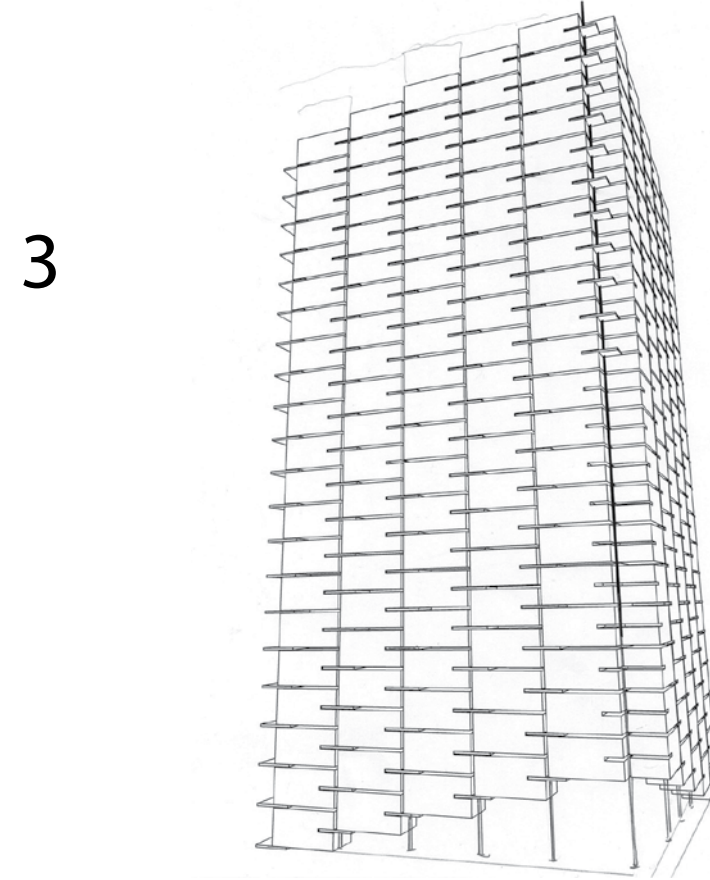




## PRELIMINARY STUDIES

The review of conceptual images influenced the early studies of how a structure can concentrate and disperse. I began to study elements in repetition such as the glass block and steel plate shown in the sketch to the left. The glass blocks were hung on rods and each block was supported by a steel plate. In elevation, the layout becomes a pattern that does not evoke images of concentration and dispersion.

When the pattern became three-dimensional, and viewed in axonometric, a three-dimensional pattern emerged. It was not until the pattern was viewed in three-dimensional perspective that it started to exhibit variations in density between one side and the other, from top to bottom, from foreground to background. Finally, when the glass blocks were made transparent, the three-dimensional pattern began to truly exhibit all characteristics of concentration and dispersion. This study helped solidify the observations previously described, that structures that concentrate and disperse rely on the repetition of distinct elements, shown in perspective, where the edges are blurred by transparency or variations in density.



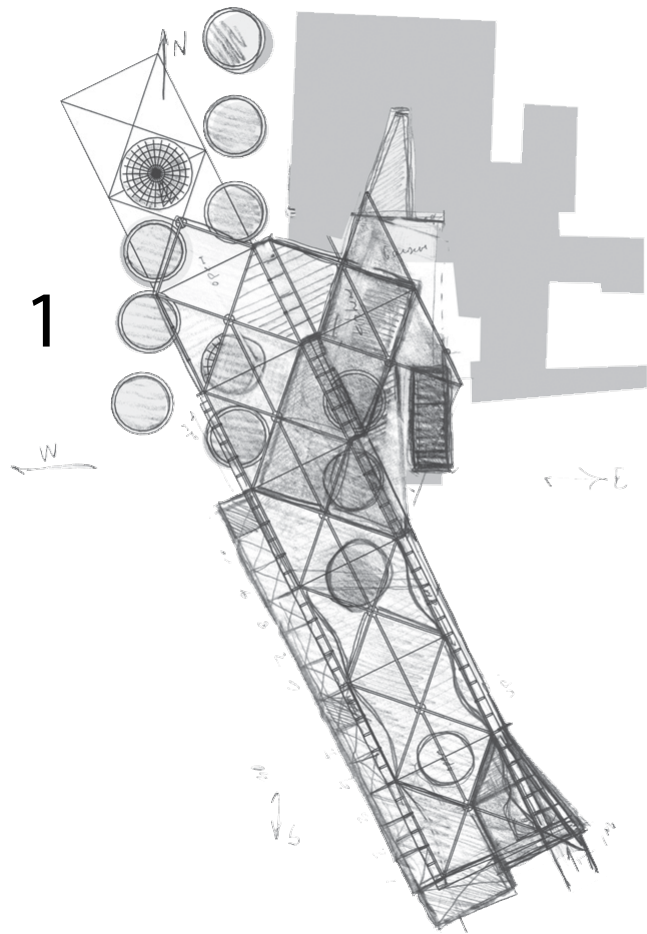


### PRELIMINARY DRAWINGS

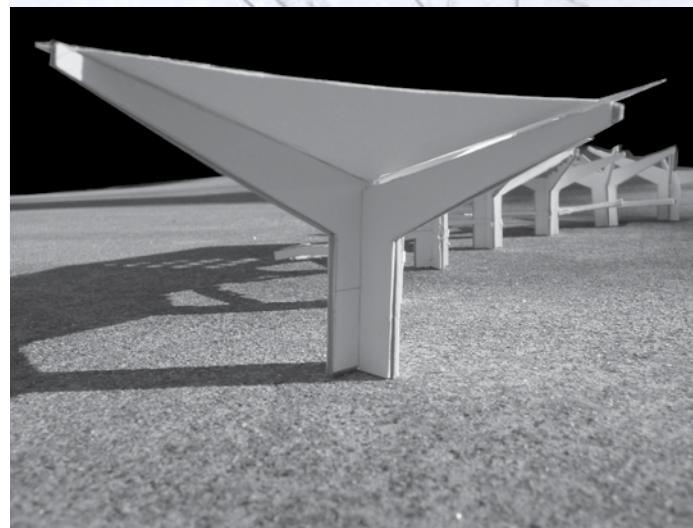
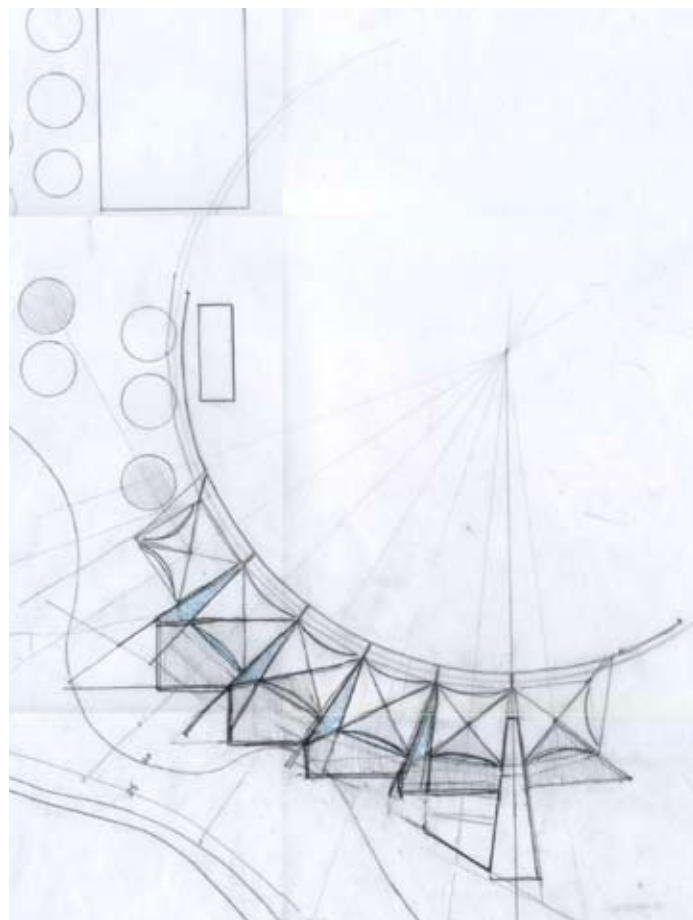
Based on the conceptual images and preliminary studies of concentration and dispersion, I experimented by drawing the structure of the interpretive gallery and ceramics studio in perspective. Yet the structure did not concentrate or disperse. I tried layering elements; I tried the gradients; and I tried to imagine how the structure of this facility was intended to concentrate and disperse. At this point, the structure was too predictable and where was the edge? What elements were meeting? The success of the final design was in the unpredictability of the structure. The blurred edge became two - where structure meets landscape and earth meets sky.

## DESIGN PROGRESSION

Another level of concentration and dispersion was revealed during the design process. A design that started as a compact building, covering the brick kilns was raised to cover the kilns. The cover then slid off the kilns to reveal them and expand the site, as described in the **site section**. When the building covered the kilns (Drawing 1), the roof was supported by eight massive columns, each supporting a portion of the canopy at its center point.



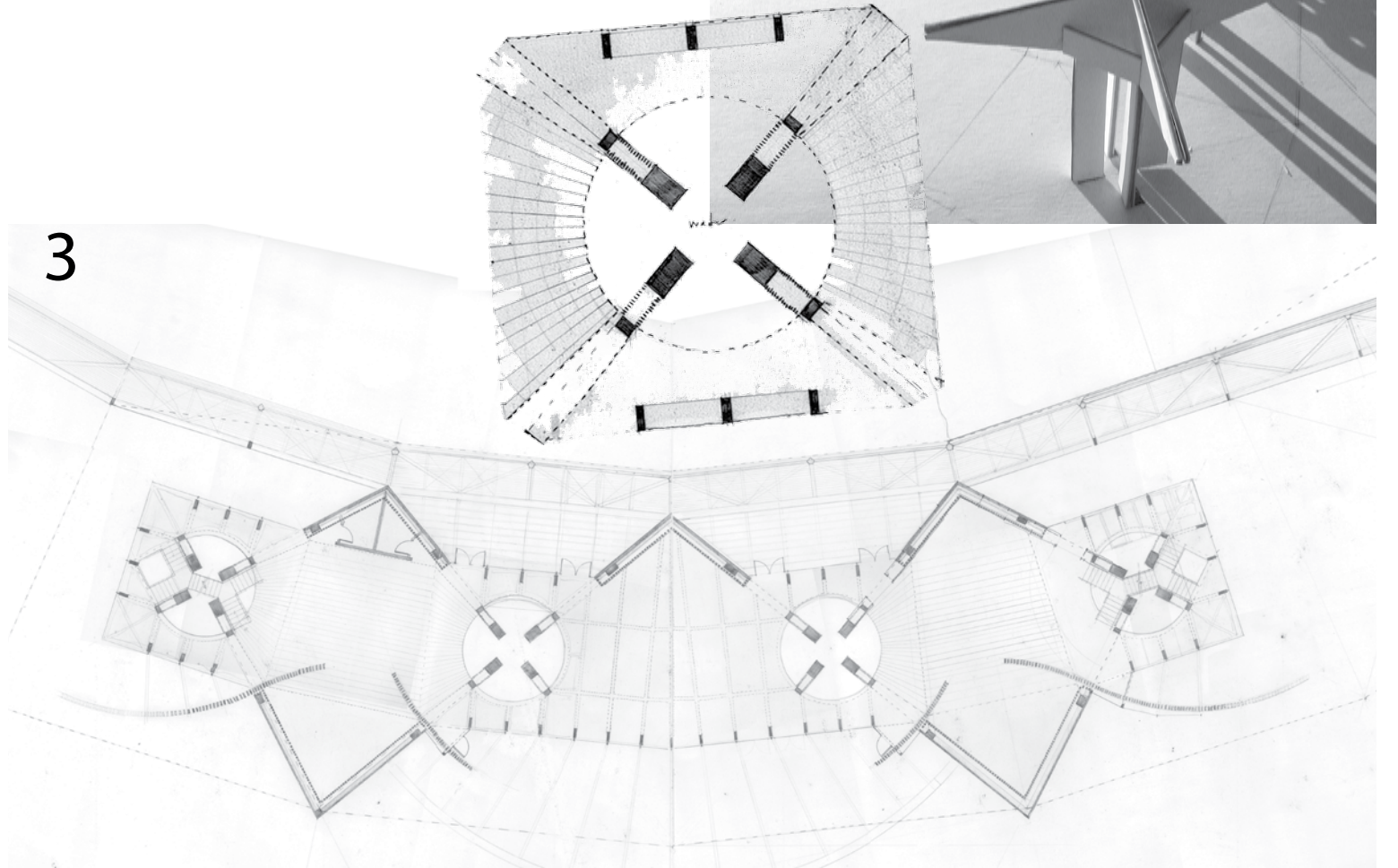
2



When the building slid off the kilns (Drawing 2), the kilns and building structure, which were in concentration, dispersed. As the design progressed, the massive columns each became four smaller columns (Drawing 3).

In the final design (Drawing 4) the central grouping of four columns multiplied to one hundred. One hundred columns supported each of the eight planar roof structures. In plan, the formation of the columns disperses. The column grouping nearest to the brick kilns is a concentration and the column grouping supporting the body of the interpretive gallery and ceramic studio is in dispersion.

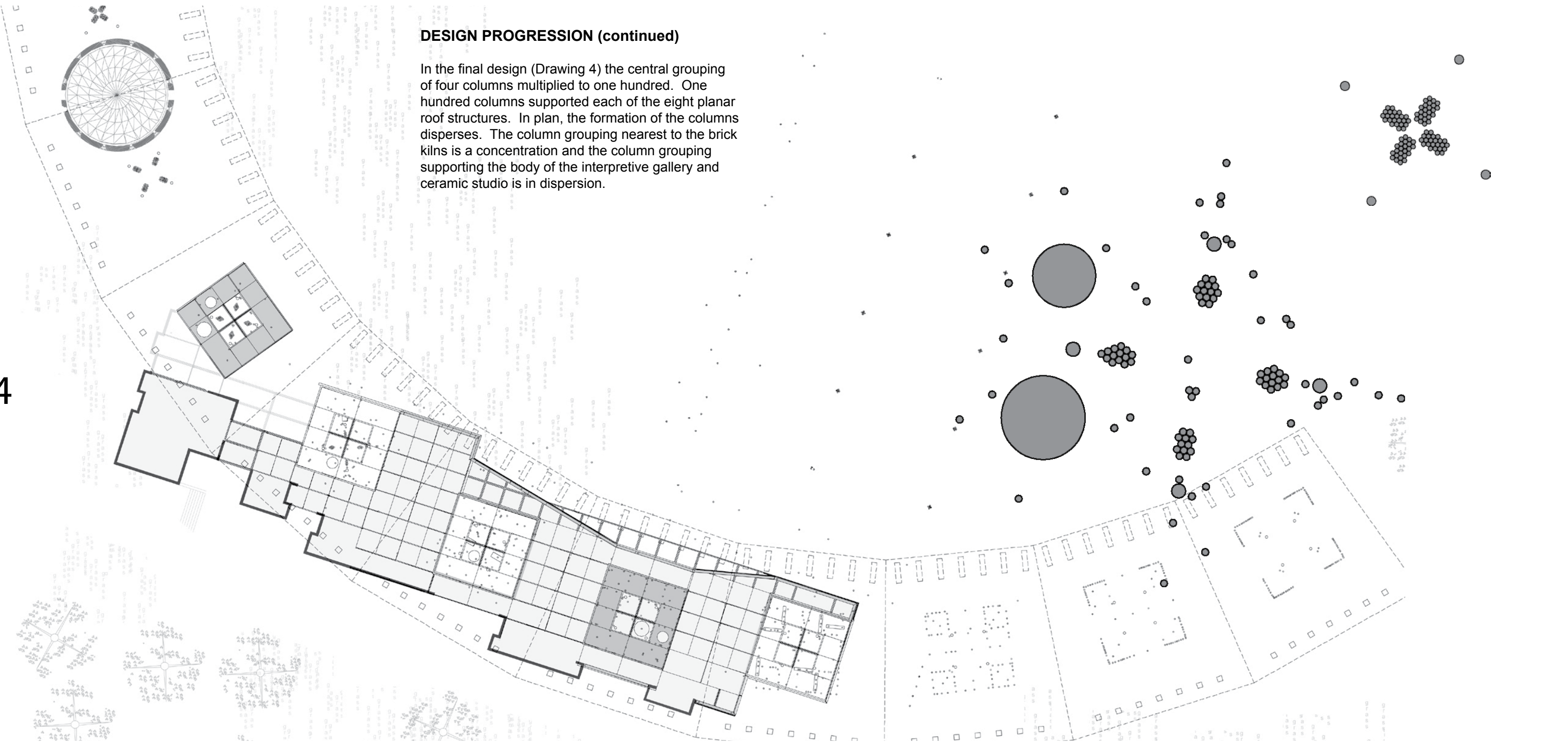
3



**DESIGN PROGRESSION (continued)**

In the final design (Drawing 4) the central grouping of four columns multiplied to one hundred. One hundred columns supported each of the eight planar roof structures. In plan, the formation of the columns disperses. The column grouping nearest to the brick kilns is a concentration and the column grouping supporting the body of the interpretive gallery and ceramic studio is in dispersion.

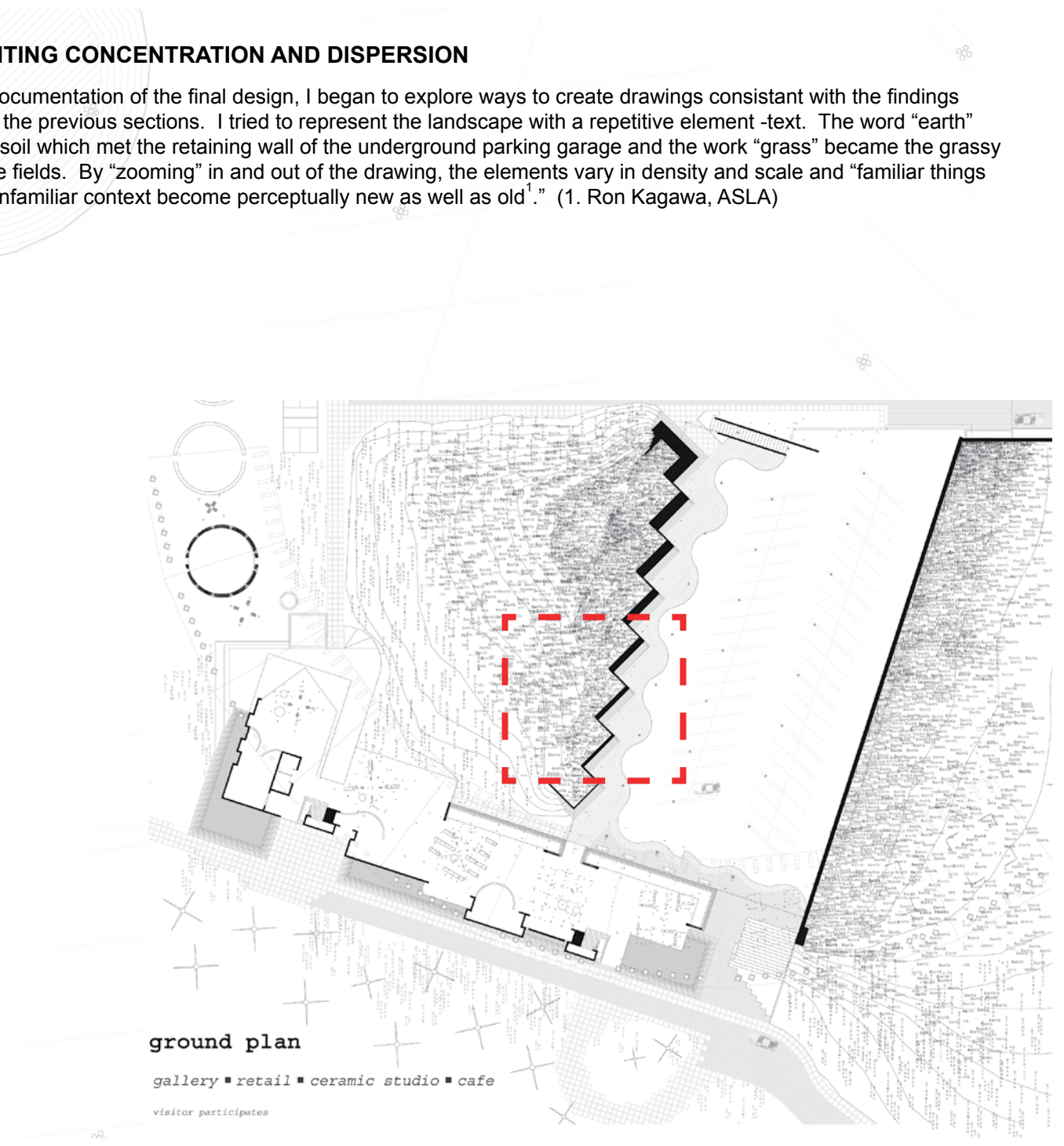
4

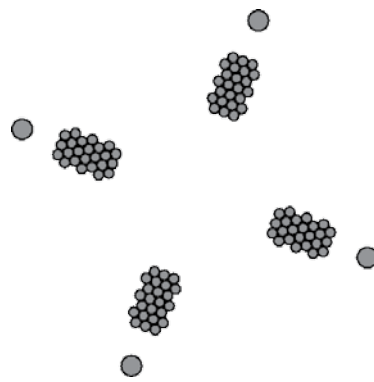




## DOCUMENTING CONCENTRATION AND DISPERSION

During the documentation of the final design, I began to explore ways to create drawings consistent with the findings described in the previous sections. I tried to represent the landscape with a repetitive element -text. The word "earth" became the soil which met the retaining wall of the underground parking garage and the work "grass" became the grassy texture of the fields. By "zooming" in and out of the drawing, the elements vary in density and scale and "familiar things seen in an unfamiliar context become perceptually new as well as old". (1. Ron Kagawa, ASLA)



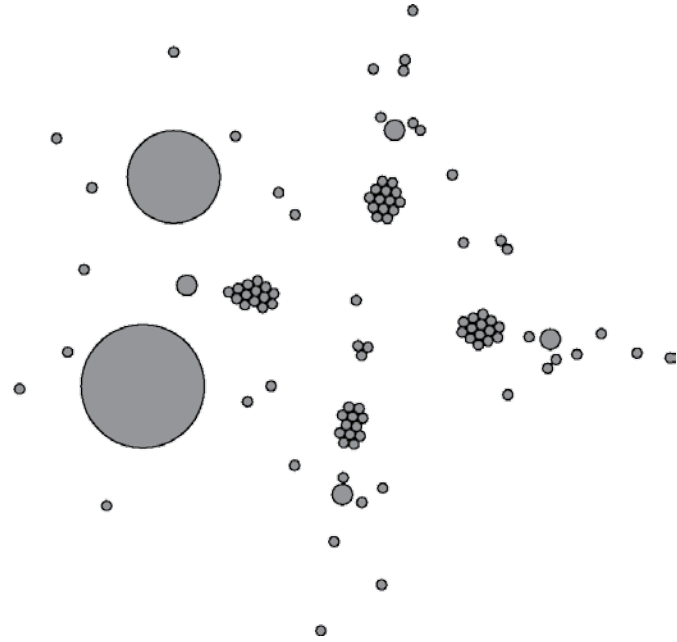


## CONCLUSION

This thesis study started with the intention of creating an architecture of perceived boundaries, formed by elements of concentration and dispersion - but the *extent* of this study was entirely unexpected. The history of the site, the brick making process, the description of the landscape and the story of theoretical visitors were all be described using the language of concentration and dispersion. The structure and the landscape did concentrate and disperse - in drawings and in model.

Most important was the design process and how the building, at first a concentrated enclosure covering the artifacts finally was free to disperse...





## NOTES / CREDITS

.... which requires a huge **thank you** to my entire thesis committee for helping me to disperse.

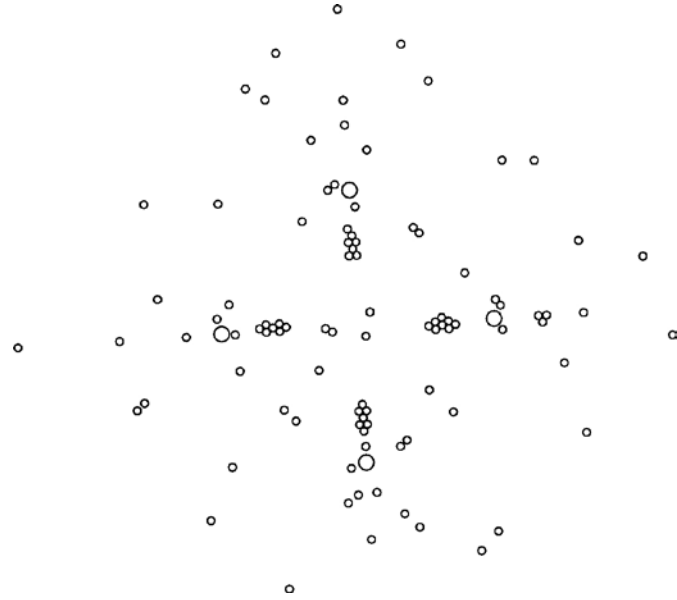
### IMAGE CREDITS

Unless otherwise noted, photos and work are by the author.

#### Page 5 (image 1)

USGS Aerial Image, [http://www.terraserver.com/imagery/image\\_USGS.asp](http://www.terraserver.com/imagery/image_USGS.asp)

.... and a final thank you to my family for all their continued support and love.



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