

To the Graduate Council:

I am submitting herewith a thesis written by Bolin Briscoe Evans entitled, "Architecture of Mutual Permeation." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Masters of Architecture, with a major in Architecture.

Scott Wall

Scott Wall, Major Professor

We have read this thesis
And recommend its acceptance:

Edgar Stach

Edgar Stach

Jason Brown

Jason Brown

Accepted for Council:

Carolyn Hodges

Vice Provost and Dean of the Graduate School

Architecture of Mutual Permeation

A Thesis Presented for
the Master of Architecture
Degree
The University of Tennessee, Knoxville

Bolin B. Evans
May 2007

Copyright © 2006 by Bolin Evans
All rights reserved.

ACKNOWLEDGEMENTS

This thesis is dedicated to the life and work of my late father, James Mignon Evans, whose influence and inspiration in my studies and in life is incapable of being quantified into words, and whose advice and love will be missed greatly. I would also like to dedicate this thesis to my mother, Gayle, and my wife Sparrow, who have endured hardship and frustration during the course of my study yet have remained encouraging and inspirational.

I thank Scott Wall, Edgar Stach, and Jason Brown for their input and guidance through this process.

ABSTRACT

“Human life is not intended to oppose nature and endeavor to control it, but rather to draw nature into an intimate association in order to find union with it...this kind of sensibility... de-emphasizes the physical boundary between residence and surrounding nature and establishes instead a spiritual threshold... While screening man's dwelling from nature, it attempts to draw nature inside.”
--Tadao Ando¹

The result of humanity's dominant approach to nature has led us to separate ourselves from the natural environment, both physically and spiritually. As J. B. Jackson explains, “we have persisted in separating man from nature and in keeping them separate. The separation I mean is not primarily a physical one, an inevitable outcome of modern urban existence; it is a separation incorporated in our dichotomous way of thinking.”² This separation in architecture is manifested in the enclosure, exemplified by a dominant approach to the elements and an exhaustive use of resources. This dominance reflects the ideology born of the industrial revolution, and has produced a flawed system and a false dependence on technology, as well as a pervasive attitude that the natural environment exists for our exploitation. This thesis resists such dominance in favor of a more cooperative relationship with the natural environment, and proposes a design pattern of mutual permeation that can foster this approach.

¹ Ando, Tadao: *Theorizing a New Agenda for Architecture: An Anthology of Architectural Theory*. 462.

² Jackson, J. B. *Landscapes: Selected Writings of J. B. Jackson*, ed. Ervin H. Zube. . 41.



Fig. 1: Stone footbridge in Vallemaggia district, Ticino, Switzerland

Source: Author

PREFACE

This thesis explores the idea that architecture can foster a sustainable relationship between man and the environment. Such a relationship can only be achieved through a synthesis of sustainable technology and symbolism. By exploring the conventions of the boundary, a symbolic foundation of mutual permeation will encourage this relationship.

TABLE OF CONTENTS

Chapter	Page
I. Introduction.....	1
Architectural Implications.....	3
Nature and Shelter	5
Proposal	6
II. Site Selection.....	7
Zoning.....	32
Climate.....	32
III. Program Description.....	34
Organization	35
Quantitative	35
Public.....	36
Private	36
Qualitative.....	38
IV. Neglect of the Existential.....	40
Natural Environment	41
Boundary	43
Genius Loci and Critical Regionalism	49
V. Case Study.....	56
VI. Bibliography	65
VII. Appendix A Precedent.....	68
VIII. Appendix B Building Code.....	85
VIII. Appendix C Final Drawings.....	86
Vita	107

LIST OF TABLES

Table	Page
Table I.....	37
Table II.....	37
Table III.....	38
Table IV.....	38
Table V.....	39
Table VI.....	76
Table VII.....	76
Table VIII.....	76

LIST OF FIGURES

Figure	Page
Fig. 1: Stone footbridge in Vallemaggia district, Ticino, Switzerland Source: Author.....	v
Fig. 2: Primitive hut Source: Laugier.....	1
Fig. 3: Mutual permeation of interior and exterior allow interrelationships and a greater understanding of both conditions. Source: Author.....	3
Fig 4: Cellulose Factory, Alvar Aalto. Source: Fleig.....	6
Fig.5: Tri-state region Source: Author	8
Fig 6: Memphis, TN 2006 Source: Author.....	8
Fig 7: Memphis, TN Interstates form a loop around main body of city. Source: Author.....	9
Fig 8: Memphis, TN train system, which drastically shaped the development of the downtown. Source: Author.....	9
Fig 9: Memphis, TN Interstate in the orange and main highways shown in yellow. Source: Author.....	10
Fig 10: Memphis, TN River traffic along the Mississippi River. Source: Autho	11
Fig 11: Memphis, TN Levee system Source: Author.....	12
Fig 12: Memphis, TN Floodplain on the shore of the Mississippi Western banks. These agricultural fields flood on a yearly basis Source: Author.....	13
Fig 13: Memphis, TN 1940's Source: website	14
Fig. 14: Barge terminal below site from bluffs. Source: website	14
Figure 15: the perceived zone of the commercial downtown Source: Author.....	16
Fig 16: Band of parks act as threshold to city, and transition for urban fabric into the river. Source: Author.....	17
Fig 17: Band of parks act as threshold to density of downtown. The site is shown in purple as part of this zone of transition. The density falls off within the horseshoe shape mentioned Figure 5, The high bluffs of the city are shown against the levee and floodplain of Arkansas. Source: Author.....	17
Fig. 18-19-20: 18-Section of Mississippi River at the site at regular level. The temporary quality of the floodplain is shown in Figure 19, and the raw power of the Mississippi River is displayed in the surpassed levee in Figure 20.....	19
Fig. 21: Man-made levee system shows our necessary control of nature, and the perilous position it leaves us in. Source: Author	20
Fig. 22: Natural bluffs on the Memphis side of the river provide protection from the flooding . Source: Author	20
Fig. 23: Zones of the site – yellow – industrial green- parks ..blue-residential Source: Author	22
Fig. 24: Access to the site shown in orange, with a purple oval around the site. Source: Author.....	23

Fig. 25: Site shown in purple oval. Souce: Author	24
Fig. 26: Site shown in purple oval. Interstate shown in green dissecting the neighborhood of the site and the streets that have been severed are shown in brown. Souce: Author	26
Fig. 27: The property line of the site is shown in purple, and shows the development of natural and man-made boundaries. Source: Author.....	27
Fig. 28: The North and West boundaries of the site are formed by a steep bluff. Source: Author.....	28
Fig. 29: The South and East boundaries of the site are formed by the brick wall on the street to the South, and the remaining Naval facilities to the East, which are abandoned and could be incorporated into the site. Source: Author	29
Fig. 30: The major axes of the site are created by the new imposed entrance, and by the strong axis East-West through the sallyport of the Naval building. Source: Author.....	30
Fig. 31: The buildings form an outdoor room that is used heavily throughout the year. Source: Author.....	31
Fig. 32: The main entrance of the grounds and main museum building. The red arrow marks the direction of view. Source: Author	32
Fig. 33: Indian burial mounds source: Author	32
Fig. 34: view fro the bluff to the bend in the river	32
Fig. 35: Zoning map Source: Author.....	33
Fig. 36: threshold as line	45
Fig. 37: threshold as zone	45
Fig. 38: Mutual permeation of interior and exterior	46
Fig. 39: traditional understanding of threshold.....	48
Fig. 40: expanded significance of zone of threshold.....	48
Fig. 41: Ancient stone dwelling. Near Iragna, Switzerland. Source: Author	52
Fig. 42: Ha-ha wall in English countryside. Source: Author	53
Fig. 43: Sketch of stone footbridge in Switzerland Source: Author	57
Fig. 44: View from the rock attached to the bank which the bridge hugs on its way out to the water. Source: Author.....	60
Fig. 45: Plan diagram of bridge, showing the bridge attached to the rock that is part of the bank in red, and the amount of turning the bridge does to suit the site. Source: Author.....	61
Fig. 46: Sketch of the second jump the bridge makes, and how the stairs attach themselves to the edge of the rock. Source: Author	62
Fig. 47: Transverse section of bridge and island rock showing connection. Source: Author.....	63
Fig. 48: Longitudinal section of bridge displaying the use of three rocks as supports.....	64
Fig. 49- Site Plan. Source: Progressive Architecture	69
Fig. 50: Model Source: PatkauArchitects.....	69

Fig 51 & 52- Overhangs and irregular roof- Source: Patkau Architects	71
Fig. 53: Stack ventilation Source: Author.....	72
Fig. 54: Example of treatment of boundary between built and unbuilt. Source: Patkau	72
Fig. 55: Spaces in brown show in-between zone separating pods of classrooms. This zone serves as a transitional element. Source: Author.....	73
Fig. 56 & 57: Stepping floor plane reduces impact on site Source: Author	75
Fig. 58: daylighting Source: Patkau.....	76
Fig. 59: Zentrum Paul Klee section showing zones of introduction into building as opposed to one line. Source: Author.....	78
Fig. 60: Zentrum Paul Klee section showing zones of introduction into building as opposed to one line. Source: Author.....	78
Fig. 61: Building dives into earth and jumps back out on the other side of entrance ramp. Source: Cantz.....	79
Fig. 62: Side view of roof showing relationship to landscape. Source: Cantz	80
Fig. 63: rear of building, where three humps merge into natural landscape. Source: Cantz.....	81
Fig. 64: Image of pond and engawa Source: GA Document	83
Fig. 65: Museum of Modern Art, Fort Smith.....	84
Lanterns in the pond. Source: GA Document	

CHAPTER I

Architectural implications

It is vital for designers to formulate a fitting relationship with the natural environment that hinders neither our experience nor the ecosystem. Shelter is an essential aspect of this human experience with the environment, and is manifested in the realm of enclosure. The motivation for the primitive hut and origin of architecture, enclosure creates a boundary between the interior and exterior and imparts a feeling of security to the user. The phenomenon of the boundary has been explored by many designers and users alike, from early man creating necessary shelters like the primitive hut shown in Figure 2, to today's



Fig. 2: Primitive hut Source: Laugier

structures. Tadao Ando states that “Architecture has always been about boundaries; building boundaries for protection and then opening them up for movement.”³ I envision this movement not only in the physical sense, but in the emotional or spiritual fabric of life as well.

The physical realm is the definition of space by boundaries, and the spiritual realm is how those boundaries evoke emotional reactions. The tension that is created at this threshold represents our innate interaction with nature: protection from the elements yet connection to the environment. The tension of transition from interior to exterior will be explored by altering the limitations of the boundary and its surfaces. This thesis proposes that manipulation of the enclosure and its inherent tension can produce an architecture of mutual permeation (Fig. 3) that will foster a better relationship with the environment.

Nature and shelter

The meaning of nature is what the particular culture decides, so the value and importance differs from culture to culture. “Today, unfortunately, nature has lost much of its former abundance, just as we have enfeebled our ability to perceive nature. Contemporary architecture, thus, has a role to play in providing people with architectural places that make them feel the presence of nature.”⁴ With the natural environment becoming increasingly harder to experience in our

³ Ando, 448.

⁴ Ibid, 452.

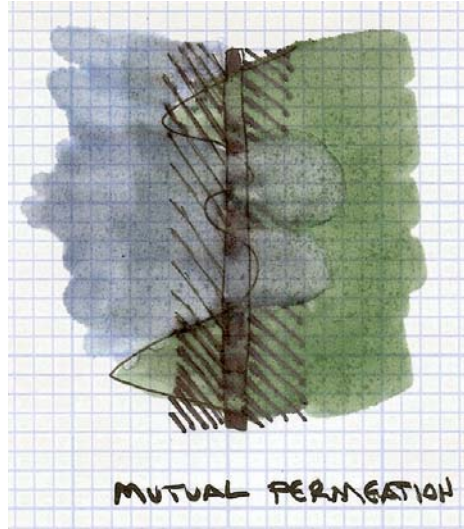


Fig. 3: Mutual permeation of interior and exterior allow interrelationships and a greater understanding of both conditions. Source: Author

daily lives, a new agenda must focus on bridging this divide while preserving what resources remain, which leads to mutual permeation and an environmental design of sustainability.

Environmental design does not mandate a complex technological application, so when technology is mentioned it is of a broader understanding than modern technology yet does not reject it. Noting methods of indigenous peoples of the world as well as the animals, we can understand that sustainable principles such as daylighting, passive ventilation, appropriate siting, and use of

local, renewable materials have been established conventions of building throughout its history. Victor Olgyay explains that “the ancients recognized that regional adaptation was an essential principle of architecture.”⁵ While the practice of sustainability proceeds by preserving the earth’s resources on a literal level, there is a necessity for the symbolic level to make people aware that the land is part of the community and not a commodity. The natural world is essential for our existence, both physically and spiritually; therefore an architecture that does not attempt to preserve actual resources nor relate its inhabitants to the natural environment is not providing an appropriate response to shelter.

The essential idea of shelter is defined by its boundaries, which constitute the focus of this investigation. The boundary holds great value in the dichotomy of interior and exterior relationships. It is the qualities of the boundary, such as threshold, tension, transition, and liminality that drive this investigation towards an architecture that can foster a closer relationship with the natural environment.

Proposal

A responsible approach to design demands an understanding of the site with an environmental and cultural focus. A focus on the site will inherently incorporate a philosophy of cooperation with nature. This thesis proposes to instill the concept of cooperation with nature into the redevelopment of the

⁵ Olgyay, Victor. *Design With Climate: A Bioregional Approach to Architectural Regionalism*, 1.

National Ornamental Metal Museum. The Metal Museum is located on the Eastern bank of the Mississippi river in the South of Memphis, Tennessee, and will be the program and site for this thesis. The Metal Museum proposes to be a bookend for the re-urbanization of downtown Memphis, and is the southern tip of 5 miles of public riverfront. Its position as a metal working artist's community establishing a better relationship to nature is quite an antithesis of craft. A catalyst of the Industrial Revolution, which produced much of the dominant attitude toward nature and its ultimate results, the metal artist community will serve as a symbol for cooperating with nature. Figure 4, Alvar Aalto's Cellulose Factory at Sunila, from 1935, displays an example of this overall attitude: even a factory such as this can work with the natural environment as opposed to completely controlling and exploiting it. This program of a Metal Museum will allow the site to generate the desired affect of encouraging more interaction with nature, while at the same time heightening the visitor's awareness of nature, how we treat it, and our place in the natural realm.

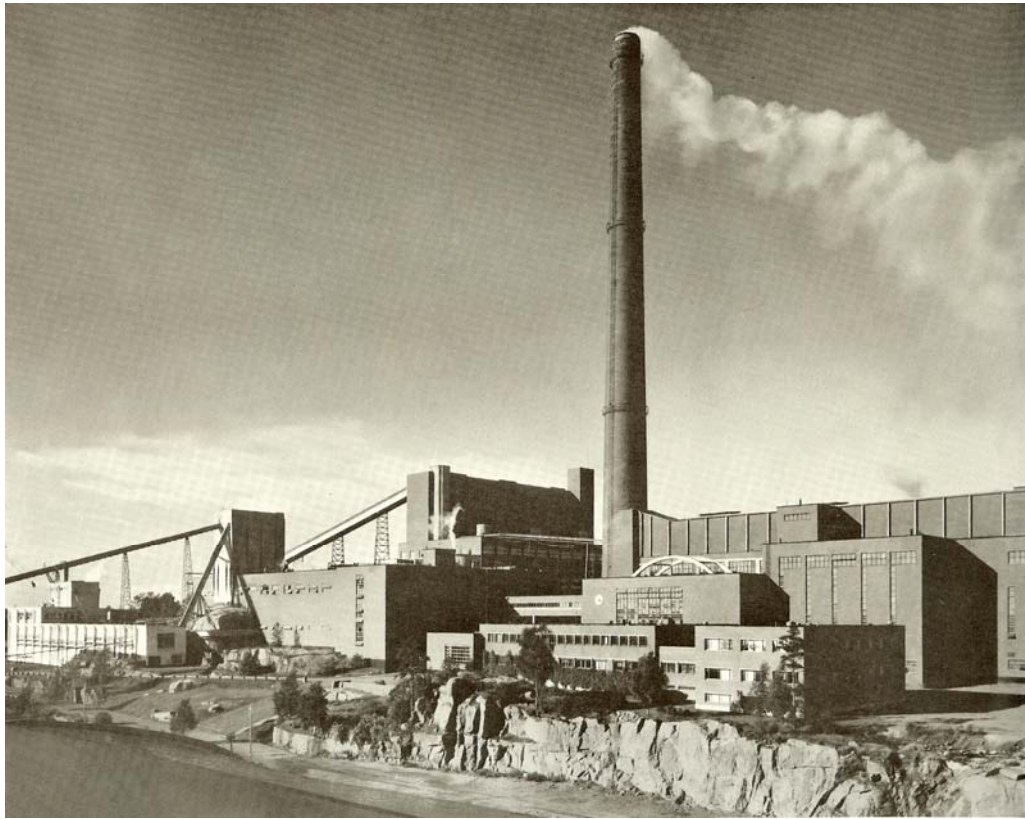


Fig 4: Cellulose Factory, Alvar Aalto. Source: Fleig

CHAPTER II

Site Selection

In Architecture the forces of the site should be elemental in the generation of form. The outcome of the design is dependent on the factors present, both physical and spiritual. All places have a distinct essence, a unique particular that is individual to the location on many scales. This thesis will incorporate these particulars of the site in order to blend with the natural and cultural environment while maintaining an identity within. The chosen site is in Memphis, Tennessee, at the National Ornamental Metal Museum. The city of Memphis was founded by land speculators from Nashville, one of whom was Andrew Jackson. A square grid was laid out along a bend in the Mississippi River at the point where the three states Arkansas, Mississippi, and Tennessee meet. (Figure 5) The major metropolitan area of Memphis and its position on the Mississippi River is analyzed in the series of maps.(Fig. 6-12)

The Mississippi River is responsible for much of the development here, and Memphis became a regional hub for trade and commerce while river transport was important. One of the key barge terminals, shown in Figure 13 & 14, is at the foot of the bluffs below the site and is still very active to this day. As business along the river dwindled, the economic state of the downtown core degraded. The downtown became disconnected from the river after the cotton trade and steamboat traffic dissolved, leaving abandoned warehouses lining the streets close to the riverfront. A general revival in interest of the downtown area

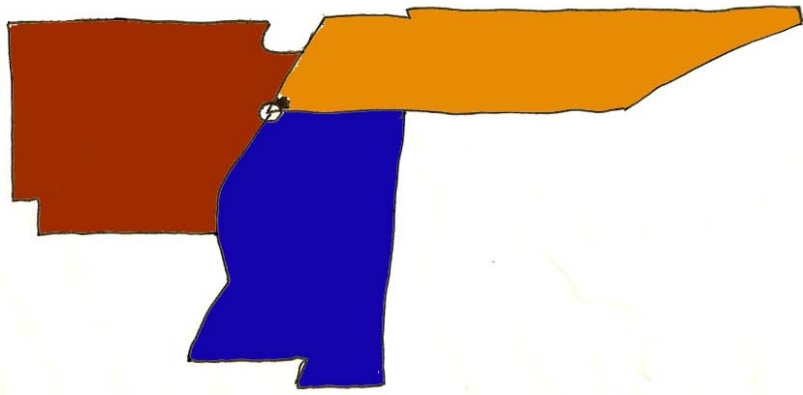


Fig. 5: Tri-state region
Source: Author

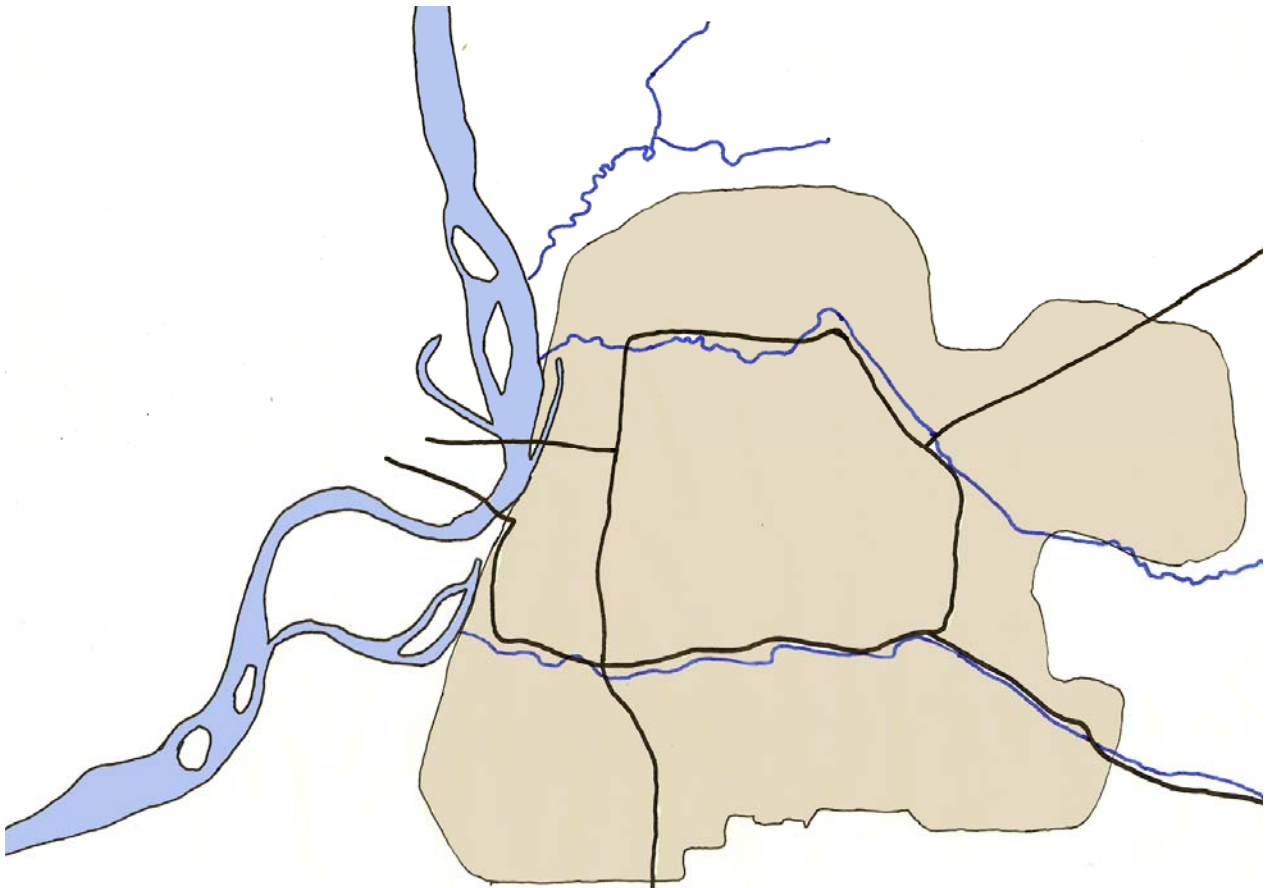


Fig 6: Memphis, TN 2006 Source: Author

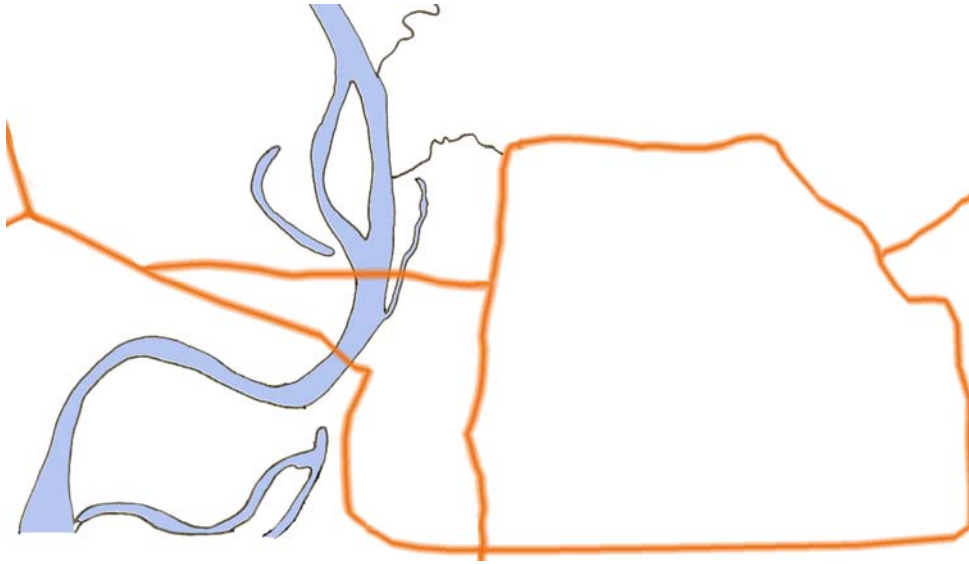


Fig 7: Memphis, TN Interstates form a loop around main body of city. Source: Author



Fig 8: Memphis, TN train system, which drastically shaped the development of the downtown. Source: Author



Fig 9: Memphis, TN Interstate in the orange and main highways shown in yellow. Source: Author

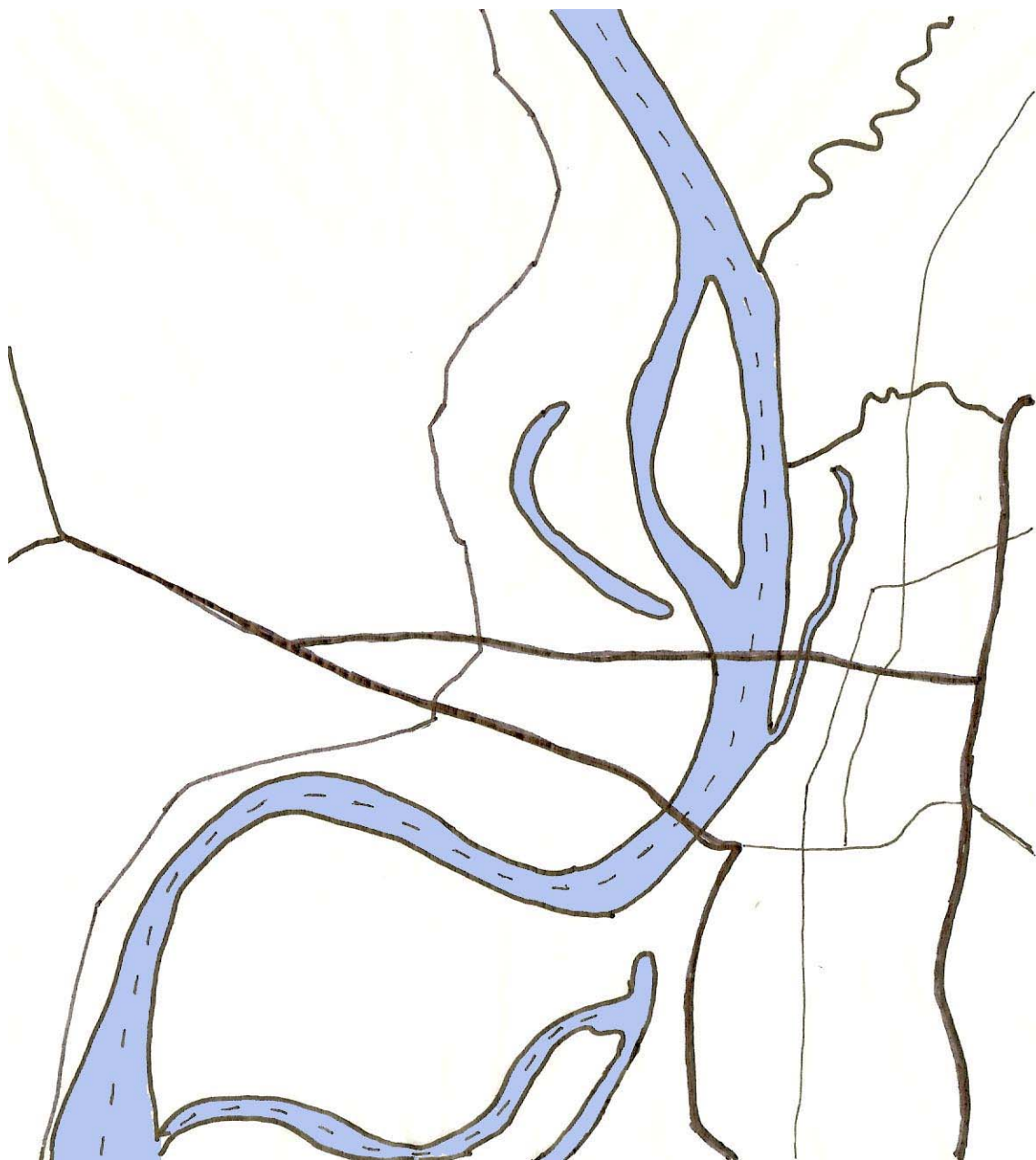


Fig 10: Memphis, TN River traffic along the Mississippi River. Source: Author



Fig 11: Memphis, TN Levee system along the banks of the Mississippi. The levee system built by the Corps of Engineers is far more extensive at Memphis on the opposite bank, as Memphis is located on a bluff that protects it from the forces of the river. Source: Author

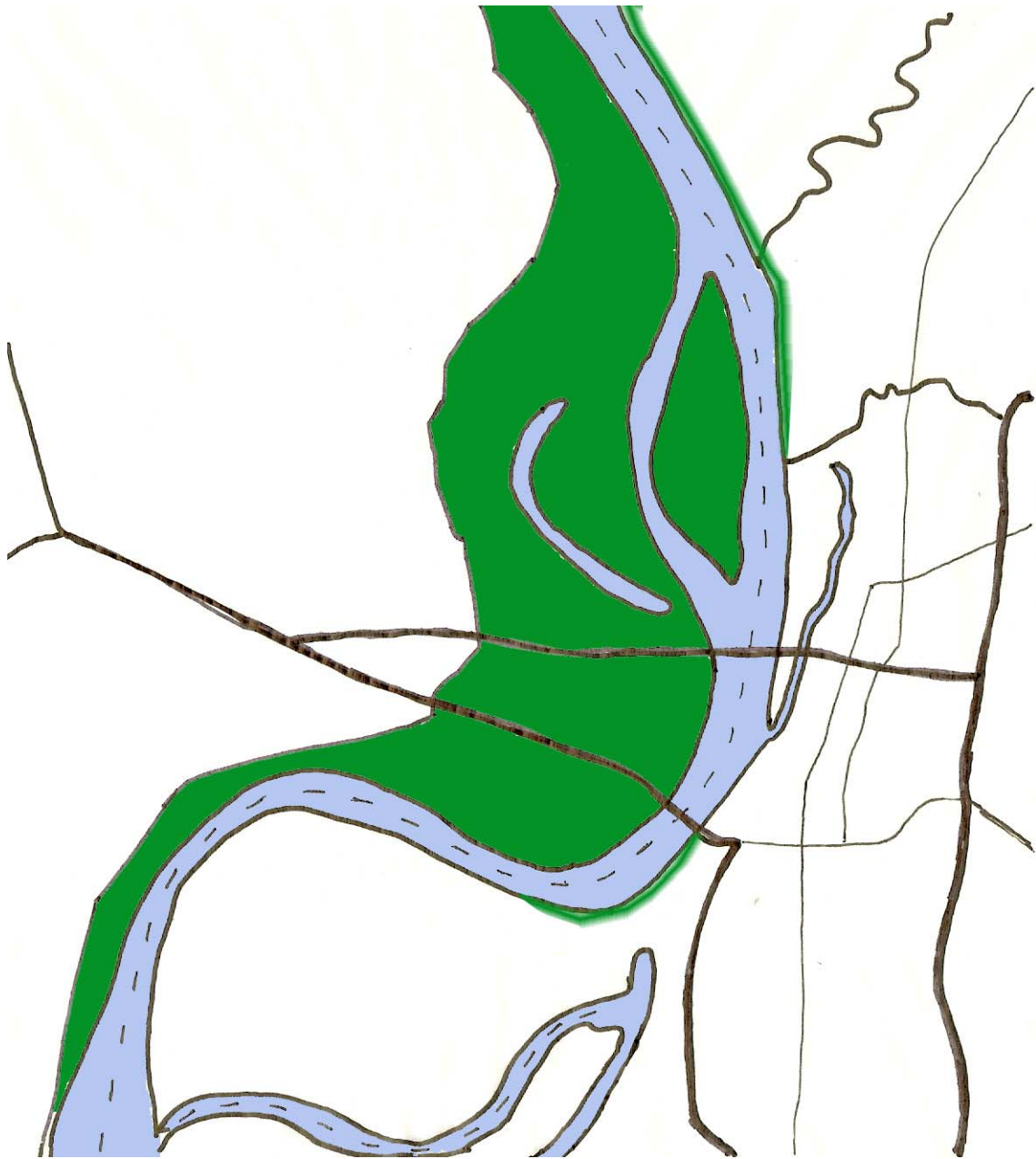


Fig 12: Memphis, TN Floodplain on the shore of the Mississippi
Western banks. These agricultural fields flood on a yearly basis Source:
Author



Fig 13: Memphis, TN 1940's Source: website



Fig. 14: Barge terminal below site from bluffs. Source: website

occurred as it did with many American cities in the late 1990's, with the development of the riverfront leading the way. Memphis is poised to develop a more appropriate response to its unique position on one of the most powerful and traveled rivers in the country.

This proposal for the Metal Museum will be a bookend for continued re-urbanization of downtown Memphis. Its position as a metal-working artist's community that establishes a better relationship with nature is quite an antithesis of craft. A catalyst of the Industrial Revolution, which produced much of the dominant attitude toward nature and its ultimate results, the Metal artists community will serve as a symbol of a harmonious relationship with nature.

Memphis has seen a revitalization of its downtown district in the past decade, and the quality of architecture has risen dramatically. The intense demand to live downtown has reversed the long trend of moving East, out of the city. This demand has produced much urban infill, and the downtown core has benefited greatly. The re-urbanization has made its way down Main Street, parallel to the Mississippi River, to the bridge just north of the chosen site. This thesis proposes that the combination of extended program and site can serve as a significant piece of the urban fabric which constitutes the transitional zone from city to downtown. The metal museum forms a piece of the boundary or transition zone from the city of Memphis and its downtown commercial area. It is at the southern end of a horseshoe shaped area that constitutes the perceived downtown.(Fig. 15) It also serves as a boundary by its place in the band of parks that one must cross to enter the city. (Fig. 16 & 17) These major parks provide a

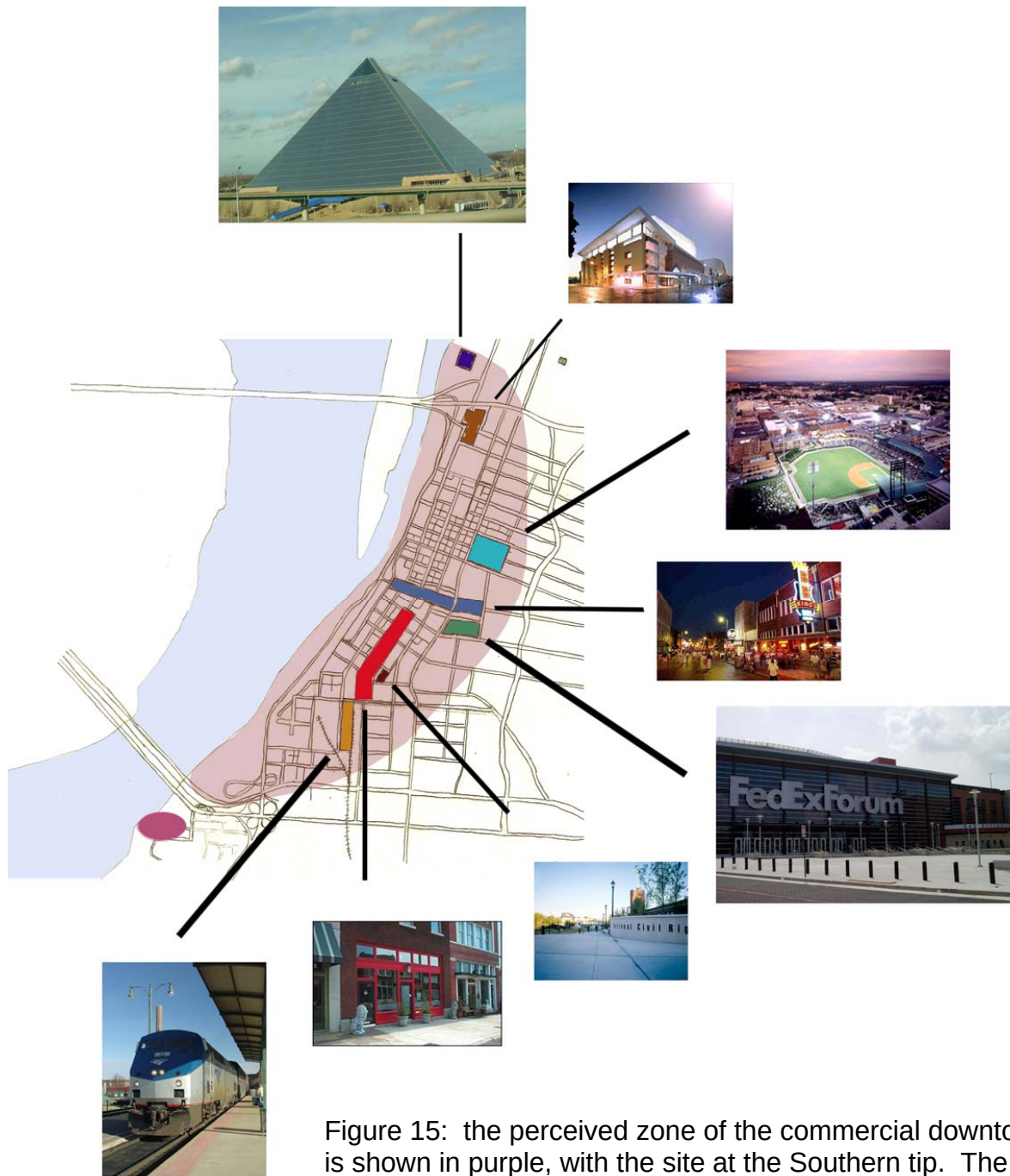


Figure 15: the perceived zone of the commercial downtown is shown in purple, with the site at the Southern tip. The images describe the landmarks which frame this zone, and announce its presence while providing a transitional element. These landmarks include the Pyramid, Convention Center, Autozone Park, Beale St., FedEx Forum, The National Civil Rights Museum, artist galleries along Main St., and a renovated commuter train station at the location of old Central Station, just off of Main Street's gallery row. Source: Author

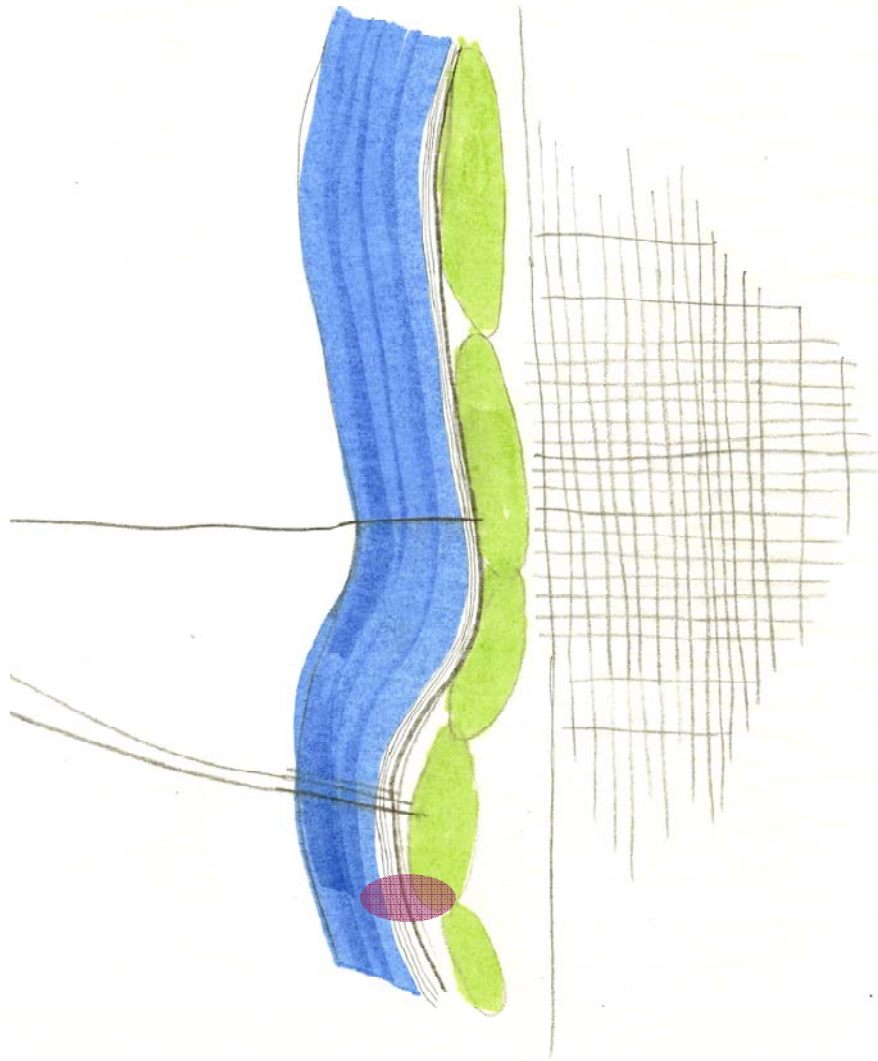


Fig 16: Band of parks act as threshold to city, and transition for urban fabric into the river. Source: Author

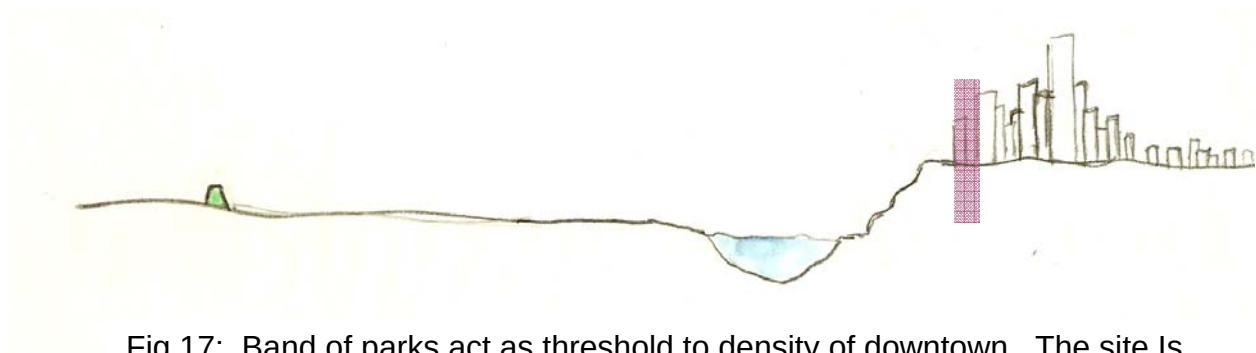


Fig 17: Band of parks act as threshold to density of downtown. The site is shown in purple as part of this zone of transition. The density falls off within the horseshoe shape mentioned Figure 5, The high bluffs of the city are shown against the levee and floodplain of Arkansas. Source: Author

zone of transition into the city, as well as a way for the urban fabric to merge with the river.

This band of public park space along the river was envisioned with the founding of Memphis in 1819. Andrew Jackson's desire to leave the high bluffs of Memphis as a promenade for its citizens to enjoy the picturesque qualities of the Mississippi River is only now coming into reality. The preserved public bluffs allow city-dwellers the opportunity to conveniently experience the natural environment, from the Mississippi River to the undeveloped flood plains of Arkansas. As shown in figures 18-20, the River regularly floods these fields directly across from Downtown, reminding us of its immense power while at the same time rationalizing the placement of the city on the high bluffs. These high bluffs provide the natural placement out of reach of the Mississippi floods, while providing a direct experience at how much land the swollen river can consume and shape. It also allows a glimpse at the artifice of man, in the construction of a system of levees longer than the Great Wall of China that control the mighty power of the Mississippi River and prevent it from reclaiming past lands. (Fig. 21 & 22)

This particular site on the river has always held an important position in the development of Memphis. Native Americans chose this high spot on the bluff for sacred burial sites which are still evident in Desoto Park just across the street. The military chose these cliffs as a defensive position for Fort Dickerson, and the Navy placed a marine hospital on the adjacent site. This was the first crossing of

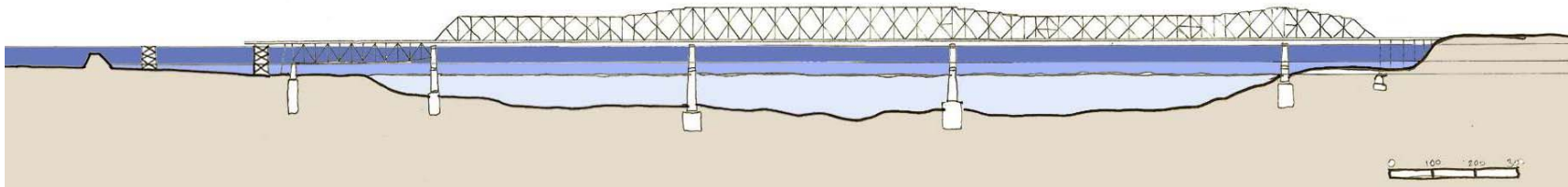
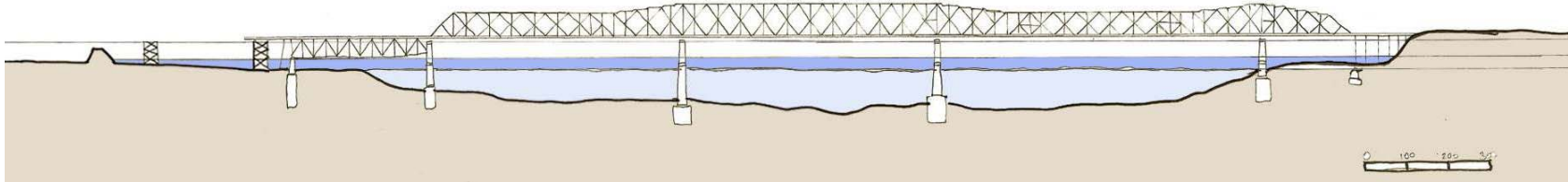
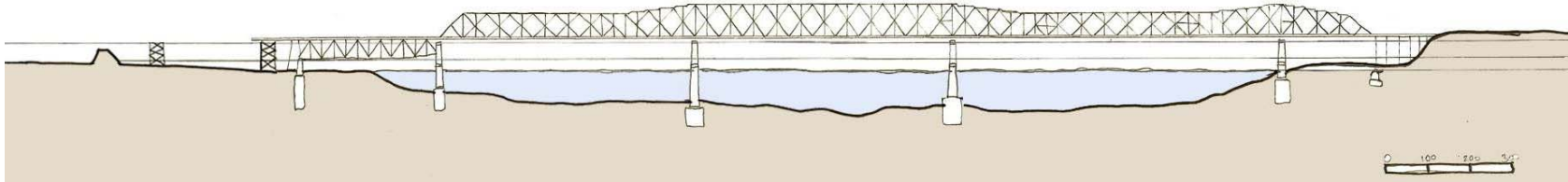


Fig. 18-19-20: Section of Mississippi River at the site at regular level. The temporary quality of the floodplain is shown in Figure 15, and the raw power of the Mississippi River is displayed in the surpassed levee in Figure 16.

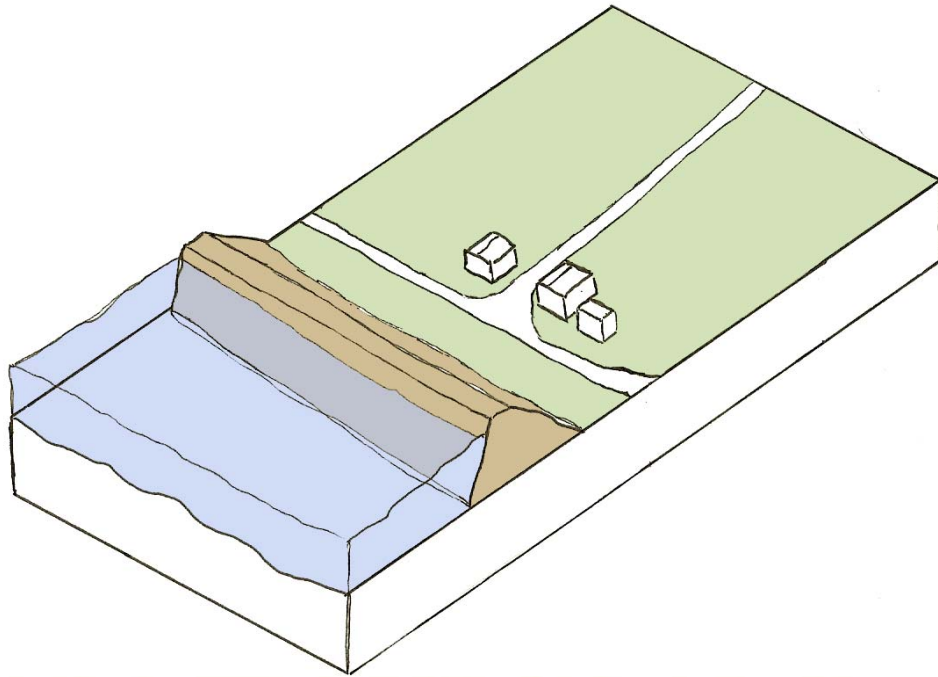


Fig. 21: Man-made levee system shows our necessary control of nature, and the perilous position it leaves us in. Source: Author

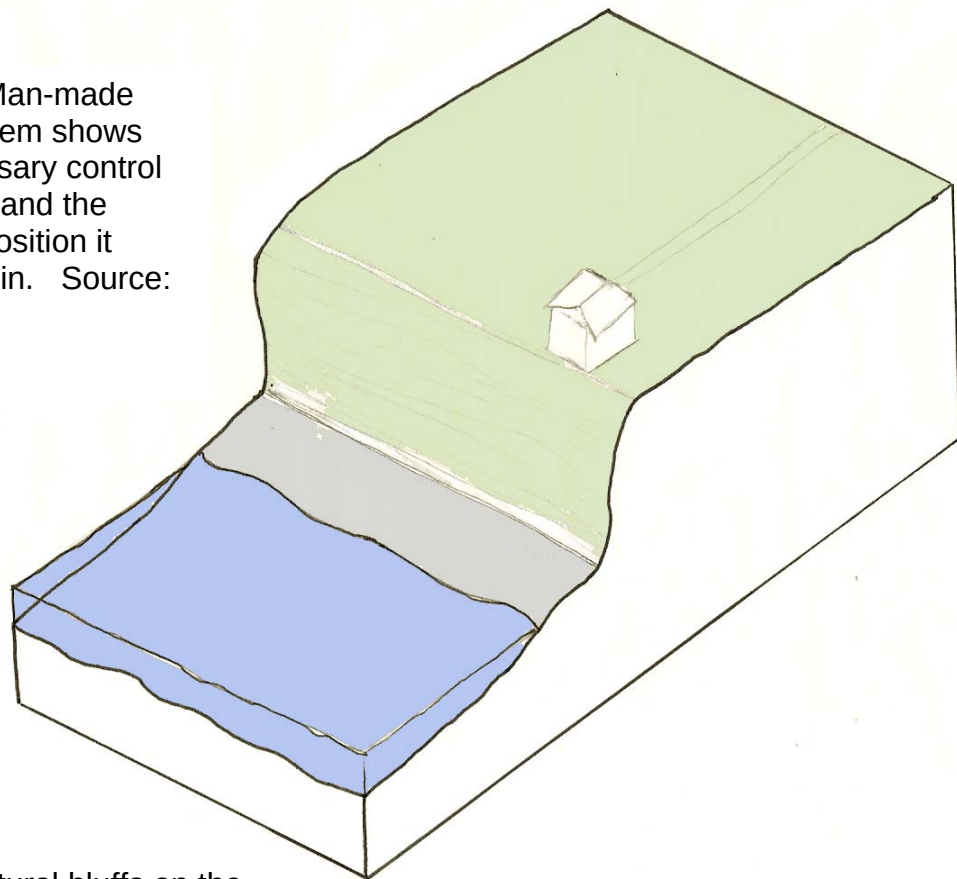


Fig. 22: Natural bluffs on the Memphis side of the river provide protection from the flooding . Source: Author

the Mississippi River in Memphis in the late 1800's, with the Hernando Desoto bridge to the north coming much later in the 1970's.

The neighborhood is situated around the Fort Dickerson park, where the Indian Burial Mounds are located. (Analysis shown in Figures 23 – 25) The neighborhood is surrounded by factories and receiving ports, and is cut off from its original larger neighborhood by Interstate 55, which is located to the North of the site and turns South toward Mississippi. The resulting collection of cul-de-sacs exhibits the impact the interstate had. Another developing factor of this area is the early train yards and tracks, that separated the downtown from the river in every way. (Fig. 26)

The site itself is a former Naval Hospital, and the aging architecture needs renovation or replacement. (Fig. 27-30) The buildings frame an outdoor area (Fig 31) which holds annual activities. There are many very old Oak trees on the site, so daylighting will take special attention if the existing trees are to be preserved, especially on the south side where trees grow atop the Indian mounds making them even taller. (Fig 32 & 33) There is a revetment to the bluffs on the West side of the site, and this construction looks out over a broad bend in the Mississippi River that allows a large view of water. (Fig. 34) The bluffs create a boundary on the West and North edges of the property. They are too steep to attempt to ascend on the West, and the North has brick walls that combine with the steep slope to close off the property. The East border of the property is formed by the residual buildings of the Naval hospital, and could be expanded if



Fig. 23: Zones of the site – yellow – industrial green- parks
blue- residential Source: Author



Fig. 24: Access to the site shown in orange, with a purple oval around the site. Source: Author



Fig. 25: Site shown in purple oval. Souce: Author



Fig. 26: Site shown in purple oval. Interstate shown in green dissecting the neighborhood of the site and the streets that have been severed are shown in brown. Source: Author

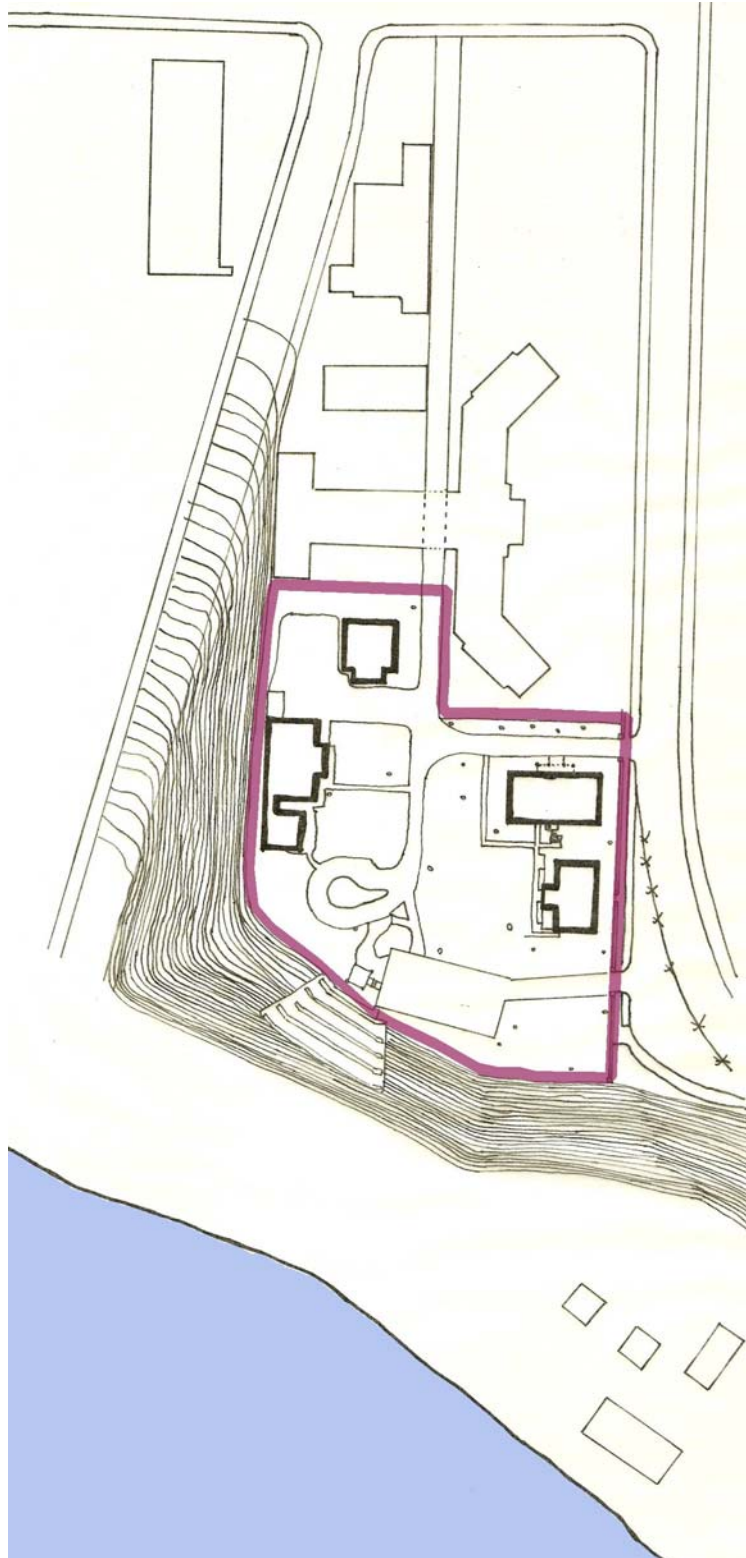


Fig. 27: The property line of the site is shown in purple, and shows the development of natural and man-made boundaries. Source: Author

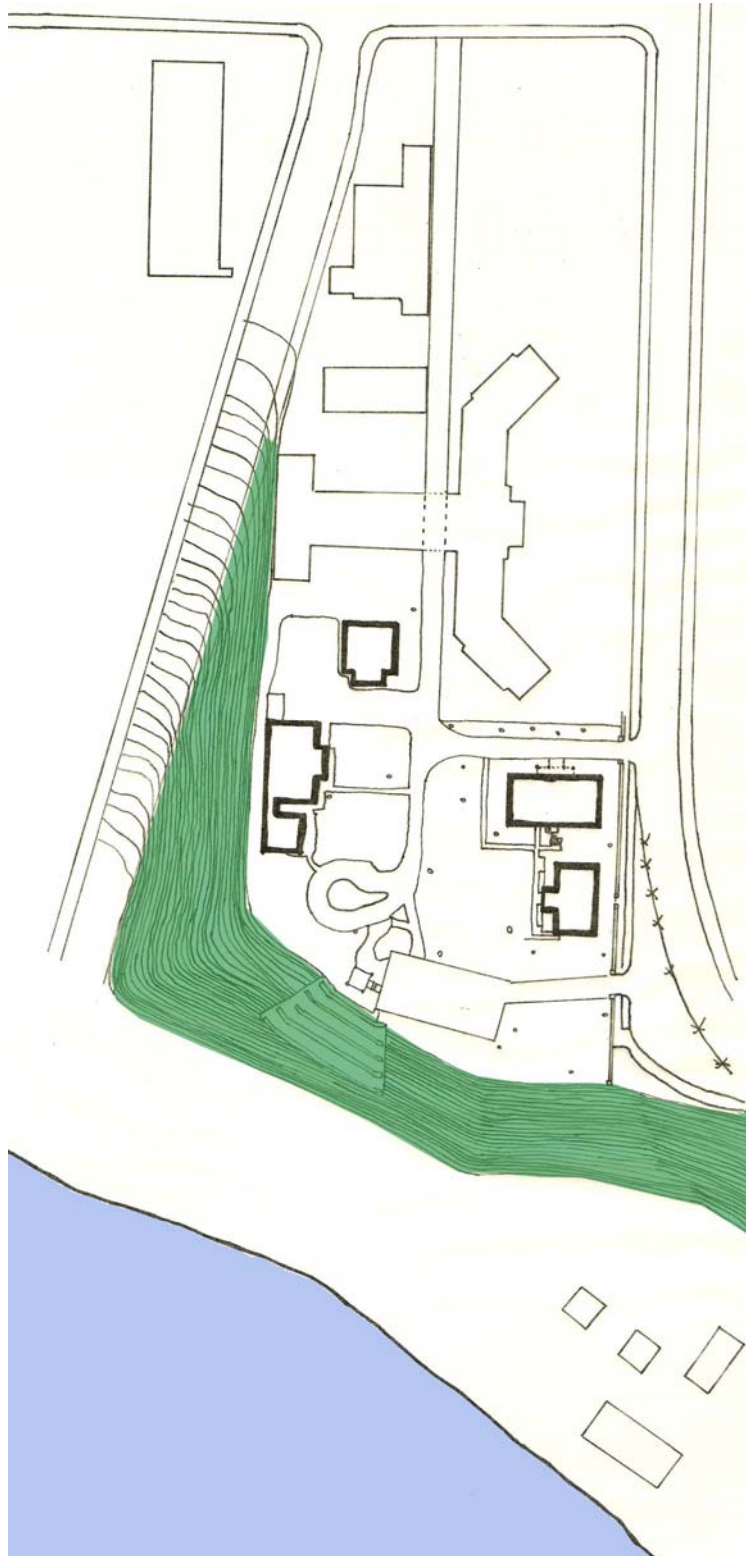


Fig. 28: The North and West boundaries of the site are formed by a steep bluff. Source: Author

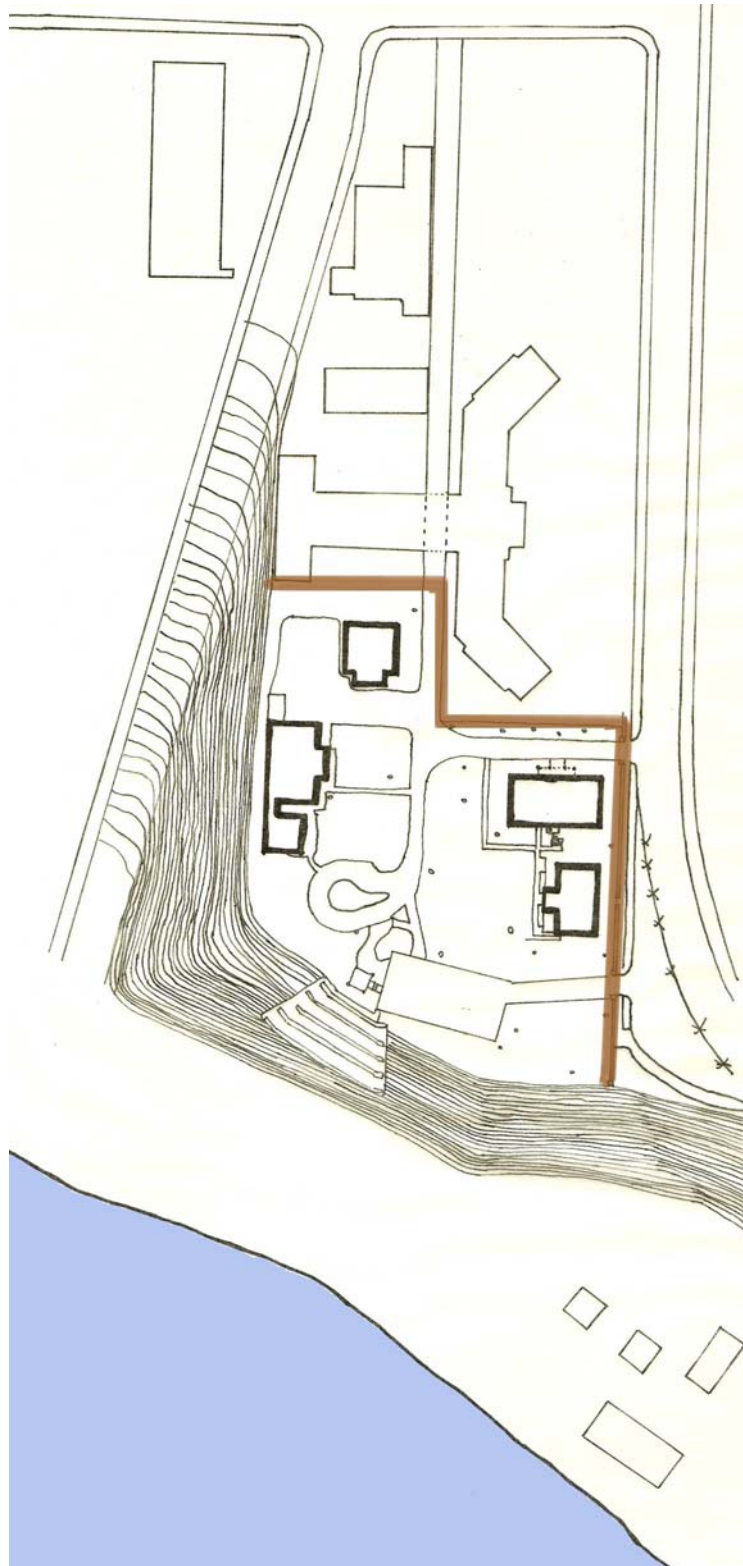


Fig. 29: The South and East boundaries of the site are formed by the brick wall on the street to the South, and the remaining Naval facilities to the East, which are abandoned and could be incorporated into the site. Source: Author

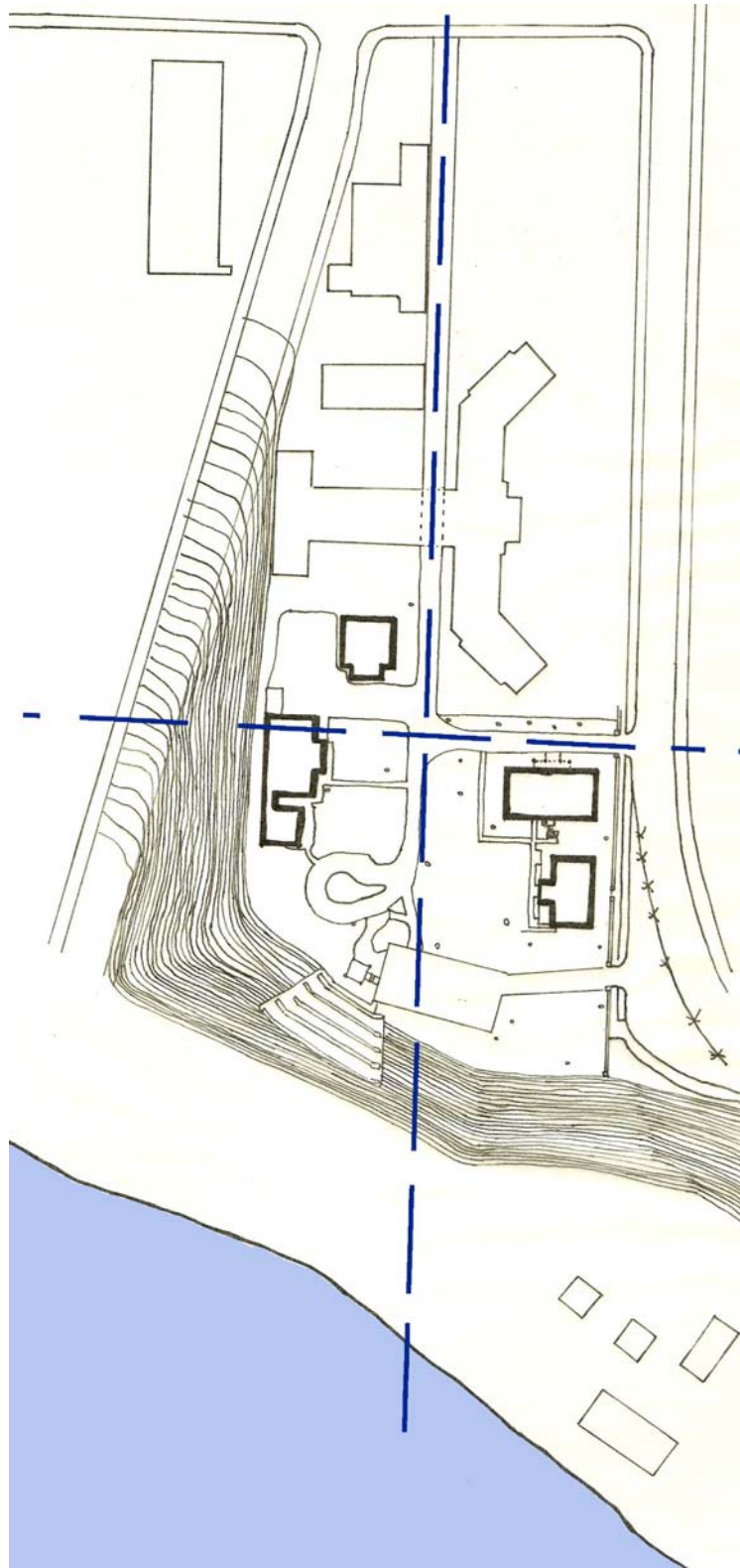


Fig. 30: The major axes of the site are created by the new imposed entrance, and by the strong axis East-West through the sallyport of the Naval building.
Source: Author

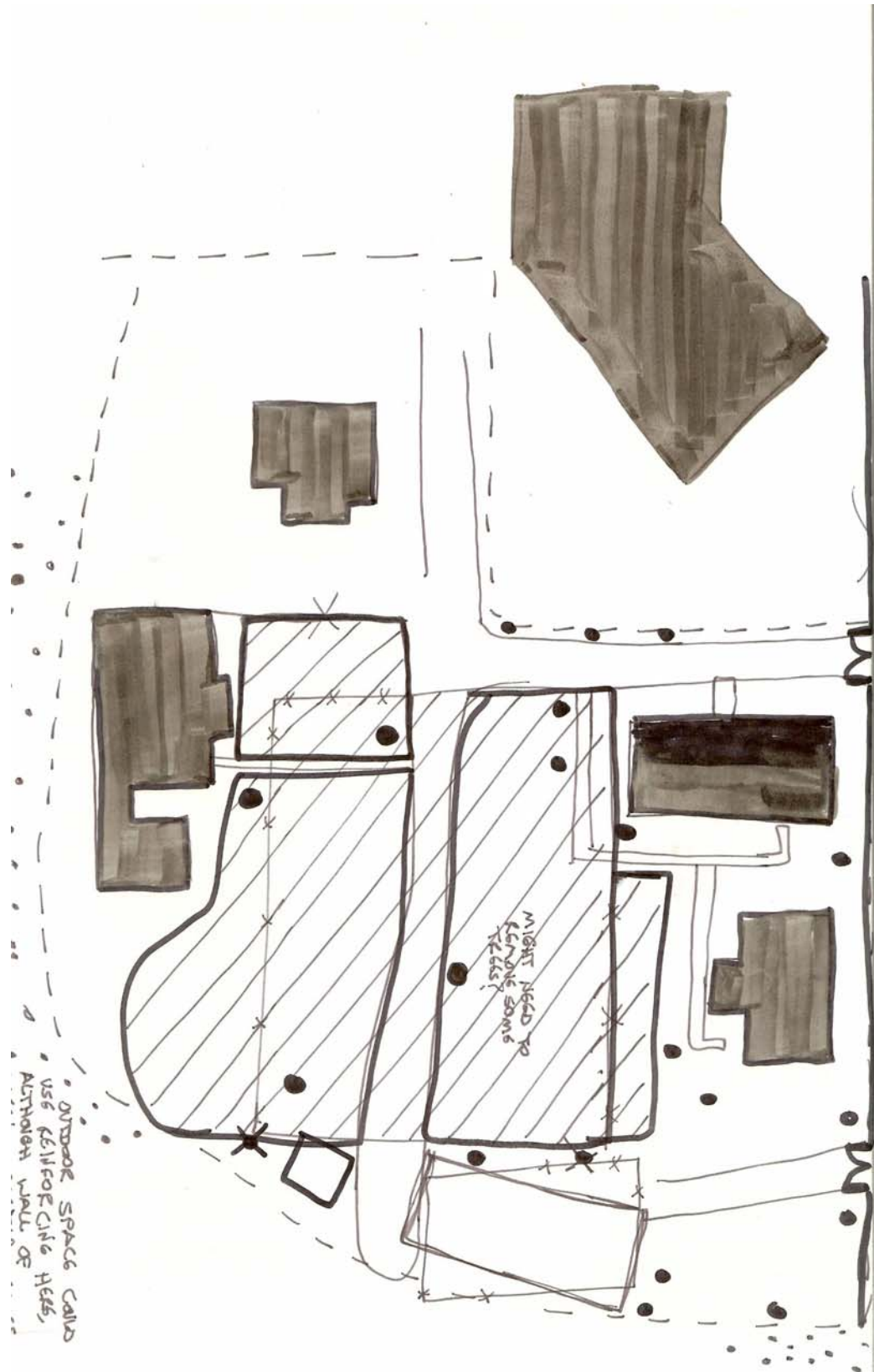


Fig. 31: The buildings form an outdoor room that is used heavily throughout the year. Source: Author



Fig 32: The main entrance of the grounds and main museum building. The red arrow marks the direction of view. Source: Author

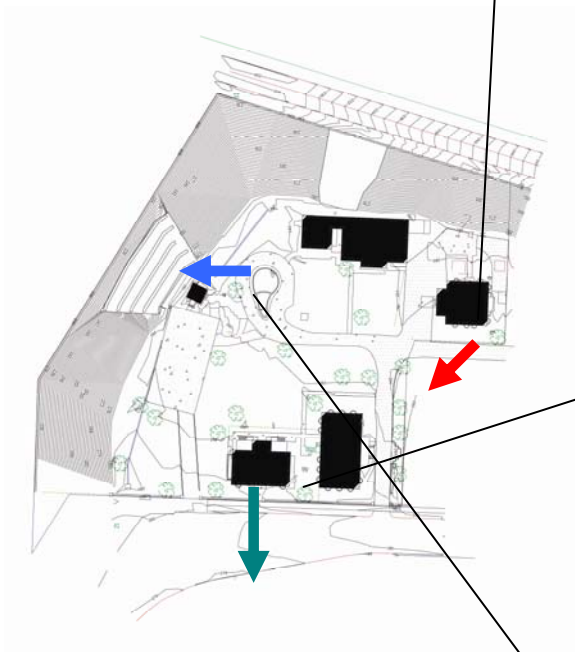


Fig 33: Indian burial mounds source: Author



Fig 34: view fro the bluff to the bend in the river

the program requires. These buildings are slated to become mixed use developments and bring life to this vacant part of the site.

Zoning

The Museum is on a Residential zoned property, with R-MH its designation. This represents the Multi-housing segment and is the only one of its kind on the south leg of the Mississippi River. (Fig. 35)

Climate

Memphis has a moist continental climate located at the mid latitude level around 35 degrees. This affords four very distinct seasons in the region, with summer being the most extreme in heat and humidity. Extreme weather such as thunderstorms and flash-flooding is a possibility. Though these storms bring ample rainfall to the area, it also receives copious amounts of sun, with over half of the days in a year bathed in sun. The bluff rests on a pivotal bend of the Mississippi River and so it receives more wind than the average location in the city. This large body of water to the west also reduces the ambient temperature for the microclimate. Large 2-foot thick Oak trees scattered throughout the sight provide ample shade throughout. This information will guide the overall strategies like daylighting and natural ventilation and site orientation in order to produce an efficient building.

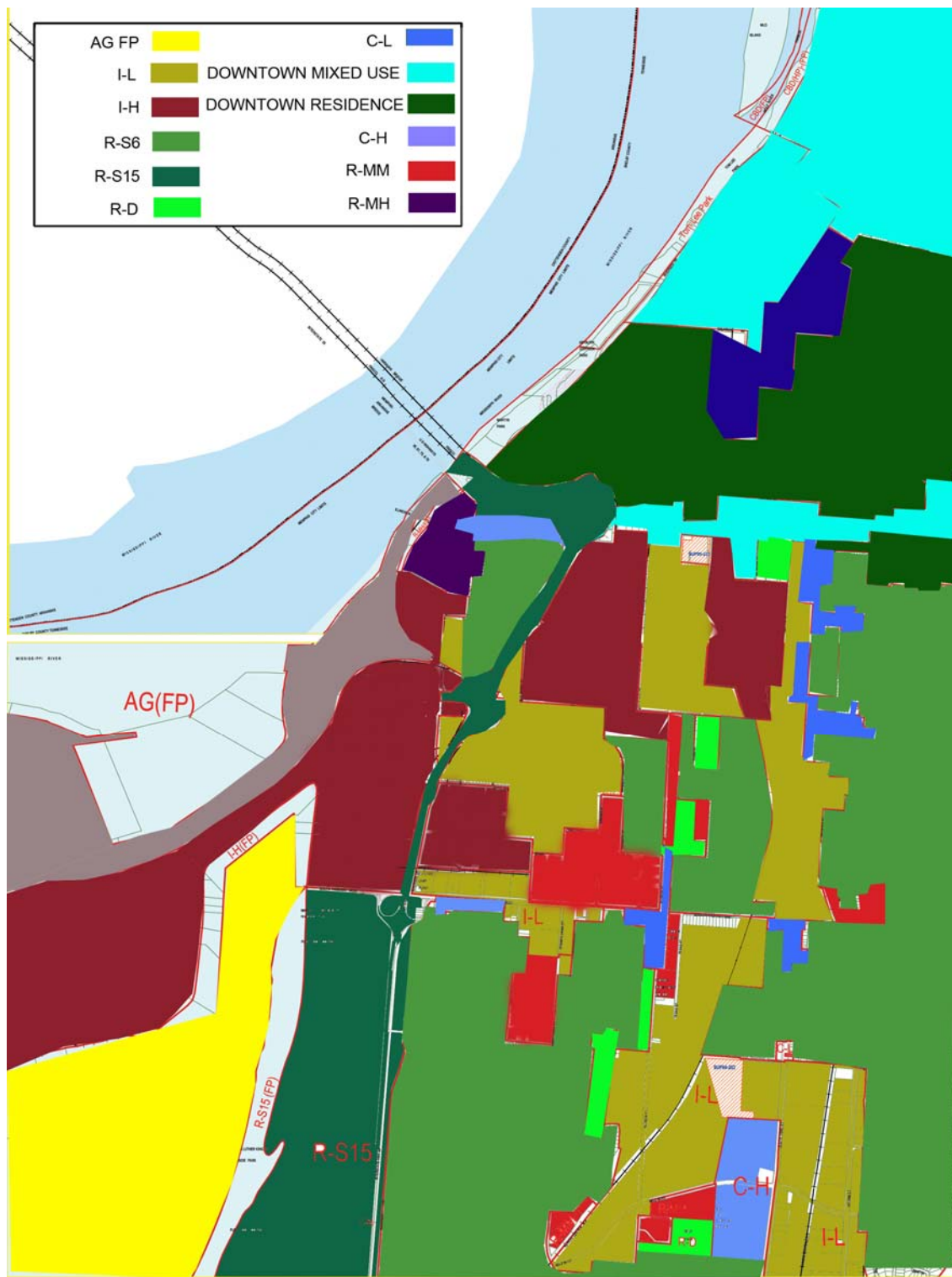


Fig. 35: Zoning map

Source: Author

CHAPTER III

Program Description

The program for the National Ornamental Metal Museum consists of exhibit and storage space for various metal collections which change throughout the year, library, living space for faculty and visiting artists and apprentices, retail space for the museum shop, and the smithy and related workshops. The existing facilities are unable to house most of the students and faculty, and can't fulfill the storage needs for the display items. The library is being retrofitted into an aging building that will have storage difficulties, and the older museum has long run out of room for the exhibitions and especially storage. Four buildings of varying date and aesthetics currently comprise the roughly 23,000 square feet of existing facilities, and this program proposes to replace at least two of these buildings. A focus will be given to children, and school visitations will be a regular occurrence. This program will allow the site to generate the desired affect of encouraging more interaction with nature, while at the same time heightening the visitor's awareness of nature, how we treat it, and our duty in the natural realm.

Organization

The program will be broken up into two main categories, the educational and the gallery. Each of these segments contains public and private sectors which can guide relationships of program. Each area will have interior and exterior spaces,

with the main exterior space made up of the main gallery continued to the main lawn.

Quantitative Program

The individual square footage of the program is outlined in the Tables I-V.

Public Educational: There will be a lobby to welcome the students, visitors, and faculty, with a reception area and restrooms as well. An outdoor classroom will be open to the public.

Private Educational: This includes a kitchen for the studio, a lounge, administrative offices, a computer lab, a library and studios/classrooms for metal exploration.

Public Gallery: The gallery space will be doubled from the existing 6000 square feet, and will allow for more permanent collection to be on display with the temporary collections. An essential element to the manipulation of the boundary will be the expanded exterior gallery. The museum store will also increase in size, and there will be restrooms provided for the patrons. This segment of the programming will incorporate the smithy: the forge which is the heart of the grounds, which is always on display to the public.

Private Gallery: The behind-the-scenes element of a museum is normally never seen by the patrons, but this program will celebrate these elements. This includes storage of both temporary and permanent collections, museum

Table I. Zone A Public Exhibit Spaces

ZONE	TITLE	DESCRIPTION	SIZE
A	Lobby	Main entrance to the museum area	1000sf
A	Reception	Ticketing information for museum	300sf
A	Museum Shop	Gift shop- sale of craft made at the museum	1000sf
A	Interior Gallery Permanent	Main gallery space for permanent collection	6,500sf
A	Exterior Gallery	Exterior gallery for permanent and temporary	25,000sf
A	Interior Gallery Temporary	Area for traveling exhibits	4,000sf

Table II. Zone B Public Educational Spaces

ZONE	TITLE	DESCRIPTION	SIZE
B	Lobby	Display student work	1000sf
B	Reception	Near museum rec.	300sf
B	Auditorium	Lectures	2000sf

Table III. Zone C. Private Exhibit Spaces

ZONE	TITLE	DESCRIPTION	SIZE
C	Permanent storage and staging	Ready exhibits for display	3,000sf
C	Museum Administrative	Offices for director, staff, curator, kitchen, lounge, and volunteer space	2400sf
C	Staff Restrooms	One of each	600 sf
C	Shipping	Loading dock access	300sf

Table IV. Zone D. Private Educational

ZONE	TITLE	DESCRIPTION	SIZE
D	Kitchen	Student and staff	800sf
D	Lounge	Student and staff	800sf
D	Administration	Administrative offices including director & staff	1,200sf
D	Library	Library for study of metallurgy	4,000sf
D	Classrooms	Studio based classrooms	2,000sf

Table V. Zone E. The Forge and Smithy

ZONE	TITLE	DESCRIPTION	SIZE
E	The smithy	Holds the iron forge and fire pits	4,000sf
E	Disposal	Slag and water disposal	200sf
E	First aid	Support of smithy	300sf

administration, shipping and receiving, exhibit staging, conference rooms, management and curatorial offices, a director's office for the smithy, and the storage space of 3000 square feet will be doubled as well. There is not currently any temporary storage, so this will be added to the storage component.

Qualitative Program

An essential concept to the element of boundary, which is principle to this thesis, is the understanding of public and private areas either defined or brought together by that boundary. The program of a museum often consists of public and private areas: the gallery and those behind the scenes spaces where exhibits are assembled and valuable items are secured. This program proposes to blur the line between these two types of spaces by mixing them whenever functionally possible. One method will be restricting access yet presenting the private elements within the public realm. This approach is very much in agreement with the hands-on culture present at the museum, especially considering the smithy and repair days.

The nature of the material exhibited at the National Ornamental Metal Museum allows an outdoor gallery to house a substantial percentage of the museum's artifacts. This quality unique to a museum of metals lends itself to the idea of blurring the boundary between inside and outside. The main gallery can

be extruded from the interior and continued onto the exterior lawn without harm to the artifacts. The galleries and smithy, as well as the studios for the school can be as open to the elements as the design desires, allowing many opportunities to use a zone of transition rather than a finite boundary to define spaces. This method will return the importance to the experience of the place, and foster the relationship that is a rejection of the attitude that was forged during the Industrial revolution.

CHAPTER IV

Neglect of the Existential

The industrial revolution brought many great advances to humanity, such as motorized transportation, mechanized industry, medicine, and so on. Society that had functioned in relatively the same manner for thousands of years changed drastically within the span of 100 years, from 1800 to 1900. The advances in metallurgy created powerful steam engines which replaced water wheels, allowing warehouses to leave the river banks and form dense urban areas. For the first time in the world's history, farmers swamped the cities in hopes of finding a job. The focus on the inhabitant was replaced by a drive for consumption whose goal was profit and expansion. The growth was overwhelming, as the rapid increase in numbers of citizens left no time to plan the cities or regulate the preservation of open space. As a result, crowded, dark cities emerged from the collection of industries and established an ugliness that replaced the picturesque qualities that existed until this time. The revolution removed nature from our daily lives and stripped the beauty from the city. It is ironic that a catalyst of the Industrial Revolution, a metal working artist community, will promote to bring beauty and nature back to the city while framing the development of downtown Memphis.

Modernism similarly neglected the user experience in favor of efficiency and necessity due to rapid increase in numbers. "Modern architects have in

general excluded the existential dimension..."⁶ Modern planners attempted to solve the problems of society by over-planning, creating large boxes that could act as machines to house the workers. This dominant attitude stripped much of the character from our cities, as modern planners decided that certain areas were full of blight and needed to be replaced by architecture that had no connection to place. This thesis does not propose to reform society through architecture, as the Modern movement attempted with the clearing of blight by wiping the slate clean. As the Modernism movement has exhibited, hoping that design can cure society's ills is a dangerous approach. Ando says "While architecture can't by itself change the values of a culture, it can make the culture aware that other value systems exist."⁷ This thesis does not propose to change culture, but to heighten our awareness of the natural realm through architectural experience.

Natural Environment

The natural world can be seen as a tool for living, and something to imitate in design methodology. Much can be taken from nature's examples, but designers must extend beyond imitating its form. Form alone does not give us the valuable insight that we can gain from the nonhuman nature available to us. As David Abram states, live beings in nonhuman nature

⁶ Norberg-Schulz, Christian. *Genius Loci: towards a phenomenology of architecture*. New York: Rizzoli, 1979, 48.

⁷ Romansky, Carter. Two Approaches to Ecologically Conscious Architecture: Part 2: The Ethical Commitment of Tadao Ando. Website. <http://90ways.com/critarchive/crit20.php> Current as of 11-14-06.

are purveyors of secrets, carriers of intelligence that we ourselves often need: it is these Others who can inform us of unseasonable changes in the weather...By watching them build their nests and shelters, we glean clues regarding how to strengthen our own dwellings, and their deaths teach us of our own.⁸

Van Gogh's statement "I find it ready made in nature, though I still have to extract it" is misunderstood in the same way Aristotle's saying "man imitates nature" is interpreted as simply copying nature's forms and materials. Neither the philosopher nor the artist implies that man imitate nature, rather, "man was the only creature who, like the gods, has the capacity for true creativity."⁹ This capacity for creation simultaneously separates and connects us to nature, which Aristotle dubs the 'active forces of the universe.'

According to Alberti there are three types of nature: wilderness-- unchanged, agrarian-- agriculture, and the garden-- our idealized version. It is in this idealized version which most modern urban dwellers experience nature on a regular basis. The ability of design to relate us to nature is in this idealized version. As Lavine explains

Nature in its own domain (Alberti's wilderness) is not available to the human mind for contemplation because it has not been framed so that a limited portion of this world might be considered in depth. The courtyard divorces a piece of the natural world from its natural context so that it might become an object of contemplation... the courtyard houses nature as the dwelling houses its inhabitants.¹⁰

⁸ Abrams, David. *The Spell of the Sensuous*. New York: Pantheon Books, 1996. 14

⁹ Crowe, Norman. *Nature and the Idea of the Man-Made World*. 142.

¹⁰ Lavine, *Mechanics and Meaning in Architecture*. 147.

This framing of the natural reinforces its impact on our senses. This is why shadows on a wall are stronger perceptions than the sun itself. “It is not in the sky but in a temporal reflection on a wall that the sun might be known.”¹¹

The potential of architecture to reinforce the natural can go beyond the reflection of it. As a sequence of experiences, J. B. Jackson describes Grand Central Station as offering a variety of sensory experiences that rival those of a landscape: “they satisfy for the time being our craving for contact with a variety of forms and spaces and lights and sounds.” He continues by saying “Unfortunately, the tendency of the past century has been to eliminate every natural sight, sound, and color from the urban scene.”¹² As a series of experiences architecture can give us the emotional and intellectual stimulation derived from the natural setting, however we still need that interaction in order to thrive. Jackson asserts “Man is part of nature in the symbiotic approach. He is subject to the laws of nature, and dependent on his physical environment. Not only for resources but for physical and mental health.”¹³ This dependence relates to the boundary, and shows the value of a mutually permeable enclosure that allows interaction between interior and exterior.

Boundary

The boundary is what brings us together as a group and excludes those who don’t belong, while symbolizing the permanence of the structure. If

¹¹ Ibid. 147.

¹² Jackson, 58.

¹³ Ibid., 59.

the boundary is dissolved, the spatial organization needs to be reinforced in order to maintain a clear feeling of shelter, while the threshold must acquire a spiritual essence that can evoke emotion. The tension inherent within this threshold of a structure is embodied in the feeling of enclosure: the change in sensation from being out in the open and exposed, to “an incredible sense of place, an unbelievable feeling of concentration when we suddenly become aware of being enclosed, of something enveloping us, keeping us together, holding us- whether we be many or single.”¹⁴ The moment we arrive at a place that is recognizable occasionally has nothing to do with a physical boundary at all. It can stem from memory or many other cognitive experiences that shape why we feel at home or that we have arrived.

This de-emphasis on the physical element of the boundary leads to an understanding of a zone of transition rather than one finite moment. (Fig 36 & 37) The mutual permeation of the preceding and following spaces beyond the threshold convert this moment into a significant space, one that can promote understanding of the different layers of spaces while creating a new type. (Fig 38) Aldo van Eyck stated that a transitional threshold involves the interrelationship between two phenomena rather than their opposition.¹⁵ This interrelationship can be described in a discussion of the architectural application of liminality.

¹⁴ Zumthor, Peter. *Atmospheres : architectural environments, surrounding objects*. Peter Zumthor. Basel : Birkhäuser, 2006, 45.

¹⁵ van Eyck, Aldo. *Doorstep*. In *team 10 primer*, ed. Alison Smith. London: Studio Vista. 1968. 3.

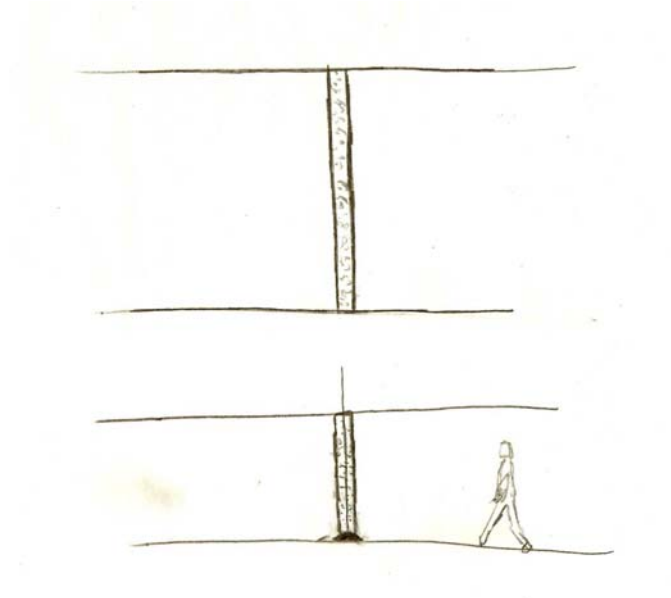


Fig 36: threshold as line

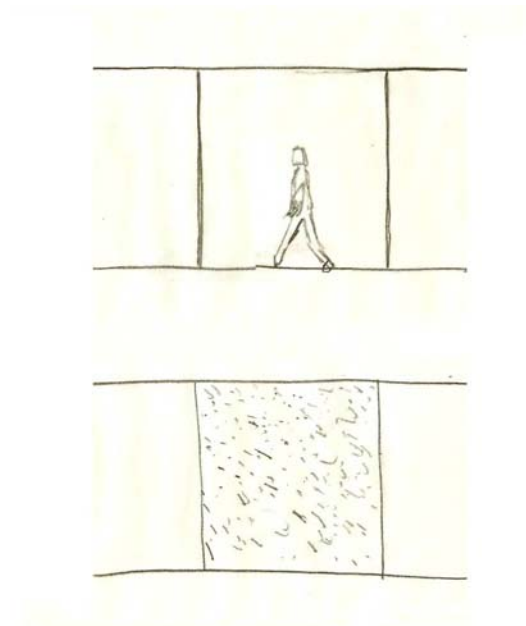


Fig 37: threshold as zone

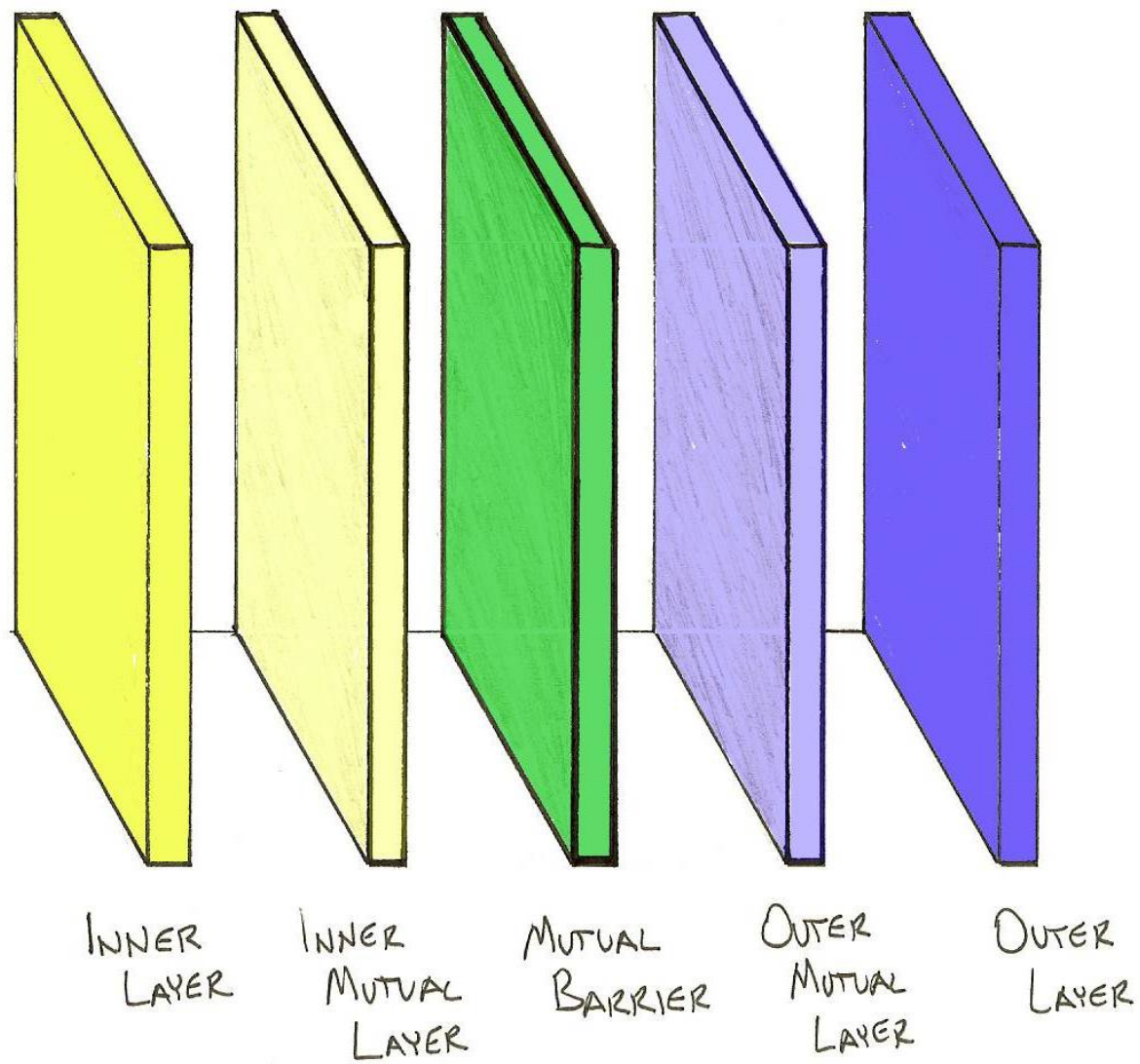


Fig. 38: Mutual permeation of interior and exterior.

Liminality is defined as a period of transition, where one is in a critical state of being neither here nor there. The between-ness of the main spaces is the realm of liminality, where major transformations occur. The quality of such a transformation refers to a threshold of perception: the transforming moment where you realize you have left one space and entered another, marking an initial awareness of a new sensation. This understanding of threshold gives it expanded significance as a place of interaction, not just a passage(Fig. 39 & 40). It is this new space that will be employed to remind inhabitants of their responsibility to the environment. Manipulation of the boundary will lead to an architecture that establishes a strong connection to nature “under a sustained sense of tension. I believe it is this feeling of tension that will awaken the spiritual sensibilities latent in contemporary humanity.”¹⁶ Ando’s statement can be interpreted that by allowing the building to adapt to climate and environment through a permeable boundary, the building causes us to adapt as well. The boundaries can be seen as filters that can be opened or closed according to the conditions at hand. This is where technology comes to play a critical role in the use of sensors and timers to control the permeability of the envelope. Such an open envelope will result in a reflective understanding of the natural environment.

The following are some methods of manipulating the boundary in physical terms in order to provide a setting for these emotional responses: sliding or raising walls that can completely disappear, strategically placed window walls that connect to a specific view or character of the site, reproduce the atmosphere

¹⁶ Ando. 460.

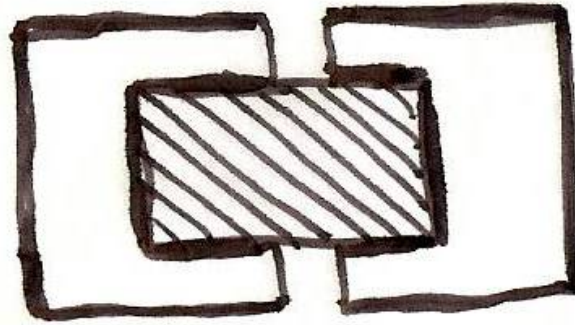


Fig. 40: expanded significance of zone of threshold

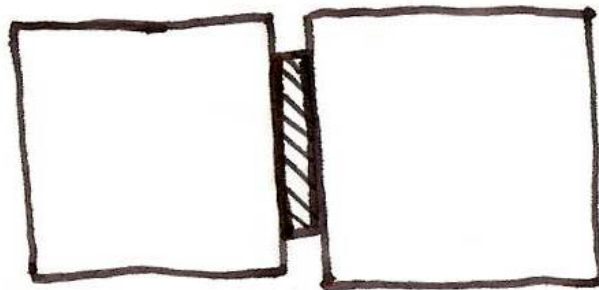


Fig. 39: traditional understanding of threshold

through the boundary, allow spaces to relate on each side of the threshold. Also, elements of the natural environment can be used as a means of support for the shelter. As Norberg-Schulz explains, “When there is no ceiling the sky acts as the upper boundary, and the space is, in spite of lateral boundaries, part of the ‘exterior space’.”¹⁷

Genius Loci and Critical Regionalism

As well as manipulation of the boundary, genius loci will establish a strong connection to place. Our existence within the ecosystem demands a more responsive, bioregional attitude toward design than is presently in practice, and genius loci is a powerful tool capable of such an approach. Genius loci can be defined as the spirit of the place, its essence or the parts that make up the whole atmosphere. In architecture genius loci relates to Alexander Tzonis and Liane Lefaivre’s concept of critical regionalism, yet it is more of an attitude or way of life than a rejection of universal modernism.¹⁸

Critical regionalism is not limited to a vernacular, but proposes a common concern for the specifics of place and rejects the tabula rasa method of universal modernism. Kenneth Frampton suggested that architects take what was best about modern architecture and modify it with the particulars of the site. Critical Regionalism requires that the architect be critical and have a project, maintain that the project is not the program, but it engages the program and the

¹⁷ Norberg-Schulz, 58.

¹⁸ Tzonis and Lefaivre, *Tropical Architecture: Critical Regionalism in the Age of Globalization*.

site. The heart of the critical regionalism principle, and how it relates to the boundary, is described by Martin Heidegger:

A space is something that has been made room for, something that is cleared and free, namely within a boundary, Greek *peras*. A boundary is not that at which something stops but, as the Greeks recognized, the boundary is that from which something begins its presencing. That is why the concept is that of *horismos*, that is, the horizon, the boundary. Space is in essence that for which room has been made, that which is let into its bounds. That for which room is made is always granted and hence is joined, that is, gathered, by virtue of a location, that is, by such a thing as the bridge. Accordingly, spaces receive their being from locations and not from 'space'.¹⁹

The emphasis on a self-directed regionalism can evoke the realization of the loss of place, as well as the understanding that we could not comprehend this loss of place while it was happening.

Critical regionalism is an alternative to an outdated modernism. It is difficult to follow such a principle in a society that is increasingly globally and technologically dependent. Alexander Tzonis and Liane Lefaivre, the creators of the term "Critical Regionalism", support this strategy of regionalism due to its system of self-criticism that lends it credibility. The critical nature of this regionalism allows it to challenge not only the world but itself, thereby avoiding nationalistic tendencies. Critical regionalism seeks to establish an identity without dimensions of ethnic or racial origin.

This idea of regionalism is not a static condition, rather open and wavering, and does not place a limit on architects to work within their own regions. Critical regionalism shares with previous versions the elements of a

¹⁹ Heidegger, Martin. *Poetry, Language Thought*. Trans. Hofstadter, Albert. 154.

pervasive concentration of place and the implementation of regionalist design elements in order to resist a placeless universal architecture. The regional design elements are manipulated in an uncharacteristic manner in order to engage the user. This is not to say that critical regionalism in the hands of Tzonis and Lefaivre rejects all current traditions with these regional design elements, yet it never attempts to simply recreate those traditions.

Genius loci as a design approach is based on everything that exists at the site, similar to the regionalism of Tzonis and Lefaivre, giving far more meaning to place than just abstract location. As Christian Norberg-Schulz explains, genius loci attempts to encompass the intangible essence of the location: "A place is more than buildings and structures; it is also social relations, emotional and spiritual experiences and everything else experienced by the senses. Beside its visual aspects, a place also has its own atmosphere, smells and sounds."²⁰ Using these intangible elements together with the tangible, genius loci allows the designer to reach an intimacy with the site that is difficult to attain. It does not, however, attempt to hide or conceal our interaction with the landscape, but celebrate a harmonious relationship. One example of this ideology is the image of a stone dwelling in Switzerland.(Fig. 41) The dwelling was situated just above the flood plain of a local river, and was constructed by digging below an enormous solid rock. The inhabitants then built up walls and created a permanent shelter. Another example of genius loci is shown in the drawing in Figure 42, which shows two options for placing a fence in the countryside. One

²⁰ Norberg-Schulz, 42.



Fig. 41: Ancient stone dwelling. Near Iragna, Switzerland. Source: Author

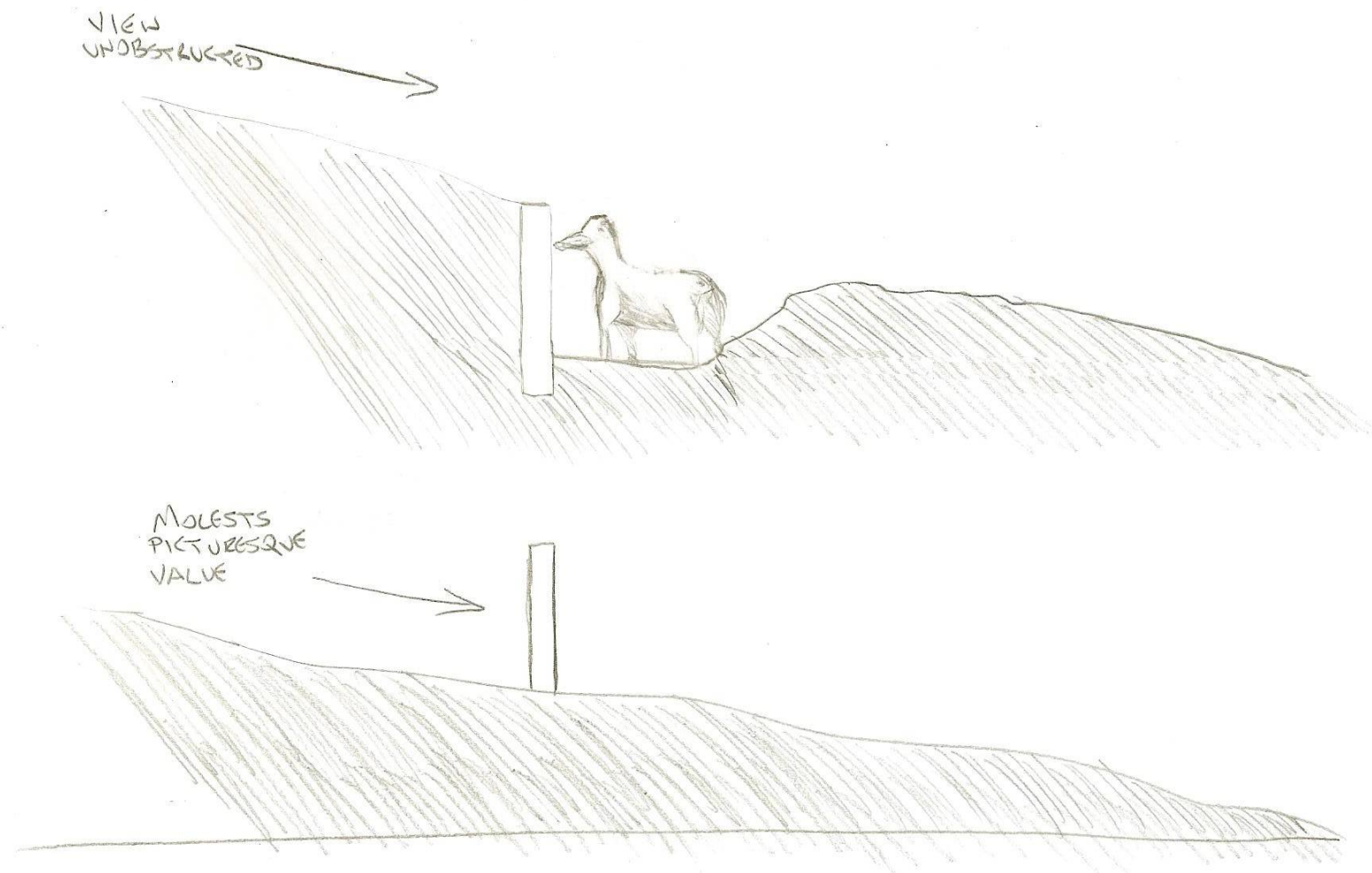


Fig. 42: Ha-ha wall in English countryside. Source: Author

does not take into account the picturesque quality of the unbroken countryside, while the other places our intervention just below the line of vision, allowing the same function while removing the eyesore. It is a phenomenology that embodies an atmosphere, from the tangible objects to the intangible feelings. Applying this phenomenology within the manipulation of the enclosure will bring the natural and built worlds closer, thereby creating an atmosphere that will foster a sustainable relationship between man and the environment.

Sustainable design has become more prevalent in the practice of architecture, yet is still only about 15 percent of built architecture. This thesis proposes that its principles become common place and part of the overall design process. Similar to ornament, which is part of the general design, sustainable principles should not be tacked on to a project at the end as if it were decoration. It is potentially more expensive initially to incorporate sustainable principles into construction, but the responsibility of the designer has never held such an impact.

The building construction industry is the largest consumer of energy in the United States. Construction and its related components makes up over half of the energy used in this country. One method of reducing this energy use is to choose local materials, as the embodied energy of materials shipped great distances can be extreme. This overuse of resources not only depletes a finite supply, but also increases the amount of pollution related to that material. The wasteful practices of the industry contribute over one third of the nation's landfills. These staggering quantities reveal our duty to the environment.

As humans, our artifice places us in the only position to work with the earth instead of exploiting it, thereby leaving future generations a viable environment. As architects, these statistics reveal our increased environmental responsibility. However, the question is one of individual accomplishments weighed against a widespread impact on the psyche of society. Should a building try to reduce its lone impact on the environment through technology and design? Or should it relate those who experience its spaces to the environment, thereby fostering the type of sustainable relationship capable of impacting a larger scale than one building. This thesis proposes that both methods are necessary, the technological and the symbolic.

CHAPTER V

Case Study

This bridge (Fig. 43) in Vallemaggia district in the Ticino canton of Switzerland shows that certain attitude, albeit on a more instinctual and less technologically dominated manner. Instead of spanning the entire riverbed, it first runs parallel to the face of a huge rock which forms the canyon like river bank. The bridge clings to the face of the rock as it makes its way out over the water, hugging the side as if it were part of it and did not want to depart from the shore. This hugging of the rock is marking a transitional zone of the bridge, preparing you for the journey across the river and the uninhabited banks that await. The bridge leaves the sanctity of the shore and rock, and leaps for a large rock sitting in the middle of the river. This island sits in the midst of the rushing current, and here the bridge takes a strong right turn toward another large rock on the edge of the river, not quite removed from its weathering effects. This slightly undercut rock receives the last of seven steps of the bridge just at its edge, and the bridge appears capable of picking up its end and choosing the next rock to land on. Yet under more scrutiny it is clear this bridge could not exist elsewhere. It is not until you step off of this last large rock that you reach terra firma, and the sequence of the bridge is complete.

The bridge is working with the present situation, and would be entirely different if it occurred anywhere else along the bank. It uses the rocks, instead of blasting them out of the way to create a flattened, idealized site to build on. This



Fig. 43: Sketch of stone footbridge in Switzerland Source: Author

response reveals the intricacies of the region, and preserves as much of the existing natural environment as possible. It is the ultimate example of man working with nature instead of dominating it.

The bridge itself acts as a threshold from the inhabited area lining the highway to the wilderness area across the river. The construction of the bridge reveals elements of transition from man-made to natural. The moment that the man-made organization of stones meets the solid surface of the rock is difficult to decipher due to the manipulation of rock and stone, for example, the manner of smaller pieces of stone filling in the gaps. An essential element to the cohesive nature of the bridge is this manipulation of rock and stone, the stones are made smaller to fill the gaps, and the rock is carved away to accept the bridge. Each entity lends itself to the other; there is no fine line of separation but an understood give and take.

The shadows cast at these connections further blur the boundary of man-made and natural. Had the bridge been raised high above these rocks to span the entire river, its shadows might have been lost below. Now these shadows speak of the connection those who built this bridge held with their natural environment. These shadows highlight the willingness of those builders to work with nature as opposed to controlling it, as well as the desire for an intimate association within that nature. This bridge exemplifies the ability of architecture to permeate between the built and natural worlds, thereby relating us to the natural realm.

This mutual permeation develops an architecture that treats boundaries as zones or filters rather than confines. By allowing both the interior and exterior to hold some form of importance, the architecture brings its level of experience to one of an intimate association with nature through that architecture. This union is manifested in the idea that architecture can foster a sustainable relationship between man and earth, capable of creating its own domain while maintaining an awareness of the world around it. The bridge is analyzed in the following images.(Fig. 44-48)



Fig. 44: View from the rock attached to the bank which the bridge hugs on its way out to the water.
Source: Author

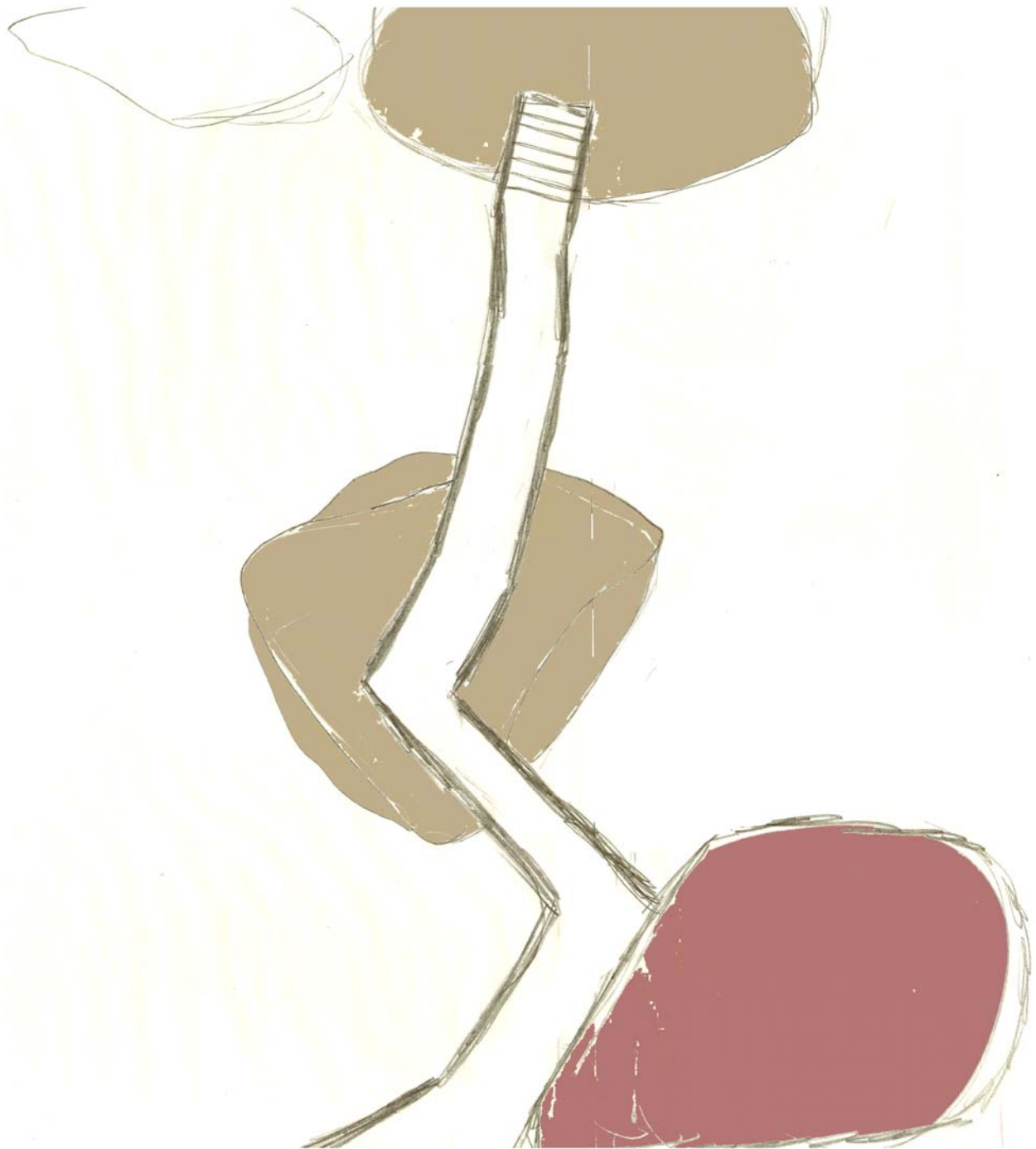


Fig. 45: Plan diagram of bridge, showing the bridge attached to the rock that is part of the bank in red, and the amount of turning the bridge does to suit the site. Source: Author



Fig. 46: Sketch of the second jump the bridge makes, and how the stairs attach themselves to the edge of the rock. Source: Author

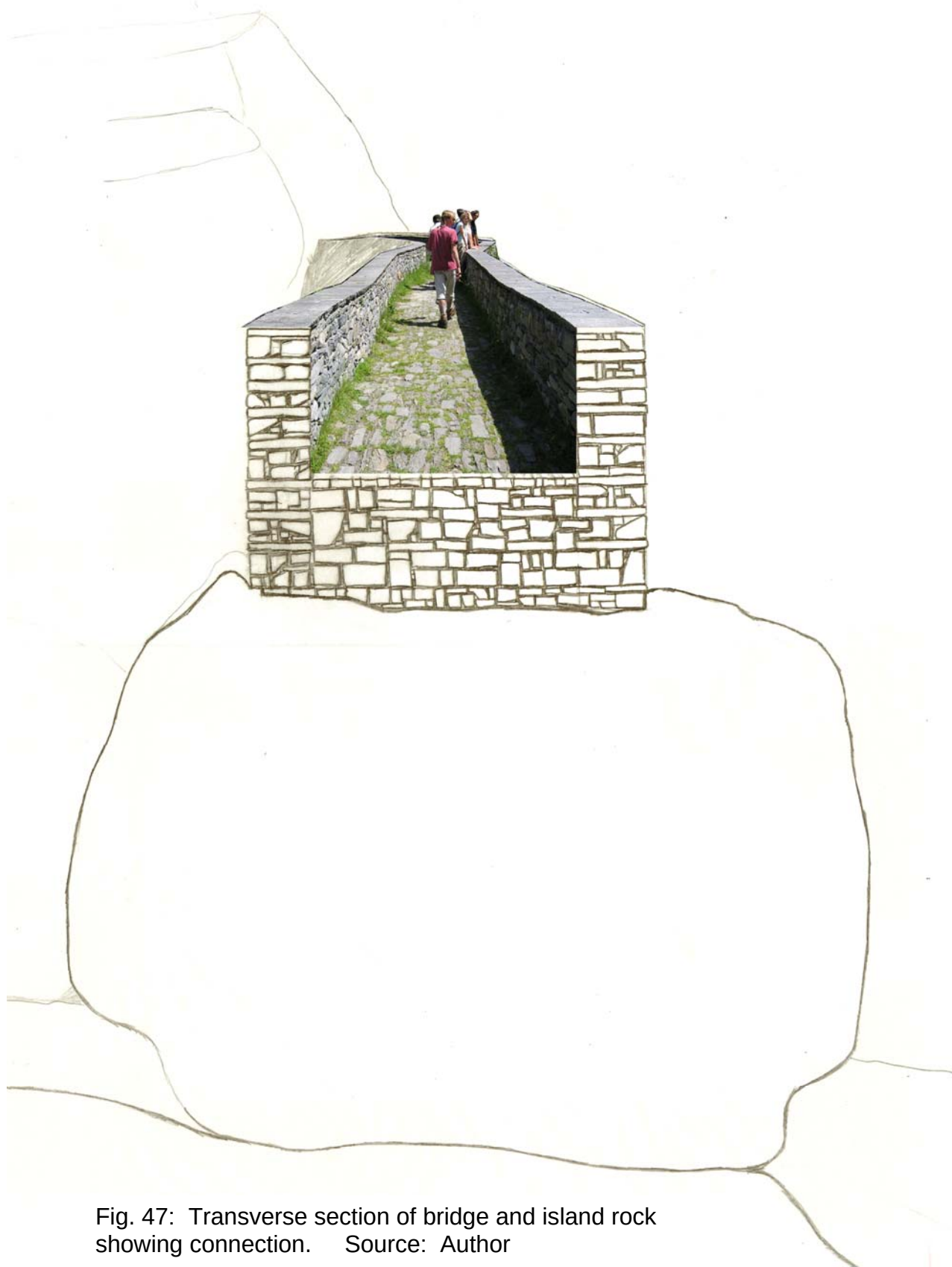


Fig. 47: Transverse section of bridge and island rock showing connection. Source: Author

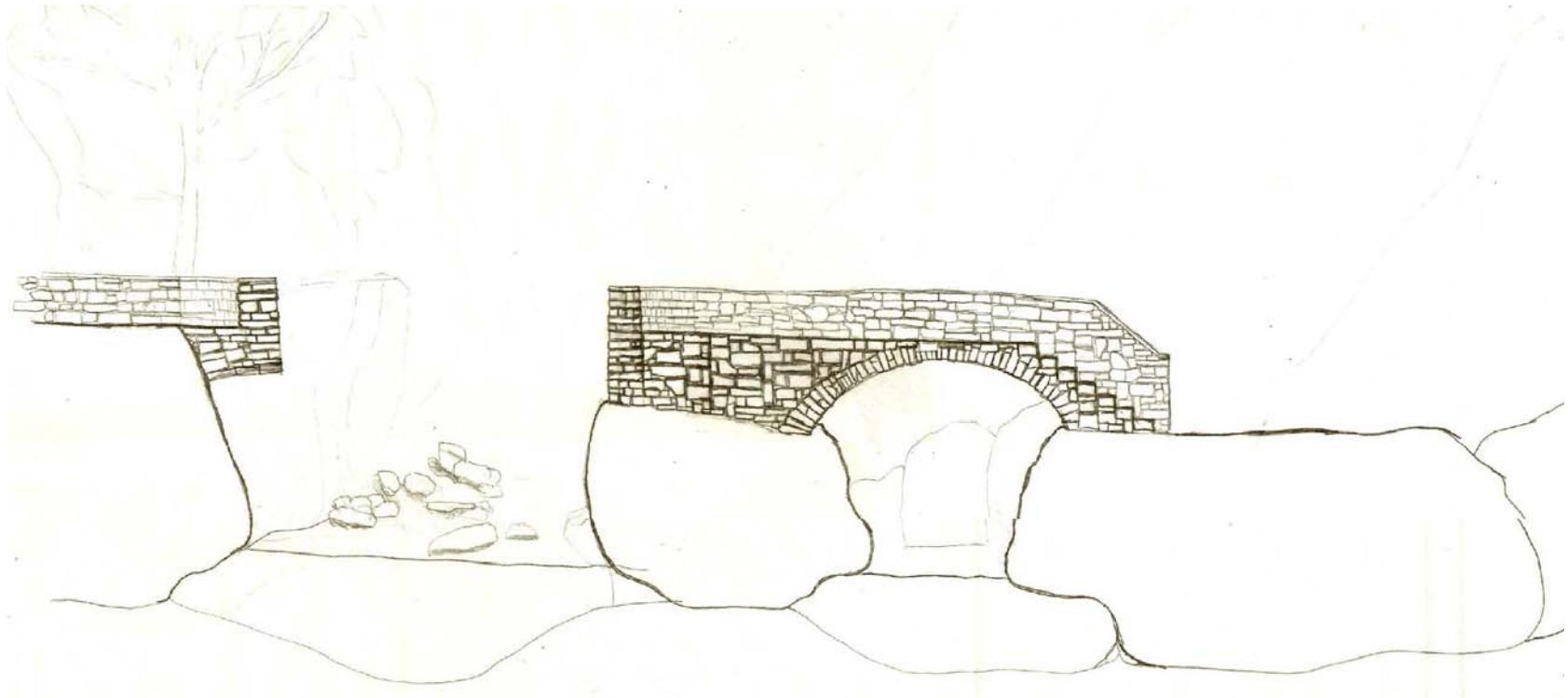


Fig. 48: Longitudinal section of bridge displaying the use of three rocks as supports

BIBLIOGRAPHY

BIBLIOGRAPHY

Abrams, David. *The Spell of the Sensuous*. New York: Pantheon Books, 1996.

Allen, Edward and Iano, Joseph. *Architecture Studio Companion*, 3rd Edition. New York, NY: John Wiley and Sons, Inc. 2002.

Ando, Tadao, "Toward New Horizons in Architecture," *Theorizing A New Agenda for Architecture: An Anthology of Architectural Theory*, ed. Kate Nesbitt. New York: Princeton Architectural Press, 1996.

Crowe, Norman. *Nature and the Idea of a Man-made World*. Cambridge, Mass: MIT press, 1995.

Heidegger, Martin. *Poetry, Language Thought*. Trans. Hofstadter, Albert. New York, NY: Harper and Row Publishers, 1971.

Jackson, J. B. *Landscapes* Selected Writings of J.B. Jackson. ed. Ervin H. Zube. Massachusetts: University of Massachusetts Press, 1970.

Jackson, J. B. *The Necessity for Ruins*. Massachusetts: University of Massachusetts Press, 1970.

Lavine, Lance. *Mechanics and Meaning in Architecture*. Minneapolis: University of Minnesota Press, 2001.

McDonough, William. *The Hannover Principles: Design for Sustainability*. New York: William McDonough Architects, 1992.

Norberg Schulz, Christian. *Genius loci: towards a phenomenology of architecture*. New York: Rizzoli, 1979.

Olgyay, Victor. *Design With Climate: A Bioregional Approach to Architectural Regionalism*, ed. Van Nostrand Reinhold: New York, 1992.

Romansky, Carter. *Two Approaches to Ecologically Conscious Architecture: Part 2: The Ethical Commitment of Tadao Ando*. Website.
<http://90ways.com/critarchive/crit20.php> Current as of 11-14-06.

Simmel, Georg. 'Bridge and Door,' trans. Mark Ritter, *Theory, Culture, and Society*, Vol 11 (1994).

Tanizaki, Jun'ichiro. *In Praise of Shadows*. New Haven: Leete's Island Books, Inc., 1977

Tzonis, Alexander, and Liane Lefaivre, *Tropical Architecture: Critical Regionalism in the Age of Globalization*, ed. Alexander Tzonis, Liane Lefaivre, and Bruno Stagno. England: Wiley Academy, 2001.

van Eyck, Aldo. Doorstep. In team 10 primer, ed. Alison Smith. London: Studio Vista. 1968.

Zumthor, Peter. *Atmospheres: architectural environments, surrounding objects*. Basel: Birkhäuser, 2006.

APPENDIX A

Precedent Study

Strawberry Vale Elementary School is located in a suburban community near Victoria, British Columbia, on a gently sloping piece of land bounded by a rare Oak woodland to the south and housing in the other directions. The program of the school is a 35,000 square-foot elementary school for 450 students, and uses include classrooms, computer rooms, library, special education, multipurpose room, recycling room, and administrative offices. The site holds a transitional position in a place between the nature of the preserved woods in the park and the built environment of Victoria. Patkau Architects designed the school with great inspiration taken from the rocky site that the architecture seems to navigate as if passing through a glacier field. The linear manner of the building follows the topography of the existing natural terrain. The school is replacing an aged schoolhouse from 1893 and uses this history of education on the site as its organizational concept. Buildings are arranged on the site in order to preserve existing playing fields and more significantly to introduce a linear historical sequence of the education of the neighborhood. (Fig. 49-50) The new building on the South end of the site is the culmination of this tripartite sequence, and is constructed in such a way that it treads lightly on the environment. For example, the affect of the building on the hydrology of the site is taken into consideration. Concrete trenches move the runoff from south to

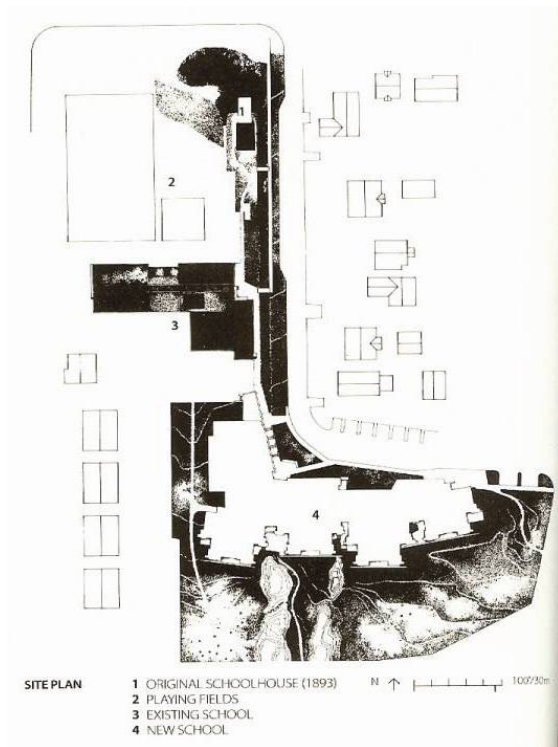


Fig. 49- Site Plan. Source: Progressive Architecture

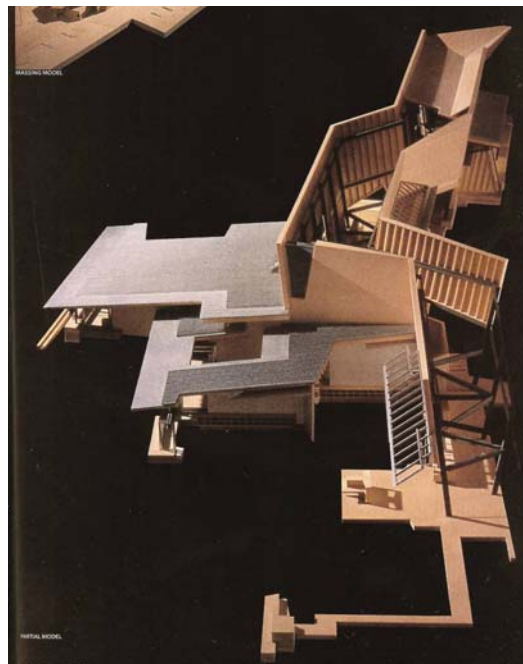


Fig. 50: Model Source: Patkau Architects

north to a ground swale that leads to a marshy area, allowing the water a chance for natural filtration treatment by the water plants present.

Sustainable principles are essential in exploring the boundary and its implications on our relationship with the environment, and Strawberry Vale elementary applies many sustainable design practices. The desire for locally accessible and renewable materials is one principle applied here, and wood fits this description. Steel is also used in the construction as some of the main support members. Reinforced concrete is used for the slabs, which follow the existing grade of the site. The floor plane appears almost as a stepped contour model of the topography.(Fig 51 & 52) A focus on minimizing the energy demands of the building has lead to selection of materials that promote low energy consumption. Another guiding principle in the choosing of materials was the amount of toxins present in those materials, and this lead to a sparse implementation of interior claddings overall. Form and orientation of the building are also derived from the natural environment, with all of the classrooms oriented to the south and large overhangs protecting from the high summer sun.(Fig. 53 & 54)

The building continues the goal to minimize energy consumption by the incorporation of passive systems of heating, ventilation, and lighting. Technology controls the passive heating and lighting systems in order to maintain efficiency. Careful placement of skylights and clerestory windows allow the reflective inner surfaces to produce even lighting within. Stack ventilation is used to introduce fresh air into the classrooms, shown in Fig. 55.

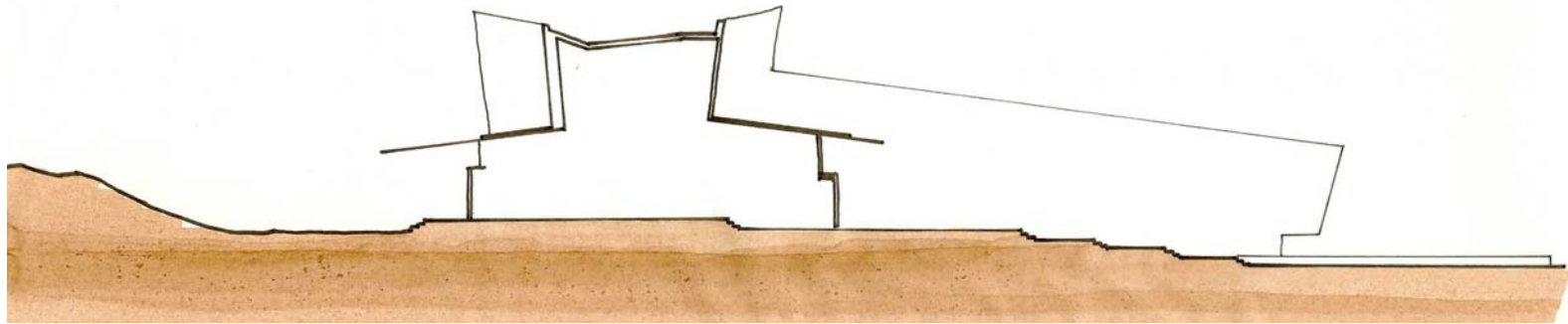
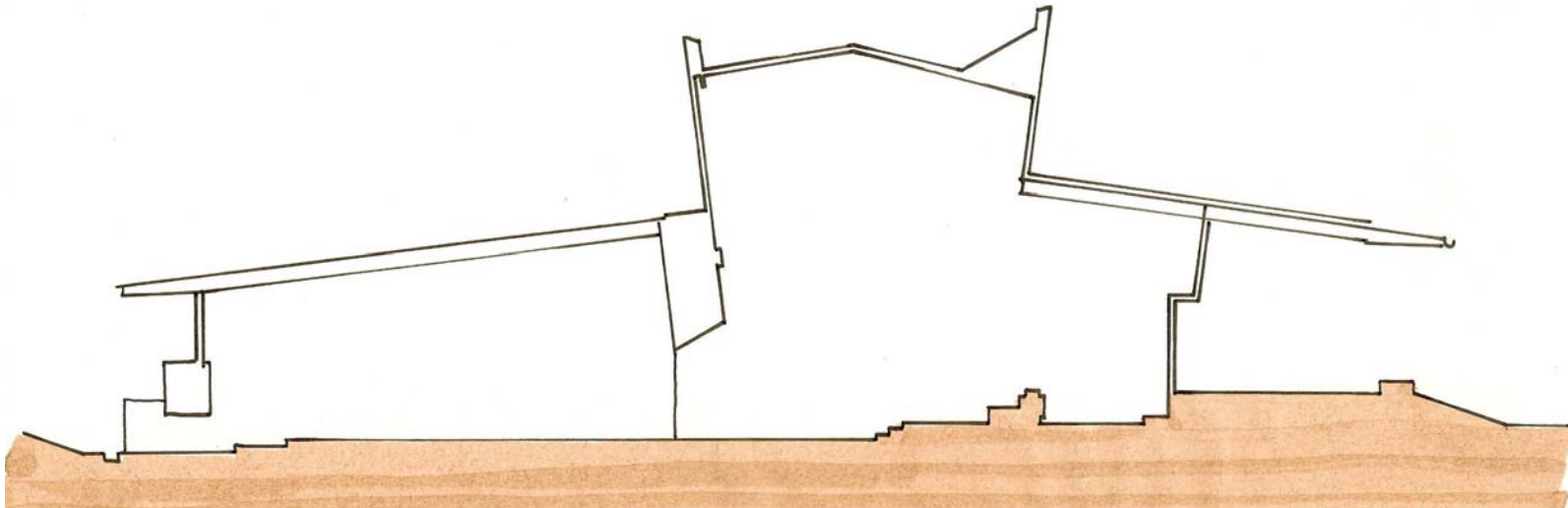


Fig. 51 & 52: Stepping floor plane reduces impact on site Source: Author



Fig 53 & 54- Overhangs and irregular roof- Source: Patkau Architects

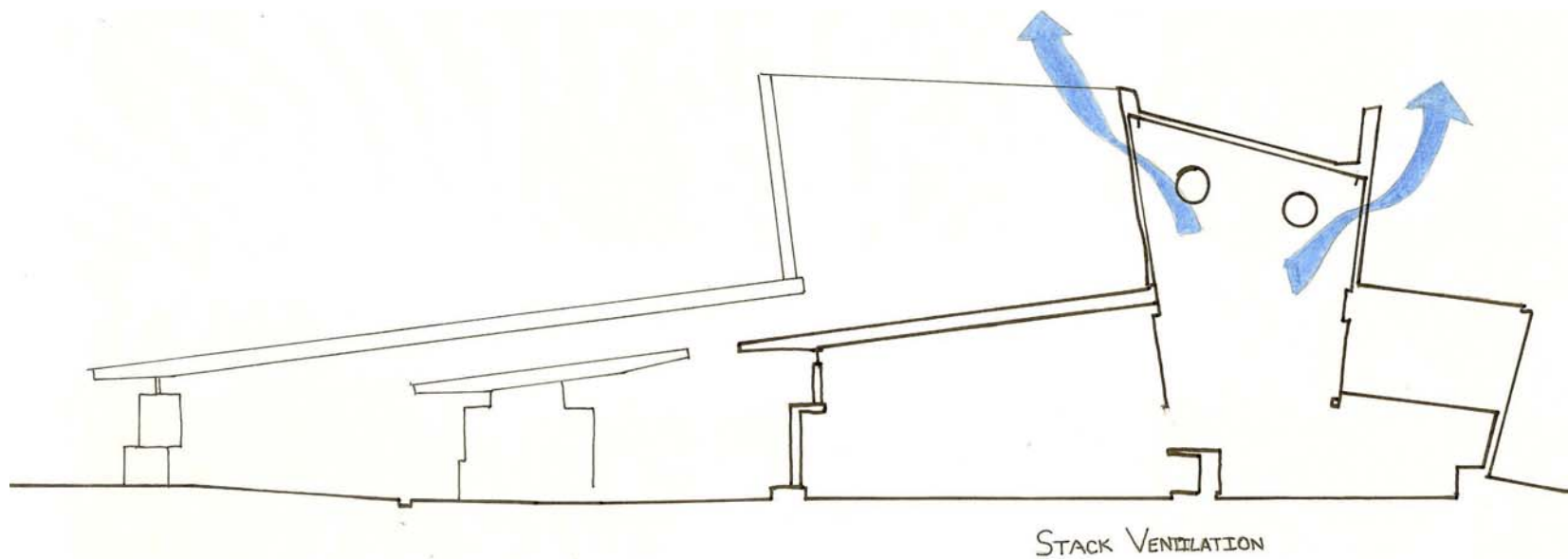


Fig. 55- Stack Ventilation

Source: Author

The school becomes a teaching tool itself in order to educate about the environment, implying a form for the natural forces acting on the site. This is one way that our relationship to nature is emphasized in the architecture. Another major way the building focuses on our relationship with the natural environment is through the manipulation of the boundaries.(Fig. 56 & 57) In some places the hallways or rooms are outdoors, and the floor plane itself consists of the topographical changes that existed on the site. Often spaces are mirrored or in some manner connected from interior to exterior, and the views of the preserved park are emphasized by the windows and the building's orientation. The interior spaces are defined in a similar manner, with a zone of transition established as opposed to strictly walls. Classes and outdoor porches are treated as features in the landscape in an attempt to truly connect the site and program.

Some keywords:

- | | |
|-------------------------------|--------------------------|
| -Indoor/ outdoor | -Education beyond school |
| -Harmony | -Environment |
| -Preserve natural surrounding | -Minimal intrusion |
| -Boundary | |

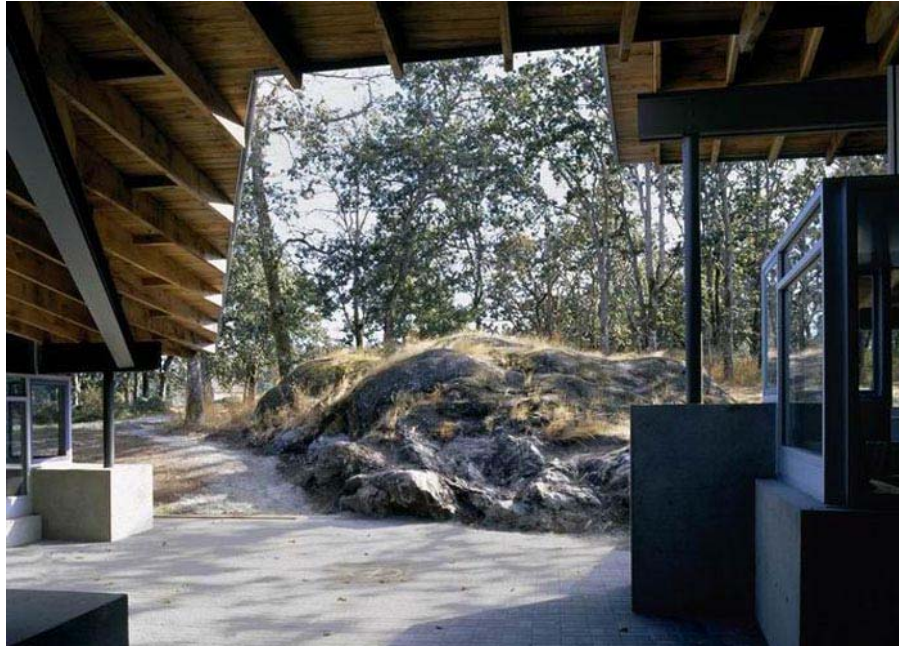


Fig. 56: Example of treatment of boundary between built and unbuilt.
Source: Patkau

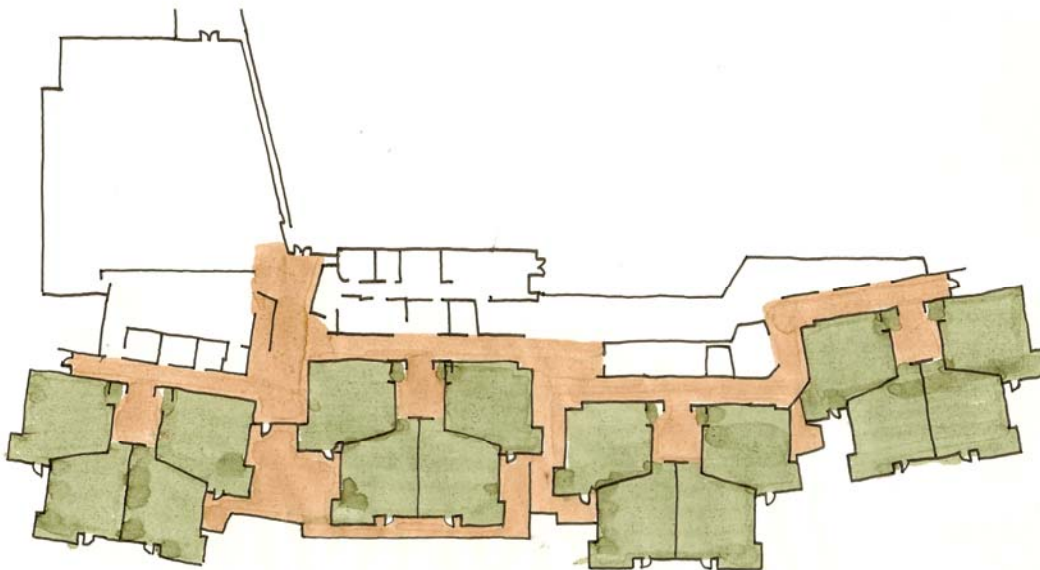


Fig. 57: Spaces in brown show in-between zone separating pods of classrooms. This zone serves as a transitional element. Source: Author



Fig. 58: natural light Source: Patkau

Renzo Piano's Zentrum Paul Klee in Bern, Switzerland is a formal investigation into our relationship with the natural world. The museum consists of three humps that mimic the rolling hills in the distance, and seem to settle into the landscape like they were born from it. The building extends itself into the landscape.(Fig. 59 & 60)

This extension blurs the line between indoor and outdoor space, and the typical boundary is replaced by a series of screens and zones that slowly introduce the visitor to the space before entering the front door.(Fig 61) The series of screens and sunroofs filter the natural lighting rendering it safe to use in the museum's galleries. The light shelf displayed in Fig. 62 shows how the light is bounced to the rear of the building.

The Zentrum Paul Klee displays a pervasive attitude toward working with the environment and respecting its place, instead of dominating nature. It is a formal example of the overall attitude this thesis holds as a goal, with our relationship to the natural landscape strengthened through the manipulation of the boundary of our structures. Here the walls become the roof and sink into the rolling hills, and the floor falls away to accept the earth.(Fig. 63)



Fig. 59: Building dives into earth and jumps back out on the other side of entrance ramp. Source: Cantz



Fig. 60: Side view of roof showing relationship to landscape. Source: Cantz

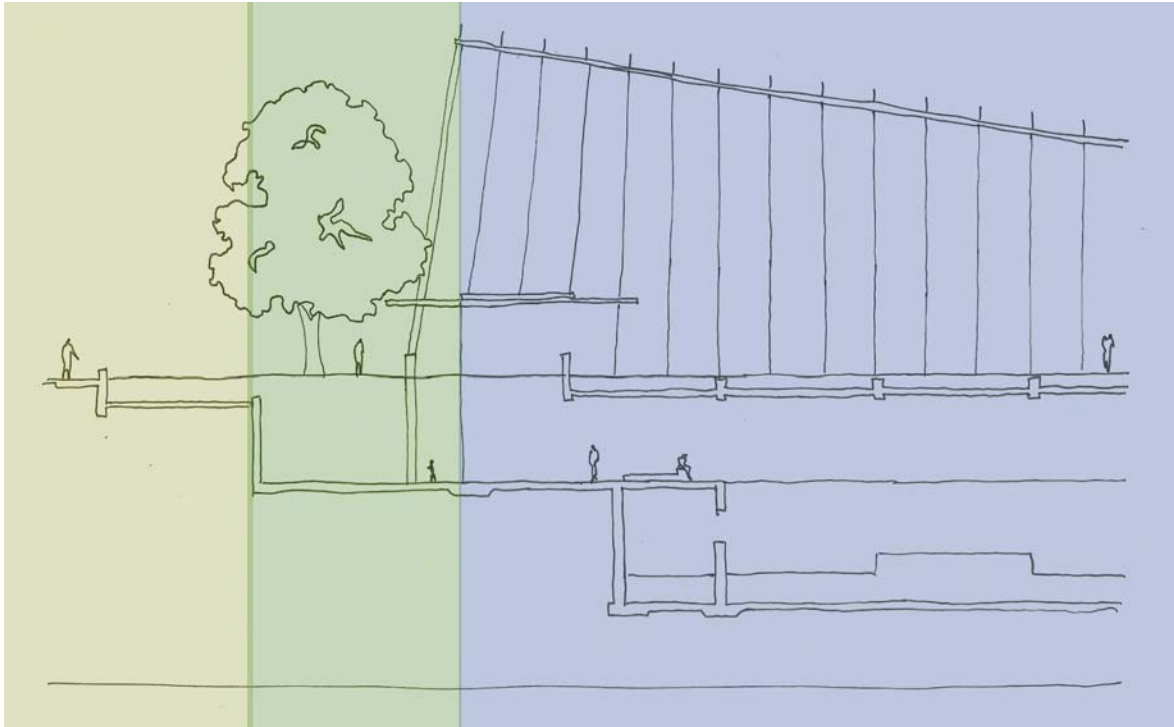


Fig. 61: Zentrum Paul Klee section showing zones of introduction into building as opposed to one line. Source: Author

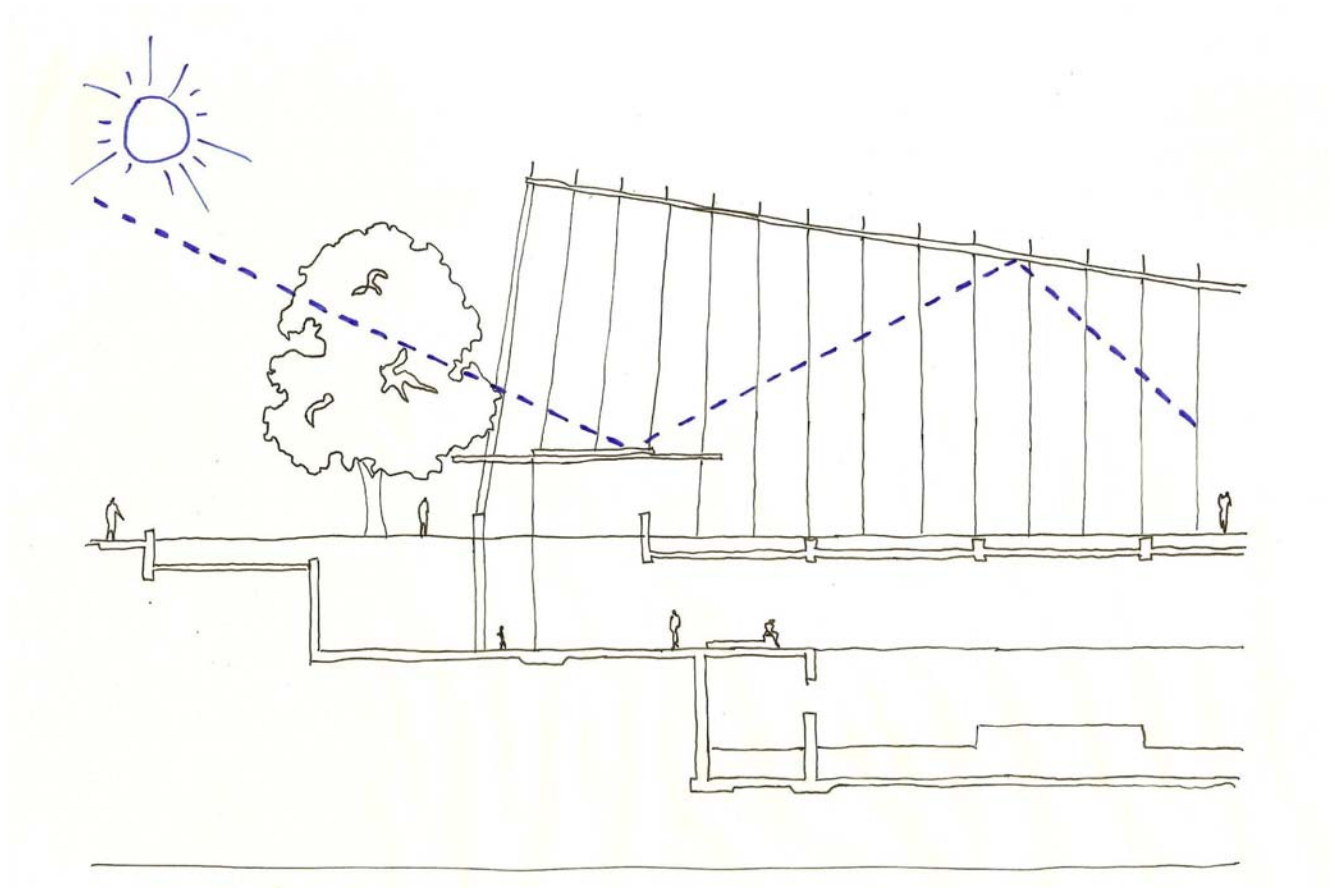


Fig. 62: Zentrum Paul Klee section showing zones of introduction into building as opposed to one line. Source: Author



Fig. 63: rear of building, where three humps merge into natural landscape. Source: Cantz

Tadao Ando's Museum of Modern Art in Fort Worth, Texas, is an excellent example of a museum which shares the value of a transitional zone connecting us to nature.(Fig. 64 & 65) This museum is much larger than the proposal for the National Ornamental Metal Museum, but the principles applied here will be noted in the design. The calming nature of the museum produces a sanctuary for the spirit, removed from the active life of the city. An outdoor reflective pond serves as a buffer from the city. It provides a zone of transition between the city life and the museum, allowing the visitor to prepare for the contemplative activities of the interior. The pond is only 2' deep, and it projects the changes in the atmosphere, such as the rippling surface when the wind blows, or reflecting the clouds in the skies.

The museum at night appears to bob in this pond, as if lanterns from Ando's homeland were placed in the heart of Texas. A true Japanese tradition of the "engawa" is presented at the museum many times. Its historical value in Japan is to establish a buffer zone between the interior and exterior. It is usually a place where both interior and exterior could be experienced, and celebrates the tension of our relationship with nature. In the Fort Worth museum, Ando expands this meaning to create small sanctuaries within the space that traditionally in Western society holds little or no spatial volume. Ando created small spaces of refuge between the concrete interior and the outer glass and aluminum walls.

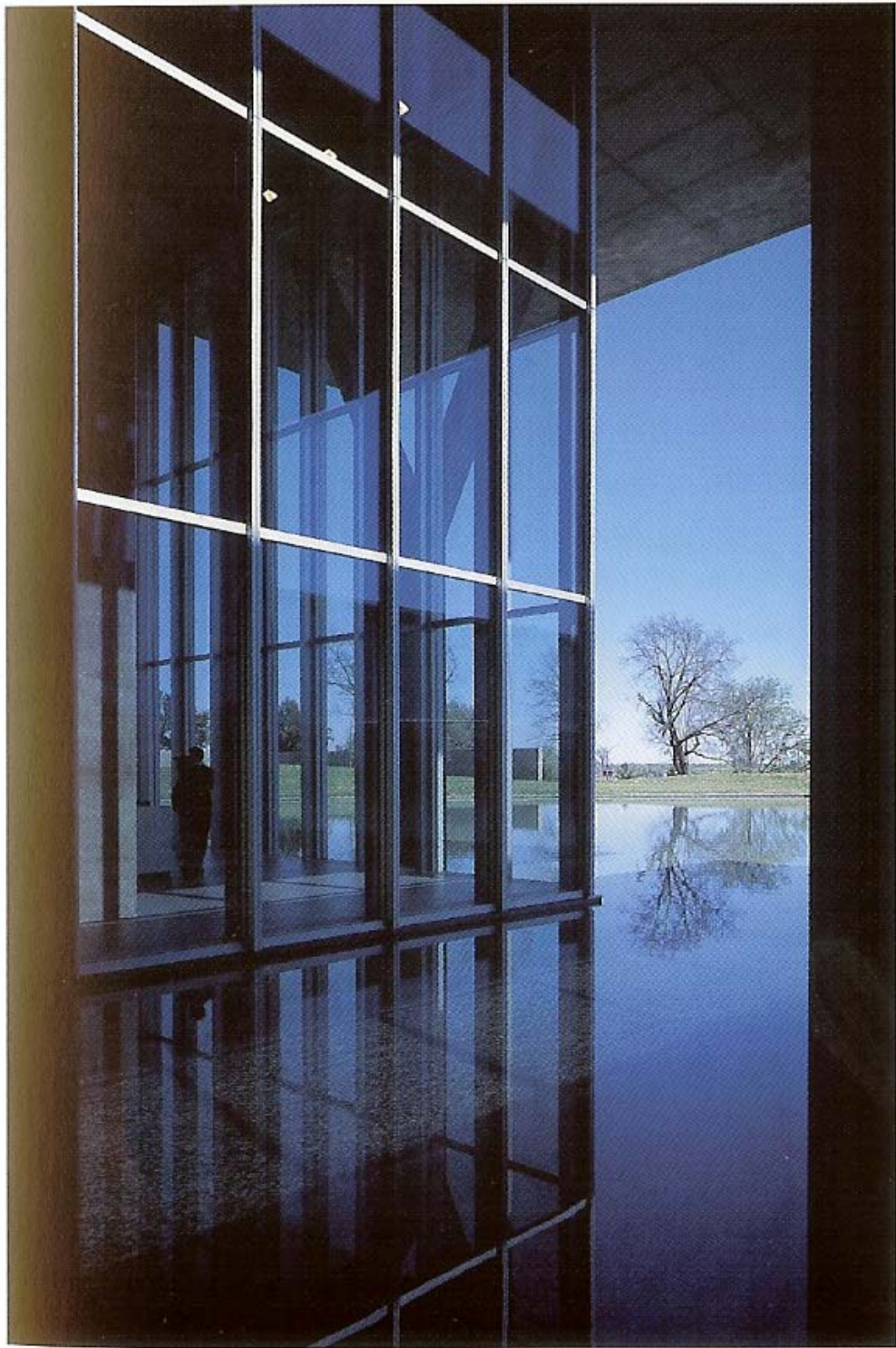


Fig. 64: Image of pond and engawa

Source: GA Document



Fig. 65: Museum of Modern Art, Fort Smith
Source: GA Document

Lanterns in the pond.

APPENDIX B

Building Code

The International Building Code from Allen's *The Architect's Studio Companion*, *Third Edition* will be used for this project. It classifies a museum as designation A-3 Assembly group. This designation may vary as the proposal actually falls somewhere between a school, residence, and museum.

Table VI. Occupancy groups

A-3	Museum
A-2	Education

Table VII. Construction types

Construction type	Applicable Code
I-A: 3 hour noncombustible	Requires fire rating of 2 hours for floor and 3 hours for column and load bearing walls.
I-B: 2 hour noncombustible	Requires fire rating of 2 hours for floor, columns, and walls.

Table VIII Egress

Fire Exits	2 per floor, minimum, or 250 persons/ fire exit
Door, corridor, and ramp widths	3.9 ft minimum
Stairs	4 ft minimum

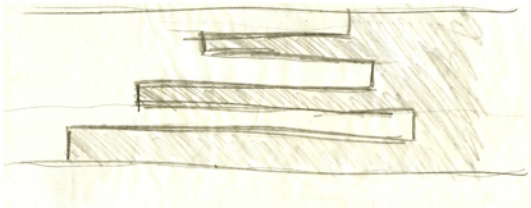
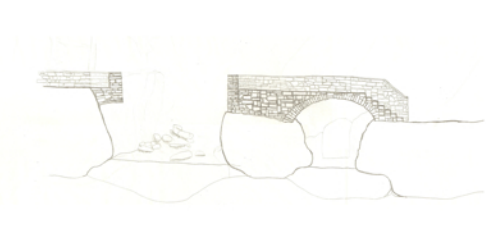
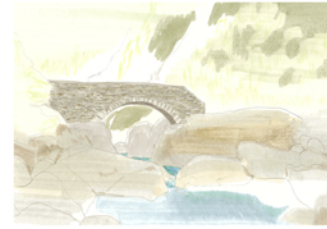
APPENDIX C

Final Drawings

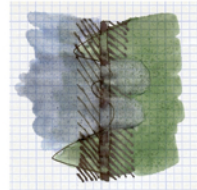
ARCHITECTURE OF MUTUAL PERMEATION

Bo Evans Spring 2007

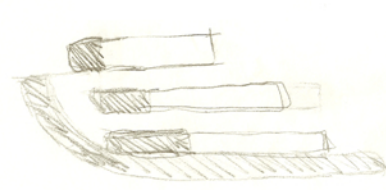
"Human life is not intended to oppose nature and endeavor to control it, but rather to draw nature into an intimate association in order to find union with it... this kind of sensibility ... de-emphasizes the physical boundary between residence and surrounding nature and establishes instead a spiritual threshold... While screening man's dwelling from nature, it attempts to draw nature inside." Tadao Ando



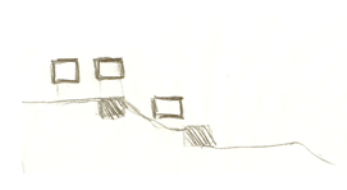
weaving built and unbuilt



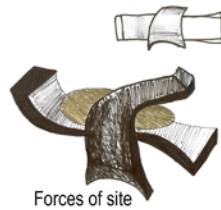
mutual permeation



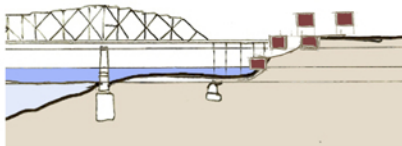
parti



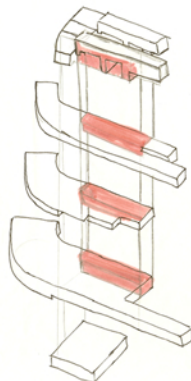
floating vs. embedded



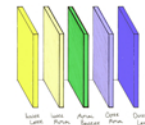
Forces of site



interactive



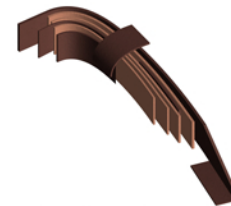
shaft as bridge



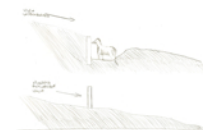
permeation through layers



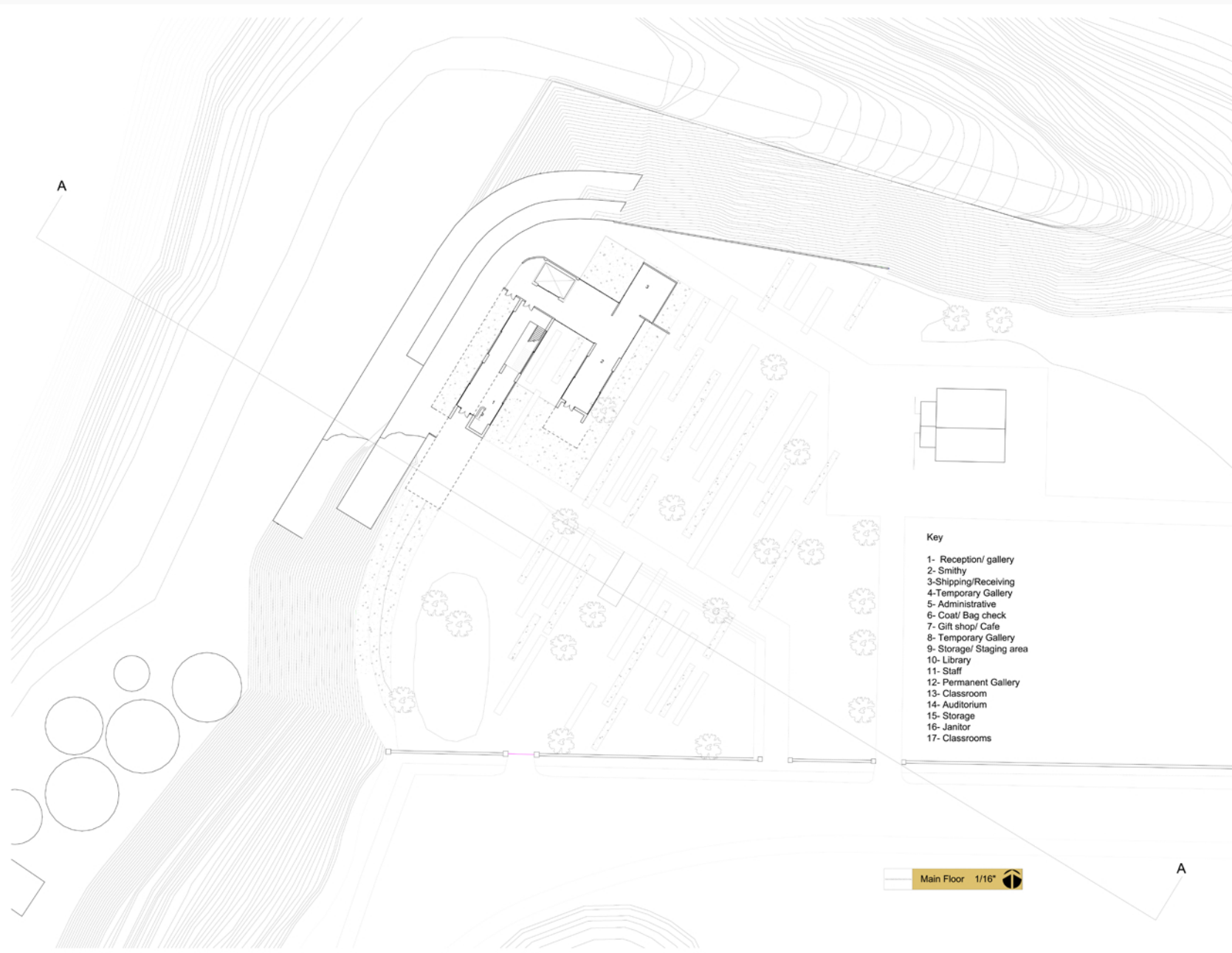
Engaging bluff



translating layers



ha-ha wall as inspiration

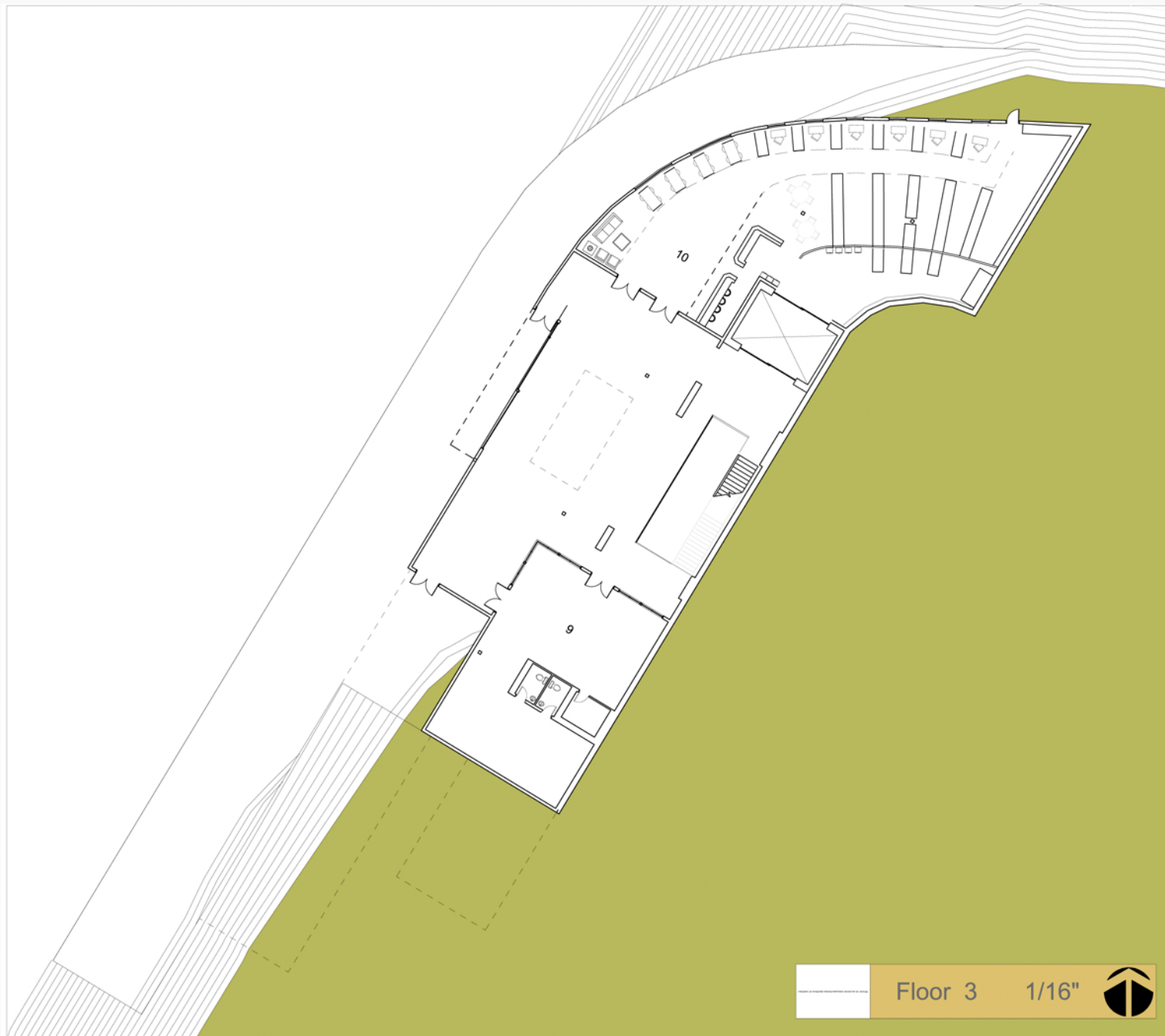


Key

- 1- Reception/ gallery
- 2- Smithy
- 3-Shipping/Receiving
- 4-Temporary Gallery
- 5- Administrative
- 6- Coat/ Bag check
- 7- Gift shop/ Cafe
- 8- Temporary Gallery
- 9- Storage/ Staging area
- 10- Library
- 11- Staff
- 12- Permanent Gallery
- 13- Classroom
- 14- Auditorium
- 15- Storage
- 16- Janitor
- 17- Classrooms

Main Floor 1/16"





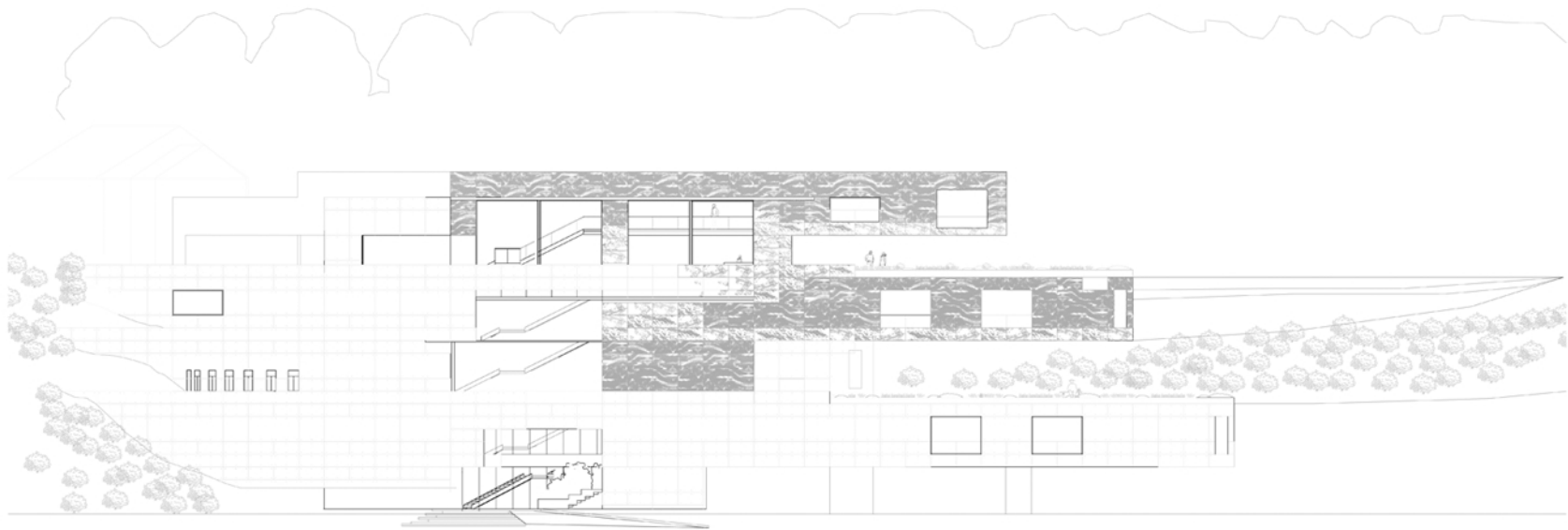


Floor 4

1/16"







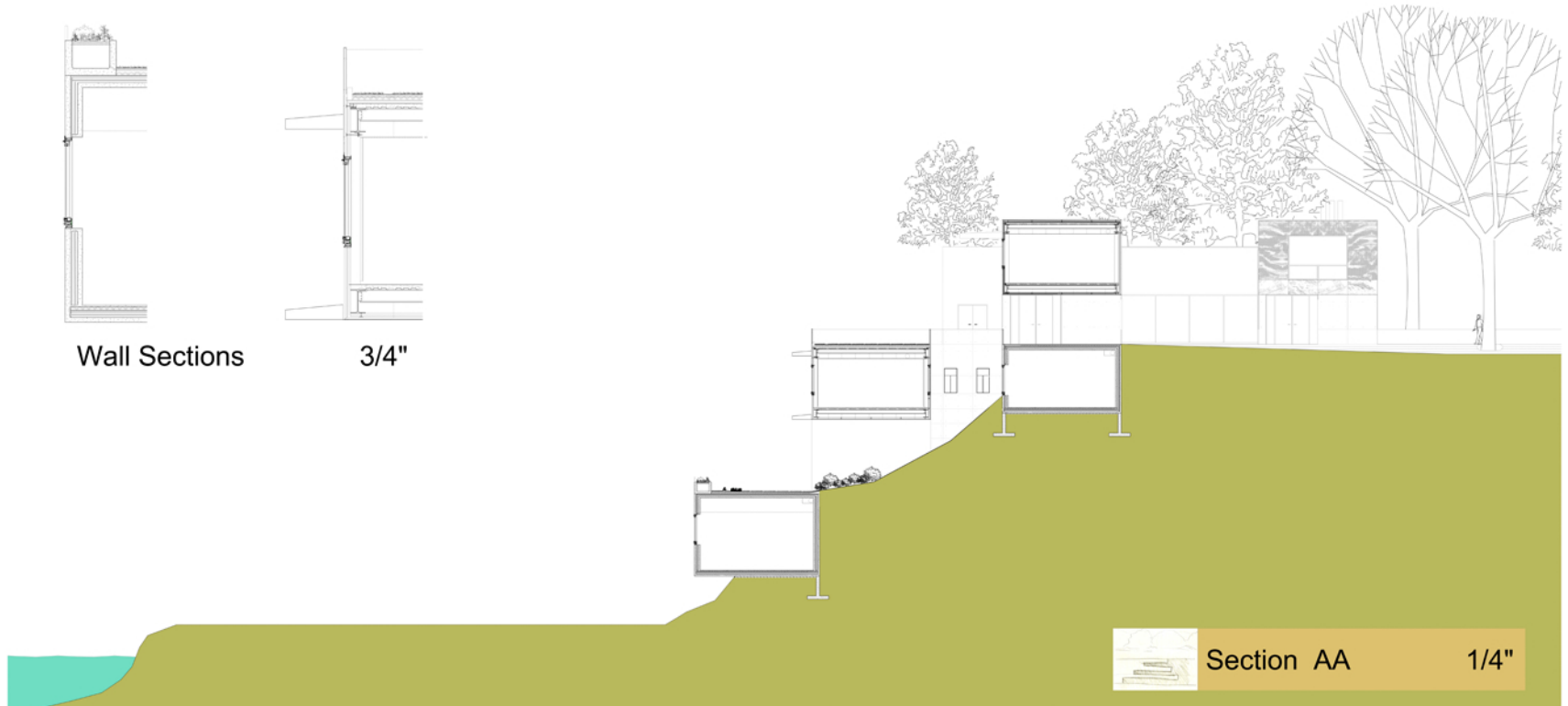
ELEVATION

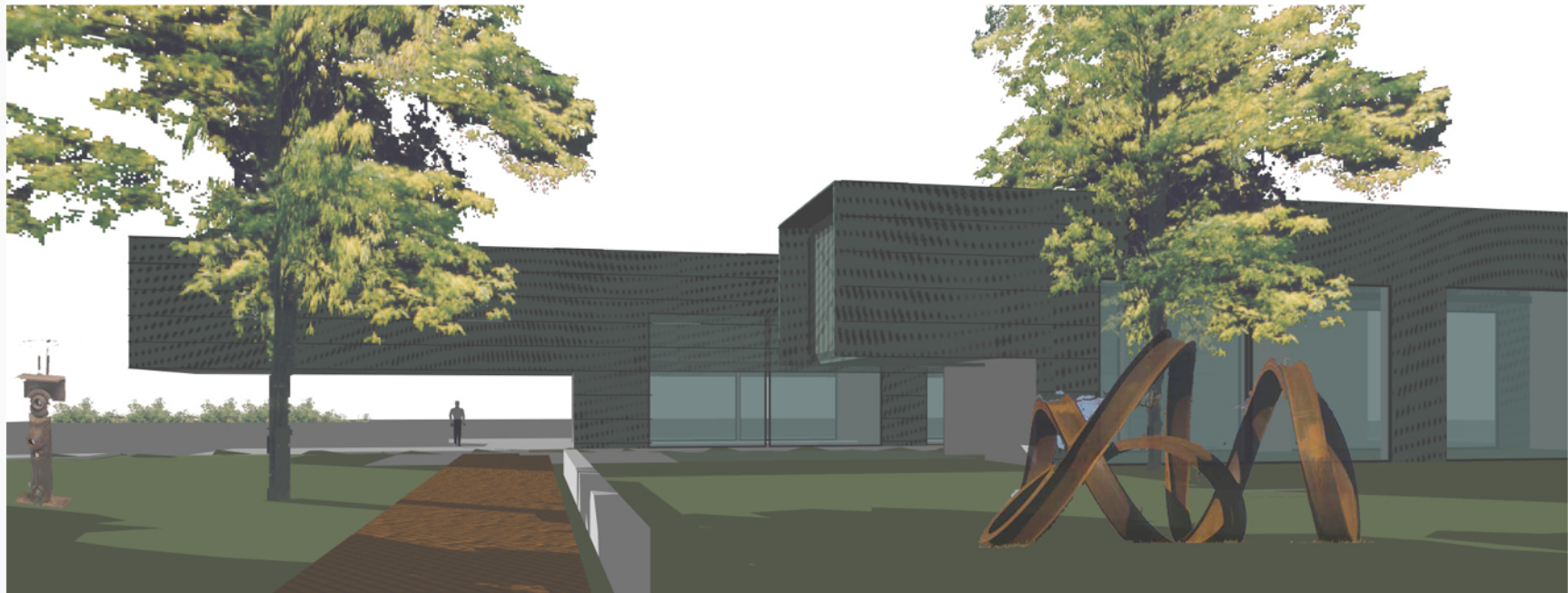
1"
8'

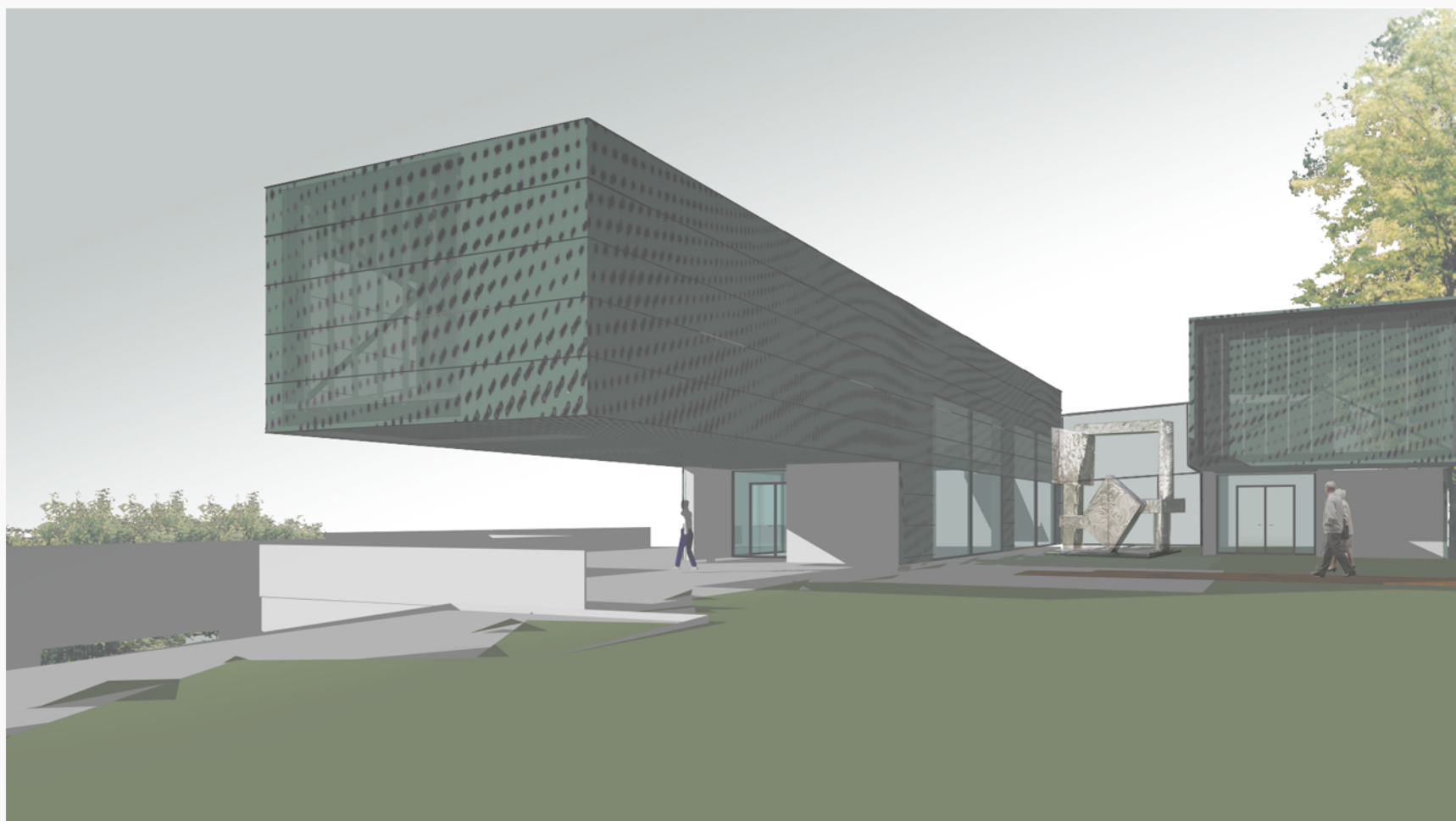


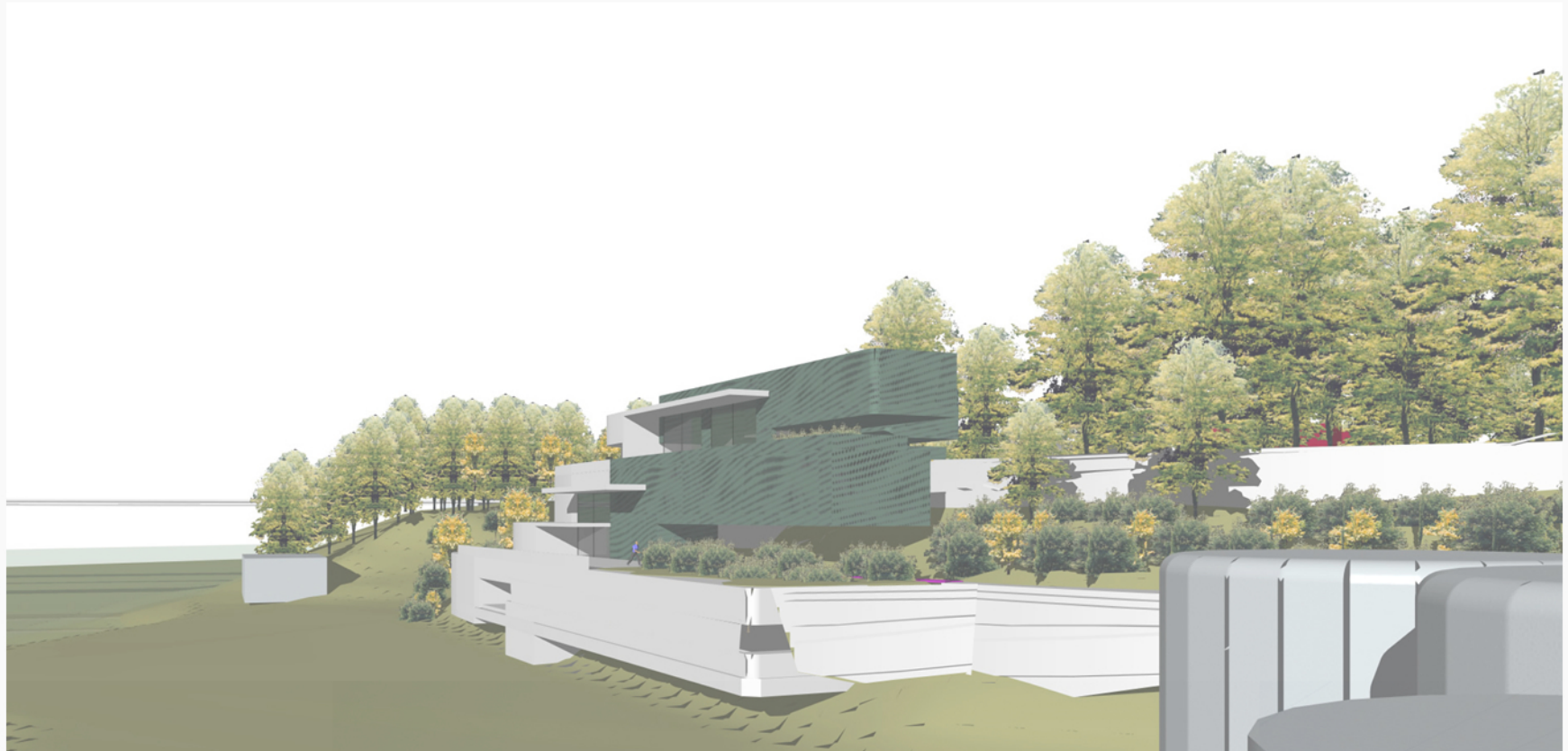
Wall Sections

3/4"

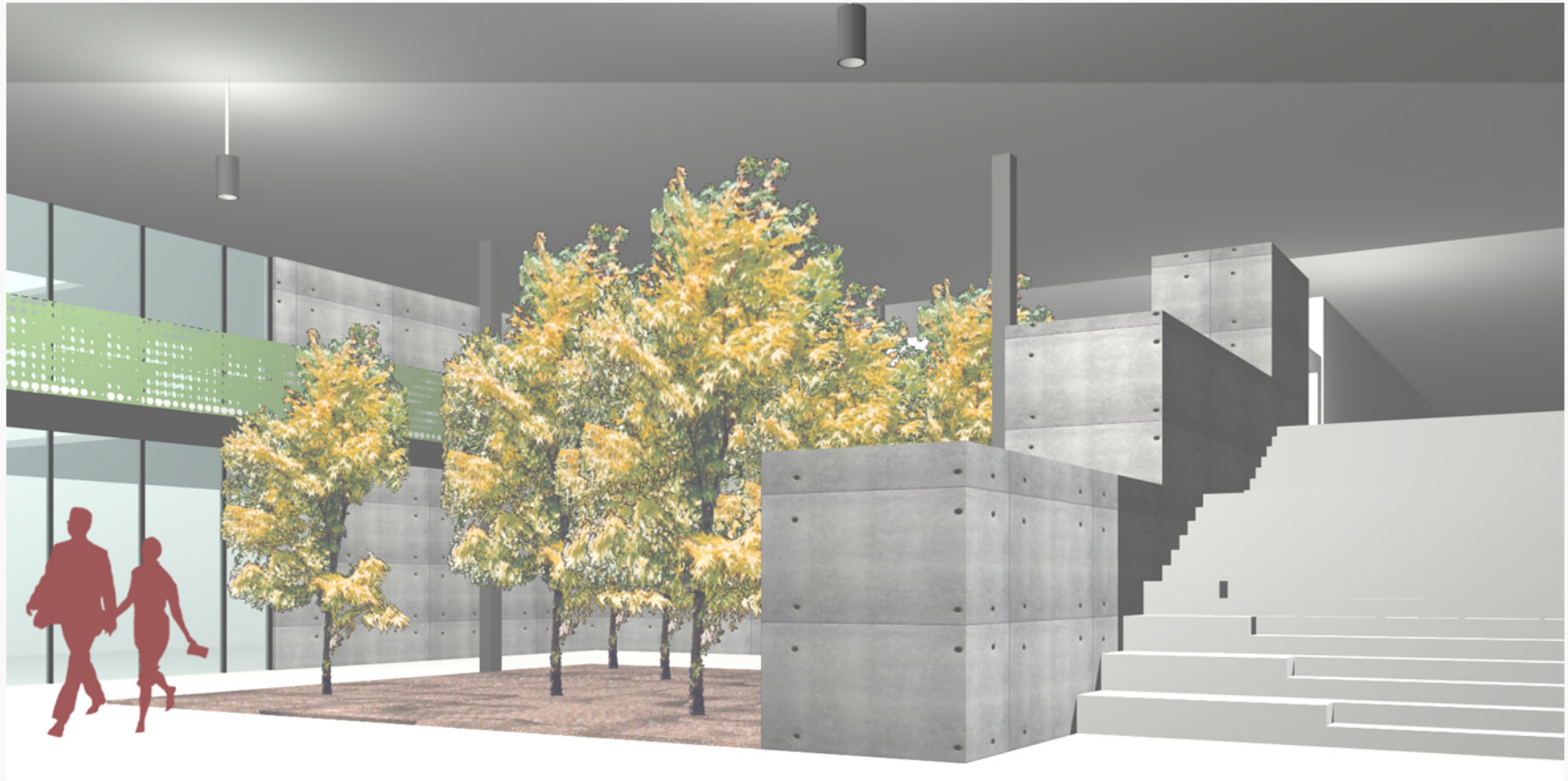


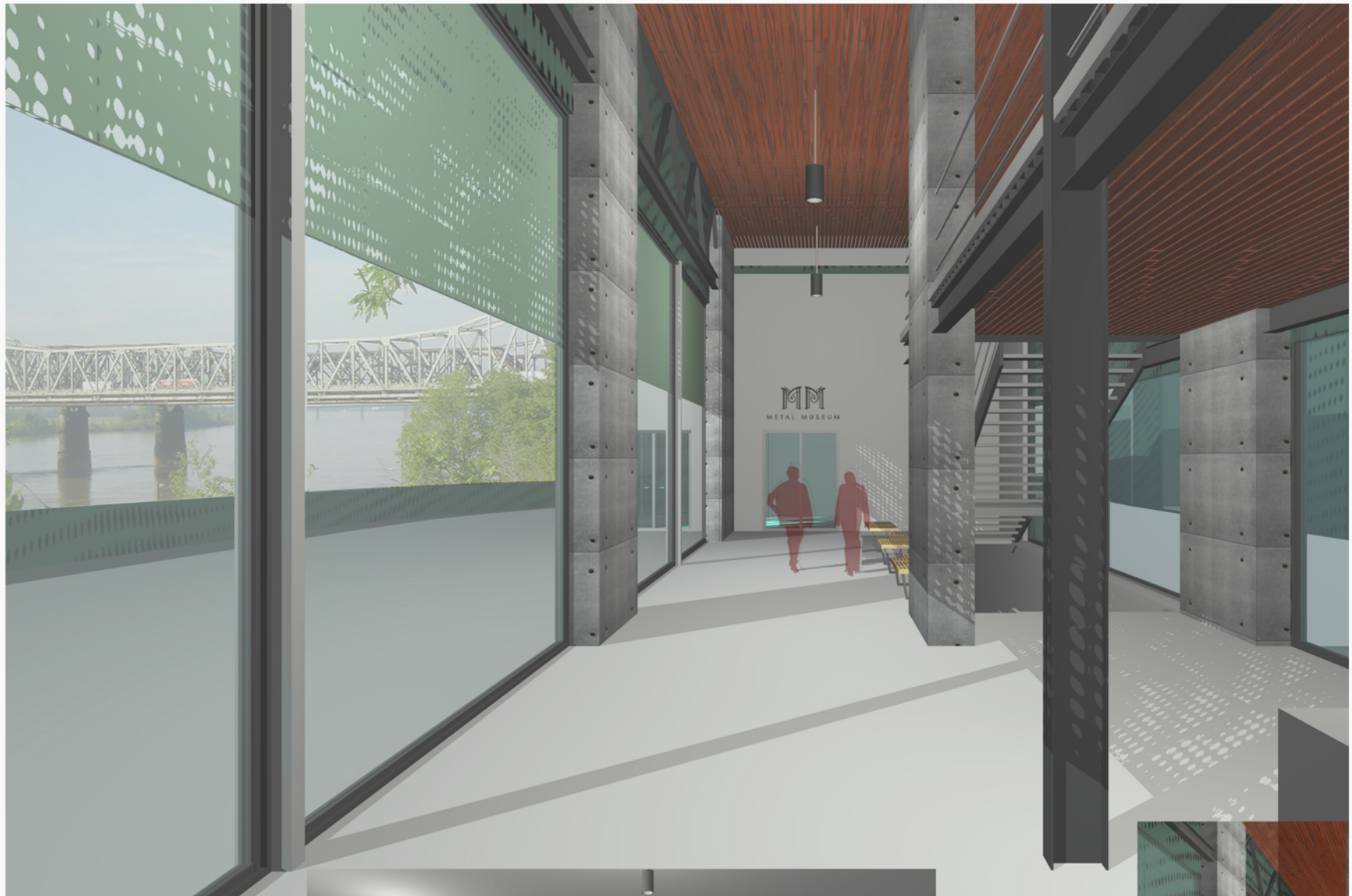


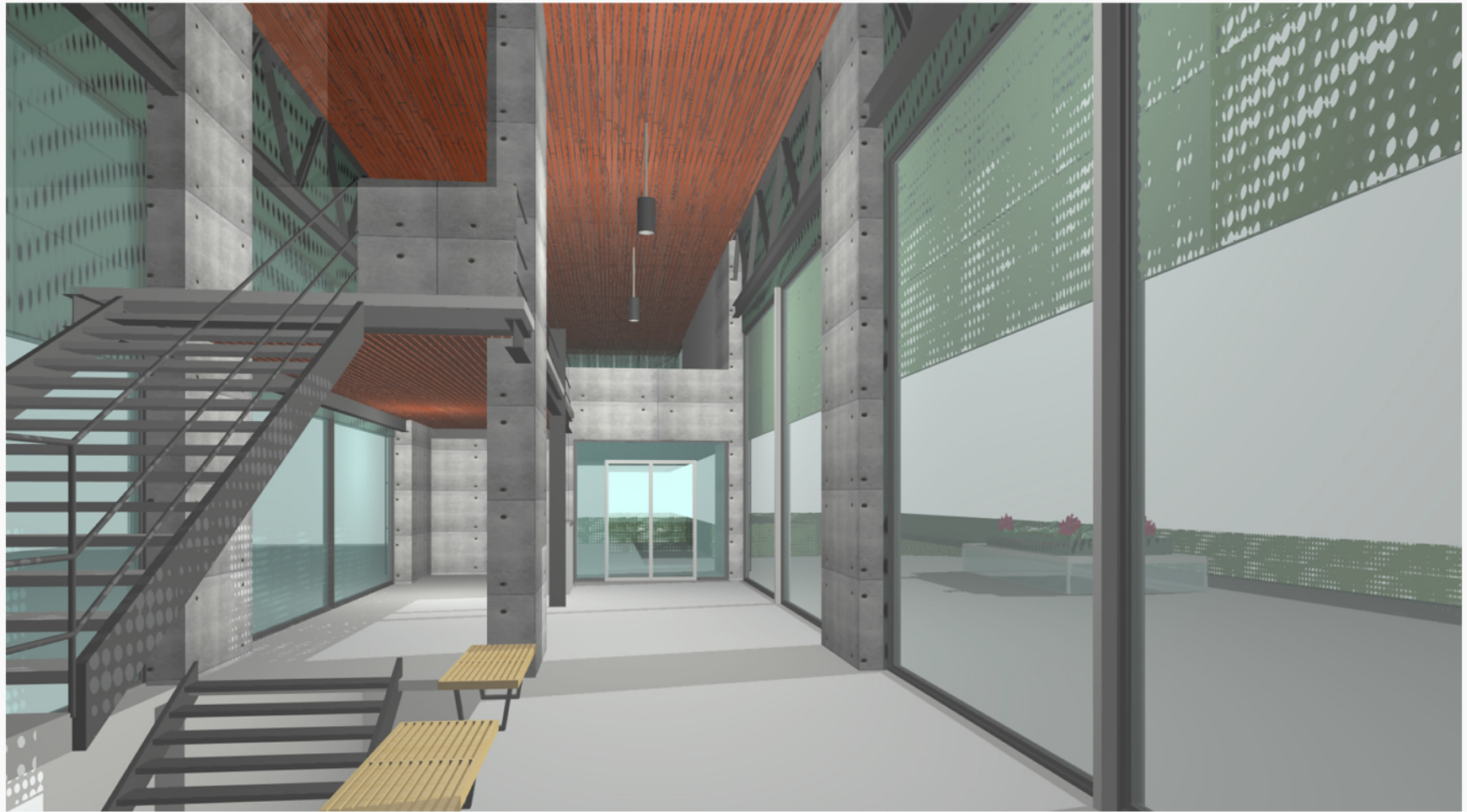












VITA

Bolin Evans was born in Memphis, Tennessee on June 23, 1977. He received a Bachelor of Arts in Art History from the University of Oregon in 2001. He entered the University of Tennessee in 2003 and began his architectural education, which has tested and surpassed his limits both physically as well as mentally.