ON THE ART OF FORTIFICATION

A New Visitor's Center to Revitalize Fort Washington Park

Leslie J. Thompson

INTENTIONALLY LEFT BLANK

ON THE ART OF FORTIFICATION
A New Visitor's Center to Revitalize Fort Washington Park

Leslie J. Thompson

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Master of Architecture in Architecture

Paul Emmons, *Committee Chair*

Marcia Feuerstein

Melinda Humphry-Becker

May 7, 2012

Alexandria, Virginia

Keywords:

Fort Washington

Military Architecture

Visitor Center

Fortifications

Bastion

ABSTRACT

ON THE ART OF FORTIFICATION

A New Visitor's Center to Revitalize Fort Washington Park

During the 18th and 19th centuries, the evolution of artillery has commanded the evolution of military architecture. Fortifications physically depict a representation of the history of engineering and architectural principles; including strategic site placement, materiality, construction methodology, principles of weaponry, defense and design layout. Visiting any one of these enigmatic and monumental structures offers a walk into the past, a glimpse into the ideologies, cultures and sentiments of its conception. Fortifications, particularly American fortifications, lay silent waiting for visitors to unlock their contributions to the national and local historic fabric. Fort Washington is one such structure located within Fort Washington Park, Maryland perched above the Bank of the Potomac River where it long protected the Nation's Capital.

Through my research, I propose to answer the following questions: How did the evolution of artillery and its unique site influence the design layout of Fort Washington? How does one begin to revive and restore such an extraordinary site? How can the architecture of today spark the interest of visitors while encompassing the needs of local residents? My proposal for a new, multifunctional visitor center tries to embrace, respect and reflect the existing structures by inspiring wonder among tourists and attracting local residents while also allowing for their restoration and self-sustainment.

To my family

Thank you for your love and continuing support in all I endeavor
regardless of the challenges and

in memory of my grandfather
Herschel Newton Johnson

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

Fortresses were built for a variety of reasons. The most obvious was so that a smaller force could hold off an invading army and defend territory within the walls. The three basic pieces of every entrenchment are:

1) Covering masses or embankments, dominated by

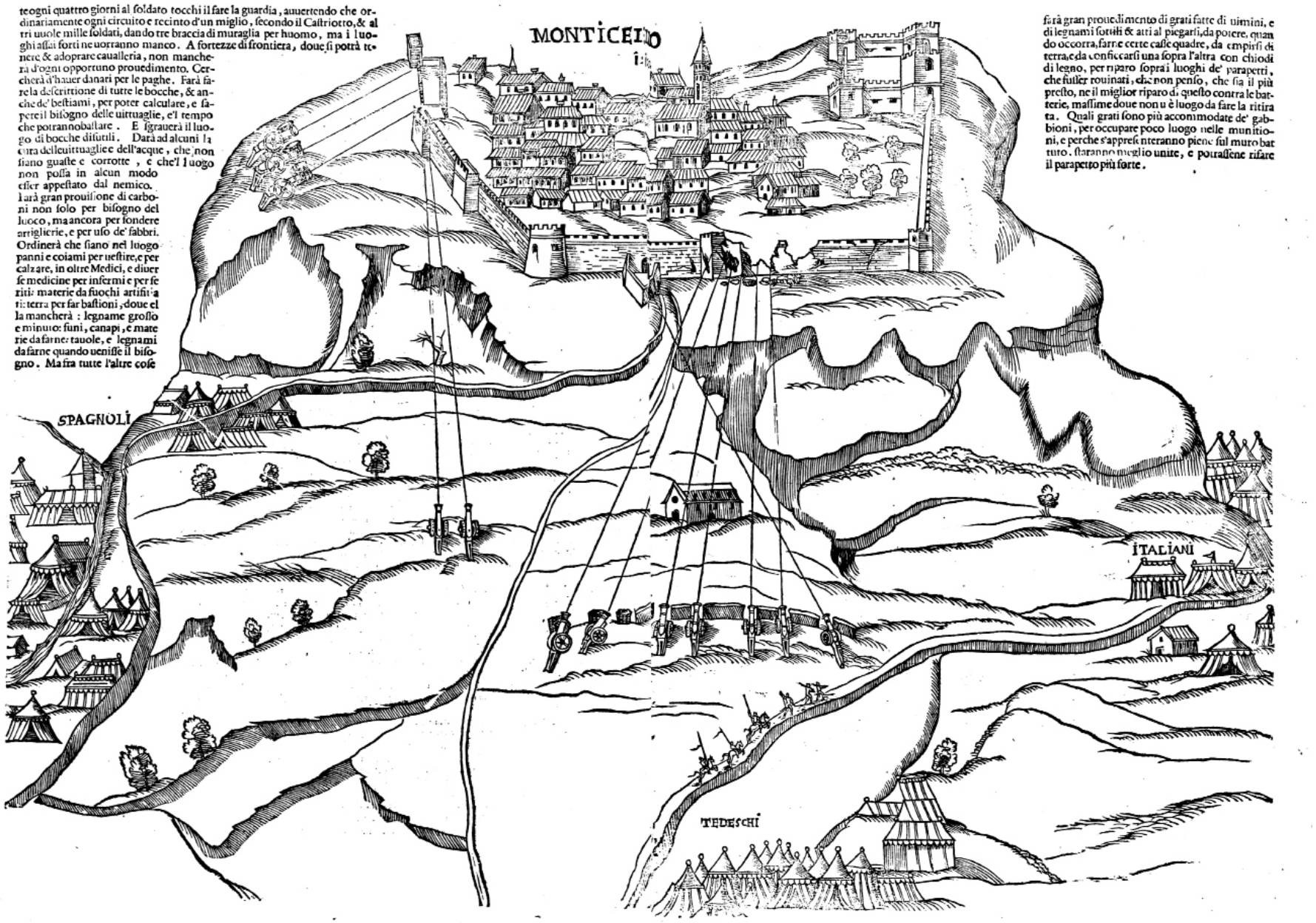
2) Parapets, which are separated by

3) Ditches.

However, these are just physical obstacles with a goal of exposing the attackers to the defender's fire (Mahan 1-2). With correct placement of cannons, a stronghold could now project power. In 1526, Spanish engineer Pedro Navarro said, "A city can expect to have more guns than an army can carry with it; whenever you can present more guns to the enemy than he can range against you, it is impossible for him to defeat you." This concept changed a fort from a defensive fortification to an offensive power (Hale 12). By situating your troops on a battlefield near a fortress the two could be mutually supporting, offering increased defensive and offensive power. Cavalry could harass enemy flanks, cause damage, and then retreat behind the protective umbrella of their own artillery (Duffy 20).

A good fortress also served other purposes. A tyrant could insulate himself from peasant uprising by building a citadel in the heart of city. A fort could shorten supply lines during offensive campaigns; ammunition, weapons, and food did not have to travel hundreds of miles if there was a storehouse nearby with defenses to guard it. And a well-placed fort could block mountain passes, defend rivers (such as Fort Washington), and enforce taxes by cutting off trade routes (Duffy 20-23).

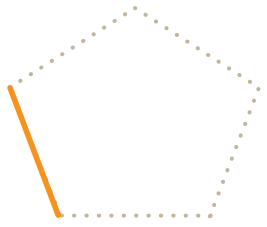
Towns along important trade routes now became military objectives that needed to be protected. Citizens of these towns quickly learned that anything outside the walls were subject to destruction so it was beneficial to live inside the defenses. Now there was a problem of limited space. Instead of spreading out, buildings reached up. Businesses and trade stores sprang up to replace what people used to have to do themselves. Fortresses became population centers where people desired to live and work. Very quickly defensive architecture began to change the size, shape, and lifestyle of cities (Duffy 17-18). Two military architects will be discussed as having a significant impact on the design and design process of fortifications: Teofilo Gallaccini and Marshal Vauban.



teogni quattro giorni al foldato tocchi il fare la guardia, auuertendo che ordinariamente ogni circuito e recinto d'un miglio, fecondo il Caſtriotto,& altri uuole mille foldati, dando tre braccia di muraglia per huomo, ma i luoghi aſſai forti ne uorranno manco. A fortezze di frontiera, doue ſi potrà tenere & adoprare caualleria, non mancherà d'ogni opportuno prouedimento. Cercherà d'hauer danari per le paghe. Farà fare la deſcrittione di tutte le bocche, & anche de' beſtiami, per poter calculare, e ſapere il biſogno delle uittuaglie, e'l tempo che potranno baſtare. E ſgraueràil luogo di bocche difutili. Darà ad alcuni la cura delleuittuaglie e dell'acque, che non ſiano guaſte e corrotte, e che'l luogo non poſſa in alcun modo eſſer appeſtato dal nemico. Farà gran prouiſſione di carboni non ſolo per biſogno del fuoco, ma ancora per fondere artiglierie, e per uſo de' fabbri. Ordinerà che ſiano nel luogo panni e coiami per ueſtire, e per calzare, in oltre Medici, e diuerſe medicine per infermi e per feriti: materie da fuochi artifitiati: terra per far baſtioni, doue el la mancherà: legname groſſo e minuto: funi, canapi, e materie da farne: tauole, e legnami da farne quando ueniſſe il biſogno. Ma fra tutte l'altre coſe farà gran prouedimento di grati fatte di uimini, e di legnami ſottili & atti al piegarſi, da potere, quando occorra, farne certe caſſe quadre, da empirſi di terra, e da conficcarſi una ſopra l'altra con chiodi di legno, per riparo ſopra i luoghi de' parapetti, che fuſſer rouinati, che non penſo, che ſia il più preſto, ne il miglior riparo di queſto contra le batterie, maſſime doue non u è luogo da fare la ritirata. Quali grati ſono più accommodate de' gabbioni, per occupare poco luogo nelle munitioni, e perche s'appreſenteranno piene ſul muro bat tuto. ſtaranno meglio unite, e potraſſene rifare il parapetto più forte.

Figure 1. Establishment of camps and fields of fire into the city of Montalcino,1553 (Maggi, Castriotto and Montemellino).

INTENTIONALLY LEFT BLANK



01 | ANTHROPOMORPHIC NARRATIVE OF FORTIFICATIONS

Teofilo Gallaccini

Anthropomorphic Narrative of Fortification

Teofilo Gallaccini

Teofilo Gallaccini (1564-1641) was a physician by training, but from 1621 until his death he was a professor of mathematics and philosophy at the University of Siena. Gallaccini did not understand physics as we know it today. He studied how a man would flex his arm or bend over to pick up a heavy object. He used these movements of the human body to develop his ideas. He was a prolific writer who commented on nearly every kind of architecture. The majority of his writings were not published until after his death; however, his impact can be seen in the works of architects that followed. (Payne, Architectural Criticism, Science, and Visual Eloquence: Teofilo Gallaccini in Seventeenth-Century Siena 150) Following in the traditions of Vitruvius and Alberti, Gallaccini explained architecture in anthropomorphic terms. Unlike his predecessors, Gallaccini was more utilitarian in his employment. In his treatise “L’idea della fortificatione ad uso dell’architettura militare e dell’arte della guerra” (The idea of fortification for use of military architecture and the art of war), Gallaccini uses a pentagram (based on Vitruvian proportions) to show how to turn it into a pentagon. He also explains fields of fire from a bastion by depicting the line of site from the human eye. (Payne, Notes from the Field: Anthropomorphism 30)

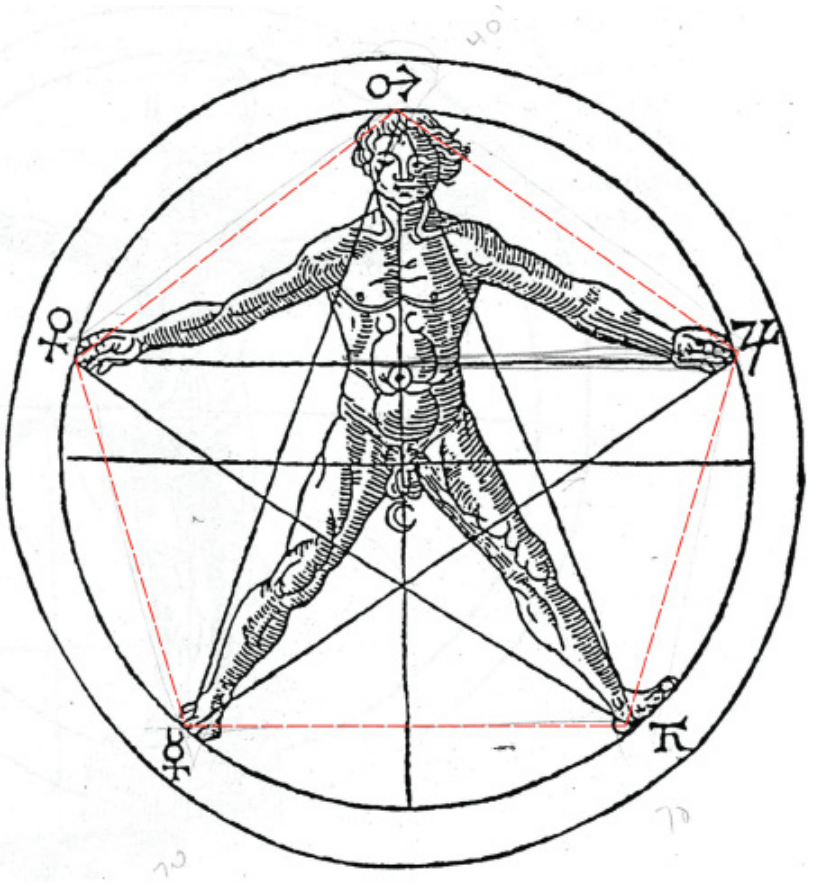


Figure 2. Anthropomorphic description of a pentagram (Agrippa and Freake).

an•thro•po•mor•phic

adj \ˌan(t)-thrə-pə-ˈmȯr-fik\

Definition of ANTHROPOMORPHIC

1: described or thought of as having a human form or human attributes <anthropomorphic deities>

Source: http://www.merriam-webster.com/dictionary/anthropomorphic

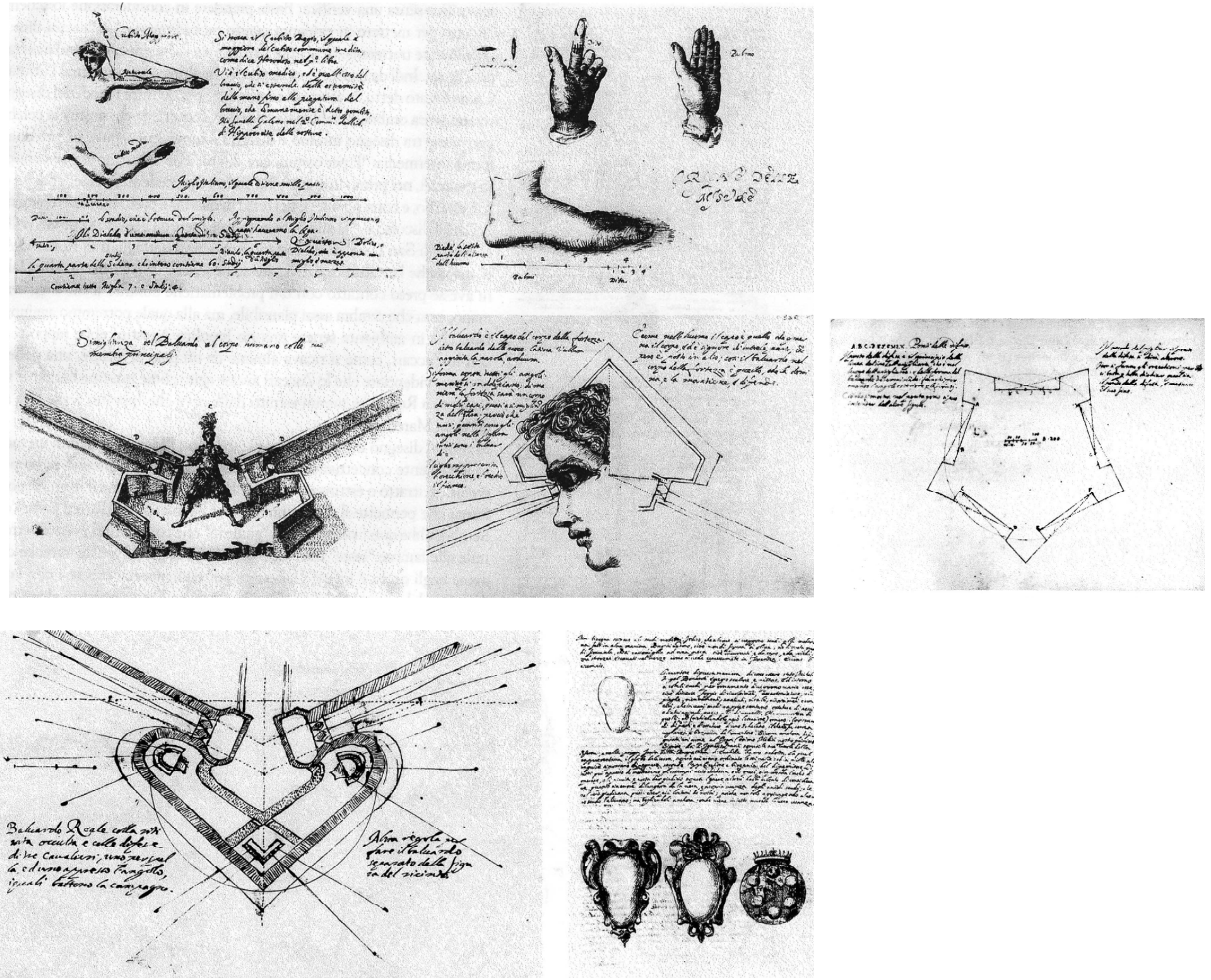


Figure 3. *Top six images*, Teofilo Gallacini's metaphor to describe designs. (Morolli). *Far center right*, (Payne, Notes from the Field: Anthropomorphism)

INTENTIONALLY LEFT BLANK

02 | MILITARY ARCHITECTURE

Marshal Vauban

The most significant of all architectural forms evolved during the Renaissance was the angle bastion. ...[T]he application of the angle bastion to forts and town walls led to a homogeneity of style wherever Europeans settled overseas; from Havana and San Juan in the Caribbean to Mombasa and Mozambique in East Africa and to Diu and Goa across the Indian Ocean, visitors saw the outlines that characterized townscapes from the Baltic to the North African coast. The international style par excellence of the Renaissance was that of military architecture, and its module was the angle bastion. It did not only extend in space, it endured in time... Neither the star forts built to guard the mouth of the Mississippi in the war of 1812 nor the walls of Fort McHenry as they appeared to the author of The Star-Spangled Banner would have appeared strange to Antonio da San Gallo the younger, the Florentine architect who died in 1546.

- John Hale, *Renaissance War Studies*

Military Architecture

Sebastien Le Prestre de Vauban

With the development of effective canonry, new designs were needed that prevented the enemy from having a clear shot at the wall (Duffy 47). This resulted in long, sloping designs with clear fields of fire and increased visibility. Guns created too much smoke and towers limited the arc and angle of fire; therefore, they were abandoned in favor of open air platforms (Hale 10). Traditional square designs with round turrets at the corners created blind zones. So architects abandoned old concepts in favor of pentagon-shaped structures with angled bastions crafted to create interlocking fields of fire (McEwen, Lines of Fire 62). Extended earthworks started to appear and these created more difficult fortresses to attack. This was the creation of the “star forts”.

Architectural historians have tried, unsuccessfully, to establish who invented the design, even attaching famous names such as Leonardo da Vinci, Brunelleschi, and Michelangelo (Hale 4). However, one of the most innovative architect/engineers of this new design was the Frenchman, Sebastien Le Prestre de Vauban (1633-1707). Traditional designs were created from the inside out. Marshal Vauban chose, instead, to design from the outside in. In his day, Vauban was more renowned for his expertise in attacking structures. Therefore he approached the building process from that point of view. What would the enemy see when approaching this structure? Where are the blind spots? How does the terrain play into a siege? Vauban would design the structure to eliminate the attacker’s advantages and maximize the defender’s. This process earned him a reputation as the pre-eminent military architect of his day and his concepts were quickly adopted and used by other European architects (Duffy 33).

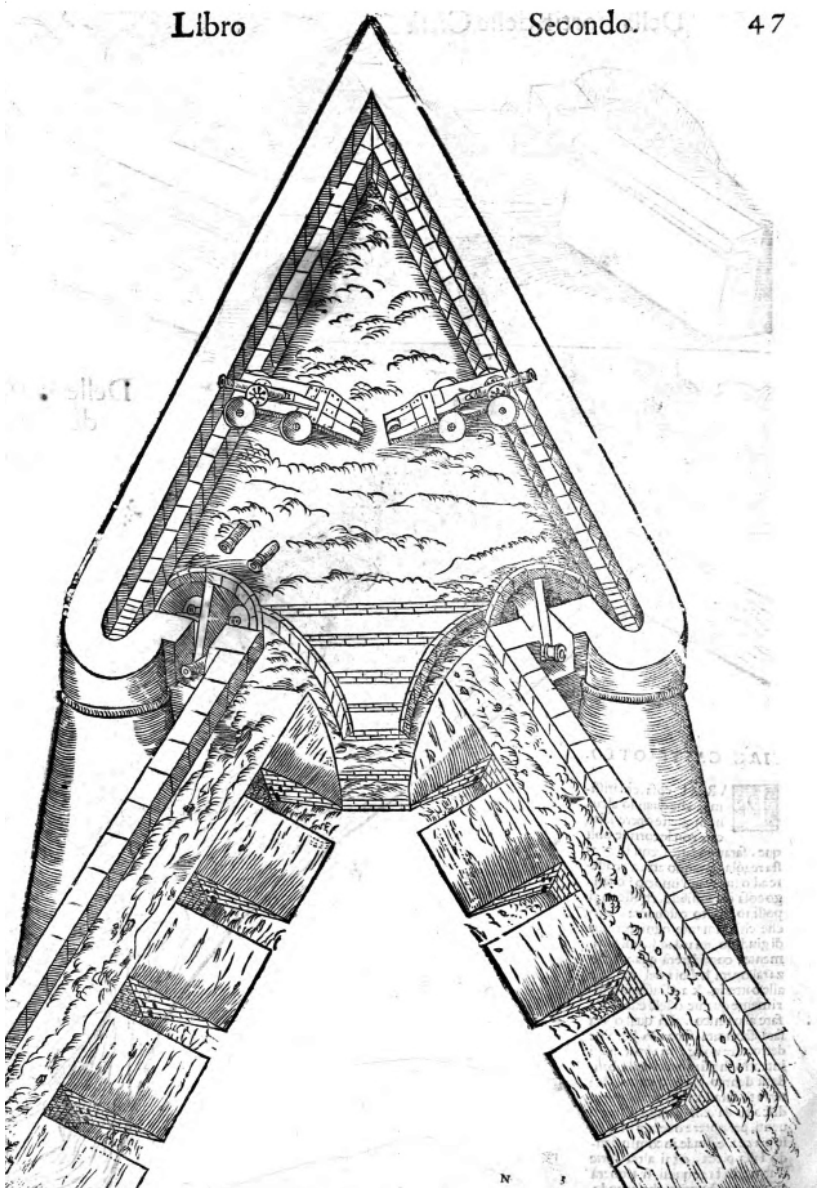


Figure 4. Plan of an angle bastion (Maggi, Castriotto and Montemellino).

The history of fortifications describes a competition between advances in artillery and architecture. Traditional Medieval castles relied on tall masonry walls. These forced invaders to assemble at the base of the walls and scale them with siege engines or batter open the gates with battering rams. Either way, this played into the defender's advantage of raining arrows and other projectiles down on them. However the invention of gunpowder and firearms in the late 15th Century rendered medieval structures, with straight vertical walls, obsolete. Cannons, mortars, and rifles made hand-to-hand combat a thing of the past. A few well-aimed cannon shots at the base caused the entire section to fall. French King Charles VIII used new artillery tactics during his invasion of Lombardy in 1494. This spurred 16th Century Italians, followed by the Dutch and French in the 17th Century, to create new architecture (McEwen, Lines of Fire 62).

Figure 5. 1630 depicting the use of mortars and muskets in warfare (Duffy).

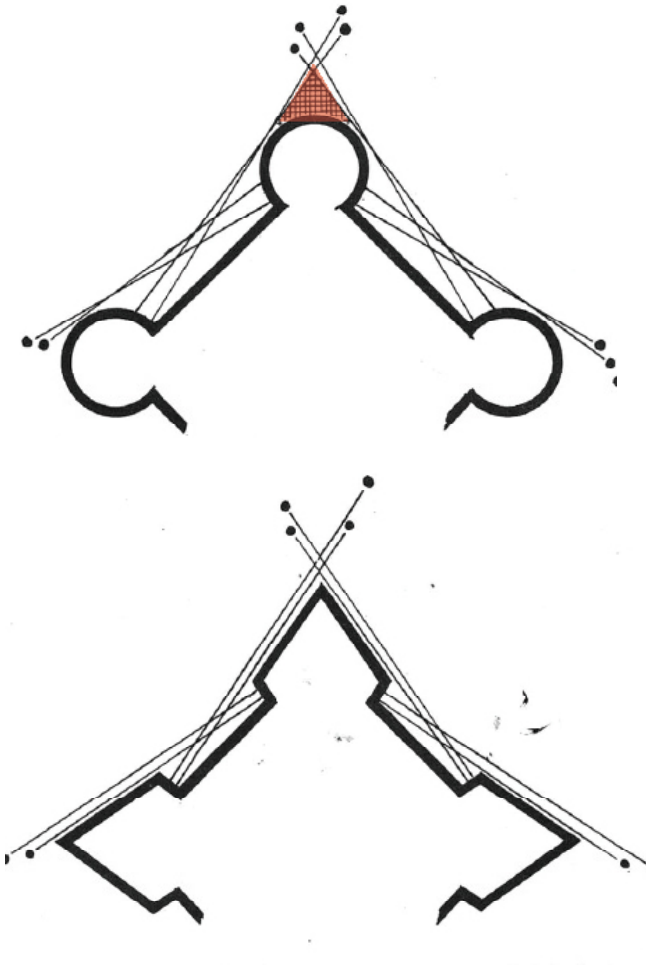


Figure 6. Dead zone comparison between circular towers (*top)* and a bastioned (*bottom*) (Duffy).

The most prominent features of star forts are the pentagon shape and the inclusion of bastions. Military architects of the 16th and 17th centuries were heavily influenced by artists of the day, many architects being artists themselves. Michelangelo oversaw the fortifications of Florence from 1529-1530; and Brunelleschi designed the forts at Pisa, Pisaro, and several other towns (Hale 7). Therefore, following Gallaccini's model of using the human figure to explain concepts, it is easy to see how the design of forts shifts from squares to pentagons. These were more than artistic designs. Later architects would argue that a five-sided fort created more space inside without the burden of requiring a larger garrison to defend it (Duffy 67). But it also ensured that an army could not advance towards the fortress without facing fire from three of the bastions (Duffy 67). Bastions are additional structures added to each of the five corners. They extend out and create two additional faces and two additional flanks for each side. This design creates interlocking fields of fire extending out from, and along the curtain wall. Salients are the angles formed by the two faces of the bastions that project outwardly toward the enemy. (Interpretation Manual) This angle should not be less than 60 degrees (Mahan 14).

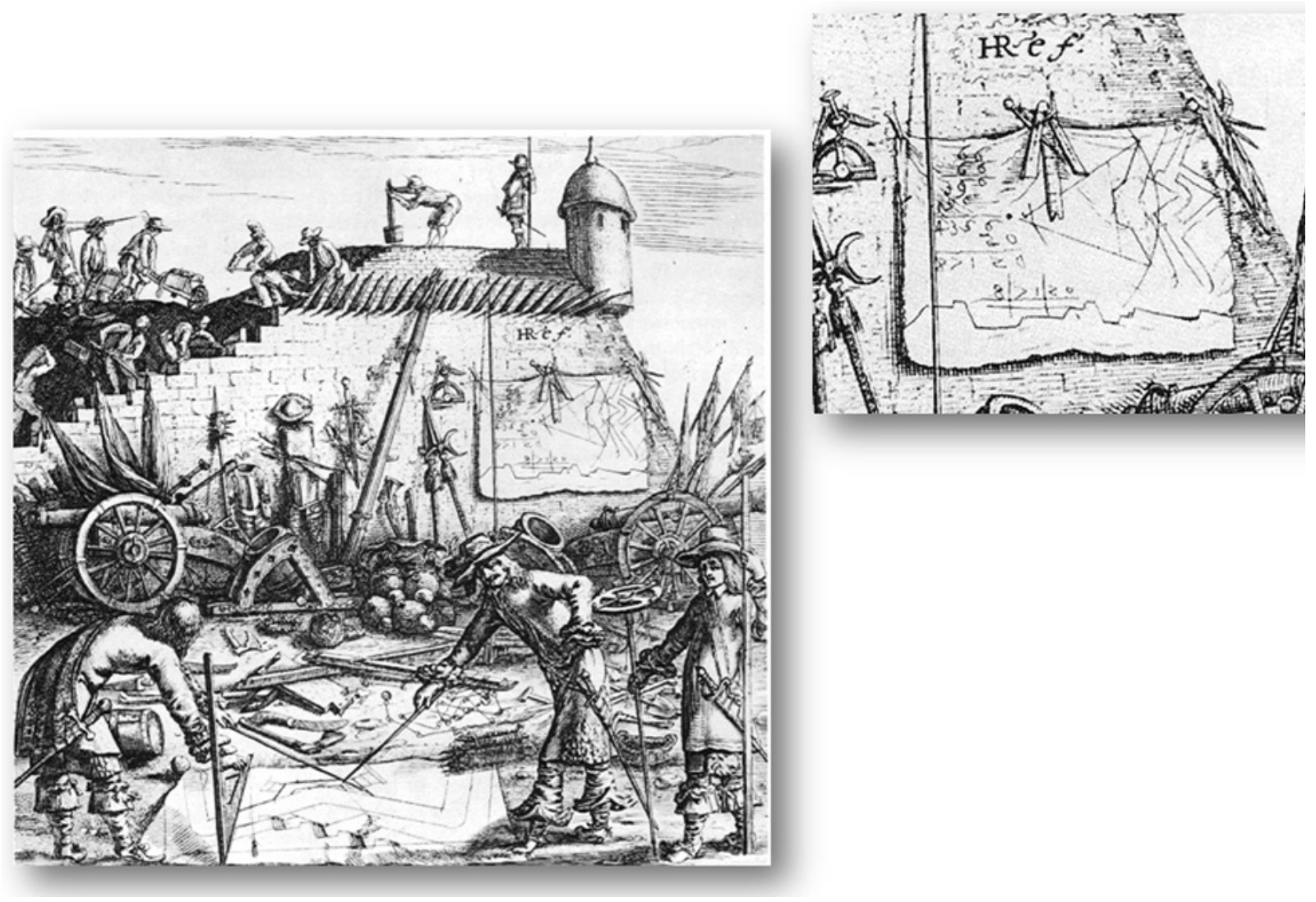


Figure 7. Construction of a bastion salient. (Duffy).

An architect/engineer designing a new star fort would begin by selecting the center point of the new location. Then he would design the fronts of the fort. He would lay out the different fronts, place his bastions, and develop his salient angels based on this center point. From there the engineer would move map, set up on a table, around the construction site. This was to ensure that everything was aligned properly to confirm that the fort layout was traced exactly onto the ground as it was in his plans. Wooden poles would be driven into the ground to designate border, corners, and angles (Duffy 33).

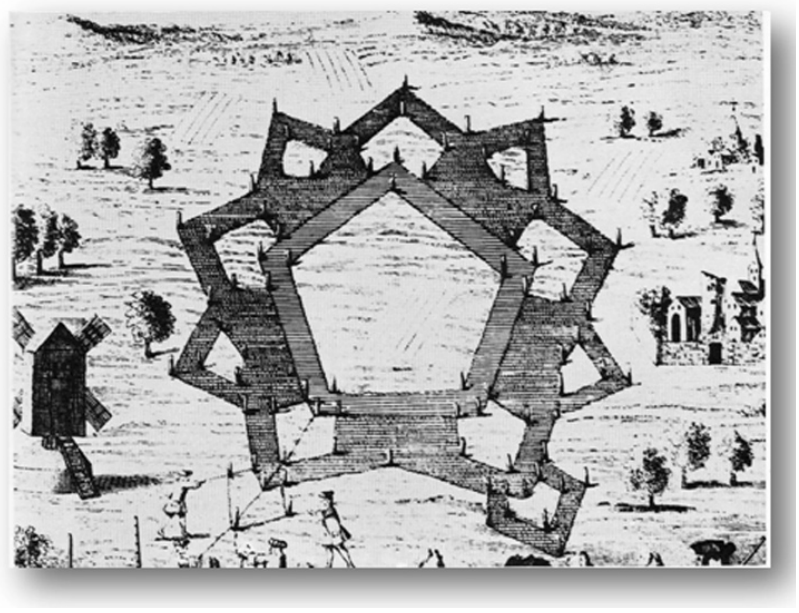


Figure 8. *Left*, Surveying the site (Duffy). *Right*, Planning of fort system (Duffy).

Vauban had a very specific process for designing his forts. The first step was to decide the salient points for the bastions, usually positioned 360 yards apart, and joined them by an imaginary line. At the center point of this line, he would add a perpendicular line 15 yards long. Then he would create lines from the salient points to and through the end of the center point line. The first 25 yards from the salient points formed the face of the bastions. Connecting the ends of these lines formed the face of the curtain wall. The last step was to connect the face of the bastions to the curtain wall. This would create one side of the fortress. By duplicating this process four more times, Vauban arrived at the basic design for a star fort (Duffy 34). The salient angle should be no less than 60 degrees. Anything less is considered too weak to withstand either an attack or the effects of weather and it creates a bastion that is too small to maneuver the cannons and troops positioned there (Mahan 7).

Once the stakes formed the outline of the fort, it was time to design the other features. A ditch is added all along the wall. This ditch served two purposes. The first was as an additional barrier to impede the advance of oncoming enemies. Secondly, as moving earth was a difficult and labor intensive task, it also served as a source of dirt to create the curtain wall, glacis, and other earthworks (Duffy 40).

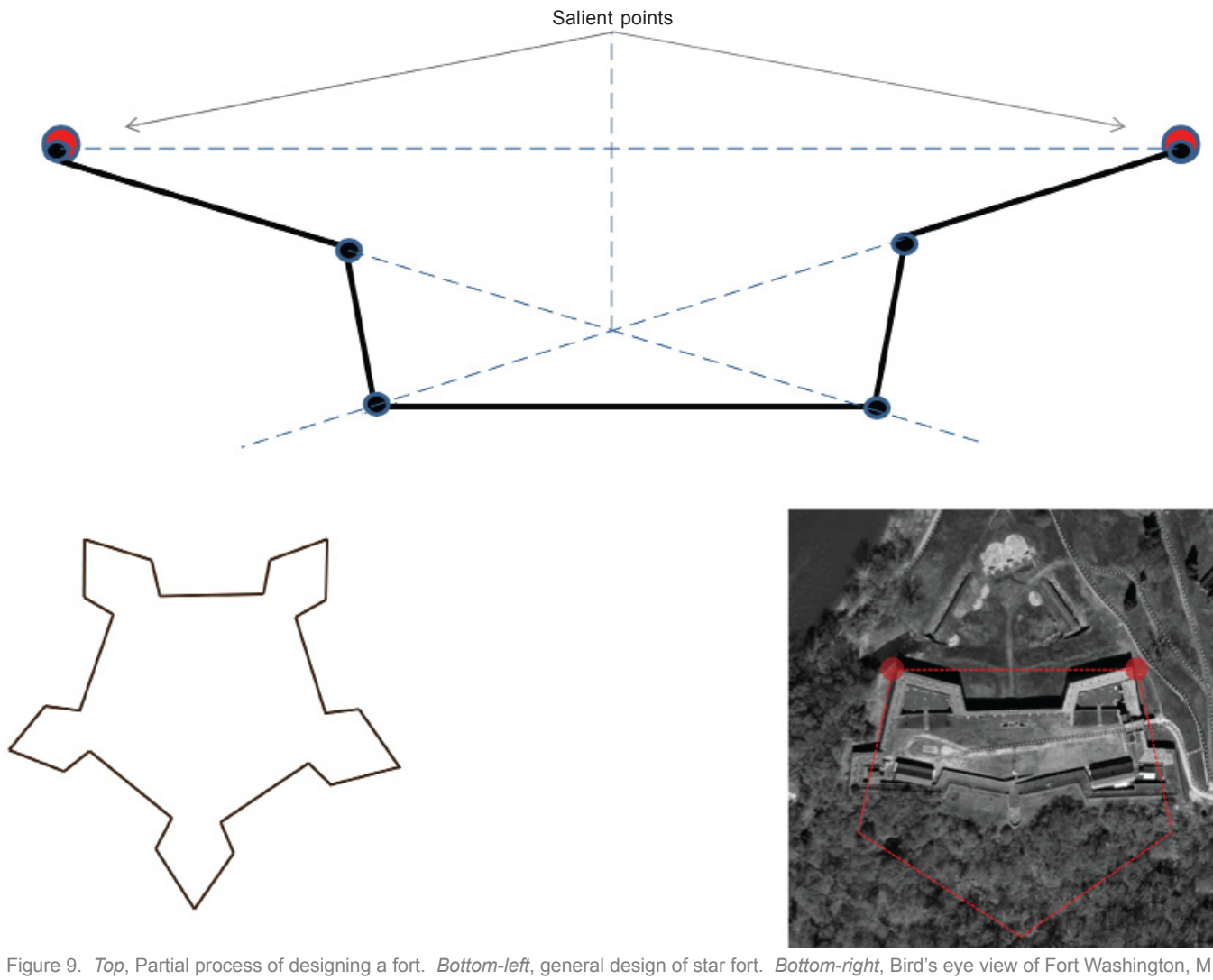


Figure 9. *Top*, Partial process of designing a fort. *Bottom-left*, general design of star fort. *Bottom-right*, Bird's eye view of Fort Washington, MD (Microsoft).

The cross section of a fortress shows additional details of the design. The terreplein is generally 44 feet across. This gives enough room for placement of the heavy guns (14 feet), room for recoil (12 feet), and still leaves room for ammunition carts to move about behind the guns (18 feet). Vauban recommended that the parapet should rise 4 ½ feet above the banquette, where the riflemen stood. The parapet, top of the curtain wall, should have a slight, 30 degree downward angle that allows the riflemen to rest their muskets on and still naturally aim towards the enemy (Duffy 48). Most infantrymen fired blindly; therefore, parapets were designed to naturally face the enemy flanks and increase the effectiveness of their musketry (Duffy 46).

“A good ditch is always the best element in a work of fortification,” said Vauban (Duffy 59). However, he spent relatively little time designing them. Austrian engineer Raimondo Montecuculi gave a simple description that it should be deeper than the height of a man and wider than the width of a tree (Duffy 59). The decision whether to have a dry or wet ditch was usually decided by the local water table, but there were advantages and disadvantages to each. The most obvious is that a wet ditch would provide an additional physical obstacle for attackers to deal with. Most architects of the era agreed that this single benefit was negated if it froze over during winter and did not outweigh the consequences of having standing water located to close to the fortress (Duffy 59).

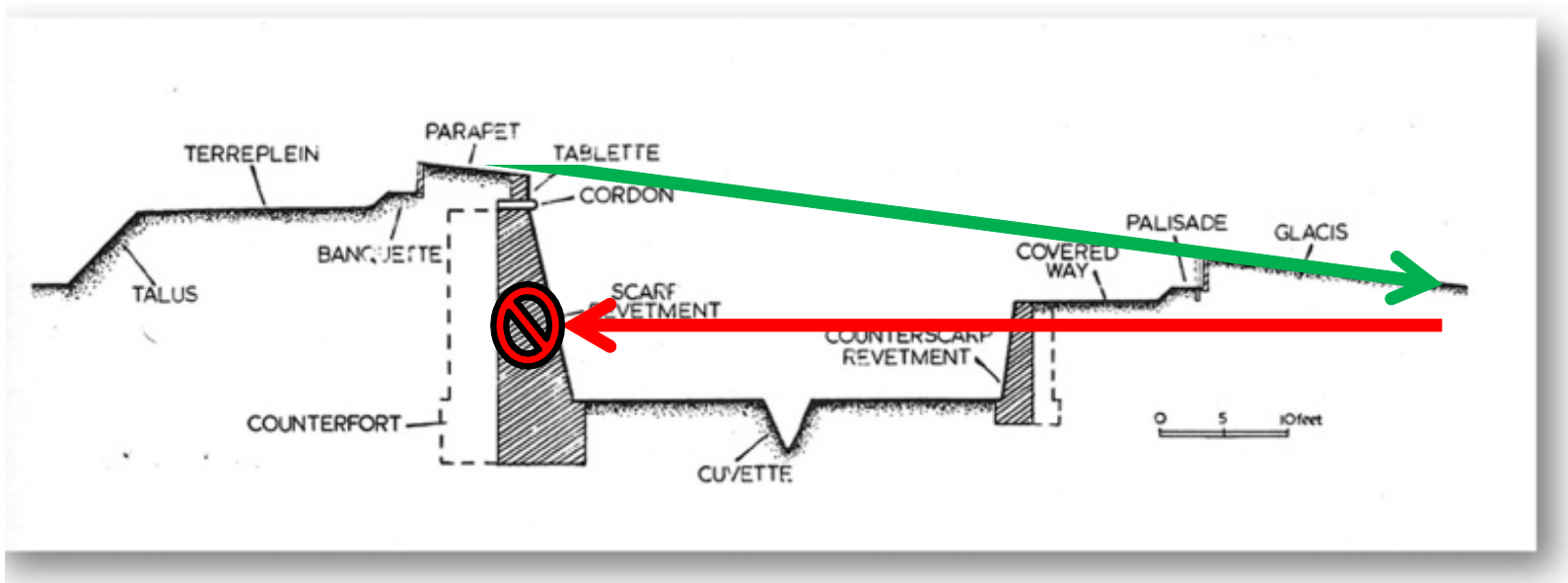


Figure 10. Profile of an intrenchment (Duffy).

The ditch was then surrounded by a variety of earthworks, earth mounds or masonry structures usually detached from the main structure. The addition of this earthwork extended the defender's visibility and cannon range. This created an additional obstacle that attackers must overcome before they could approach the curtain walls. One of the major features of fortresses in that time was the addition of ravelines. A redan is any "V" shaped earthwork added to the main fortress. And a ravelin is a "V" shaped earthwork created in front of the ditch (Interpretation Manual). These were place around the structure, in between the bastions.

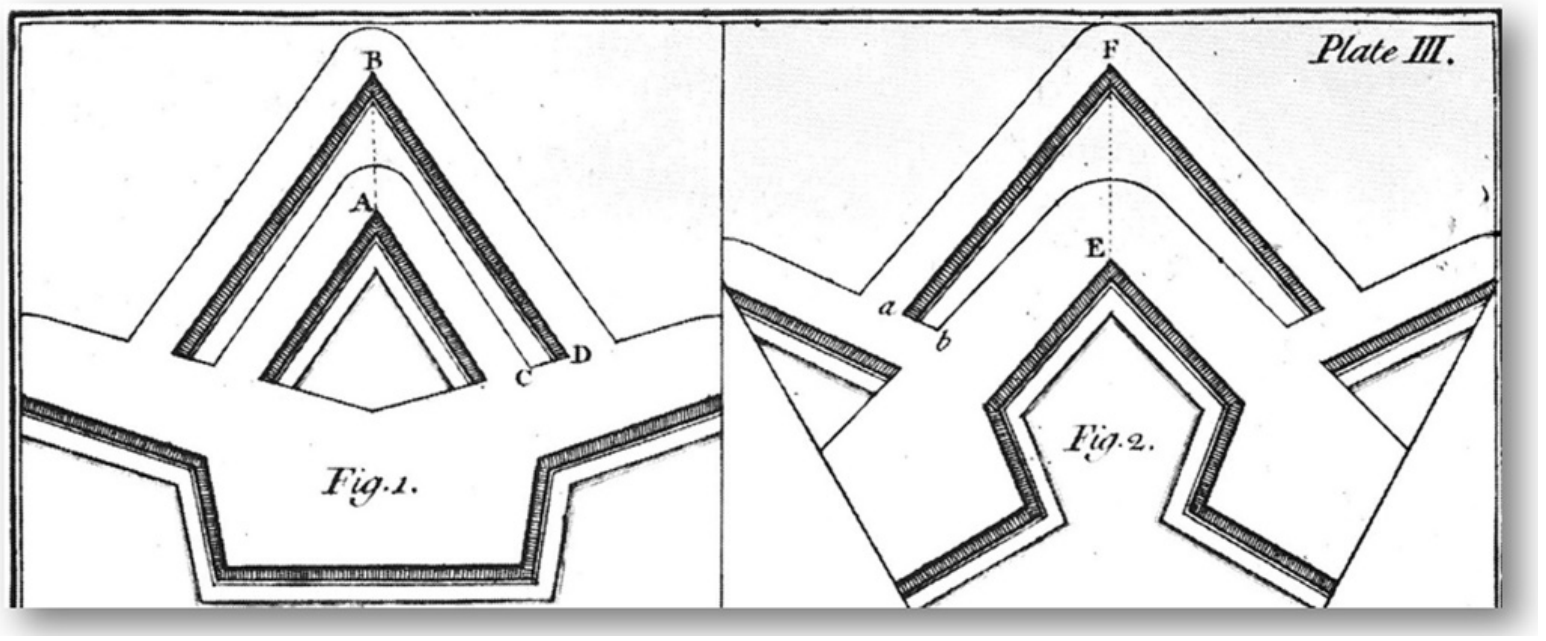


Figure 11. Detached works of a fort (Duffy).

Additionally, one was usually placed in front of the gates. They served to break up the attack of the advancing enemy and channel them into flanking fire. In this way, ravelines serve to augment the role of the bastions (Hale 14).

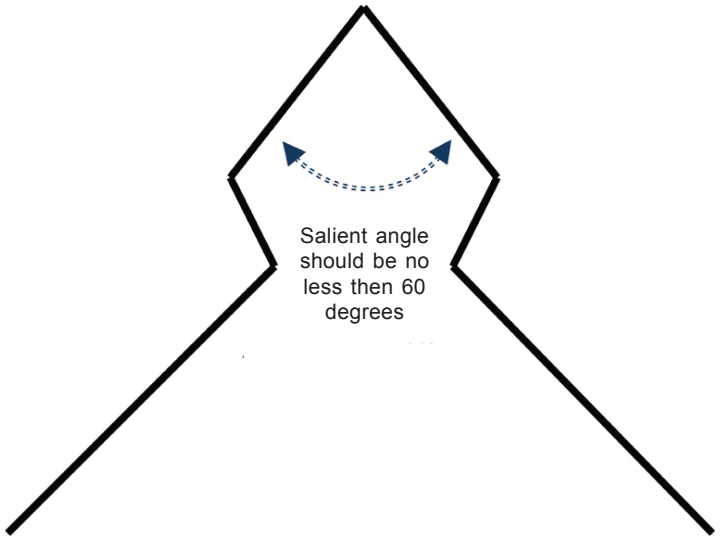


Figure 12. Minimum degree of salient angle in a bastion.

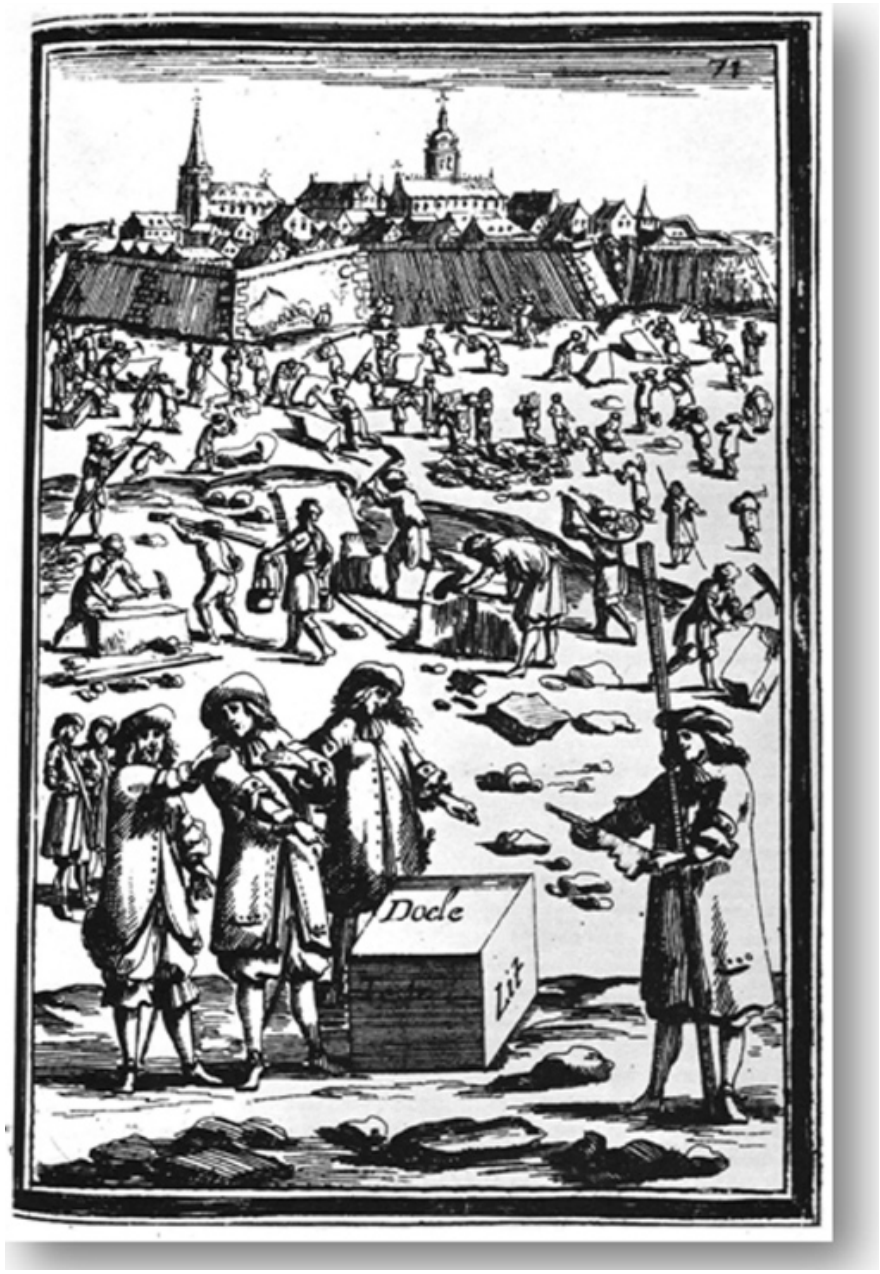


Figure 13. Stone-cutting materials for construction of fortification (Duffy).

Resources for building were a challenge. The excavated dirt from the ditch served the needs for much of the fill material, but other materials were scarce (Duffy 39). Vauban found it economical to cut a canal to carry as much material as a hundred wagons from a nearby quarry to the site. Quality of the local stone was an important consideration amongst mason, engineers and contractors. In general, extremely hard stone was considered to be a poor material because it shattered under the impact of cannon shot more easily than did a softer stone or brickwork. Additionally, brickwork was less expensive to build and repair than working with stone. Stones possessed additional problems. Boulders and exposed rock did not bind well with mortar. (Engineers in the 17th and 18th Century still used Vitruvius' mortar recipe) (Duffy 38). Engineers of the time felt that these rocks had lost their 'seminal spirit,' the ability to be the base of any thing important. Instead these boulders were used for facings, foundation, and sections of masonry that were exposed to water (Duffy 36).

The location of the fortress was equally as important. Sand, which flowed like water when building, did not provide a solid foundation for the curtain wall. Rivers and marshes provided natural hindrances to advancing armies. However, standing water created the additional challenge of promoting illness for the garrisoned troops. Mountainous terrain had line of site problems and required blasting the rock which was difficult and expensive. Stony ground provided the same foundation problems as sand and water. And there was the added detriment that the loose stones turned into shrapnel when hit by cannon shot. The ideal location for a fortress was flat, fertile ground (Duffy 24-32).

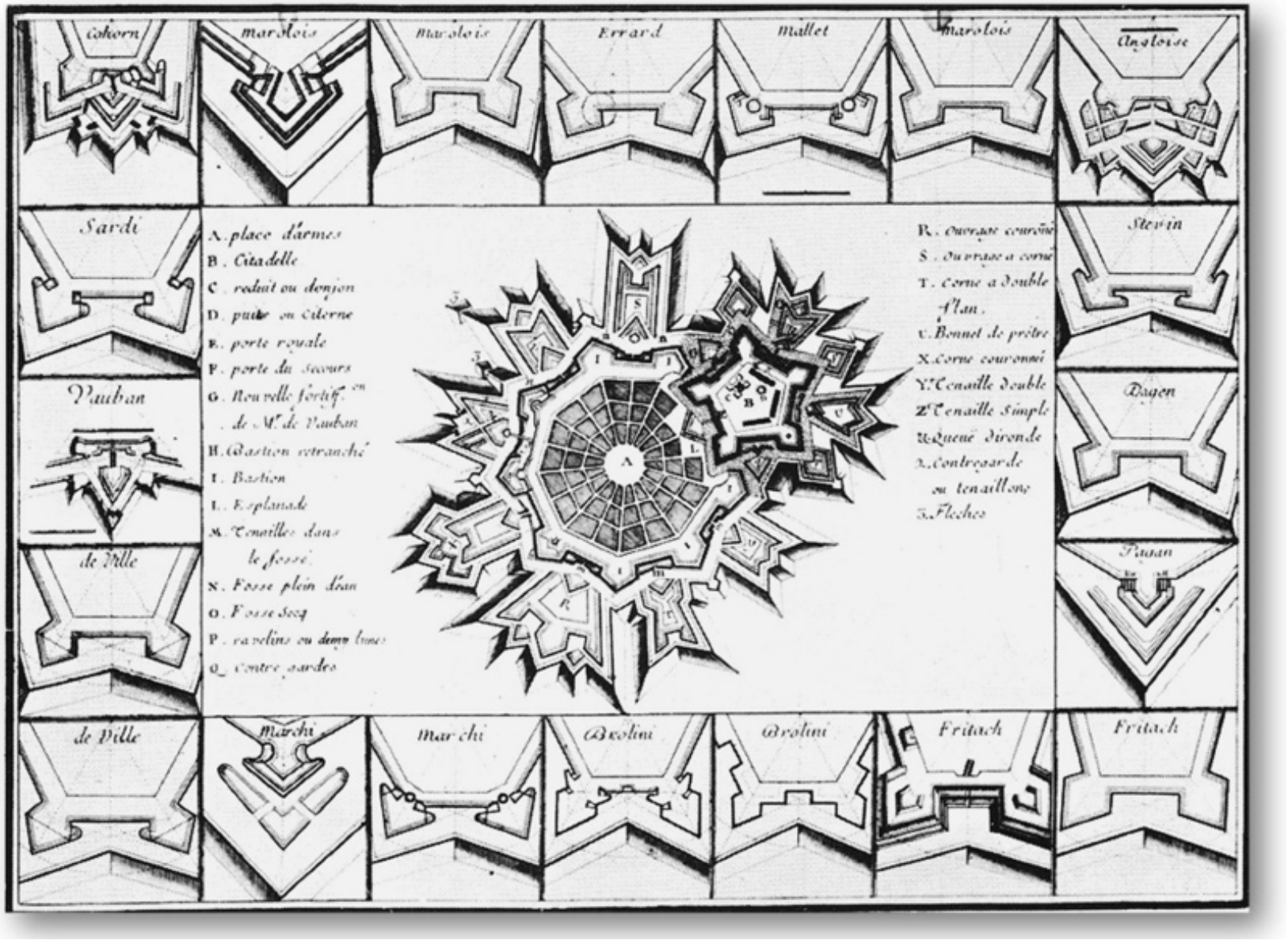


Figure 14. Imaginative designs based on principles of fortification (Duffy).

Using detached earthworks to augment the curtain wall and bastions, there are almost unlimited variations of defensive formations. This drawing demonstrates a fictional fortified city. It contains examples of all the main types of formations: redan – a general term that meant any "V shaped formations of detached earthworks, raveline – a redan in front of the ditch positioned directly in front of the curtain wall and between bastions, and lunette – a raveline extending out in front of the bastion instead of the curtain wall. The most impressive was the hornworks – a curtain wall detached from the main fortress ending in half bastions with its own detached earthworks, usually a raveline. All of these formations had the purpose of extending the line of site of the fortress and channeling the enemy into the defenders' interlocking lines of fire (Duffy 63-67).

The top image is the opening image from an 1858 treatise on fortification and was used to train new British military officers for the East Indian Company. The document cites Marshal Sebastien Le Prestre de Vauban (1633-1707) as the originator of fortress architecture created in response to gunpowder's inclusion to siege warfare (Straith, Cook and Hyde). When compared to the image below of Fort Washington, the similarities between the two demonstrate that Vauban's principles were still heavily in use late into the 19th Century and had a significant influence on the construction of Fort Washington.

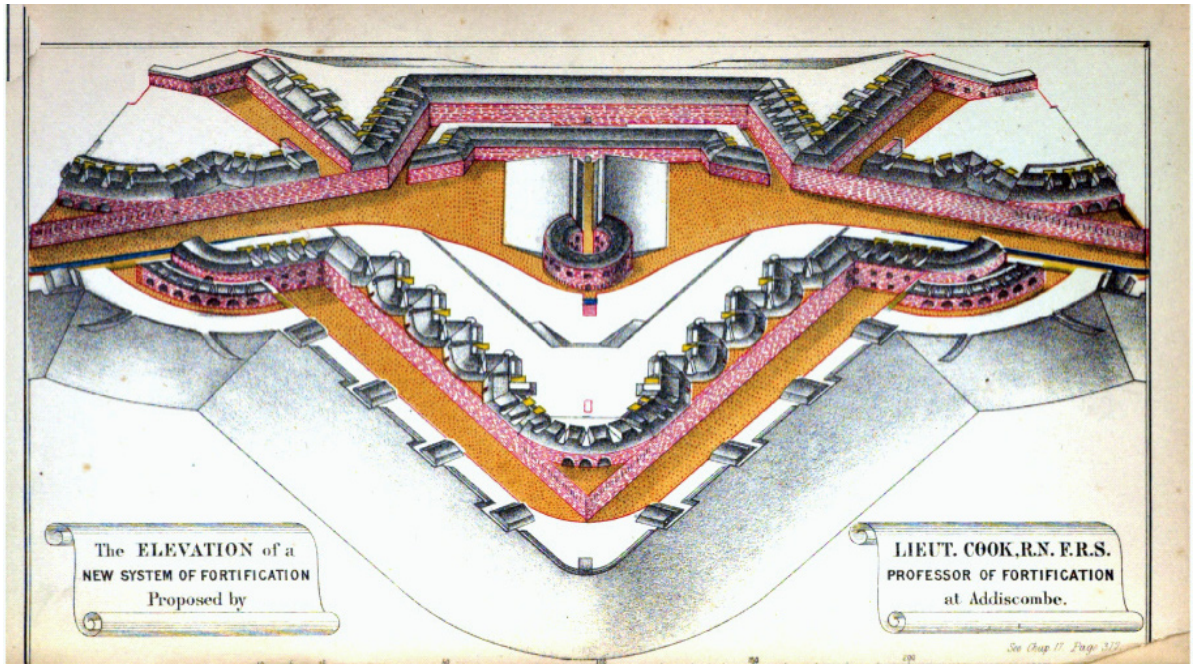
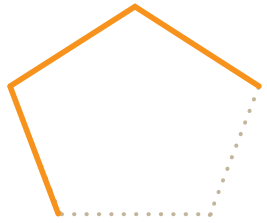


Figure 15. Fortification drawing in a treatise used to train young officers at the East India Company Military Seminary, 1809-1861 (Straith, Cook and Hyde).

Figure 16. Bird's eye view of Fort Washington, MD (Microsoft).

INTENTIONALLY LEFT BLANK



03 | FORT WASHINGTON

Site Analysis

SITE ANALYSIS: FORT WASHINGTON NATIONAL PARK

Fort Washington, Maryland

Fort Washington was not the first fortification erected on the site, but the second. The first was Fort Warburton, a replica of a fort in nearby Annapolis, Unites States Naval Academy. As a replica the fortification was flawed and no part of the terrain was taken into account; therefore, General George Washington and other topside military officials found it weak and labeled it a flawed defense fort. ‘Captain Bomford reported "Fort Washington was really an attempt to adopt a standardized plan to an unsuitable site. It violated a fundamental rule in the art of fortifications - the fort must suit its site" (National Park Service - Fort Warburton). Regardless of opinions, the fort did not survive long. During the War on 1812, Captain Samuel T. Dyson, commanding officer, destroyed it for fear that the British would overtake it. He was given a court martial and immediate steps were implemented to rebuild a fortification to protect the nation’s capital. Acting Secretary of State, James Monroe, ordered renowned Major Pierre L’Enfant to design the new fortification to be the first true coast defense fortification protecting the nation’s capital. Displeased with the slow progress, L’Enfant was relieved of the duty and Lieutenant Colonel Walker K. Armistead, Army Corps of Engineers, was put in place to complete the construction plans. The fortification was finally completed in October 2, 1824 (National Park Service - Fort Washington). Throughout the years, the fortification and site continued to undergo many modifications to adapt to the evolution of weaponry and defense strategies. The Department of Interior took responsiblility of the Fort since 1946 and continues to do so today.

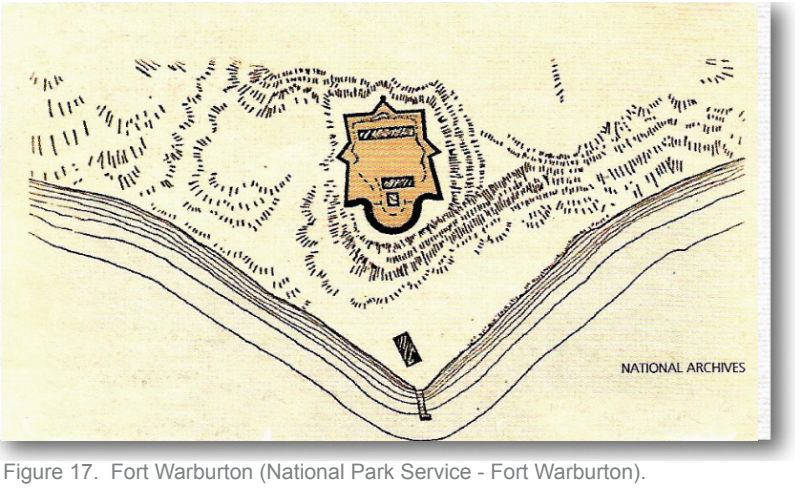


Figure 17. Fort Warburton (National Park Service - Fort Warburton).

Figure 18. Fort Washington, MD. (Interior).

Figure 19. Fall 2011, Photograph taken of Fort Washington from George Washington Parkway.

1957

1980

2006

Figure 20. Aerial Images of the development of Fort Washington site from 1957-2006 (TerraServer).

As part of my site development, I examined the population changes in the area. Above are three images dated 1957, 1980, and 2006. They show how suburbia has surrounded and steadily encroached on the site. The lack of forethought makes it necessary to drive through neighborhoods in order to reach the fort. If the purpose of a new visitor center is to attract more people, then it becomes necessary to also consider the impact on the surrounding community or propose another way to reach Fort Washington.

The image to the left is of a topographical model of the site. I created this in order to examine the terrain and better understand the difficulties of building new roads and infrastructure. This ended up having a significant impact on my final proposal and design. Additionally, I later used this model to determine the best place to situate my visitor center so that it preserves the integrity and natural contours of the site.

Water Taxi Route Proposal

Fort Washington National Park, MD

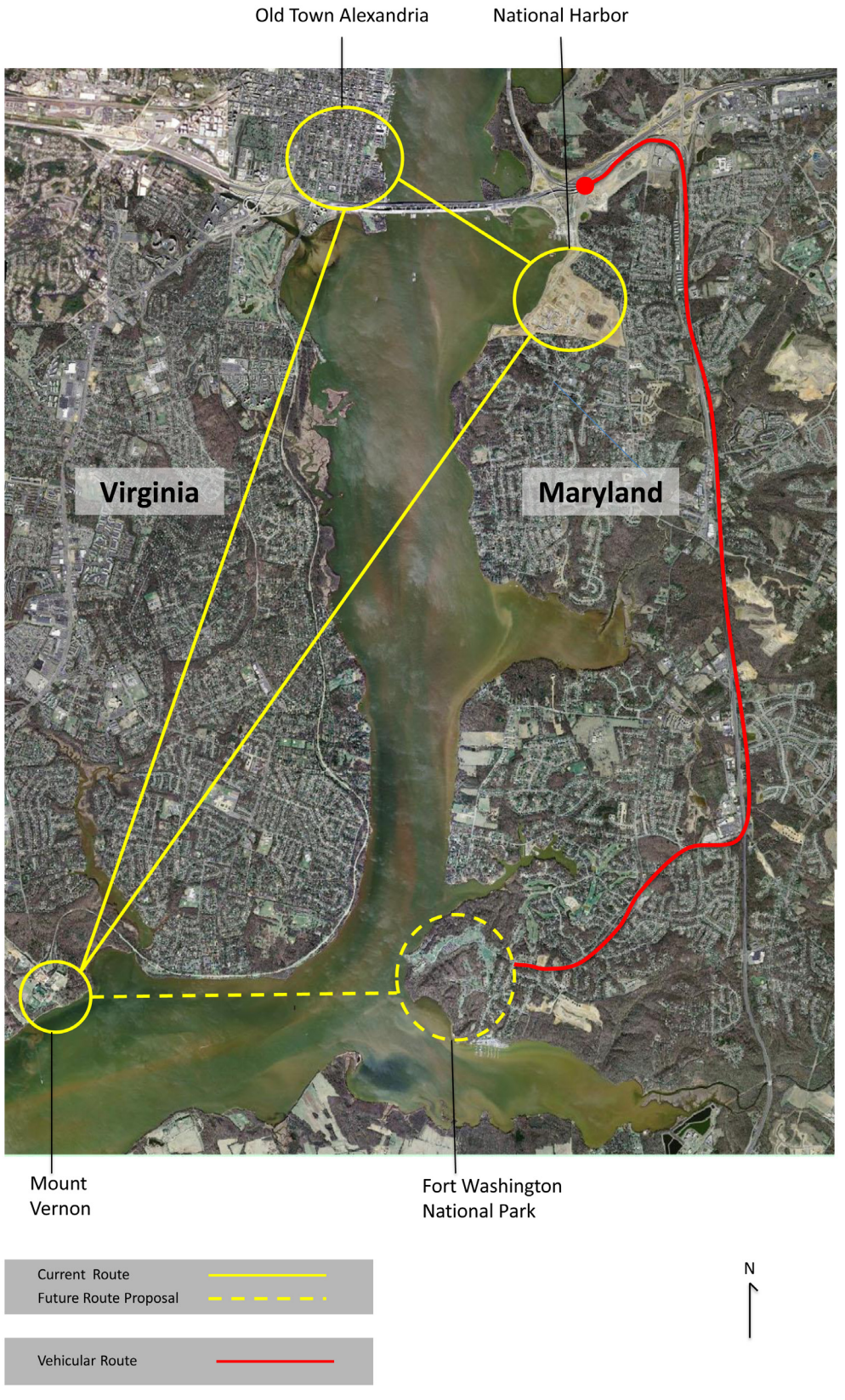


Figure 21. Aerial image of Virginia and Maryland. Adaptation (TerraServer).

Currently, there is a water taxi which services three tourist destinations: Old Town Alexandria, National Harbor, and Mount Vernon. Both National Harbor and Old Town Alexandria have several hotels and retail shops. And Mount Vernon is a famous location for tourists. Therefore, I propose that a fourth location be added to the route in order to promote access to Fort Washington and reduce vehicular impact on the surrounding neighborhood.

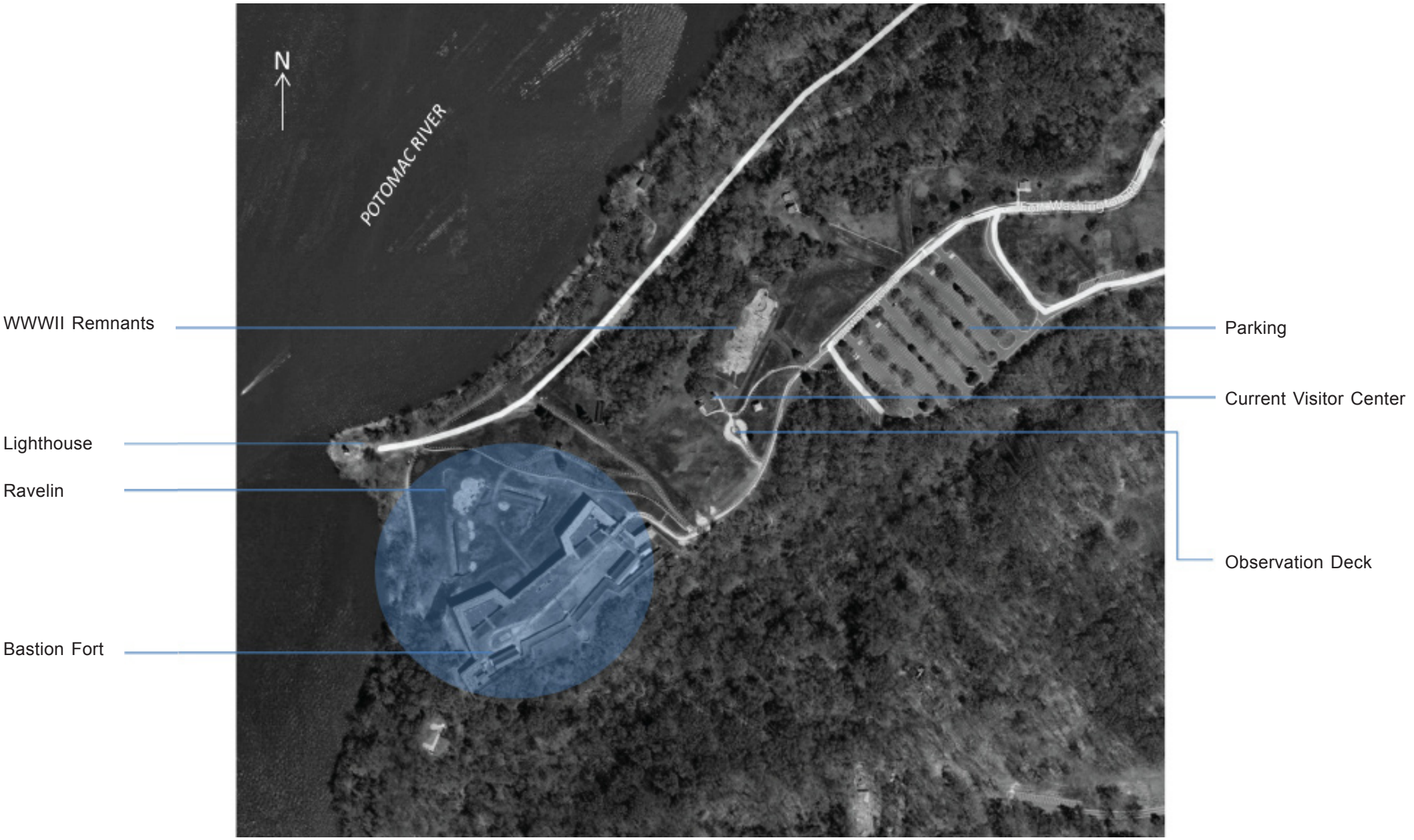
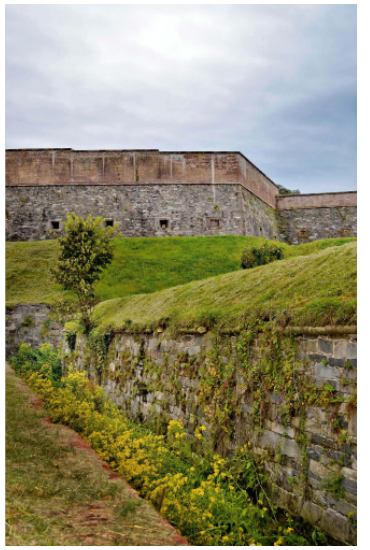
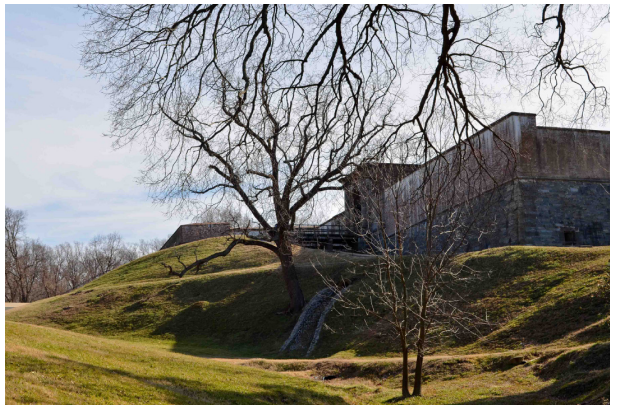


Figure 22. Fort Washington thesis site. Adaptation (Microsoft).



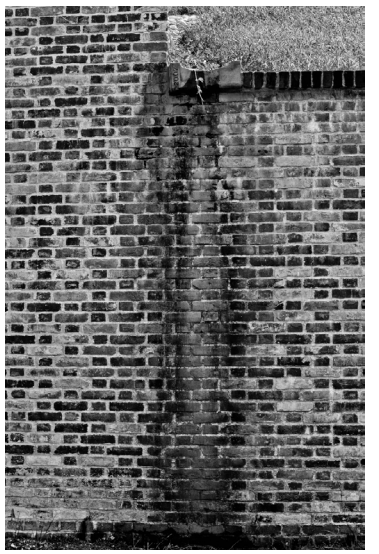








Figure 23. Photographs of Fort Washington.

Photo Assemblage

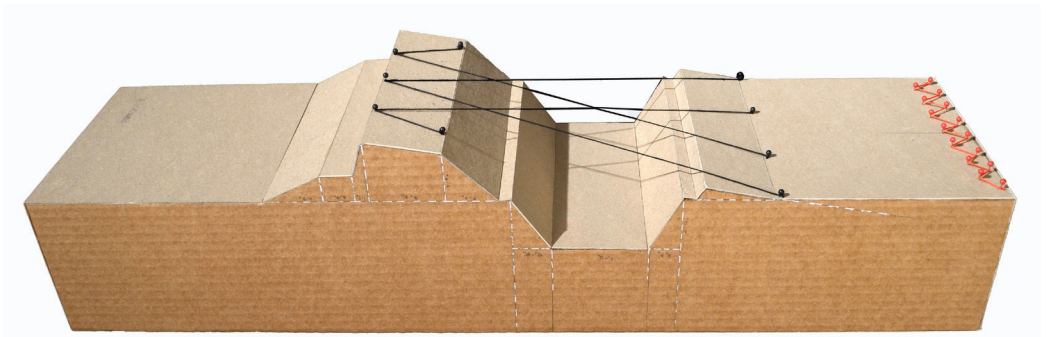
In addition to using drawing as a media to explore imagination, I used photography to create a surreal version of the fort. I allowed myself to reflect on unique architectural elements of the fort and, by joining 18 photographs, incite my imagination to explore endless possibilities.

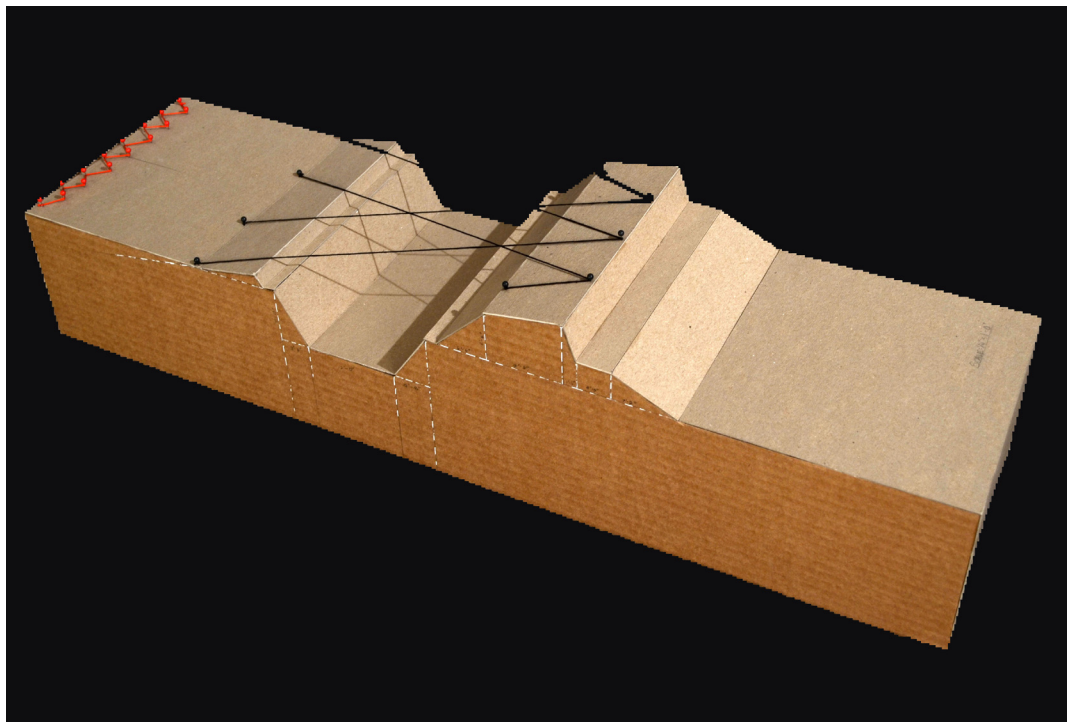
My intent in this image was to provoke thought from the viewer, to express a moment of uneasiness by creating a narrow path that is high in the sky with no safety railings. *You are here…you need to go there, but first you must walk on this narrow path and try not to look down.*

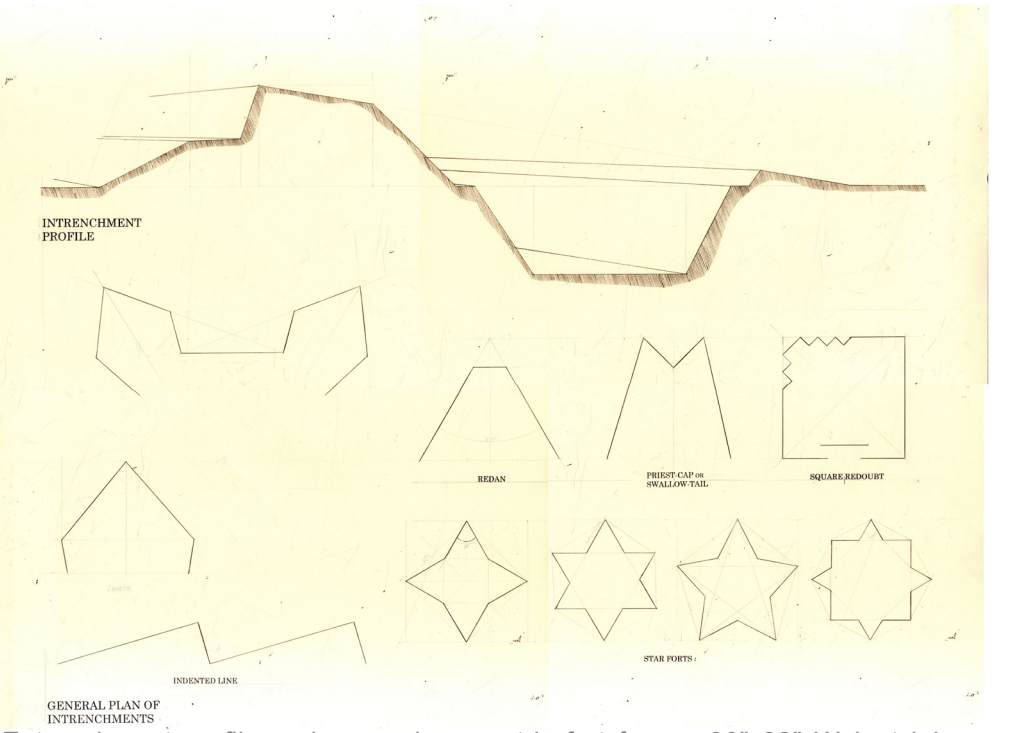
This image influenced how to move throughout the visitor center. I came up with an idea of a narrow path on each level. This would serve as a transition point from one side of the building to the other, because they are located in the same location on each floor, they become a point of reference throughout the building.

Site and Fort Analysis: Model and Drawings

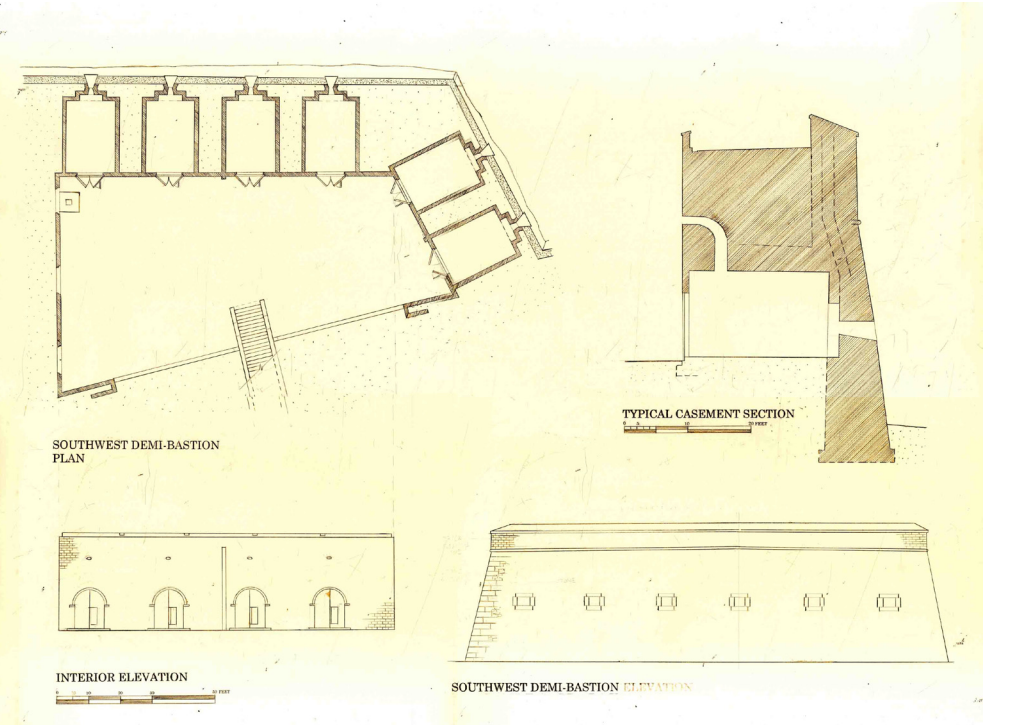
Before I could begin designing the visitor center, it was only fitting that I construct drawings that would enable me to understand the geometry, anatomy, and construction of Fort Washington. The model and corresponding drawings allowed me to truly understand how the structure and entrenchments of this man-made topography created an intricate system of defense.



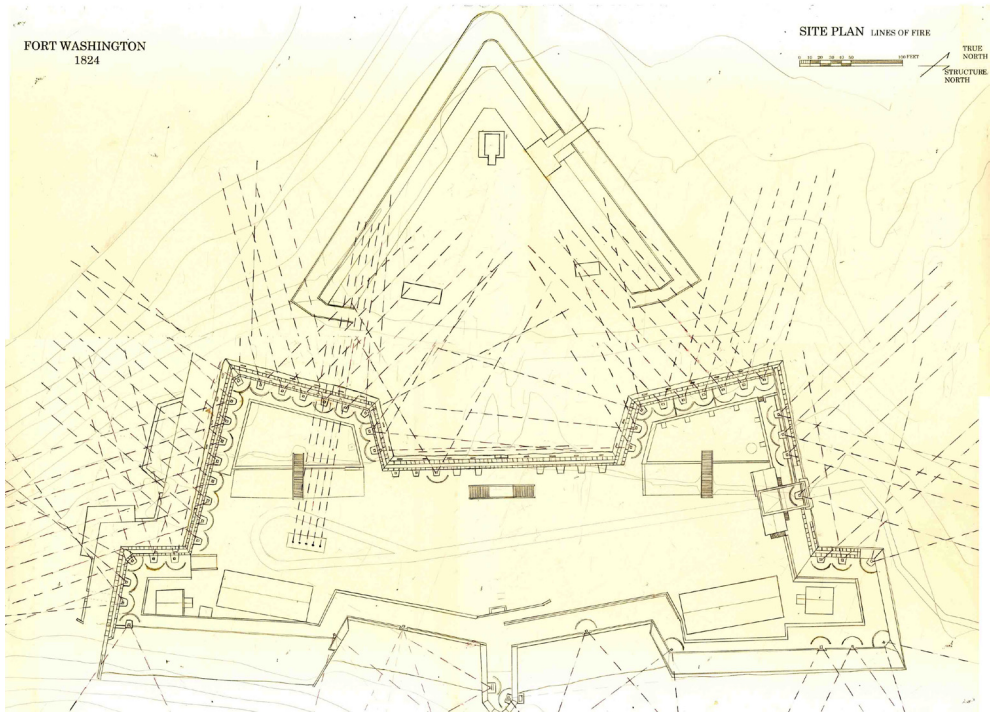




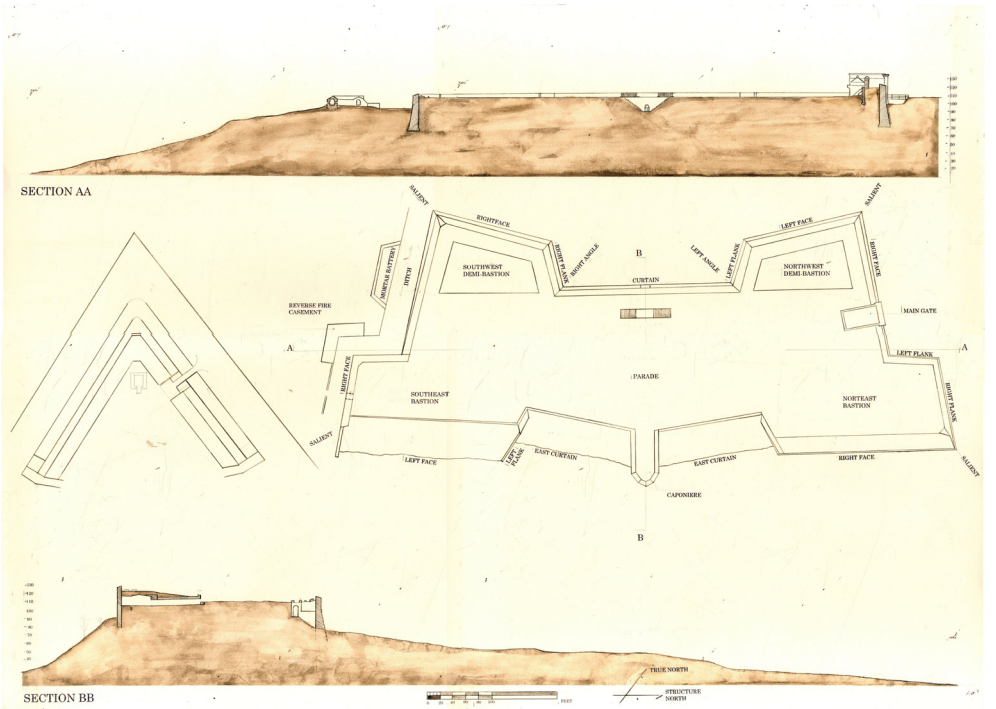
Entrenchment profile and general geometric fort forms, *30”x22” Walnut ink on fine paper.*



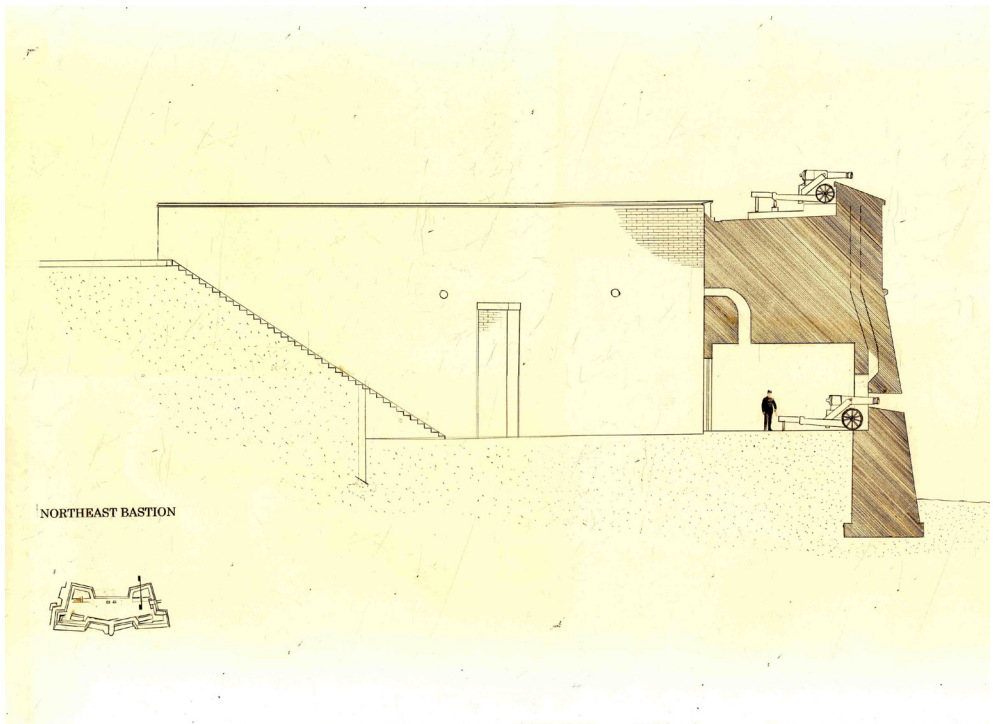
Bastion Section, *30”x22” Walnut ink on fine paper.*



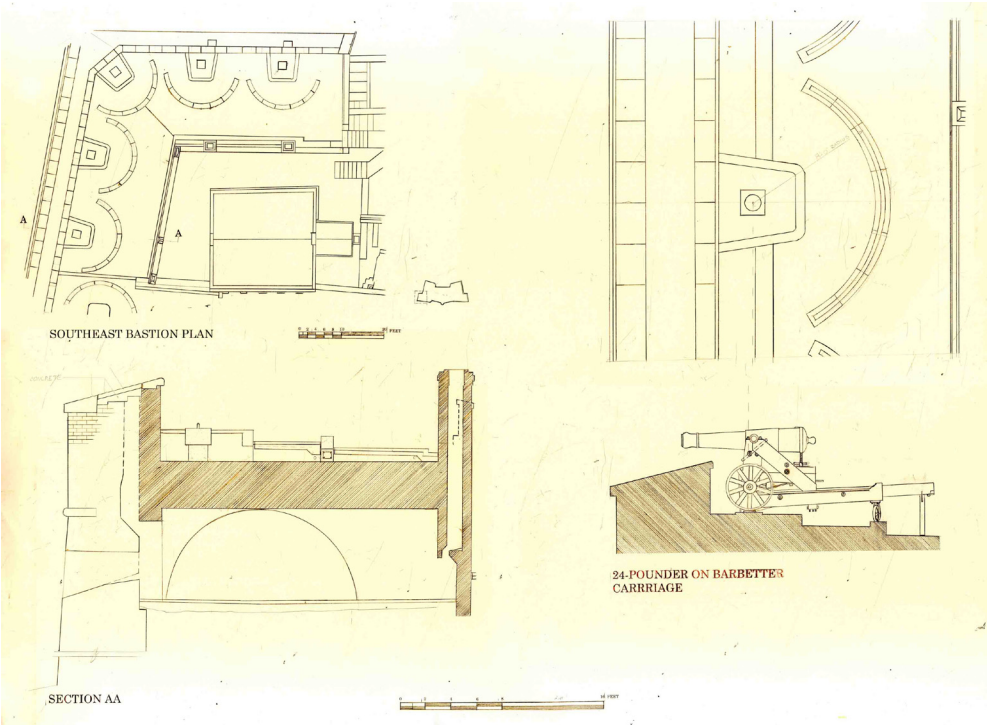
Interlocking fire diagram, *30”x22” Walnut ink on fine paper.*



Overall Sections, *30”x22” Walnut ink on fine paper.*



Bastion section, *30”x22” Walnut ink on fine paper.*



Enlarged plans and sections, *30”x22” Walnut ink on fine paper.*

INTENTIONALLY LEFT BLANK

04 | CONCEPTUAL PROCESS

Exploration Drawings

“The world of senses begins in the periphery of our bodies and moves to inner and higher levels of perception and from there, in analogical manner, senses rule the way we wittily act in our world.”

-Marco Frascari, *Architects, never eat your maccheroni without a proper sauce! A macaronic meditation on the anti-Cartesian nature of architectural imagination.*

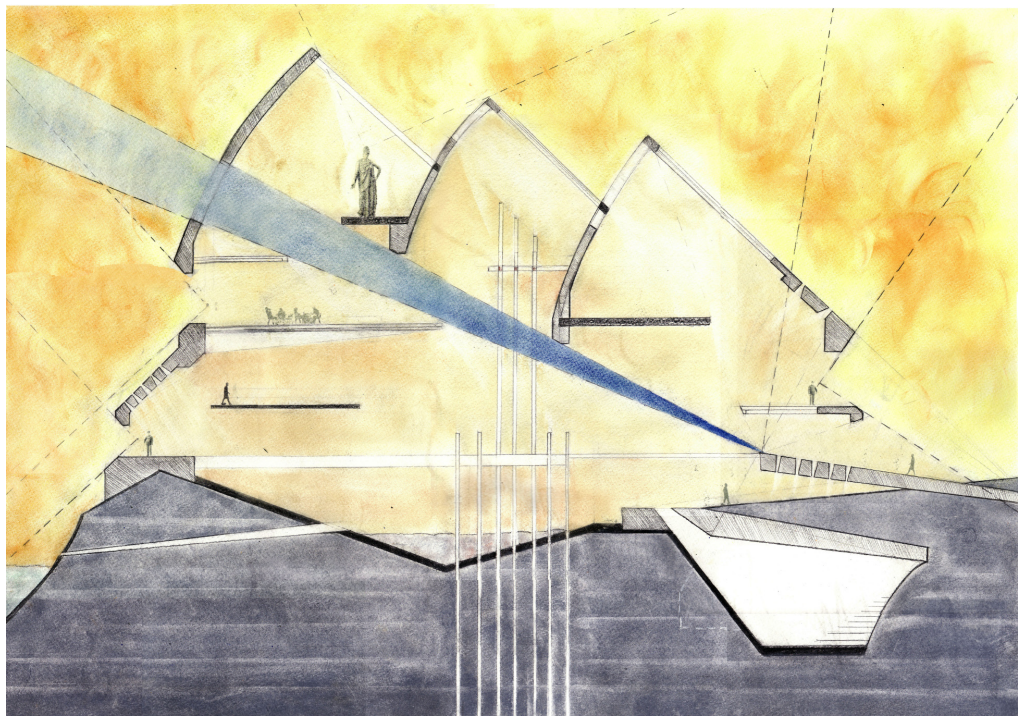
Drawings of the Five Senses: Material and Imagination

Creating and evoking architectural inspiration through drawing was a crucial step in finding the beginnings of the visitor center. I began my conceptual process by creating five imaginative drawings each tuning into one of the five senses: vision, touch, sound, smell, and taste. Through these drawings I was able to extract desirable qualities from the fort to integrate into my design. This was the first time I approached design in a different way by working from the inside out as opposed to my conventional way of designing from the outside in. Through the construction of these drawings I inadvertently created a visual record of memory allowing me to explore freely with my hand and mind without reservations and tap into material imagination.

Ekphrasis: VISION

Through this pictorial, my intent was to express my interpretation of the site and to include future desires for the proposed visitor center for Fort Washington Park, MD. Each time I visited the site, I envisioned the soldiers stationed there and all the stories they could tell. If the fortified walls could talk the tales would depict the fort's carefully designed layout, purpose of its materiality, and the construction methods used. They would also give accounts of the thoughts and emotions experienced by the soldiers whose job was to guard the nation's capital at this fortification they called home.

My process in creating this drawing was to work both with the recto and verso sides simultaneously. In my first step I visually mapped my perception of a dramatic song that represented to me some of the long, lonely nights those soldiers must have experienced. Although an anachronism, I chose *Send in the Clowns* sung by Frank Sinatra. The slow and deliberate instrumental sounds and emotions of the lyrics seemed to convey the right tone. I used an imprecise grid drawn in Black India Ink filled with markings.



Recto side, *27"x19" Pastels on watercolor paper.*

Next, I turned the sheet over to the recto side to begin thinking about my proposed visitor center. I began making my first marks to my visionary section, three curves that can be interpreted as the roof of my imaginary section, which were brought forth from the musical grid on the reverse side. I admit that when I began with the section I had already preconceived notions that the finish section drawing would be completely in ink. There would be no remains of pencil mark traces of any kind, just as I had done on the verso side. However, shortly after my first few markings, my drawing had a will of its own. Beauty and guidance was found in overlaying line after line, some thick others dashed, recording my every notion one right after the other. Every mark made was questioned and each time a line was created, it was the consequence of the previous line. Without realizing it I had created a personal journal of the thoughts and feelings I experienced the first time I visited the fort.

One of the most influential section of David Rosand's *Criticism, Connoisseurship, and the Phenomenology of Drawing*, is when he writes,

> The drawn mark is the record of a gesture, an action in time past now fixed permanently in the present; recalling its origins in the movement of the draftsman's hand, the mark invites us to participate in the recollection of its creation. That invitation to the viewer, to rehearse the creative gestures in his or her imagination, is a distinctive aspect of the appeal of drawing.

As I continued developing the drawing I included the ground, water, air, and the heavens. The thick hatched irregular shapes symbolize fortified walls with slanting apertures allowing glimpse of light to spill inside. The dashed lines denote cones of vision taken from the idea of military interlocking fields of fires and sight. Conventionally, sight is

expressed horizontally. However, in my dream world I adopted the idea and transformed them in to cones of vision spanning ninety degrees vertically with the eye level as the midpoint. Where the cone of vision meets the fortified walls I clipped them. I did this in order to avoid any obstruction of a visitor's sight, such as overhangs. I want a visitor to have a connection with the heavens without having to adjust their posture.

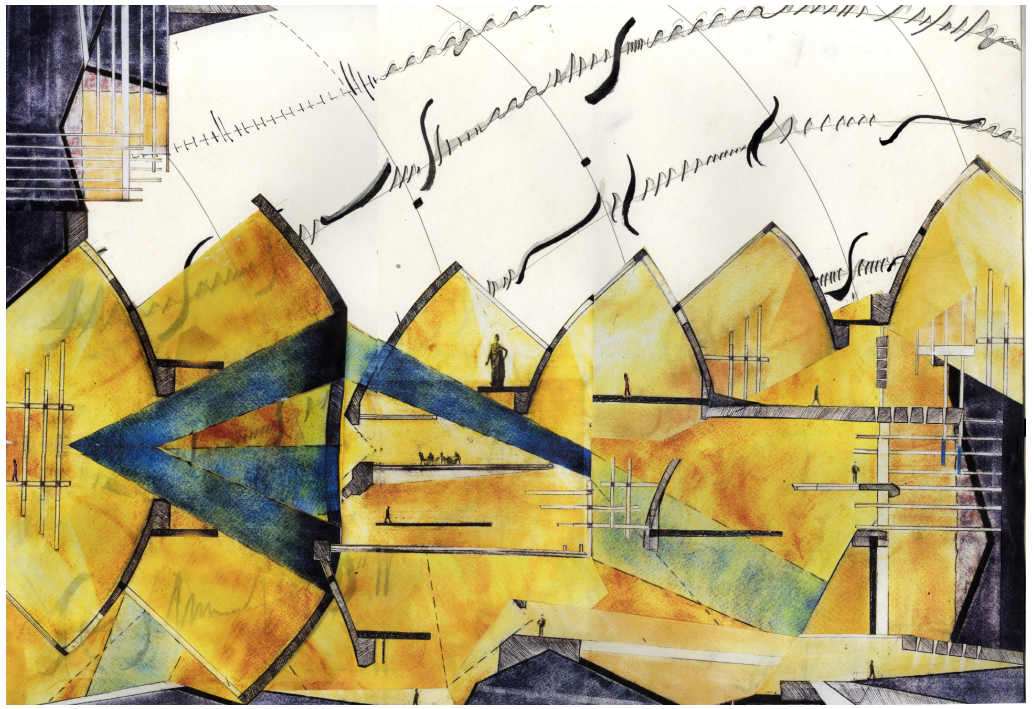
On the right of the drawing (*see drawing p 28*), I drew in water to symbolize the Potomac River bordering the site. I included a basin in the center which could potentially collect rain water from above. Then thinking of a way to avoid flooding, I included to the left of the basin an opening in the earth to allow water to spill into the Potomac River if need be. In this way I have followed the water's journey raining from the sky, pooling on the earth, and finally flowing out to the sea waiting to evaporate and start the cycle over again.

I created multiple level slabs to show the possibilities of different purposes throughout the building. Then, I began to include color by gently scraping pastel colors with a knife, similar to the process of getting powder cinnamon by scraping cinnamon sticks. When I felt I had reached the right amount of pastel powder, I would rub and blend the colors until I was satisfied with the right tones. I was particular about the colors I chose to illustrate the heavens, air, water, and earth. For the heavens, I chose a bluish cone beginning from off the paper. For the air, I chose a yellowish-orange color to symbolize the warmth. For water, I chose a greenish-brownish color to represent the mixture of water and earth in the Potomac River. For the earth, I chose gray for its dark qualities. And finally, I removed color in a linear pattern with a kneaded eraser to give the earth texture and represent the layering of the earth through time.

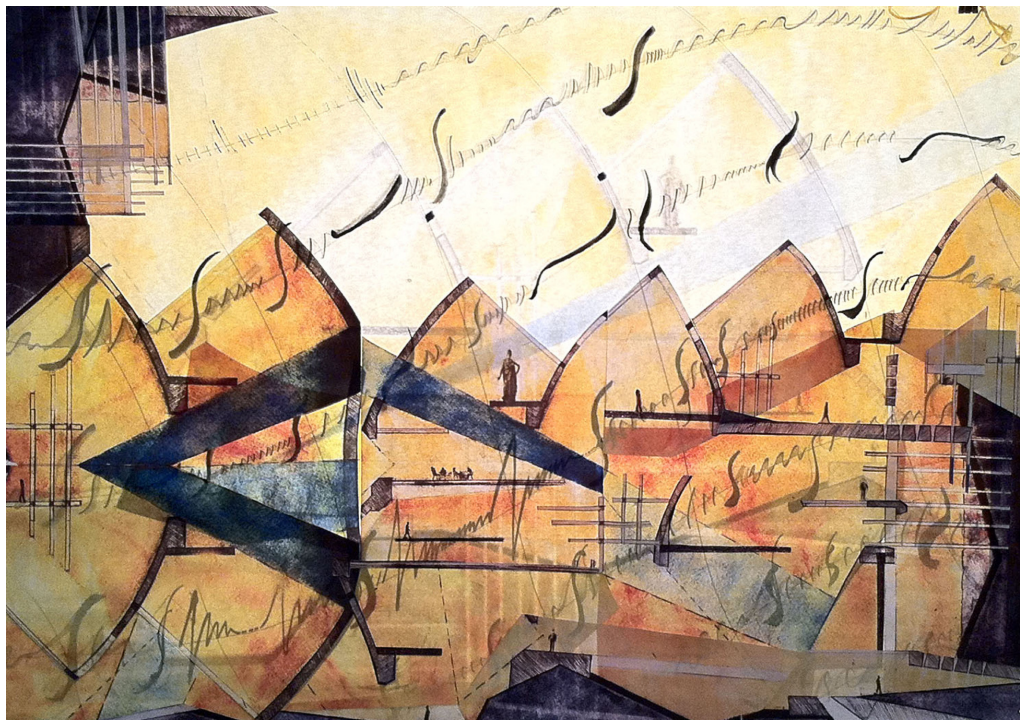
To assist in the narrative of the drawing, I proceeded to include human scale figures. On each side of the section soldiers were included to represent the guarding of the fort. The faceless figures represent visitors partaking in activities. Lastly, the most personal touch was when I added Athena, goddess of warfare and the arts. I purposely illustrated Athena twice the height of the humans to imply her divinity and placed her on the highest platform of her closeness to the heavens.

Once at a stopping point with the recto side, I scanned it and began to experiment with the digital tool, Adobe Photoshop (see drawing top p29). I revisited the verso side and, using the "clipping mask" tool began layering fragments of my imaginary section over my musical configuration creating a new fantasy section. I used the same process with the recto side, questioning and rethinking every gesture done. Eventually, through layering, the verso side of the drawing became a sort of labyrinth created by using fragments of the recto section. Using digital tools allowed me to push myself further into exploring endless potentials and intentions toward my thesis.

The intention was not for my thesis project to mimic the shapes of either fantasy sections in my drawing. My intention was to use what I have recorded through the drawing to continue to question the endless possibilities for my building.



Verso side, *27"x19" Pastels on watercolor paper.*

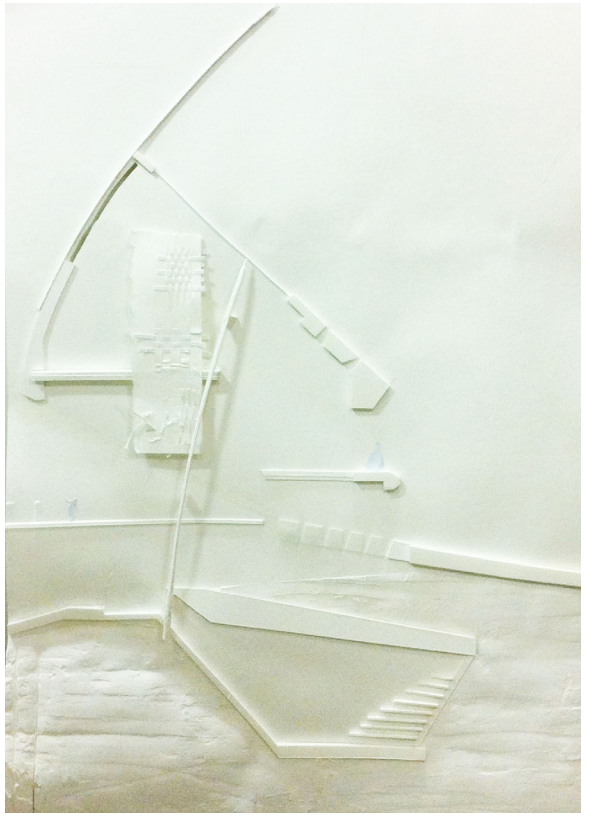


Recto and verso side of drawing activated by light to create a third drawing.

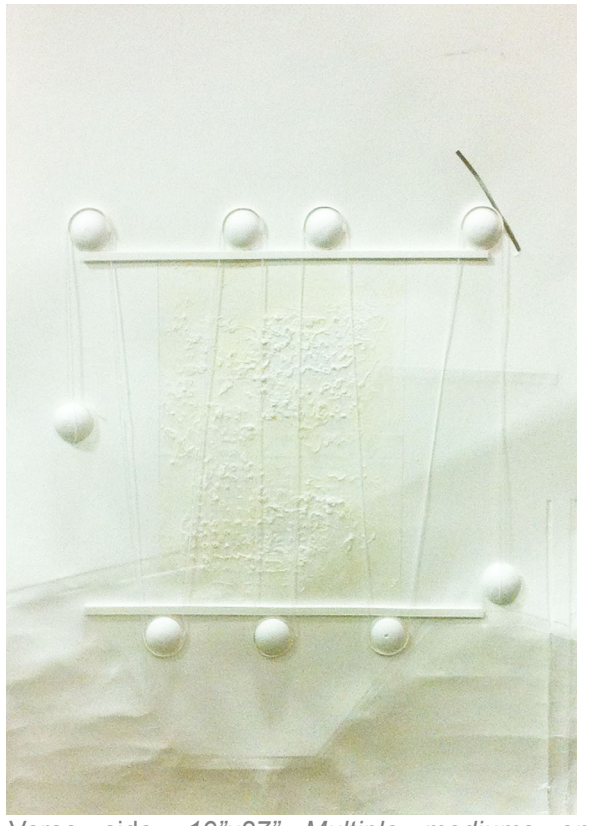
Ekphrasis: TOUCH

The purpose of this drawing was to explore the essence of touch in materials and their physical qualities within the existing fortification located at Fort Washington National Park. The criteria called for the use of only white materials so colors would not influence the process. I started creating a mental library of the fort's materiality, such as the wearing down of the stone walls and the decaying of wood planks. I then extracted the colors from the material allowing me to experiment with the possibilities by only focusing on the feel. This drawing is an exploration of the existing structure material quality and how it will evoke the use of conceptual materials for my proposed visitor center.

By revisiting my previous drawing of an imaginary building section, I was able to work deeper around the idea of a focal point somewhere in my building. I enlarged prominent areas of my previous drawing, the focal point and the underground space. Using computer software, I was able to invert the partial section and print it in black and white, highlighting the contrast between the elements. I then overlaid the printout on a watercolor sheet of paper and carved the outline with a stylus.



Recto side, *19"x27" Multiple mediums on watercolor..*



Verso side, *19"x27" Multiple mediums on watercolor.*

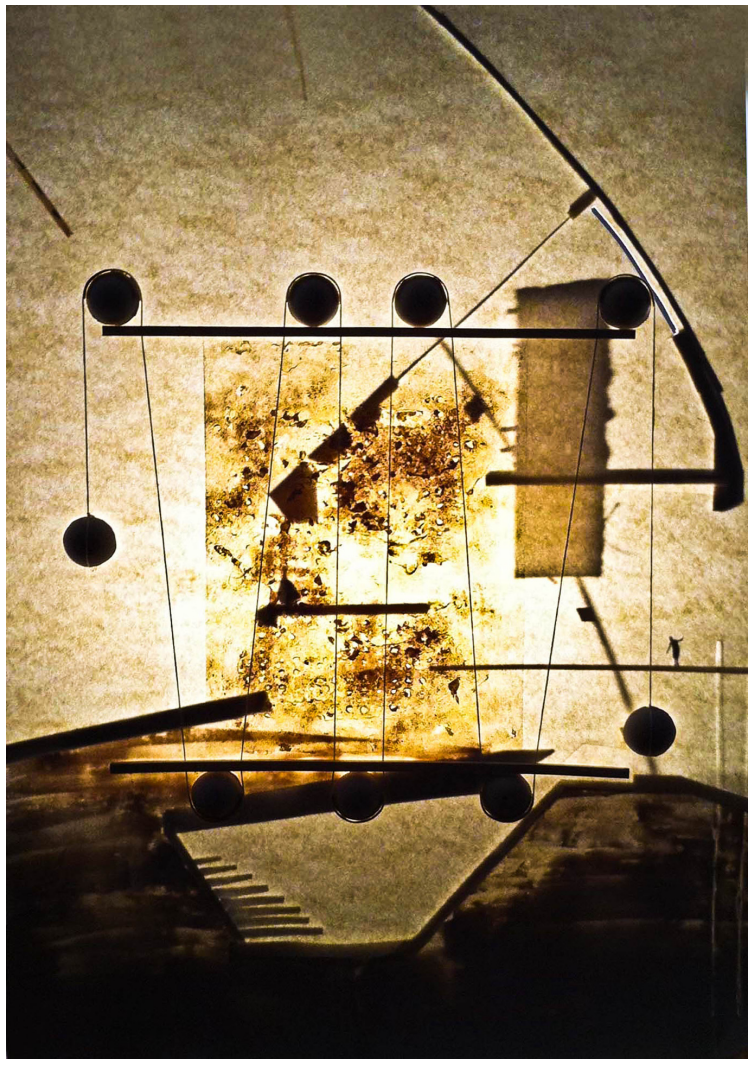
After completing the outline, my next intent was to show structural elements, such as the earth and most of the horizontal elements, as different thickness. For the earth, I began layering plaster with a spatula. The bottom layers are dense and have the most plaster expressing the compactness of the earth through time. Gradually, the top of the earth is loose and almost powdery, like top soil. The retaining walls and floor, although thin, are represented as clear, irregular cut shapes to show their artificiality. The arched elements represent the concept of using the exposed skeleton to be part of the aesthetics of the building.

At this point in my drawing, I was reading Gottfried Semper's treatise, *The Four Elements of Architecture and Other Writings*. He mentions the origin of one of the four elements, enclosure. He describes the enclosures as walls and the weaving and entangling of materials and the use of carpets as the first space dividers. This gave me the inspiration to explore ideas of enclosures and walls. I weaved thread into a separate piece of paper to explore the different senses created by expanding or contracting the intervals between the weaves. I then added this swatch to my drawing.

On the verso side, I imagined a wall detail of my building. My intent was to compare and contrast the rough feel and state of the old fortifications with the smoothness of modern building materials. I did this by representing the idea of old through the use of spreading glue in a rectangular area and poured loose plaster on top. Using a grill with circular pattern openings, pressure was applied manually until the glue and plaster extended beyond the face of the grill. I lifted the grill and shook the leftover plaster powder off the sheet and studied the remains as it dried and began to think of how to create a detail of a new wall over the representation of the old.

In exploring the new wall detail, I experimented with mixing fragile materials, like thread, with heavy materials, like stone. This lead to the idea of a moving wall mechanism based on counter weights. I began by creating oversized semi-circles and positioned them on the top and bottom of my wall. To give the feel of something heavy, smooth, and cold, I used solid, round anchors. Using thread, a loom was created to establish contrast between fragility and sturdiness thus, exploring their presence together.

I learned many things in creating this drawing. By eliminating colors, I was able to extract deeper meanings out of the materials using only my sense of touch. I learned that the density of compacted earth and solid floors and ceilings created their own tactile experience. Gottfried Semper's description of the origin of enclosure and my experiment with weaving showed me that walls do not have to be solid to give the feel of separation between spaces. Through my experimentation with plaster and glue I learned that it is nearly impossible to recreate or mimic the feel of old materials. Finally, I discovered the use of thread and concrete together created some unusual effects. I used some of these lessons to choose materials during the final design of my thesis.



Recto and verso side of drawing activated by light to create a third drawing.

Ekphrasis: SOUND

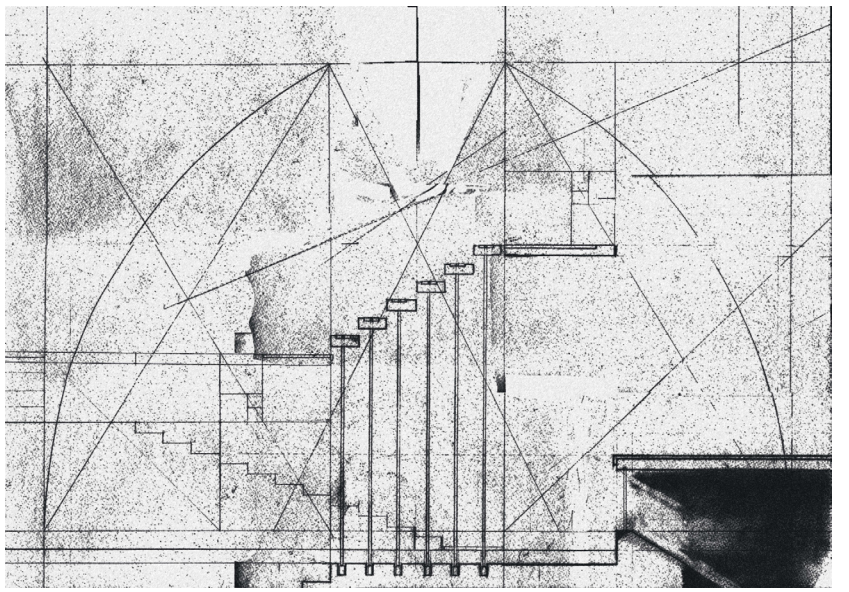
My topographical model of the site helped me to understand that there were significant changes in elevation throughout Fort Washington allowing me to invision mulit-levels in the visitor center, but would require creative methods for moving from one story to another. These architectural drawing embody an imaginary building section with a detailed architectural element threshold, the stairs. The form of the stairs and its surrounding spaces are organized by utilizing the Fibonacci number sequence as a proportioned diagram through the golden sections. In addition, the creating of both recto and verso sections is influenced by an ancient Japanese alert device system and the recordings of two sounds both familiar and unfamiliar to my thesis site. By doing this, I was able to examine how sound could influence my design.

Architects, engineers, and artists of the 17th and18th Century were fascinated with symmetry and reoccurring numbers. So I decided to incorporate that idea into a drawing. Beginning with the recto side of the drawing, a 2H graphite pencil was used to lay out the first set of lines of the golden sections using the Fibonacci numbers. To further experiment with the idea of utilizing a proportion diagram as a guide, I found myself including a second golden section mirrored to the first. After completing the layout of the golden section's thin silver lines, a scale of 1"=1'-0" was used to create the main stair. It is positioned in a central focal point between the two golden spirals to show a hierarchy toward the other stairs.

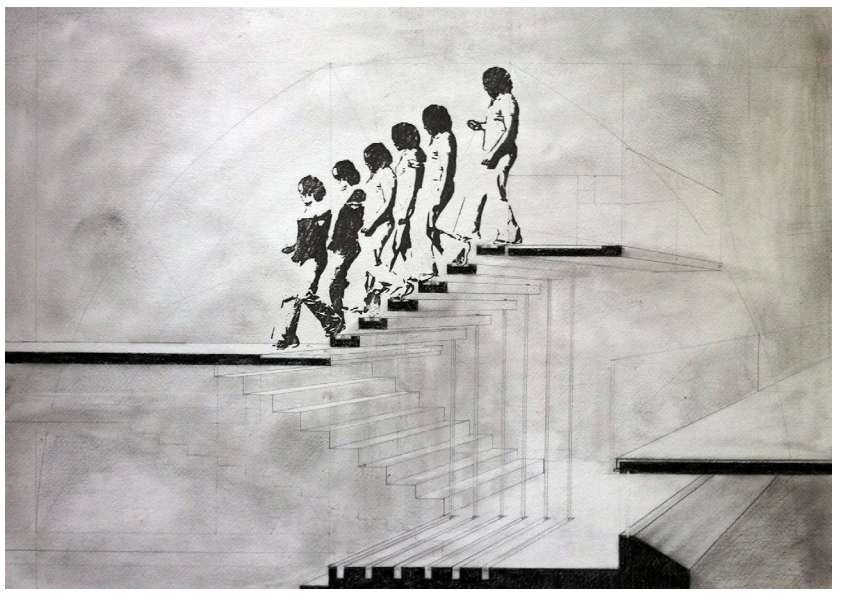
The design of the main stair was partially influenced by Japanese nightingale floors, also known as *uguisubari*, which was used as a security device system making it unlikely for any one to go on undetected. With this idea I was able to link artistry and security, a military concept, into a design about sound. The basic design of this security system was a squeaky sound that would occur between the rubbings of the flooring nails against the flooring clamps when pressure was applied by someone walking on them. In the main stair design, a metal strip is attached to both sides of each step which lowers slightly when pressured, striking a solid metal object fixated at the level directly underneath. The sound continues with each step until reaching either the top or bottom platform. All persons within hearing distance will immediately know that someone was going up or down the main stairs.

Another strong influence in the making of this drawing came to me while reading Federica Goffi-Hamilton's, *Carlo Scarpa and the Eternal Canvas of Silence*. I was struck and inspired by the following passage:

> "The 'slow time' of Venice surfaces in his work. The city does not allow for a direct 'linear' perception of its whole, it has to be discovered slowly through multiple 'fragmented views', which overlap and intersect 'simultaneously', like the sound paths and positions of performers, instrumentalists, orchestras and electronic sound generators..."



Enlarge section of drawing showing the main stairs organized by the golden sections. *27"x19" Graphite medium on watercolor.*



Recto side, *27"x19" Graphite medium on watercolor paper.*

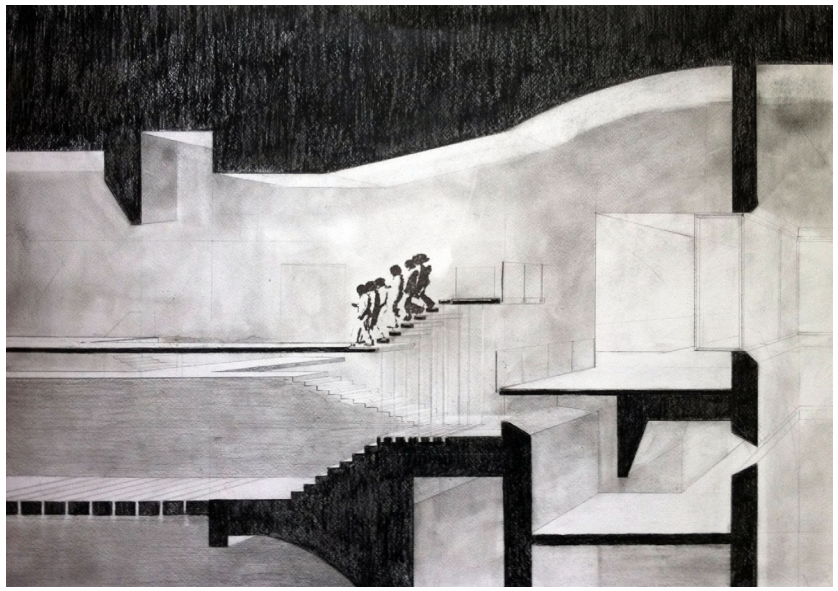
I translated this to be the majestic idea of slowing down the act of discovering parts of a whole in a building by creating varying juxtaposition architectural spaces to slow a person to a strolling pace allowing for the complete absorption of each space through the senses.

In the continuation of my drawing, I turned to the verso side. A 2H graphite pencil was again used to lay out the set of lines for the golden sections. As drawn on the recto side, I used two mirrored golden sections utilizing the scale of 3/8" = 1'-0" to create the rest of the building working outwardly in a spiraling pattern from the main stairs, located centrally.

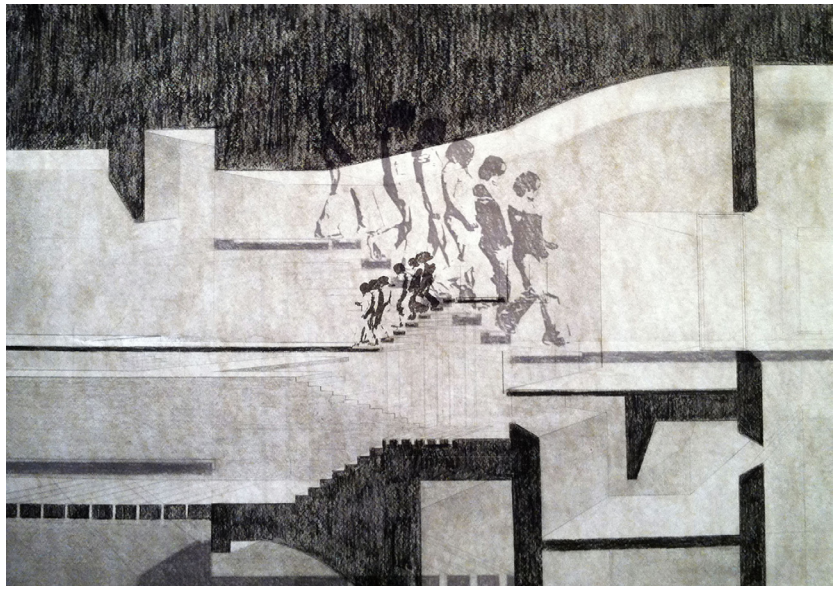
Next, I recorded two sounds – one unfamiliar and the other familiar to my site. The first sound, unfamiliar, consists of echoing sounds created from visitors walking and whispering throughout the galleries at the west building of the Smithsonian National Art Gallery. The cavern like spaces, with marble floors and walls, amplified the sounds. This experience stimulated the idea to design the remaining section underground, significantly altering the overall feel of a conventional building section. One of the architectural elements included in this drawing is the top horizontal window with a vast opening signaled by the open accordion shutters located at the top right of the section. The air and audible characteristics of the space are altered by allowing a good amount of light to cut into the space through this horizontal window.

The second sound, familiar to my site, is a recording of my steps walking on an exterior stair approaching the main entrance of Fort Washington. Playing back the recording, I hear the different characteristics of my steps as I transition between materials, from gravel to stone to wood. If you look closely in the drawing, all the stairs throughout the section are built from different materials that produce varying sounds. The variations of materiality and usage of architectural spaces all have a collaborating role in the playing of sounds throughout the section.

My intent through this architectural drawing was to explore sound through the design of a staircase. The inclusion of the golden sections as a guiding force is instrumental in rationally positioning architectural spaces and elements throughout the section. The idea of the Japanese alert device system, known as the nightingale floors, was a fitting system for exploring the thesis design. Although, I did not include it in my eventual proposal, I did discover ideas that were included. One of these concepts was to vary materials throughout the building to create notions of space.



Verso side, *27"x19" Multiple mediums on watercolor paper.*



Recto and verso side of drawing activated by light to create a third drawing.

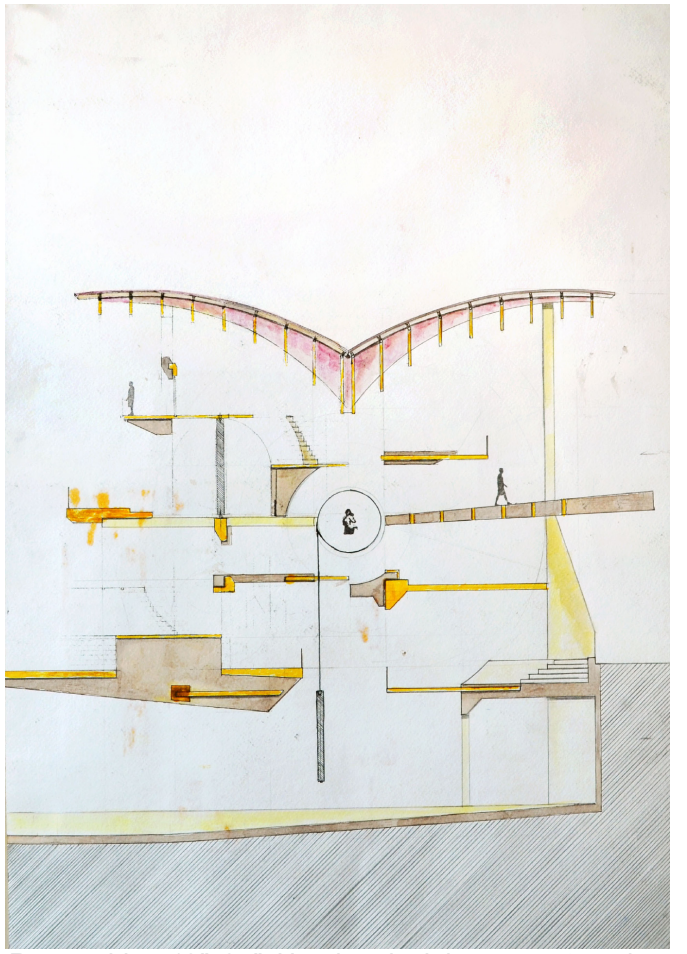
Ekphrasis: SMELL

These drawing explored scent and the notion of air as elements of architecture. The power of smell can induce memories and sway moods instantaneously. I discovered emotional and physical connections between materials used and its contributions to the health and balance of a building and its inhabitants throughout the making of this drawing. I interpreted the roof like a strong man filling the role of “protector” and the internal parts of the building as a complex woman. The focus was on balancing the parts of the building and the interrelated relationship as a whole exploring between feminine and masculine qualities.

While reading Jean-Pierre Chupin’s *Hermes’ Laugh: Philibert de l’Orme’s Imagery as a Case of Analogical Edification*, I came across the following quote that influenced my thought process while creating this drawing:

> “Here, along with the notions of “winds” and “alteration, “ de l’Orme refers explicitly to the writings of Hippocrates…Del’ Orme raises prudence to the level of guardian of architectural practice, because he sees matter as analogous to memory which as such demands to be manipulated with care and respect. Again, one must remember that the architect’s work was still part of a living physis in which any action could induce a natural but frightening reaction.”

Although architecture enhances all senses, continually overlooked is the sense of smell - how we breathe in air and how the pattern of the wind is affected by its existence. Even though air is invisible, it is the most powerful of all elements because it is constant and is needed to live. I interpreted l’Orme’s message to be innovative with the creation of good architecture and good judgment being always cautious of its consequences.

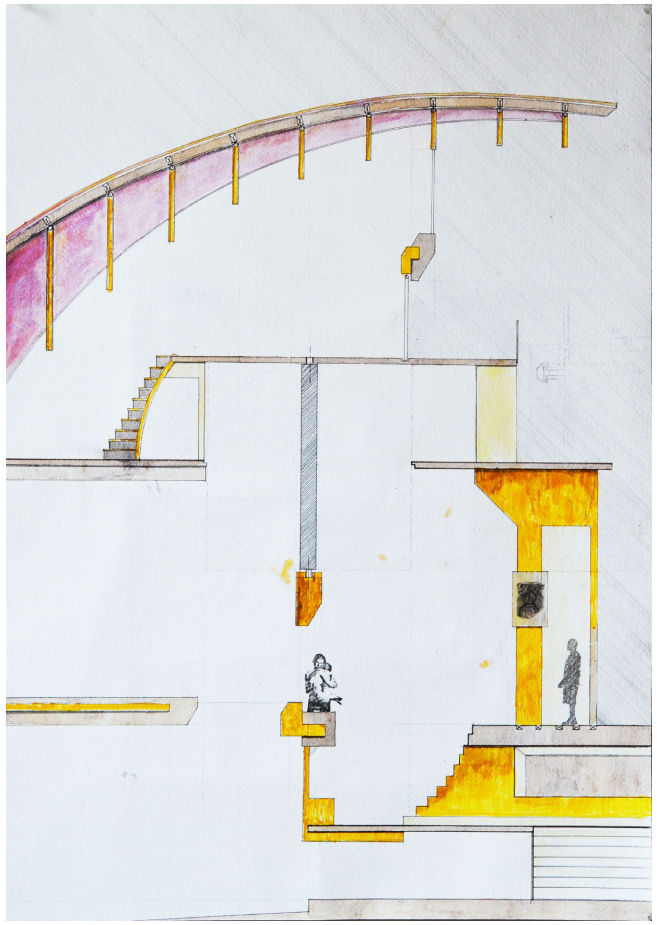


Recto side, *19”x27” Handmade inks on watercolor paper.*

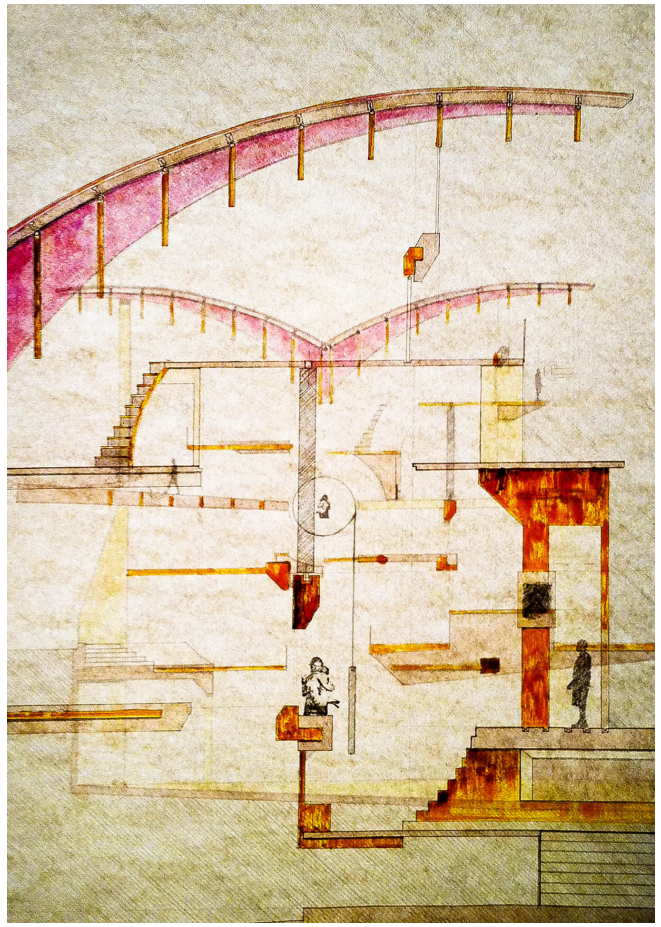
The love narrative used to explore opposite relationships can be summed through the image located in the center on the recto and verso side of the drawing. The image denotes the ideology of man filling the conventional role as a protector and the woman as a support to the internal architecture elements. To translate the love between the couple into architecture I chose to embody the arms of the man as the roof and the woman as the internal architectural elements. The light pencil lines throughout the drawing on both surfaces are resonant of my thinking process. I utilized a 6 inch by 6 inch square grid system and golden rectangles to guide the placement of forms throughout the section. Inks, used to symbolize the building’s materiality, were chosen for their qualities and for the similarities in their making process to the actual material. Three self made inks were used in the drawing: walnut ink, turmeric ink, and berry ink. Respectively, the inks implied building materials: wood, stone, and steel. Metaphorically, the materials and inks chosen were based on my own memories of scent. Wood is related to a musky and heavy scent much like that of a man, so I chose walnut ink. The surface of raw wood is rough and unpleasant much like a man’s stubble, and the shaping of the desired form of wood can be interpreted as callous. In order for wood to be refined, it has to be cut, sanded, and steamed.

As for concrete, I envision a woman's soft skin when touched. Similarities include the fluidity property of concrete before hardening, its scent, adaptability to almost any form, incredible strength, and its attractable surface desiring touch. The yellow ink reminds me of the sun and its nature of giving life to our world much like a woman's ability to give life. Turmeric ink was used for two reasons: for its color symbolism and the way it is made. Both the color and concrete use water to make the material instead of fire.

In regards to steel, I used a slightly different approach for its representation. I used raspberries to make a reddish tint to illustrate steel. I felt this was fitting since both steel and the making of the ink required the element of fire. The shape of the roof is dictated by the curved steel supports that were designed in this manner to symbolize the arms of a man embracing and protecting all that is within his reach.



Verso side, *19"x27" Handmade inks on watercolor paper.*



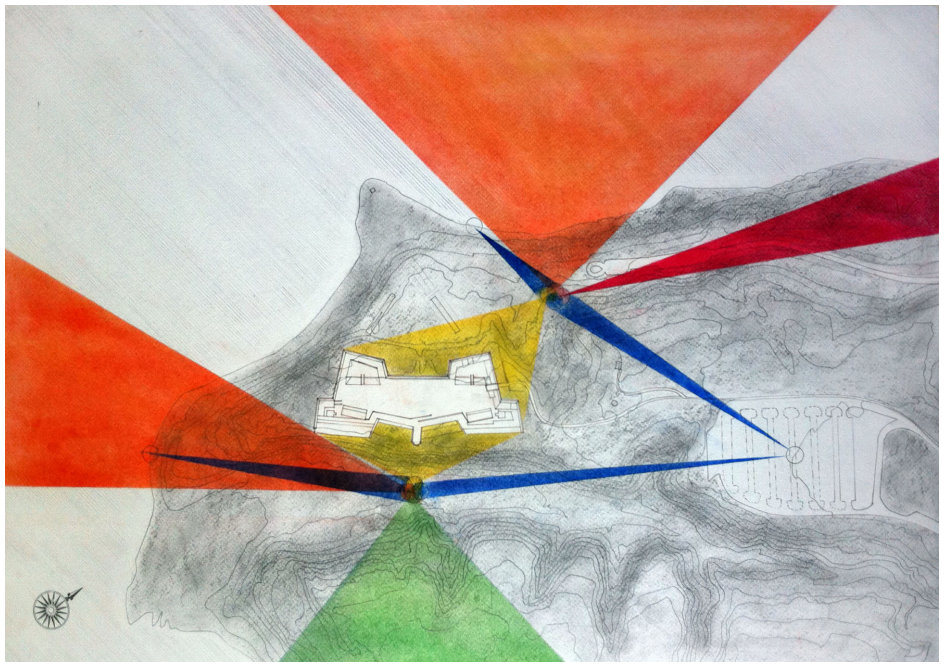
Recto and verso side of drawing activated by light to create a third drawing.

The forms seen throughout the drawing embody interdependence, much like the relationship of a man and woman. I explored the idea of using irregular geometries and forms throughout the section. My perception of these irregular forms was the combination and merging between the round forms representing the female and linear elements representing the male. The building section was intended to be an open scheme allowing for movable parts throughout. For instance, the vertical elements seen hanging from the roof can swing back and forth when activated by wind. It is attached to the roof with a pivoting hinge that allows for easy movement with the slightest breeze. Furthermore, these moving elements are made of wood and the intention is that the swaying can move air and release its natural musky aroma.

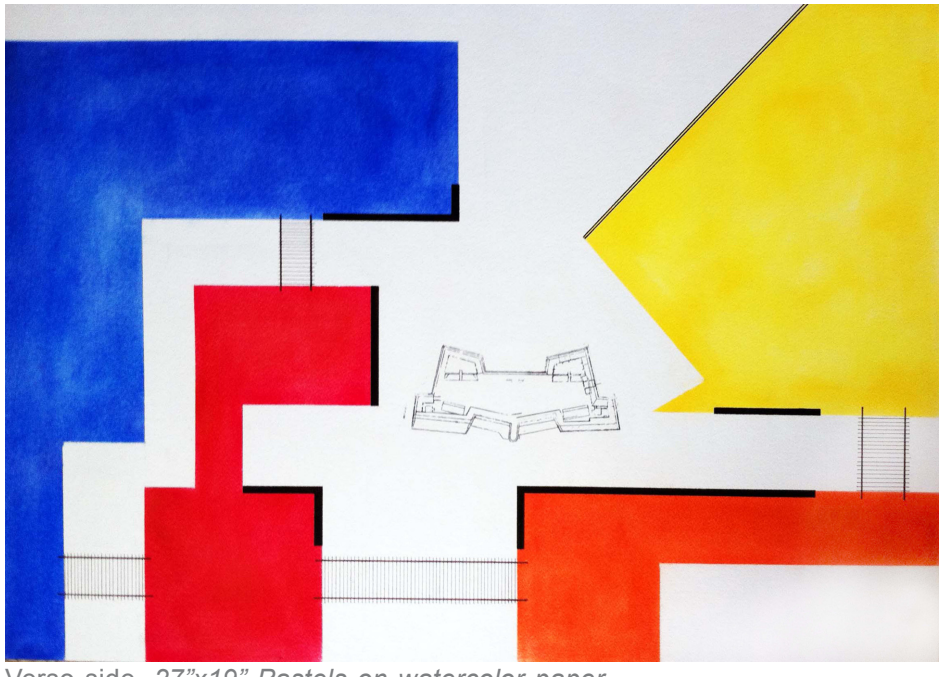
The intention of this abstract architectural drawing was to explore scent and the notion of air as influential factors in the creation of architecture. I explored the notion of air by focusing on a part of a building and discovering the relationship between the internal and external components. Metaphorically speaking, I engaged in discovering a sense of balance between opposite characteristics such as those between feminine and masculine qualities. The power of smell has the ability to transcend inhabitants of a building from the physical world to the emotional world; the visible into the invisible.

The most significant discovery from this exercise was to form the perception of the roof as a defensive structure – the same purpose as the fort I was studying. This would later morph into the concept of a "copper shield" roof protecting the building.

Ekphrasis: TASTE



Recto side, *27”x19” Pastels on watercolor paper.*



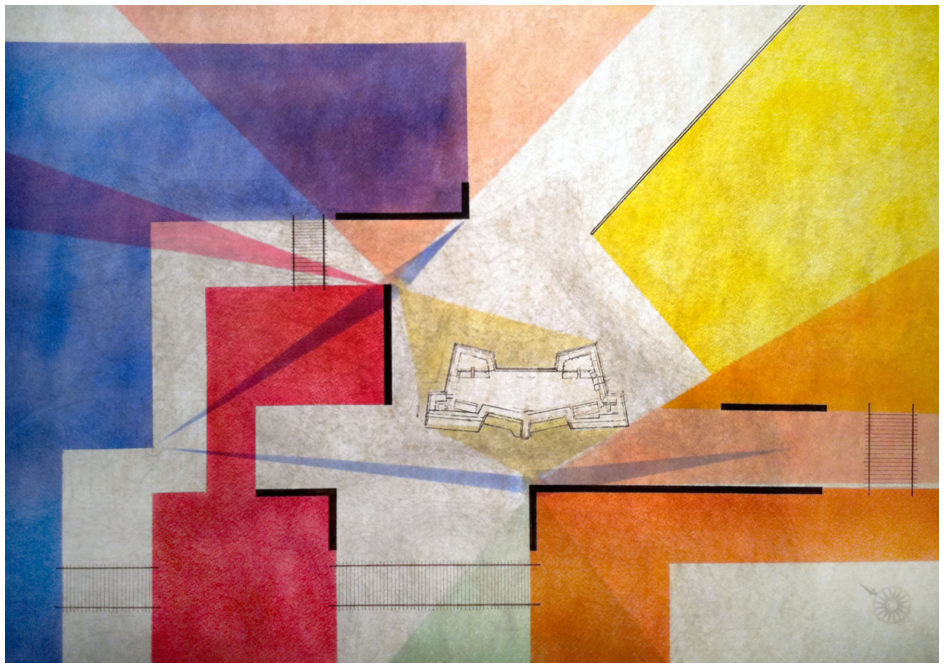
Verso side, *27”x19” Pastels on watercolor paper.*

Today, taste has lost most of its mystical connotation and it is now largely defined in relation to fashion trends. My desire throughout this drawing was to allow architecture to serve the visitor with a comprehensive sensorial experience as you would when sitting in a formal setting and consuming a four-course meal. In this drawing, I explored the essence of taste by applying the analogous principles chefs use to create their art and applying those principles to create architecture that focused on exploring the sensory perceptions to nurture the mind, soul, and body. Architecture is a well composed menu, consumed through sensorial ingestion. By choosing complementary courses and ingredients a meal can connect the body with its spirit and the above. Hence, I endeavored to use the fitting proportions of materials and spaces to enhance a visitor’s connection with my proposed visitor’s center.

On both the recto and verso side of the drawing, each line and color has been carefully chosen, imagining how a visitor’s mind and body relates to the building and transforms them through exposure to materials and cohesive spaces. Each stage in my design is a portion of a four-course meal. The colors symbolize movement through the building. Cobalt characterizes the intensity a visitor feels as they approach the building by land or water. As you continue throughout the building the colors become warmer, gradually moving you through each course of meal. At the end of the journey you reach the color yellow, which in this case would be a connection to the existing fortification.

The recto side of my drawing explores two possible locations for the visitor center. In the same way the chef goes about choosing between menus to serve, I evaluated between two locations. I began by exploring which menus would best serve a visitor, in this case a northwest or a southeast menu. As mentioned earlier, certain colors represent a particular view or an experience a visitor would encounter as they move within the building, keeping in consideration atmospheric factors such as sun and wind exposure. Although, both menus at first glance seem to be the same there are two color variations, red and green, in each menu. In the northeast menu, the color red depicts the site’s strong visual connection with the nation’s capital; it is the very purpose for the fort’s existence. On the other hand, in the southwest menu a visitor is served with beautiful view of the remaining richness of the site embodied by the color green. I decided that the best fit and most note worthy home for my future building will be the northeast location allowing for the intangible connection between nation’s capital.

The verso side of the drawing illustrates an abstract exploration of what the visitor will experience in stages through the chosen menu. A visitor initiates the journey with the first course, represented in blue, just as one would



Recto and verso side of drawing activated by light to create a third drawing.

consume appetizers in a meal. The journey continues with the indulgence of the second and third course, respectively depicted by the colors red and orange. They move through each stage awakening their sensorial perceptions and eventually arriving at the ultimate view of the fortification, illustrated in yellow, symbolizing dessert. The lattice objects seen in between each stage signify transition areas. My desire was to experience a gradual intake and avoid shocking or fragmentations between experiences.

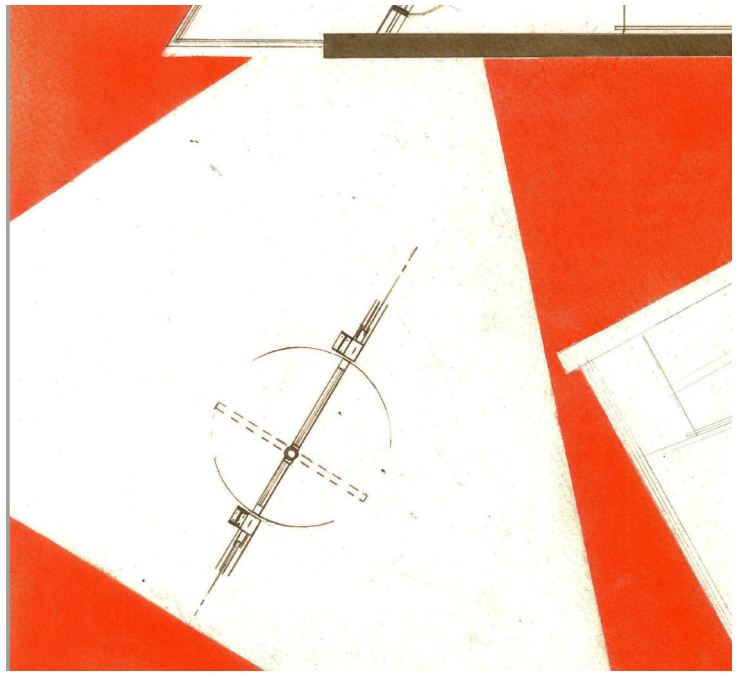
The intention of making this abstract architectural drawing was to explore taste and how a chef and an architect commonly strive to combine the best ingredients to produce a delicious outcome. When reading Margaret Visser's, *Much Depends on Dinner*, I was particularly taken by the following memorable passage:

> "A meal is an artistic social construct, ordering the food stuffs which comprise it into a complex dramatic whole, as a play organizes actions and words into component parts such as acts, scenes, speeches, dialogues, entrances, and exits, all in the sequences designed for them. However humble it may be, a meal has a definite plot, the intention of which is to intrigue, stimulate, and satisfy. "

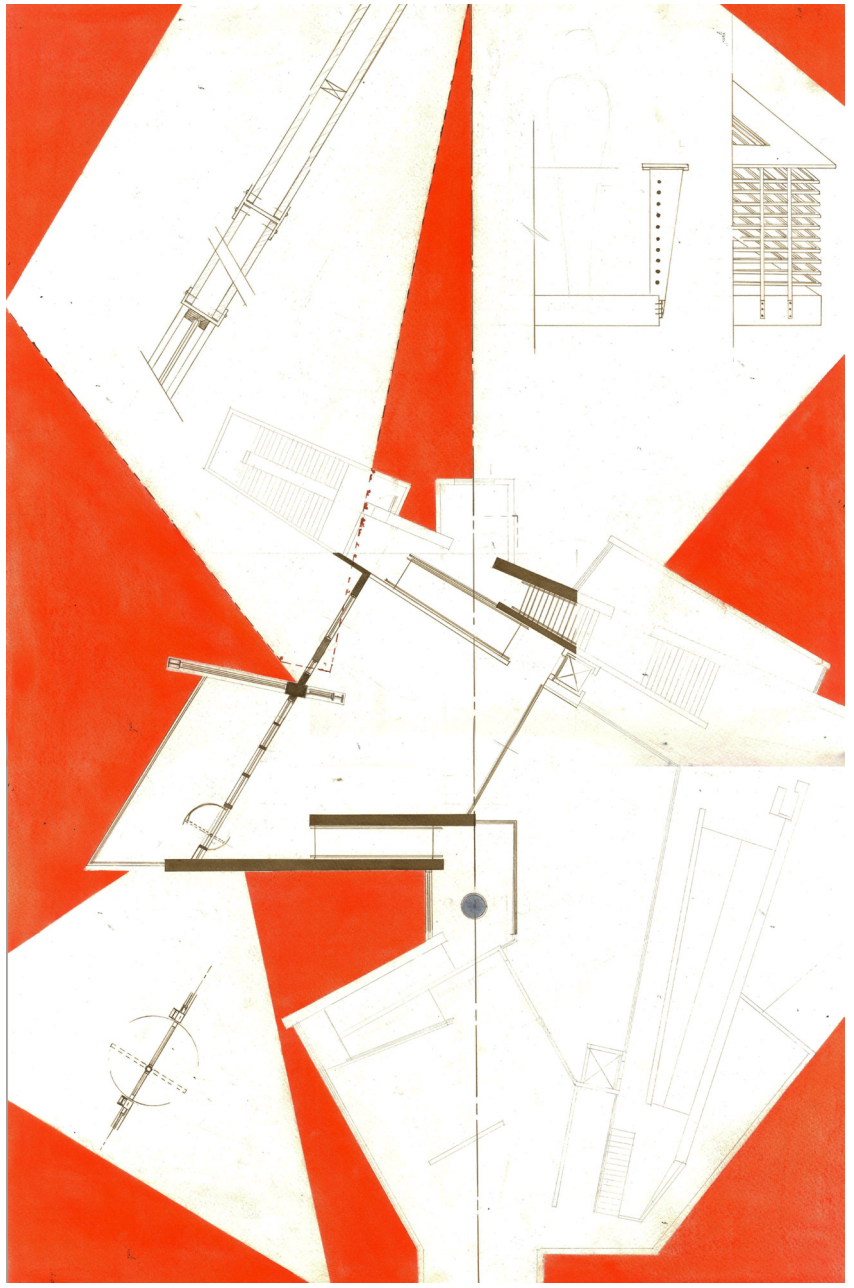
The writer eloquently defines what a true meal is and its potential to intrigue, stimulate, and satisfy the receiver, if skillfully executed. I too strived to skillfully create architecture that provides visitors with a "meal" where they can feel intrigued, stimulated, and satisfied. Up to this point, I had not yet begun to cook my building. However, I had decided on the four-course menu and begun to set the table. This drawing presented me with a remarkable opportunity to profoundly explore potential locations for the visitor's center. Additionally, it affected my concept of four exhibitions with windows that blocked some views but highlighted a specific vista.

Detail Drawings

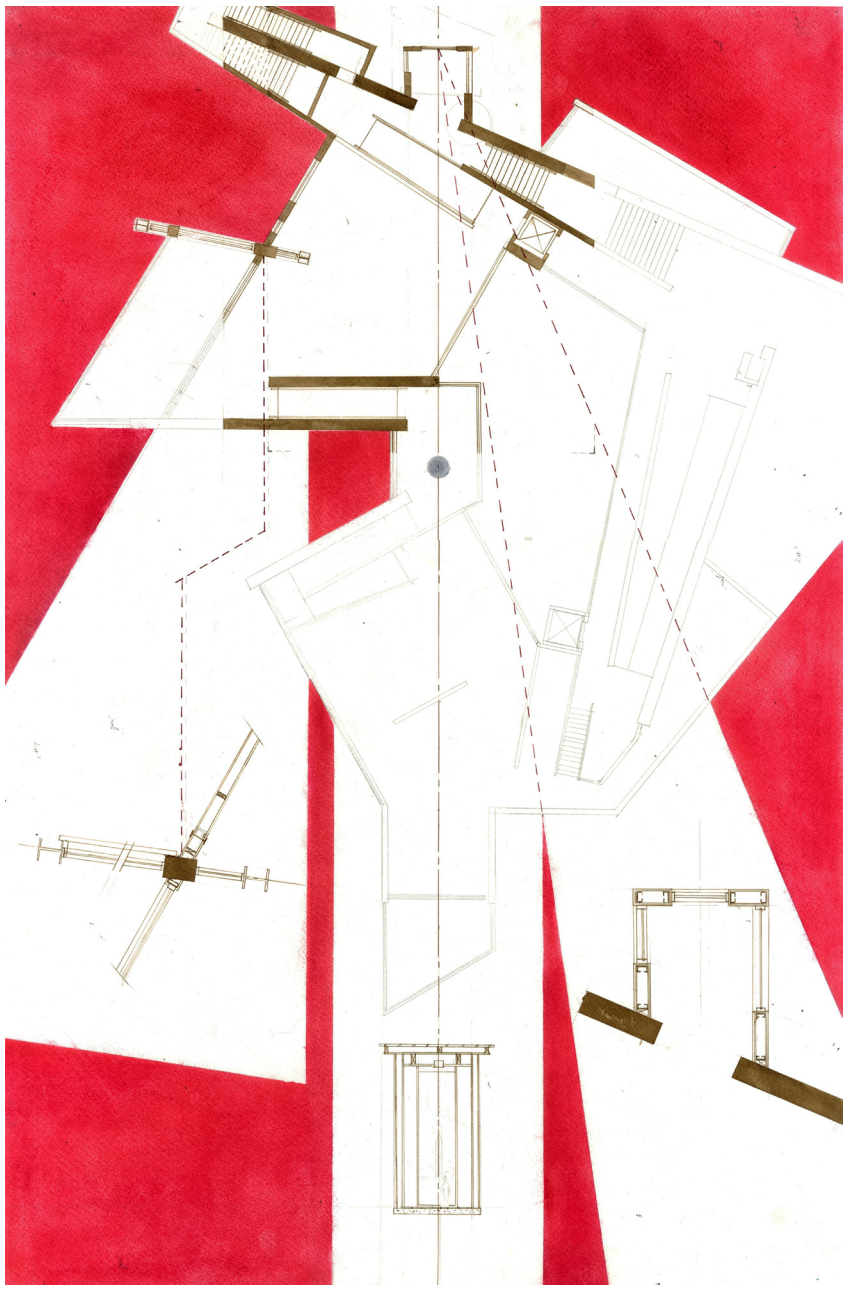
Transitions from one area of my building to another required additional attention on how to join the architectural elements, such as the walls and floors. Therefore, I choose five areas and constructed drawings. In each I placed the architectural floor plan, and then dissected and enlarged the complex connection points demonstrating potential solutions. The color coding relates back to my taste drawing (p.45) in which each color is assigned to a particular exhibition or common space.



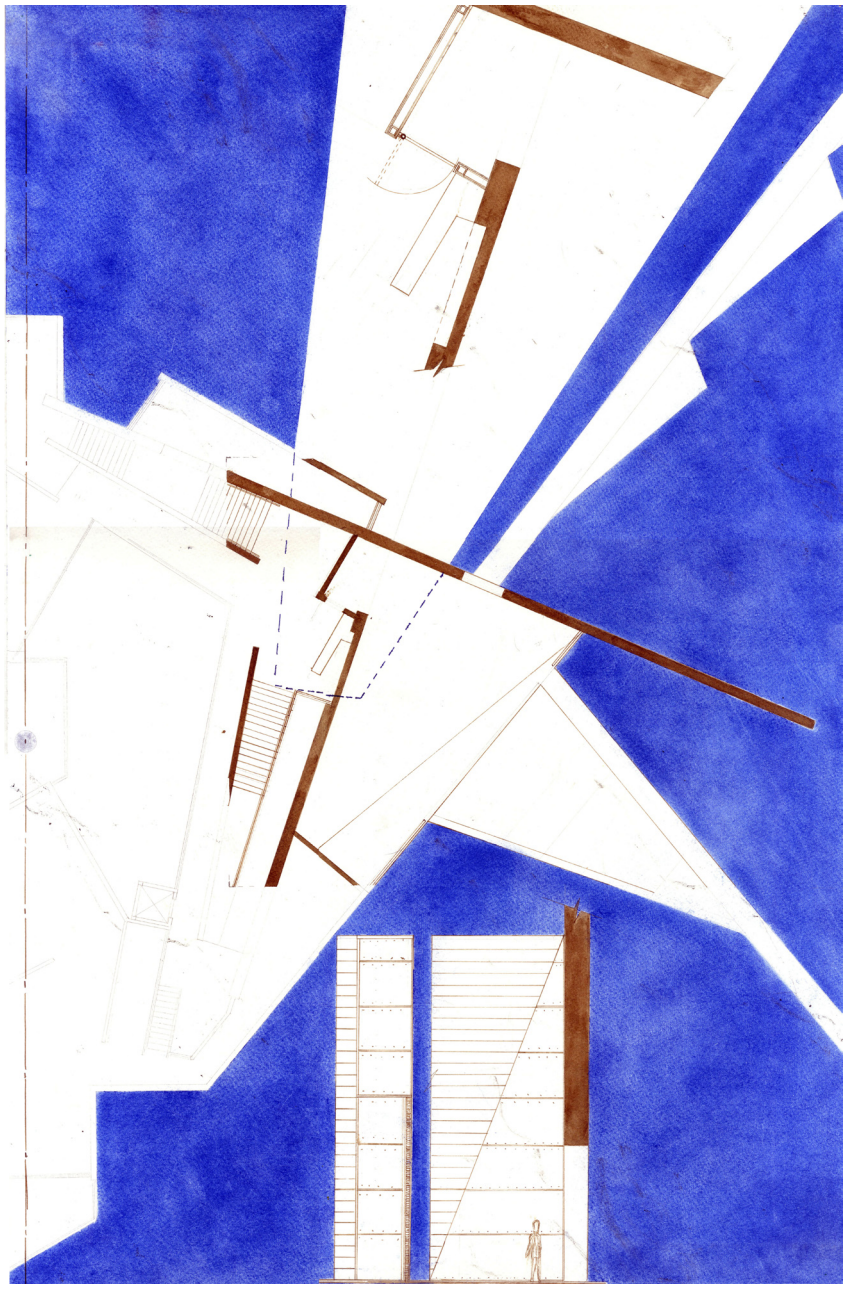
Enlarged view of the rotating door at the Potomac Exhibition



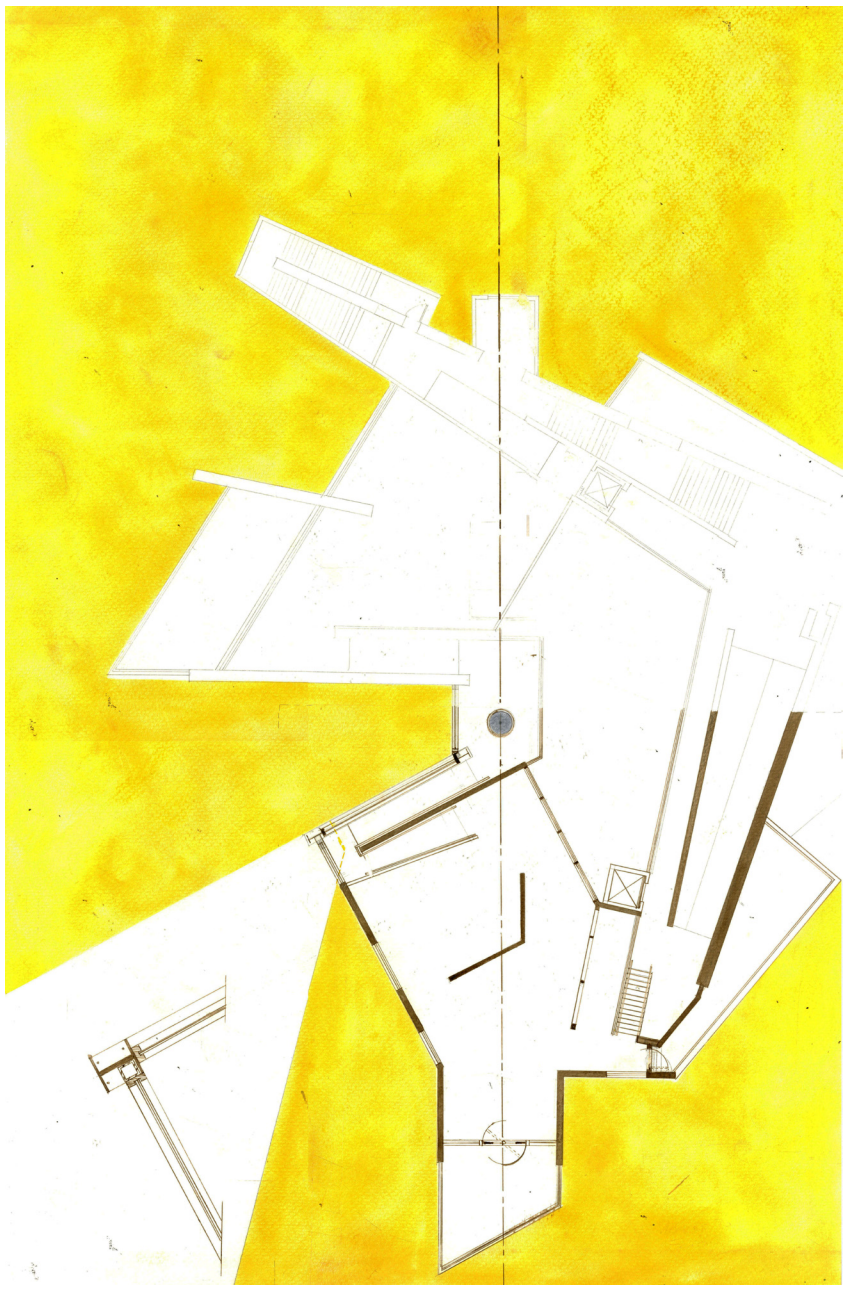
Potomac River Exhibition, *22”x30” Pastels and walnut ink on watercolor paper.*



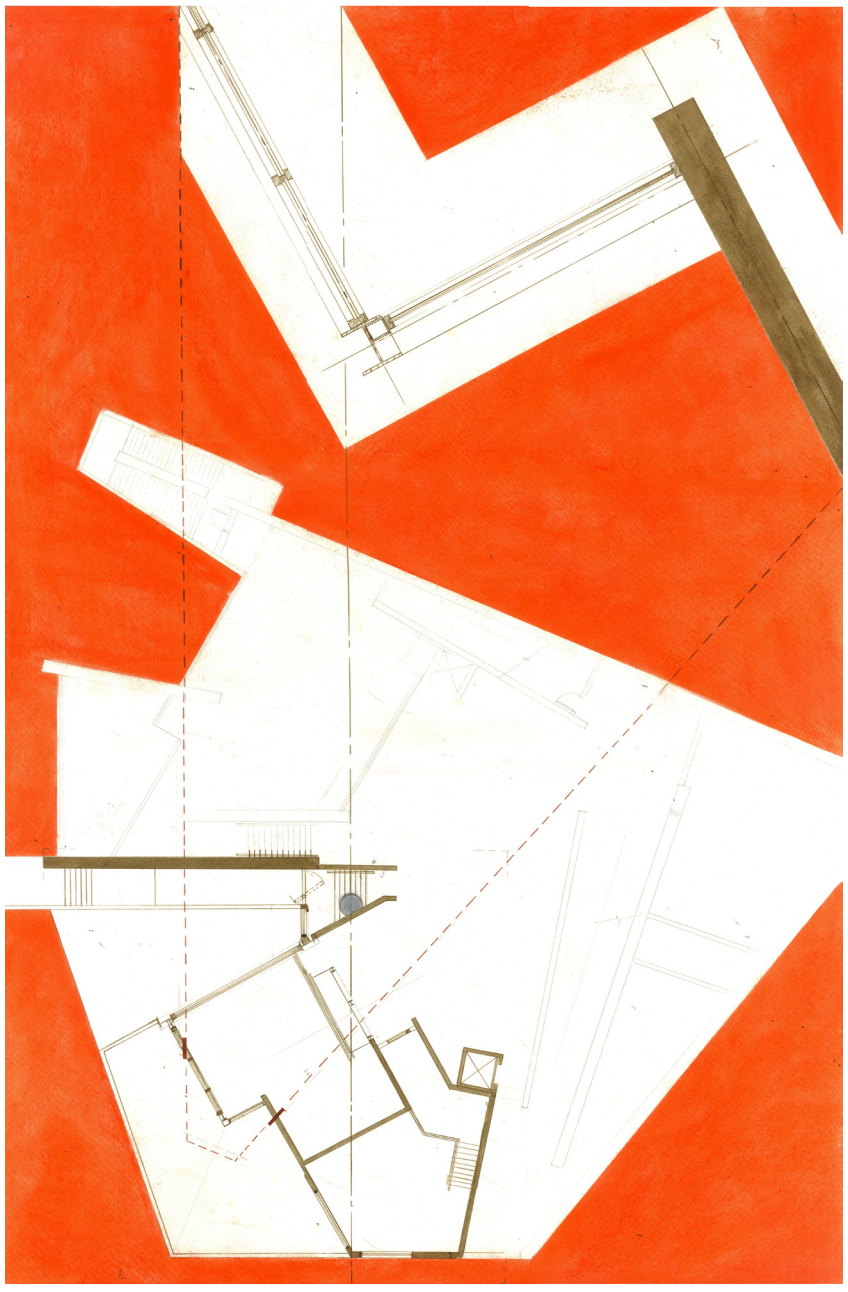
Washington, D.C. Exhibition, *22”x30” Pastels and walnut ink on watercolor paper.*



Main Entrance, *22”x30” Pastels and walnut ink on watercolor paper.*

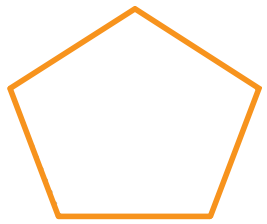


Fort Washington Exhibition, *Pastels and walnut ink on watercolor paper.*



Cafe space, *22”x30” Pastels and walnut ink on watercolor paper.*

INTENTIONALLY LEFT BLANK



05 | DESIGN PROCESS

Schematics Sketches and Models

Geometric Contemplation

The visitor center is a dialogue between the invisible lines of the anatomical parts of Fort Washington and the geometry of the construction of a pentagon. In my research, I learned that forts generally begin with two types of geometric shapes, a square or pentagon, before finally becoming customized to a site (Mahan 14). In Fort Washington's design, I theorize that its design originated from a pentagon which was then cut in half due to its location abutting a steep ridge. To reflect the fort I used the same principles to conceive the origins of the visitor center by beginning with the construction of a pentagon and then folding it in half and customizing it to the site's topography.

The bottom center point of pentagon is the location where the line of defense for the Northwest bastion and the redan's line of gorge intersect. I chose to begin constructing the pentagon by utilizing a circle with the axis aligned with the National Monument in Washington, D.C. and south to the main entrance of the Fort. Throughout my thesis the angle of 60 continued to appear so I found it fitting to create the radius of the circle to 60 feet doubling to 120' center width of the pentagon. I then folded the pentagon at its navel to give way to the plan of the building and located my spaces accordingly to my taste drawing (p 45).

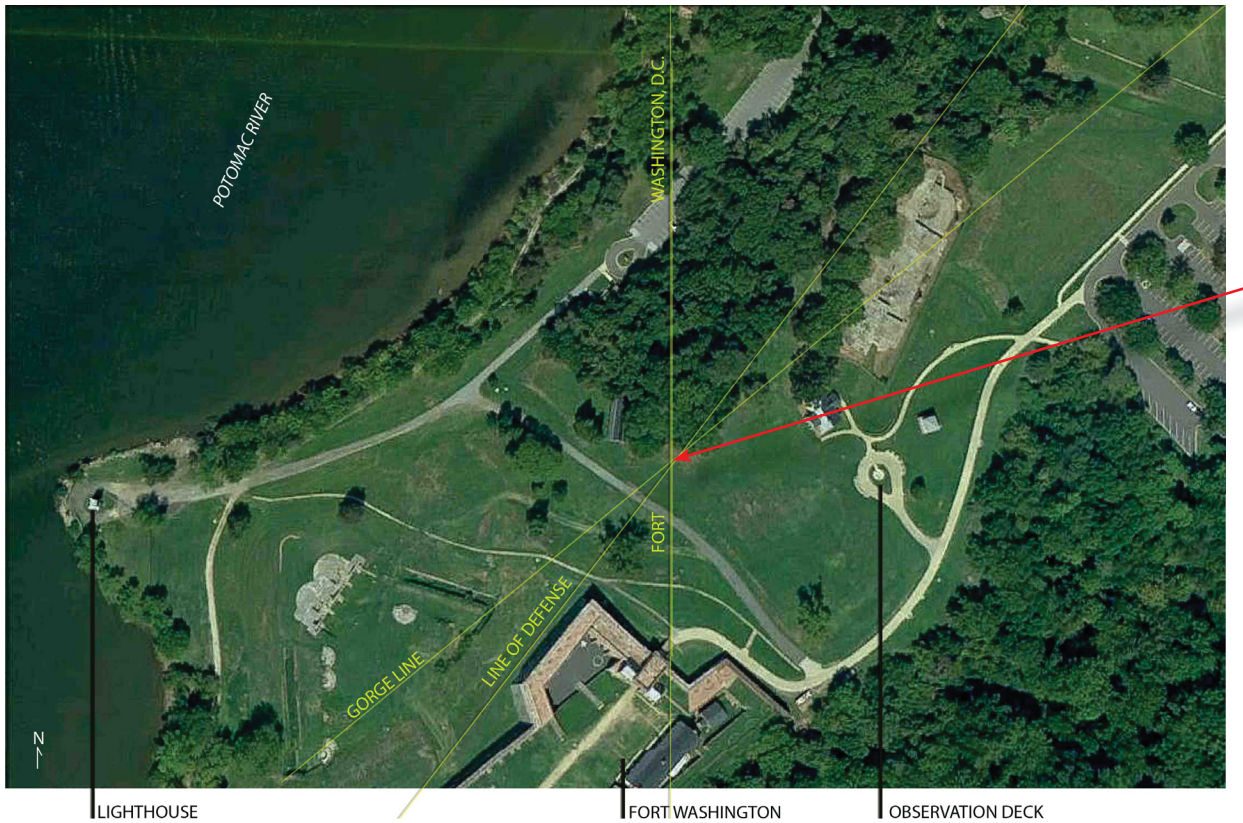
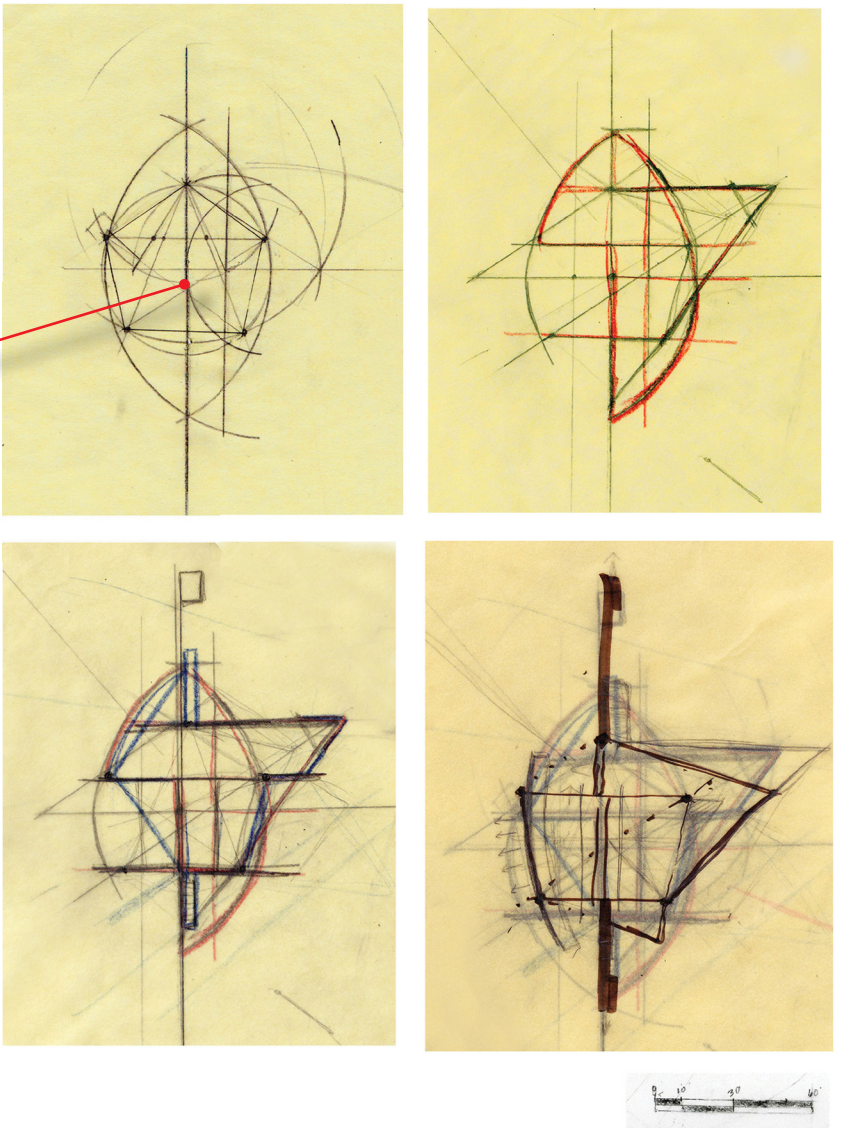
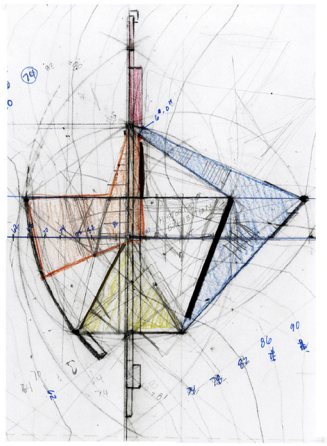
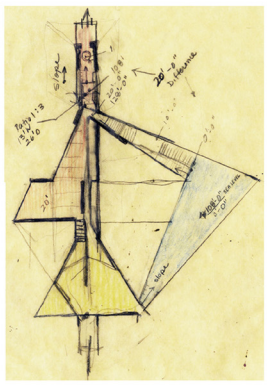


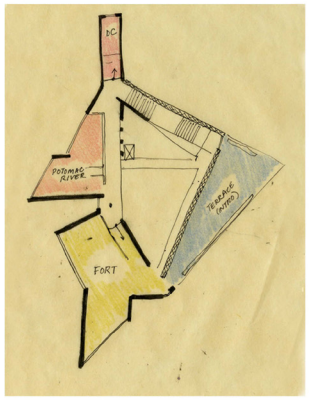
Figure 25. Autodesk Revit solar radiation analysis. Adaptation (Microsoft).

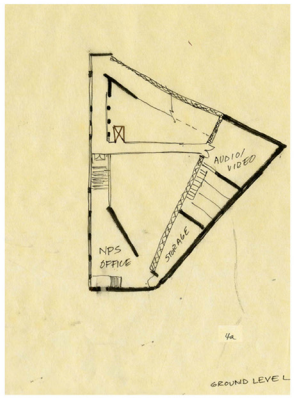


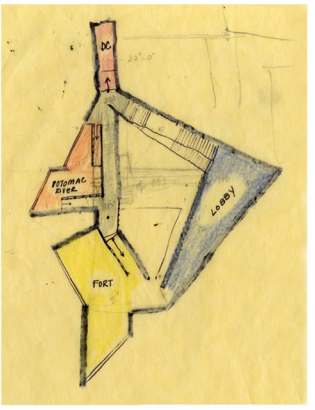
Process Sketches

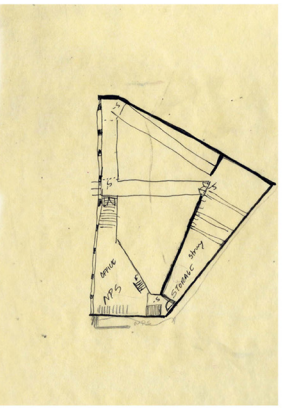


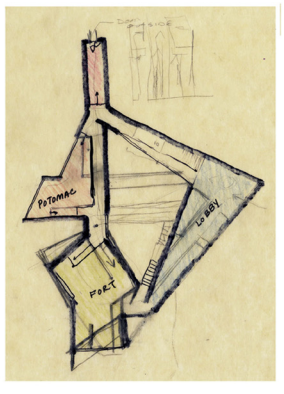


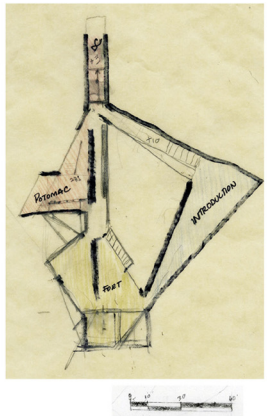


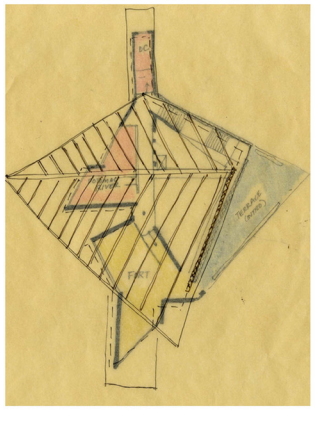


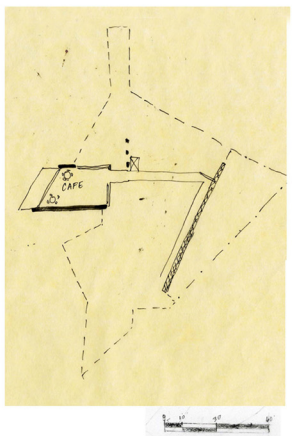


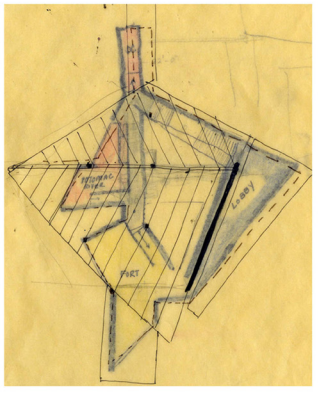


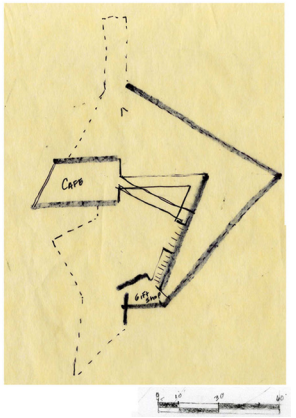




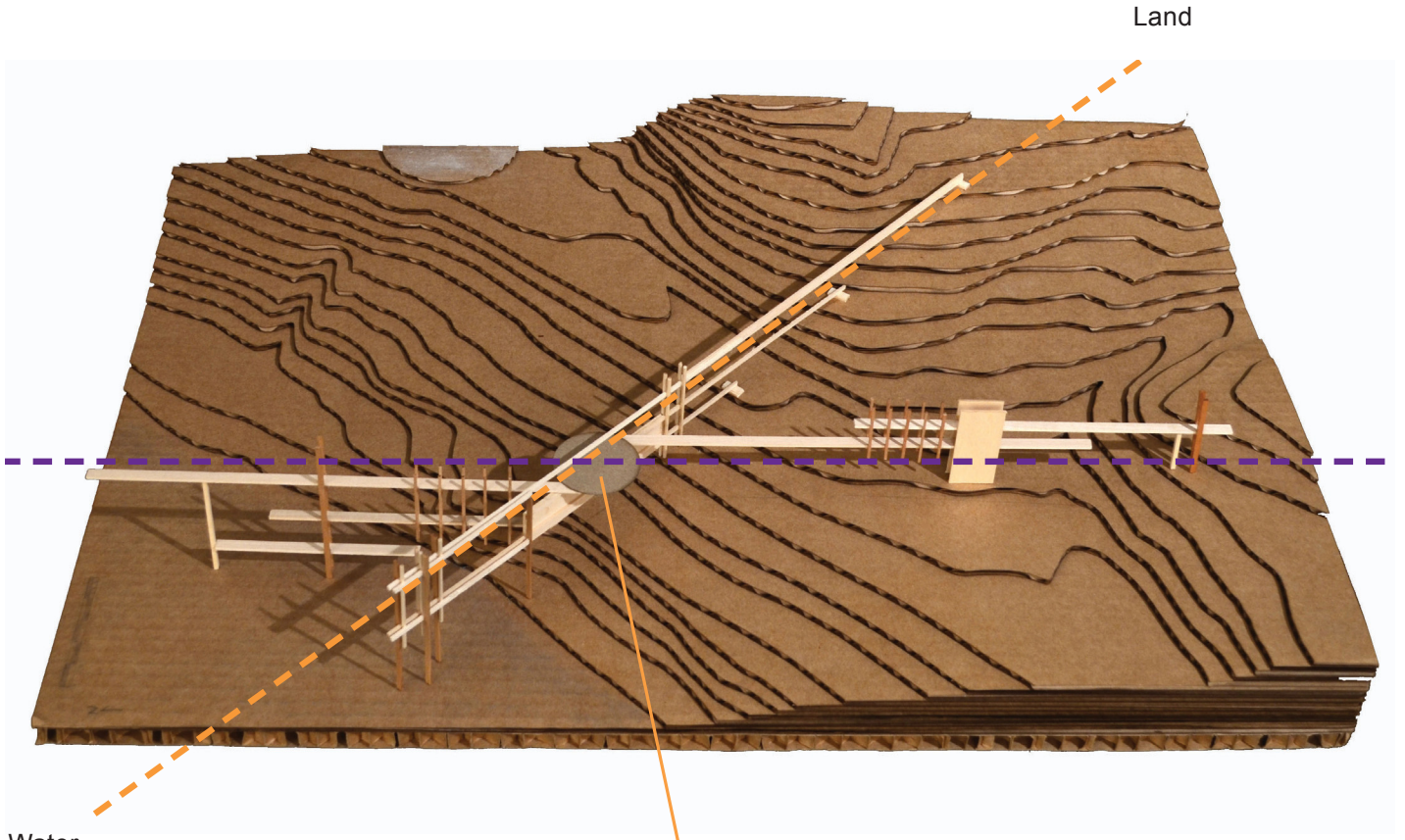


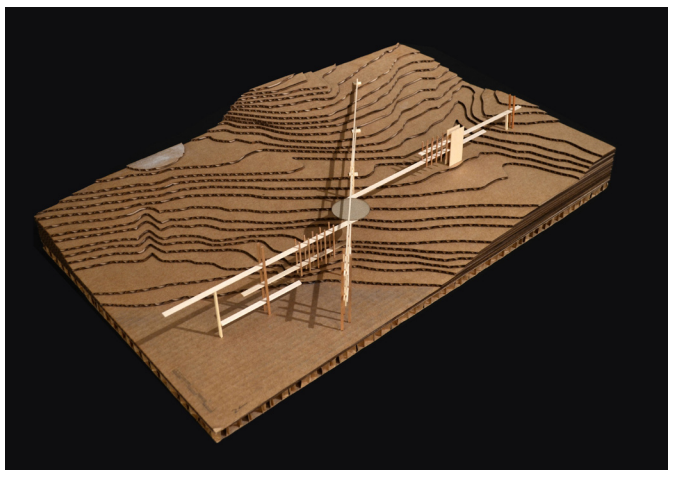


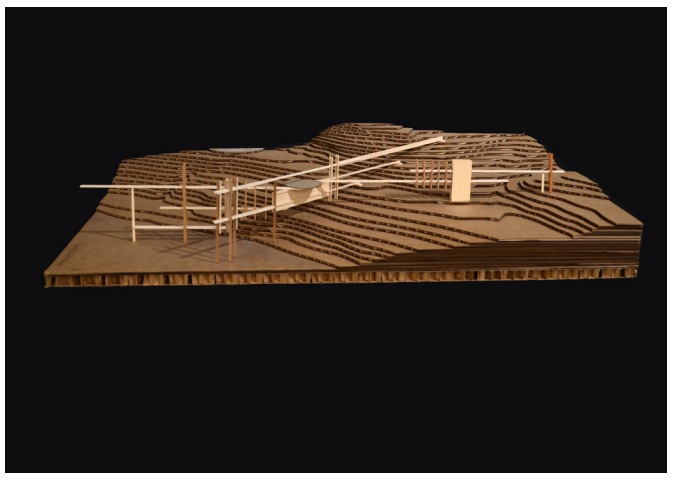




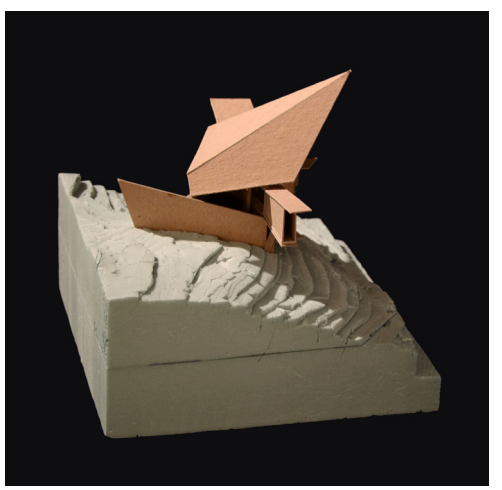
Conceptual Site Model

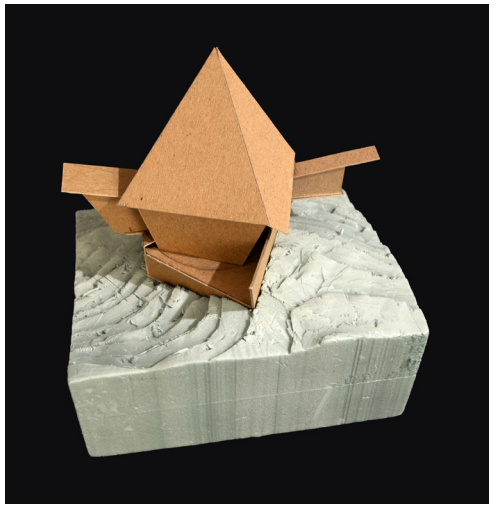






Conceptual Model and Site Design





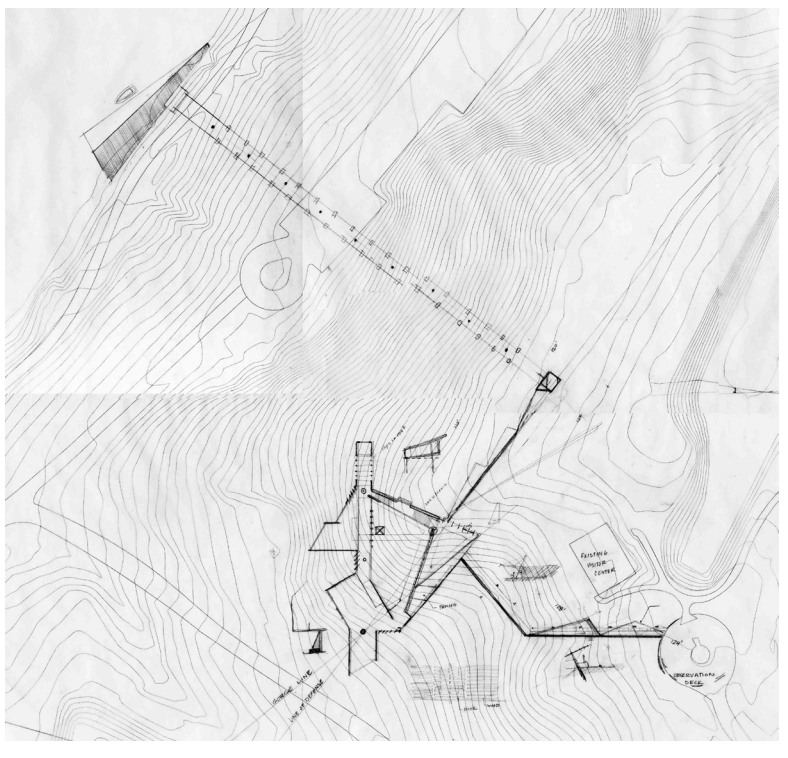
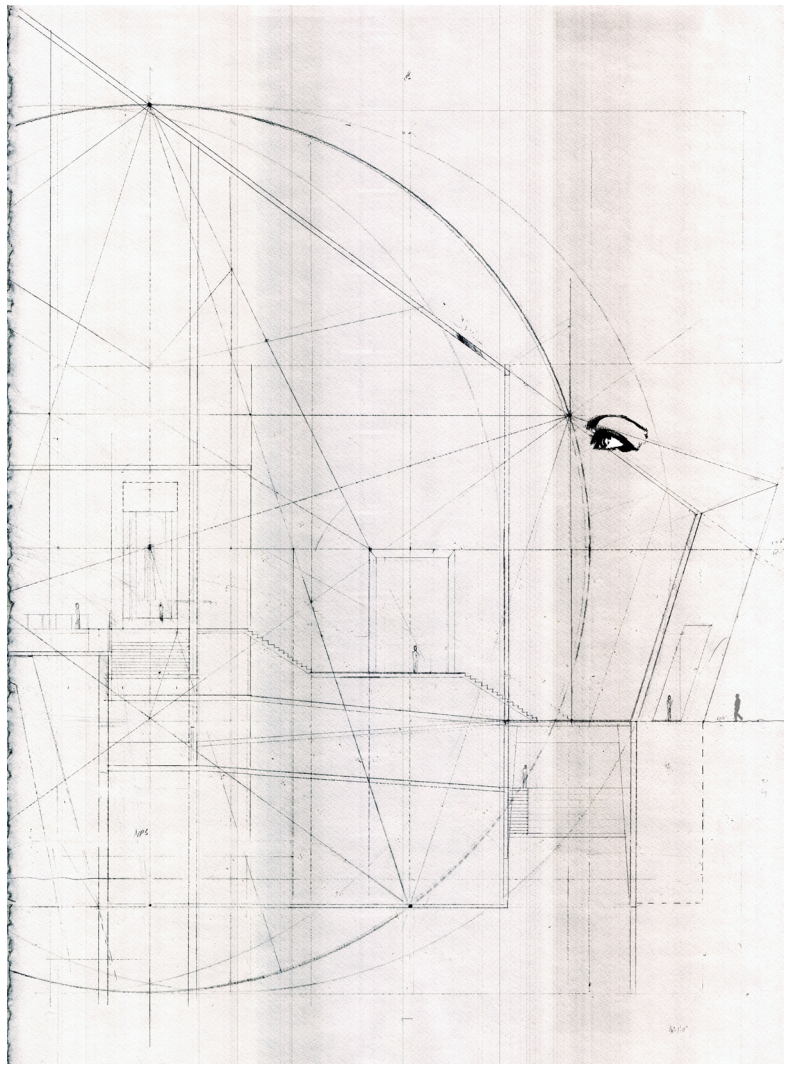


Figure 25. Fort Washington thesis site. Adaptation (Google).

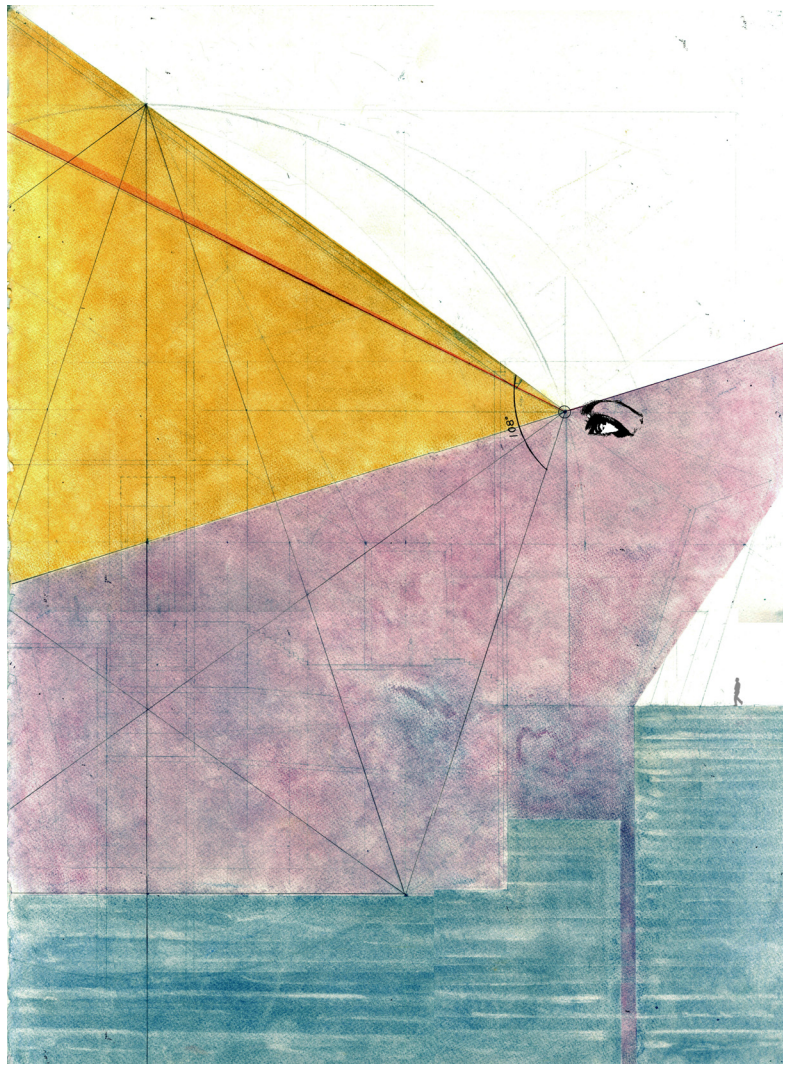
Section Drawing

This section drawing allowed me to make discoveries in profile. Using the same dimensions, I tilted the pentagon vertically. Both shapes are joined at its common center point. I explored using the angles, much like the principles used to consider cannon trajectories, to decide geometrical configurations and locations of walls and the angle of the roof.

I took several ideas from this drawing. First, I made sure that the center point of the building was left as an open space. This included creating a skylight, the only opening in my “shield,” in order to let natural light illuminate this space. Next, I used the ideas of “line of sight” and “lines of fire” to create a building that expanded out to create distinct vistas. 28, 30, 60, 78, and 108 degrees kept appearing in my research so I made sure to include their symbolic significance in my conceptual design. Lastly, I added colors to the drawing in order to distinguish materiality within the building design.

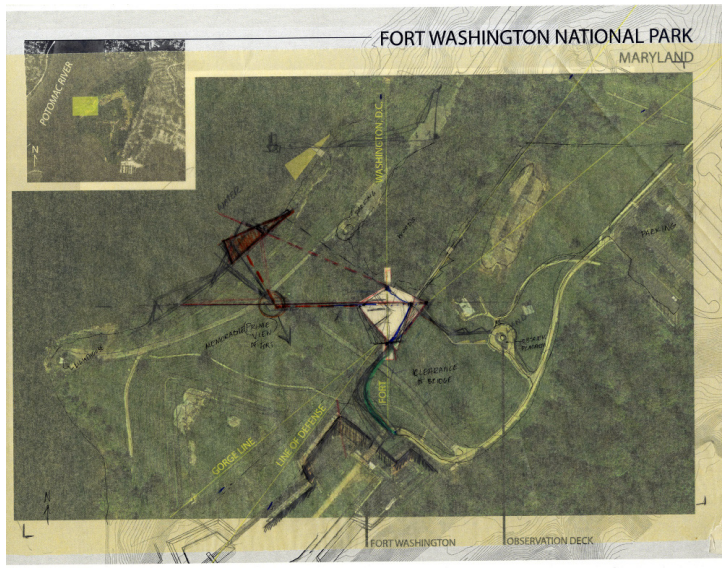


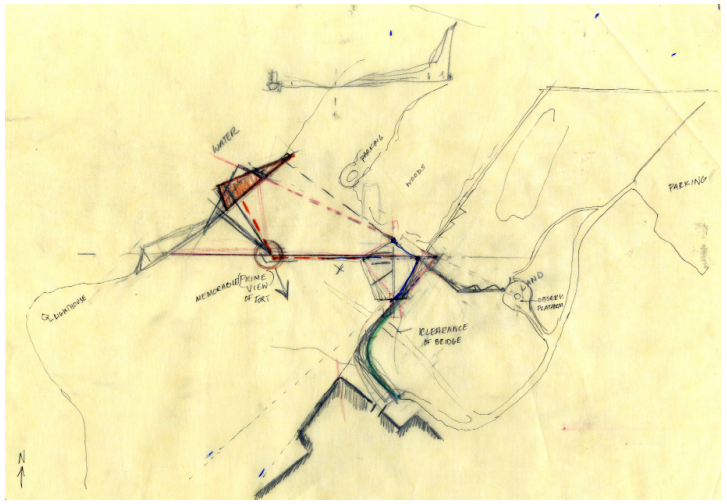
Conceptual Section, 22”x30” *Graphite medium on watercolor paper.*

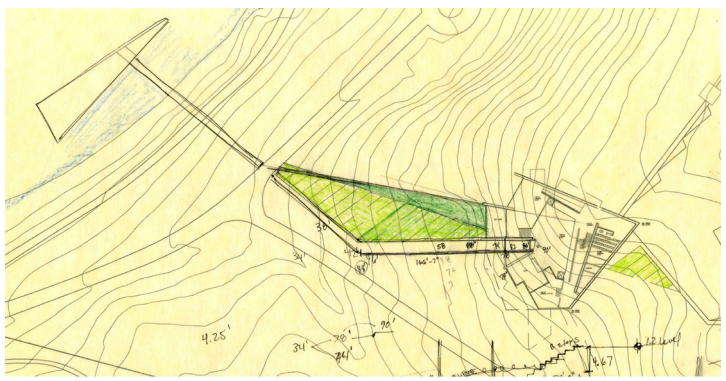


Conceptual Section, 22”x30” Graphite, *pastels, india and walnut ink on watercolor paper.*

Redesign Site and Solar Building Analysis







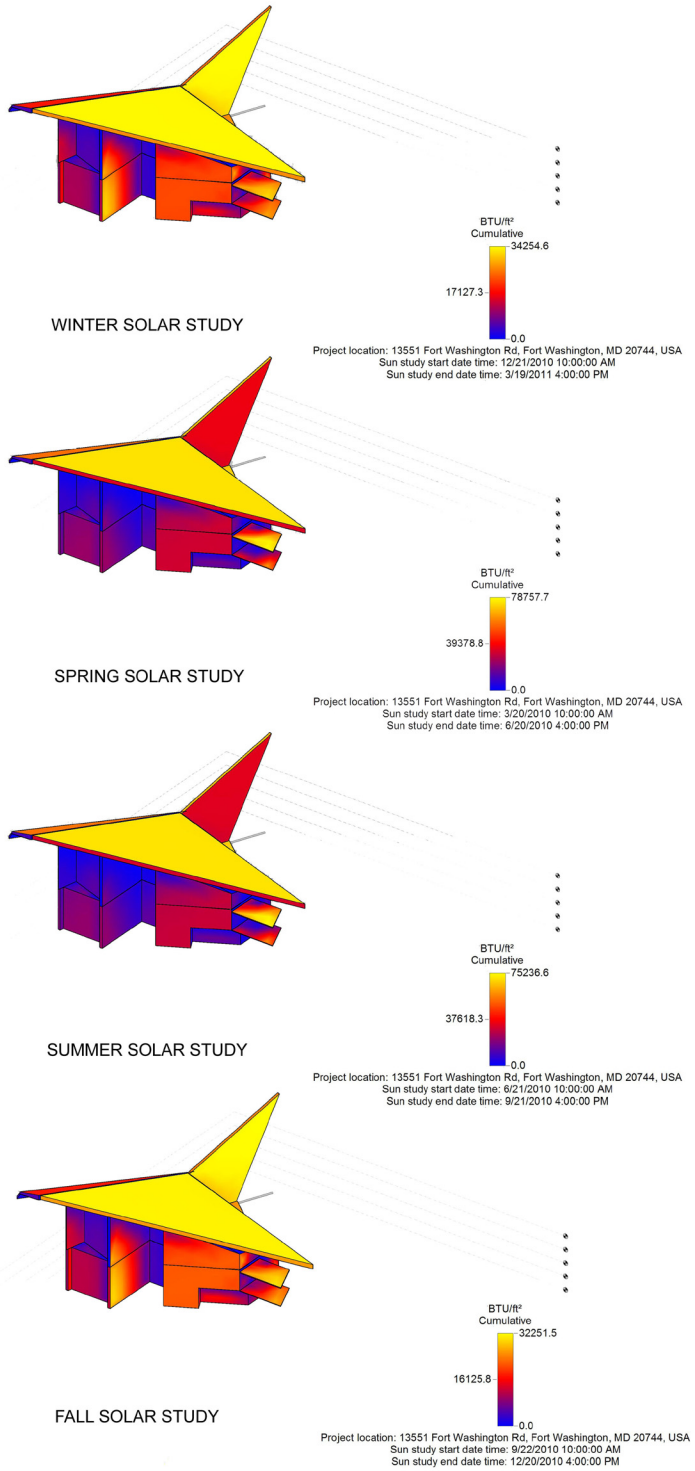
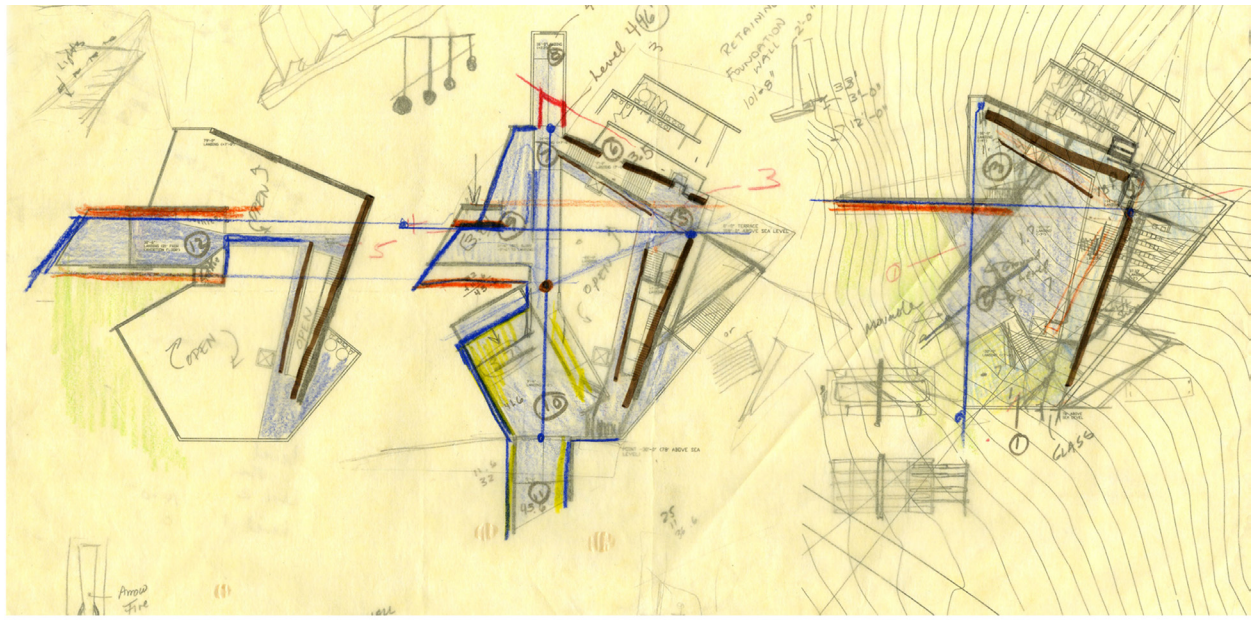
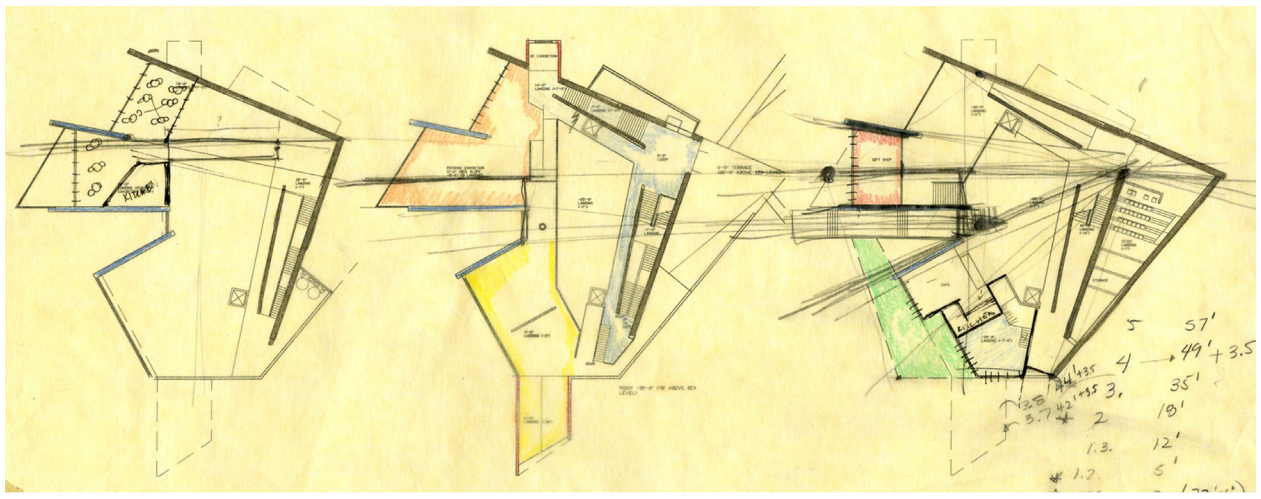
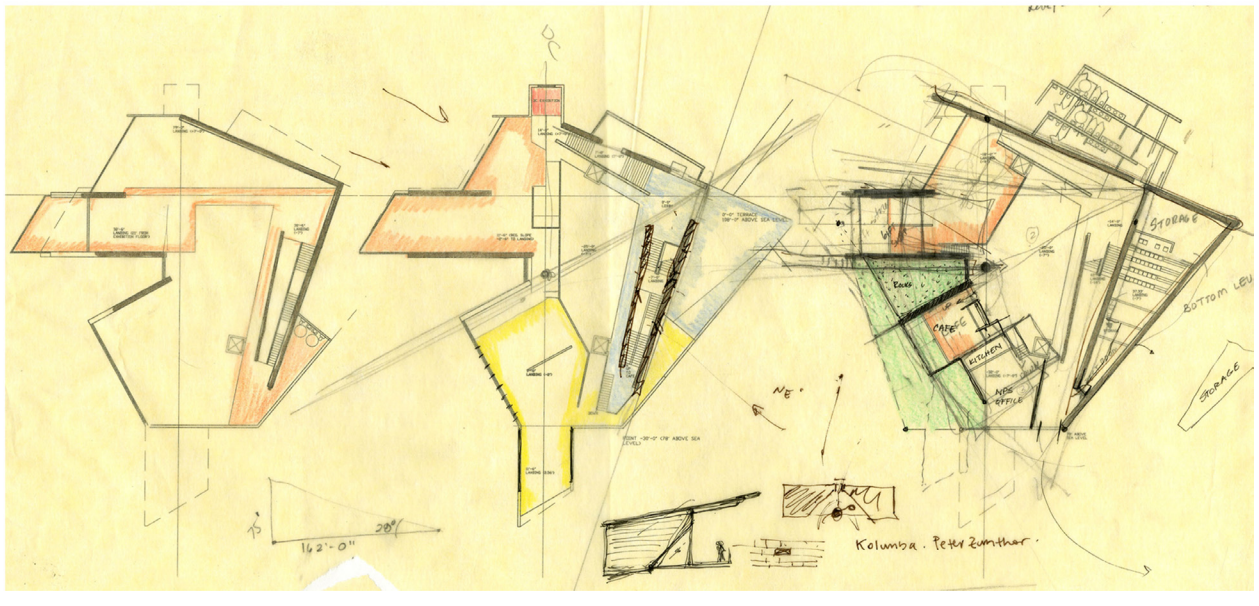


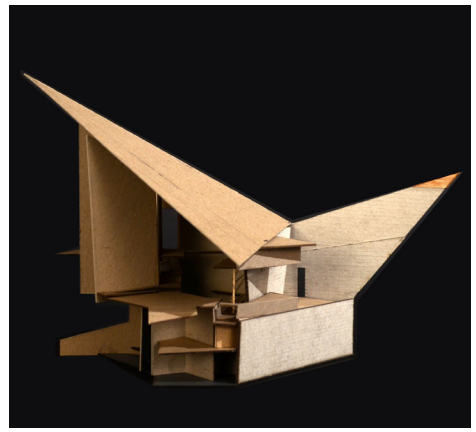
Figure 26. Autodesk Revit solar radiation analysis.

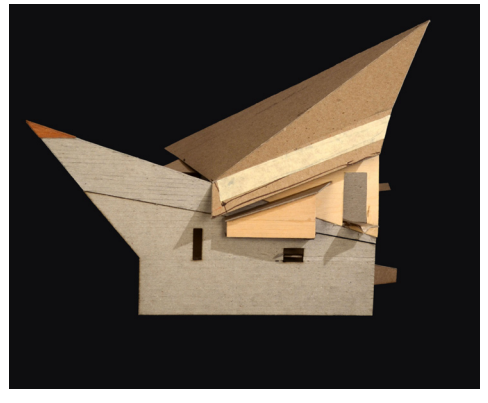
Figure 27. Fort Washington, MD thesis site. Adaptation (Google).






Columbia . Peter Zumthor .





INTENTIONALLY LEFT BLANK

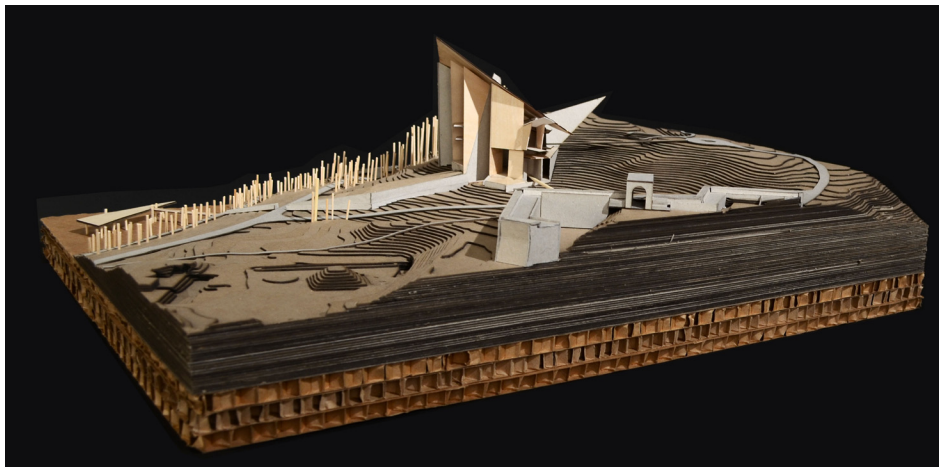
FINAL | VISITOR CENTER DESIGN

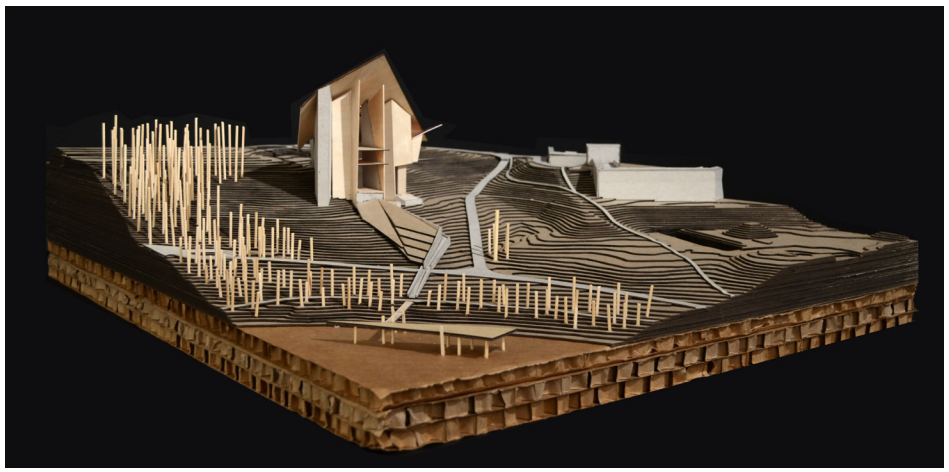
Design Proposal

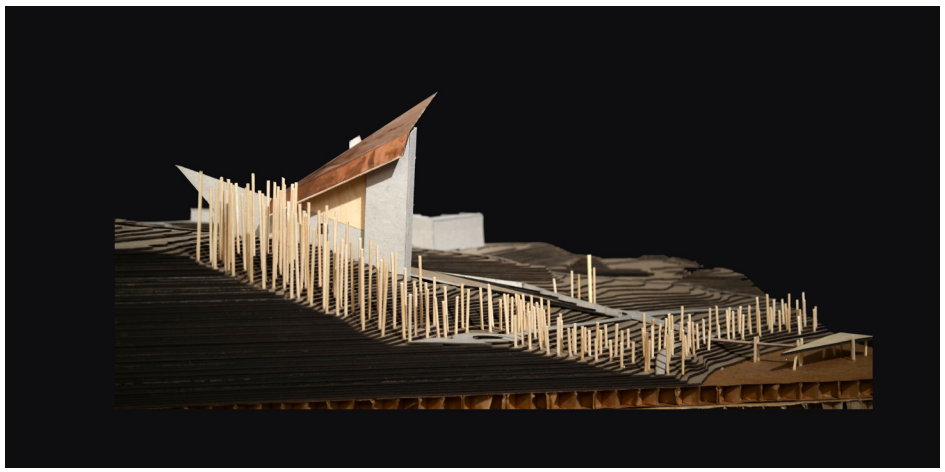
Site Plan

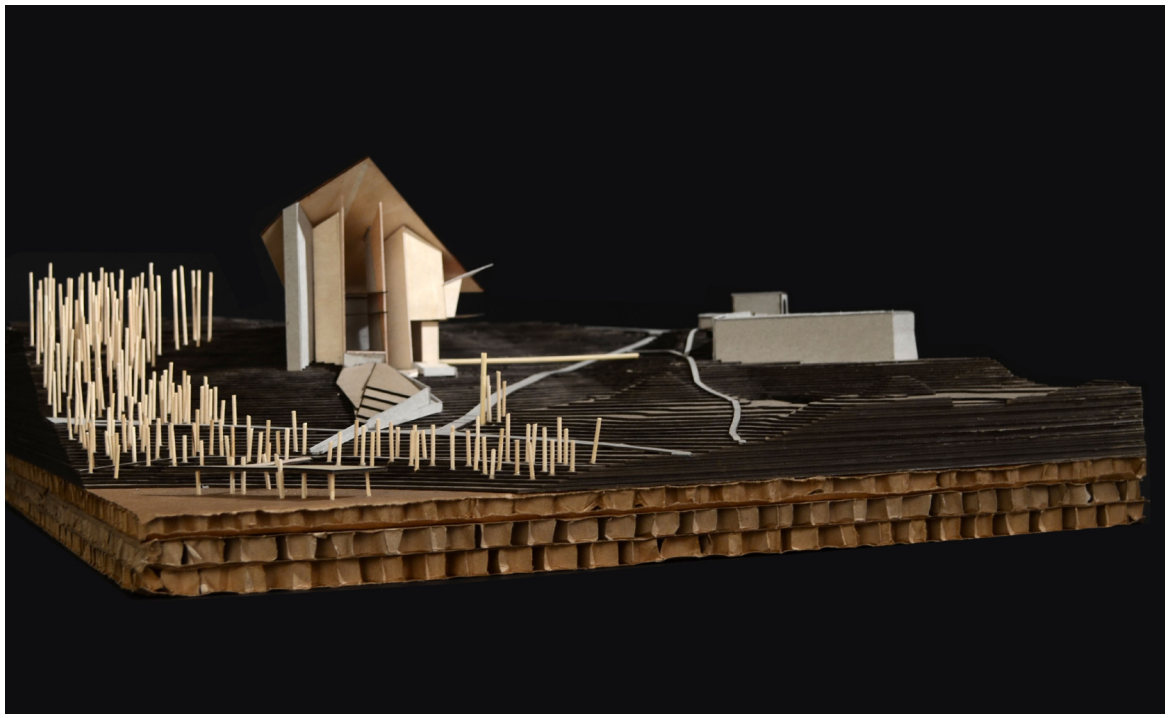
Figure 28. Fort Washington, MD new site plan. Adaptation (Microsoft).

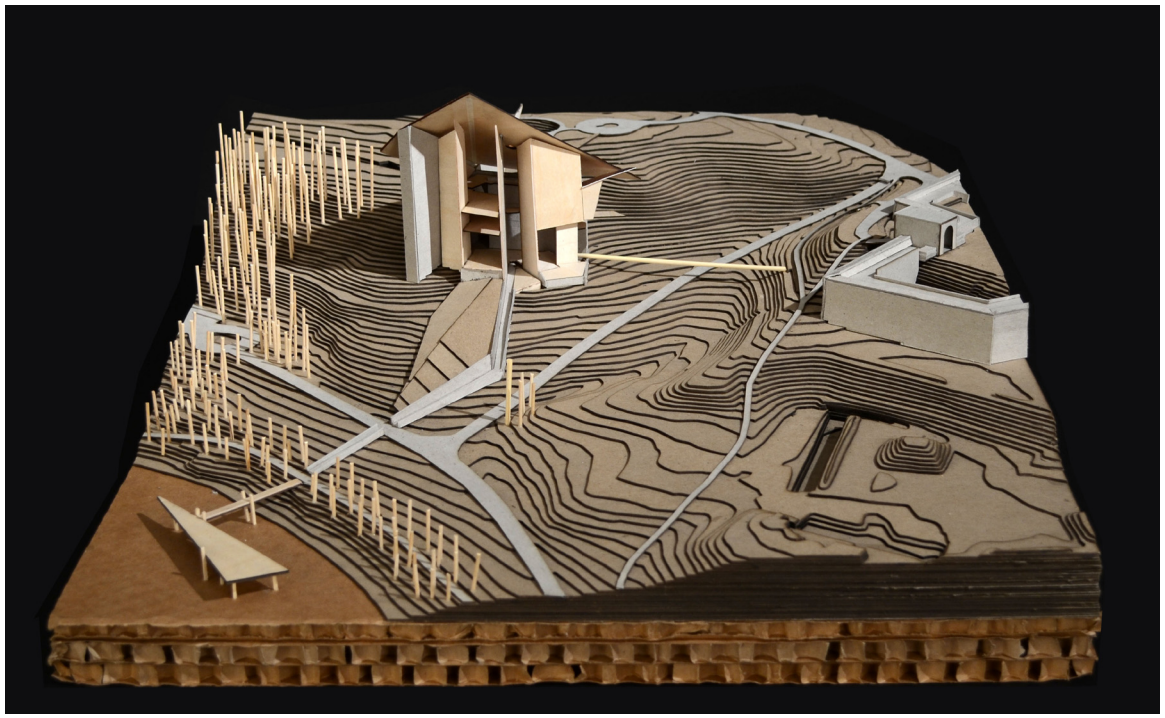
Site Model



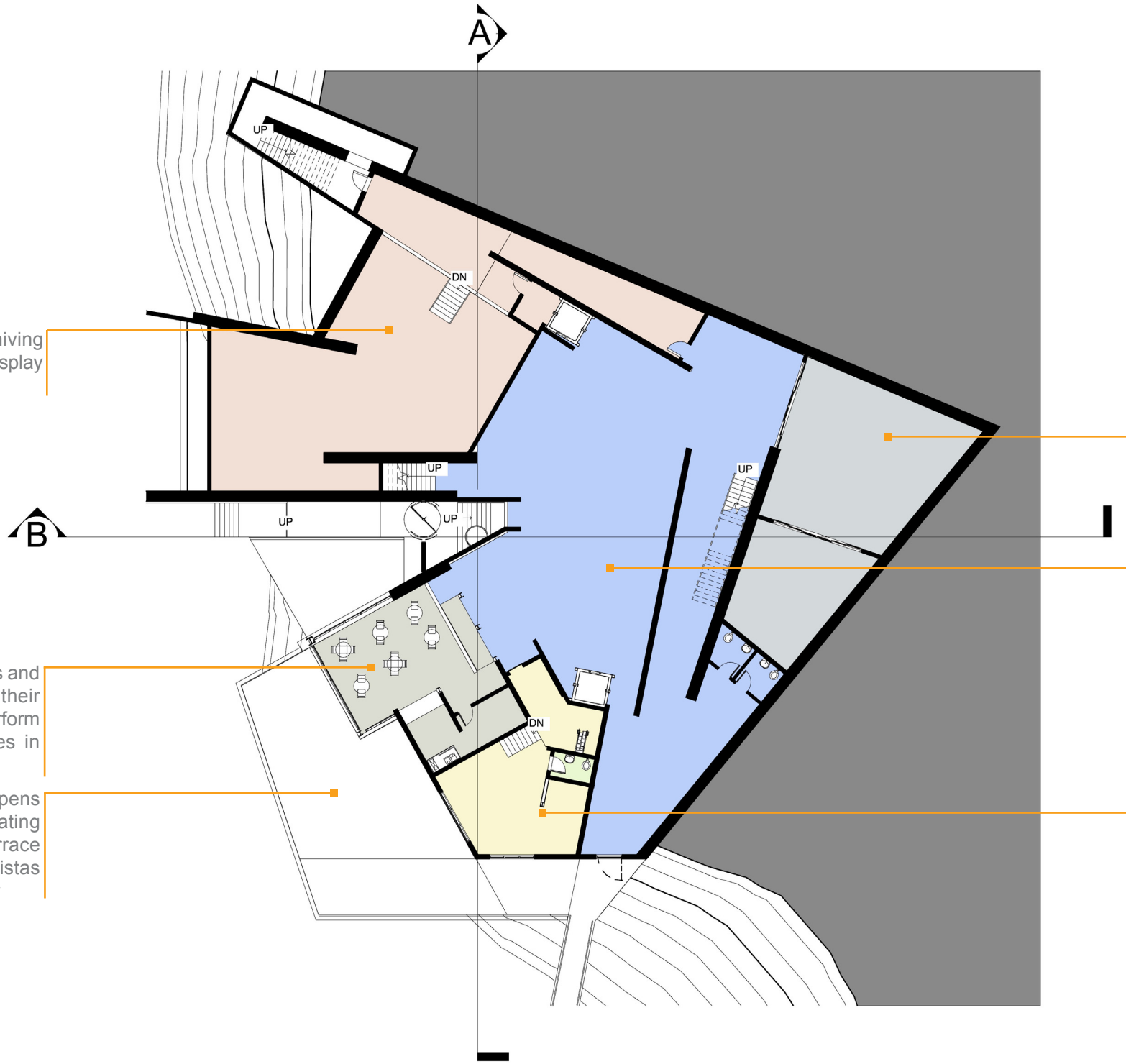








Floor Plans



Storage space for archiving collection and exhibit display items

Future expansion space for storage or exhibition

Bastion ground floor to exhibit historic cannons on barbettes

Cafe to service tourists and local residents after their regular run, walk or perform other outdoor activities in the area

Cafe curtain wall opens connecting interior seating space to outside terrace area highlighting the vistas of the Potomac River

NPS office deliberately in this area of the building to for security reasons and for direct visual of the fort and its grounds

N

GROUND LEVEL

0 30 FT

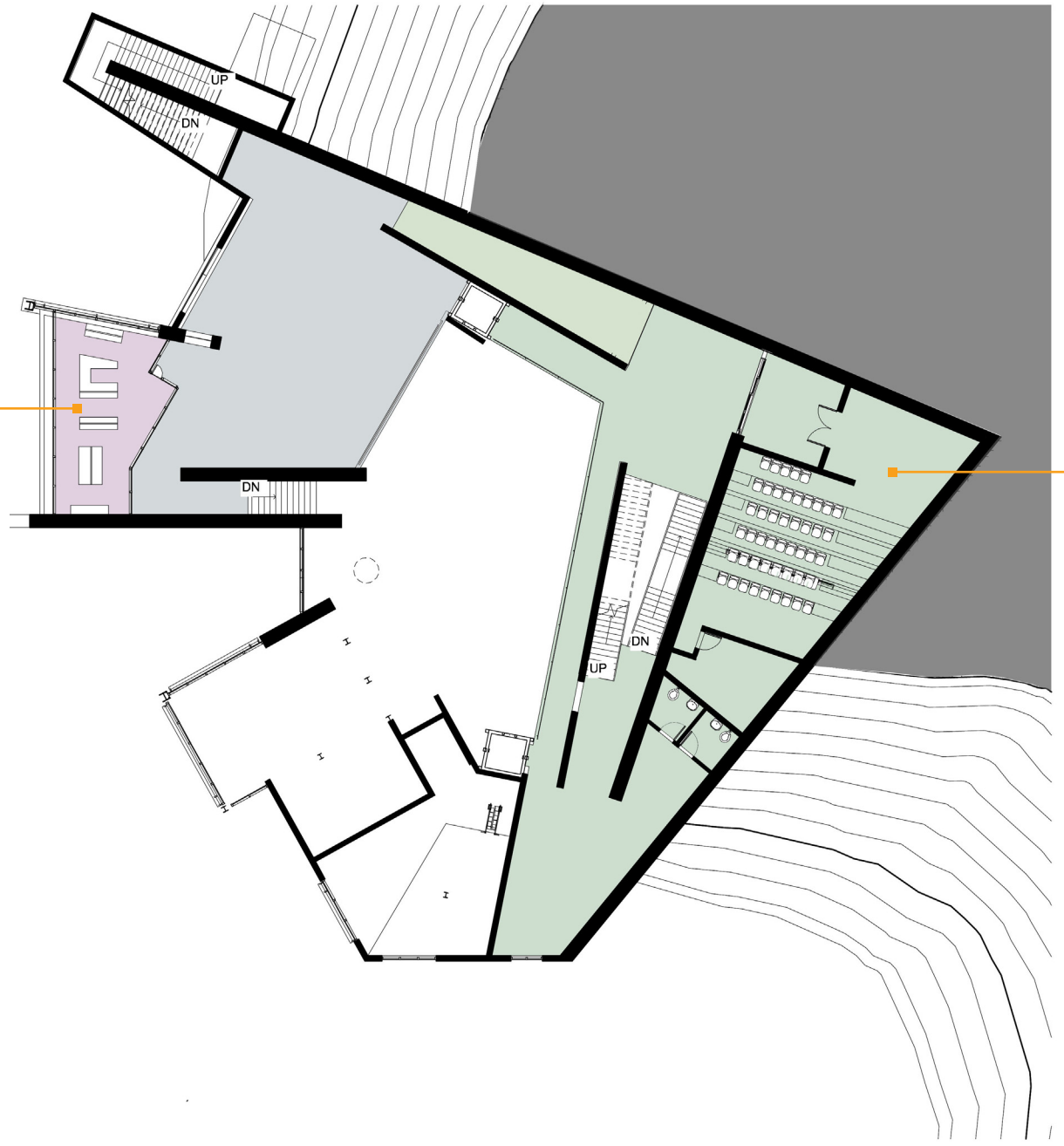
ATRIUM LEVEL

CAFE

NPS OFFICE

STORAGE

Sell merchandise to provide revenue for restoration and self-sustainment



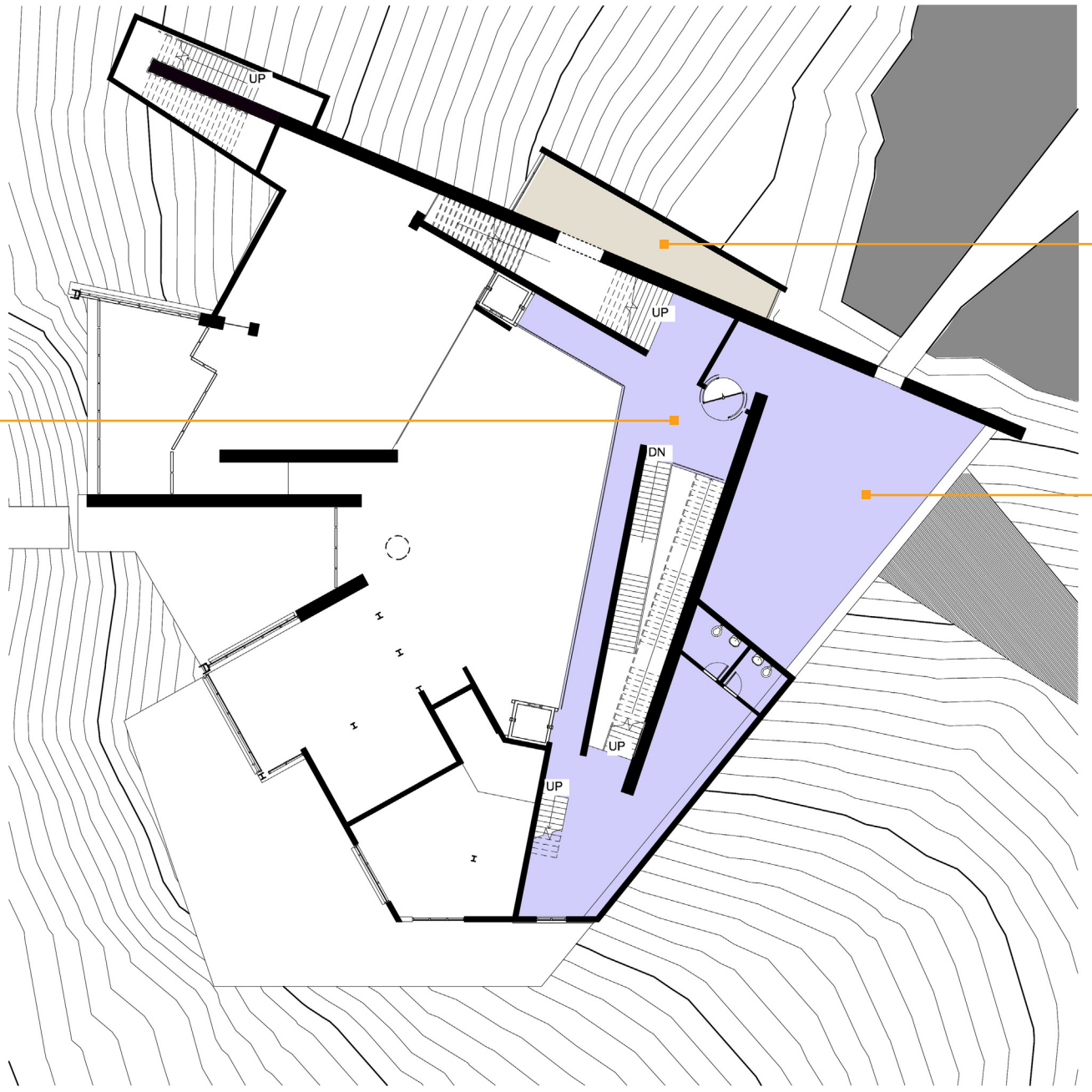
Digital presentation of historic fort. Additionally, enough seating to accommodate local residents for movie night club

N

SECOND LEVEL

0 30 FT

GIFT SHOP
AUDITORIUM
FUTURE USE



General exhibition to familiarize visitor with site before moving on to the other exhibition spaces

Lobby area with information desk

Main terrace mainly for congregation of groups including tour groups

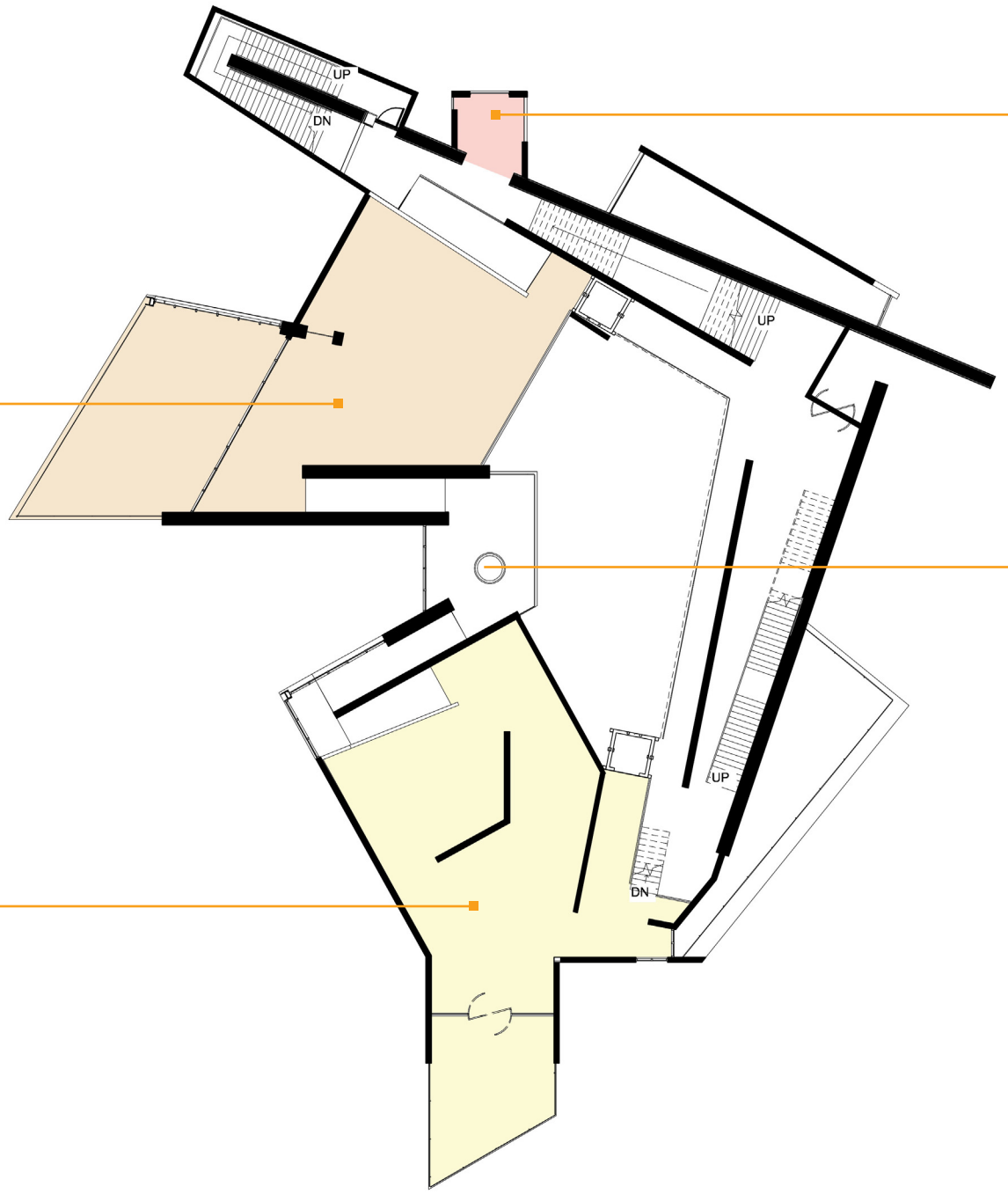
N

THIRD LEVEL

0 30 FT

MAIN ENTRANCE

SITE EXHIBITION



Main focus is framed view of National monument visible from this point.

Exhibition informs visitor of the historic nature and influence of the Potomac River on to the fort

Circular absence symbolizes the point where the vertical and horizontal halved pentagon meet at the navel

Visual direct connection with the fort as visitor transitions through the Fort Exhibition space

N

FOURTH LEVEL

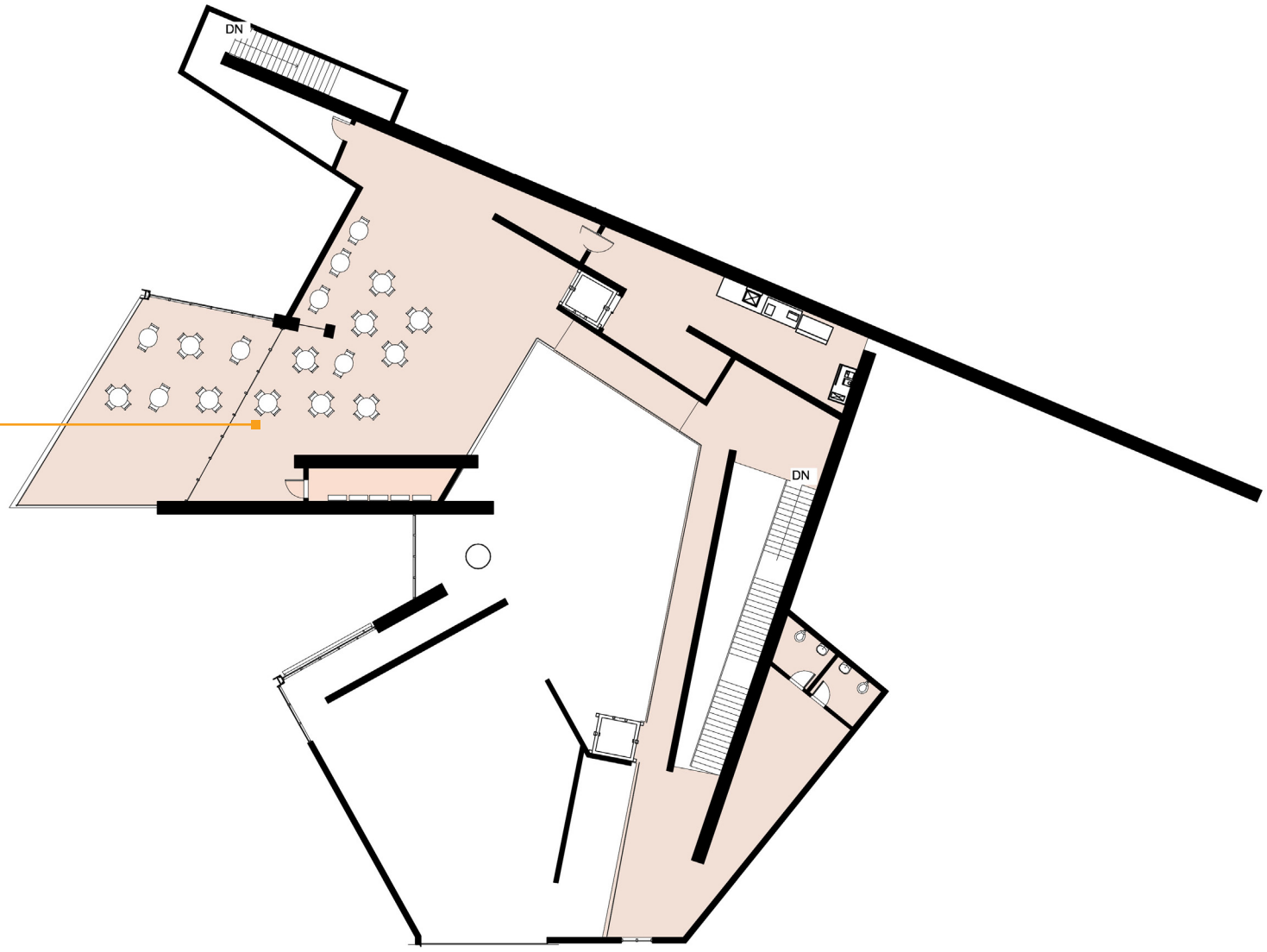
0 30 FT

WASHINGTON DC EXHIBITION

POTOMAC EXHIBITION

FORT EXHIBITION

Additional revenue can be received by promoting a restaurant with exquisite dishes and priceless vistas



RESTAURANT

N

FIFTH LEVEL

0 30 FT

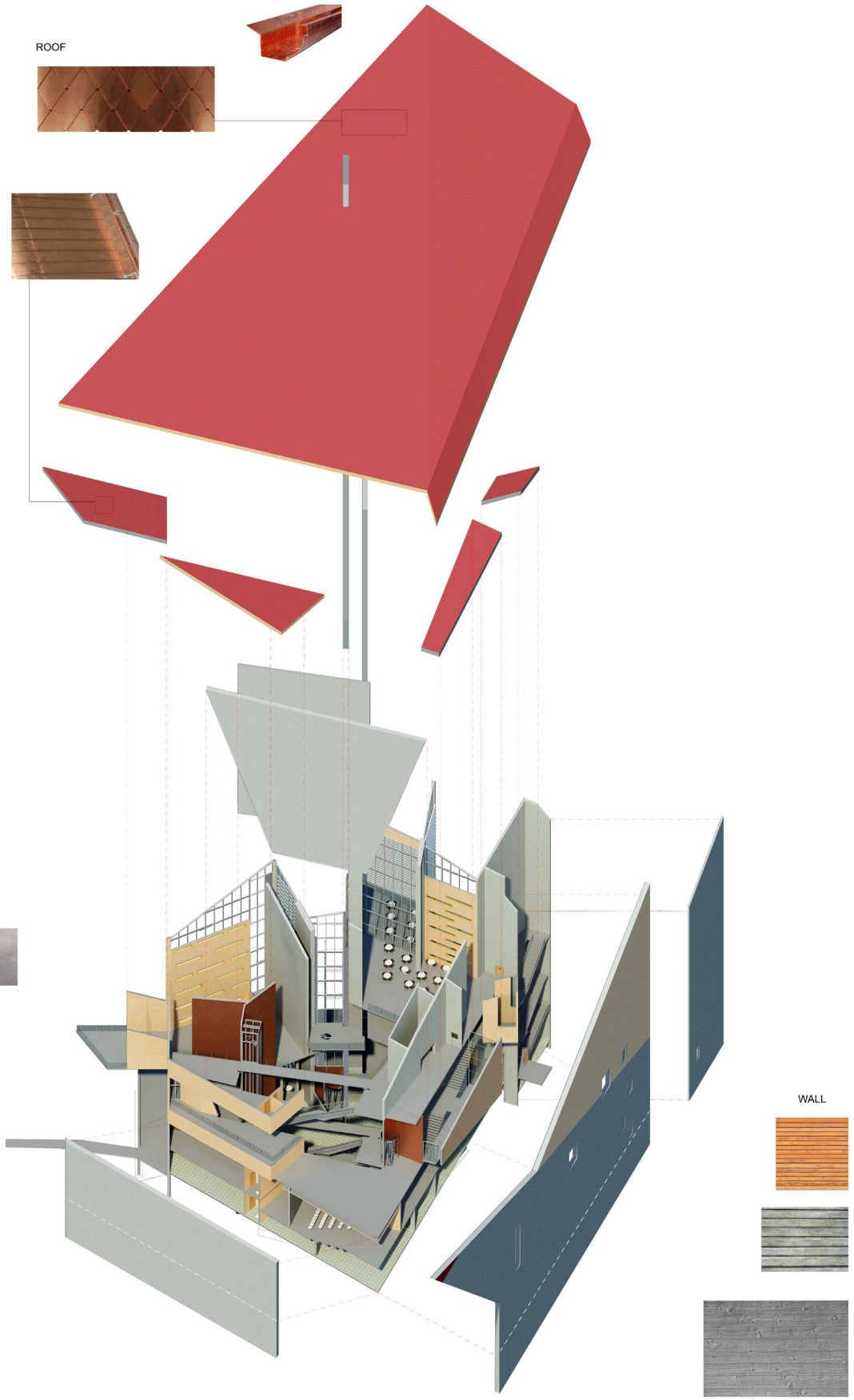
Building Materials

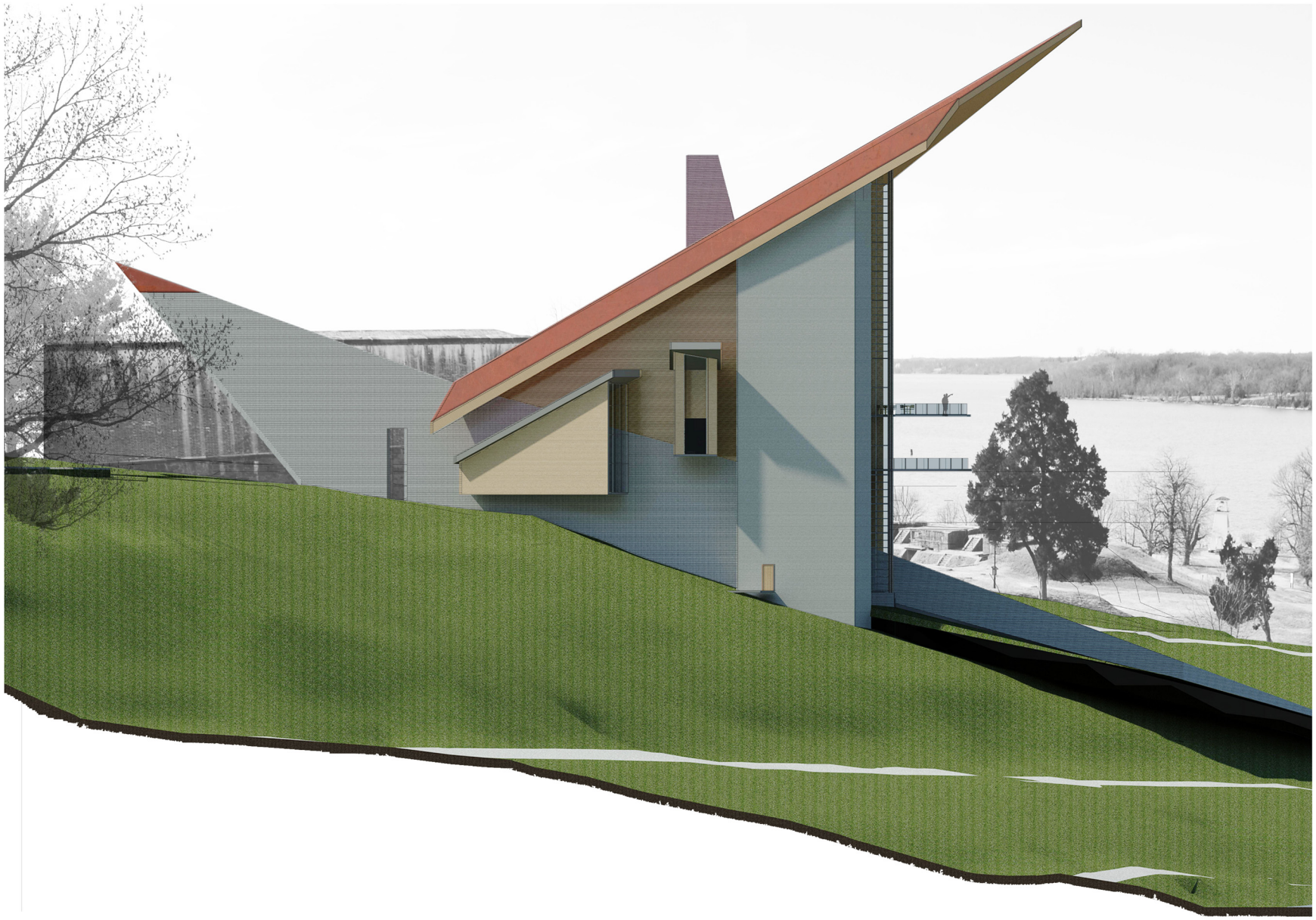
The fort's material and construction techniques are incredible, but I was careful not to replicate it in my design. Instead, I was inspried by the fortified wall construction technique of stacking stones and bricks emphasizing horizontality within the material. The materials I used throughout the building reflect the current times. In particular, there are three retaining walls which use a conventional form-work, two are adjacent to each other and closest inland supporting a large section of the earth. The third is the center wall arranged east and west supporting a large portion of the roof structure. These major retaining walls will be cast-in-place concrete with horizontal pattern left behind by the removal of the wood boards used for the form-work. Any other walls in the design will be cast-in-place concrete, but instead of a horizontal pattern with wood grain texture, they have horizontal reveals with a smooth finish reflecting the current times.

The main roof would be made of copper with a diamond-shaped shingled pattern symbolizing the interlocking shields technique once used in ancient warfare.

The walls made of wood also have a horizontal pattern as a compliment to the cast-in-place concrete in order to bring warmth to the building design.

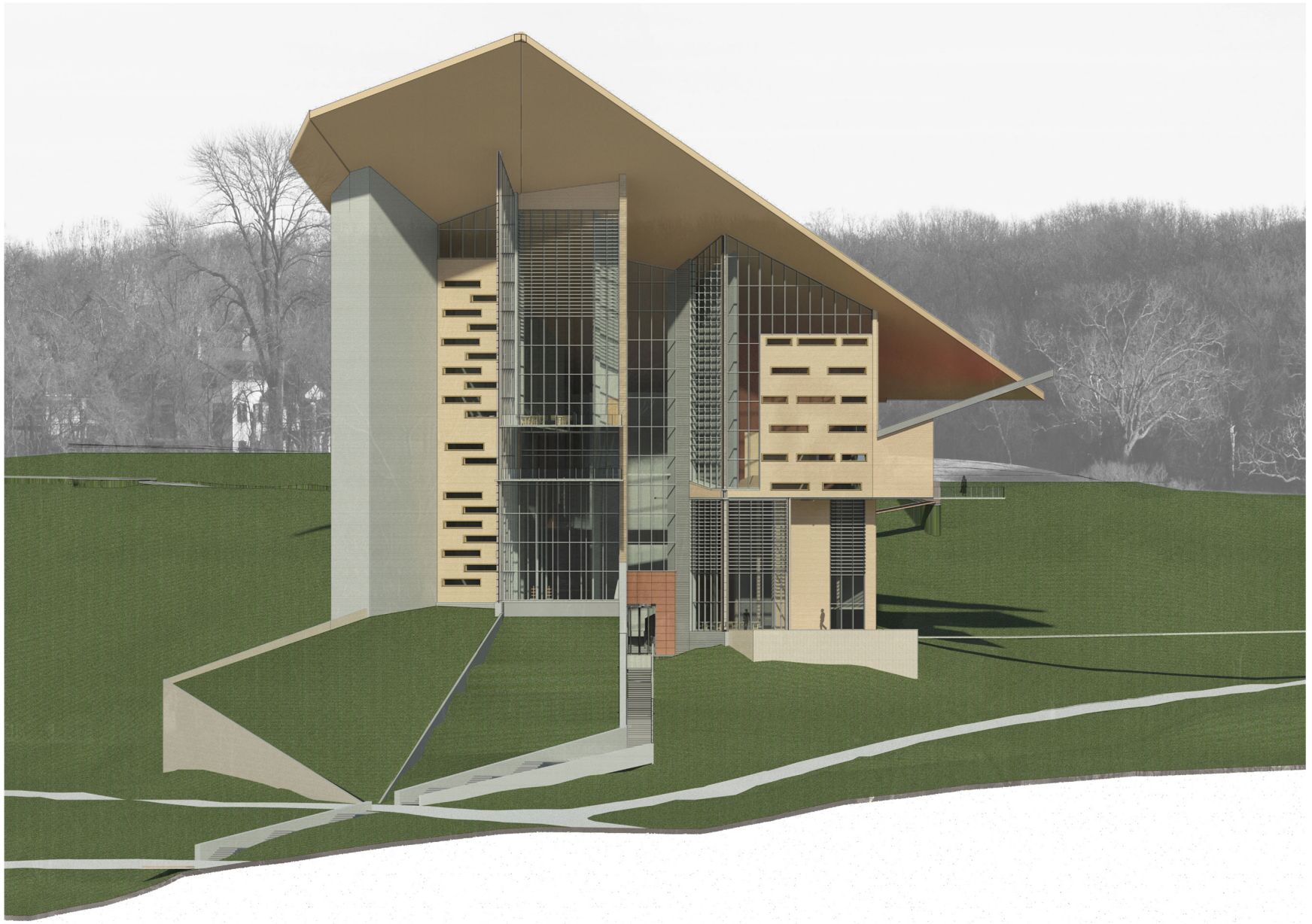
As the building moves towards the water and away from the excavated earth, the materials become lighter and glass is introduced.





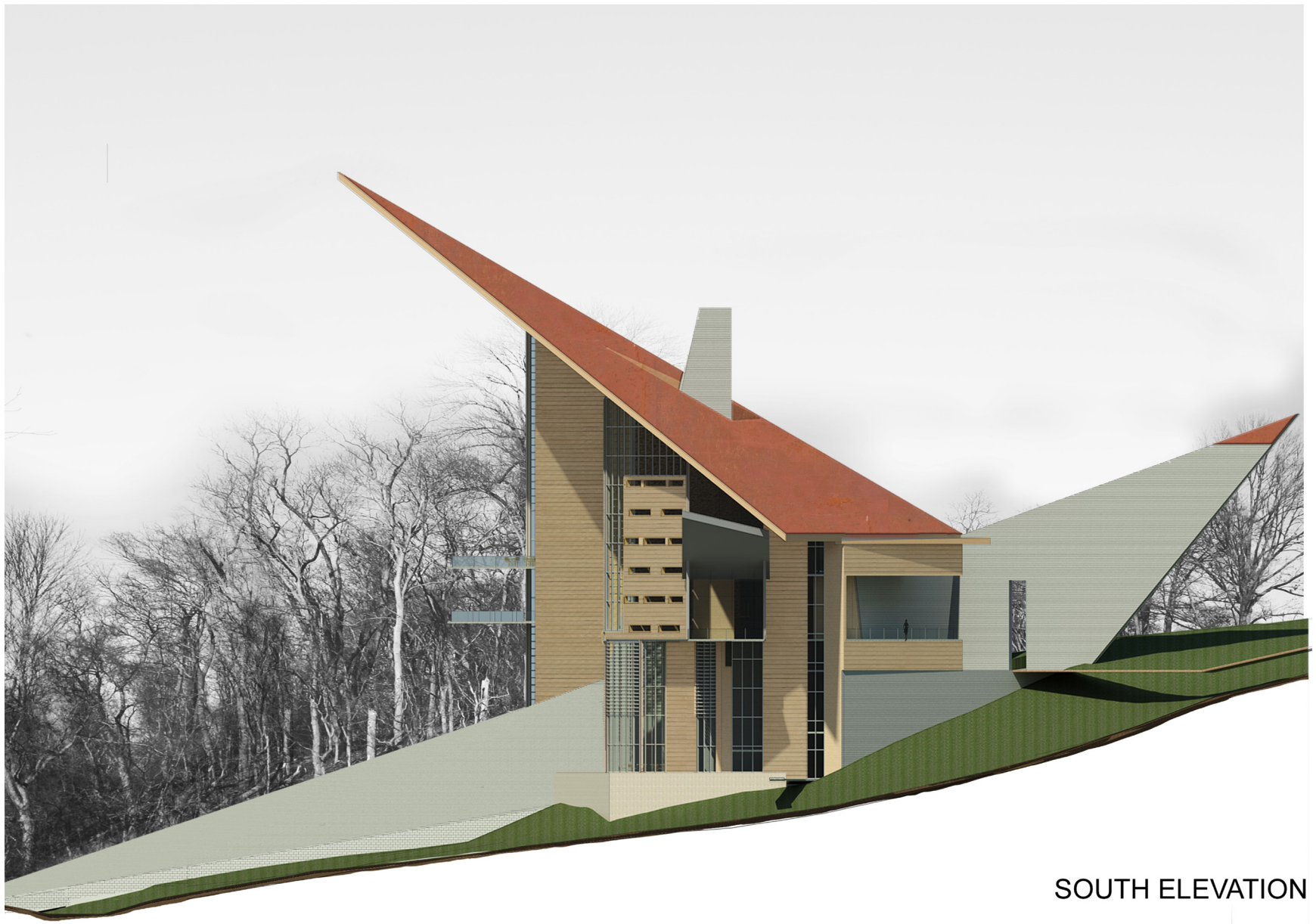
NORTH ELEVATION

0 30 FT



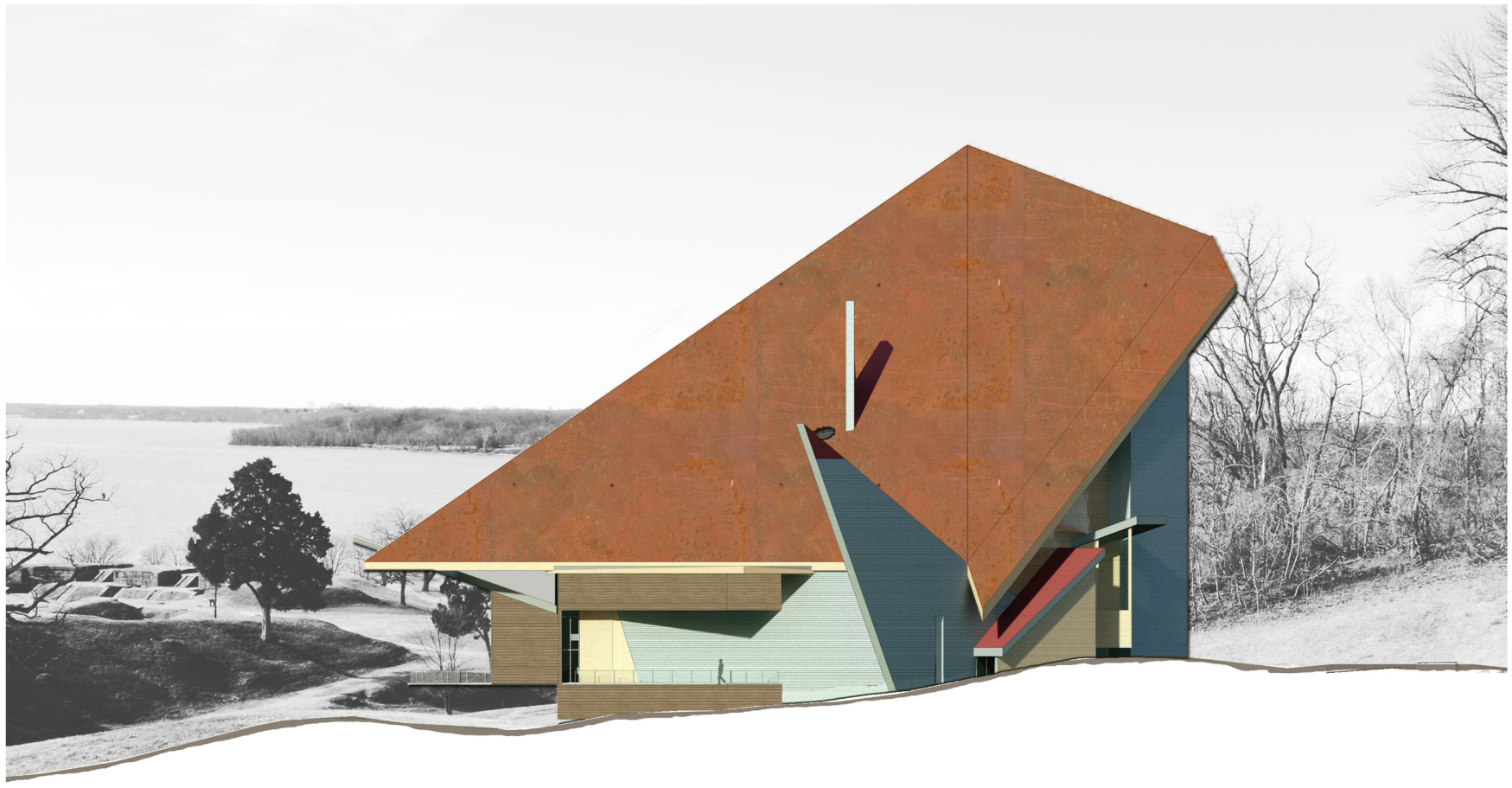
WEST ELEVATION

0 30 FT



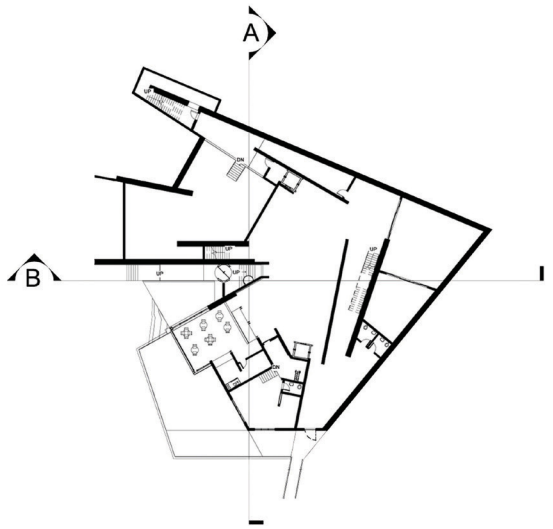
SOUTH ELEVATION

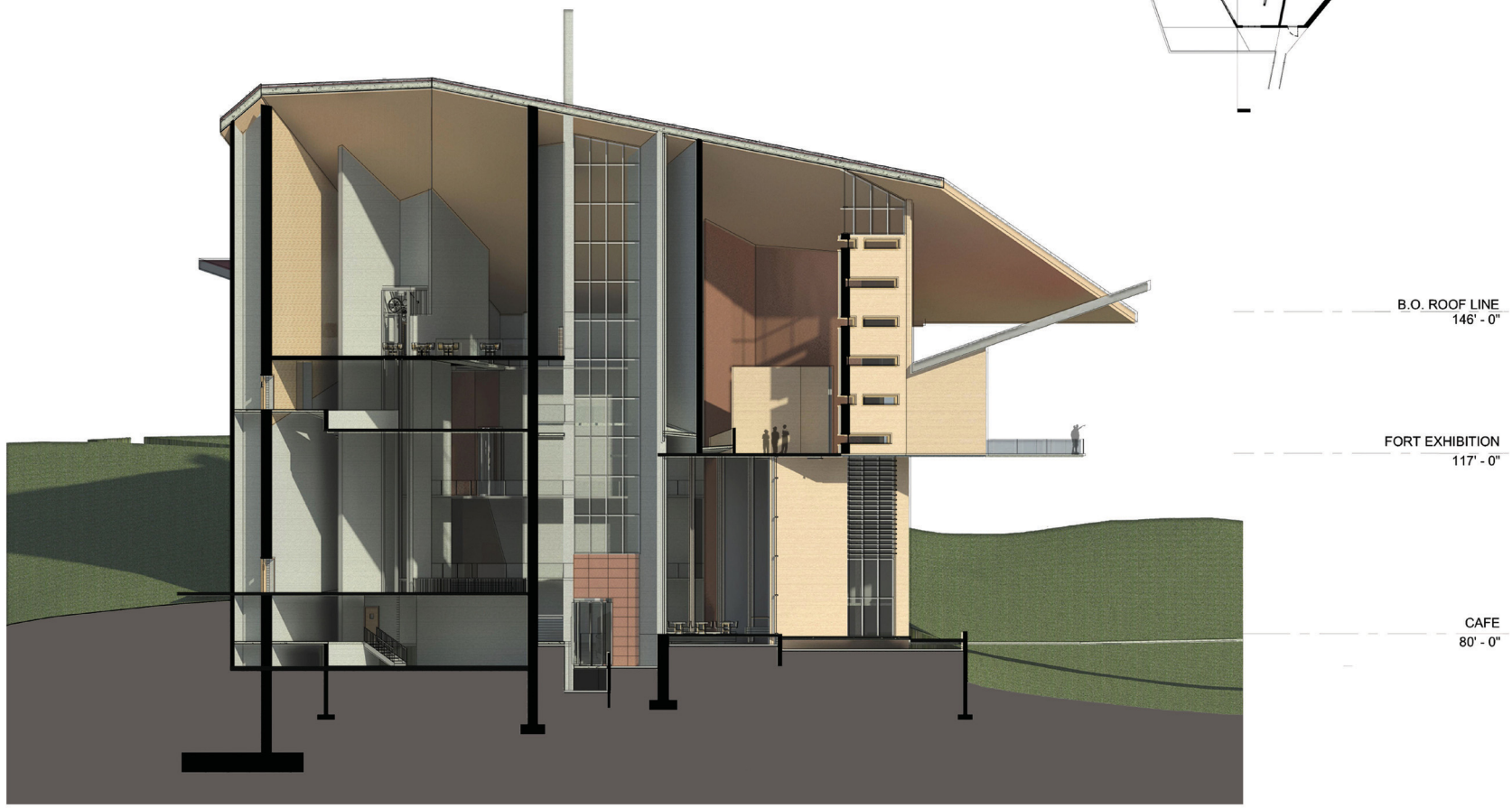
0 30 FT



EAST ELEVATION

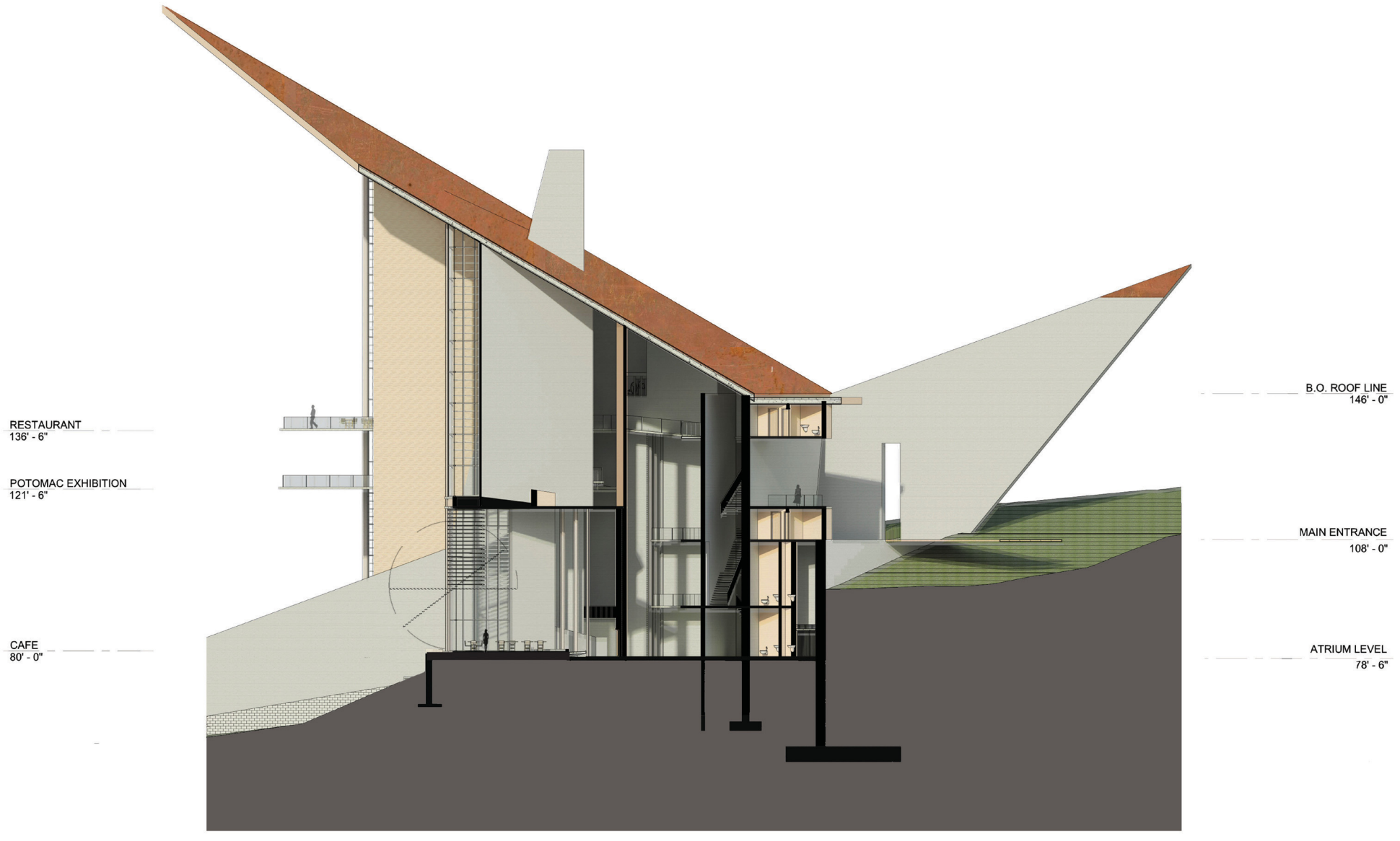
0 30 FT





SECTION A

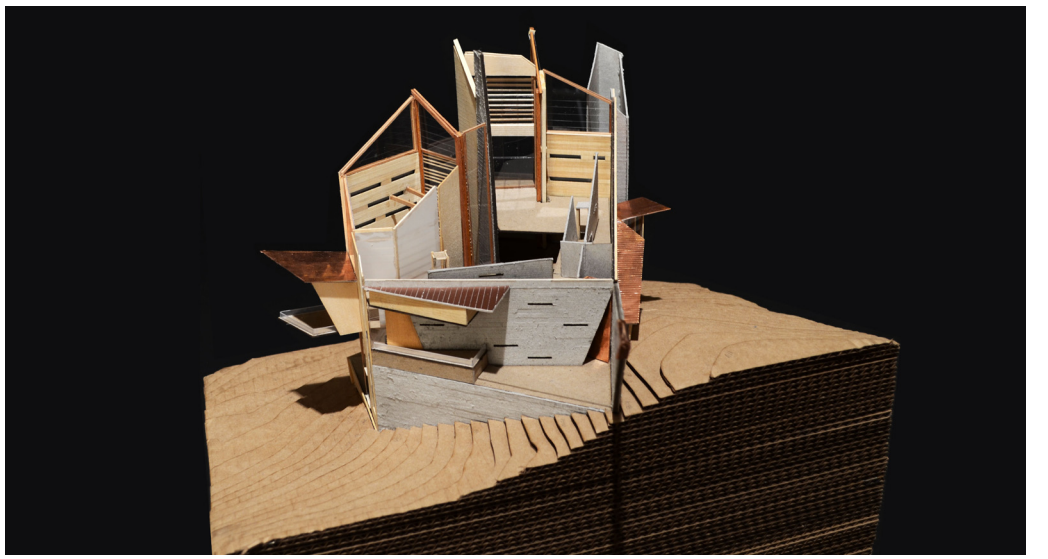
0 30 FT



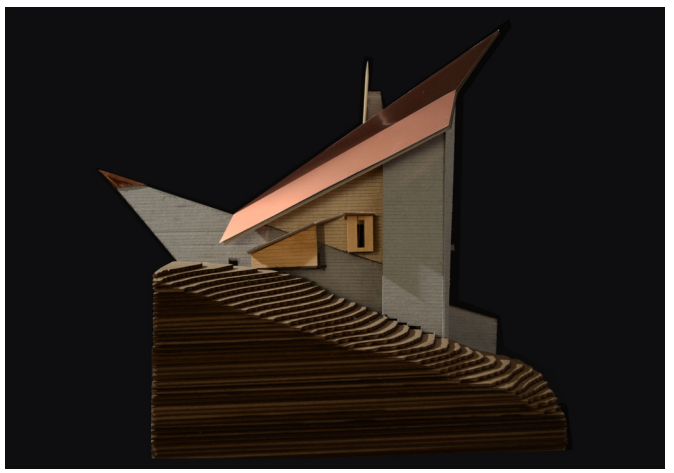
SECTION B

0 30 FT

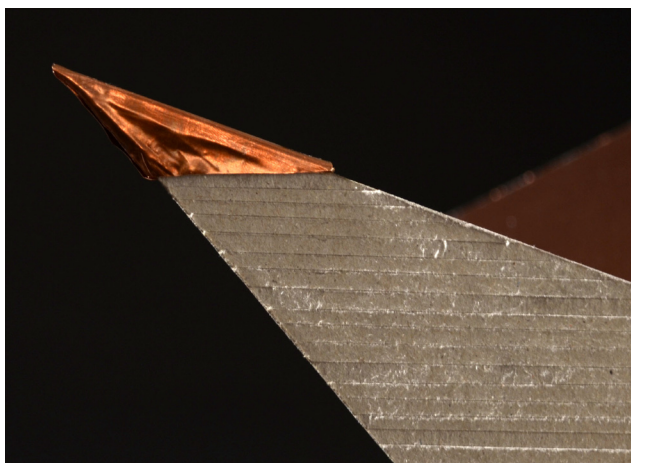
Rendering. Axonometric projection of building with removed roofs.



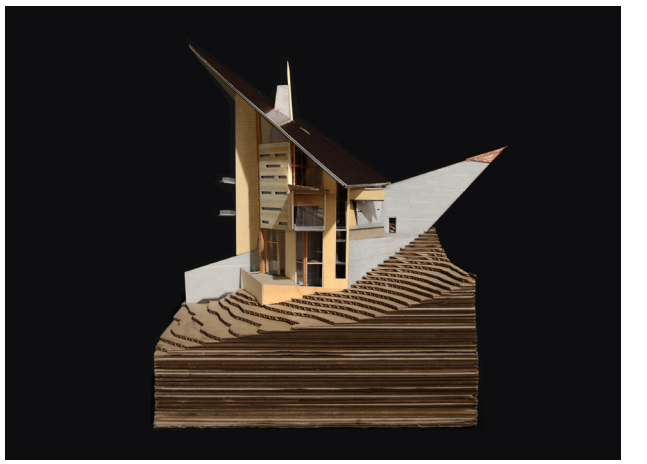
Model. Axonometric projection view of building with major roof removed.



Model. North elevation.

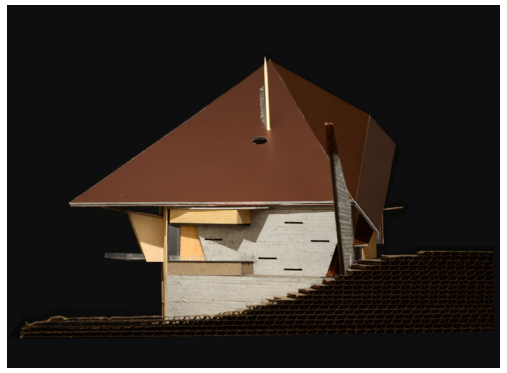


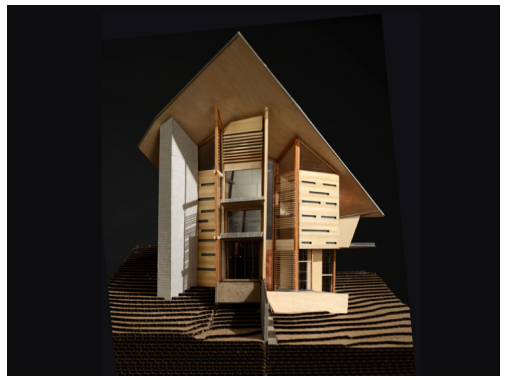
Model. Cast-in-place concrete wall with copper tip to metaphorically symbolize the mast on a ship as the bulding faces from water to land.

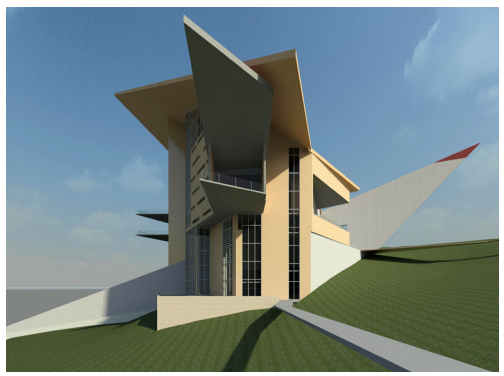


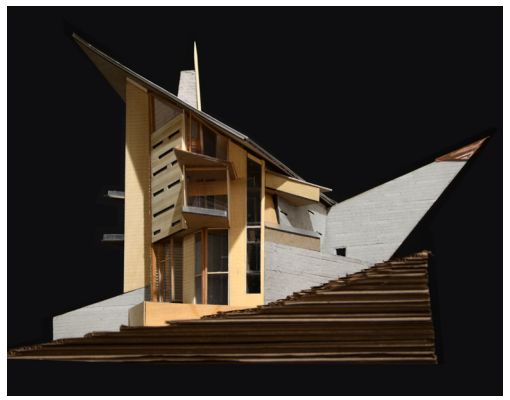
Model. South elevation.

Comparison of Computer Rendering with Physical Model

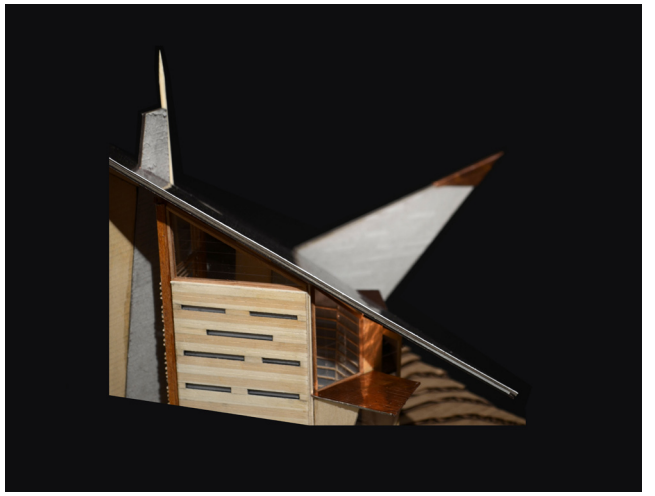








Model. Exterior wall of fort exhibition space.



Model. Exterior wall of fort exhibition space.

Rendering. Viewing from inside cafe area toward the Potomac River

Model. Image of west elevation.

Model. Exterior wall of fort exhibition space.

Render Image. Viewing from lobby area toward the cafe.

INTENTIONALLY LEFT BLANK

BIBLIOGRAPHY

Brice, Martin Hubert. *Stronghold: A History of Military Architecture*. New York: Schocken Books, 1985.

Chupin, Jean-Pierre. *"Hermes' Laugh: Philibert de l'Orme's Imagery as a Case of Analogical Edification." Pérez-Gómez, Alberto and Stephen Parce. Chora 2: Intervals in the Philosophy of Architecture*. Quebec: McGill Queen's University Press, 1996. 37-68.

Collins, Patricia. "A Manuscript of an Architectural Work: 'Il Tempio', by Teofilo Gallaccini," in *Florence and Italy: Renaissance Studies in Honour of Nicolai Rubinstein*. Ed. Peter Denley and Caroline Elam.London: Westfield Publishing Company, 1988. 493-501.

Duffy, Christopher. *Fire and Stone: The science of Fortress Warfare, 1660-1860*. Newton Abbot: David and Charles, 1975.

Gottfried Semper, Harry Francis Mallgrave, Wolfgang Herrmann. *The Four Elements of Architecture and Other Writings*. Cambridge: Cambridge University Press, 1989.

Frascari, Marco. *"Architects, never eat your maccheroni without a proper sauce! A macaronic meditation on the anti-Cartesian nature of architectural imagination."* Nordic Journal of Architectural Research (2003).

Frascari, Marco. *Eleven Exercises in the Art of Architectural Drawing: Slow Food for the Architect's Imagination*. New York: Routledge, 2011.

Goffi-Hamilton, Federica. *"Carlo Scarpa and the eternal canvas of silience."* Architectural Research Quarterly (2006): 291-300.

Google, Inc. "Google Maps – Fort Washington National Park, MD." Map. Cartography by Google, Inc., 03 02 2012.

Hale, John R. *Renaissance War Studies*. London: The Hambledon Press, 1983.

"Interpretation Maual." Volunteer in Parks Interpretation Manual. Fort Washington Park: National Park Service, 14 August 1989.

Lawlor, Robert. *Sacred Geometry Philosophy and Practice.* New York: Thames and Hudson, 1989.

Maggi, Girolamo, *d. 1572, et al. "Della fortificatione delle città (1564)*." Google Book. 5 18 2012 <http://books.google.com>.

Mahan, Hart. *A Treatise on Field Fortifications*. New York: John Wiley, 1852.

McEwen, Indra Kagis. *"Lines of Fire."* Architectural Theory Review (2008): 60-77.

Microsoft. "Bing Maps – Fort Washington National Park, MD." Map. Cartography by Navteq, 02 05 2012.

Morolli, Gabriele. *Siena 1600 Circa: Dimenticare Firenze. Teofilo Gallaccini (1564-1641) e l'eclisse presunta di una cultura architettonica*. Siena: Protagon editori toscani per Santa Maria della Scala, 1999.

National Park Service - Fort Warburton. 15 April 2012 <http://www.nps.gov/fowa/historyculture/warburton.htm>.

National Park Service - Fort Washington. 15 April 2012 <http://www.nps.gov/fowa/historyculture/index.htm >.

Payne, Alina. "*Architectural Criticism, Science, and Visual Eloquence: Teofilo Gallaccini in Seventeenth-Century Siena."* The Journal of the Society of Architectual Historians (1999): 146-169.

Payne, Alina. *"Notes from the Field: Anthropomorphism."* The Art Bulletin (2012): 29-31.

Pepper, Simon, and Nicholas Adams. *Firearms and Fortifications: Military Architecture & Siege Warfare in Sixteenth-century Siena.* Chicago: University of Chicago, 1986.

Robinson, Willard B. *"Military Architecture at Mobile Bay."* Journal of the Society of Architectural Historians (1971): 119-139.

Rosand, David. "Criticism, Connoisseurship, and the Phenomenology of Drawing," in *Drawing Acts: Studies in Graphic Expression and Representation*. Cambridge, UK: Cambridge University Press, 2002. Chapter 1.

Straith, Hector; Cook, Thomas; Hyde, John. *Treatise of Fortification and Artillery*. London: W. Allen & Co., 1858.

TerraServer. "TerraServer Maps – Fort Washington National Park, MD." TerraServer, 16 9 2011.

Tyson, Donald, and James Freake. *Three Books of Occult Philosophy*. St. Paul, MN, U.S.A.: Llewellyn, 1993.

Viollet-le-Duc, Eugene Emmanuel. *Military Architecture*. Novato: Presidio Press, 1990.

ACKNOWLEDGMENTS

Hubby, thank you for your calm that keeps me balanced. Without you my dream of receiving my Master Degree of Architecture from the WAAC would have not been possible. All through my crazy endeavors you have been there every step of the way from boot camp to deployment with the infamous Seabees, to moving across the country to make my dream a reality. You have never once hesitated and for that you hold my heart.

Mom and Sis, you both inspire me to continue to grow and keep reaching for my dreams. I am blessed to be a part of you.

I would like to thank the National Park Service. In particular a special thanks goes to Ranger Wesley Grant. You were instrumental in providing historic information of this amazing fort.

Mr. Larry Morris, thank you for lending me your Fort Washington reenactment manual it was a fountain of information.

Thank you Maryland-National Capital Park and Planning Commission for providing the digital data used throughout the thesis.

Lastly, I give a special thank you to the entire WAAC family and friends. You are a treasure box full of jewels. You each played an important role in my education, evoking a further craving and desire for knowledge of true architecture. It is rare to find a school which provides astute guidance and complete freedom to explore by allowing the student to be the main driver to truly discover the essence of architecture. You were all there every step of the way.