UNIFYING THE PROCESS, A PERSONAL JOURNEY

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School of Architecture
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Doctorate Project Committee
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We certify that we have read this Doctorate Project and that, in our opinion, it is satisfactory in scope and quality in fulfillment as a Doctorate Project for the degree of Doctor of Architecture in the School of Architecture, University of Hawai'i at Mānoa.

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Dedicated to David Boney

ABSTRACT

The unchanging need for harmony in design and construction is best addressed by the traditional master builder. Unfortunately, the master builder is merely an ideal and because of the complexity of today's projects, it is impossible that the archetypal master builder could be replicated in a single person. However, there are masters in the profession of architecture practicing today that have the knowledge and leadership skills necessary to lead a unified team that, as a whole, embody the master builder archetype. This thesis studies two 'master architects' to identify the process of emulating and pursuing the career of "a master."

CONTENTS

INTRODUCTION

HYPOTHESIS

This thesis was born from a belief that architecture as a profession was lost, and that the ideal historic figure of the master builder must be reintroduced into modern society as the shining light in the building industry. The historical figure known as the master builder "provided a seamless service that included what we now refer to as design and construction…"[1] The master builder is an ideal figure of the past, an ideal that is unachievable for one person in today's complex building culture.

The hypothesis for this thesis was that the title of 'master builder' adds confusion to an already divided building process. A seamless design and building process is not the work of one individual. Instead, a unity of design and build processes needs to evolve naturally under a leader who knits together the current segregated disciplines in any given project.

THESIS

Instead of replicating the master builder in title and function, the embodiment of the master builder in a unified team is meant to inspire change in the current paradigm of segregated building processes. Unity requires relationships that are deeper than contractual agreements, which come from the rational head.[2] It requires commitment from the creative heart of each individual involved to understand and accomplish the

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[1] Beard, Jeffrey L., Michael C. Loulakis, and Edward C. Wundram. *Design-build: planning through development*. (2001), pg. 13.
[2] Head vs. Heart, see Purpose of Study, p.p. 7-9, and Luis Longhi: Tangible Heart, p.p. 75-76.

vision for the project. Unity creates heart and mind agreement, which maintains the vision of the project even through separated disciplines.

An architect-led, unified team that works as one to accomplish a vision is the answer. These unified teams should function through mutual relationships, complementing the knowledge and skill of each individual entity to attain a result that is a cut above other professionals in the architecture field. Ultimately, this will produce a superior built environment. There are architects today that lead by sharing their vision so that each member of the team is a vital part of one body functioning for one purpose. In this setting, the architect is the head directing each part.

This thesis presents three chapters of research based on our ability to replicate the master builder today. As the discussion evolves, it becomes evident that replication of the master builder is a nonviable means to a unified design and building process. Although the embodiment of the master builder is hypothesized to be attainable, it is only used to explain the concept of unity in pure form. Through case studies, two architects are analyzed to show that an architect-led team can achieve the same unity seen in the master builder archetype, without using the master builder title. The variable in each case study is the method with which each architect transmits his vision from project conception through completion of the project.

The first architect, Byoungsoo Cho, is a Korean architect working out of Seoul, Korea. He has associate architects in his firm that are trained to be him in the office and on site; to transmit his heart, mind, and spirit in each project. Cho has also trained his brother, now a contractor, to build his projects the way he would build them. The combination of associate architect and contractor both working as an extension of Cho

allows him control over the design and construction process whether he is in his office in Seoul, on the jobsite, or teaching a studio in the U.S.

The second architect, Luis Longhi, is a Peruvian architect working out of Lima, Peru. He transmits the visions of his projects to associate architects that he has groomed and guided through education and practice. Longhi also has created a deep personal and professional relationship with his contractor, Hector Suasnabar. This allows for a design-while-building process that can be controlled by Longhi through his associates, or Hector, who transmit the heart, mind, and spirit of Longhi in the design and building process.

The common thread through these case studies is the direct connection both Cho and Longhi have with the building process because, to them, the design process and building process are one and the same.

GOALS

The goal of this thesis is to present a means of unifying the segregated processes of design and construction. The investigation led to a solution of an architect-led, unified team, using two examples of architects that create the master builder archetype by implementing close relationships on both sides of the divided process.

The scope of the case studies is private residential buildings designed and built under the single vision of an architect and his team. The end results of the case studies could be extrapolated into larger projects or simplified to smaller projects. However, the goal of this research is to exemplify the effectiveness of a unified team under the vision and guidance of one architect, not to assume that this example will fit every project.

Both Cho and Longhi have had the opportunity and foresight to form valuable relationships that allow them to function at a very high level of architectural thought and

practice. The ability to develop relationships is not something that is innate to every human being. This thesis hopes to change the paradigm of solitary, exclusive processes by bringing to the surface the unique opportunities that are available to anyone who is aware and bold enough to take advantage of them. Thinking outside the box is not only necessary in design, but also in forming creative relationships in order to unite the design process to the building process.

The complexity of any building project varies greatly with size, project type, and client. The architect-led, unified team approach may not work in every case, and in any situation, the relationships will be unique to the individuals and the context involved. The specific relationships illustrated should not be viewed as an ultimate template. Instead, the case studies have two major goals: to increase awareness of how unique relationships can be formed to create a more unified approach to the design and construction of specific projects, and to guide individuals from all disciplines towards their own unique process.

Every person is different, every project is different, and every process will be different. The end goal is to show a clear path towards unifying relationships, establishing a vision for each project, and imparting that vision to each project member. In turn, the vision controls the project because each person is driving toward the same end goal, and unified processes will produce a better, more beautiful, and more cost effective built environment.

PURPOSE OF STUDY

On March 09, 2005 I wrote an essay for my application to the University of Hawai‘i at Mānoa School of Architecture. Today, as I reflect on the goals I had entering this school, I realize that this dissertation has been growing inside me for many years.

> It has been my experience that there is no greater pleasure than to take a job from conception to completion and to be involved in every step along the way. I feel excitement when starting something new and knowing that I can design and make it from start to finish. Also, it is great to see how pleased the client is when the job is completed correctly, with integrity. It is an amazing feeling to accomplish something that was conceived in someone's imagination. That is what I would want to bring to the islands: quality in construction, creativity in design, and confidence in character.[3]

After nearly six and a half years and countless hours spent studying the art of architecture, I am convinced that this statement still holds true. I have had amazing opportunities, and my time has been directed under a personal vision that design and building should be one fluid process, with a leader taking a job from conception to completion and being involved in every step along the way.

My awareness of the built world started under the custody of several different building contractors. I worked, ate, and lived with building contractors from various disciplines (general contractors, electrical, flooring, framing, audio/visual, plumbing, finish, etc.) for three years. I was intrigued with the profession of architecture, which was deemed upon several occasions by different contractors, the dark side (in reference to Star Wars and the battle between good and evil).

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[3] Stephen Larson to University of Hawai‘i at Mānoa School of Architecture, excerpt from essay, Kula, Hawai'i, 09 March 2005. *Entrance Portfolio to arch<u>h</u>awai‘i*, pg. 2.

When I entered the architecture program, I was determined to infiltrate, understand, and bring down the evil Architects that controlled the building process and to bring to power the true rulers of the building process, the contractors. While I started architecture school as an undercover spy for contractors, the ethereal nature of architecture softened and overtook my espionatic (from espionage) heart over time.

After my first year in the program, I became aware that my mind must be more open to communicate with my body. I would envision a glorious design, and not be able to express it physically. The manifestation of my design was something less than what I knew I saw in my head because my body wasn't trained to express my thoughts clearly. My internal miscommunication left me frustrated and confused because I was acutely aware of my shortcomings and subsequent inability to do anything about them.

Through my second and third year, my ability to physically communicate what was in my brain came more and more naturally. During the second half of my third year, driven by lack of sleep and sheer frustration, my heart was able to break through the thick, foggy lens of my brain, and my first experience of intermingled internal and external processes was manifested at a level unrealized in any previous studio project.

The simplicity of my original idea that was envisioned with heart and brain was successfully expressed through my body. This was evident in the project because the level of functional beauty impressed my professor, my peers and me. Unfortunately, I did not know that the success of this project was because of the internal continuity, so I was unaware of how to repeat this process. Instead, I rode on the lingering high from that project for the next few years, feeling increasingly that my ability to merge heart and brain was, in fact, decreasing.

Also, during my third year, I was able to intern for a design-build contractor, and I immediately saw design-build as the answer for the segregated processes in architecture and construction. After the initial intrigue wore off, I saw firsthand the effect that a lack of theoretical vision and internal alignment of heart and mind has on the final products.

When projects start in the rational and progress through the rational, they end in the rational, and like a still-born, have no life in them. Yet the project that is born from the imagination of the heart and is brought through the rationalization of the brain can live a life of its own because the building made has the spirit of the architect.[4]

I learned about this living spirit in architecture during the summer after my fourth year when I enrolled in a summer study abroad studio in Peru taught by Luis Longhi. Longhi spoke with such conviction for the spirit of architecture and the importance of the heart's involvement in our decisions (in architecture and in life). This is when I realized how important it was for my heart to be involved in my design. I became aware that my lack of internal alignment directly affected my past shortcomings in my studio designs.

I believe that my heart learned faster than any other organ in my body because it was unrestrained by rationale. However, because of the speed at which my heart learned, the burning desire of my heart was rarely communicated through my brain, which is ultimately the vehicle that allows desire be manifested through the body.

I was now aware that my mind must be more open to receive communications from my heart and then communicate that to my body, but I was unable to do anything about it. I had to start the process of learning how to communicate internally over again. I became frustrated when my brain refused to communicate with my heart. Because of my brain's refusal to listen to my heart, my fifth year studio project was one of the worst

[4] Louis Kahn and Robert Twombly, *Louis Kahn, essential texts*. (2003), p.p. 68-70.

projects I've ever submitted in my time at the University of Hawai'i School of Architecture (archawai'i).

Before, my heart had a voice that was able to occasionally slip past my brain's rationalization filter. But now, I was designing like a builder, my brain deliberately cut off from all the information my heart had absorbed (it thought it knew better). The result was a standardized house, full of head knowledge but lacking in heart knowledge—in essence, lacking spirit.

Since the fifth year project was the last required studio course, I thought that I would not have another opportunity to try to merge my heart and brain in a project until after I graduated. I began to study under Luis Longhi for my thesis, knowing that the answer to the unity of design and building process existed in his work.

As I worked with Longhi, I fell in love with architecture – I started to believe in the power behind it. True design, the kind that gives physical form to the spirit of the architect and the client, must be personally studied and practiced relentlessly to be fully understood. The reason architecture cannot be discerned through mere explanation is that each individual's mind, heart, and body change and intermingle through the regular exercise of thought and the manual practice of design. The outcome is an understanding of the art of architecture that continues to grow over time.

After a year of studying with Longhi, both in Peru and Hawai'i as a teaching assistant and intern, I was pointed towards Byoungsoo Cho. I was then given the opportunity to study in Seoul, Korea in a studio class sponsored by archawai'i. In Cho's studio, I was given another opportunity to design with internal harmony of heart and mind.

The Seoul studio was focused on the rational explanation of design through experimentation. We physically built what we designed. We were also encouraged to experiment with the spiritual concepts of eastern religion, which taught the alignment of body and mind through meditation and letting go of one's self. I thrived in this studio and found a process that connected the ethereal to the practical that manifested in rational, physical models.

The completion of the Seoul studio was the point at which I finally accepted architecture into my life with no reservations. I let go of any notion that I would end up on a light or dark, relevant or irrelevant, side of the field and realized that the divided processes could be united by a strong leader with a vision. I am aware that the vision must come from the architect if the resulting project is going to have life. Since this realization, I have been training to design buildings with my heart and mind working in harmony through rigorous exercise of both theoretical thinking and habitual practice.

Looking back on all of my opportunities and struggles, victories and failures, I am not naive enough to think that any of it was coincidental. I had a vision of a seamless design process from day one, and today, I am thankful that I have been led down a path in alignment with my vision. Although I know the process that led to my conclusion is unique to my situation and that every person will have a different experience, I merely hope to provide insight into one avenue of achieving unity between design and building: the relationship between the architect and the contractor.

INTRODUCTION TO MASTER BUILDER

The capacity to design buildings cannot be acquired through the action of building alone. Standard dimensions, layout, function, form, and constructability are requisite. Yet any work designed with only practical knowledge will inevitably lack spirit and be a lifeless building. An architect must be a student of both the theoretical and the practical in order to carry authority in building design.[5]

Design can be taught, but it must begin in the heart, move through the brain, and manifest itself in physical form. Everyone experiences the ethereal qualities of design, even if only subconsciously. However, the ability to control these qualities is only achieved through re-learning how to think and how to express the desires of an individual's heart in physical, functional form.

Similarly, the ability to design buildings cannot be acquired through the study of design alone. A designer must have theoretical vision; artistic skill; and an understanding of order, proportion, and beauty, but any work built with only theoretical knowledge will inevitably lack the physical manifestation of the vision. Therefore, if the process of theory is disconnected from the process of practice, the spirit is lost during the transfer of processes or the vision will never be realized.

Building, in reference to the practical nature of designing buildings, can be taught, but it must be explored with the level of thought required by design. Therefore, an understanding of materiality and common techniques must be acquired, digested, and regurgitated in unique ways. This is the nature of an architect's relationship to theory and practice.

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[5] Vitruvius and M.H. Morgan, *The Ten Books On Architecture.* (1960), p.p. 4-5.

Design and building processes have functioned separately since at least the beginning of the professionalization of architecture. The desire for a seamless process belongs to design professionals, builders, and clients alike. Many attempts have been made to unite these processes, most of which focused on having a single entity responsible for both the design and construction. Often, these less traditional project delivery methods are based off of the model of the master builder because this historic figure is the symbol of unity between the design and construction processes.

The master builder is defined as a figure in history that was fluent in both the theory and practice of design and building. More recently, the master builder has been defined as a person who is responsible for every decision in the process, from the conception through the completion of a project. In fact, there are people who claim to be master builders today: conceptualizing the design, making all decisions and directing the construction directly, and functioning as both designer and builder.[6]

My search for examples of how a master builder functioned in the past begins in the Renaissance, as most definitions point to individuals during this period.

Unity of process is being searched for in this thesis because it is what is desired in today's building culture, and it is the future of every discipline involved in the process of building. A seamless process, now a luxury desired and longed for by clients, is fast becoming necessary for anyone to keep relevant in any building project.[7] The first chapter of this thesis begins with the hope that historic examples of master builders will lead to solutions to common problems seen with disintegrated design and building processes.

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[6] "What Is A Masterbuilder," http://www.glennbrunoarchitectbuilder.com/what_is_a_masterbuilder.
[7] James P. Cramer and Scott Simpson, *The next architect: a new twist on the future of design.* (2007).

ONE

MASTER BUILDER REPLICATED

The master builder once provided unparalleled value, and in turn, received an immense amount of respect because of the knowledge and ability required to develop a vision and make all of the decisions in the conception and completion of each built work. Given this, the question becomes whether an individual in the present era can effectively replicate the master builder in order to "resurrect the prestige and position" this historic figure once held in society.[3]

Although current definitions of the term "master builder" do not clearly describe what exactly a master builder was, why people were considered master builders, or how one gained the title of master builder, most of the definitions and descriptions of the master builder point toward certain individuals in the Renaissance. Without question, a thorough definition of a master builder will include references to persons of the Renaissance.

The term "Renaissance man"[8] is used today to describe a person proficient in many fields. This expression developed from examples of individuals who were geniuses in numerous fields of study during the time of the Renaissance,[9] or the rebirth of knowledge in Europe from the fourteenth to seventeenth centuries.

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[8] "Renaissance Man," dictionary.com, http://dictionary.reference.com/browse/renaissance man.
[9] "Renaissance," dictionary.com, http://dictionary.reference.com/browse/renaissance.

Leon Battista Alberti[10] was a man of the Renaissance whose mastery of building techniques and processes was seen in his work, *The Art of Building in Ten Books*. In the foreword of *The Art of Building*, it is said that Alberti "was a man of rare brilliance, acute judgment, and extensive learning."[11] The genius of Alberti was apparent in all areas of the arts, to the point that his proficiency in each field exceeded most people's ability and knowledge in one.[12]

Alberti's capacity to grasp each field of study so completely and his ability to transmit that knowledge demonstrate how men of the Renaissance changed the standard of knowledge in society and allowed future generations access to an enormous volume of information.

The understanding exemplified by Alberti is currently replicated only in part through the work of design professionals and builders. The division of the master builder happened during the early twentieth century when the once prevailing unity between design and building that defined the master builder finally separated into disciplines or specialties.

The necessity of limited services, through which one person provides specific services within design, fabrication, or construction, but not an all inclusive service, came from increased technology and building complexity. Basically, no one person had the knowledge and ability to provide all of the services anymore.[13]

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[10] Anthony Grafton and Leon Battista Alberti, *Leon Battista Alberti: master builder of the Italian Renaissance.* (2000).
[11] Leon Battista Alberti, *On the art of building in ten books.* (1988), p.p. 1-2.
[12] Ibid.
[13] Mark Konchar and Victor Sanvido, "COMPARISON OF U.S. PROJECT DELIVERY SYSTEMS," *American Society of Civil Engineers, Journal of Construction Engineering and Management* (1998).

Complexity in the building process caused the knowledge base to rise to the point that it would be impossible for one person to have the knowledge and ability once inherent in a master builder. The increasing standards of design, permitting, and building techniques, as well as project size and technology made it unachievable for one person to make all of the decisions on a project as a master builder would.[14]

The accepted thought is that complexity dismantled the master builder; there was simply too much knowledge for one person to retain proficiency in all the fields necessary to be considered a master builder. In order to truly replicate the master builder, steps would have to be taken to piece back together what history undid; a new breed of people would need to be raised and developed from scratch, never being taught that design and building were separate.

The oneness of design and building would have to be ingrained in this new breed to the point that design could not exist without building or building without design. Because the master builder existed in a time before design and building were separated, design and building must once again become one in order for the master builder to be replicated in an individual today.

[14] Flavell, Eric. "Master Builder: Historical Icon?" *Leadership Management in Engineering* (March 2011).

Fig. 1 My rendition of a modern-day master builder hard at work

Creating a new breed of modern day master builders would require a shift in the paradigm of society as a whole or at least in the now segregated disciplines involved in the building process. The systems that control each discipline's education and scope, including schools and associations, would have to drop any preconceived notions of developing their pupils to become master builders, and a new system would have to be created to mature these individuals properly.

The first steps toward a master builder profession would have to be taken under the current paradigm of segregated disciplines and building processes. A society of master builders would have to be created to do what the American Institute of Architects (AIA) and the National Council of Architectural Registration Boards (NCARB) do for architects in the United States—decide upon and uphold the definition of the title and protect it by law. Then, this master builder association would need to cut a clear path for the education, mentorship, and registration of these individuals.

Additionally, the society would need a mission statement that would indicate the importance of changing the current paradigm in which design and building are separated. The paradigm would be replaced with an integrated, single process trademarked as *design+building* or *duilding* or *besign*. Design+building would be led by these master builder figures, and it would be a seamless *designstruction* process.

In concert with creating a society of master builders, a strategy would have to be formulated to effectively train and teach master builders. The making of a master builder would bring to light another impending paradigm shift to the belief that one person can possess all of the required knowledge and skill to be considered a master builder.

Knowledge that seemed complex in the thirteenth century was suddenly known in great depth and breadth by the Renaissance men in the fourteenth century. The replication of the master builder today would be similar to the rebirth of building in the time of the Renaissance. Several individuals would have to emerge, gaining proficiency in all areas of the building process.

This master builder could be raised through the current systems, but would have to go through a strenuous process of learning and acquiring the skills of each discipline in the building process or be apprenticed through each discipline. Even after going through such strenuous training, a person would almost have to have a superhuman ability to absorb and understand all the facets of the building culture. The Renaissance individuals had genius-level knowledge and ability in a wide variety of disciplines. Internal continuity between disciplines gave them the ability to comprehend each discipline as part of a whole, instead of separating them into distinct areas of study (as our current education system for design and building professionals does).

In a sense, this would create a modern day rebirth of the current building process, because society thinks that the complexity and knowledge base has come to a point where no man can master it; however, there is always the possibility that there are a few individuals yet to be discovered that stand out as genius-level master builders. These master builders could prove that complexity and knowledge are relative, and that the mastering of all the disciplines in the built environment is possible.

Maybe complexity did not kill the master builder. Perhaps there were simply no more master builders left who were worthy of the title, or the would-be master builders joined the separating disciplines and never rose to their full potential. All it would take is a single person to emerge, through current systems, apprenticeships, or superhuman understanding, to prove that the master builder wasn't killed off, but simply hibernating for a couple hundred years.

The question must be asked, if this is the case, and a person did rise to the full potential of the ideal master builder, could the role be sustained in future generations, or would the master builder die with the individual(s) that rose up?

The example of Alberti shows that humans have incredible potential to understand a great deal of knowledge, and disproving the master builder based on the notion that there is simply too much knowledge doesn't necessarily disqualify the belief that if master builders existed before, they could exist again.

In the end, the knowledge would have to be synthesized into a new system that doesn't differentiate between designer knowledge and builder knowledge, designer skill and builder skill, or designer building and builder designing. Even if a modern day master

builder developed in the current separated system, the profession would only survive in a new system created by master builders, for master builders.

The master builder society would have to be created and managed by a group of greatly respected and powerful people, because they would essentially be circumventing everything that architects, engineers, and contractors have been fighting for since the beginning of each profession: power and responsibility in the building process.

Master builders could not piggyback on the credentials of an architect, ride the coattails of an engineering degree, or claim to be construction managers or contractors. A master builder's knowledge and skills would trump any other individual's in any discipline because the master builder's understanding and expertise would be the synthesis of all the disciplines put together.

Architects or builders that claim to be master builders today are only self-proclaimed or the result of a misuse/misconception of the term. This thesis believes that the reason master builders cannot exist is because they never existed (at least not in the legendary form). There has always been a foreman, a contractor, a master mason, a tradesman, etc. between the building designer and the physical construction.

There has been, and always will be, interpretation and explanation between the design phase and the actual building of any significant built work. This thesis believes that the master builder myth came from the concealment of others' deep involvement in the processes because each individual was working under one vision, in unity.

The general contractor taking on the design or the architect taking on the construction only removes the middle man from the process; it doesn't guarantee a successful project, just that the person in charge will have a lot more stress. The

construction process needs someone covering every detail, orchestrating the intentions of the design. If the construction is orchestrated by the architect, he has to run between the trades, spinning the plates, to make sure no part of the project falls and shatters. The design process needs someone who is trained in design and unchained to someone who could constrain the process. If the contractor is running the design process, it will surely not be a priority during the building process.

Fig. 2 Single person as master builder – as complexity and scale rise so does the likelihood of something important getting dropped.

If the architect is removed or absorbed, the general contractor has a direct relationship with the client and construction. If the general contractor is removed or absorbed, architect has a direct relationship with the client and construction. However, there has to be a relationship between the people explaining (architect or contractor) and the people interpreting (tradesman). Regardless of the contractual structure (even if every

discipline was absorbed into a single entity) the flow of information moves through multiple people, and the relationship between these individuals is what is important. There can never be one master builder who does everything on a project, there can only be a removal of a key individual in the process, either the architect or the contractor.

Single source project delivery is not an axiom for unity in design and building. Although single source delivery systems provide an opportunity for unity, it is not automatically present in the delivery system or any single given entity. Unity must reside in the relationship between the persons designing the project and the persons building the project.

Architecture is relationships. Building is relationships. The business of designing and constructing buildings is relationship based. If an architect and a builder are forced together simply to provide single source delivery without creating a relationship of unity, there will be a huge gap in the process even if these individuals live under the same roof.

The complexity, knowledge, and ability needed to be a master builder are one of the reasons none have existed and cannot exist today, but another reason is the sheer amount of work any construction project takes, even in the time of the Renaissance. The desire for a modern day master builder to be replicated in a single person in order to bring clarity and precision to each built work is understandable although unattainable. There is confusion and misrepresentation among every party involved in the building process as Davis describes, "Everyone is 'right,' yet the built environment does not really get better."[15]

[15] Davis, Howard. *The Culture of Building*. (1999), pg. 4.

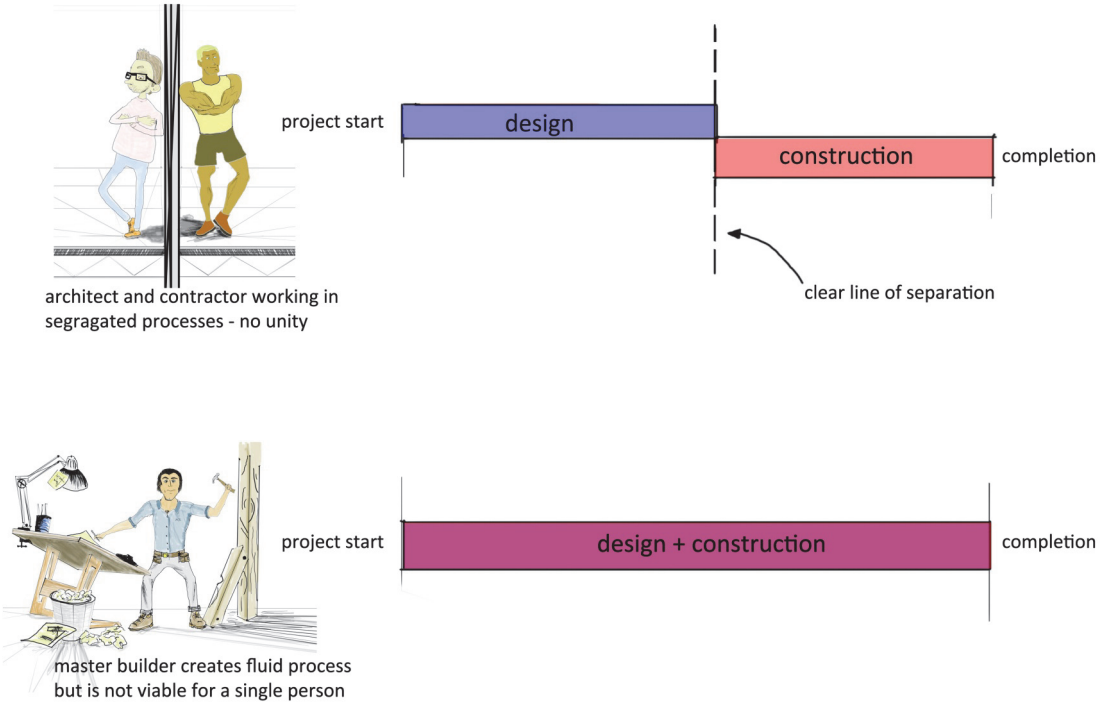

Fig. 3 Traditional segregated process (top). Master builder process (bottom)

The desire to be a master builder basically means that either the architect or the contractor are fed up with how they relate to the other, so they want to get rid of each other and do the whole project themselves. If an architect can't work with a contractor, how could he possibly work with several subcontractors? Would it not be easier to have one point of contact with an individual who is trained to manage the building process? If a contractor cannot work with an architect, how could he possibly understand the ethereal nature of design? There is a reason why design and construction have been separated; they are two distinctly different disciplines that have different goals, skills, and knowledge bases.

Any attempt, from a person or entity, to assume the role of a master builder would cause confusion and misrepresentation in our current segregated paradigm of design and

construction process. The master builder cannot be realized in a literal sense, but what the master builder represents—unity between the design and building processes—can be used as an example of how to make the current segregated processes more unified. While the replication of the master builder is non-viable, the next chapter will explore the embodiment of the archetypal master builder's spirit.

TWO

MASTER BUILDER EMBODIED

The allure of a seamless design and construction process has turned the master builder into an idealized figure toward which design professionals and builders alike have aspired. However, there is no one person alive today that has the aptitude, even if the potential is there, to be a literal replication of the master builder ideal. Project complexity and requirements including a vast knowledge base and understanding of current laws, would deter even a greatly respected, powerful, and extremely gifted individual from changing the paradigm of society to accept a master builder.[16]

The master builder is merely a myth brought about by a desire and need for a leader to inspire unity in the built environment.

The master builder legend explains the great designer-builder slowly dividing into the roles seen today. In the nineteenth century, the development of larger buildings with new technologies brought about complex building techniques, which required more specialized trades. Since then, building projects have continued to grow in size and complexity, technology has continued to advance at an exponential rate, and building techniques have continued to become more specialized with each project. The clear need for the master builder to be divided into distinct disciplines has not only grown at an

[16] Flavell, Eric. "Master Builder: Historical Icon?" *Leadership Management in Engineering* (March 2011).

exponential rate since the nineteenth century, but will continue to grow and change drastically.[17]

In a time when master builders were rumored to exist, the design and building processes would have had to be one. Every written work about the master builder tries to piece together the feeling of unity in the now separated processes. Today, there is not even a word to describe design and building as one process. The term master builder is the only term that comes close, and to explain the concept of the master builder, design and building need to be separately written and discussed because the unity between these processes does not exist today. If society could perceive the design and building processes as one, without separation in distinction, profession, or creed, it would plant the seed for an understanding of what a master builder could be.

The replication of the master builder today is nonviable,[18] but the need for the unification of the building process is apparent and desired. Changing aspirations from the replication of the master builder toward a more realistic desire for embodiment gives a tangible form to an abstract concept.[19] Extracting the concept of what is desirable from the master builder archetype ends the need to recreate the mythical historic figure. An individual replicating the master builder would have to have the knowledge and skills to make all the decisions for any given project. Alternatively, the master builder could be embodied by a team that worked as one.

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[17] Jones, Chad B.. "The Role of the Architect: Changes of the Past, Practices of the Present, and Indications of the Future," (Masters Dissertation, 2006)
[18] Flavell, Eric. "Master Builder: Historical Icon?" *Leadership Management in Engineering* (March 2011).
[19] embodiment. Dictionary.com. *Collins English Dictionary - Complete & Unabridged 10th Edition*. HarperCollins Publishers. http://dictionary.reference.com/browse/embodiment

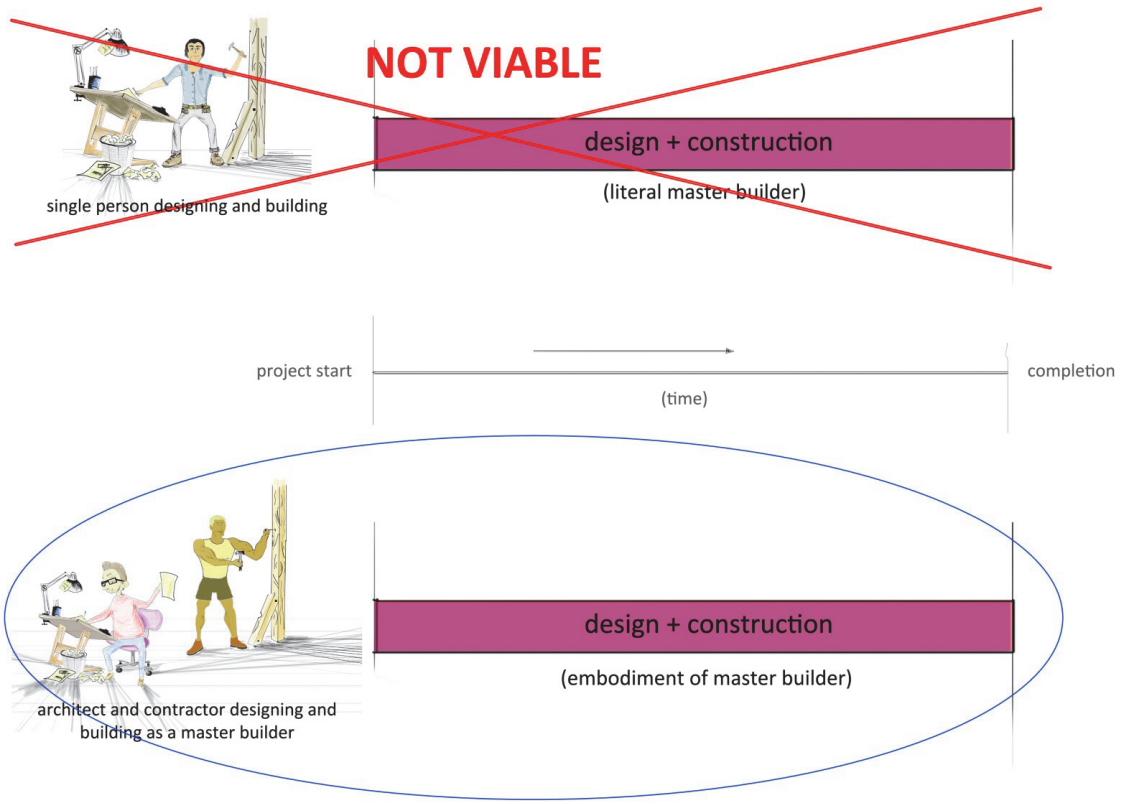

Fig. 4 Literal master builder (top) assumes the role of both the architect and contractor. The embodiment of the master builder (bottom) is an architect and contractor working as one.

To successfully embody the master builder, a team would have to function with the same goals, heart, and spirit. The team would need to be led by a virtuous person poised to establish a vision and direct the team, and the team members would need to be able to use their own knowledge and skills to fill in where the leader is lacking. The point of this thesis is not to prove that a design professional or builder should be the master builder or that the master builder should be reproduced in a literal sense.

The legend of the master builder is a great model that can be used as an example of how unity in the building process can create an ideal situation, not a literal solution, for everyone involved. The tangible form of this embodiment is the unity created by the

force of will of each person involved in any given project to come under one vision for the completion of the project to the best of their abilities. A team unified under one vision is the embodiment of the master builder, and requires a leader to create and transmit that vision to others involved in the process.

The fragmentation of the building process is a result of the diminishing role of a qualified leader. Because there is not internal agreement among a single discipline responsible for the built environment, and certainly not agreement between the different disciplines, a leader must step up to unify each aspect involved in any given project. Leadership in this case is not a matter of forcing people to do what one person wants, but rather having the boldness to create a vision, and the responsibility to transmit that vision so that each person involved in the process feels a sense of responsibility for the vision of the project. The reintroduction of unity into the building process would create a group of people that all function with one vision and embody the perfect cohesion seen in the archetypal master builder.

The embodiment of the master builder can work within the current system as the leader only has to create a vision and transmit that vision to each of the other disciplines involved to the point that they are responsible for that vision. Each individual would have to commit his or her knowledge and skills to that vision within his or her scope of involvement in a contractual or social agreement on any given project. In a real sense, unity is collaboration in heart and head, knowledge and ability. This collaborative effort must go beyond contractual agreements; there must be a willingness and sense of responsibility in each individual involved to carry out the vision of the project, regardless of money and titles.

While collaboration can be viewed in an idealistic way, even where there is a team working in unity and with complete agreement, "[collaboration] is messy, as with all endeavors human."[20] Some people just don't get along, and collaboration cannot be forced. Force is not the intent of unity. Collaboration within the existing system of disintegrated specialties requires a leader that has the boldness to take responsibility for a vision and project, and to trust a team that has the knowledge and skills to back up that vision.

Forced collaboration is flawed because if each person does not make a choice to participate with an open mind and heart before getting engaged, at some point, unity will be met with resistance. Unity means joining individuals with consistent characters to generate a distinct end product.[21] The key to unity in the building process is relationships. This means that not everyone will be able to work together unless individuals relinquish their superiority complexes and the egos, defensive actions, and insecurities that come from segregated disciplines.

Even when using the master builder as an example of oneness in the building process, the conversation comes down to the principle of unity through relationships. So why should the master builder be brought into the conversation? The master builder is not, and never was, the answer for unity in the building process. Although the master builder is an example of oneness of process, the master builder myth destroys the sense of unity, which is multiple people being one. As a legend or fairy tale, it is a great story, but

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[20] Ken Bishop, "Contention In The Construction Environment: Collaboration Can Be A Contact Sport," *The American Institute Of Architects.* http://www.aia.org/practicing/groups/kc/AIAB081945/
[21] Unity. Dictionary.com. *Collins English Dictionary - Complete & Unabridged 10th Edition*. HarperCollins Publishers. http://dictionary.reference.com/browse/unity

as an example of where design professionals and builders should be headed, it is unequivocally flawed.

The single (individual), all encompassing, design-builder is a myth. Multiple people working as one that become the all-encompassing design-builder archetype is true unity of process.

Thus, using master builder, literally or theoretically, adds unnecessary confusion to the search for unification in the building industry. As will be seen in the following chapter, the Renaissance men of the past were not master builders, and the processes in the past were very similar to those today.

THREE

THERE IS NO MASTER BUILDER

During the Renaissance, many genius individuals did great things for the advancement of building technology and knowledge, but the individuals that are commonly used as examples of master builders—Andrea Palladio (1508-1580), Leon Battista Alberti (1404-1472), and Filippo Brunelleschi (1377-1446)—all have legendary tales that fall short of current perceptions of the model master builder under closer examination.

Palladio's Villa La Rotonda provides a great example of a Renaissance villa or palace. He began the design for Villa Rotonda, otherwise known as Villa Almerico Capra, in 1566. At age fifty-eight, Palladio was not physically capable of building it himself. His apprentice, Vicenzo Scamozzi, was only fourteen years old, and although a man of fourteen can be intelligent and eager to do the work an older man cannot, he was also not doing the physical building.

Palladio had a lot of projects running concurrently; roughly two more villas, several churches and palaces, a few bridges, a gate, and a large indoor theater were all being designed or built during the construction of the Villa Rotonda.[22] Palladio designed and managed these projects until his death in 1580. At the time of his death, the Villa Rotonda was still not finished. Scamozzi, twenty-eight at the time of Palladio's death, would complete the villa several years later.[23]

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[22] Caroline Constant. *The Palladio Guide.* (1985).
[23] Kim Williams, Giovanni Giaconi, and Andrea Palladio, *The villas of Palladio.* (2003), p.p. 128-130.

Palladio's career started at a very young age. He was born Andrea di Pietro in 1508; his father was a mill worker. At thirteen, Andrea was apprenticed to a stonemason for three years until he broke his contract. He worked in the mason and stone carver's guild until around 1537 when he met Giangiorgio Trissino, who started a classical workshop that gave Andrea his formal training in architecture as well as the name Palladio. After sixteen years of work as a stonemason, he was trained as an architect.[24] Did his physical experience building and then the architectural training make him an architect, builder, or a master builder?

Although he had the knowledge and skills of a builder, evidence shows that Palladio in fact functioned much as an architect would today: running multiple projects and overseeing construction, but not actually doing the physical labor. After he was trained as an architect, he functioned as one. Palladio was a forerunner, whose influence in architecture reached beyond the Renaissance. He has inspired modern architects to think of space as more than an incident of form and buildings as part of a landscape.

[24] Kim Williams, Giovanni Giaconi, and Andrea Palladio, *The villas of Palladio.* (2003), p.p. 128-130.

Andrea Palladio's Life and Process in one page

Life and training

Born Andrea di Pietro in 1508. → In 1521 (age 13) he apprenticed with a stone mason. He worked as stone mason until 1537 (16 years). → He met Giangiorgio Trissino in 1537 (age 29) who named him Palladio and gave him formal training as an architect. → He was a builder for 16 years until he was trained as an architect, and then he was transformed into an architect.

Palladio's Process at Villa Rotonda

Palladio began to design Villa Rotonda in 1566 (age 58). → He had a team of artisans and craftsman building the Villa. → In addition to Villa Rotonda, Palladio had several jobs going simultaneously, he must have had a foreman managing the different projects. → The Villa was not finished being designed or built at the time of his death in 1580 (age 72). So the project must have been being designed while it was being built.

What we know from this research

1. Palladio led the project by working closely with a foreman (or tradesman and artisans).
2. He had sixteen years of construction experience, but functioned as an architect.
3. He designed during the construction of the Villa project.
4. He was not a master builder - but he did have an unified process.

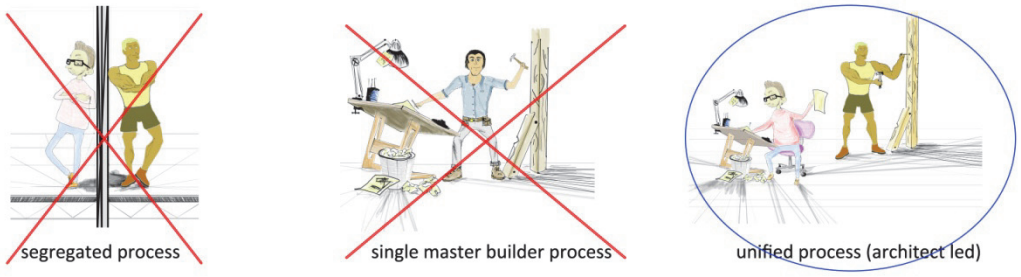

Fig. 5 Andrea Palladio's life and process in one page

With regard to Alberti and his book, *On the Art of Building in Ten Books,* it is not clear what path he took to acquire the knowledge so clearly portrayed in his written work. In this book, he talks about architects as a professor would, not a professional. It is never mentioned in his book or anywhere else that he actually built anything.

Alberti was a philosopher and a great man of the Renaissance. He was talented and knowledgeable in many fields including design and building. Alberti also contributed a great deal of knowledge about architecture to the world through this book, which at the time was a modern version of Vitruvius' book, *Ten Books on Architecture* (c. 15 B.C.). Although he designed and collaborated on a few building projects and had a tremendous

level of historical and theoretical knowledge of architecture, he was certainly not a master builder.[25]

Filippo Brunelleschi, born in 1377, began his journey towards building in his youth with an amazing aptitude for solving mechanical problems. At age fifteen, he entered into an apprenticeship with a goldsmith. Many up and coming sculptors and painters of the Renaissance, including Leonardo di Vinci, began their journeys as apprentice goldsmiths, so this path was not uncommon. Brunelleschi grew up "in the shadow" of an unfinished Santa Maria del Fiore, the place where he returned at age forty-one to present his elegant solution to its dome in 1418.[26]

It wasn't until 1420 that Filippo's daring design was accepted and prepared to be built. During this time, the aged *capomaestro,* Giovanni d'Ambrogioon, of the Santa Maria del Fiore project had become too frail to ascend to the 140 foot tall tambour to inspect the mason's work and thus had to be replaced. Thirty-eight-year-old master mason Battista d'Antonio, who had served as *vice-capomaestro* under d'Ambrogioon, was appointed the new capomaestro.[27]

When translated from Italian to English, capomaestro means "master builder." However, because this thesis discusses the definition and legitimacy of this term, it must be noted that d'Antonio had no official training, knowledge, or skill in building design; therefore, he was more of a foreman or contractor than an architect or designer. Since the project had a contractor over the workers on-site, Brunelleschi acted as an architect rather than a master builder.[28]

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[25] Leon Battista Alberti, *On the art of building in ten books* (Cambridge: MIT Press, 1988), p.p. 1-2.
[26] Ross King. *Brunelleschi's Dome: How A Renaissance Genius Reinvented Architecture*. (2000), p.p. 1-20.
[27] Ibid.
[28] Ibid.

The three-hundred workers on this site answered to and were paid by the foreman, d'Antonio, whose task it was to explain the architect's plan to workers who could not grasp the complicated drawings.[29] A more thorough investigation of this work by Brunelleschi reveals that he controlled the construction through drawings and models, and therefore functioned as an architect on this project, directing the capomaestro as the foreman or contractor. Brunelleschi is a great example of a Renaissance architect, and if a thorough definition of the master builder is to include men from the Renaissance, certainly it would point to Brunelleschi. Although Brunelleschi was a genius level Renaissance man and architect that changed building processes and techniques in an amazing way, he was not a master builder.

[29] Ross King. *Brunelleschi's Dome: How A Renaissance Genius Reinvented Architecture*. (2000), p.p. 1-20.

Filippo Brunelleschi's Life and Process in one page

Life and training

Born Filippo Brunelleschi in 1377. → In 1392 (age 15) he entered into an apprenticeship with a goldsmith, and by 1398 (age 21) he was a master goldsmith. → In 1401 (age 24) he entered into a competition for the bronze doors of the Baptistery of San Giovanni. He did not win. → He grew up around the Santa Maria del Fiore, and after the competition he traveled extensively through Rome for thirteen years to survey architectural achievements.

Brunelleschi's Process at the Dome of Santa Maria del Fiore

Brunelleschi presented his vision for the dome of Santa Maria del Fiore in 1418 (age 41). → To win the competition he directed a group of craftsman to build a scale model of the dome. → In 1420 construction started on the dome. Brunelleschi worked with a foreman, Battista d'Antonio who directed over 300 workers. → Brunelleschi developed drawings that were explained to the foreman, who then explained them to the workers on site.

What we know from this research

1. Brunelleschi led the project by working closely with a foreman
2. He had nine years of experience as an artisan/tradesman, and thirteen years of experience studying roman architecture.
3. He designed during the construction of the dome model, and, most likely, the actual dome.
4. He was not a master builder - but he did have an unified design+construction process.

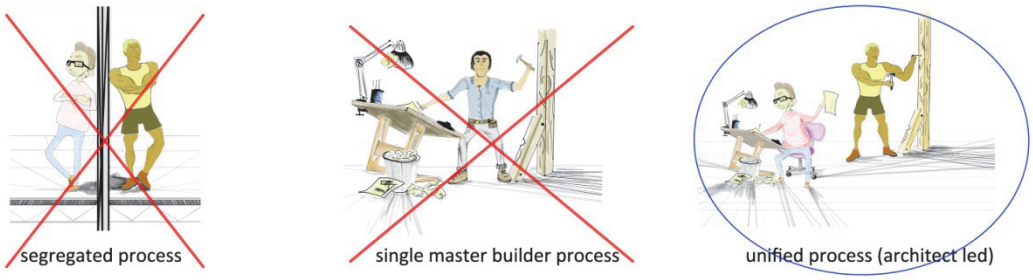

Fig. 6 Filippo Brunelleschi life and process in one page

Is it possible that by the time of the Renaissance, design and building had already split to such a degree that there were distinct roles between architect and builder? If so, maybe the exemplary master builder is buried further in the past. There is a deficient amount of existing information concerning building techniques in ancient times to get an accurate account of whether or not master builders ever existed. The one solid reference is a book, *Ten Books on Architecture,* written by Vitruvius Polio, who lived c. 1st century BC. The book is estimated to have been written c. 15 BC and includes many of the ideas of off which Renaissance men based their theories.[30]

[30] "Marcus Vitruvius Pollio Biography," http://www.vitruvius-pollio.com

The knowledge that came from Vitruvius' book may have been the jumping off point for the revival of building in the Renaissance. Although it cannot be determined whether Vitruvius was himself a master builder, the fact is that knowledge of building and design existed. Someone mastering pre-modern building techniques only need read the book to have a broad understanding of what building was like in the past.

Although the *Ten Books on Architecture* has been translated and edited many times since its creation over 2,000 years ago, it does not mention 'master builder' once in the one-hundred-eighty-three pages that make up the 2005 version in English.

Vitruvius' book is the only source that survives in entirety today which explains almost every aspect of classic Roman architecture and goes into detail describing the education and significance of what it means to be an architect. Over the last 2,000+ years, the profession of architecture has changed and indeed become fragmented. Although this book may not describe the modern architect, what is described is still an architect, not a master builder.

The search for the master builder presents the prospects for a relatively straightforward solution to the problem of a fragmented building process. That solution comes from the hypothesis that the master builder had an ideal process in which design and building were one. There is no evidence to back up that hypothesis, and therefore, the master builder as the ideal, single source, archetypal designer-builder, is a myth. Any implementation of a mythical figure, replicated or embodied as a leader in today's building process is not only non-viable, but utterly senseless. Why use a mythical figure to piece together an already confused building culture?

It is not the master builder that needs to be re-created; rather, a non-fictitious leader must be introduced. In the past, this has been an architect, as seen in tangible examples from the Renaissance. Much of the knowledge that was once necessary and common for one architect to master has been segmented into various disciplines. This is because of the growth of knowledge, building size and complexity, and technology. It's not the role of the master builder that has disintegrated, but that of the architect.

Today, faced with the threat of losing control over the process, design professionals' egos and defensive actions take the place of respect and candor in business relationships in the building process. In turn, builders react, and have a right to do so. The myth of the master builder was born as the 'father' of the design and building processes. The legend of the master builder silently spread and became a dissident's pretext for control; he who controls the title of master builder controls the processes. This thinking is wrong. The answer for projects is, and has always been, unity between the architect and the builder and unity between the design and building processes.

It is obvious that there has been a degenerative change in the prestige of the design professional, but the answer is not to bypass the critical builder; the answer is finding a way to rebuild the relationship. The architect should lead the process by uniting disciplines and setting an example, thus earning a place at the head of the table, not by claiming birthright.

As individuals in the building industry continue to realize that the hostile tug-of-war for power and control in projects is detrimental to their success, trends are starting that advocate mutual respect through relationships between every discipline involved in the process. Relationships that are built with mutual respect allow the separated

disciplines to operate in their specialties without feeling the need to fight for control. Whether relationships become partnerships or are simply social or contractual agreements, the consistent character and ability to function together as one unit benefits everyone involved in the project, especially the clients.[31]

Prospective change in the business of building is gaining momentum in political opinion as well as with individuals of all disciplines who are advocating for a shift in accepted practices. In addition, paradigms of adversarial relationships and litigious societal propensities that have become commonplace in the process of building are shifting toward relationship-based collaboration, which stimulates efficiency through interdisciplinary teamwork. The tendency to question what can be done to evoke unity in the building culture is moving towards how and when unity between the heads and the hearts of individuals can be implemented in common business practices.[32]

The solution to the fragmented building process will come naturally through relationships. There is not a system or diagram that can be devised that will solve the dilemma on a broad scale. The instrument of change in the business of building will come from individuals who make personal choices to run their practices, lives, and companies with internal unity. This internal unity, between emotion and logic, will start in the individual and allow for collaborative unity in a multidisciplinary team.

The best way to prove unity can bridge the gap between segregated disciplines is through example. Using a mythical example like the master builder doesn't make sense. First of all, it's not a real example. Secondly, oneness in design and building will come

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[31] "Building Relationships: New Trends In Commercial construction." *AllBusiness.com*. http://www.allbusiness.com/north-america/united-states-utah/828459-1.html.
[32] Michael Tardif, "Master Builder, R.I.P.," *AIArchitect This Week* (2007, January 01): p.p. 1-2. http://info.aia.org/aiarchitect/thisweek07/1221/1221rc_face.cfm

from the unification of disciplines under a leader with a vision: one person who knows all and does all cannot exist, and that concept actually hinders the ability to work in unity, as a team. With current real life examples of unity through relationships that exist today, the need for a clear definition or example of a master builder becomes irrelevant although the embodiment of the master builder can be used as the standard of unity, once the example is separated from the title of master builder.

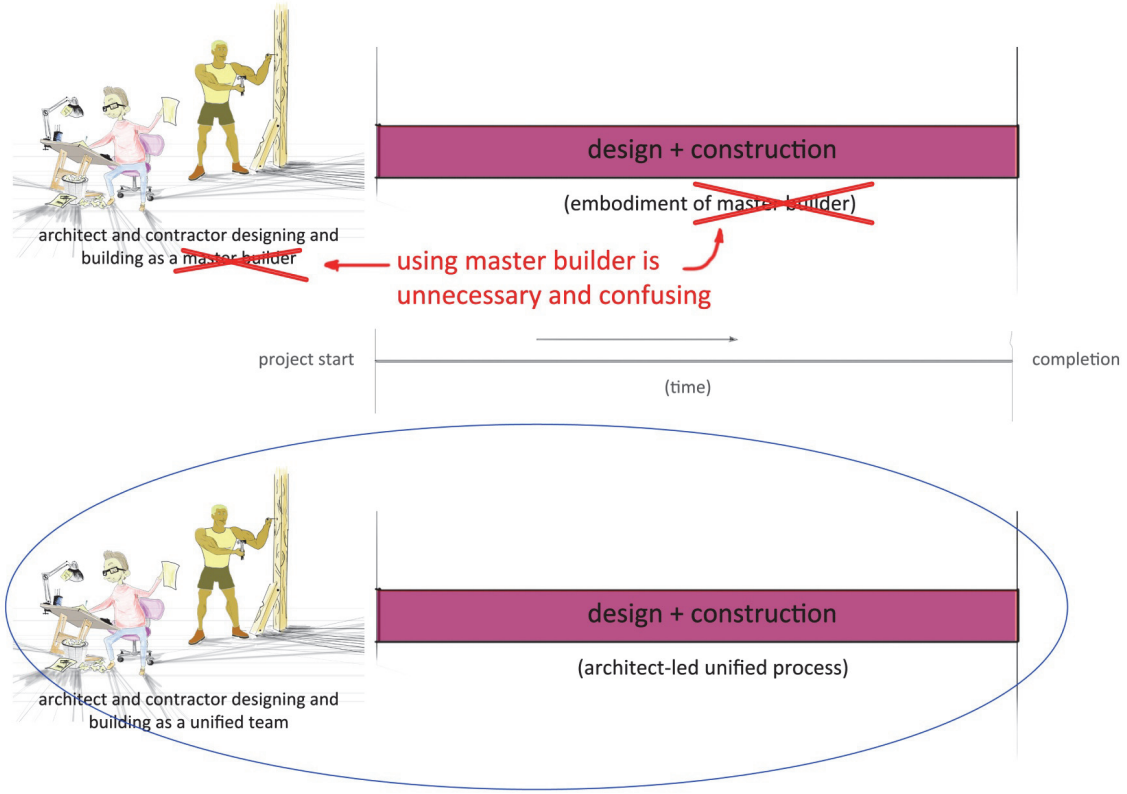

Fig. 7 The master builder is an example of unity, not a title of the unified process

It is impossible for one man to design and build a building of any great significance alone. Even if it were possible, since theoretically nothing is impossible, why would anyone want to design and build a building of any great significance alone?

It would be difficult for one man to design and build a building today because most materials are manufactured, most buildings must be permitted, and most building methods generally require more than one person. The building constructed under a single person in the past, or today, was done out of necessity. There could have been master builders, who built small personal projects, and the same could exist today, but as the building's importance, size, and complexity rise, the ability of a single person to design and build it decreases drastically.

Looking for insignificant examples of buildings done by lone individuals would prove nothing, because there is no way to extrapolate isolated incidences of inferior building projects to projects of superior quality, size, and complexity. Instead, using examples of small, but significant and beautiful projects done by architects who surround themselves with relationships that support unity in the design and building process would give the ability to extrapolate the processes into larger and more complex building projects.

The next two chapters are case studies of two architects that build with the same unity seen in Palladio's and Brunelleschi's projects. Since the two case studies were recently built projects, there was much more detailed information about how the relationship between the design process and the construction process could be integrated. Both of the case studies are examples of architect-led unified teams (the teams consists of the architect and his pupils, and the contractor and his tradesmen). Both architects lead the process through a relationship with a contractor.

FOUR

BYOUNGSOO CHO: RATIONAL EXPERIMENTS

Byoungsoo Cho is a Korean architect who believes in rational exploration of architectural material and details through experimentation and implementation. This explorative attitude guides his design process, which he then rationalizes using trial and error until arriving at a final form in each project. The context, site, and surroundings of each project inspire the discovery of material and detail, which Cho then applies to the site.

Many architects start from the macro scale, solving larger issues first before slowly moving to the micro, which deals with materiality and details. Cho designs a specific detail before he considers specific larger issues, save the general essence of the site's surroundings. Although Cho's unique process seems backward and may appear at first to be a primitive way to think about design, it yields incredibly creative results.

In addition to using this unique design process in his practice, which is located in Seoul, Korea, Cho teaches this method in his design studios. Cho was a full-time professor at Montana State University, where he graduated with a Bachelor of Architecture, and has run a branch of his firm out of Bozeman, Montana. He now has several universities that claim his time; including Montana State, Harvard Graduate School of Design (GSD), from which he graduated with a Masters of Architecture; and the University of Hawai‘i at Mānoa School of Architecture (arc<u>h</u>awai‘i).

In his studio classes, Cho teaches that material and detail design come before programmatic considerations: "I don't believe in one absolute idea in architecture but in thoughtful description and how it is executed."[33] Not having an absolute idea means that there is not an architectural concept that dictates the design. Instead, the agenda and intentions brought about by a concept are replaced with experimentation and implementation.[34] In addition to this unique process, Cho uses a very different teaching method, in which the student is very much in control of the direction of the material and detail research and design: "You learn the most when I tell you the least."[35]

Students' ideas flourish through site inspiration and research, and then mature through physically testing a material detail at a large or full scale. Cho gives input throughout the process, and his input is most effective when he critiques a physical model because there can be a dialogue about the constructability and beauty of the model.

After the critique, the material detail is then redesigned, or tossed out, and the process starts from the beginning. The process of making and being critiqued that the students experience is very similar to the relationship that Cho has with interns and architects within his firm. The difference between Cho's students and employees is that Cho generally has more input into projects in his firm while he lets the students have ultimate control over their individual projects.

The goal of Cho's design process is to become familiar with a chosen material, abandon preconceived applications, and find a unique way to use that material in a designed detail. Function and constructability are key factors as the detail is applied to a

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[33] Cho, ByoungSoo. Harvard University GSD Lecture. April 2006.
[34] Voice Maker. Space Magazine. Architectural Design Exhibition. http://www.vmspace.com/eng/sub_archprize_exhi1.as
[35] Byoungsoo Cho. "Seoul Studio Lecture" (lecture, University of Hawai'i at Mānoa School of Architecture, Honolulu, Hawai'i, January 13, 2011). Lecture given in Seoul, Korea Study Abroad Studio.

site, which is the beginning of programmatic design. The detail, designed from experimentation and site considerations, must now fit into the site in a functional way. According to Cho, the most important part of the process is learning to have a relationship with material. The more the architect knows about the process and technique involved in the construction of a project, the easier it is to have a conversation with the builder, thereby making the design intent greatly understood.[36]

Because of Cho's interest in materiality and construction, it is not a surprise that his firm started as a design-build firm. He hired his brother, Youngmook Cho (Youngmook), and trained him to build. Cho's knowledge was transmitted to Youngmook, whose experience and knowledge grew while building Cho's projects. Youngmook's ability soon took off, and he started his own company. Although he still works with Cho on projects, they have both outgrown the design-build years of the firm and now operate independently. Cho's firm does not build their projects internally anymore, but his firm still functions under the same philosophy and has a very intimate relationship with the construction process.

Cho has a strong connection to the philosophical traditions of the East, and much of what he believes comes from the basic concepts of harmony within one's life. These ideas include letting go of one's preconceptions, being one with nature, and not doing anything, in his case, teaching, without teaching. Understanding the mental blocks, preconceptions, and external answers that are input into a person's brain, and breaking free through meditation is an extremely important piece of these traditions as well.

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[36] Byoungsoo Cho. "Seoul Studio Lecture" (lecture, University of Hawai'i at Mānoa School of Architecture, Honolulu, Hawai'i, February 16, 2011). Lecture given in Seoul, Korea Study Abroad Studio.

Although Cho has expressly stated that it is not required for his studio,[37] meditation is supposed to clear the mind of these external inputs and allow one to find answers within oneself. Through persistence, one's inner voice can be heard. Decisions are made based on that insight, and are then immediately rationalized physically to help explain what was done.

The letting go of one's self is important to experience oneness between separate elements in life, internal and external body, building and nature, and self and others. This is how Cho relates to the building process as well as the relationships with his employees, students, and even his contractors.

Although Cho has become one of the most esteemed architects in Korea, working on everything from complex large-scale office buildings to more humble traditional Korean houses, his process for each project is very simple. His methods will be shown by example using a studio residence built in a small town outside of Seoul, Korea, which was designed and managed by Cho from the United States. This project is an example of the effectiveness of relationship-based management in projects. The relationships created with both the design professionals in his firm and with his brother (and contractor), Youngmook, allowed Cho to be on the project site managing the construction without actually physically being in the country.

[37] Byoungsoo Cho. "Seoul Studio Lecture" (lecture, University of Hawai'i at Mānoa School of Architecture, Honolulu, Hawai'i, January 25, 2011). Lecture given in Seoul, Korea Study Abroad Studio.

I hope that this house will be a place where one can sit down and welcome a friend who has come to visit from a long distance, and where together they can look at the stars and the moon in the night sky. I also hope that it will be a place where one can feel the dynamic changes of the four seasons.[38]

-Byoungsoo Cho

[39]

Project name:	SQUARE-SHAPED CONCRETE BOX HOUSE
Function:	Single Family Retreat (Studio)
Chief architect/office name:	Cho Byoung-soo / BCHO ARCHITECTS
Project team:	Jo Young-joon
Client:	Cho Byoung-soo
Construction:	Cplus Construction Co., Ltd.
Design date:	January 2004
Completion date:	July 2004
Building Area:	191.14 sqm (2,066 sq. ft.)
Photography:	Kim Jong-oh

[38] Cho, ByoungSoo. *+Architect 03: Cho Byoung-soo.* Seoul, Korea: Space Publishing Co., 2009.
[39] BCHO Architects. "Concrete Box House 2_1," http://www.bchoarchitects.com/main/concrete.htm

Byoungsoo Cho "believes that buildings are made, not created."[40] His process comes from making architecture and then rationalizing it through experimentation and implementation. Rationalization is used to explain to others what was made, and the need to rationalize is one of the things that differentiate the art of architecture from other arts. The first design sketch for the Concrete Box House was given to the contractor the day site work started, although the process that led to the first sketch started a year beforehand.

A group of more than twenty people got together to start a community on a hillside in Yangpyoung, South Korea. One of the center lots was given to Cho by his friend with the conditions that Cho must build his own house first, then design a house for his friend, and oversee the master plan for the community. The Concrete Box House is the first building designed and built as part of the community in Yangpyoung. Cho stated, "This studio house was designed as a retreat from the busy life of Seoul, and is located on a peaceful site on a hill overlooking the quiet rice fields of Yangpyoung."[41]

The Concrete Box House was designed by Cho, for himself, so he was free to make it as he desired. Cho talks about experimental and experiential architecture in his studio. The Concrete Box House is an experiment in the experience of nature. Turning the focus of the house inward toward a courtyard allows for a controlled environment that "lets us experience the subtle changes in nature."[42] The simplicity of the materials, details, and form puts the focus on the nature surrounding and within the house.

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[40] BCHO Architects. http://www.bchoarchitects.com/main/aboutbcho.htm
[41] 2007 Award of Excellence - AIA Montana Design Awards – Honor Award. PDF Document retrieved from: http://*www.jenmdse.net/AIA/Newsletters/AIAMT2007_4thQtr.pdf*
[42] Ibid.

"The design intent was to create a building that would appear quiet and unassuming on the outside, but offer elements to engage the individual with nature on the interior."[43] The retreat from a busy life in Seoul becomes more than a retreat from the city, and allows a retreat from one's self. The focus is not only directed away from the building, but away from one's own nature.

[44]

Fig. 8 Interior courtyard with openings in concrete plates towards the sky

The Concrete Box House project was constructed in a unique nature: instead of design documents being completed and sent to bid, or to the contractor to build, the

[43] 2007 Award of Excellence - AIA Montana Design Awards – Honor Award. PDF Document retrieved from: http://*www.jenmdse.net/AIA/Newsletters/AIAMT2007_4thQtr.pdf*
[44] BCHO Architects. "Sketch 1". Concrete Box House. Yangpyoung, Korea.

design was mostly communicated verbally through the construction process. Cho says, "The design changed the day before construction started. I basically told [the contractor] what I wanted, and since we had previous work experience with each other, he was able to continue work without any specific drawings."[45]

Cho was out of the country when this project was being built. The contracting company, Cplus Construction Co., Ltd., is owned by Cho's brother, Youngmook Cho. Cho, the architect, said, "We have a mutual sense of professionalism. [Youngmook, the contractor,] ensures work will get finished."[46]

The communication between Cho and Youngmook, who were thousands of miles away from each other, across the Pacific Ocean and in different countries, seems to be better than the communication between some other architects and contractors even when they are sitting in the same room together. Written communication is also preferred in litigious societies because miscommunication without documentation can lead to litigation.[47]

The fact that communication between the architect and the contractor in the Concrete Box House project was carried out verbally or through rough sketches indicates a relationship that is deeper than a mutual sense of professionalism. It is a good example of a simple relationship with mutual professionalism in addition to mutual respect, understanding, and desire to accomplish a great finished product. It was a relationship of unity, the architect and the contractor working as one. This kind of relationship creates a social agreement between two parties. With common understanding and respect, the

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[45] Larson, Stephen. Interview with ByoungSoo Cho. Written Correspondence. June 11, 2011.
[46] Ibid.
[47] Saucerman, S.S.. "The Architect, the Contractor and the Lost Art of Communication," *Construction Dimensions.* October 1998. PDF Document retrieved from: www.awci.org/cd/pdfs/9810_f.pdf

contractor listens to the architect as the construction is executed, and the architect provides information based on what has been built, when necessary.

There were no formal contracts between the architect and contractor for this project, "only legal paperwork and very brief legal works concerning municipal matters."[48] The construction costs ran higher than anticipated, but without a detailed and finalized design before construction begins, it is difficult for the architect or the contractor to estimate costs accurately. Youngmook stated in an interview that there is a strict rule for construction projects: "the more precise plan, the less money."[49] In this project, as with many of Cho's projects, things changed as the project unfolded. Cho said, "It is necessary to manage the design along with the construction process."[50]

While it is not possible for every detail in drawings to be perfect, and while it is more than likely that designed details must still be rationalized after being designed, understanding constructability allows for more dialogue between the architect and the contractor. The more the architect understands the details of the construction process of a project, the more s/he can work with the contractor to have them built, or rationalized, correctly. As the Concrete Box House process shows, a good dialogue is just as important as a finalized set of plans.

Because Cho functioned as both the architect and the client, one of the freedoms he had was absolute control over the design and construction process. Freedom of the architect, coupled with a contractor that was willing to listen to the architect, created a synergy within the building process that allowed for exploration in materiality and detailing.

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[48] Larson, Stephen. Interview with ByoungSoo Cho. Written Correspondence. June 11, 2011.
[49] Larson, Stephen. Interview with Youngmook Cho. Written Correspondence. June 11, 2011.
[50] Ibid. Footnote 48. Same page (pg. 48).

Youngmook said, "When the project started, enough construction documents were not available…with one page of sketch, I could not proceed."[51] The construction was held off a few days until some basic construction documents were made. When construction continued, Cho, Youngmook, and Youngjun, the onsite design supervisor, all collaborated to develop the detailed drawings during the construction process.

 [52]

Fig. 9 Overall view of floor slab before pour

The site was excavated and the floor slab forms, including the interior and exterior floors and the perimeter and interior wall footings, were prepared in sections to allow for proper finishing as each area was poured. Rebar was placed and the utilities were stubbed, then the slab was poured after extensive documentation. With digital cameras, it is possible to take hundreds of photos that only take up a relatively small amount of room on a hard drive.

In addition, digital photos can be emailed to anyone around the world in a moment, so it has become common in the construction industry to digitally document

[51] Larson, Stephen. Interview with Youngmook Cho. Written Correspondence. June 11, 2011.
[52] BCHO Architects. "Overview of Floor Forms", Concrete Box House, Yanypyoung, Korea. 2004.

jobs as they progress. The visual documentation of the rebar and utility locations are generally used for future reference, but in this project, the photos were also used to get confirmation and communicate the job site visually to Cho, who was out of the country.


[53]

Fig. 10 Detailed view of rebar and utilities before pour


[54]

Fig. 11 Wall forms and staging for roof forms

[53] BCHO Architects. "Detail View of Floor Forms", Concrete Box House, Yanypyoung, Korea. 2004.
[54] BCHO Architects. "Wall forms", Concrete Box House, Yanypyoung, Korea. 2004.

After the floor slab was poured, the wall forming went up and staging for the roof forms began. Poured in place concrete is much different than the light-frame construction methods of the US, but relatively common in countries where the construction labor cost is lower. The biggest difference between these types of construction is the material. Residential light-frame construction in the US typically uses wood stud platform framing with interior and exterior finishes. Until the finishes go on, it is relatively easy to change the location of interior non-load bearing walls, utilities, etc. Poured in place concrete, by nature, is more permanent. So, although the design of the Concrete Box House was developed alongside the construction process, once the floor, walls, and roof were poured, the overall design couldn't be changed without a considerable amount of work.

Once the floor was poured, the basic layout of the house was fixed, and before the walls and roof were poured, the overall design was finished with enough detail to place outlets and fixtures in the house. Again, throughout the construction process, pictures were relayed back to Cho in the US and his office in Korea through Youngjun, who acted as Cho's eyes and mouth on the jobsite.

 [55]

Fig. 12 Outlet placement

 [56]

Fig. 13 Rebar placement & waterstop seal

[55] BCHO Architects. "Outlet placement", Concrete Box House, Yanypyoung, Korea. 2004.
[56] BCHO Architects. "Rebar Placement and Waterstop", Concrete Box House, Yanypyoung, Korea. 2004.

An interesting by-product of designing the details first is that even though changing the programmatic design the day before construction starts would normally be a big deal, many details are already decided and only need to be modified to fit the new program. This process doesn't leave unsolved ideas to interpretation; rather, the ideas are immediately rationalized through action.

As the making of the design is rationalized, the details are then applied to the site and programmatic concerns begin. The program and details adapt back and forth as the design matures. The material or detail may change to suit the program, and likewise, the program may evolve to allow for the use of that new material or detail. Such adaptations led to unique design characteristics in the Concrete Box House.

Three unique characteristics were used in the making of the house: "the structural wooden columns, the concrete roof and just the nature of construction"[57] Cho had bought wooden columns years before the project started. He said "I saw them on the side of the road and thought I would use them someday."[58] These columns are used to support the design intent, to provide a primitive and clean structure, as well as the roof, which is "designed to be only twelve inches thick including the structure, finish material, and insulation."[59]

Beginning with the details first and moving into programmatic design clearly illustrates that knowledge and care for the construction process is very important to Cho. In the end, figuring out which came first, details or program, becomes similar to the chicken and the egg debacle, and the answer is up for debate. Although Cho starts with

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[57] Larson, Stephen. Interview with ByoungSoo Cho. Written Correspondence. June 11, 2011.
[58] Ibid.
[59] 2007 Award of Excellence - AIA Montana Design Awards – Honor Award. PDF Document retrieved from: http://*www.jenmdse.net/AIA/Newsletters/AIAMT2007_4thQtr.pdf*

details and the program is influenced by them, the details also become influenced by the program.

The Concrete Box House began as a two-story storage house. At some point, either the choice to use the wooden columns and the roof detail led the program in a different way, or the program was led in a different way and the wood columns and roof detail adapted to the new program. The point is that simultaneous evolution of detail and program from the beginning of the process brings harmony in the design so there is no clear division between the two aspects, program and detail, in the final product.

What is not described in this process study is the time, effort, or detailing that went into the pre-design of the Concrete Box House. These are important to understand the full scope of the design and building process, but that information was not released. Even though the design started with a sketch the day before construction began, there was a period of thought that started before that sketch, which led to what is built on this site today.

The wood columns were made specifically for the Concrete Box House before the project started, or possibly the project was made specifically for the wood columns. Whenever Cho saw these columns on the side of the road may have been when this project began to develop, possibly before the site was chosen. One of the last wall forms were placed as the columns were cut to size and prepped for hardware.

Fig. 14 Placing a wall form with crane[60]

Fig. 15 Prepping the wooden columns[61]

The column design was an off grid arrangement that allowed for adequate support of the roof while seeming like they were placed by nature. The roof had to accommodate the off-grid column placement, so a flat poured in place concrete roof without beams was planned. The columns worked together to support the roof so a load bearing wall was not necessary to support the opening in the center where the courtyard would be.

After the wall forms were in place, the crane started to move the columns into place. As each column was prepared for installation, it sat alone waiting for the roof element. It was reminiscent of the temple house visited in Cho's Seoul studio: the columns in the temple house were cut so perfectly that they sit on each foundation stone without a visible gap on the rough surface of the stone. The quality of these columns and the custom level of care that went into the placement show that the detail is not only in what is designed, but also its execution.

The personal responsibility that Youngmook took on throughout the construction process to carry out Cho's vision for this project shows in the details. Youngmook cared for the execution of the project as if he were Cho.

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[60] BCHO Architects. "Placing a wall form," Concrete Box House, Yanypyoung, Korea. 2004.
[61] BCHO Architects. "Prepping wooden columns," Concrete Box House, Yanypyoung, Korea. 2004.

 [62]

Fig. 16 Crane truck

 [63]

Fig. 17 Placing columns with crane

The care does not exist without concern or problems. Cho designed the roof to be twelve inches thick including structure, insulation, and finish materials.

"The concrete roof was an experiment to remove all waterproofing materials and seal with cement. [Youngmook] was highly skeptical about this method, but since it was my house, I insisted he do it this way and I would be responsible for the outcome. [Youngmook] executed it extremely well, and it remains watertight to this day. [The process] requires workers to stay overnight and re-trowel the roof during the curing process. As the water rises they have to re-trowel the surface every 3-4 hours about 3-4 times depending on the temperature and humidity that day."[64]

The conversation between Cho and Youngmook about how to properly finish the roof was ongoing as work continued. The column placement can be seen in the picture below, braced and prepared for hardware to be installed.

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[62] BCHO Architects. "Placing a wall form," Concrete Box House, Yanypyoung, Korea. 2004.
[63] BCHO Architects. "Prepping wooden columns," Concrete Box House, Yanypyoung, Korea. 2004.
[64] Larson, Stephen. Interview with ByoungSoo Cho. Written Correspondence. June 11, 2011.

 [65]

Fig. 18 Columns in place, ready for the roof forms

 [66]

Fig. 19 Braced columns

 [67]

Fig. 20 Hardware preparation

An impressive amount of temporary supports were used in the poured in place roof forms. All of it was constructed in a day or two, but in photos, the amount of labor that goes into poured in place concrete structures is evident. The materials used for the forms are temporary; they are erected and taken down and used for many more jobs. Most of the costs for form materials can be spread over several jobs by the contractor, but the amount of labor is intense.

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[65] BCHO Architects. "Columns in place," Concrete Box House, Yanypyoung, Korea. 2004.
[66] BCHO Architects. "Braced columns," Concrete Box House, Yanypyoung, Korea. 2004.
[67] BCHO Architects. "Hardware Preparation," Concrete Box House, Yanypyoung, Korea. 2004.


[68]

Fig. 21 Raw form structure for roof pour


[69]

Fig. 22 Roof form posts


[70]

Fig. 23 Raw roof forms

The roof's form boards were laid on a skeleton frame, and the hardware that penetrates the columns and the roof's forms were installed. After insulation was installed, rebar installation began; it was tied into the walls and column hardware.

[68] BCHO Architects. "Raw roof forms," Concrete Box House, Yanypyoung, Korea. 2004.
[69] BCHO Architects. "Roof form posts", Concrete Box House, Yanypyoung, Korea. 2004.
[70] BCHO Architects. "Roof forms," Concrete Box House, Yanypyoung, Korea. 2004.

 [71]

Fig. 24 Insulation and hardware installation

 [72]

Fig. 25 Insulation installed

[71] BCHO Architects. "Hardware installation," Concrete Box House, Yanypyoung, Korea. 2004.
[72] BCHO Architects. "Insulation installed," Concrete Box House, Yanypyoung, Korea. 2004.

Just as all the steel and wood used in a temporary structure for poured in place concrete is impressive, so is the amount of concrete and steel rebar used. The steel rebar reinforces the concrete to help prevent shrinkage and cracking. The reinforcement is used very strategically in this structure because there are no beams between the columns. A grid pattern is used for the entire roof that is tied into the steel rebar in the wall and welded to the column's hardware. In addition, it is used in an alternate pattern running against the grid to prevent the concrete from cracking where the greatest stresses will be on the structure. This was done over each column and around each penetration, including the corners of the courtyard penetration.


[73]

Fig. 26 Crew discussing rebar installation

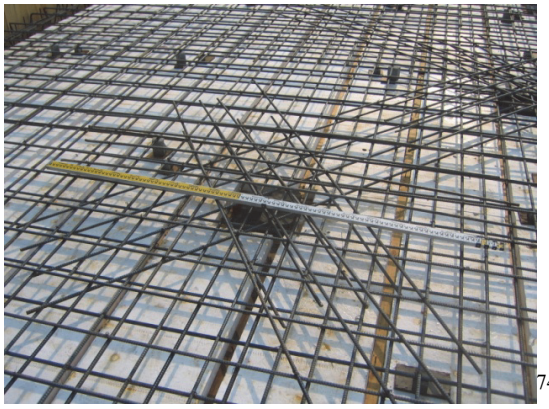
[74]

Fig. 27 Rebar installation detail

Cho made a judgment call on Youngmook's concerns with the roof detail aspect of the project. He took responsibility for the outcome, good or bad, and Youngmook executed it with the same rigor as if it was his idea and he was responsible. This is the definition of a heart and mind agreement. Where there is a concern, the questions are raised and the issue is resolved. In this case, the architect took responsibility for the design and the outcome of that design, and the contractor worked diligently to make sure it was done correctly.

[73] BCHO Architects. "Rebar installation," Concrete Box House, Yanypyoung, Korea. 2004.
[74] BCHO Architects. "Rebar installation detail," Concrete Box House, Yanypyoung, Korea. 2004.

The walls were actually poured at the same time as the roof. This relatively simple structure was done in one massive pour. The reason the walls were not poured before is because this would have created a visible joint between the roof and the exterior walls, but with one massive pour there was no visible joint. A little after eight in the morning, the pour started. The walls were poured first, using a crane pump and a crew packing the concrete into the wall forms and another crew vibrating the forms to make sure it was filled completely.

 [75]

Fig. 28 Walls being poured

After the walls were completed, the main roof was poured using a similar strategy. The finishing crew worked the concrete by hand until it was set up, then used a motorized trowel or whirly-bird to refinish it several times as it cured to seal the surface cracks, making sure it was waterproof.

[75] BCHO Architects. "Pour overview 1," Concrete Box House, Yanypyoung, Korea. 2004.


[76]

Fig. 29 Finished concrete pour by hand


[77]

Fig. 30 Finishing the edges before the motorized trowel

The motorized trowel is used to speed up the process of re-toweling several times. It is faster and only requires one operator while another finisher can work the edges where the motorized trowel cannot reach. The first pass looks as if it ruined what was done by hand, but it is in fact a necessary part of keeping the surface from cracking, and the concrete surface will become smoother as the concrete cures and the motorized trowel takes more passes.

[76] BCHO Architects. "Pour overview 2," Concrete Box House, Yanypyoung, Korea. 2004.
[77] BCHO Architects. "Pour overview 3," Concrete Box House, Yanypyoung, Korea. 2004.

 [78]

Fig. 31 First pass with motorized trowel

By the end of the day, the concrete was poured and finished. It was six-thirty in the evening and most everyone was ready to go home for the day. At least two people had to stay the night to re-trowel the surface several times. A couple days later, the roof was cured and waterproof.

 [79]

Fig. 32 Roof, a few days after concrete pour

[78] BCHO Architects. "Motorized trowel," Concrete Box House, Yanypyoung, Korea. 2004.
[79] BCHO Architects. "Roof poured overview," Concrete Box House, Yanypyoung, Korea. 2004.

Cho took a studio class to the Concrete Box House in 2011 and almost seven years after the roof slab was poured, it is still holding up, watertight. After studying in Peru, where the average rainfall is 13mm (0.512 inches) per year,[80] and living in Hawai‘i, home to some of the wettest places on earth, I was hesitant to accept the legitimacy of the claim that this house, and technique, is in fact waterproof. However, I was assured that it rains a lot in Korea during the summer. From a quick look at climate statistics, it seems that it does rain quite heavily through the summer months in Korea. The average rainfall in Seoul, Korea, about an hour and a half away from the Concrete Box House, is 1,344.2mm (52.9 inches) per year, totaling a little over double that of the city of Honolulu, Hawai‘i which comes in at 559.3mm (22 inches) per year.[81]

With the amount of rainfall and changing weather conditions, from freezing in the winter to hot and humid in the summer, I think that this technique has been thoroughly tested. The best part about the roof is the simplicity. It is waterproof without additives, coatings, or protection. There is no parapet because it doesn't have to have waterproofing running up the sides, so it creates a beautiful form derived from a detail.

Another innovative detail was the skylight. This was finished after the roof was poured, and was designed for the glass to be flush with the concrete. The result was a glass skylight without a frame.

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[80] "World Weather Information Service-Lima." *Climatological Information.* http://worldweather.wmo.int /029/c00108.htm

[81] "Korea Meteorological Administration." *World Climate.* web.kma.go.kr/eng/weather/climate/ worldclimate.jsp

 [82]

Fig. 33 Detail of glass skylight from roof

The idea behind the skylight, and where a lot of metal-frame skylights don't perform very well, was that concrete and glass expand and contract in similar ways, where metal does not. The glass and concrete have an expansion joint that is filled with silicon, but will stay watertight because they have similar material properties; the metal frame for the glass became irrelevant. The glass sits on a platform of stacked glass on one side and blocking on the other, with one pane on top to seal the opening. The finish is flush with the flat concrete roof and can be walked on as part of the roof.

After the roof forms were taken down inside, finish work started on the interior. The exterior has windows, doors, and a skylight, but otherwise has a raw concrete finish. Rock fill was used over heating coils to evenly heat the floor. The ceiling is finished with a light wood, and the living area to the left and kitchen in the far corner have poured in place cabinets.

[82] BCHO Architects. "Glass Skylight", Concrete Box House, Yanypyoung, Korea. 2004.


[83]

Fig. 34 Studio living area surrounding an open courtyard in the middle

The sliding doors went in to control the temperature of the house in varying weather conditions. During the winter, they can be closed to protect from cold weather, and during the summer, they can be completely opened to allow for ventilation.


[84]

Fig. 35 Sliding door installation

[83] BCHO Architects. "Interior Overview 1," Concrete Box House, Yanypyoung, Korea. 2004.
[84] BCHO Architects. "Sliding door installation," Concrete Box House, Yanypyoung, Korea. 2004.

Although the overall design of the building was changed before construction, many of the important details helped to develop the program into what is built today. Making architecture through the experimentation and implementation of materiality and detailing is one of the reasons Cho's work is so unique. The Concrete Box House was made from a few sketches, detailed discussions between the architect and the contractor, and willingness from every person involved in the project to accept a vision from Cho and execute it as if it were executed by Cho himself.

The vision for the Concrete Box House project was initially revealed by Cho in his preliminary sketches. With these sketches and verbal communication, Cho explained to his office and contractor what he envisioned and a set of drawings were developed. Construction started, and as it progressed, Cho's office and contractor communicated verbally and through images of what was built. Then, Cho would give instruction or detail sketches, if necessary, to communicate the desired outcome of the next process.

The communication and feedback between Cho, his office, and his contractor continued throughout the design of the Concrete Box House. If this process was written out linearly, it would be a repetitious pattern: explore-communicate-implement-communicate-explore-communicate-implement-communicate-etc. Since this is not a linear process, it is better explained in a cyclical diagram:

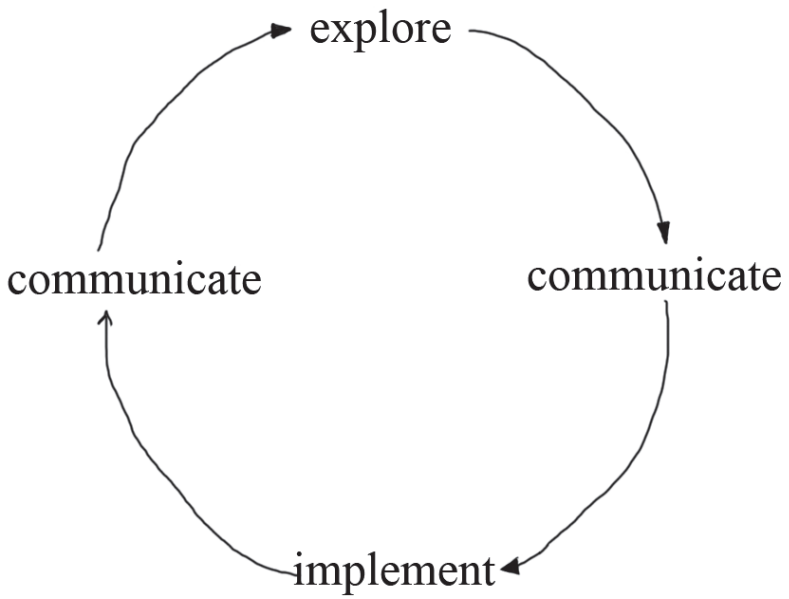


Fig. 36 Cho's design-build-design-build process

This revolving process went on during the entire project, and one of the best examples of the continuous exploration, communication, and implementation is in the roof detail. The far left of the diagram (Fig. 9) is the communication from the contractor as the forms for the walls and the wood columns are being placed, and to the far right is the communication back to the architect so the detail of the interior finishes, skylight, etc. can be started. Each detail is explored, communicated, implemented and then communicated as the project progresses.

Although any single process in Cho's work is not necessarily linear, as it is a fluid process where information flows as is necessary, the diagram portrays the level of detailed thought that can go into a single detail when it is explored, communicated, and implemented, and finally re-communicated. A lot of the exploration from the architect is finished prior to the information being required on site, and communication can happen in parts, as a complete explanation all at once, or as the project unfolds.

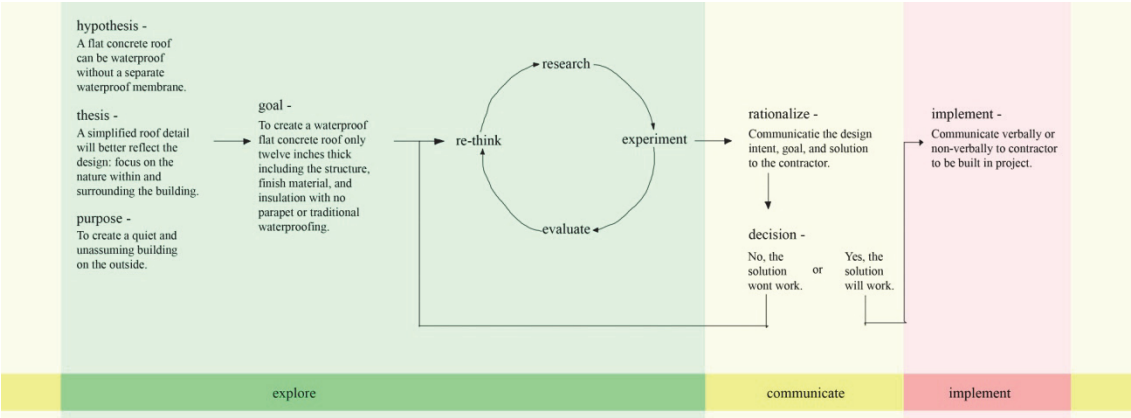


Fig. 37 Concrete Box House, linearly shown revolving process for flat concrete roof

This kind of process blurs the lines between the design process and the building process although the individuals physically doing the work are separated. There is clearly an architect, and clearly a contractor, functioning in separate roles, working together to complete the project. In the Concrete Box House, Cho works as the architect, using his design team in the office as an extension of his design process, a project architect from his office as an extension of his physical body on site and in the office, and his contractor as an extension of his building process.

Cho has built these relationships so that he can set up the overall vision for the project and have people implementing as if it were him physically doing all the design and building work. Because of the training in the relationships that Cho has set up, he can trust that the work will be done the way he would do it, and only has to set the vision to begin the process and approve what has been done to continue it.

During the training of his staff and contractor, Cho was doing a lot more of the work, unable to focus on guiding the process, and unable to work on a large number of projects at once. Cho has always been interested in the entire scope of the construction process. Starting as a ceramic artist, he both conceived and built his artwork. Because of

the larger scale and complexity of building design and construction, there was simply too much physical work for Cho to do it all himself. In order to stay so connected to the process, Cho trained someone to do it the way he would do it. So his firm began as a design-build firm with a relationship tree like any other design-build firm.

Although it may look similar to the design-build delivery structure, the reason Cho set up his firm this way was to align his firm with his vision of how he thought an architect should relate to the process of design and construction, not to conform to a changing code of acceptable project delivery systems nor to race against other architects and contractors that were set up as design-build firms. As proof, his firm now operates as a traditional architecture firm in structure, although his methods are still anything but traditional. The structure of the firm shown in Fig. 10 illustrates the deeper meaning behind why Cho started his firm out as a design-build firm.

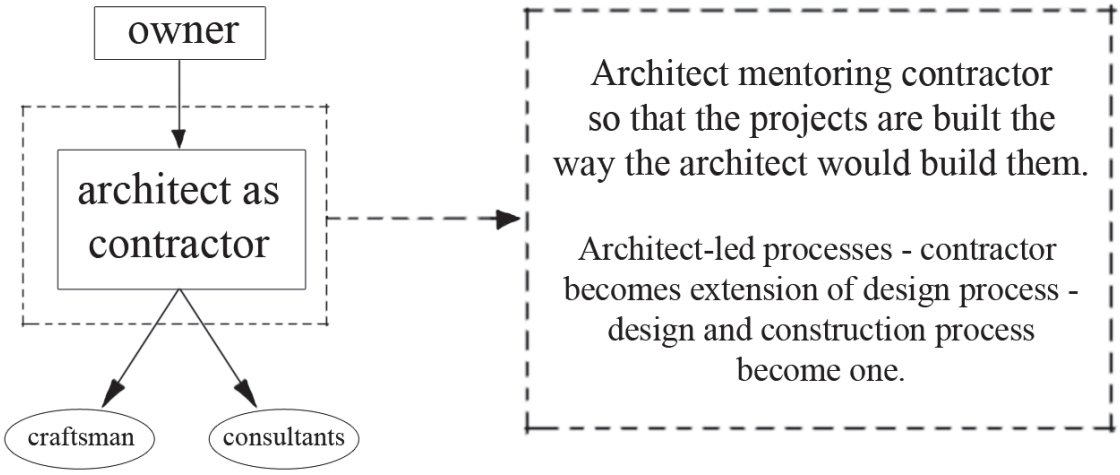


Fig. 38 Larger purpose behind design-build structure

Youngmook, who was Cho's contractor in training, was an engineer by profession who became a contractor under the mentorship of Cho. As he grew in expertise and Cho's projects grew in scale, their relationship, previously structured as one, split into two separate entities. The Concrete Box House was built after they were operationally separated, but they still functioned as one. For this project, the relationship tree would look like a traditional design-bid-build system, although Cho was also the owner.

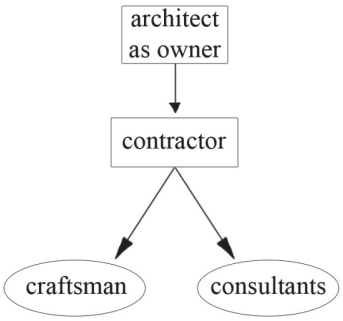


Fig. 39 Contractual relationship tree for Concrete Box House

Although these relationship trees are very telling of standard contractual relationships, they don't explain the relationships that actually exist during the project. For the Concrete Box House project, the contractor completely signed on to the vision for the project. He was trained to function as an extension of Cho in the building process. Even though they were separated, they were working as one unified team. The vision, seen in the gradient, is created by the architect and funnels down to other individuals on the jobsite through the contractor. The architect and the contractor, although separated operationally and financially, are one.

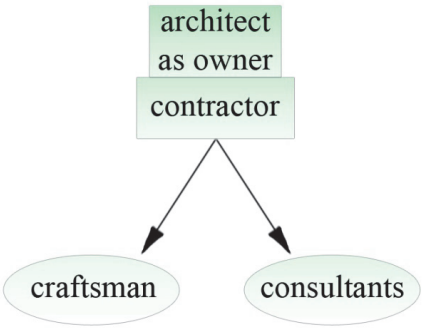


Fig. 40 Relationship tree for Concrete Box House (gradient is vision from architect down)

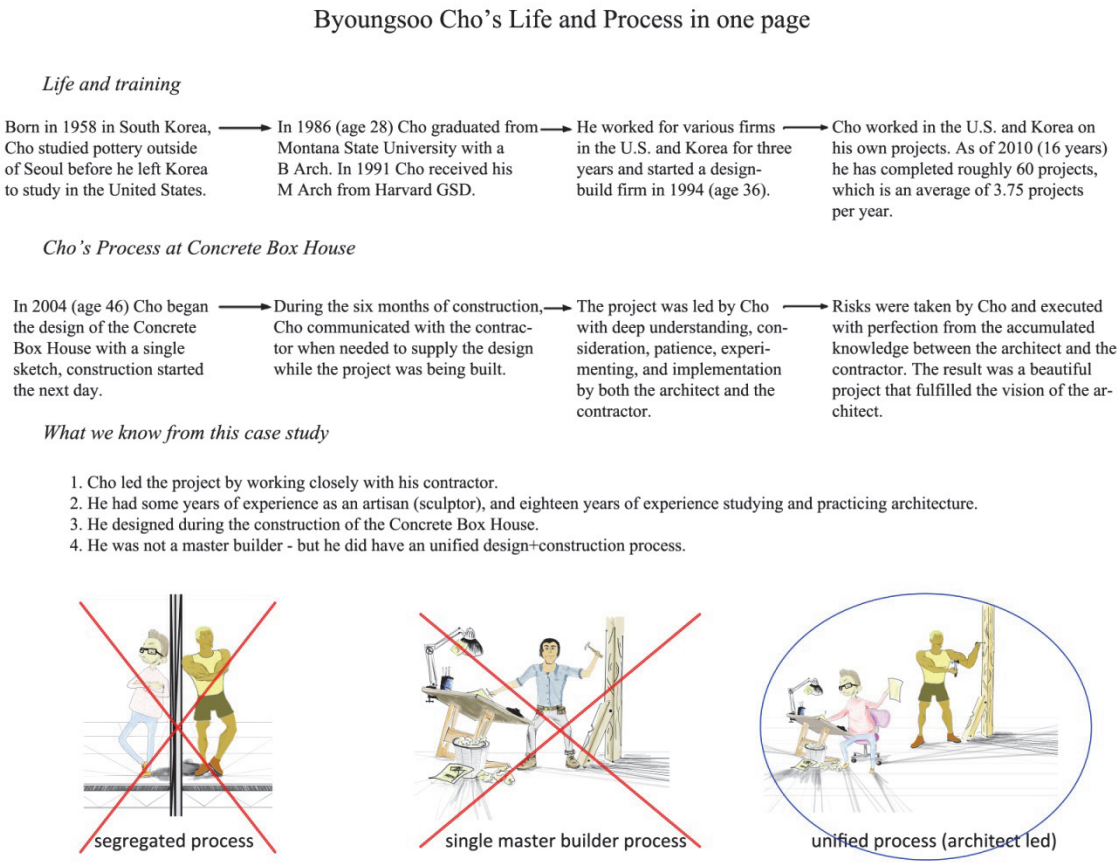


Fig. 41 Cho's life and process in one page

Presently, Cho has been working on larger projects using other contractors, but his philosophy for his firm has not changed. The Twin Tree Towers is Cho's most recent project, and is an example of his ability to control the design and construction process in larger projects. For the Twin Tree Towers project, Cho used a huge Korean general contracting firm, a structural engineer, a services engineer, a façade contractor, and a façade consultant while maintaining the same level of transfer of vision seen in the Concrete Box House.

FIVE

LUIS LONGHI: TANGIBLE HEART

Luis Longhi is a Peruvian architect who trusts in his heart over his brain because he believes that his intuition outweighs his rationality. It is clear throughout each of his projects, from conception to completion, that his intuitive nature guides him. Sensitivity and instinct guide his relationship to each site, client, and design. His wealth of knowledge does not come from books and research; rather, intuition and instinct have brought him to a very high level of thought on the topics of architecture and life.

Longhi has a different perspective on architecture than most. He believes everything in one's life is connected; thus, architecture is not separate from anything else a person does. He has a deep connection with his roots in Peru and his ancient ancestors, the Incas.

In addition to his practice, Longhi also teaches at several universities. For the last few years, he has split his time between the University of Hawai‘i at Mānoa, for one semester (four months) a year, and his home city in Lima, Peru, for the rest of the year. Instead of the teaching taking away from what he is doing in the office, or his work taking away from his dedication to his students, they feed each other. The university refreshes his brain in knowledge, and his practice gives him experiences to share with his students.

Longhi talks about sharing knowledge and experience as a tennis match. He is the tennis coach, and he serves up architectural tennis balls of thought for his students. He will start with the forehand, and when the student can return his serves and has a nice game going, he will give them something new to work on. “Let’s try the backhand now,” Longhi says, trying to get the students to up their games with concepts of architectural thought. The tennis match matures the students by facilitating a dialogue that teaches them to think about architecture in new ways.

The ideas and experiences of both the students and Longhi grow together, with fluidity, until they become equal partners serving up new ideas and concepts in this creative, back and forth relationship. Longhi does not limit these back and forth relationships to his students; his life is a tennis match of knowledge and experience, and he relates to everyone in his life this way. Conversations with Longhi can change a person’s perspective of life, love, and architecture. Longhi redefines the relationship with the profession of architecture, and encourages architecture students to fall in love with architecture.

It is generally not accepted in any professional setting to discuss matters of the heart, especially not falling in love. Yet this thesis deals with matters of the heart because it is something that should be part of everyone’s life, and internal awareness and unity with oneself is essential in order to have unity with others. There is an internal battle for focus inside each person; control of focus comes from awareness of this battle.

Longhi describes this internal battle between the heart and brain through a metaphorical dialogue: the heart imagines and sees a rock as a mountain. The brain says, “That is not a mountain—it is only a rock.” The heart dreams and says, “No, it can be

anything we want it to be. I know it is a mountain; we can climb it." The brain will not allow this insubordination, and so it insists, "That is not a mountain! Don't be ridiculous! How can we climb it? It is only a rock!" The heart tries to reason with the brain, "No, it is not literally a mountain—it is a representation of a mountain." Finally the brain accepts, but only after the raw imagination of the heart is limited.

The brain is incapable of accepting the dreams of the heart, and thus one is forced to reason internally. The heart starts with raw imagination, seeing a rock as a mountain, and during the conversation, the brain is constantly trying to pull the imagination back using rational perception. This rationale is taught from birth out of necessity, in order for children to learn the difference between realities and make believe. However, it limits the potential creativity within a person. Unhindered creativity can be re-taught to some extent, where the difference between reality and imagination is a fine line.

Longhi lives in constant exploration. He doesn't try to be mystical, or to gain economic or sociopolitical benefits from the way he talks. Rather, he lives how he speaks. One can segment each aspect of his/her life to the point where they become the Professor, the Architect, the Parent, and the Spouse instead of a person who is unified in every aspect of his/her life. Continuity breeds integrity; integrity, respect. Longhi is able to constantly engage in mutually beneficial relationships with people that respect him because of his integrity.

These mutually beneficial relationships have made Longhi the accomplished architect that he is today. A particularly important relationship with his contractor, Hector Suasnabar, has let Longhi intuitively gain knowledge and experience in the construction of buildings. At first, Longhi relied on the knowledge and experience of Hector, but they

now work as one. Although they are financially and contractually separated, with Hector managing the design in the field as the contractor and Longhi creating the vision for the project and feeding Hector drawings as the architect, they work as a mutually respected team. Longhi, in concert with his contractor, functions as a great example of unity through relationship in the building process.

Longhi puts the making of beautiful and well-built buildings before profit, and Hector signed onto this vision when they first started. Unfortunately, in the past, it usually meant they were spending their profits on the project, which made the starting years hard on their businesses. Now they are realizing that their mutual heart for building has given them a reputation that will be financially and socially rewarding.

Longhi's relationships to architecture and his builder will be shown through example using a case study of Casa Pachacamac. This will outline Longhi's process, including his relationship to building, which unifies the process of design and building while still maintaining a clear distinction between architect and builder.

The intervention [Casa La Favre] in untouched environment on the coast of Peru has helped me understand that in order to achieve successful architecture in natural sites, it is fundamental to listen to the environment and to establish a relationship with it. This relationship is similar to any other type of relationship between humans—it can be direct, sophisticated, romantic, respectful, sane or insane.[85]

-Luis Longhi

[86]

Project name:	Pachacamac Hill House
Function:	Single House
Chief architect/office name:	Luis Longhi / Longhi Architects
Project team:	Veronica Schereibeis, Carla Tamariz, Christian Bottger
Client:	a couple of philosophers
Construction:	Longhi Architects / Hector Suasnabar
Design date:	2006
Completion date:	2009
Building Area:	480 sqm (5,166 sq. ft.)
Photography:	CHOlon Photography Elsa Ramirez

[85] Longhi Architects. "Relationship to Site". Pachacamac Hill House. Pachacamac, Peru.
[86] Longhi Architects. "Pachacamac West Elevation at Night" Pachacamac Hill House. Pachacamac, Peru.

Luis Longhi's intuition outweighs his rationality. His intuitive process is born out of relationships. For the Pachacamac Hill House, as well as many of Longhi's other projects, his relationship to the site itself and sensitivity to nature are the most important parts of the process. Longhi feels that the concept is the essence of his projects. The concept is the design represented in its simplest form, and it is essential to the development of the rest of the project. Longhi writes:

> In the old days in Peru, the selection of the site for a specific Inca building (use) was the most important action to be taken; only when they found the right site did they follow-up with the intervention, which usually took very little in order to produce a great building (e.g. the Temple of the Sun and the Temple of the Moon in Machu Picchu). In our days, people seldom follow that order; usually the "need" comes first and the search for the site, later.
>
> In the case of Pachacamac House, I know the order was as in the old days. The clients fell in love with the site. Only later on when they learned that it would be the place they would spend their last days did they understand the magnitude of their decision.[87]


[88]

Fig. 42 Temple of the Sun

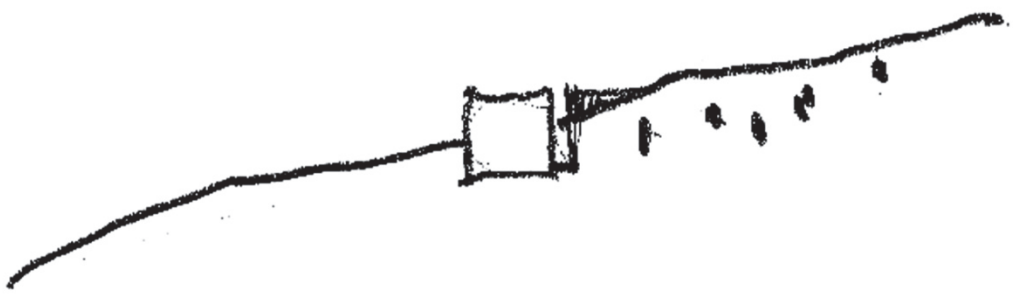

[89]

Fig. 43 Temple of the Moon

[87] Longhi Architects. "Description of Site". Pachacamac Hill House. Pachacamac, Peru.
[88] Taylor, Alyssa. "Temple of the Sun". Machu Picchu, Peru. 2009.
[89] Larson, Stephen. "Temple of the Moon". Machu Picchu, Peru. 2009.

Longhi's desire for a relationship with the Pachacamac site was evident to the clients, because the site helped guide the function instead of the function being imposed on the site. Longhi thinks that each site has a specific function, or a list of functions that would meld into its being, almost as if it is the site itself that decides what it prefers. This is a romantic way of looking at architecture that inspires the imagination of the architect.

> In the Pachacamac Hill House, the response to the site was to bury the house inside the hill, in order to create a balanced dialogue between architecture and landscape, where inside / outside becomes a constant interpretation of materiality with a strong sense of protection and appreciation of the dark and the light. A glass box sticks out of the hill symbolizing architectural intervention on untouched nature.[90]



[91]

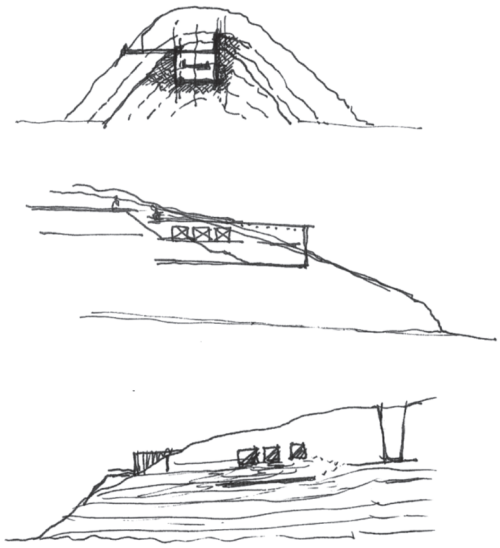
Fig. 44 Conceptual drawing of Pachacamac Hill House

Conceptual images, such as the one above, represent the essence of the house. At the moment of conception, these simple lines represent Longhi's ideas of light, circulation, architectural intervention, and relationship of structural design to site. When one visits the building, the culmination of the conceptual image synthesized with the

[90] Longhi Architects. "Concept Description." Pachacamac Hill House. Pachacamac, Peru.
[91] Longhi Architects. "Concept." Pachacamac Hill House. Pachacamac, Peru.

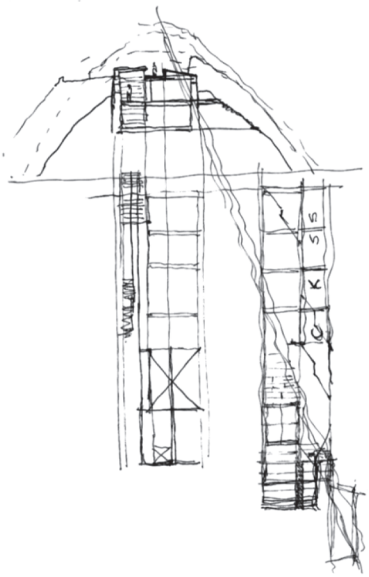
structure, revives these feelings. The architectural work then is realized as a representation of this whole.

The conceptual design is followed by detailed plans, sections, and processes, and continues back and forth, decidedly more precise than the original thought. Longhi formed the conceptual design of the Pachacamac Hill House while he was in Bozeman, Montana teaching at Montana State in March 2006. This example illustrates that once a relationship with a site is established, inspiration can come anywhere, anytime.



[92]

Fig. 45 Conceptual sketch. March 24, 2006



[93]

Fig. 46 Conceptual sketch. March 25, 2006

Ideas and thoughts come through more clearly in each consecutive drawing as the building details slowly emerge from conceptual design sketches. Longhi's process for the Pachacamac House differed from the traditional design-bid-build process seen in the US, because his contractor was already contracted before the design was complete. With the

[92] Longhi Architects. "Conceptual Sketch 3". Pachacamac House. Pachacamac, Peru. 2006
[93] Longhi Architects. "Conceptual Sketch 2". Pachacamac House. Pachacamac, Peru. 2006.

initial design done, the price was then negotiated between the contractor, Hector, and the owner, with Longhi as an agent of both.

In 1991, Longhi studied computer animation for architecture at the Graduate School of Design at Harvard University. He adopted the computer as the main instrument for development of the conceptual design. This thought process engages different parts of one's brain and creativity, as one uses both modalities of sketching and computer aided design (CAD). The fluidity that can be achieved between sketching and CAD allows Longhi to traverse back and forth from conception to completion within himself, or with his associates in his office in Lima, Peru.

[94]

Fig. 47 Concept sketch, section at stairs


[95]

Fig. 48 Computer rendering at stairs

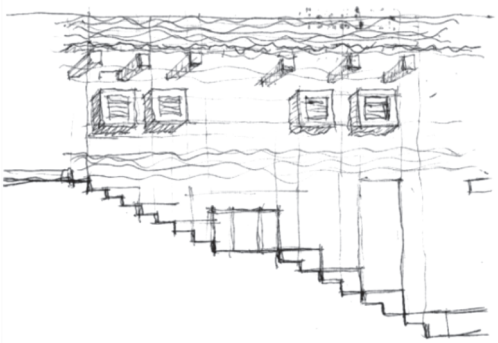

[96]

Fig. 49 Concept sketch, section at stairs

[94] Longhi Architects. "Conceptual Sketch 1.1." Pachacamac House. Pachacamac, Peru. 2007.
[95] Longhi Architects. "Corredor 2." Pachacamac House. Pachacamac, Peru. 2007.
[96] Longhi Architects. "Conceptual Sketch 1.2." Pachacamac House. Pachacamac, Peru. 2007.

The advantage of CAD in conceptual design is how it provides the ability to express detailed design of materials and to share ideas three-dimensionally with clients, staff, and even the contractor. Longhi writes regarding the process of design and construction for the Pachacamac Hill House:

> The job of an architect is that of interpreting the dreams of the client; the more interesting the client, the more opportunity the architect has to do his work.
>
> When an architect finds himself interpreting philosophy, the result is fascinating and unexpected architecture; in other words, architecture that is difficult to plan before the beginning of construction. In this case, many design decisions take place during construction.
>
> The development of this 'process' occurs only when the client gives the architect total freedom to design and build.
>
> The clients for the Pachacamac House are a couple of philosophers now discovering spaces in their house which can transport them to their memories both from their past and from their future.[97]

In implementing design through the construction process, it is imperative that an architect have a flexible and talented contractor. The conceptual sketches are developed into plans in order to start building, but the details are developed during construction. In this case, the engineering was done in-house with Longhi and Hector, and changes were made due to the unexpected soil conditions discovered during excavation. The early design of two-foot-thick reinforced concrete retaining walls evolved into eight-inch thick walls made of cast in place concrete.

[97] Longhi Architects. "Description of the Client." Pachacamac Hill House. Pachacamac, Peru.

 [98]

Fig. 50 December 21, 2006 – excavation

 [99]

Fig. 51 Excavation 1

 [100]

Fig. 52 Excavation 2

In February 2007, the excavation was nearly complete and the formation of the foundations and walls were underway. During this time, Longhi was developing details of the house. The detail drawing of the stairs and computer generated models, shown earlier, were completed in order to develop drawings and move forward with construction.

[98] Longhi Architects. "Excavation 1." Pachacamac House. Pachacamac, Peru. 2006.
[99] Longhi Architects. "Excavation + Retaining Walls." Pachacamac House. Pachacamac, Peru. 2007.
[100] Longhi Architects. "Excavation + Retaining Walls 2." Pachacamac House. Pachacamac, Peru. 2007.

 [101]

Fig. 53 Retaining walls poured

With an understanding of the manpower it takes to form, hand mix, and pour yards of concrete, one can truly appreciate the simplistic beauty and Herculean effort of this type of construction. In a matter of weeks, the site can be transformed from a gaping hole in the ground where rocks used to be, to a complex of reinforced concrete walls and footings. During the process, most of the wooden form boards are re-used, and the amount of grueling hard work seems insurmountable. The work done by the masons may not appear as refined as those of a fine furniture maker, but the skills are just as refined and valuable. Though each craftsman's profession may differ, the dedication to their craft is the same.

The difficulty and precision of this craft is veiled while watching the masons work. The integral skill set is so ingrained in their movements that it is as fluid as a person tying their shoes, and their motions seem repetitive: clear the site, set the string

[101] Longhi Architects. "Retaining Walls". Pachacamac House. Pachacamac, Peru. 2007.

here, cut the rebar there. It is continuous throughout the day as they form walls until there is a pause. "*Arquitecto, donde esta este hueco*?" The foreman stops to ask the contractor where a specific hole should be located. The plans are taken out as the workers keep moving. Hector, the contractor, is also called *arquitecto*, or architect, on the job site as a form of respect from his workers. He is responsible for receiving and understanding the plans from Longhi and explaining them to his foreman and workers on the jobsite.

Hector is a very talented, compassionate, and devoted contractor. He knows exactly how much his crew can get done in a given amount of time, and he personally works alongside Longhi to stay ahead of the crew. If they are going to form up a series of walls, the plans will have been done for the excavation, and the details will be on their way. Longhi produces very detailed sections, plans, and elevations to help the contractor understand and follow the design. Hector will then walk through the jobsite with the master craftsman who is the foreman, analyze the plan, and draw whatever is necessary in order to achieve a clear understanding between them.

Although detail plans are normally drawn in advance, Longhi and Hector speak their own language. Beyond Spanish and English, they understand each other on a level that goes beyond any rational explanation. Whether they are face to face or on the phone, many times, design and construction issues will be resolved verbally and plans will be produced after the feature has been built. They have the kind of unity where they often come to the same conclusion; and if they do not, they have mutual resolve.

 [102]

Fig. 54 West side of library retaining wall poured, center being laid out

Everything that goes through Longhi's office is approved by Longhi, while everything that gets built on the jobsite goes through Hector. And still they trust each other implicitly. The details are emailed or printed and given to Hector, who in turn, can direct the work on site. Longhi doesn't have to be on site micromanaging the project because he trusts his contractor to build what is drawn. Hector is on site supervising, and trusts that after he has explained the drawings, the workers can accomplish the given tasks. Longhi's vision became Hector's vision for the Pachacamac project, just as it does for every project.

 [103]

Fig. 55 Library rendering

 [104]

Fig. 56 Library nearly completed

[102] Longhi Architects. "Retaining wall." Pachacamac House. Pachacamac, Peru. 2007.
[103] Longhi Architects. "Studio looking west." Pachacamac House. Pachacamac, Peru. 2007.
[104] Longhi Architects. "Library tunnel at studio." Pachacamac House. Pachacamac, Peru. 2008.

Longhi and Hector are not only coworkers, they are friends. There is an understanding between them that the work they do is much more important to both of them than purely designing and building houses for profit. Longhi described this mutually agreed upon relationship that started in 1998: "[Hector and I] have done some very nice things. When we were done, whatever money was left over, which was never very much, we split."[105] Although they have moved into larger projects, multiple projects, and are not financially tied anymore, the essence of the agreement is the same.

Now that their financial arrangement is more normalized, Longhi does the conceptual design and charges the client a fee. He then enters into negotiations with Hector and the client, advocating for both parties for the cost of the construction. Hector is far above the standard contractor in knowledge, ability, and care, and charges relatively less. Instead of giving the contract to the lowest bidder, Hector reviews the vision and plans with Longhi, to understand the scope of work and the general costs. In the end, the client gets a very fair negotiated price that includes a guaranteed level of quality that is beyond standards. While there is a negotiated price, it is also made clear to the client that there will be changes that will affect the total cost of the project.

It is completely understandable that the client would have a problem not having a set price for the project. On most jobs, Hector will negotiate a price that is fair to him and the client while the change orders are usually initiated by Longhi or the client. Although the price is affected by these changes, they are always made and always worth it. Longhi explains to the client through the negotiations that there is no way to get an exact price with how they work, but Hector knows this, and the estimate is usually close.

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[105] Luis Longhi. "Peru Studio Lecture" (lecture, University of Hawai'i at Mānoa School of Architecture, Honolulu, Hawai'i, June 20, 2009). Lecture given in Lima, Peru Study Abroad Studio.

I had the privilege of witnessing one of these negotiations. I have changed or simplified the details because of the confidential nature of this information, but the basis of the conversation is true. The client said, "I only have $100,000 to spend on my house." Longhi said, "How can we build a $250,000 house for you for $100,000? I can design you a house that will only cost you $100,000, but it won't be this house." The discussion went on in Spanish for hours. There was wine and computer generated images of the house on a screen. At one point, the client looked at me and said, "Do you understand all of this? This is how you negotiate. Should we be talking in English?" I replied, "*No, por supuesto, comprendo todos se hablan.*" I didn't want to be rude, but truthfully, I did not understand everything they were saying. Honestly, I missed whole sections of the conversation because they were speaking really fast. From what I understood, the client wanted the house Longhi designed for $100,000, but the house would cost $250,000 to build. They settled on $150,000, both being fully aware that it would end up costing at least $200,000.[106]

Longhi talked to me after the meeting and said that people in Peru love to negotiate. "Even if he came to the meeting knowing it would cost him $250,000, he left knowing that we are going to build it for the best price possible, and we will get it built." Longhi and Hector shook hands with the client and excavation of this house literally started the next day. I was surprised that he and Hector would start the project without the first payment, but Longhi said, "If I trust someone, I trust someone completely. If I don't, I don't at all." If Longhi trusts someone, so does Hector. The written contract and deposit came in later, and the work started immediately.

[106] Luis Longhi. "Client Meeting" Internship with Longhi Architects, June 20, 2010.

For the Pachacamac Hill House, the clients were even more flexible. There was a negotiated price, but it was more of a negotiated schedule. Since the clients didn't plan to live in the house until they retired, and they only had the ability to pay a set monthly amount, scheduling the construction to fit their monthly budget was more important than when it would be completed. Longhi's and Hector's plan was to design the home and build in stages as the money became available. A certain amount of work was planned and completed each month. The flexible design and construction schedule continued for three years, from 2006 until it was completed in 2009.

The Pachacamac House didn't have a fixed price and timeline, so Longhi and Hector had the opportunity to design, build, and re-design in an unrestrained process. In order to make construction feasible, some of the upfront costs were advanced from the accounts of Longhi and Hector. As the larger components of the house were completed, much of the crew was sent to other job sites because they were not able to maintain the size of the labor force due to the nature of the construction schedule.

 [107]

Fig. 57 The roof was poured on the lower part of the house

[107] Longhi Architects. "Roof lower level." Pachacamac House. Pachacamac, Peru. 2007.

 [108]

Fig. 58 The crew who pours concrete into the night together eats together

Most of the laborers on the crew cannot afford cars and have a very long commute to get to the jobsite. Many of them will carpool or ride the bus once a week, and they typically sleep on site. This situation happens in Peru because of necessity, but the by-product is a unity among the workers. Some of them are father-son apprenticeships, some of them have been working with Hector for years, some of them are new, but they are all family. They know each other very well, treat each other very well, and because of this, they work very well together.

The crew continues to build in step with details from Longhi and instructions from Hector. The best example of this is the stair detail. Longhi drew the stair details on February 28, 2007; the computer model with generated images was produced on April 19, 2007; and the stairs were built over the next few months as the construction of the house progressed.

[108] Longhi Architects. "The crew." Pachacamac House. Pachacamac, Peru. 2007.

[109]

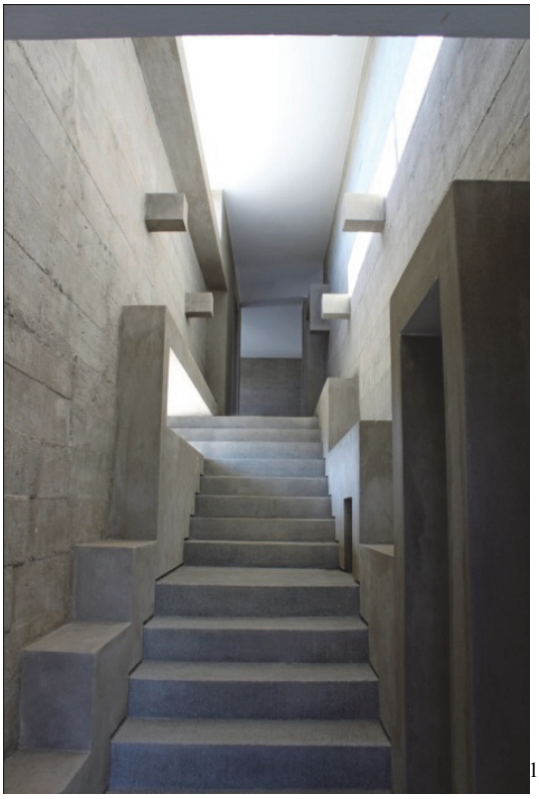
Fig. 59 Rendering, top of stairs

[110]

Fig. 60 Rendering, bottom of stairs

[111]

Fig. 61 Picture, top of stairs



[112]

Fig. 62 Picture, bottom of stairs

[109] Longhi Architects. "Computer rendering of stairs." Pachacamac House. Pachacamac, Peru. 2007.
[110] Longhi Architects. "Computer rendering of stairs 2." Pachacamac House. Pachacamac, Peru. 2007.
[111] Longhi Architects. "Picture from top of stairs." Pachacamac House. Pachacamac, Peru. 2009.
[112] Longhi Architects. "Picture from bottom of stairs." Pachacamac House. Pachacamac, Peru. 2009.

Three-dimensional renderings are shown above and the final product below. The project has the same overall feel from conceptual sketch through completion, although materiality and detailing were changed through the unique design to construction to design process.

The drawings, renderings and pictures from a vantage point on a nearby hill show the process more clearly. This shows the initial conceptual idea developing through the design and construction process.

[113]

Fig. 63 The raw conceptual idea, March 24, 2006

[114]

Fig. 64 Construction progress picture, April 6, 2007

[113] Longhi Architects. "Conceptual sketch." Pachacamac House. Pachacamac, Peru. 2009.
[114] Longhi Architects. "Progress picture 1." Pachacamac House. Pachacamac, Peru. 2009.

[115]

Fig. 65 The conceptual idea rendered with CAD, September 11, 2007

[116]

Fig. 66 Construction progress picture, September 11, 2007

[115] Longhi Architects. "Computer model." Pachacamac House. Pachacamac, Peru. 2009.
[116] Longhi Architects. "Progress picture 2." Pachacamac House. Pachacamac, Peru. 2009.

[117]

Fig. 67 Construction progress picture, April 19, 2008

[118]

Fig. 68 Construction progress picture, April 24, 2009

[117] Longhi Architects. "Progress picture 3." Pachacamac House. Pachacamac, Peru. 2009.
[118] Longhi Architects. "Progress picture 4." Pachacamac House. Pachacamac, Peru. 2009.

[119]

Fig. 69 Construction completed, December 18, 2009

[120]

Fig. 70 Construction completed, May 29, 2010

[119] Longhi Architects. "Progress picture 5." Pachacamac House. Pachacamac, Peru. 2009.
[120] Longhi Architects. "Progress picture 6." Pachacamac House. Pachacamac, Peru. 2009.

The vision for the Pachacamac Hill House began with conceptual sketches. With these and verbal communication, Longhi explained the project to his associates in the office. The initial plans and renderings were made which showed the layout and general feeling of the house. Longhi explained the vision to Hector with these plans, and renderings and construction started. As site conditions and feelings were fed back to Longhi through his site visits and conversations with Hector, more detailed plans were developed for building. If this process was written out linearly it would be a repetitious pattern: detail a conceptual idea-communicate-construct-communicate-detail a conceptual idea-communicate-construct-communicate-etc. Since Longhi's process is not linear, it is better explained in a cyclical diagram

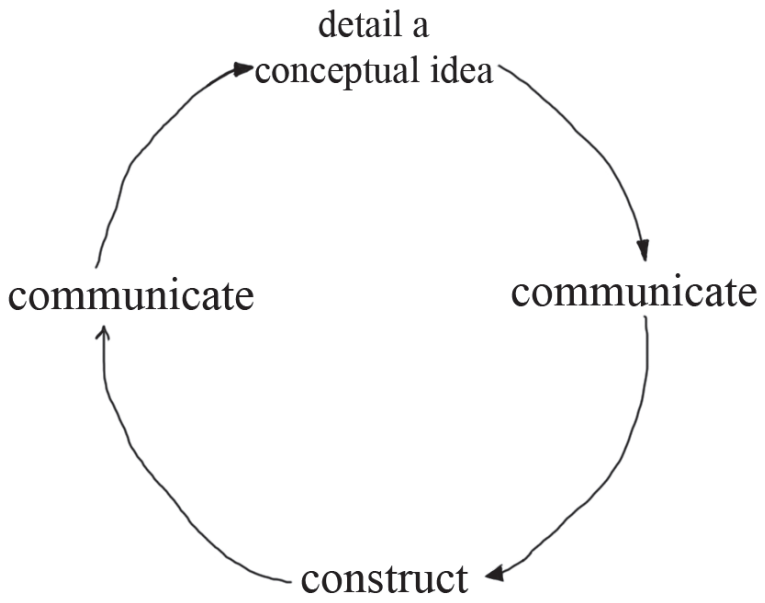


Fig. 71 Longhi's design-build-design-build cyclical process

After the conceptual idea and initial renderings were complete, and the excavation was done, the conceptual idea for the foundation and walls were able to be detailed. After the foundation and walls were built, the site conditions were communicated back to Longhi, and the detailed plans of the stairs and the library were able to be developed. One of the best examples of this cyclical process in the Pachacamac project is the stair detailing.

From the left of the diagram (on the next page), the contractor communicates that he needs the stair details, the architect processes the field information along with the original conceptual idea through his detailing process, then the intent is communicated back to the contractor, and the contractor evaluates the intent with his experience and actualizes the details. Although this stair detail process is shown linearly, it is only for clarification of how the design and construction processes were connected on the Pachacamac project. Again, the processes flow naturally back and forth; by the time details are ready to be built, they have already been through the architect's process and communicated to the contractor.

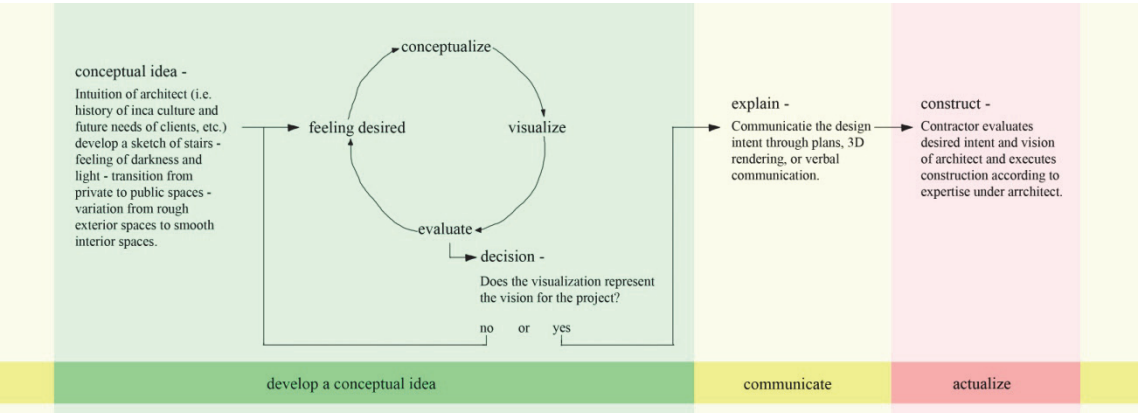


Fig. 72 Pachacamac, linearly shown revolving process for stair detail

The separate functions of the architect and the contractor are very clear, but the nature of this rotary process doesn't distinguish between design and construction in a linear timeline because the detailed design decisions happen throughout the construction process. Therefore, there is no line drawn to separate the processes, and the construction process becomes an extension of the design process.

In the detailing of a conceptual idea, Longhi passes the conceptual sketches or a conceptual 3D rendering to his associates who create more detailed 2D drawings and 3D renderings that he approves. He then communicates with the contractor, Hector. Longhi's and Hector's relationship allows Longhi to communicate the vision verbally if it cannot be understood through the plans and renderings. This conversation starts with the feeling desired from the end product and can involve deep philosophical discussion involving construction techniques, feeling of occupant, or an unrelated life topic.

The actualization of each detail is carried out by the expertise of the contractor after fully understanding the design intent. The deep involvement of Longhi in the construction process comes from Hector's willingness and ability to understand and execute Longhi's vision. Hector becomes an extension of Longhi in the building process.

Longhi has built such relationships because he realizes the importance of having his project built as he would build them if he could. Without Hector's expertise, precision, and willingness to be involved the way he is, Longhi wouldn't get the same extraordinary results or would at least need to be much more involved in the process.

Longhi has always been interested in the building process; his education was in architecture, urban design, sculpture, and computer animation. His ability to detail very deep conceptual ideas probably came from his background in sculpture where he was

able to conceptualize and physically build his work. When he started his firm, he knew how important the connection to the building process was. During one of his early projects, he found Hector, who was trained as an architect/engineer and worked as a contractor. They began to work on small remodel projects together.

Longhi and Hector started out very similar to a design-build firm. Longhi would work on site with Hector, sketching designs to explain ideas to Hector and learning building techniques from him. The experience, as I understand it, is one of mutual respect and learning, with two distinct roles: Longhi as the architect and Hector as the contractor. Although this structure sounds similar to a design-build delivery system, the goal was to join forces and be able to build something that neither of them was capable of making on his own. They were never one company, only working as one.

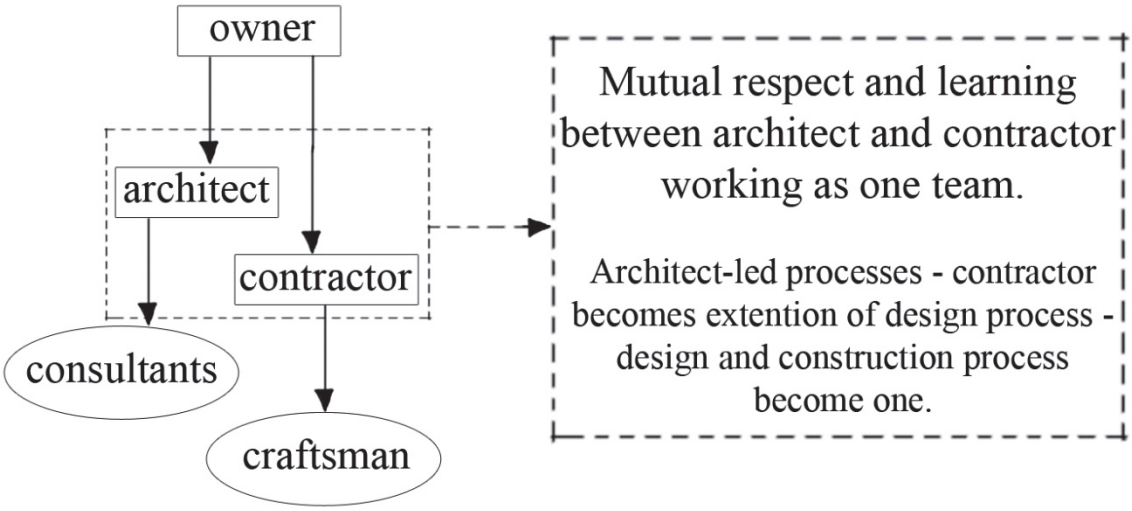


Fig. 73 Larger purpose behind design-bid-build structure

Their operation has grown and still has the same non-linear process; they work together under a delivery system that looks a lot like the traditional design-bid-build process with a negotiated select team (Hector). The difference lies in the relationship between the architect and the selected team. The actual relationship is different than the contractual relationship shown in the standard design-bid-build diagram; they were working as one. The actual relationship would look more like this:

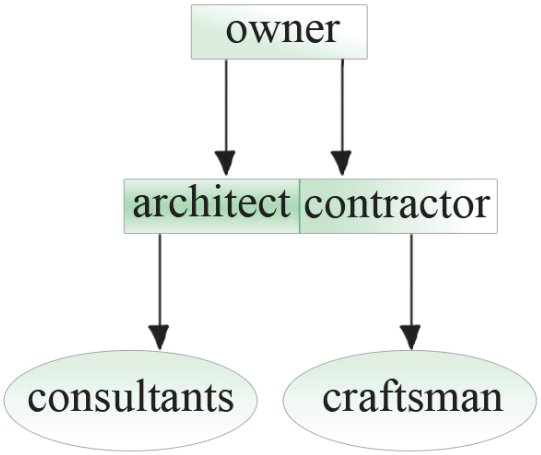


Fig. 74 Relationship tree for Pachacamac Hill House (gradient is vision, radiating out from architect)

Luis Longhi's Life and Process in one page

Life and training

Born in 1954 in Puno, Peru Longhi received his B Arch from Universidad Ricardo Palma in Lima, Peru in 1979 (age 25). → He came to the U.S. and graduated from the University of Pennsylvania with his M Arch and Masters in Sculpture in 1984 (age 30) he also interned under BV Doshi in India. → He worked for several architecture firms in the U.S. and studied Computer Animation in 1991-2 (age 37). → Longhi studied and worked in the U.S. for 13 years until he formed his own firm in Lima, Peru in 1994. Today, Longhi has completed over 50 projects, including buildings, stage design and installations.

Longhi's Process at Casa Pachacamac

In 2006 (age 52) Longhi started the conceptual design of Casa Pachacamac. Construction started and the design details continued. → The project was dependant on a monthly allowance, which allowed plenty of time for Longhi to work through the details of the design during construction. → The project was led by Longhi who communicated to his contractor, who managed the construction of the project as Longhi would. → Risks were taken by Longhi and his contractor because some of the work required stretching the monthly budget. The result was a beautiful project that is alive with the spirit of the architect.

What we know from this case study

1. Longhi led the project by working closely with his contractor.
2. He had some years of experience as an artisan (sculptor), and thirty-one years of experience studying and practicing architecture.
3. He designed during the construction of Casa Pachacamac.
4. He was not a master builder - but he did have an unified design+construction process.

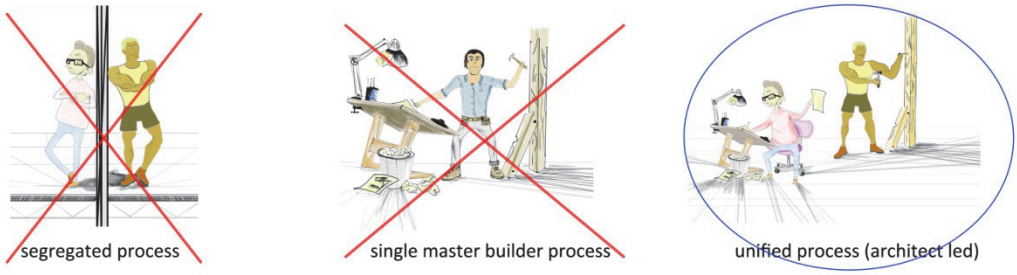


Fig. 75 Longhi's life and process in one page

The direct relationship between Longhi and Hector is not contractual. Longhi's vision of the design and construction process created the desire in Hector to sign on to a social agreement with Longhi. This agreement may never be put into writing, but it is clear to both of them that their relationship is important for Longhi's process, and it gives Hector a sense that he is doing something bigger than building just for the sake of building. Together, they are making architecture that is fascinating, unexpected, and very well built. The result is something that is bigger than both them, something spiritual.

SIX

UNIFIED PROCESS WITHIN DELIVERY SYSTEMS

The processes of Cho and Longhi break the barriers of any current delivery system, traditional or otherwise, and the distinct lines between the design and building processes begin to blur as they progress together. Traditional design-bid-build project delivery does not offer clients the seamless process that clients so desperately want, but this delivery system is seen differently when it functions as a unified collaboration between the architect and the contractor.

Many believe that new delivery methods solve the problems of the old ones by merely changing the structure. However, the methods of these two architects work extremely well not because they change the client to designer/builder relationship, but because the architect and the contractor work as a unified team and the project has one process instead of segregated processes. The architect designs through the construction process, and the contractor functions as an extension of the architect's process while still being able to work under scheduling and financial restraints.

The idea that new methods of project delivery are designed to innately hold the key to unity of process is based on the false premise: the belief that the restrictive system of design-bid-build must be replaced with a new system in order to solve common problems in project delivery. The truth is that new methods of project delivery replace one restrictive system for a different, but equally restrictive system.

The building culture, by nature, is always evolving, project to project, and any delivery systems that bind individual disciplines to codes of conduct, methods, and contractual obligations don't leave the necessary legroom for creativity in process. Each rule that makes up a project delivery system is intentionally broken at one time or another, because otherwise, projects would not get built. These naturally occurring violations of restricted project delivery systems are actually necessary for progress to occur.[121]

Evolution of the traditional design-bid-build system took place when it broke down and re-formed into a new delivery system: design-build. The design-build method adapted rules to correct previous violations that occurred in the traditional system. However, the key to delivering a seamless built project is not a new system. Rather, the solution comes from replacing the segregation of the design and building processes within any system, traditional or otherwise, with unification. This is shown in part by the historic architects of the Renaissance, and in more depth by the processes of Cho and Longhi. The available delivery systems need to be compared to better understand the opportunities for unity in each available method.

DESIGN-BID-BUILD (D-B-B OR TRADITIONAL)

The design-bid-build project delivery method was set up to separate the processes of the architect from those of the contractor. Creating a contractual barrier between the design professional and the builder allowed the architect to act as the "intermediate agent between the employer [client], whose honor and interest he was to study, and the

[121] Feyerabend, Paul K.. *Against method*. Reprinted der 3. ed. (2000), pg. 1.

mechanic [contractor], whose rights he was to defend."[122] The architect's position required trust and respect from both the client and contractor, and if the architect's sole interest was for the owner, or if he was acting as the contractor, there would have been potential for conflict of interest.

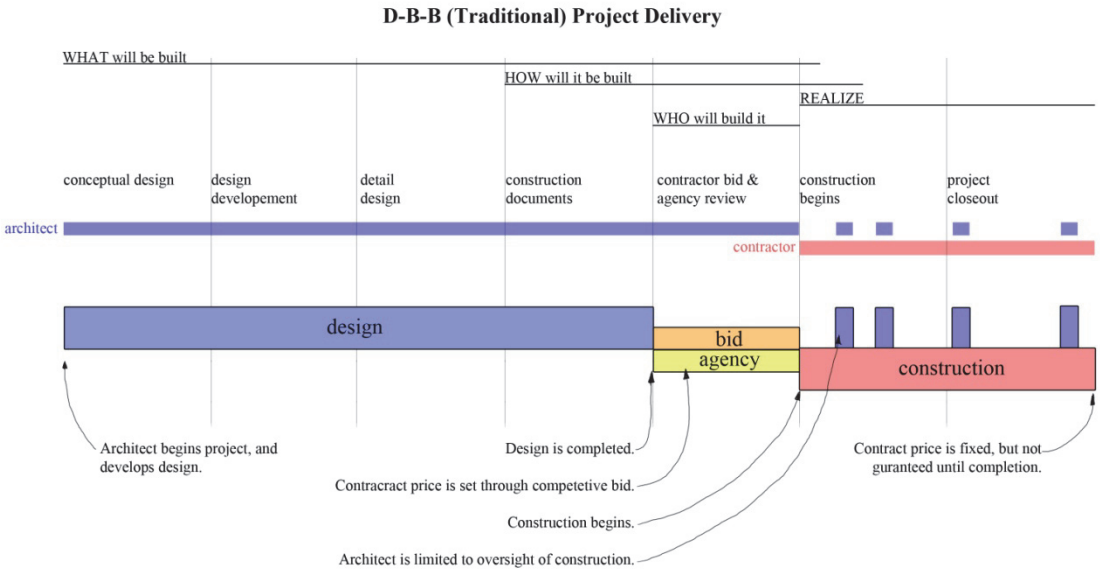


Fig. 76 Design-bid-build process

In traditional D-B-B project delivery, the architect starts and finishes the design. The construction documents are then sent to bid and to get approved by the permitting agency. A bid is accepted based on lowest responsible bidder (public sector) or personal choice (private sector), and construction begins. During the construction process, the architect makes site visits as needed to oversee the work, but the physical work done is based solely on the 'finished' plans that were sent to bid.

[122] Dana Arnold, *Reading Architectural History.* (2002), pg. 62.

Design issues found during construction are submitted to the architect and usually will change the contracted price. The architect retains little to no control over the project after the construction process begins. The idea is that the construction documents will provide enough information to complete the construction of the built work.

The bidding can be handled two ways: either competitive bid or negotiated bid, both happening at the design development stage. The competitive bid allows for a wide range of prices from qualified contractors, which guarantees a fair price for the project. The major problem is the unknown in the process is very high because it is bid at the design development phase.

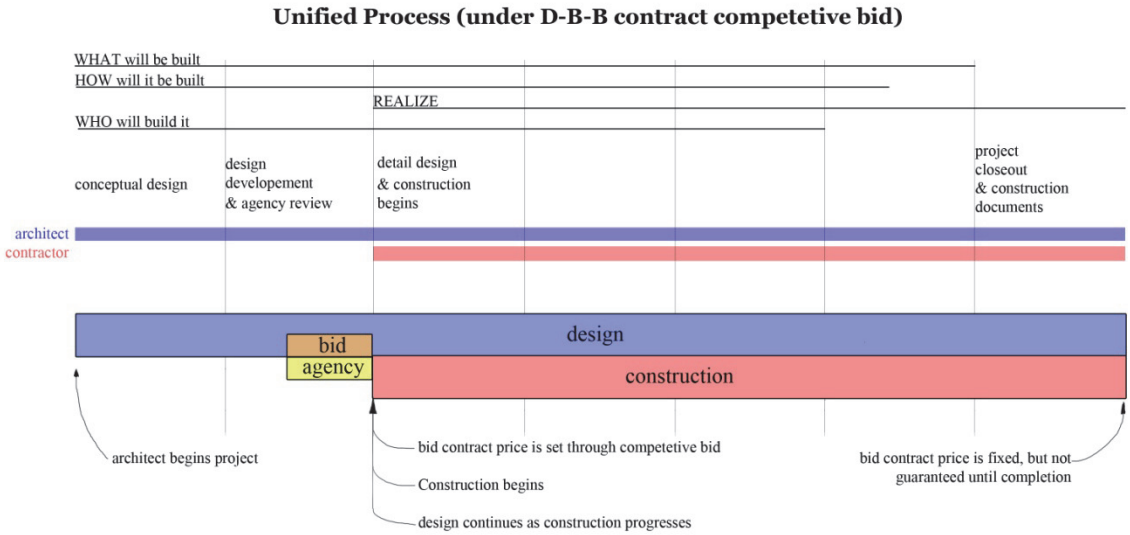


Fig. 77 Unified process (under D-B-B contract competitive bid)

The likelihood of a contractor bidding low and raising the cost during the construction is also very high. This could be solved by having the biding contractors

guarantee a maximum price (GMP), but with a GMP, the project could get overbid to allow for the unknown. The unknown is better solved through a working relationship between the architect and the contractor.

One solution for the unknown bidding problem could be for the architect to build relationships with several contractors who know the architect's design process and could give more accurate bids. Another solution could be to use a contractor from the beginning of the process and negotiate a bid price at the design development stage. The contractor would then be involved from the beginning of the project, better understand the design intent, and therefore, be more capable of delivering a more accurate price. In any case, the more the contractor understands the architect's design intent, the more accurate the price will be.

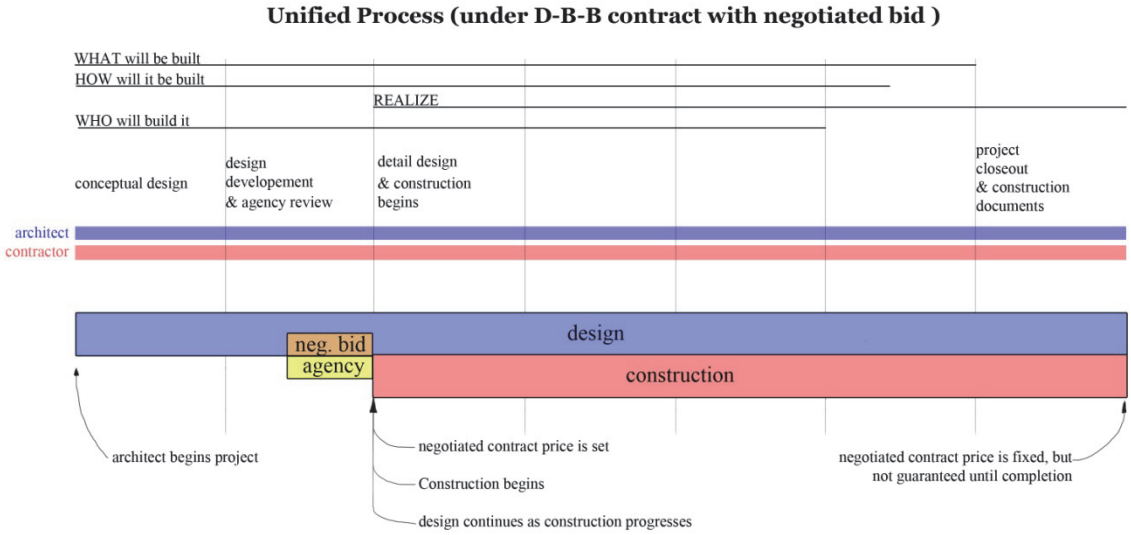


Fig. 78 Unified process (under D-B-B contract with negotiated bid)

This design-bid-build model (with negotiated bid) is the model Longhi followed for Casa Pachacamac and most of his other projects. The contractual relationship was the same triangle, owner-architect-contractor, which creates two distinct disciplines, architect and contractor, within one process of design+construction.

DESIGN-BUILD (D-B)

Design-build is an alternative delivery method to the more traditional design-bid-build. Its humble roots began in agricultural and utilitarian buildings. It was not until the 1980s that design-build began to take over many of the projects that previously would have used the more traditional procurement method. In fact, before 1979, it was ethically prohibited for architects to engage in design-build projects. This was not only because having the architect as both prime designer and contractor went against the AIA code of ethics, but also because professional liability insurance explicitly excluded projects of this nature. [123]

Today, design-build is a preferred method for many clients because it offers a single source of contact and liability on the project. As of 2002, design-build was already being used for forty percent of all new construction in the US; of those, ninety percent of the design-build projects were led by non-architects.[124] Architects are not currently leading most design-build projects because of the ethically prohibitive paradigm that was embedded into the architects since the beginning of the profession. However, some

[123] American Institute of Architects. *The architect's guide to design-build services*. (2003).
[124] Rosemarie Buchanan, "Architect-led Design-build," *AIA Chicago newsletter.* (April 2002), pg. 12.

architects believe that taking the lead in design-build is the best way to re-take the leadership role architects once had in the process.[125]

The major difference between the design-bid-build and design-build delivery methods is that in design-bid-build, the design and construction is carried out by separate entities, the architect and contractor. In design-build, the processes are both designed and built by one entity, the design-build firm. This meant the owner had one contract and one point of contact with either a designer-led or contractor-led entity. Within this single design-build entity, processes differ, and the opportunity for unity is provided, but not guaranteed. Because there is only one entity, there is the potential for conflict of interest.

In Phillip Gallegos' doctoral thesis, *Architects as Master Builders: One View of the Profession and Education*, he sought avenues to connect architectural education to the design-build delivery system. He wrote: "In 1974 when I attempted to join the American Institute of Architects, I was shaken to learn that architects were ethically prohibited from engaging in actual construction work, acts that formed my interest in architecture through a family of builders and craftsmen."[126]

Gallegos proposed to link quality design and quality construction in both the practice and education of an architect. The outcome of this design-build education would essentially lead to designer-led design-build practices, which would replace the restrictive design-bid-build delivery method with an equally, albeit different, restrictive design-build delivery method.

Although design-build offers freedoms in areas that are restrictive in design-bid-build, such as the ability for the architect to be engaged in the physical construction work,

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[125] American Institute of Architects. *The architect's guide to design-build services.* (2003).
[126] Gallegos, Phillip B. "Architects as Master Builders One View of the Profession and Education" (Doctorate Dissertation, April 2006)

design-build requires a single entity to both design and construct the work. This means that the design firms that do not have a construction force or the constructors that do not have an architectural team cannot participate in this procurement process. It also gives the illusion that a single source delivery system is necessary for the seamless process of design+construction, which is not true.

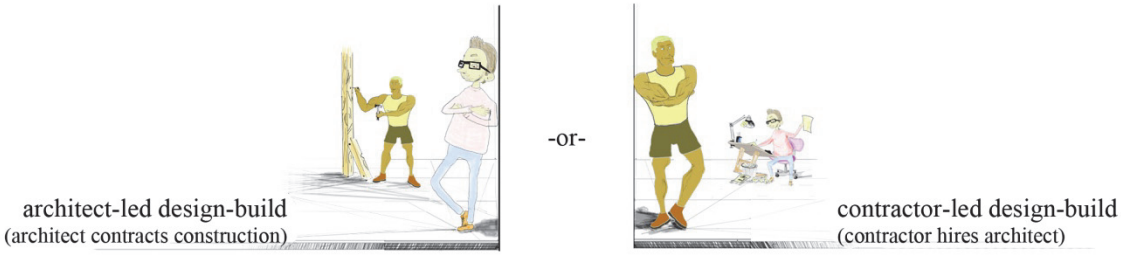
Contrary to Gallegos' proposal, this thesis seeks to link the quality designer (architect) to the quality builder (contractor) because unity dwells in the relationship between the architect and contractor, not in the delivery system. Although project delivery methods are important to discuss and understand, they are not the solution to the current segregated processes. Even the right delivery methods can be unsuccessful if implemented for the wrong reasons.

The argument needs to become less about how the architect can regain glory by either replicating the master builder, or slowly but surely overtaking the process of design-build, and more about how the architect and the contractor can have a process that is truly unified, regardless of delivery system.

The unified processes exemplified in both Cho's and Longhi's projects were achieved through collaboration of the designer and builder, and by blending the design process into the construction process. They became allies, not adversaries. Collaboration was achieved through a relationship of communication, trust, and respect.

Design-build relationships

Adversarial relationship in design-build:



Design-build can belittle the importance of both key roles:

Either the architect acts as the contractor or hires one.
-or-
The contractor hires an architect.

The thought that oneness can exist in an adversarial relationship (architect owns contractor, or contractor owns architect) is wrong. If these relationships exist there will continue to be conflict between the architect and contractor, not unity.

Opportunity for a unified process in design-build:

The architect and contractor should unite to become one.

(the contractor is involved in the design process and the contractor becomes an extension of the architect in the building process)

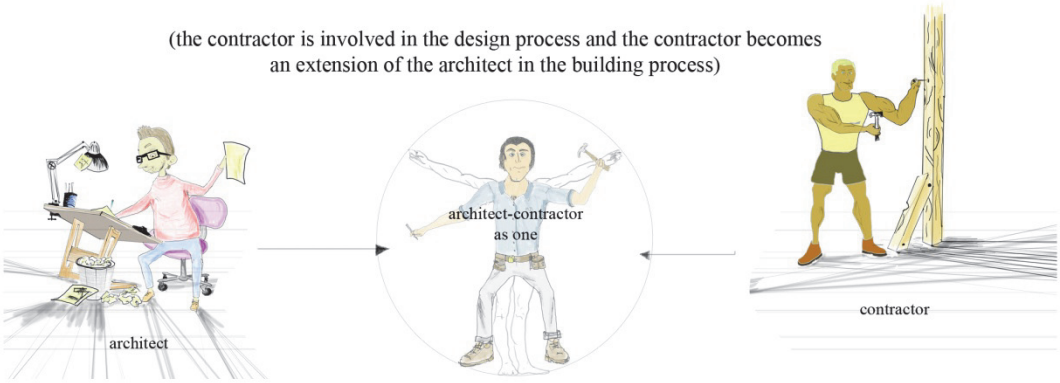


Fig. 79 Adversarial relationships vs. unified relationships

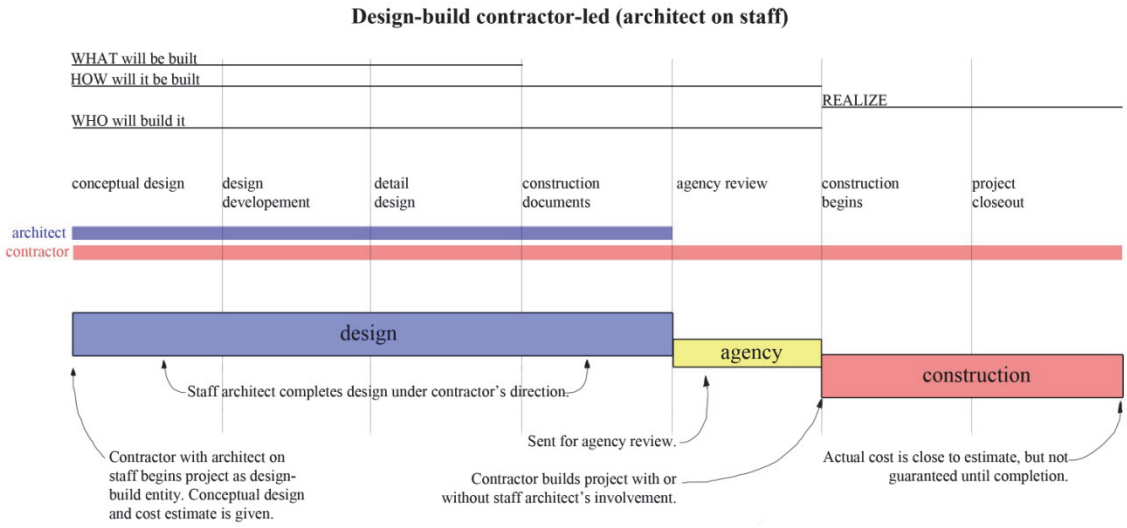


Fig. 80 Design-build contractor-led (architect on staff)

Contractor-led design-build is when the contractor is the sole owner of the design-build entity (there is not an architect in the passenger seat and certainly not the driver's seat). The theory behind contractor-led design-build is that the architect becomes a subcontractor to the contractor, and the contractor runs the design and construction process. The architect is usually hired temporarily or is an employee of the design-build contractor.

This delivery system is an advocate of saving time and money. This type of process produces buildings, but does not necessarily make architecture.

In contrast, architect-led design-build has the ability to deliver architecture, but without a contractor to work under his vision, the processes will be sacrificed for simply finishing a job.

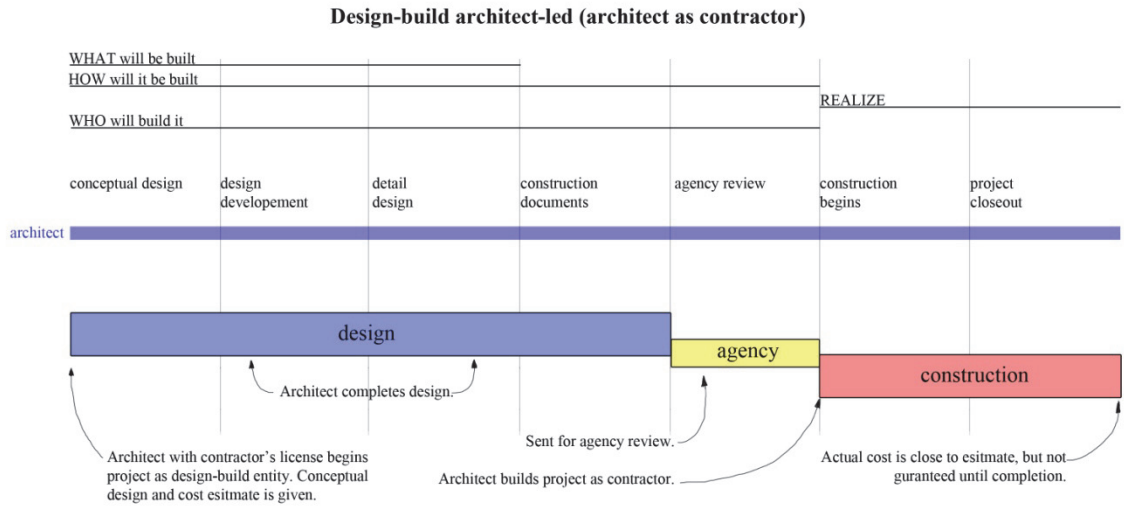


Fig. 81 Design-build architect-led (architect as contractor)

The design-build approach is ideal for a single process because it is one entity that contracts the design and construction. It is relatively the same as the unified process under design-bid-build except the architect and contractor are literally one entity, instead of just having an agreement to work together. As with all design-build projects, the unified process is subject to scrutiny because of potential conflict of interest, as the architect is teamed with the contractor. Although this argument becomes void because caring for the interests of clients is an ethical obligation for architects, if it is ignored in design-build, it could be ignored in any delivery system. In other words, the architect should always advocate for the interest of the client, regardless of delivery system.

The bigger difference here is that the oneness between the architect and contractor in design-build creates synergy between the processes because of the knowledge and

experience residing in the duo. A contractor-led or architect-led design-build team must include counterparts to achieve an effective and seamless process.

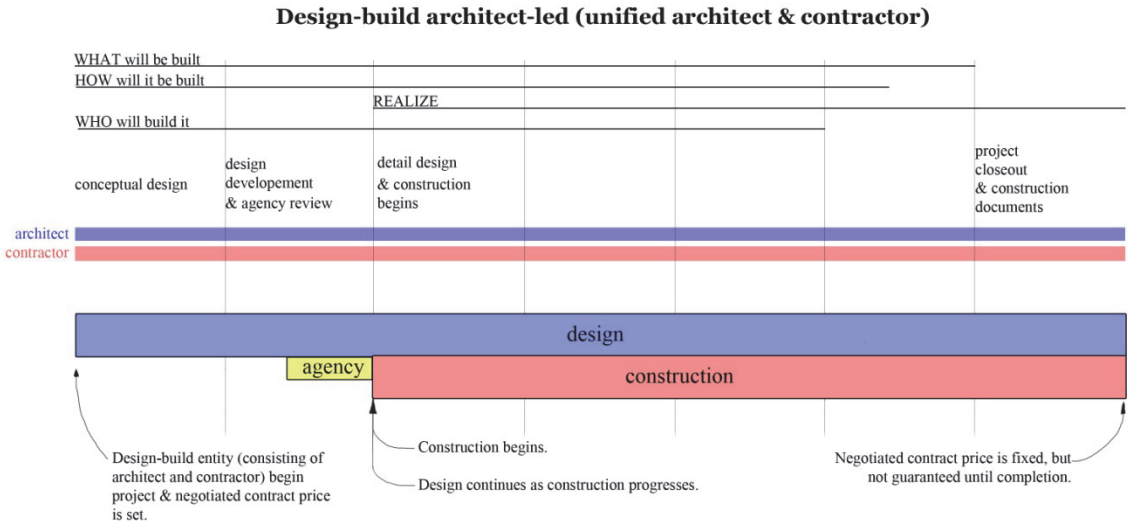


Fig. 82 Design-build architect-led (unified architect & contractor)

INTEGRATED PROJECT DELIVERY (IPD)

There is a relatively new initiative for project collaboration within current project delivery methods called Integrated Project Delivery (IPD). The process was described in depth by the American Institute of Architects National and California Council's *Integrated Project Delivery: a Guide,* defining IPD as:

> A project delivery approach that integrated people, systems, business structures and practices into a process that collaboratively harnessed the talents and insights of all

participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.[127]

In its fullest form, IPD melds the owner, prime designer (architect), and prime builder (contractor) into one entity from conception to completion of a project. The goals of IPD reach far beyond traditional approaches of project delivery because it is based off of what is best for the project, as opposed to what is best for the individual. Instead of the contractual agreements that cause adversarial relationships between the owner, architect, and contractor (in design-bid-build) or between the owner and the design-build entity (in design-build), full IPD creates a single agreement between the owner, designer, and builder (IPD Team) known as a multi-party agreement.[128]

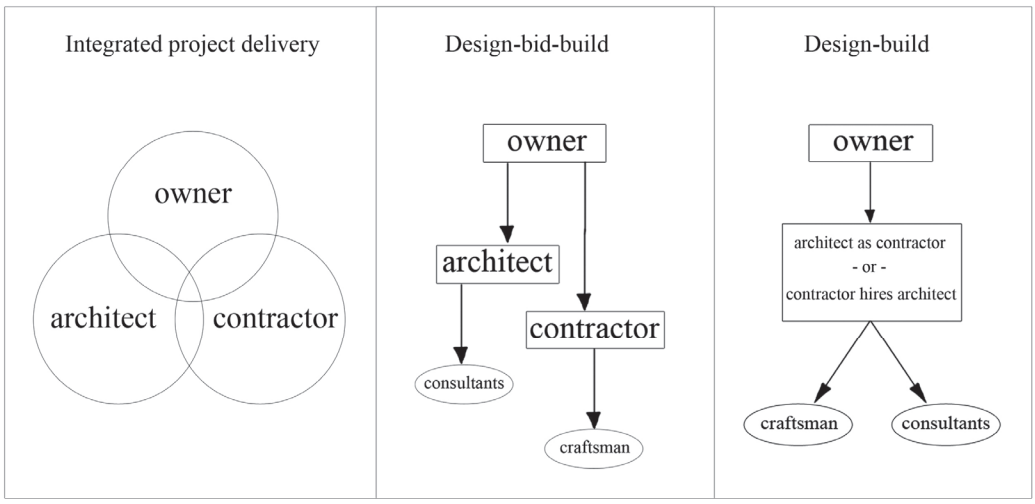


Fig. 83 Relationship trees - comparing IPD, D-B-B, and D-B

[127] "The American Institute Of Architects - Integrated Project Delivery: A Guide, Contract Documents," PDF document retrieved from: http://www.aia.org/contractdocs/AIAS077630
[128] Ibid.

This multi-party arrangement binds the IPD team under an umbrella agreement that creates a temporary organization with detailed management and decision-making procedures. The IPD delivery system has three different structures: project alliance, single purpose entity, and relational contracts. Each structure allows different options within IPD to better suit the specific project's needs, and each structure has financial gains and losses tied to the success of the project.[129]

A project alliance is an informal organization that is structured by the owner, and it guarantees that the architect and contractor direct cost compensation with a bonus for profit and overhead based on project success or failure. Decisions are made as a team and legal claims against team members are waived, unless there is willful misconduct. The structure of the project alliance is set up so that the team succeeds and fails together.[130]

For the single purpose entity (SPE), a temporary but formal organization is created for the purpose of realizing a specific project or multiple projects. This is basically a formal project alliance, where each member is compensated for the services s/he provides and additional compensation is paid according to project success. The SPE is more complicated by nature because instead of an agreement, it is a formal entity, subjected to corporate formalities.[131]

The final arrangement, relational contracts, is also a virtual organization made up of the IPD team. The differences are the risk, reward, and decision sharing structure. The team limits the liability but does not waive it completely, so individual insurance is expected to cover the liable party if there are errors. Also, there are financial rewards for

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[129] "The American Institute Of Architects - Integrated Project Delivery: A Guide, Contract Documents," PDF document retrieved from: http://www.aia.org/contractdocs/AIAS077630
[130] Ibid.
[131] Ibid.

a successful job, but members may or may not have joint responsibility for cost overruns. Finally, decisions are made as a collective, but the owner retains the final decision in the event of team disagreement.[132]

Although the three multi-party agreements allow freedom in how the IPD team is structured, the continuity between them is that each member is tied to one another financially and legally. The mission of the IPD team is to complete the project successfully, on time and budget. The collaborative nature of IPD requires that the individual's goals, at least financially, are directly linked to the project. This creates unity by benefiting individuals if they work as a team. Within the integrated process, relationships are made because they are all tied together, not necessarily because they made a choice to be one.

The contractual links between the IPD team begin to change the adversarial relationships seen in traditional delivery systems. The process becomes integrated because other disciplines have early involvement in the project, but the processes of design and build are still separated. Design is finished, and then construction begins. Just as any project delivery systems presented, IPD has pros and cons. It requires in-depth contractual relationships, which introduces a new learning curve beyond a simple agreement between the architect and contractor. However, the built-in benefits of decreased financial and legal liability for the architect and contractor make IPD a very attractive delivery system for unified processes.

The integration in IPD comes from the key individuals, including the owner, being joined financially and legally as one entity. Design-bid-build separates the client,

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[132] "The American Institute Of Architects - Integrated Project Delivery: A Guide, Contract Documents," PDF document retrieved from: http://www.aia.org/contractdocs/AIAS077630

architect, and contractor financially and legally while design-build separates the client from the design-build entity financially and legally. Therefore, IPD is best suited for owners who want to be heavily involved in an intensive collaborative procurement process and who are willing to take on a larger role and risk in the building process.

The real tool that sets IPD apart from other delivery methods is Building Information Modeling (BIM), which is a digital three-dimensional digital model of the building and all the required systems. BIM is used as a building block for team collaboration in IPD. There are several different programs that allow BIM collaboration. They are very powerful and precise and will continue to be improved, and also continue to inspire collaboration in integrated project delivery.

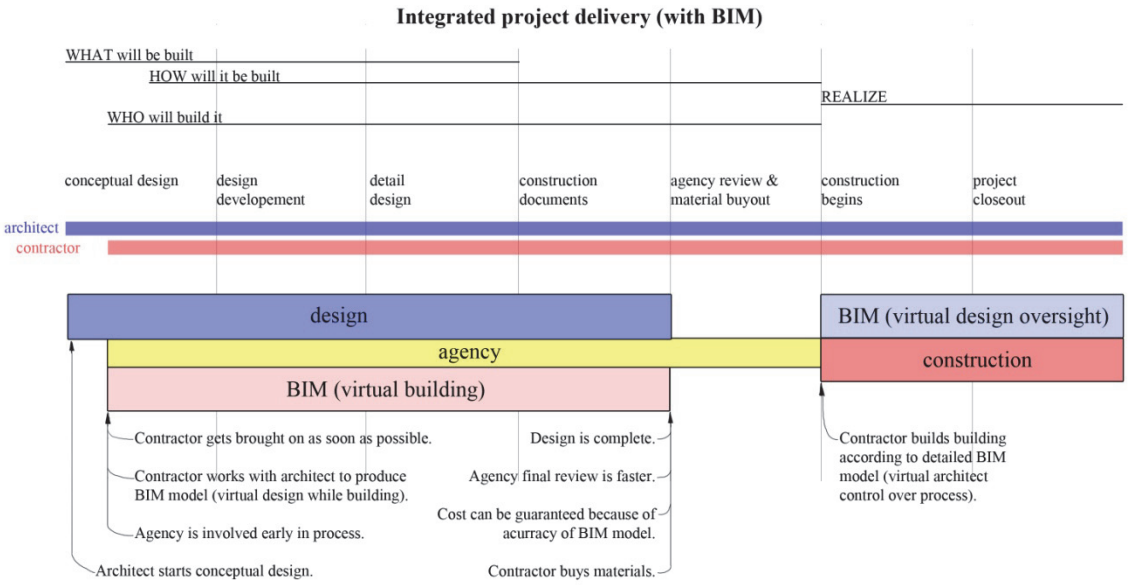


Fig. 84 Integrated project delivery (with BIM)

What is interesting about the BIM process is that it could replace the design while building approach as it becomes more widely used. It will never completely erase other project delivery methods, but as the software gets more powerful and gains popularity, it will create an ideal unified process. To function as a unified process, the virtual model would have to be perfect (within reason) and would basically replace the real building process with a digital one.

In order for BIM to replace the unity needed in the physical building process, it would need to get to the point where the design team can trust that the model is accurate enough to build without interpretation. This may or may not happen, but the idea is intriguing.

The reason BIM is effective in the collaboration of IPD is because the IPD team builds a virtual mock-up of the entire building that is to be constructed, which is very accurate and detailed. BIM is an efficient way to collaborate because the design and virtual construction is started and finished before any money is spent on the physical construction of the project.

After the BIM design process, construction becomes a full scale replica of the digital model. BIM presents a problem for disciplines who want to participate in IPD projects because there is a heavy reliance on the team working as one on a digital platform, as opposed to physically building the project. Although BIM programs flag potential problems and is set up for collaboration, there is a huge learning curve for everyone involved in a BIM-controlled IPD project.

As IPD and BIM become more widely accepted and implemented, it could cause a division between projects of a certain size or budget: the projects that use IPD and BIM,

and the projects that do not. If this were to happen, it would also cause a division between the people able to participate: the people that use IPD and BIM, and the people who do not. These divisions will cause further separation in the profession of architecture and among contractors because a new breed of IPD and BIM trained individuals will be ready to partake in IPD while many others will be left behind.

People who use IPD without the implementation of BIM allow for early contractor involvement, but the level of collaboration is greatly diminished because the drawings are the only thing to discuss. The two-dimensional drawings do not offer the same detailed analysis of the unified processes, so projects that use IPD but not BIM are not taking full advantage of the early contractor involvement, and the processes are still just as separated even though there is more collaboration.

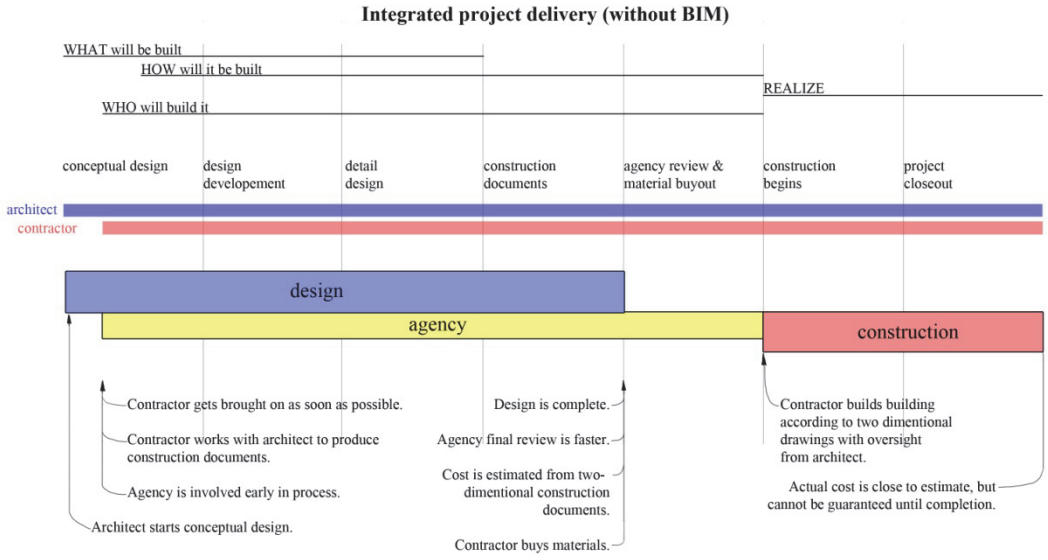


Fig. 85 Integrated project delivery (without BIM)

The IPD process without BIM looks a lot like design-bid-build or design-build with early contractor and agency involvement. Also, if the agency can be involved this early in the process in IPD without BIM, it could be involved early within every delivery system, which would make the unified process in D-B-B and D-B work faster. If the agency could approve schematic plans, construction could start immediately and be involved in the rest of the process.

The reason Cho was able to start the Concrete Box House with a single sketch is because there was not an intensive permitting process; it was only some municipal paperwork. If every construction project began with one sketch, contractors would want to complain, but they wouldn't have time to. Everything would be front-loaded, and the design would unravel throughout the whole process.

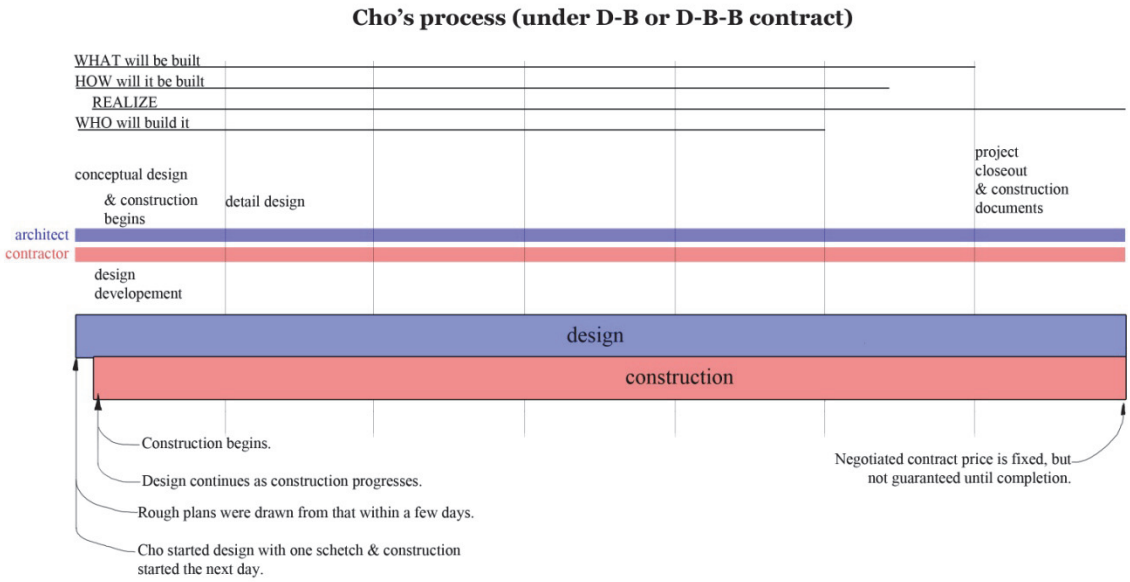


Fig. 86 Cho's process (under D-B or D-B-B contract)

There wasn't time to bid or negotiate; there was just a sketch and then the construction process started. Integrated project delivery is organized in a tight structure that offers multiple contractual relationships and various methods of project completion. It has detailed workshops on how to trust and work in collaboration with previously segregated silos of knowledge. An architect and contractor working together in a single process from start to finish of a project is something else entirely; the only way to learn how to do this is to do it: there will be no workshops.

Believers in IPD and BIM depict a future where projects and people who do not learn to use IPD and BIM will be left with antiquated delivery systems without integration or collaboration. This is simply not true. IPD and BIM may be a growing trend geared toward the future, but the delivery system itself does not innately hold the key, either to project success or to unity. There is a reason design-bid-build had been around for over two-hundred years: it works. It may not be ideal, but it is still widely used because it offers financial and legal separation that some clients desire. IPD and Cho's and Longhi's processes are as different as they are similar. IPD is a new delivery system with an innovative set of contractual relationships and financial motivators that facilitate unity. Cho and Longhi simply had relationships with their contractors and made design and building one process. Early involvement of the contractor and late involvement of the architect did not guarantee a seamless process, but a continual system of designing while building and building while designing integrated the processes to the point that it was hard to distinguish one from the other.

There were similar differences in the required level of involvement from the owner, architect, and contractor. Cho and Longhi both operated as the advocate for the

owner and the contractor. They received involvement from each party when necessary, but separated the involvement so that the control over the project was held by the architect. Although IPD is set up to facilitate unity in a unique way, it cannot guarantee it because unity is a choice. In Longhi's case, the client and the contractor had to trust him to both study the interests of the client and to defend the rights of the contractor.

Mutual trust and respect from all parties is not only beneficial during any construction process, but it is required to have unity within the process. If the client hires an architect to do a project, it can be assumed that mutual trust and respect has already been established, or that it will be earned through the process. IPD fosters team building exercises that help maintain mutual trust and respect, but an architect or a contractor can earn or lose trust and respect regardless of the collaborative training. However, if trust and respect is never in the relationship, or if it dissipates, problems occur regardless of what delivery system is used, whether it is design-bid-build, design-build, or IPD.

None of the available delivery systems can contractually obligate trust and respect. Trust and respect in the building process come out of relationships, whether new or deeply developed. It is a simple choice to have a relationship that is deeper than what is required from a contractual obligation. Both Cho and Longhi had these types of relationships with the contractors who built their projects, and thus are excellent proof that these relationships can and do work.

Youngmook, Cho's contractor, grew out of their relationship and decided to start working on different projects, so their relationship changed. Youngmook would still build Cho's projects, as he did with the Concrete Box House, but the firm changed from design-build to design-bid-build when Youngmook made that decision. Youngmook went

on to build projects on his own, and, because of his training under Cho, has been doing very well. Cho found opportunities to work on larger scale projects that his relatively small in-house construction team may not have been able to build.

Although Cho and Youngmook's relationship started as a committed mentoring relationship, it continually changed, and there was positive growth seen in both of them as a result. Cho had developed a process that started with conceptual development and moved right into construction, with the detailed design being controlled through the process. Because his process was developed through a controlled relationship, it could now be explored in new relationships. The process could be clearly explained to any new contractor that agreed to come under Cho's vision and work with him through the process.

Longhi and his contractor Hector re-committed to their relationship before, during, and after every job. In a personal conversation with Longhi about his philosophy of architecture and business management, Hector said, "Everyone in the office and contractors needed to be one. We all had to want the same thing, and we would always get there. Communication and planning were the two biggest things."[133] It was not a legal re-commitment; Longhi and Hector simply talked about philosophy, business, and why they do what they do. They continued in the relationship because it was what they both wanted. To them, their projects were more important than what they were doing in the moment. Rather, their work was about what would make their clients happy for years to come as well as what would make a lasting impression on the earth.

If a relationship of mutual respect and trust between the architect and the contractor is in place, any positive reinforcement can be added under, on top of, beside,

[133] Conversation with Luis Longhi. Internship in Lima, Peru. Summer, 2010.

or inside that relationship, financially or otherwise, and the project will be successful. Positive reinforcement could include the intensive involvement of the client, subcontractors, or manufacturers in the unified process; a financial incentive for finishing under budget/schedule; etc. Also, any negative situation that occurs in a project can be solved by the unity of the architect and the contractor. Negative situations could include lack of budget or schedule, change orders, material problems, etc.

This thesis does not promote or reject any of the current systems; instead, the goal of this thesis was to present a solution to unify the segregated processes of design and construction. The solution presented by this thesis is a relationship between the architect and the contractor that unifies the processes of design and construction; the relationship can function within any current, past, or future system of project delivery.

A seamless design and construction process will be further explored through a design and building project that involves the key attributes seen in the unified processes. The project will include further exploration into the process of design, developing a relationship with a contractor, and the implications of having a single unified process.

SEVEN

UNIFIED DESIGN+CONSTRUCTION PROJECT

Creating a seamless design and construction process started with the master builder, which led to a unified team embodying the master builder archetype. The master builder title was dropped because the master builder is a myth that causes confusion and further segregation of the disciplines involved in the building industry. Two architects were found, studied, and analyzed, and this thesis has determined that to have a seamless design and construction process, the architect and contractor must be united as one.

The hybridization of these two unlike disciplines creates a new breed of unified architects and contractors that together have one seamless process. Within this relationship of unity, a multitude of contractual relationships are possible, as this is not a new delivery system, but an agreement between the hearts and minds of the architect and the contractor. The mutual trust and understanding between the architect and contractor becomes a daily commitment to the success of the project over individual greed. Any circumstance can be overcome because they are one.

Attributes of unified process:

1. The architect leads the design and construction process. The contractor is the willing right hand of the architect, collaborating through the design process and acting as an extension of the architect in the construction process. The end product will be a built work that could not have been produced without either one of them.

2. The architect creates the vision and the contractor shares the same vision for the successful completion of the project. Each one agrees to put the vision above his/her personal interests, financial or otherwise.
3. Design is submitted to a permitting agency and approved by the owner after design development. Then the construction starts immediately.
4. Detailed design and final construction documents are completed during construction.
5. Design and construction become a rotary process of collaboration (similar to the already cyclical process of building design).
6. The architect advocates for and studies the interest of the client, and earns the client's respect and trust.
7. The architect advocates for and defends the rights of the contractor, and earns the contractor's respect and trust.
8. The unity of the architect and contractor is an agreement that is mutually beneficial and renewed. The choice to be one or not is made daily.
9. The architect must have a good relationship with a contractor that understands the architect's process.

The design process must be clearly understood by the contractor. Cho has a very detailed process that is simple to follow because he is very pragmatic, even with his theoretical thoughts about architecture. This process became clear after many successful projects with his brother, Youngmook. They worked so well together they could complete a project with a few sketches and verbal communication. Today, Cho's process is very developed, but because of his ability to explain his vision in measurable tasks, he is able to work with any willing contractor and achieve the same beautiful results.

Longhi has such a good relationship with his contractor Hector that they work seamlessly with very little effort. Because Longhi's process is more intuitive, he

transmits his vision in a very theoretical way that is rationalized by Hector. As a result, it is more difficult to explain to a new contractor who does not know his process as well as Hector does. This relationship is mutually beneficial and will continue to function until one of them makes a choice to move on.

The nature of Cho's process allows a new contractor to work with him equally as well as his contractor, Youngmook. The nature of Longhi's process requires a deeply established relationship with his contractor.

My relationship with a contractor will be explored through the design and construction of this project. I need to be able to understand my own process in order to explain it rationally to a new or established relationship.

MY PROCESS

The design process is what allows an architect to start with words or thoughts and come out the other end with a physical built work. The process of an architect is the synthesis of theory and practice. Theory, with regard to architecture, is the act of thinking or discussing architecture. It also includes the physical record (writing, drawing, painting, etc.) of the discourse with oneself or with others. Practice, on the other hand, is the regular involvement in or around the built world and building process. This is necessary to understand the nature of any materials (atomic composition, connections, and properties), or spaces (aesthetic composition, feeling, and functionality) used in the architect's design.

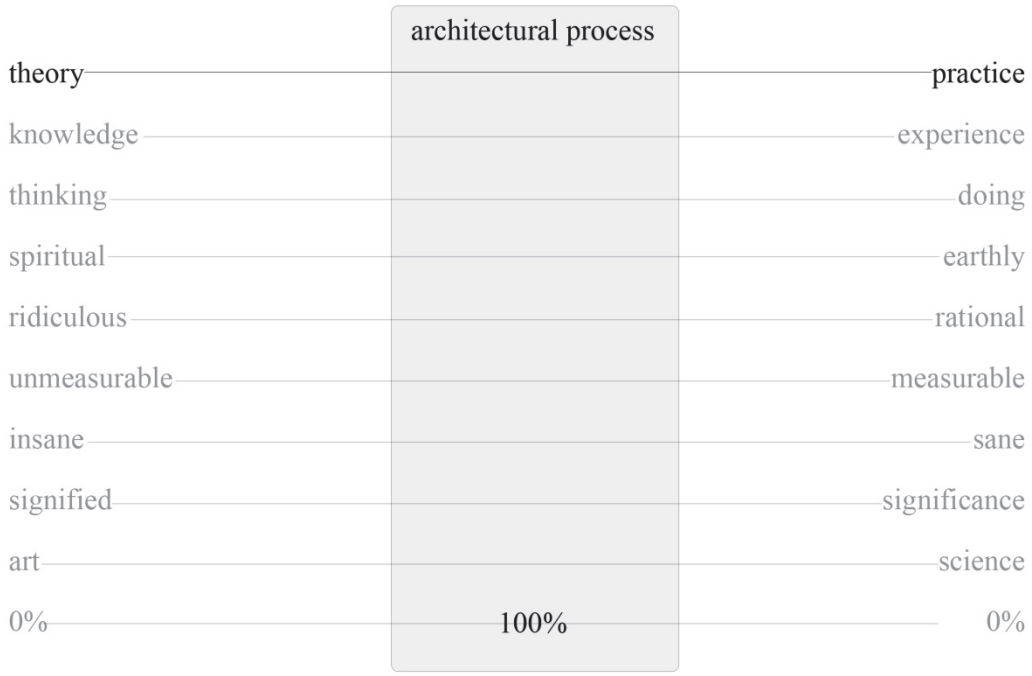


Fig. 87 The architectural process is the synthesis of theory and practice

Through constant exposure to professors' and other students' theories about architecture at archawai'i, I began thinking differently, more critically about the field. The world of practice started earlier in my life as I experienced and participated in the physical building of projects. As I continued gaining knowledge in the theory of architecture, I began to think sympathetically towards architecture. I desired to understand the immeasurable aspects of architecture, but could not break free from my rational brain. The action of repetitive thinking, verging on the ridiculous, led me to a higher plane of architectural theory.

Throughout my time in this school, I have adopted and rejected theories presented by professors in each studio class. Through trial and error, I succeeded and failed, but there has been constant development in my understanding of theory. I started architecture

school with a desire to take projects from conception to completion, but I had no idea what that meant, or how it could be done. Today, I can chart my development from the beginning of my architecture education (the first four years), to the middle (when I met Longhi and then Cho), to the end (my final thesis project).

An architect never truly reaches 100% synthesis of theory and practice because architecture is a profession of both art and science and is consistently evolving. A more complex graph can better explain the constant growth in the theory and practice of architecture. Both theory and practice are introduced, and the process of synthesis begins. Theory or practice can grow faster than the other, or one can develop while the other never does. When the development curve crosses into the middle, a synthesized process is discovered and continues to develop. Ideally, theory and practice would both converge at the same rate, but because of the nature of architectural education, and the subtle or apparent differences in architects' personalities, most architects are weighted heavier on one side or the other.

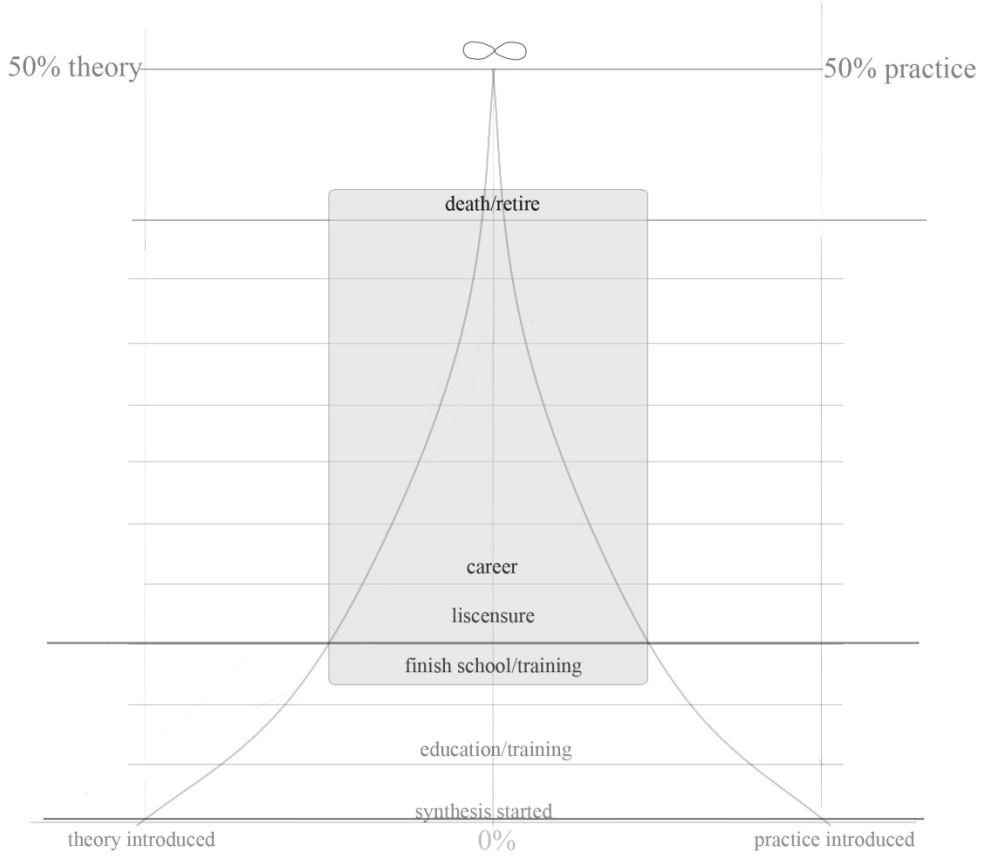


Fig. 88 Constantly working toward 100% synthesis

Although the graph is based purely on theory, an architect or student can place his/her percentage of synthesis on the graph based on where s/he is in his/her process. I was weighted heavier on the practical side when I started school, and during my time here, while I thought I was growing only in theory, my process came full circle: I ground myself in the rational so I feel comfortable in the ridiculous.

Personal clarity regarding my own process didn't happen until my third year when I took a studio class from Pu Miao, a full-time professor at archawai'i. During this studio, I learned a lot about myself and a design process that works well for me. I found that

working a design concept through rational development of architectural space, detail, and form fit my personality. Theory and practice began to synthesize in my design process, and the product was beautiful.

For Miao's studio project, I started with a concept: a soup filled bread bowl, inspired by the desire to have private offices and conference rooms within a public park. The soup (the private spaces) had to exist within the bread (the public park).I found that breaking up the bread and throwing it in the soup, or plopping a large piece in the middle would cause the bread to get soggy or the soup to spill out of the bowl. Instead, I put the soup in the bread, which allowed the two functions to operate separately while occupying the same footprint.

This concept was written out, simply stating that the bread and the soup must be separate, but contained within the same bowl; the bread became the bowl. With this concept, I created a physical working model that evolved as I worked the separate programs (public park and private office space) into the site. The concept model was used to physically convey my design ideas. Making a physical model was the best way to express myself at the time because I didn't have enough experience with digital three-dimensional modeling, and when I used a computer program, it controlled my design process. Building a physical concept model that could be torn apart and changed without a second thought was the best avenue to freely express my ideas.

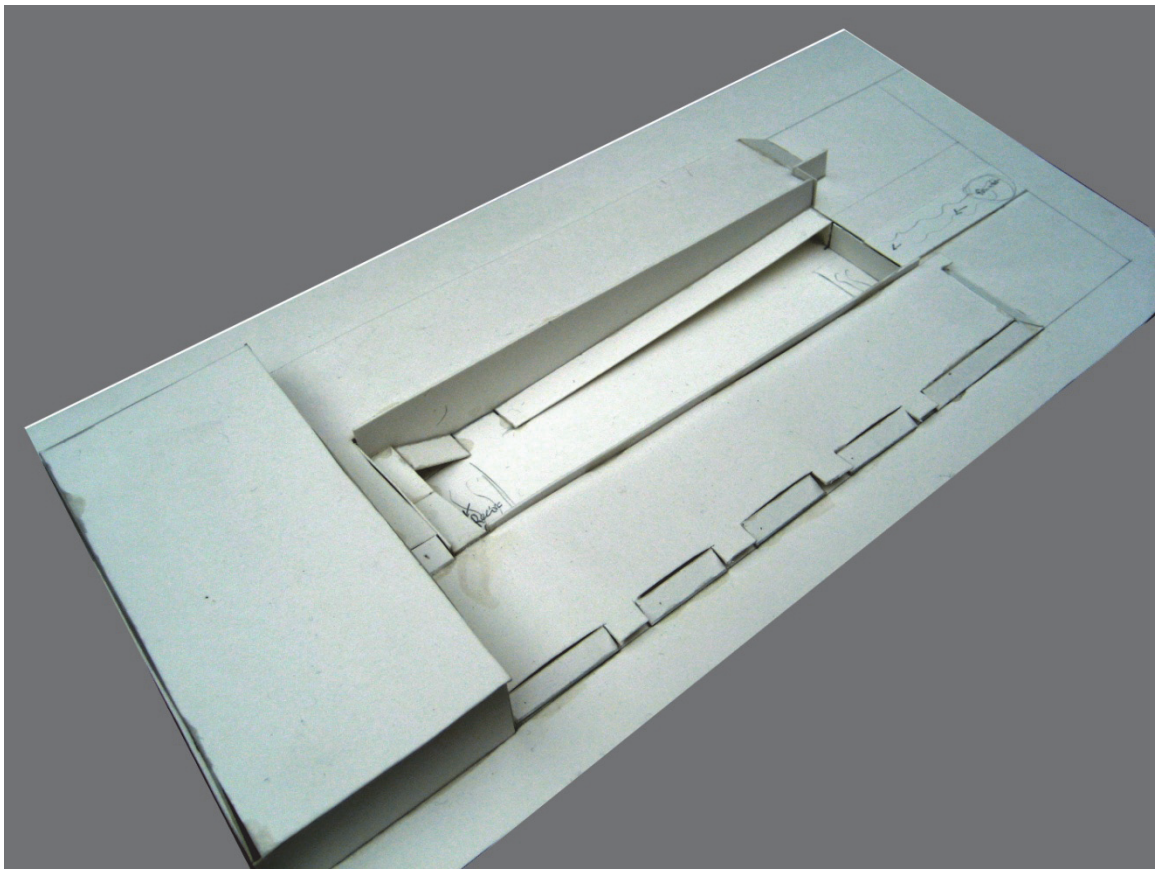


Fig. 89 Miao's studio – physical concept model

Making the model with my hands brought out what was in my brain in a way that I understood. The physical form began to materialize from an abstract thought. The concept of holding the private program within the public program was the main idea, and it was kept throughout the project, but within that immeasurable idea, measurable instances had to be implemented. Cyclical circulation connected the private areas to each other and the public areas to each other while keeping the two programs separate.

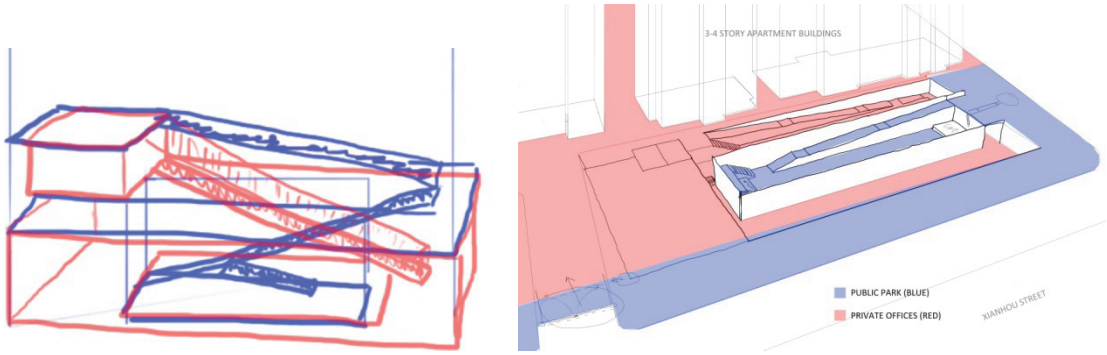


Fig. 90 Miao's studio – cyclical circulation: public space (blue) holds the private space (red)

The design culminated in the entire site being offices and the entire site being a park (on top and around the offices) without actually being connected. Having two programs within the same site was the goal of the project. The abstract concept of a bread bowl allowed for the abstraction of that goal; and the circulation, structure, and spaces (expressed in a physical model and drawings) allowed for the rational explanation of my ideas for this project.

After going through several weeks of design development drawings and detailed design drawings, I built a detailed physical model. At this point in my education, I was still practice heavy; even though school had taken over my life, I resisted the theoretical at all expense. In the end, this project started in the theoretical, and worked back and forth through my understanding of the practical, and ended in the theoretical (it was never built).

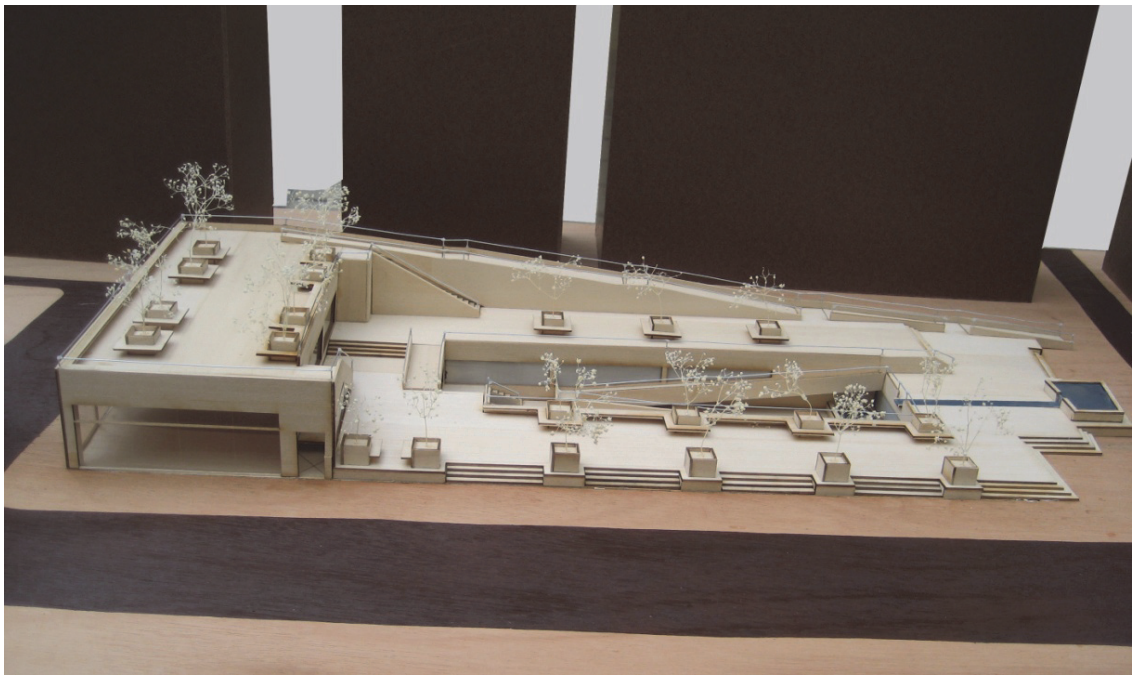


Fig. 91 Miao's studio – final physical model (public park with private offices within)

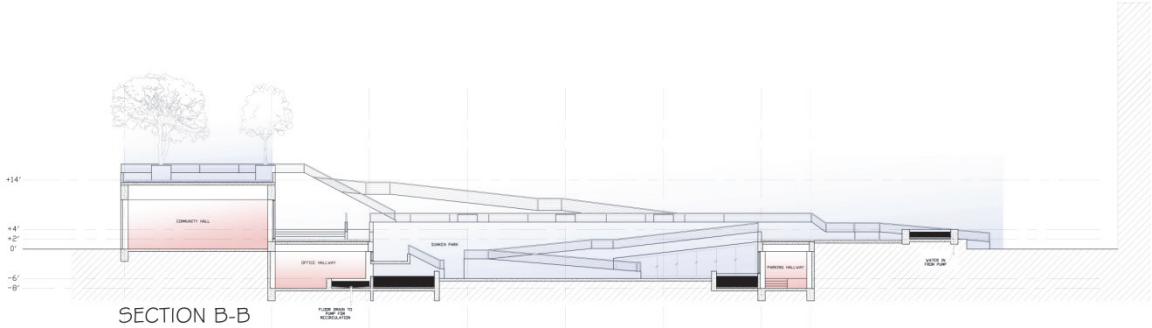


Fig. 92 Miao's studio – longitudinal site section

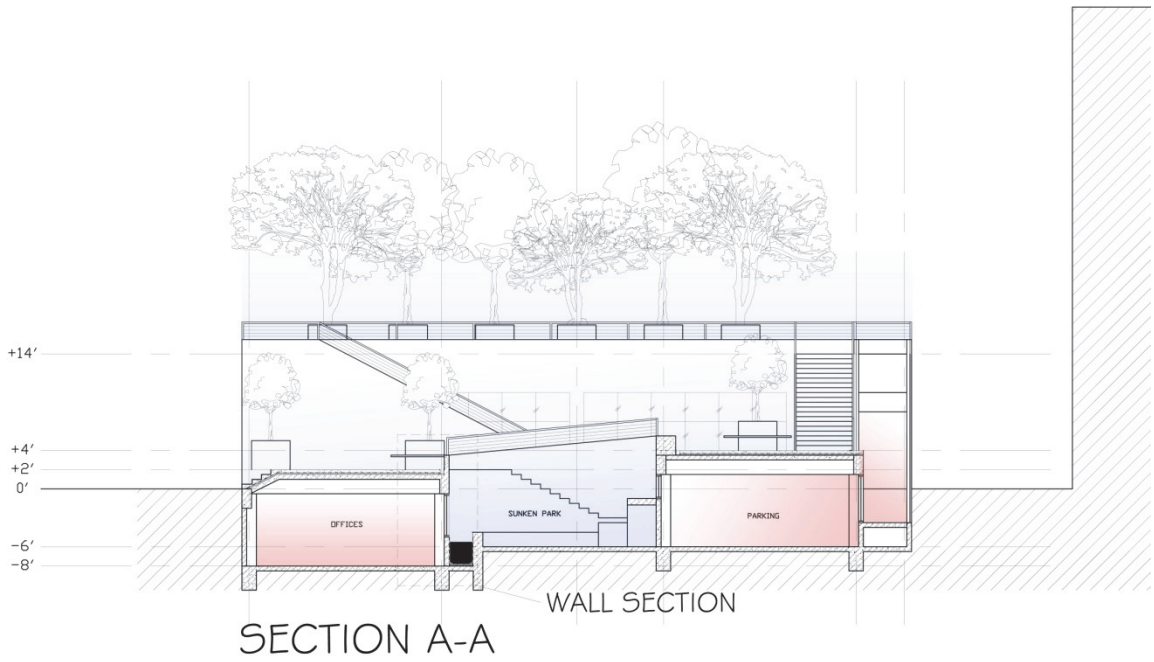


Fig. 93 Miao's studio – cross-section

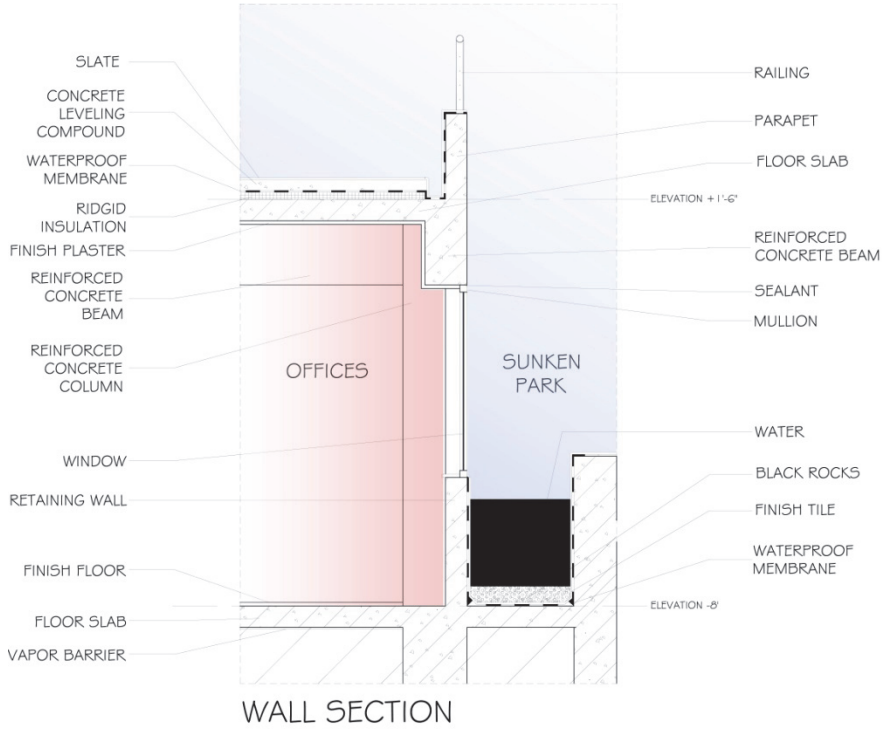


Fig. 94 Miao's studio – wall section

The process began to be a non-linear exploration between theory and practice. The design process was cyclical in nature, as I moved from physical modeling to drawing a section to figuring out the material detail in the wall section. Synthesis simply means that a person is able to pull from both sides, back and forth, between theory and practice. A theoretical architect is able to express less of the practical, and a practical architect is able to grasp less of the theoretical. Miao, as my professor and an architect, added what I was lacking in experience regarding concept, structure, material, and connections, and I was able to use that to help balance my design process between theory and practice.

Miao's studio provided an opportunity to build upon my limited experience with concrete construction. Because I had excavated, formed, and poured concrete before, I knew a little about the nature of the material. Miao helped me achieve a greater theoretical knowledge because he had more practical experience. The knowledge I received from Miao coupled with an internal desire to know how my design would be built drove me forward in this project.

Miao's goal was to have his students understand structure better, but the project did even more than that for me. This was the first time I connected an abstract concept to a logical solution that ended with a beautiful final product. There was something made at the end of this process that I had not been able to achieve before: a beauty and simplicity in space, form, and structure that came from an abstract idea. The immeasurable was connected to the measurable through synthesizing my process.

If this project was going to actually be built, in a non-unified process, complete construction documents would need to be drawn and sent to bid. If it were going to be

built in a unified process, construction would start before details were completed, and an architect would work with the contractor to complete the project.

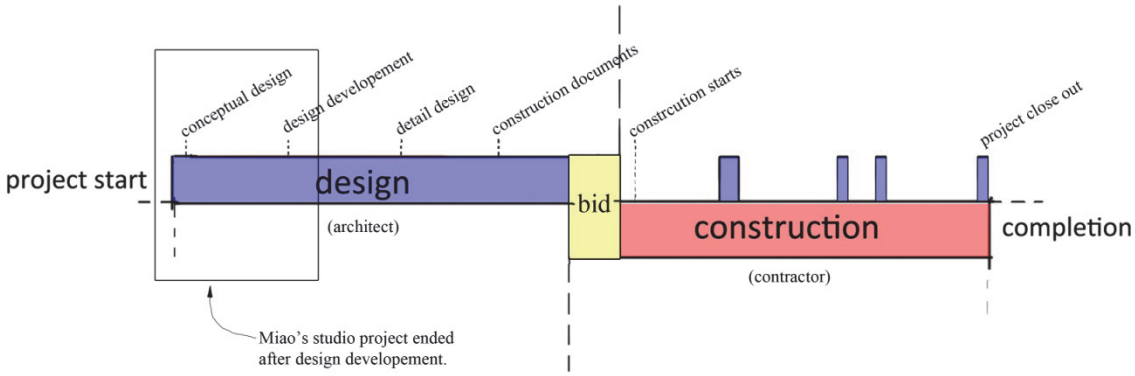


Fig. 95 Miao's studio – project as a design-bid-build (non-unified)

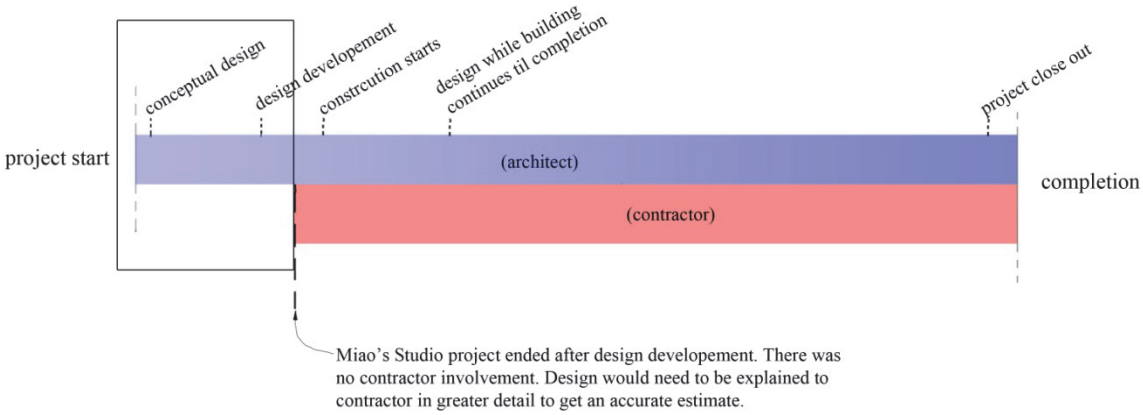


Fig. 96 Miao's studio – project as a unified process

The non-unified process is common for most building projects, where the design phase includes intensive drawings that cover every material and detail that will be built into the project. The reason this is necessary is because in non-unified processes, the project is sent to several general contractors for bids, and if the project is not detailed completely, there will be a lot of questions regarding what is to be built. Questions during the construction process generally mean more project costs.

In a unified process, common in Cho's and Longhi's building projects, the contractor was involved from the beginning of the design process and negotiated a flexible price that accounts for the unknown. Since the building process started immediately after conceptual design, or design development, total project time was shorter. Also, because the contractor had a relationship with the architect, estimates were fairly accurate.

There are several problems with Miao's studio project as a unified process. First of all, it was started and went through to design development without contractor involvement. If there were a budget, the contractor would have to negotiate a price based off of what was designed already and account for the unknown. Without the contractor being involved from the start of the design process, the project could be over budget and would have to be re-designed to suit the budget.

With innovative materials and details, there is a greater need for the contractor to be involved in the design process so he can better understand what will be built and how he will build it. There is also a greater need for the architect to be involved in the construction process because there has to be constant communication between the architect and contractor, and the ability for the architect to make the final decisions when

something is untested (like Cho did with the flat concrete roof with no added waterproofing). However, contractual agreements in procurement methods do not allow for the intense involvement of the architect in the construction process or for construction to start before the design is finished.

After Miao's studio, I found Luis Longhi, accidentally, or by fate, when I took a summer study abroad studio in Peru. I fell in love with architecture during this time because Longhi's words penetrated into my heart, past my mind which previously controlled my process. During Longhi's studio, I was lost, as one must be lost before one truly finds oneself. I was on a path to further my understanding of myself and my process. I clung to Longhi; many were calling me his disciple, and I did not correct their statements because I did not mind. I saw something in Longhi that I had to have for myself.

Longhi's process was so much more ethereal than I was comfortable with, but it made me curious about what was on the side of architecture – the immeasurable and the (slightly) insane – feelings, intuition, and not-rational decisions. Although the connection between abstract concept and finished design product was evident in my project for Miao's studio, I was unable to keep that connection in other studio projects. I was not the theoretical designer that always dreamed about abstract ideas that could be transformed into practical buildings. I wanted something more tangible, like the literal although abstract translation of a bread bowl as a container for private spaces. I was not use to giving in to my irrational feelings for architecture, but the nature of Longhi's studio allowed me to escape my comfort zone to see the deep conceptual connections I make without knowing it.

There is a little irrational behavior in all of us, no matter how pragmatic; no matter how deeply it is buried, the ability to be creative is within everyone. Longhi showed me that I have a well of untapped creativity within myself.

The project for Longhi's studio was to design a building that supported culturally appropriate rural tourism on an island inhabited by indigenous Peruvians. The project was located on Taquile Island on Lake Titicaca in Peru. I started the project with a concept of connecting the old and new. Because I was in Peru and had limited physical resources (materials and a studio space to work), I forced myself into my computer. I dwelled in a digital world for the duration of this project. My digital modeling skills were not honed enough to use the programs as a tool as I did in my physical model for Miao's studio class, so the computer program controlled my design.

I decided to design several guest houses (new) that were modern looking versions of the house that was already existing (old) on an adjacent lot.

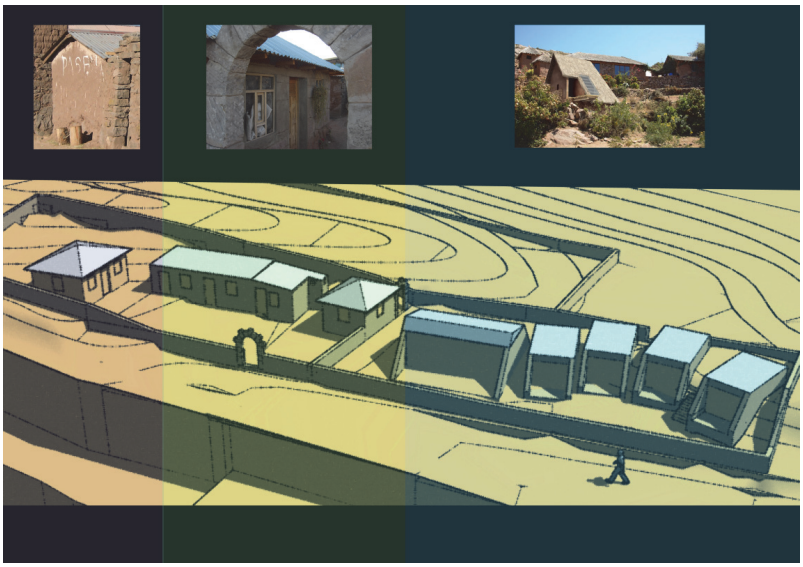


Fig. 97 Longhi's studio – concept model connecting old (left) to new (right)

The computer controlled design frustrated me and led to a sterile project (one that did not create life) for the first several critiques. After the preliminary critiques, more frustration set in because my concept was not getting across. I stopped modeling in a program and used Photoshop to show Longhi the image that I had in my head.

Fig. 98 Longhi's studio – final rendering of guest houses

Although I did not find a niche within this studio and was more frustrated with my design process and myself than I had ever been, it led me to believe that conceptual design intent is something that is felt, not forced. No one else can see or understand what you feel and dream; it must be expressed physically, and it must be expressed beautifully.

This studio project is physical evidence that the design process is in constant flux, and is never truly solved. I thought I had found my design process during Miao's studio project, but Longhi's studio altered my thinking. The ethereal depth that comes from feelings, intuition, and irrational decisions trashed everything I had previously learned about design concepts. Longhi taught me to trust my intuition and to lose all rationale in the conceptual process. After the conceptual process, the ethereal qualities have to become rational. It is the ridiculous that gives a building life after it has been rationalized.

This project was not precisely thought out and designed as Miao's project was. However, the project was solved to the point where construction could have started as details were figured using intuition from what was being built. There was a lot left to interpret, constructability issues that needed to be discussed with the contractor.

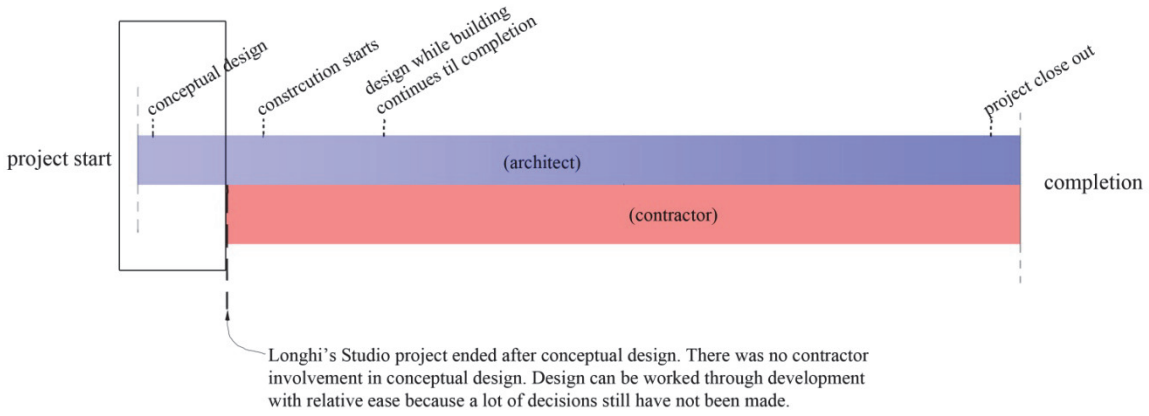


Fig. 99 Longhi's studio – Project as unified process

Because Longhi's studio project finished after conceptual design, the contractor could be involved in the design decisions and help develop a budget earlier, and construction could start earlier. This could mean faster project time and less cost to the client.

Longhi operated under the traditional design-bid-build contractual agreement. The difference is that instead of a bidding process, the contractor negotiated a fee and started construction immediately. Longhi controlled the interpretation of his intentions by working with the contractor during the construction process. Before and after Casa Pachacamac, construction times were fast, and the post-conceptual budget from his contractor was accurate. Casa Pachacamac was a unique case because of a scheduled budget.

Longhi's contractor agreed to complete this project because he believed in Longhi's vision for architecture. Their relationship allowed for a unique budget and schedule with which a non-unified design and building process would have struggled. The flexibility of the unified process comes from the agreement between the architect and contractor. Longhi and his contractor worked through the scheduling and budget issues as a team from start to finish, and the project succeeded.

After my studio experience with Longhi, I was introduced to Byoungsoo Cho's work and had the opportunity to participate in a study abroad studio in Seoul, Korea. In this studio project, I implemented Cho's method of working details, first using innovative pragmatic ideas and research, and then physically building the details to show what was designed.

My project for Cho's studio started with a site in Seoul, Korea. I walked around the site area, sketching materials and details to gather ideas for my project based on the historic surroundings.

Fig. 100 Cho's studio – alley study

The alleys in the surrounding area intrigued me. I thought that I could bring the feeling of filtering into the design. Because most private residences in the area had walls surrounding their properties, the public walkways were left over as small pedestrian alleys. Part of my site was to be a public gallery, so I wanted to create small alleys into the site to emulate the surrounding public alley spaces.

I was drawn to the bamboo reinforced mud walls that were common for the older buildings in the area. I began to study the mud walls while thinking about the contextual information gathered from the site.

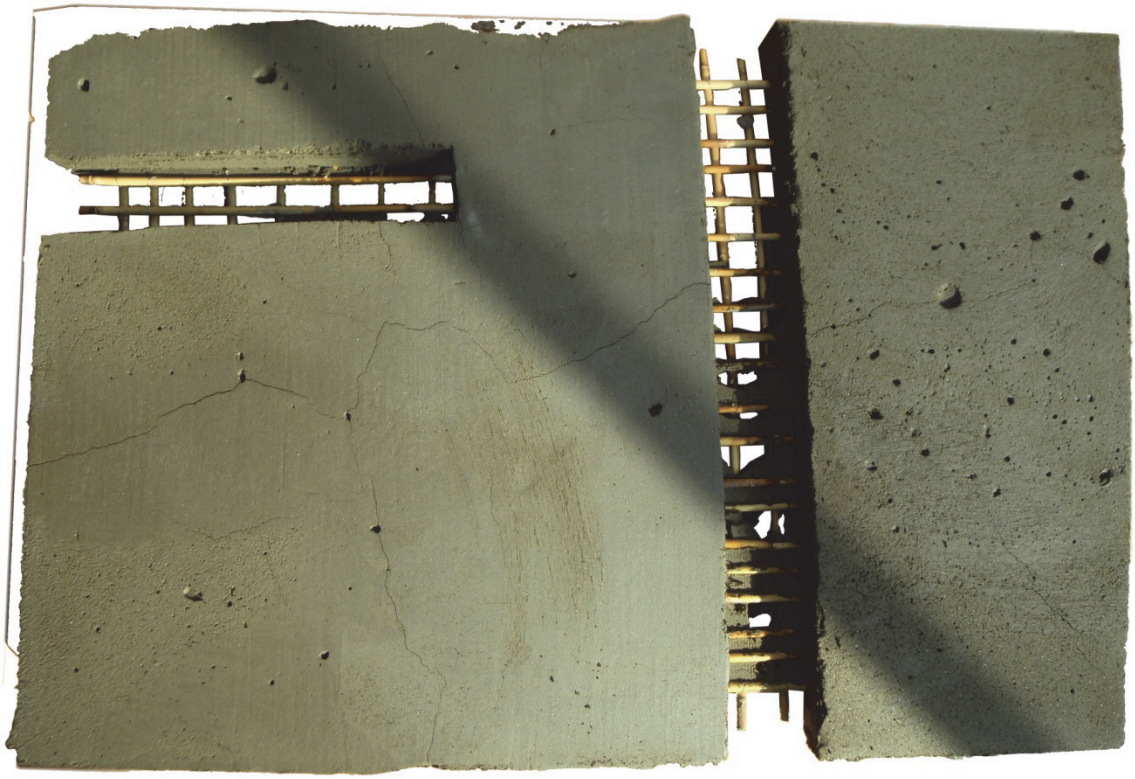


Fig. 101 Cho's studio – physical study model inspired by contextual mud walls reinforced with bamboo

Building large study models using real material was fascinating because it's something that I love to do, and it was a rational approach that I understood. We were asked to pick materials to use in the building, and then we were asked to build a detail using these materials; it made sense. The first study model was an idea for filtering light and visual interest into the site. This was a literal interpretation of a detail I had seen in a building, so when I was asked to program a feature on the site, I chose a wall.

Fig. 102 Cho's studio – digital model of designed wall

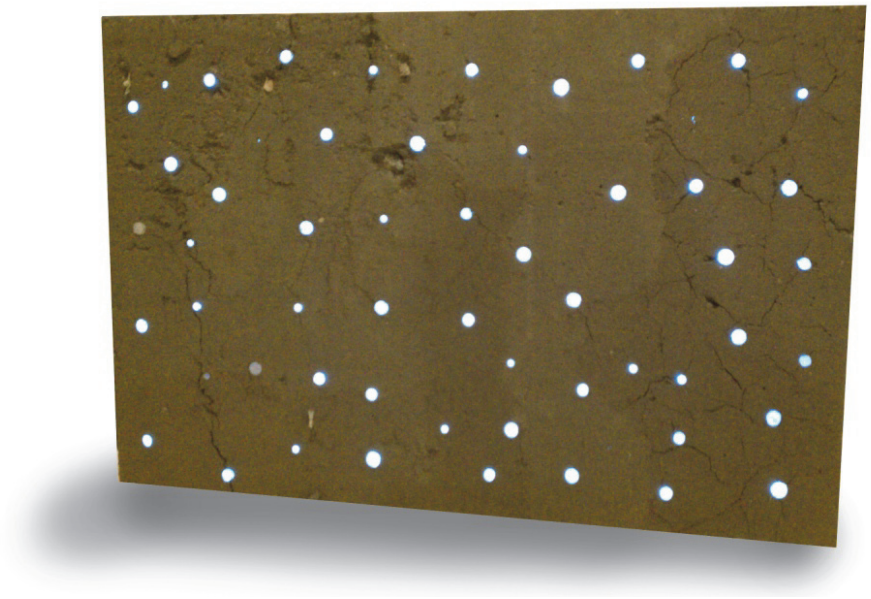


Fig. 103 Cho's studio – physical model of designed wall made with mud and plexiglass dowels

I became very connected to this project. Building full-scale (or very large scale) physical details provided a direct physical expression of my vision. This went beyond what I did in Miao's studio project because the physical models were a smaller scale that did not allow me to connect my theoretical ideas with my practical experience. When I had an idea about my design in Cho's studio, I built it. I have never been told not to build full scale models during the design process, but I have never been directed to either.

The resulting firsthand knowledge of materials and constructability gave me the boldness to stand behind an idea and say without a doubt that it would work. There was a direct correlation between ridiculous ideas and rational implementation. Although my ideas failed after several attempts, I was able to re-think, research, and try again. The wall with mud and plexiglass dowels failed because the mud was too frail after it cured. I started using rice to add strength to the mud and protect the wall against weathering. I started calling my creation rice-crete, which was basically mud with a rice additive.

Fig. 104 Cho's studio – rice-crete bricks

I made the study as scientific as I could, measuring rice-to-mud percentages and strength testing them by standing on them and breaking them apart with my hands. I made a lot of test bricks; many of them failed. I tried cooked and uncooked rice, ground and whole rice, different kinds of rice, and several different methods of curing. When I found a method that worked well (uncooked sticky rice that was ground down to powder mixed with mud), I tried mixing the rice powder with different percentages of mud. The strongest brick made was 90% mud and 10% ground uncooked rice. The process smelled terrible, as rotten rice gives off a terrible odor, but I endured.

The final project wasn't built as it was a theoretical studio project, but the process taught me how to be creative and pursue innovative materials and details. I was not afraid to fail, and I was not afraid to push past the laughs that I got when I first presented my project. I was determined that I could succeed, and in the end, I did.

I could specify rice-crete in a project, and because I have a detailed procedure for making this material, it could be explained to, and estimated, by a contractor. Regardless of the amount of detailed explanation of the process to make rice-crete and detailed rice-crete connections, in a non-unified process, a contractor would have to be crazy to bid on a project made of rice-crete. Most likely during the bidding phase or during the construction phase, an alternative would be asked for, like cast in place concrete, or, more likely, CMU block walls.

In a unified process, a contractor would voice his concerns: tell me I am absolutely insane or beg me to choose another material. Then, I would have to make a decision to stand behind its performance or redesign the material. During the decision making, construction could start on the groundwork needed for the design, and by the

time a choice had to be made on the rice-crete material, there would have been plenty of time to decide.

Although this was an extreme example, because it was rice and mud, the ability to innovate any material or detail outside of current common construction techniques is limited in non-unified processes by the architect's desire to limit liability and a contractor's blind willingness to take a risk with the architect's ridiculous ideas. Also, regardless of unification, there will always be some unknown conditions, and there could be added costs.

Cho's studio project was a unified process because Cho had his brother and contractor, Youngmook, come into the studio to guide the process. The design was taken to a conceptual level and had construction started immediately, the project would have been built the same way Cho builds his buildings.

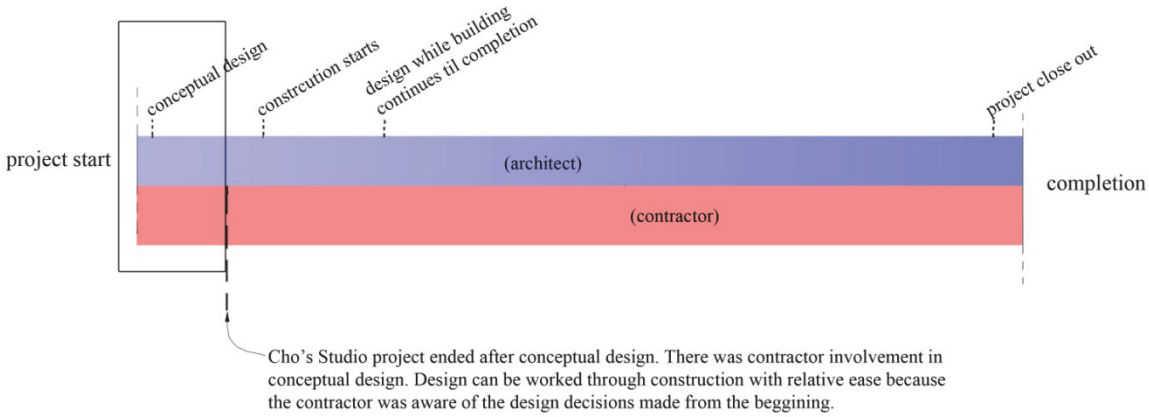


Fig. 105 Cho's studio – project as unified process

This level of innovation and pushing the limits was how Cho designed his projects. In the Concrete Box House, he told his contractor how to finish the flat concrete roof so it would be waterproof without additives or additional waterproofing material. He controlled these innovative details during the construction process and took responsibility for the outcome because he had personally, with his contractor, explored the material and tested the methods he was implementing in the projects.

His contractor built the Concrete Box House as if it were Cho building it himself. If they were working as one firm (design-build) or if they were working as separate entities (design-bid-build), it would not have mattered. In any project delivery method, the design and construction processes would be one and the same if Cho had the materials and details worked out and designed them into the project as the construction progressed.

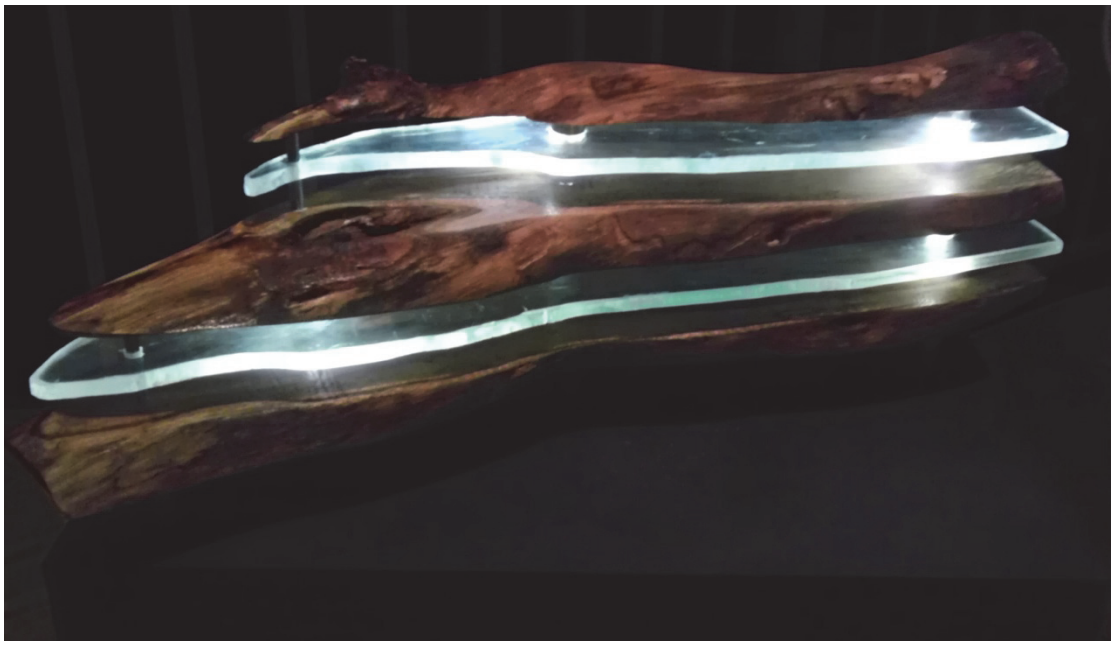
Personality dictates process, and there is not a right way to design. Every designer's process is different; even if some patterns exist in different people, there will be subtle differences. Although Cho and Longhi both work with contractors during the construction process, their reliance on the contractor and the skills they employ as architects are very different. My process will vary from theirs as well. The important link between Cho's and Longhi's processes is that there is one design and building process. Construction starts as soon as possible, and design does not stop when construction starts.

These three studio projects (Miao studio – Park/Offices, Longhi studio – Guest Houses, and Cho studio – Gallery) show the development in my personal process and helped me find a path to achieve synthesis of theory and practice. The beginning (Miao's studio) personally connected me to a solid concept and design process that I did not yet

fully understand. The middle allowed me to more fully understand the ethereal qualities of concept (Longhi's studio) and connected me to a method to explore my desire for constructability and detailed design (Cho's studio). The end was this final thesis project, a coffee kiosk located in the archawai'i courtyard, where I used everything I learned in life, work, and school, finally discovering who I am to be as an architect and how to achieve one process of design and construction. I now know this is achieved through the unity between the architect and the contractor.

I would like the coffee kiosk in archawai‘i’s courtyard to be a place where students, professors, and visitors alike can come together to think and talk about architecture while sipping on freshly brewed espresso. The footprint is small, but the atmosphere will evoke emotion and feelings about architecture, good or bad, which should be the goal of any architectural intervention, regardless of scale.

-Stephen Larson



Project name:	Archawai‘i Coffee Kiosk
Function:	small mobile coffee kiosk
Chief designer:	Stephen Larson /archawai‘i graduate student
Project team:	Stephen Larson
Client:	American Institute of Architecture Students, Hawai’i chapter and archawai‘i Advisory Council
Construction:	Stephen Larson, Randy Lau (President, DBS Hawai’i, Uriah Bagley (General Contractor), James Murray (Owner, JM Finish Carpentry)
Design date:	September 22, 2011
Completion date:	November 15, 2011
Building Area:	3.3 sqm (36 sq. ft.)
Photography:	Stephen Larson

I believe that the design and construction processes should be one. To achieve unity between these processes, I used my knowledge of the contractor in the design process and worked with the contractor to detail and build my design intent through the construction process. The line between the segregated processes was less apparent as building became an aspect of design and design part of construction. In the end, they were one seamless process.

The coffee kiosk project was suggested to me by Peter Vincent, who is on my thesis committee as well as on the advisory council for archawai‘i. I had my first meeting with the American Institute of Architecture Students, Hawai‘i Chapter (AIAS Hawai‘i) on September 22, 2011 to propose the project and work with them on the goals of the Coffee Kiosk. AIAS Hawai‘i and the advisory council were the clients and the project began to unfold.

Scheduling for the project was set by the deadline for my thesis, which was less than eight weeks away. The budget was set at three thousand dollars by donations from the advisory council, which included the construction and up and running supplies. The program was balanced by the client’s desire and the allotted budget.

Minimum program requirements:

1. Espresso machine
2. Refrigerator
3. Container for ice
4. Trash receptacle
5. Storage (for cups, coffee, and various accessories)
6. Work area for barista

Through the pre-design phase, I studied several cafés in the area.[134] I found that the flow of the café and barista were very important. Although the layout of the different cafés varied, a common element in successful cafés was that the espresso machine placement allowed the barista to face the customer.

As I worked through design and presented proposals to AIAS Hawai‘i, members of the archawai‘i advisory council, and my thesis committee, the program and details changed constantly. One week before construction started, both a full commercial café and a small mobile kiosk were proposed.[135] Although the fixed café was desired by some, the mobile kiosk fit the budget, program requirements, and fulfilled the client’s needs. Two days before construction started, a series of sketches were drawn that were submitted for review by my thesis committee.

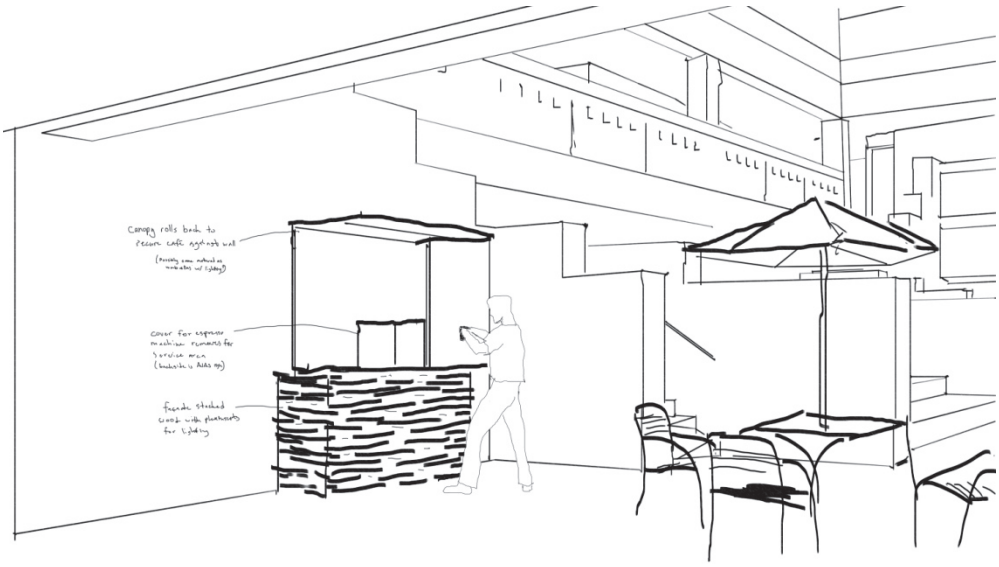


Fig. 106 Concept sketch (cafe closed)

[134] See Appendix A for case studies and analysis.
[135] See Appendix B for submittal of program and design of fixed vs. mobile coffee kiosk.

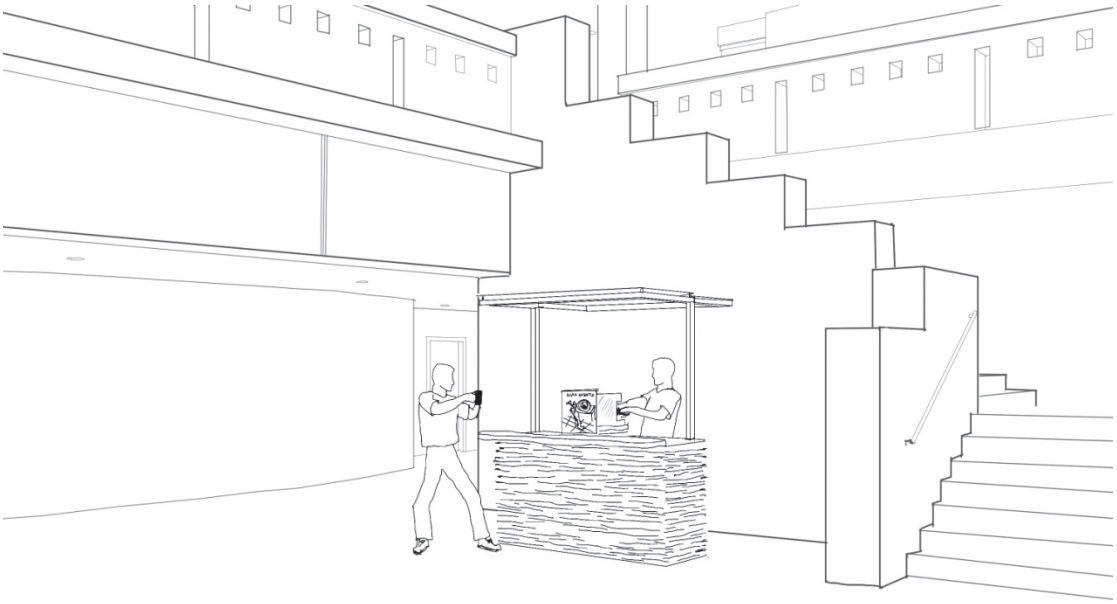


Fig. 107 Concept sketch (cafe open)

The sketches showed the mobile cart in location, but concerns were raised about the canopy not being large enough to cover the café when it rains (it rains often in the Mānoa area). The design of the canopy changed through the construction, and a larger canopy was mounted to the wall behind the kiosk.

A more detailed drawing was presented for the working side of the café, which included the size of the frame and the programmatic requirements.

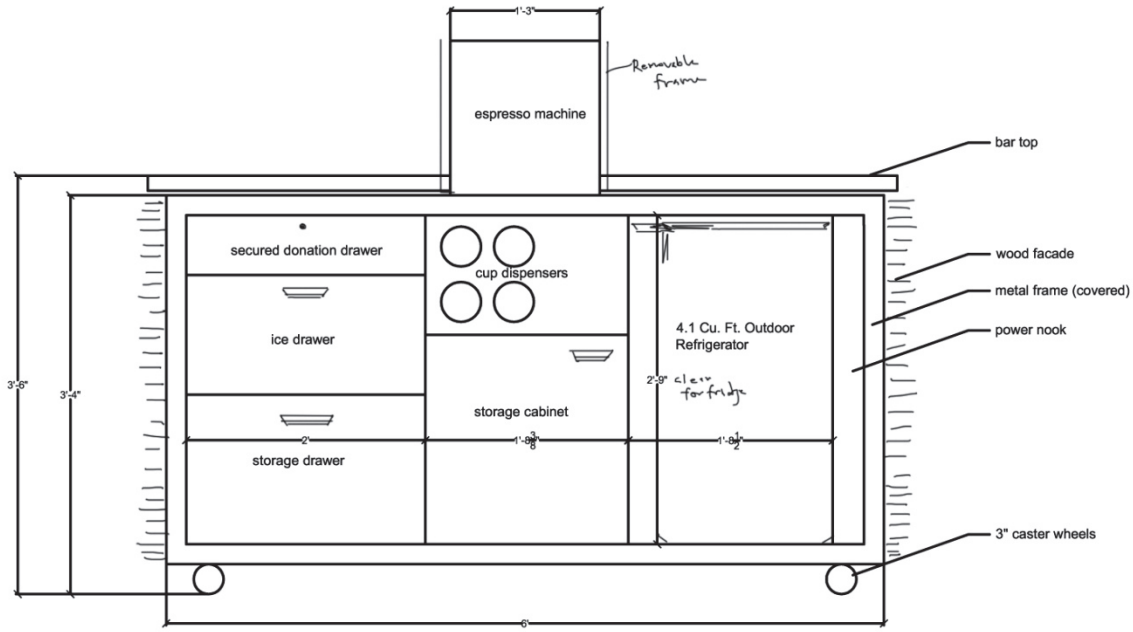


Fig. 108 Layout and dimensions of metal frame (back-work area)

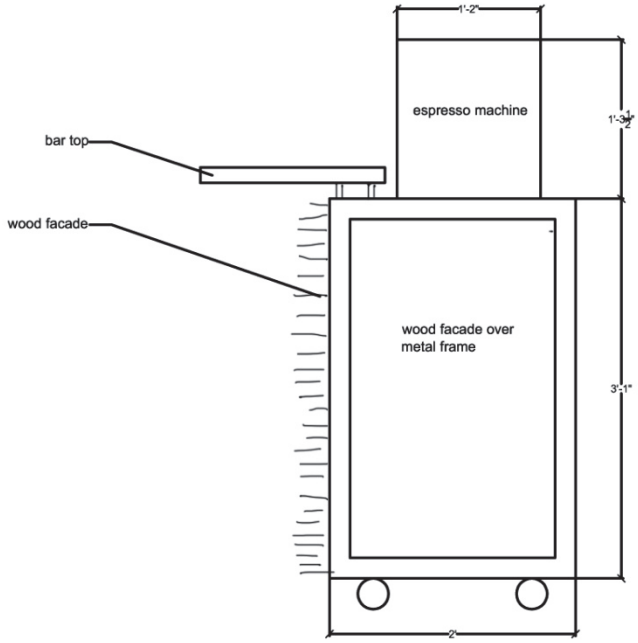


Fig. 109 Layout and dimension of metal frame (side)

Construction started on October 21. The wood and steel had already been delivered and were waiting to be milled and fabricated. The construction process was not delayed by the design changes because the materials and details were very similar to the original thought and only needed to be adjusted to fit the new program (mobile cart instead of full café). The connections that were previously discussed with the contractor only changed slightly.

The design intent was to bring the warm atmosphere of a cafe into the concrete filled courtyard space. The kiosk was mobile and needed to be secured while not in use, so I decided to have it function as a study area instead of it being an inanimate object when it was not open. To achieve this, I made a bar height counter that could be used for serving during business hours and double as a study area when the kiosk was closed.

Wood and plexiglass were used to make a layered texture on the side of the kiosk. This was done in order to give the kiosk interest and warmth. Sunlight would show the details of the undulating wood façade during the day, and at night, backlit plexiglass placed horizontally would light up the wood from the inside.

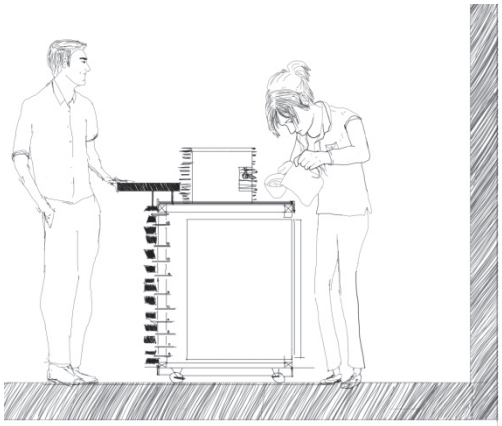


Fig. 110 Café open

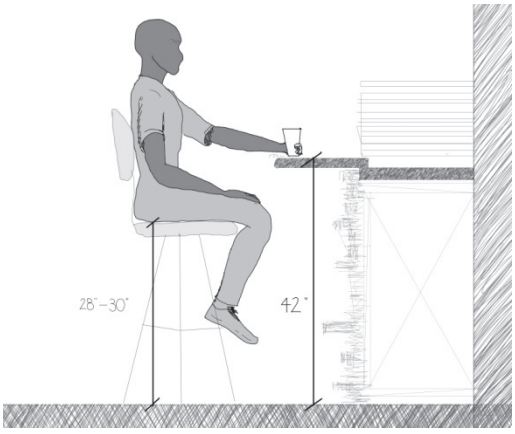


Fig. 111 Café closed

The design process included sketching, digital modeling, and physical modeling to work through the programmatic and material design. Since there was a small budget, a single contractor could not be hired to manage the construction. Instead, I involved several contractors from the beginning of design and worked with each of them on smaller parts in order to get the café built. The budget also required creativity in material use because the machines (espresso machine, bean grinder, and refrigerator) did not leave very much money for materials and operating supplies.

Wood was used for the façade of the kiosk to bring the desired atmosphere into the cold courtyard space. The amount of pre-milled wood that was used would have cost five to six hundred dollars to purchase, but a friend donated a truckload of kiawe wood for free. Kiawe is commonly used for firewood here in Hawai‘i, but when it is finished, it looks very nice.

Fig. 112 Kiawe wood dropped off at shop, ready to be milled

The face of the wood was left with the natural edge, and the top and bottom were milled and finished. To test the feasibility of the kiawe as a building material for the kiosk, several tests were done to find an efficient process to mill and construct a kiawe wood façade. I worked with a finish carpenter, James Murray, owner of JM Finish Carpentry, to mill the wood to suit the project's needs.

Fig. 113 Kiawe wood cut into small slabs on a ban saw

Fig. 114 Finishing process: milled on ban saw, bark stripped, and finally planed and sanded (left to right)

Fig. 115 Lacquer protects the wood and brings out the natural color

Working with the kiawe wood allowed me to understand the material in a way that I never had before. Instead of using theoretical knowledge about wood, I experienced how this material could be used for this project.

After milling several pieces, I started putting it together. First, I made a concept model that contained the feeling that I wanted to achieve in the final product.

Fig. 116 Plexiglass layered between the kiawe wood

The texture is warm, but introduces another material so the wood is not overwhelming. Then I put the model together with LED lighting set inside each plexiglass piece so it could light up at night. As the sun sets, the lights turn on and continue to show the detail of the wood, giving a different quality to the material than the sun does during the day.

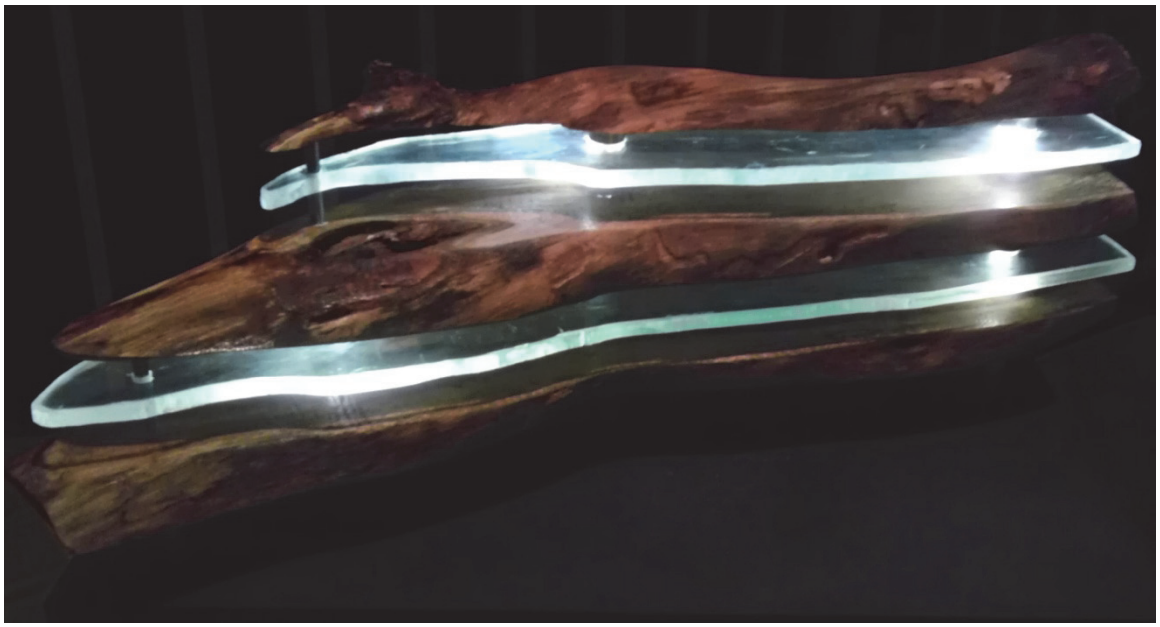


Fig. 117 Final concept model shown at night

The product seen in the concept model was extremely tedious and required the LED to be installed as the wood and plexiglass was layered, which meant that if an LED had to be replaced, the whole façade would need to be taken apart and then put back together. This led me to having a separate system where the lighting and façade worked together as different systems. The lighting could be replaced relatively easily when required without removing the façade.

Fig. 118 Kiawe wood stacked

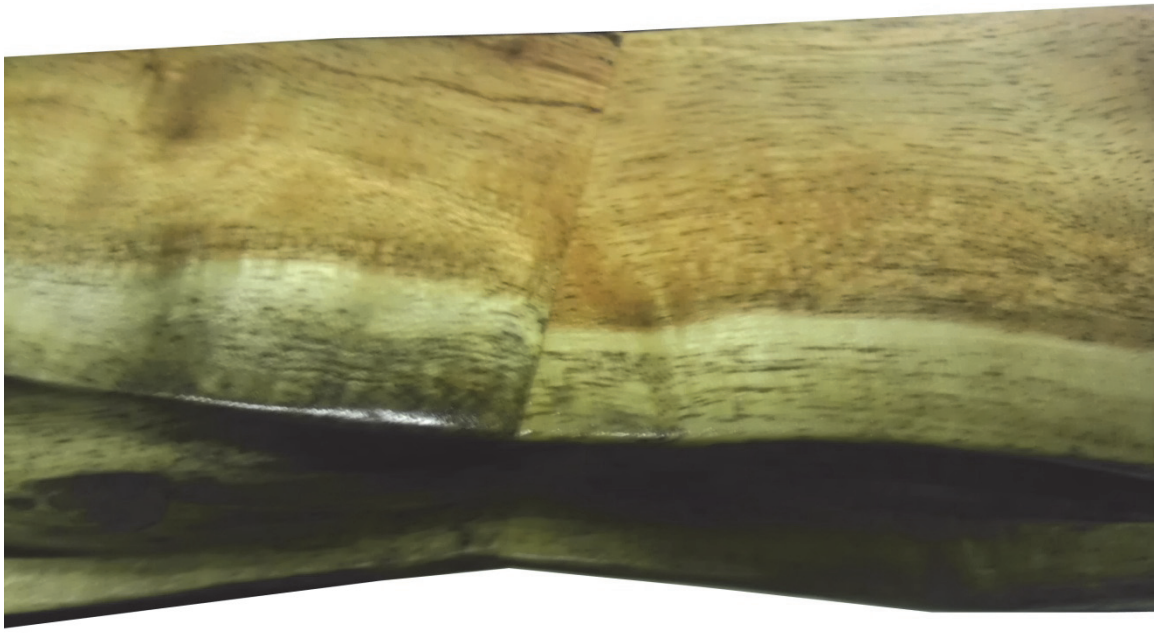


Fig. 119 Kiawe wood mitered

More tests were done to work out the separate systems and different connections. Mitering the wood took away the natural qualities, and the wood told me not to do that. The wood was being forced to conform, and I found the more it was finished, cut, and restrained, the more it died. So stacking the wood allowed the pieces to relate to each other in a more natural way.

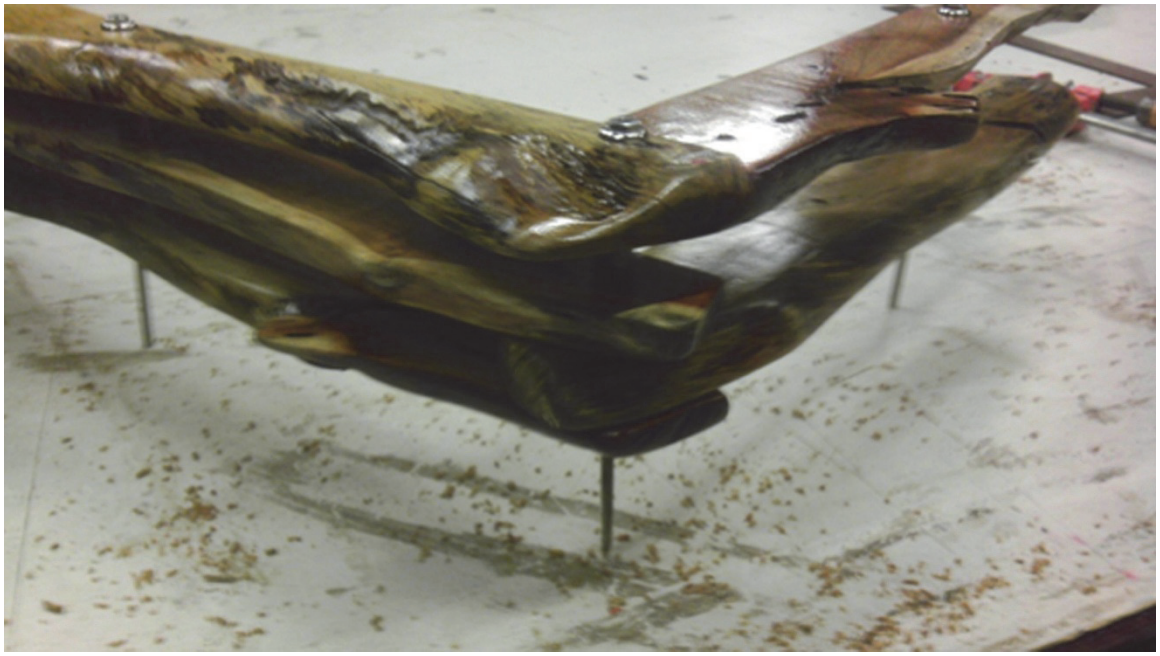


Fig. 120 A corner condition with the kiawe wood stacked

Metal connections were used because they allowed the system to be stacked without forcing square connections or joinery between the pieces. Instead of the wood being restrained, the metal was connected back to main frame, which allowed the wood to appear to float freely.

The frame was made from simple metal tubing donated by Mid Pacific Steel, a local company located in Honolulu. The construction of the frame required a material and cut list, so a rough plan was made to fabricate the structure. I worked with Randy Lau from Designer Built System, Hawai‘i (DBS Hawai‘i) and Uriah Bagley from Arita Poulson General Contracting throughout the design of the frame.

The material choice was 2-inch by 2-inch galvanized steel tubing. The frame had to be strong enough to support the kiawe wood façade and the machines, and be mobile. The steel tubing was welded together to make a rigid frame that supported the other elements of the kiosk.

Fig. 121 Metal frame being fabricated

The first problem we came across was counter height. The plan was to have the 5-inch wheels set inside the frame and brought higher to save height. Once the frame was constructed, however, the contractor felt that the weight of the wood on the front could tip the cart if the wheels didn't have enough of a wheelbase. To be safe, the wheels were brought out to the edge of the frame, which meant that the height saved from the wheels being inset, was now lost and the countertop height would be almost 43 inches.

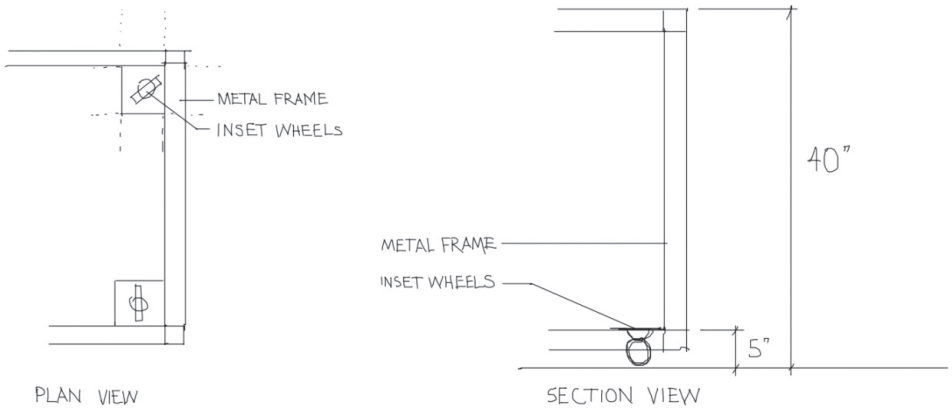


Fig. 122 Proposed plan of metal frame with wheels

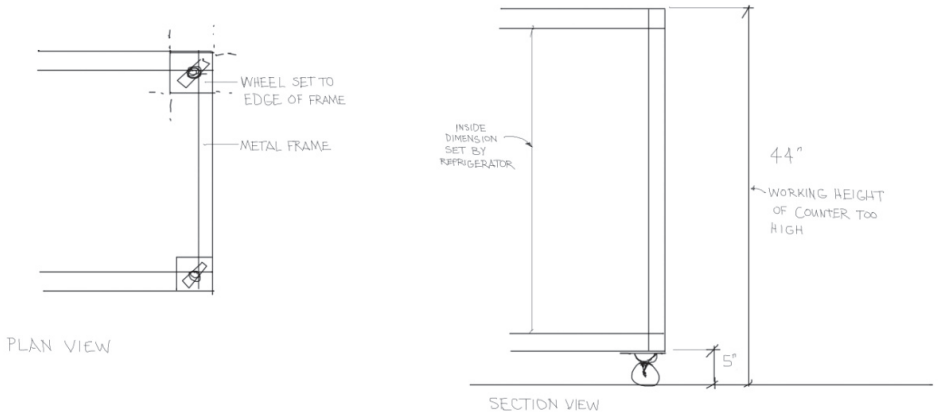


Fig. 123 Problem with metal frame with wheels on corners

To fix the problem, the space for the refrigerator was notched into the frame, which saved 3.5 inches and brought the countertop back down to 40½ inches. The last ½ inch was gained by ordering a thicker gauge metal countertop which would not require a plywood sub-top.

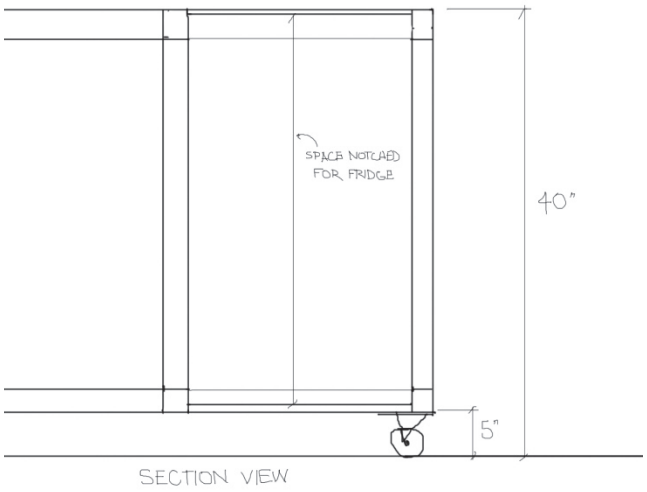


Fig. 124 Solution: notch metal frame for fridge and move wheels to corners

Fig. 125 Modifying the metal frame to fit the fridge and keep the 40” counter height

As the frame was being welded, Murray was working on milling the kiawe wood. The wood was fitted together on a series of round metal posts that would eventually be fitted and attached to the metal frame. I decided to move the ban saw that would be used to mill the wood to the same shop where the metal frame was being fabricated. This allowed the contractors to work together on the metal frame and wood façade.

After going through three ban saw blades and one tire (this is the piece that goes on the wheel of the ban saw and protects the blade from wear) on the first day, it was clear that the under-powered ban saw was not going to be able to finish the job. Only one quarter of the wood needed was milled, and the first weekend of the project was coming to an end. Since both contractors were donating their time to the project, they both had other jobs during the week. One of them had a friend with a bigger ban saw in a shop twenty miles away, so I went during the week and finished milling the wood.

This presented another problem: I was acting as the designer and a laborer. The amount of energy I was exerting on the project made decision making and design very difficult as the level of my physical involvement in the project increased. Instead of being able to make a plan, and draw and document the process, I was forced to devote energy to the physical construction of the project.

The metal frame was finished on Sunday, October 23. While I went to get everyone some refreshments, the contractors tested the durability and mobility of the frame.

Fig. 126 Durability and mobility testing of the frame

At the end of the day, I sat down with Murray to discuss the wood façade and what I wanted to do versus what was feasible. We tested a full backlit panel of plexiglass

behind a separate wood façade, and also individual pieces of plexiglass in between stacked wood. In the end, we found a solution that kept my original vision of layered wood and plexiglass, which ended up very similar to my concept model, but simplified.

Fig. 127 Murray and I discussing the detail of the wood and plexiglass façade

Sunday night, I called the person who owned a larger ban saw, and he was more than happy to let me use it. I was able to go up Wednesday, October 26. This put the project behind schedule a few days,[136] but I was able to finish cleaning up the metal frame and galvanized all the welds on Monday and Tuesday. I also ordered the countertop and a shelf that would be installed later. I was able to get all the wood cut on Wednesday and, although the project was behind schedule, I was relieved to know that a big problem was solved.

[136] See Appendix C – Project Schedule: Proposed vs. Reality

Fig. 128 Wood and ban saw day at another shop

On Thursday, October 27, after talking through the connection details with both Bagley and Murray, I installed the metal rods that would hold the wood façade onto the metal frame. Then, I joined, planed, debarked, and sanded 150 pieces of wood. This took until Friday morning. I took breaks in between the woodwork to recoat the welds with galvanized paint. During the day on Friday, October 28, I ripped the individual pieces of kiawe wood to size with a table saw, finished sanding the wood, and put the final coat on the metal frame. I finally left the shop at 2:54am Saturday morning; I had been working since Thursday morning.

Fig. 129 Metal frame with rods installed, ready to receive the wood façade

This 44-hour work day was the tipping point where the stress of being overloaded by physical and mental work became almost unbearable. At this point, I became painfully aware of two things: the architect cannot be too involved in the construction process, and a more solidified plan before going into construction may not be necessary if the designer and contractor are working in unity, but it would be very helpful.

Plans are necessary for at least two reasons. First of all, without a plan, the contractor is not able to look ahead and see problems before they happen that the designer may never be able to see. This causes the contractor to be looking straight down and walking forward, trusting that the architect is leading him in the right direction. Unity should be both the architect and the contractor seeing the full scope of the vision. Secondly, when a project is moving, unless drawings or decisions can be made on a consistent and real-time basis, it will continue to delay the project schedule.

Two issues that were deterrents to a fluid process were happening simultaneously: I did not have a detailed enough plan, and I was too involved in the physical building. These problems were exacerbated by a lack of sleep and exhaustion. As the project progressed, the ability I had to make quick (and more importantly) correct decisions decreased. I finally got a good night of sleep and we continued at 10am on Saturday, October 29.

Fig. 130 First piece of wood placed on the frame (also happens to be one of my favorites)

Fig. 131 First row of kiawe wood on the frame, with the first piece of plexiglass in place

Each of the 120 pieces of kiawe installed on the kiosk were chosen, cut, and drilled to custom fit in place. This meant that they had to be finished after they were installed. Since the plexiglass was inside the wood, it could not be brushed or sprayed on the frame, so each piece was placed, numbered, and removed to be finished with an exterior lacquer.

Fig. 132 Halfway done with the initial install of the kiawe wood façade

Fig. 133 After it was installed, each piece was labeled, this piece is 9F (9 of 60 on the front)

Fig. 134 A few of the 120 pieces: cut, drilled, and numbered. Ready for the final sand and finish

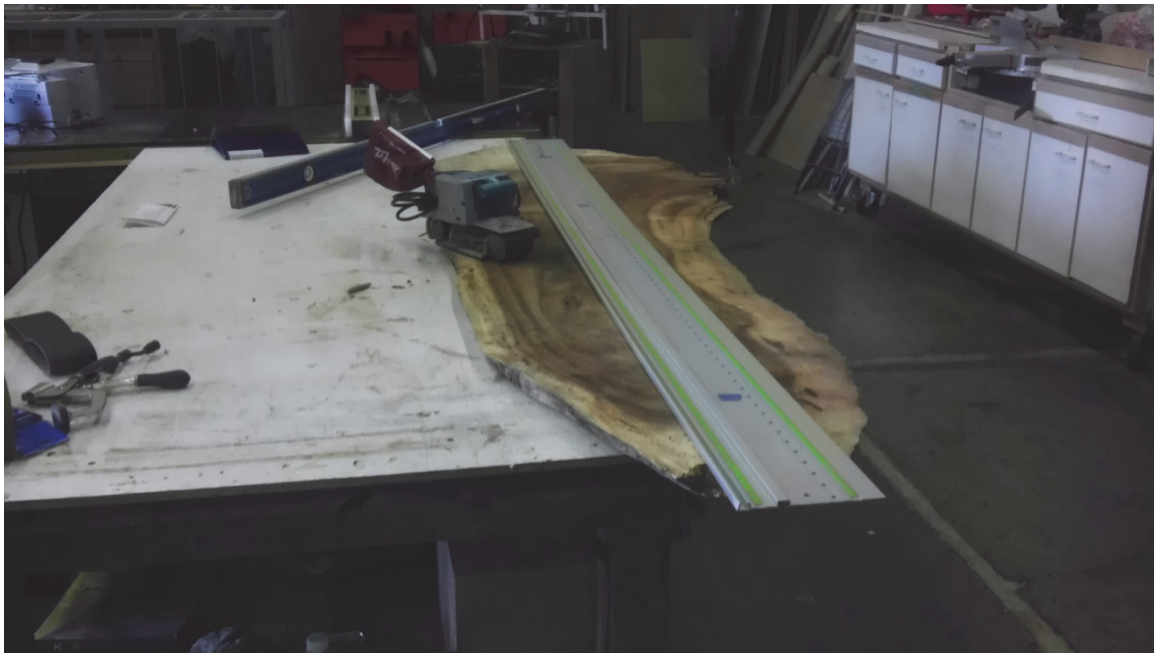


Fig. 135 While the façade was being finished, the bar top was cut and finished

Fig. 136 The bar top was fitted, then given a final sand, and finished as well

Fig. 137 120 pieces of milled, joined, planed, ripped, stripped, cut, drilled, numbered, sanded, and lacquered kiawe wood, ready to be installed

Fig. 138 Kiawe and plexiglass installed

Fig. 139 Kiawe and plexiglass installed

It was now Sunday, October 30. After each step, we kept saying, “the hardest part is done.” After the kiawe wood was mounted, I started to believe it. The project was over the midway hump and could now progress as planned. Somehow, we caught back up and were only one day behind schedule.[137]

The next thing on the list was the LED lighting. The lighting was donated by a very generous local supplier that wished to not be named. We were given all of the LED strip lighting that they had in stock, and it still was not enough to cover the hundred linear feet of the plexiglass that was to be backlit. Instead of running long strips that had to be cut and soldered at the end, the lights were broken up into groups of threes. Each of the 159 groups of three LEDs had four leads that needed to be connected, so over the next day and a half, I made 636 soldered connections. Plywood panels were made to hold the lights and allow for easier troubleshooting and replacement in the future.

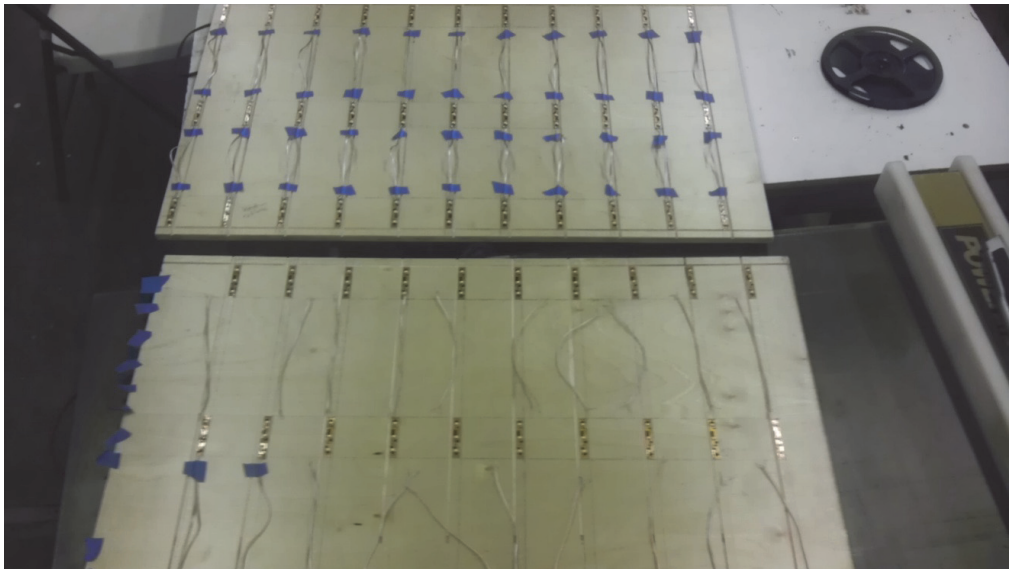


Fig. 140 Two of the four panels being wired and soldered

[137] See Appendix C – Project Schedule: Proposed vs. Reality

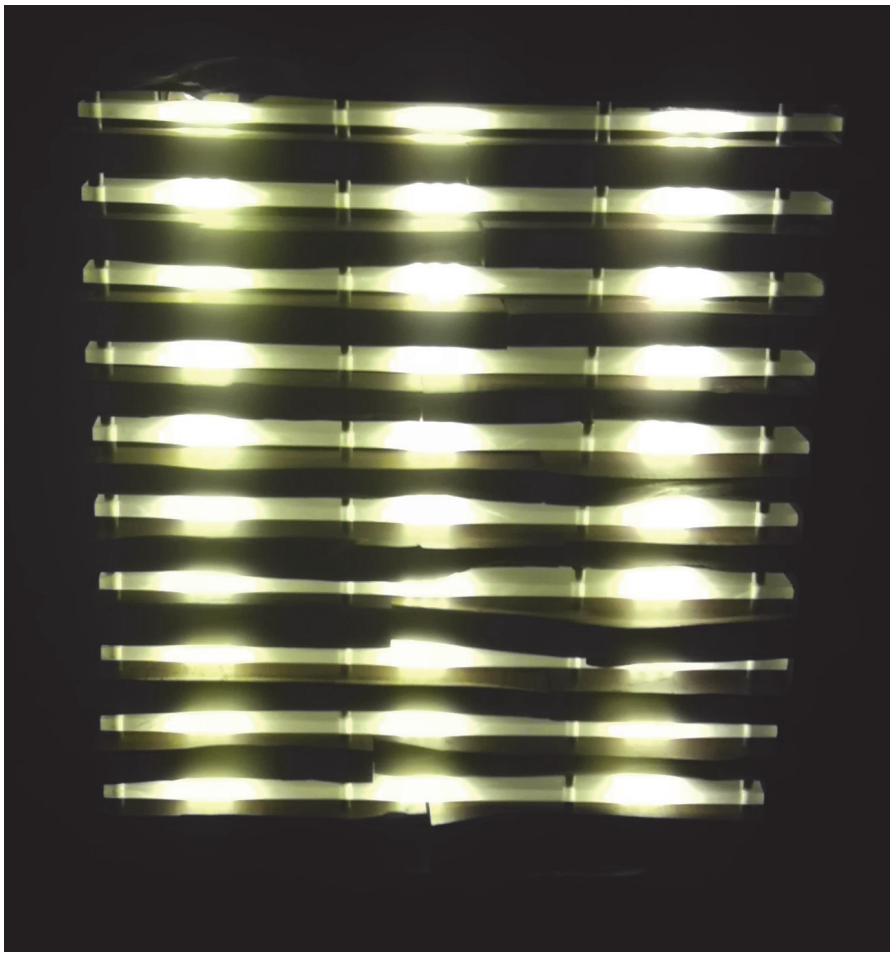


Fig. 141 The first panel soldered and installed

On the first panel, I made two mistakes: one bad connection and one short (I crisscrossed the wires). On the second panel, I made three mistakes: two shorts and one set of wires connected to the completely wrong group of LEDs. With the third and fourth panels, I did not make any mistakes.

After I was done with these panels, I felt similar to how I felt after milling all the kiawe wood: I was exhausted and barely able to function. I had an uneasy suspicion that I would have to finish the project by myself, but I was wrong. For some reason, the contractors kept coming back and helping. I believe it was because they wanted me to succeed, but also because they felt a connection to the vision of the project and enjoyed

the unique, if not idiotic, details that were being made. Bagley came after work a few days during the week to help make a sink and ice container.

A small bar sink was donated to the project, but was too big and took up almost the entire counter space, which didn't leave room for the ice container. Instead of deleting the sink or making the one we had work, we made one. I had purchased two half-pans thinking we could manufacture an ice container, and instead, we made both an ice container and a sink. Bagley drilled through the pans, and then we used a knockout set to make a hole for a drain and a bevel so it would look like a sink and so the drain could sit flat.

First, the countertop was cut to accept the sink and ice container. Bagley used a plasma cutter, which easily cut through the thick gauge sheet metal.

Fig. 142 Preparing the counter to receive the sink/ice container

Fig. 143 Measuring sink (half-pan) for drain

Fig. 144 Ice container finished, sink in process

It was now Wednesday, November 2, and the canopy had to be detailed and built. Had I been more organized before the start of the kiosk construction, I could have been freer to simply work towards a goal and make minor adjustments along the way instead of making major decisions without knowing if they were the right ones or not. For the canopy, I decided I wanted to do things differently. I wanted the contractor to understand the full vision for the canopy panels so I could be less involved with the physical construction. The contractor would have my vision and (without me being there) build it as if I were directing his every movement.

I took a few hours and worked through the canopy design with the contractor. A lot of the design was verbal communication, but there were some sketches made and the vision was clearly explained and understood. I got a material list and made sure it was ready for the last weekend push.

During the next few days, I worked on the electrical and plumbing in the kiosk in addition to getting materials for the canopy. When Saturday, November 5 came, I continued to work on tying up loose ends inside the kiosk while Bagley and Murray built the canopies.

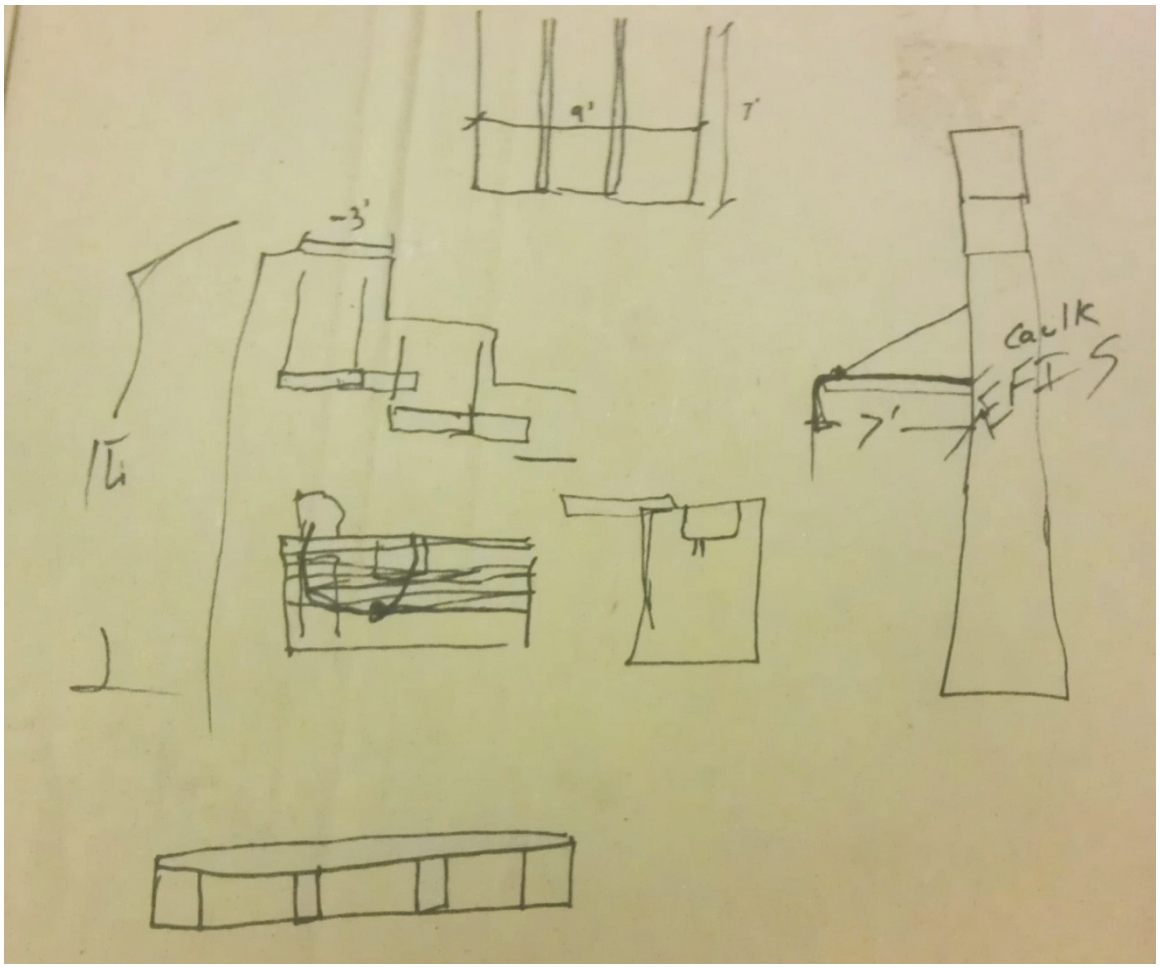


Fig. 145 The sketch of the canopies discussed between the contractor and me

By the end of Saturday, the canopies were fabricated, and the welds were coated with galvanized paint. All I had to do throughout the process was answer a few questions about measurements and appearance; the contractors did the rest. I feel like it was an easier detail to accomplish, but the fact that I did not get involved in the physical construction and yet was in total control through the vision I laid out was comforting. The panels turned out better and were built faster without my physical involvement, and I was free to do the other things I needed to do.

The balance between control through hand holding and control through vision was a fine line that could not be defined up front, but was worked through and a natural balance between the designer's knowledge and the contractor's skill was found.

Fig. 146 Contractor cutting the sheet metal for the canopies

After the panels were finished and being primed and painted, the bar top was installed. The stress that I felt before slowly faded as the contractors understood the vision. The more they believed in my ability to design and have a detail executed, the more they took responsibility and ownership over the physical building of the kiosk. All the little loose ends that I thought I would have to do myself were taken care of one by one with little to no involvement from me.

The weekend was coming to an end and I had to finish the writing for this thesis, so although the project was supposed to be installed and tested during this time, I decided to push back the install date to November 12, 2011. This allowed a few days during the week to finish painting the panels and install some switches for the lights.

On install day, I called in the reserve forces to move the kiosk into place and install the canopy panels. From the shop, we loaded the kiosk and the panels into a flatbed truck. There was a forklift at the shop, but not at archawai‘i, so we had to use the lift gate on the truck. If the kiosk was an inch larger, it would not have fit.

Fig. 147 Unloading the kiosk at archawai‘i

Between the metal frame, kiawe wood, refrigerator, and espresso machine, the kiosk weighs over 500 pounds; without a lift gate or forklift, it would have been nearly impossible to unload it. After it was unloaded, we put it in the elevator because the

courtyard is on the second floor. If it did not fit in the elevator, we would have had to push and pull it up two flights of stairs, and it would have been nearly impossible to get it into the courtyard.

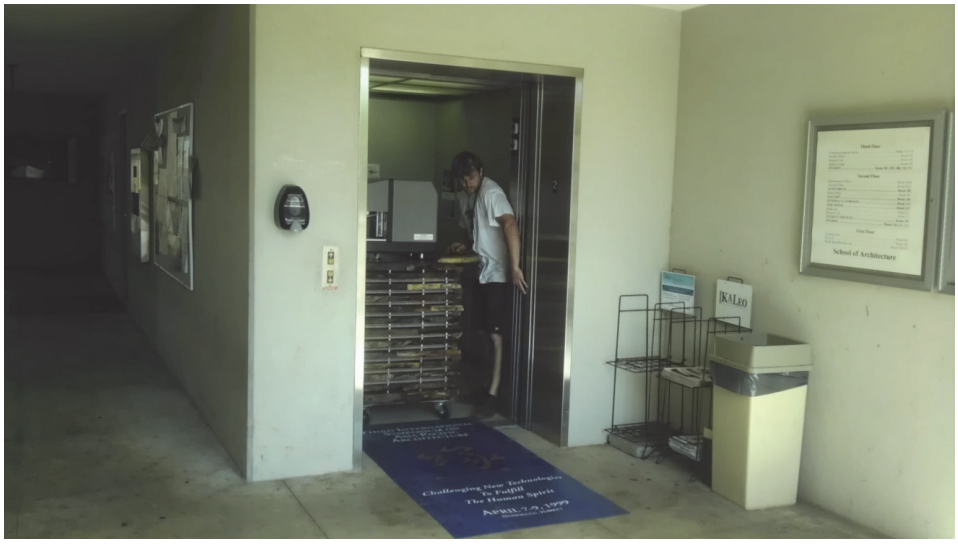


Fig. 148 Coffee kiosk meeting its new home for the first time

Fig. 149 Two out of three canopy panels installed, last one being drilled

Through this project, I was searching for the unity that is actually the state of being one: the architect and contractor functioning as one, not the architect over the contractor, or the contractor over the architect. The need to have the vision understood by everyone involved, before construction starts, is absolutely essential. Once the vision is understood, the vision is over both the architect and contractor, and they work for the same goal and purpose.

Fig. 150 Finished coffee kiosk

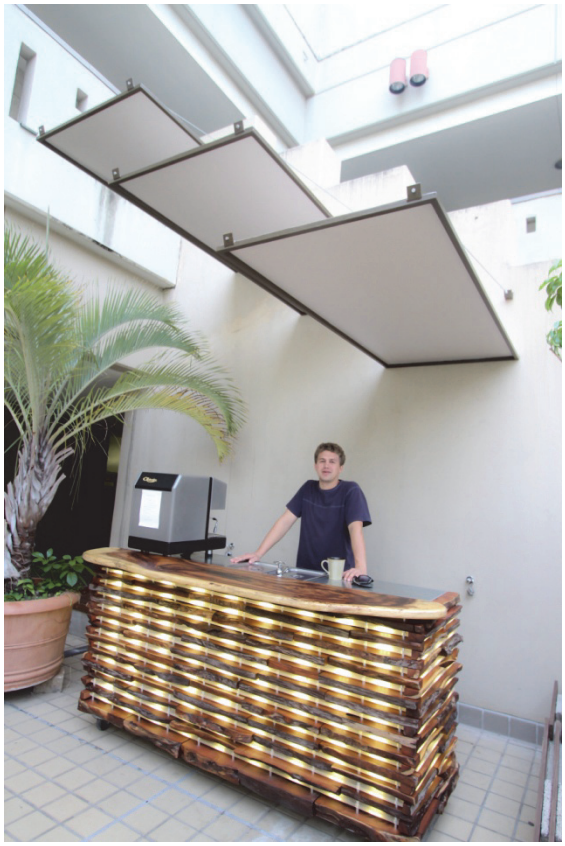


Fig. 151 Finished coffee kiosk

Fig. 152 Finished coffee kiosk

Fig. 153 Finished coffee kiosk

Although many of the problems could have been avoided if a more detailed plan was discussed prior to construction, there was an agreement between the contractor and me to complete the project under my vision. The agreement allowed moments of oneness between the contractors and me to shine through the process and grace when the relationship needed to be adjusted. At the beginning of the project, I was an overpowering designer; towards the end, we worked as a unified team, under one vision.

This project taught me the benefit of having a single contractor who can manage the process. For this project, the budget did not allow for a single contractor to be hired to build the kiosk. Instead of asking one contractor to donate fifty days of his time to the project, I asked several contractors to donate a few days of their time. Since it was being built for AIAS Hawai‘i, which is a non-profit organization, very generous material donations also made the project possible.

This project had several individual tasks within the construction process, and I was able to separate them while keeping the design and construction process moving forward smoothly with some minor delays. If the project were much larger, I would not have been able to juggle the amount of singular tasks or keep the kind of hours I was working up, and I would not have completed the project in the allotted schedule.

Also, I had several contractors that I had to consult, communicate, schedule, and work with through the construction process. If there were one contractor, I would have only had to share the vision and communicate with a single person, and he would have been responsible for scheduling and ordering single tasks. He would also take my vision and relay it to the people working under him, and it would be as if I were doing all the work I did for this project because we would be united under a single vision.

The kiosk project was set up as a designer-led design-build project with several contractors completing individual tasks. The design process was a rotary collaborative between the contractors, clients (AIAS Hawai'i, archawai'i advisory council, and my thesis committee), and me. Once construction started, the process became a design and construction process that united the designer and builders. The construction process also became a cyclical process of design, communication, building, communication, design, etc.

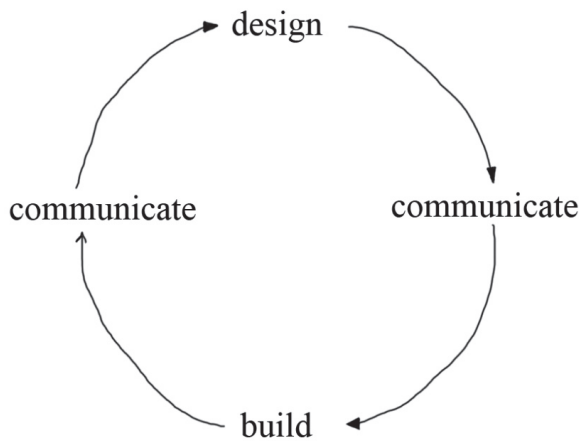


Fig. 154 Larson's design-build-design-build cyclical process

Construction started with sketches and a detail drawing of the frame, which was communicated to the contractor. The façade was milled by the contractor after the design intent was communicated verbally, but with no detail drawings. As the frame and façade were finished, the connection detail of the façade was designed and communicated back to the contractors. Because the saw broke, instead of this being completed by the contractor, I was forced to complete the work during the week.

Then the façade and countertop was installed and the electrical needs were designed and communicated. The electrical was communicated through Randy Lau, but had to go through facilities at the university campus. If a solid plan had been detailed sooner, the electrical may have been completed on schedule. The process of design-communicate-build-communicate-etc. was continued through each step of the project until it was completed.

The flow between designer and contractor was very stressful for me because half of my job was design and individual contractor communication, and the other half was physically building the kiosk. One single task, such as the façade, had to be coordinated between Murray who was milling the wood and Bagley who was fabricating the frame. Whatever they unable to complete, I finished under their direction.

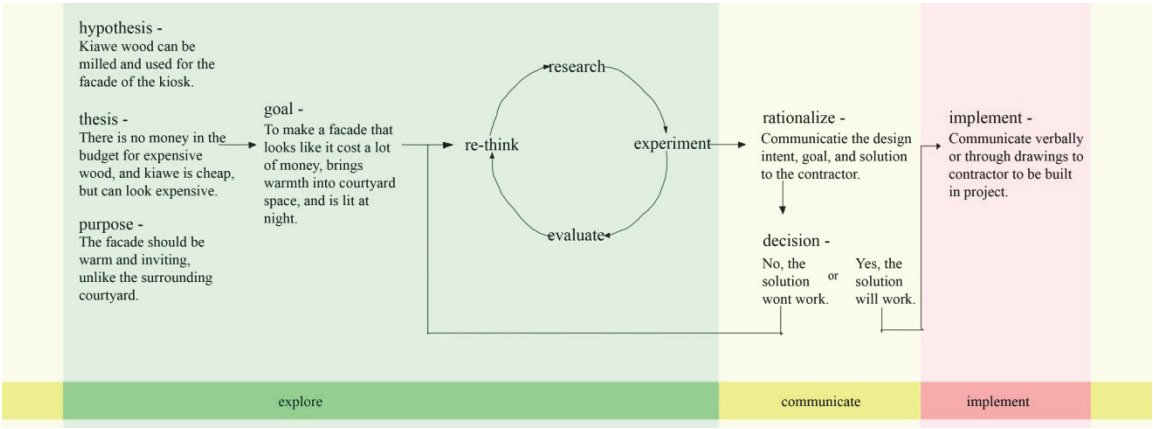


Fig. 155 Coffee kiosk, linearly shown revolving process for façade (with Murray)

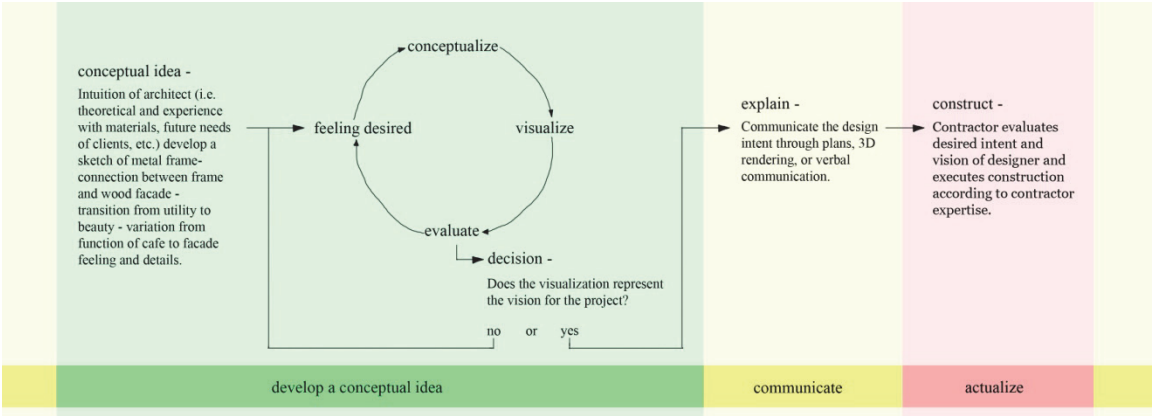


Fig. 156 Coffee kiosk, linearly shown revolving process for metal frame (with Bagley)

These two processes, the façade and the frame, happened simultaneously. For the façade, I had worked through the connection details and design intent with Murray, so there was a method to milling the wood. For the frame, I explained to Bagley what I thought would be built and relied on his experience to build it as I would, if I could. In the end, the fabricated wood had to be connected to the frame; between the three of us, we found an elegant solution that kept the intent of my vision and was feasible.

This project was very informal and had no contractual agreements or agency reviews. The project was built through an agreement between me and several contractors with whom I have relationships.

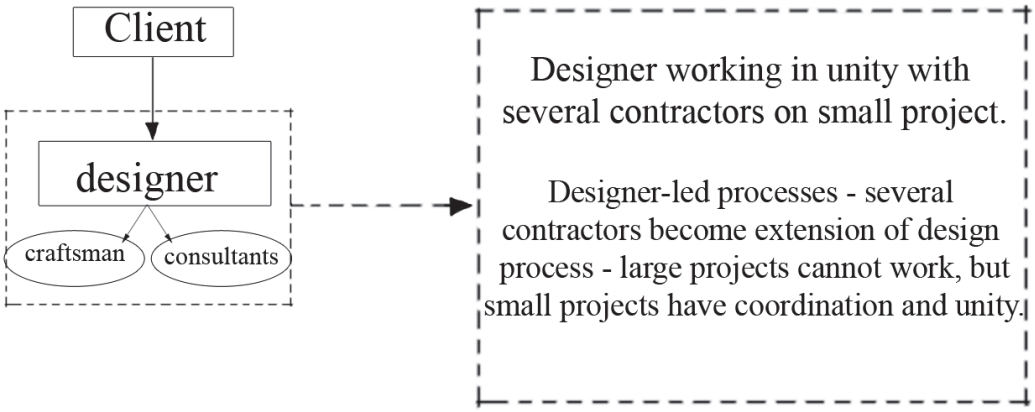


Fig. 157 Larger purpose behind designer-led (with multiple sub-contractors) design-build

The relationship tree shows what happened on this project. Although it worked for the kiosk, if the project were any larger, individual tasks within the unified process would have become too much for me to handle and coordinate. Ideally, I would have had a single contractor leading the construction process. Once the relationship between the designer and the builder is in place, the project scope can increase without failure because both the design and the construction are covered within a unified process.

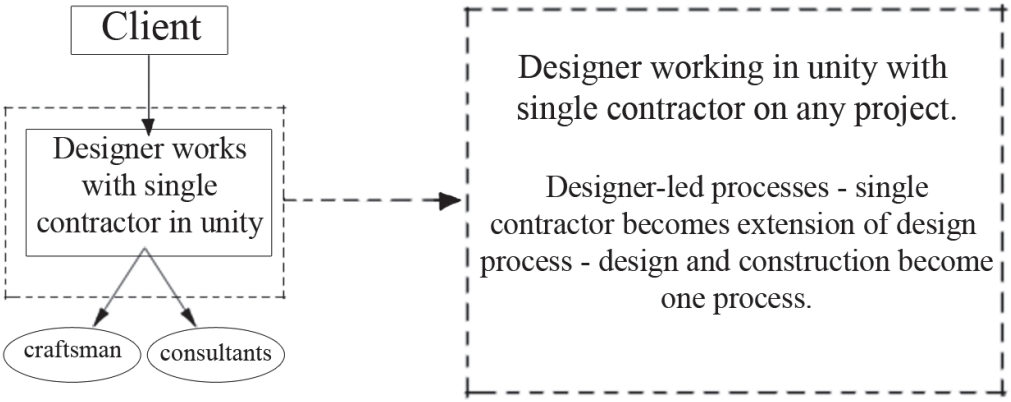


Fig. 158 Larger purpose behind designer-led (single contractor) design-build

Designer-led design-build can only function up to a certain point (in scale and scope of project) if the designer is leading the processes and is also responsible for the coordination of the subcontractors and individual tasks (the day-to-day) of the construction. Having a single contractor that is unified with the designer is essential to keeping the single process viable as the project size increases.

For this process, I used my existing relationships with contractors. I interned with Randy Lau for a year in 2009. Uriah Bagley owns BWB Construction, and I worked as a laborer and carpenter in his company for two years (from 2002-2004). James Murray owns JM Finish Carpentry, and used to work for BWB Construction and Richardson Construction (another Honolulu-based general contractor). I have known and worked with Murray since 2002. These relationships already existed, and any one of them would be a great single contractor in any unified construction process.

Although a relationship was there, a different relationship was developed with me as a designer and each one of them as the builder. These relationships formed naturally as I started talking about my project with them, they offered to help even though I could not afford to pay them. Such relationships are deeper than financial gain or contractual obligation. Each one of these contractors saw my vision and wanted to help me build it.

I was especially surprised by Bagley's level of involvement. The process, despite having obvious kinks, was exciting and natural to him. I have known and worked with Murray for years, but do not know Bagley that well. The level of commitment, patience, and care provided through these relationships blew me away. Even Lau, who runs a large construction company, was very patient with my requests and questions. Although he did not physically help build the kiosk, it could not have been built without his insight.

Looking back, I would change several things about this process. The biggest would be to hire a contractor to build the kiosk. The process would have been similar, but instead of me finding individual relationships to complete the tasks, the single contractor would have relationships that he would manage. This is the basic way a project should work: the designer makes the vision for the project based on the client's desires, needs, budget, etc. – then the architect shares that vision with the contractor – finally the contractor shares the vision with each individual working on the project. The unity between the designer and the contractor is what is crucial for the project's success.

Another thing I would have done differently is spend less time in pre-design, trying to meet $25,000 desires with a $3,000 budget. Had I made a decision to make a small mobile cart three weeks, or even two weeks earlier, I could have started construction sooner and saved myself a lot of stress, sleepless nights, and may have ended up with a better project. The design process alone is a rotary process stuck in the theoretical, while the construction process takes one moment from that static-rotating-process and manifests it physically. Ideally, the rotary (theoretical) design process works seamlessly through the linear (practical) construction process, creating one fluid process. Of course the processes work back and forth, but are always moving forward together, not in an eternal circle, and not in an out of control spiral.

The kiosk project was made in unity, even though it was not as refined or polished as the processes of Cho or Longhi; they have a few years of experience on me. I feel that if I can learn this much out of one small coffee kiosk project, after several projects (and several years), I will have a more refined process that will resemble the seamless process seen when the architect and the contractor are unified.

With that said, the one thing I learned from this project is that I am an infant, possibly even a fetus, in the field of architecture. I learned to respect the process, the learning, the growing, and the relationships more than ever. When the goal is unity, it has much less to do with the physical built work and more to do with the relationship between the designer and builder. Once the relationship is established, the superior built work becomes a by-product of the unity of individuals and unity of process.

Stephen Larson's Life and Process in one page

Life and training

Born Stephen Larson on August 1, 1985. → In 2001 (age 16) he moved away from home to Hawai'i to apprentice with a contractor, and by 2005 (age 20) he had worked as a carpenter, electrician and mason. → In 2005 (age 20) he entered into architecture school at the University of Hawai'i at Mānoa. He believed that the design and construction process should be seamless. → In 2009 and 2010 he traveled to Peru for a few months and studied under Luis Longhi. In 2011 he traveled to Korea to study under Byoungsoo Cho for four months. He found unity in design and construction processes.

Larson's Process at the Coffee Kiosk at archawai'i

The project was presented to him as a way to test the unified process of design+construction on September 13, 2011. He accepted on September 22, 2011. → The pre-design process took 27 days and included programming and material studies. Sketches and drawings were made and construction started two days later. → The details of the design were worked out during the construction using several contractors that donated their time. → The construction took only 21 days and was possible because of the relationships he involved and the unified process of design and construction.

What we know from this project

1. Larson led the project by working closely with several contractors.
2. He had four years of experience as an tradesman, and six years of experience studying architecture.
3. He designed during the construction of the kiosk, although many details were solved before construction started.
4. He was not a master builder - but he did have an unified design+construction process.

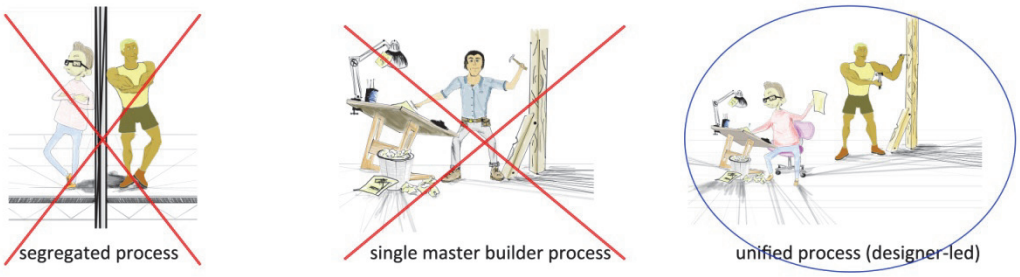


Fig. 159 Larson's life and process in one page

EIGHT

CONCLUSION

This thesis succeeded to unify the segregated processes of design and construction. Through research of the architects of the Renaissance, the legend of the master builder was revealed to be an architect and contractor working as one, under the vision of an architect through a single design and construction process. Unity between the architect and the contractor was exemplified in greater detail in both Cho's and Longhi's processes, both of which used a relationship with a contractor to make a single design and construction process.

The seamless design+construction process was then tested on a small coffee kiosk in the archawai'i building using relationships with several contractors to get the project built. In the end, the relationship between the architect and contractor through the design and construction processes was more important than the details of the process. Through the relationships between the individuals, the processes become one.

The development of relationships and unity in the process disrupts common paradigms in the building industry. Oneness needs to come into our vocabulary as architects and builders. The unified process is not something that can be put into a framework and become formally vetted because the nature of relationships and individual processes are unique to each individual and each unified team. The process can be honed

and developed, but each individual must be fully committed to conducting the business of building differently.

Hints of the unified process were seen in Brunelleschi's and Palladio's processes in the Renaissance. Their projects gave insight into the single process, which included architects and builders, but did not give specific details through the process. What was assumed in both projects was that neither Brunelleschi nor Palladio physically built anything on the project. Instead, both historic architects directed a team of craftsman under them or under a single foreman, and designed the project as it was being built.

The actual Renaissance process was different from the legendary, lone individual process of the master builder. Instead of a single person designing and building, the Renaissance men worked with builders who understood the architect's vision for the project and built it while working with the architect. These processes are compared below in the mythical master builder's process versus the actual Renaissance process.

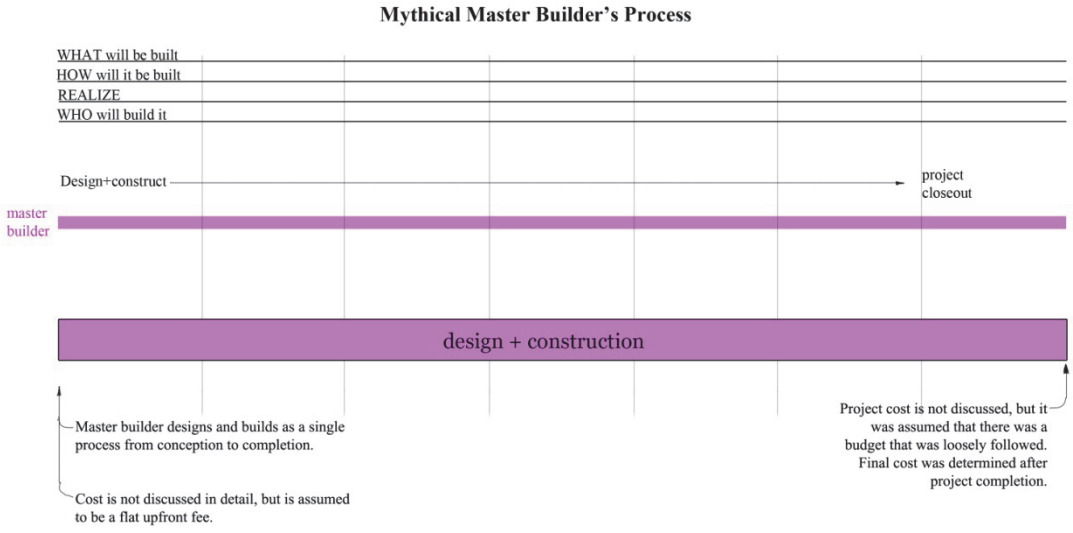


Fig. 160 Mythical master builder's process (that legendarily existed in the Renaissance)

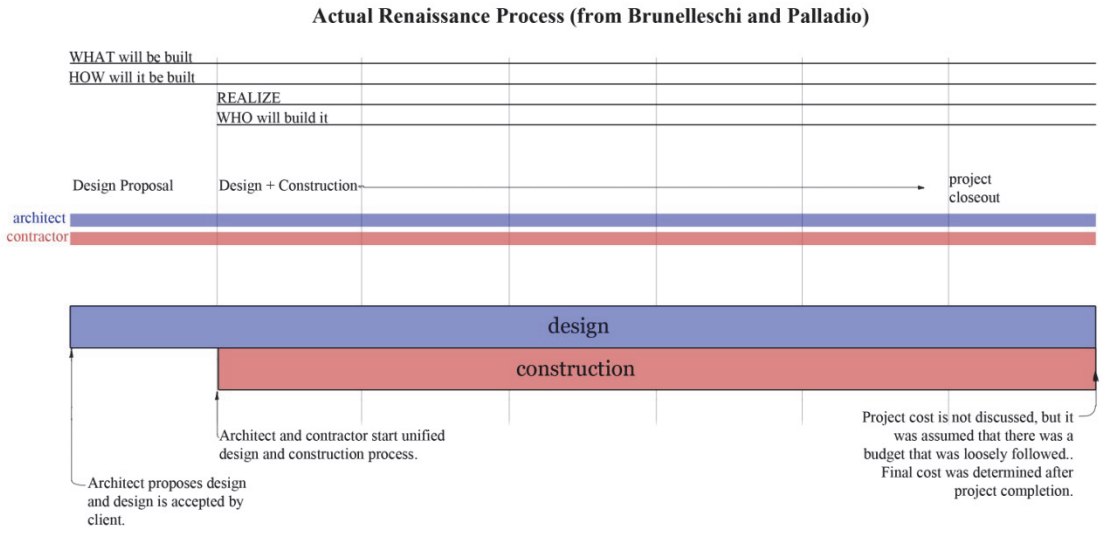


Fig. 161 Actual Renaissance process (from Brunelleschi and Palladio)

The unified design+construction process started looking very similar to those of two architects that practice today, Cho and Longhi, who both use relationships with contractors to design and construct their projects as a single process. Although each one of their design and construction processes varies slightly because of their different design philosophies and personal relationships to their contractors, they both offer examples of unified design+construction processes.

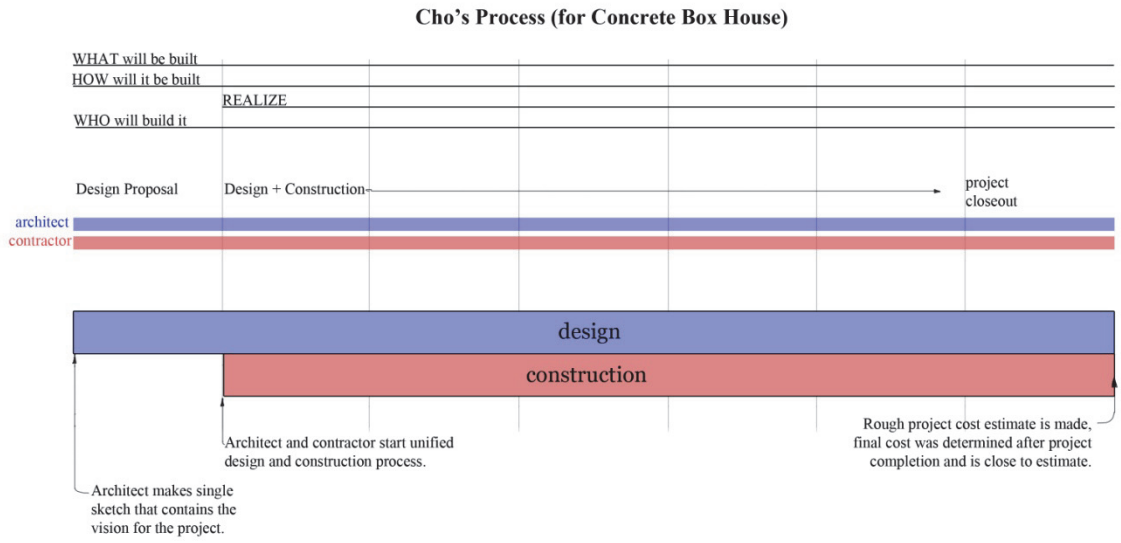


Fig. 162 Cho's process (for Concrete Box House)

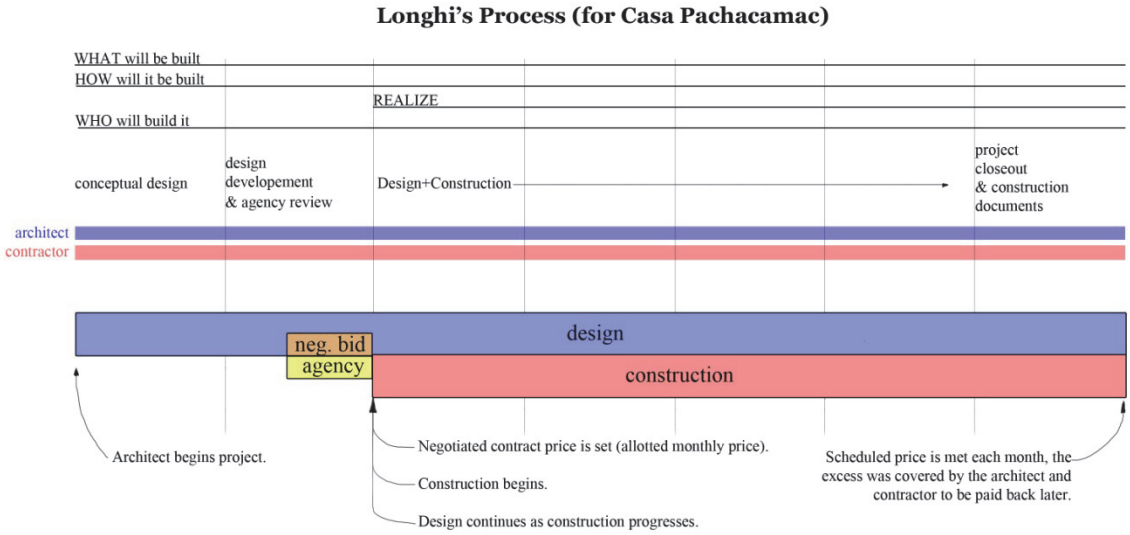


Fig. 163 Longhi's Process (for Casa Pachacamac)

The subtle differences in their processes became relatively inconsequential when compared to projects that were built under segregated design and then construct processes. Furthermore, in both Cho's and Longhi's processes, the architect and the contractor were united in a relationship, which in-turn, made the design and construction process one.

The segregated processes seen in traditional design-bid-build are more apparent because there is less opportunity for a seamless process. However, the D-B-B process offers anonymity between the client, architect, and contractor that protects the client's and contractor's interests, with the architect as the agent of both. The opportunity for unity within D-B-B offers the same contractual anonymity while allowing the architect and the contractor to work together in one process. Seen below is the D-B-B traditional process compared with the D-B-B unified process.

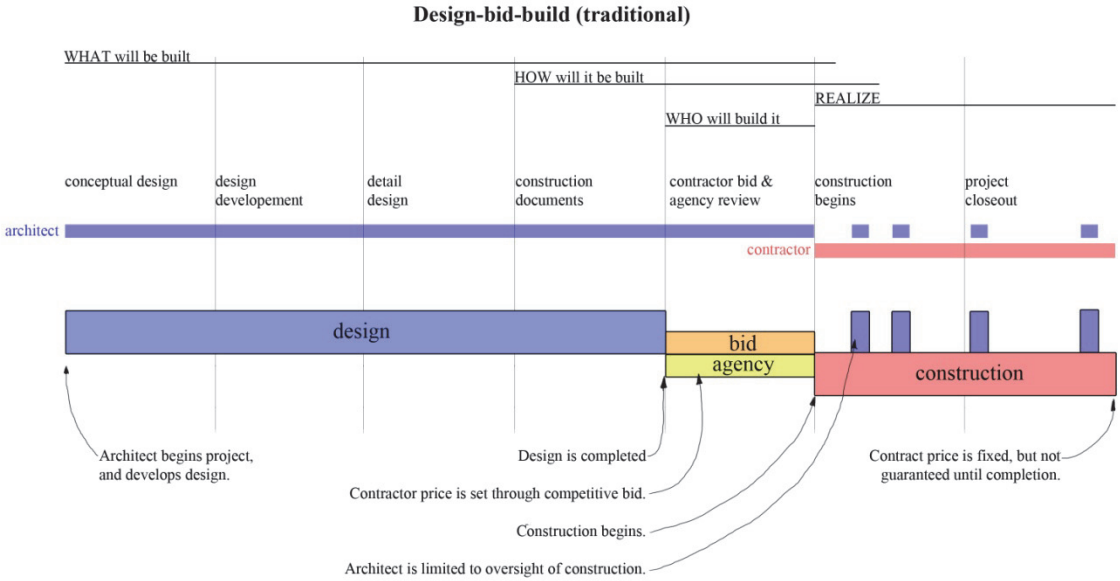


Fig. 164 Design-bid-build (traditional)

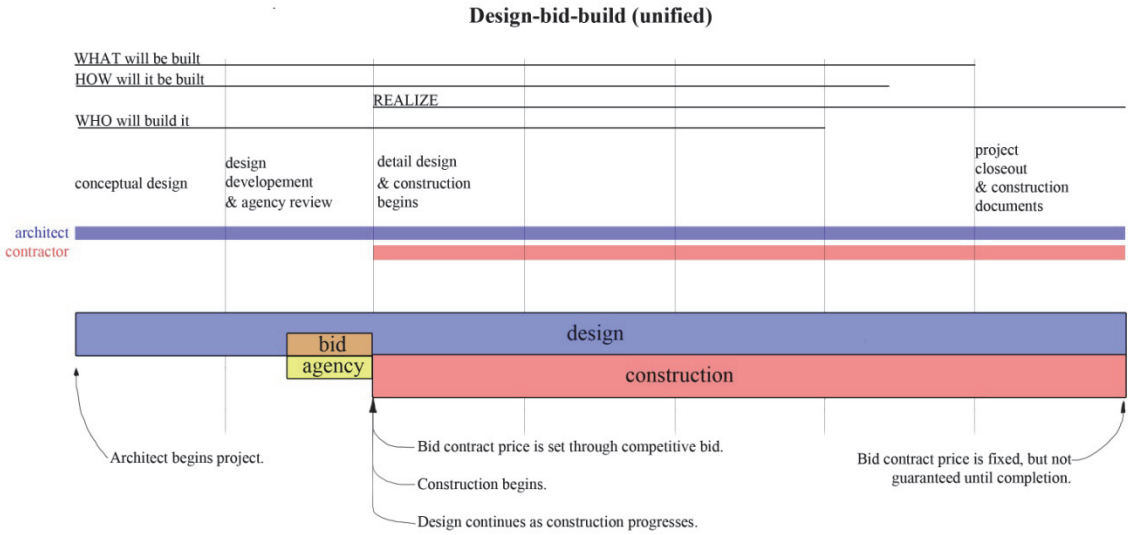


Fig. 165 Design-bid-build (unified)

Design-build offers more opportunity to have a unified process, but requires an architect and contractor to be one team that works together through design and construction. Design-build cannot work on larger projects if the process is architect-led without a contractor, and will only produce lifeless buildings if it is contractor-led with an architect being managed by the contractor. Most design-build projects are still built with separate design and then construct processes.

Below are three process figures comparing design-build options: architect-led (architect as contractor), contractor-led (architect on staff), and architect-led unified. The unified design build process combines the architect and contractor within a single entity and allows them to work together through the design and construction process.

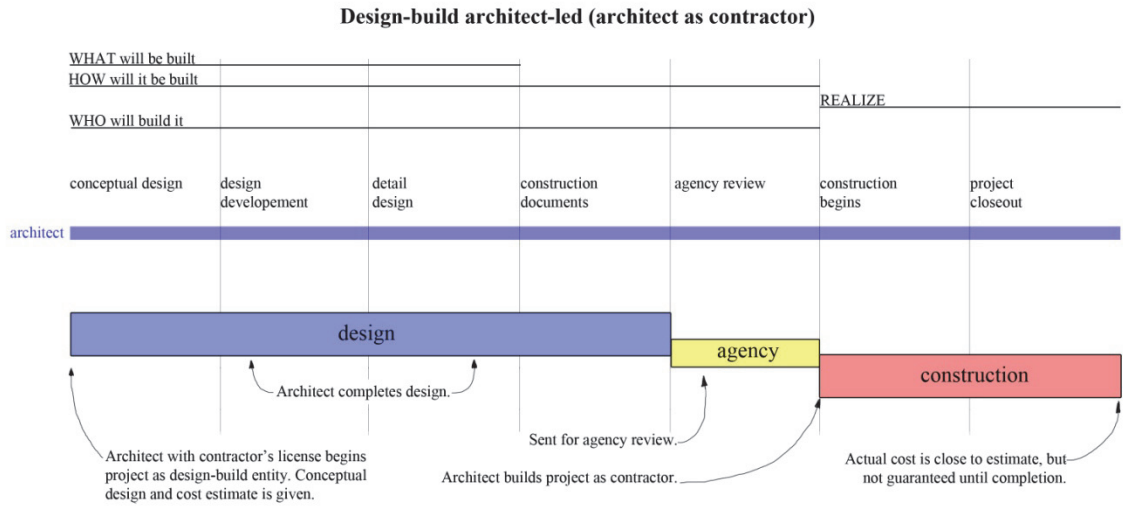


Fig. 166 Design-build architect-led (architect as contractor)

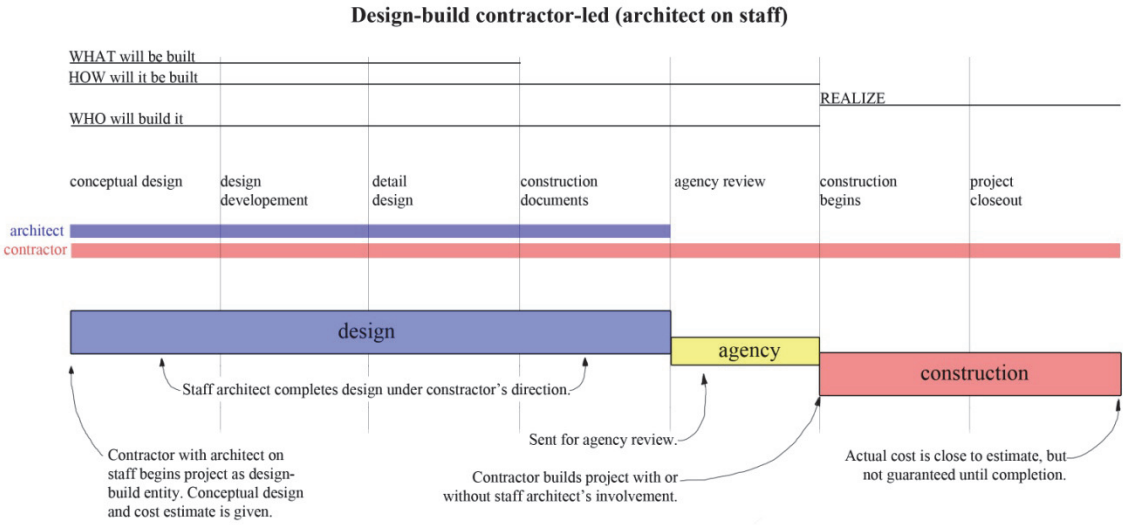


Fig. 167 Design-build contractor-led (architect on staff)

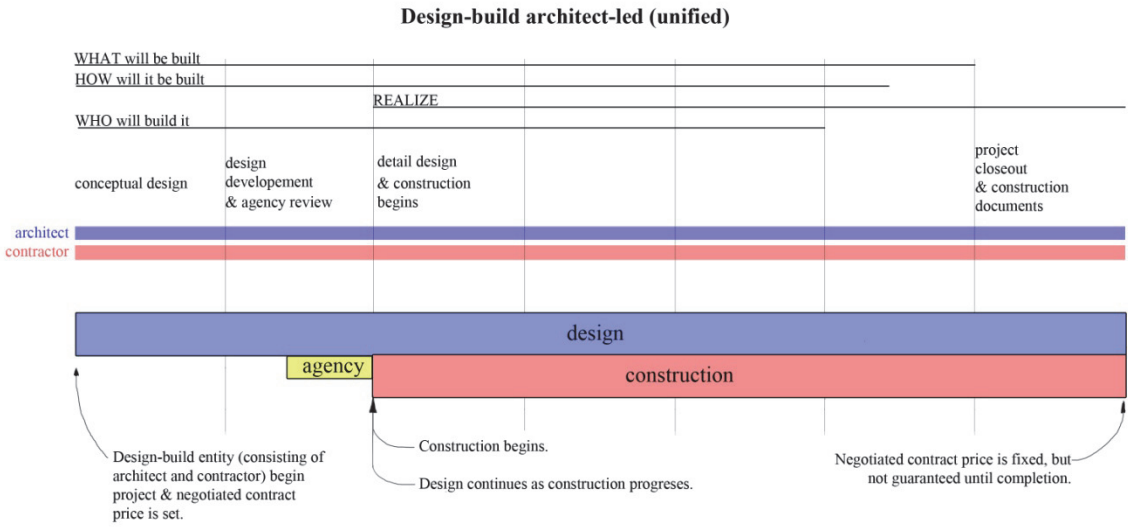


Fig. 168 Design-build architect-led (unified)

The design-bid-build and design-build processes look very similar as the processes become unified. The important difference is that the contractual relationship varies as needed from project to project. In other words, design-build was not automatically more unified than design-bid-build because when the design and construction process are one, the only difference is the bidding time and contractual agreements between the involved parties.

Integrated project delivery (IPD) offers a unique opportunity for control of cost because the unified design+construction process happens virtually, in a detailed building information model (BIM). Although IPD is a new approach to unifying the processes, it requires BIM to create a virtual construction process. If the model is not an exact replica of what is to be built or if the project cannot afford to use BIM, the process becomes segregated.

Even with contractor involvement in the design process, and architect involvement in the construction process, IPD still separates the processes by finalizing the design and then beginning construction. Three process figures are presented below showing the IPD process with BIM, without BIM, and unified without BIM.

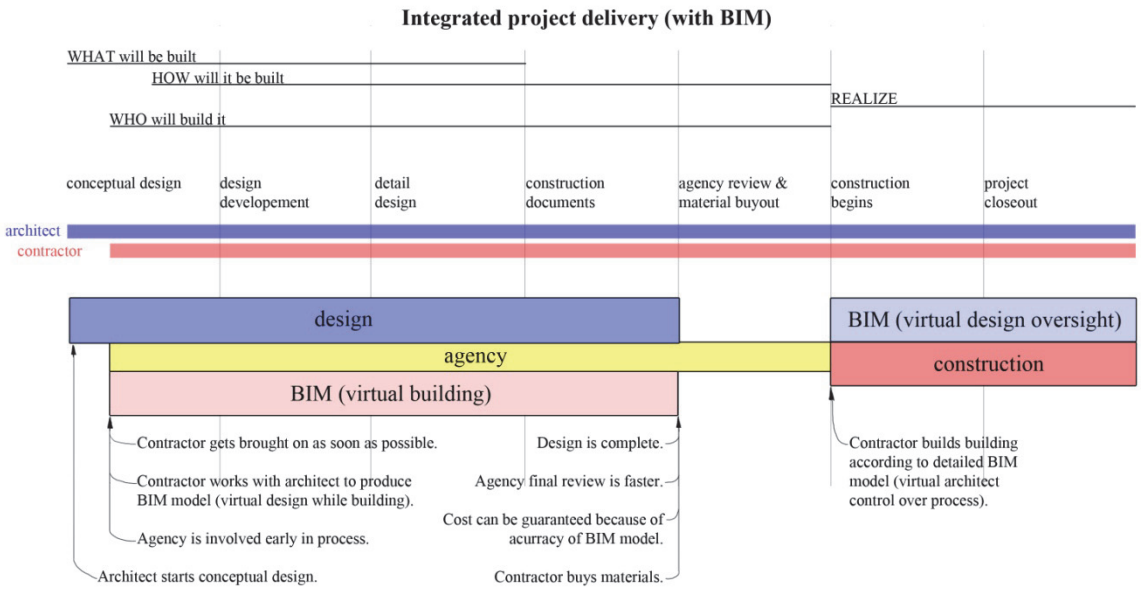


Fig. 169 Integrated project delivery (with BIM)

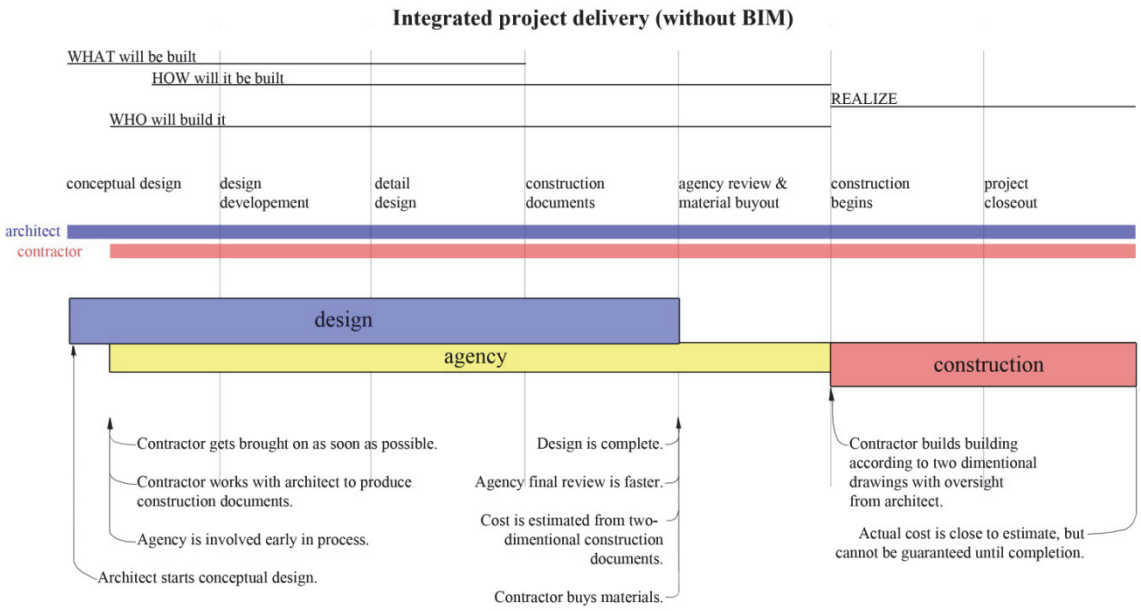


Fig. 170 Integrated project delivery (without BIM)

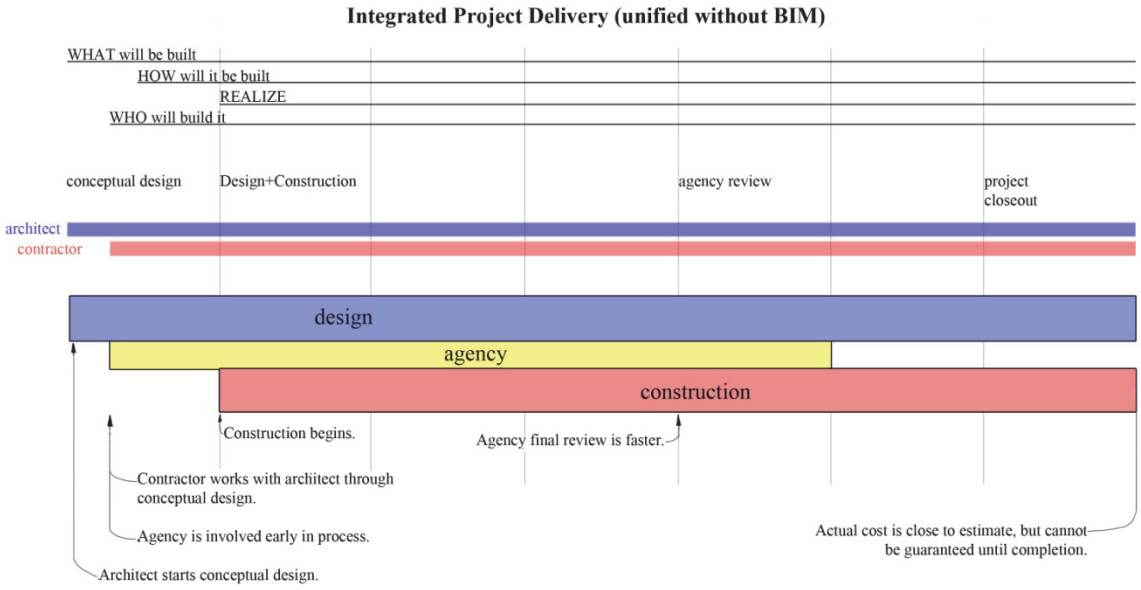


Fig. 171 Integrated project delivery (unified without BIM)

IPD discusses collaboration as a legal and financial link between the client, architect, and contractor. However, unity cannot be achieved by bonding parties together with financial reward (or consequence) and limited liability. In both Cho's and Longhi's processes, unity was a personal choice to which each individual involved in the project agreed. Mutual trust, respect, and the desire to complete the project as a team required a relationship that was deeper than financial and legal ties.

Through research, case studies, and delivery system studies, it was discovered that a unified process involves both oneness between the design and construction processes and oneness between the architect and contractor. Unity allows the architect freedom to design through the construction process and gives the project financial, contractual, and schedule flexibility.

A unified process was effective in both Cho's and Longhi's residential projects (Cho's 2,000 sq. ft. Concrete Box House and Longhi's 5,000 sq. ft. Casa Pachacamac). Those processes were emulated and found to be effective in a small scale project with a single designer acting as a contractor (with several sub-contractors) in my coffee kiosk project. However, for unity to work in larger projects, the architect and contractor have to be prepared for the planned scale. This may require the architect to work with a new contractor (a contractor with whom the architect has not had a previous working relationship).

In the kiosk project, working with new contractors posed the problem of a relationship development period. This was probably due largely to the fact that I have not designed and built anything this large before and did not know the basic challenges a project of this size would present if a detailed plan was not in place. If an architect had a

detailed process that has worked in the past, seen in Cho's process, working with a new contractor should require a relatively short relationship development period before the project can proceed without major problems.

One major difference between the kiosk project and the projects of Cho and Longhi was the amount of time they have both had to develop their processes. Although I implemented what I learned from studying their processes, the experience and knowledge they have gained from years of developing their design processes allowed for greater depth in the unity in their design+construction processes. The more developed the architect's process (merging theory and practice), the greater the quality and spirit that can be transferred from an architect into a living built work.

Through the design and construction of the kiosk project, I found that relationships were easily started, but the ability to work as one (designer and builder united) takes time. Relationships and unity are developed the longer the architect and the contractor work together, both wanting the same thing.

Another major difference between the architect process studies and the kiosk project was the confidence that comes from completing multiple projects under a unified process. The ability to make the correct real-time decisions was crucial. A single process of design and construction offers flexibility in the design through the construction process, but once a decision has to be made, it must be made quickly, and any mistakes may cause the project to move backwards or towards an undesired outcome.

I believe that design-build offers the most freedom to explore entering into a unified process with a contractor. The reason for this is simply because the liability is shared, and there is less stress on the relationship. Also, design-build separates the client

from any liability due to the learning process that both the architect and the contractor are bound to experience.

Both Cho and Longhi started in a design-build type of contractual relationship. Cho brought his brother Youngmook into his firm and trained him to be his contractor. Longhi found Hector, who was already working as a contractor, and they worked together on projects and split the profits. Although Longhi's and Hector's was less formal, the foundations of both relationships were formed in a design-build relationship.

After the relationship between Cho and Youngmook had been heavily developed, they both moved on to bigger and better things. Cho had worked through this process to the point where he was able to work on larger projects with new contractors. Although an experienced architect may have the ability to lay out his process just as clearly as Cho can now, the unified process would be a shock to jump into if one were unfamiliar with it. It requires both the architect and the contractor to rewire their brains and to align to a new way of working together.

Longhi and Hector began to separate themselves legally and now operate as two separate entities. They can now operate as one without literally being one entity.

The process becomes much more enjoyable when there is agreement and oneness between the architect and contractor because all the work that goes into protecting individual interests goes into working as one to complete a beautiful project.

Some advantages to a unified process are the flexibility to design through the construction process, and the ability to have flexible scheduling and contractual agreements that can be changed to suit the project. The unified process also has the

potential to speed up the business of designing and constructing buildings because design and construction happen simultaneously.

The unified process also has some disadvantages because the contract prices can vary greatly without the design finished before construction starts; however, this is only a major problem while implementing the unified process within the design-bid-build delivery system because the relationship that is required to achieve unity undermines the ability to get a competitive bid from several contractors.

In design-build and IPD, the project costs are estimated throughout the design process and are guaranteed before or after the construction process. Using the unified process with D-B or IPD could require a guaranteed maximum price for the building, which would work as a negotiated bid between the client and contractor, with the architect as the agent of both.

The benefits of a successful unified process outweigh the disadvantages because many of the problems are present without the unified process, and with the unified process, the unity between the architect and the contractor solves many of the issues that could arise.

The client benefits from a choice of delivery system and their level of involvement in the process. The architect benefits from being able to work through design while building and from the contractor's knowledge. The contractor benefits from being able to build projects that are communicated well through the construction process instead of having to interpret the architect's intent. Everyone, including the public, benefits from buildings that are bigger than the individuals involved, projects that will be built with the spirit of the architect's vision.

The contractor gets the short end of the stick in this deal because instead of business as usual, there must be very strong commitment to the vision of the architect. This requires a contractor that trusts in his own ability to adapt to a new way of thinking about how to build. At the end of the process, the contractor will see the benefit of working as a unified team with an architect because a building that contains the spirit of the architect will also be built with the spirit of the builder, and he will feel that the building is a part of him, something more than bricks and mortar.

The unified process provides a seamless design and building process by merging the once separated processes into one. This single process is led by an architect that has a relationship of mutual trust and respect with a contractor. Working in unity, the architect and the contractor embody the archetypal master builder and end segregated design and building processes.

The unified process should be explored freely without trying to fit an architect or a contractor into a mold. It does not have to look a certain way or be given a formal name. Once unified process contract documents are written, the process will become something else. Architecture and construction, the business of building, is a relationship based business. When unity becomes accepted in relationships that already exist in the building industry, the architect and the builder will begin to be one: separate individuals that operate under one mind, one heart, one process, and one vision. When the architect and the builder are one, architecture and construction will be unified.

RECOMMENDATIONS FOR ADDITIONAL STUDY

The intent of this research was to provide a path to a seamless design and construction process. This thesis attempted to provide insight into the truth behind the myth of the master builder process while maintaining that a unified process is possible. The processes of the architects of the Renaissance and before could be studied more intensively in order to fully understand the details of why the myth of the master builder began.

The processes of Cho and Longhi can be emulated and evolve into personal unified processes, but a detailed description of how to build a relationship of oneness with a contractor could be researched more. I believe that each person is different and that these relationships will evolve naturally if the desire to be unified is there, but if there was a detailed plan of how a relationship can be set up, it could help people who want a unified process, but do not currently have any relationships.

Integrated project delivery (IPD) with building information modeling (BIM) needs further study to understand if this is a viable alternative to the single process of design+construction. If it is, the architect and contractor could work in unity and finish a virtual building before any money is spent on construction. The problems with BIM are that the model must be 100% accurate to replace the need for unity in the construction process, and although the programs are advancing, they are not a replacement as of now. Also, there needs to be freedom within the program to explore and innovate materials and details instead of having a list to choose from.

This thesis explored the relationship between the architect and contractor and did not get into the specifics of how that relationship is carried out as everyone will have a different process that will need to be developed through a relationship. The

communication could very well happen in a virtual space, but it has been my experience that computer programs limit the ability to design and feel materials as they are experienced in construction. Until this is researched further, it remains unknown whether it is a viable solution to segregated processes.

Also, the delivery methods studied are not all that are available. A more complete study could be done to find the best approach to unify any existing/future delivery systems. This thesis proved that a unified process can work in both design-build and design-bid-build, but IPD remains uncertain because of the unknown of BIM. Other delivery systems also remain unknown.

Project size may dictate the ability of delivery systems, but this thesis believes that any size project can be completed if there is a relationship of unity between the correct architect and contractor (individuals that are prepared to handle the scope of the work). Many more projects could be studied to better understand project scope and unified process implications with regard to the scale of projects. This thesis focused on residential scale in the case studies and a small coffee kiosk in the design project.

The implications, good and bad, of the unified process need to be explored in greater depth. This research should include scheduling, litigation, bidding, estimates, contractual relationships, etc. This thesis studied the unified process as an agreement between the architect and contractor, but it could easily be formed into a delivery system. The anti-method is after all just another method. This thesis believes that as soon as it is formalized, this process will lose the qualities that make it as simple as an agreement to be one. The unity working within any system allows for freedom within the relationship.

Formalized structures take the freedom away by defining it, instead of letting it develop and grow naturally.

Re-thinking the way architects and contractors currently relate and how they could relate is an ongoing topic. This thesis is the beginning (or possibly middle) of a much bigger conversation on the subject of unity between the architect and contractor, and oneness between the design process and the construction process. The foundation of this thesis is in the relationship between the architect and the contractor. There are no boundaries around what that relationship can create.

NINE

APPENDICES

APPENDIX A

Analysis of project choice, café case studies, and analysis of program requirements

The process for choosing a design while building project was simple, I needed a project that could test the theories shown above, and in the case studies of Byoungsoo Cho and Luis Longhi. However, because the process was more important than the object, guidelines were formulated in order to choose a project:

The project should –

1. Be autonomous enough to allow freedom to explore a unique design while building process.
2. Have adequate scope and complexity, a. large enough to require a dialogue between the designer and the builder in order to make something that neither one could do alone.
    a. small enough that it can be designed and built within the allotted schedule (two months until this thesis is due)

3. Result in a tangible process and a physical product that can be evaluated to test if unity between the design and building processes, as seen in the case studies, can be replicated.

Within these guidelines, there were hundreds of projects that could have been considered. The final choice was based on the guidelines, other's needs and personal desire. The final decision was to design and build a café at the University of Hawai'i School of Architecture's (archawai'i) building. The building has long been the subject of ridicule, as any building that contains two hundred would be architects, but the problems present a great opportunity: to give life to the architecture building through intervention.

Archawai'i is located on the University of Hawaii at Mānoa (UH Mānoa) campus in Honolulu, Hawaii on the island of Oahu.

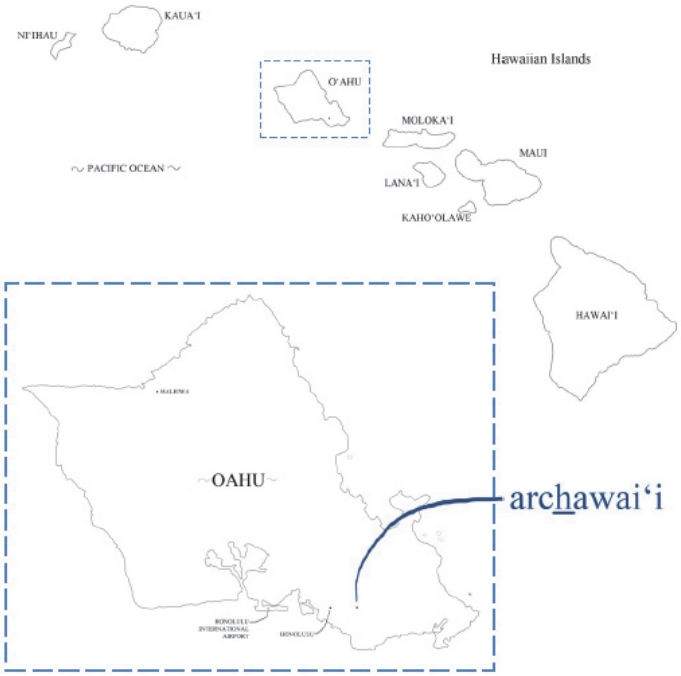


Fig. 172 Map of Hawaiian islands (zoomed on Oahu)

Fig. 173 Map of UH Mānoa campus

The UH Mānoa campus was founded in 1907, and is made up of roughly 145 buildings on 320 acres. It is located at the opening of Mānoa Valley, a few miles east of downtown Honolulu. Most of the major degree programs at UH Mānoa are split up into separate buildings: the Law School has two buildings – Engineering has a few buildings – the School of Architecture has one building. If a degree program on campus doesn't have a building, or their building is too small, students from that program will float into other buildings for classes.

Most days, hundreds of students fill the architecture building's two-hundred person auditorium because it is used by several different programs outside of the school of architecture. With the amount of students that filter through the building, it is no wonder the first thing that comes up in conversations about archawai‘i is the terrible building. The condition of the architecture building does not currently reflect the ambitions of the architecture students in it. People outside of architecture think that a building that houses the architects of the future should be nicer; many architecture students agree. It doesn't make sense to build a new building because it is relatively new, so revitalization of the architecture building a great response to the need.

The advisory council for archawai‘i, which is like a booster club for the school of architecture, has charged the American Institute of Architect Hawai‘i Chapter (AIAS Hawai‘i) with the task of implementing this revitalization. AIAS Hawai‘i will plan individual projects that will be built in the courtyard, but something needs to be done to kick-off the projects.

Some projects that have been talked about for the courtyard are:

1. A Shade structure (sun and rain protection)
2. New paint (need to fix finish material spall, choose colors, etc.)
3. Light fixtures (custom designed and built by students, not ordered)
4. Projector and screen (for classes, movie nights?)
5. Landscaping (more than potted trees!?)
6. Event Café (coffee and snacks as a fundraiser for AIAS Hawaii events and as a service area for events)

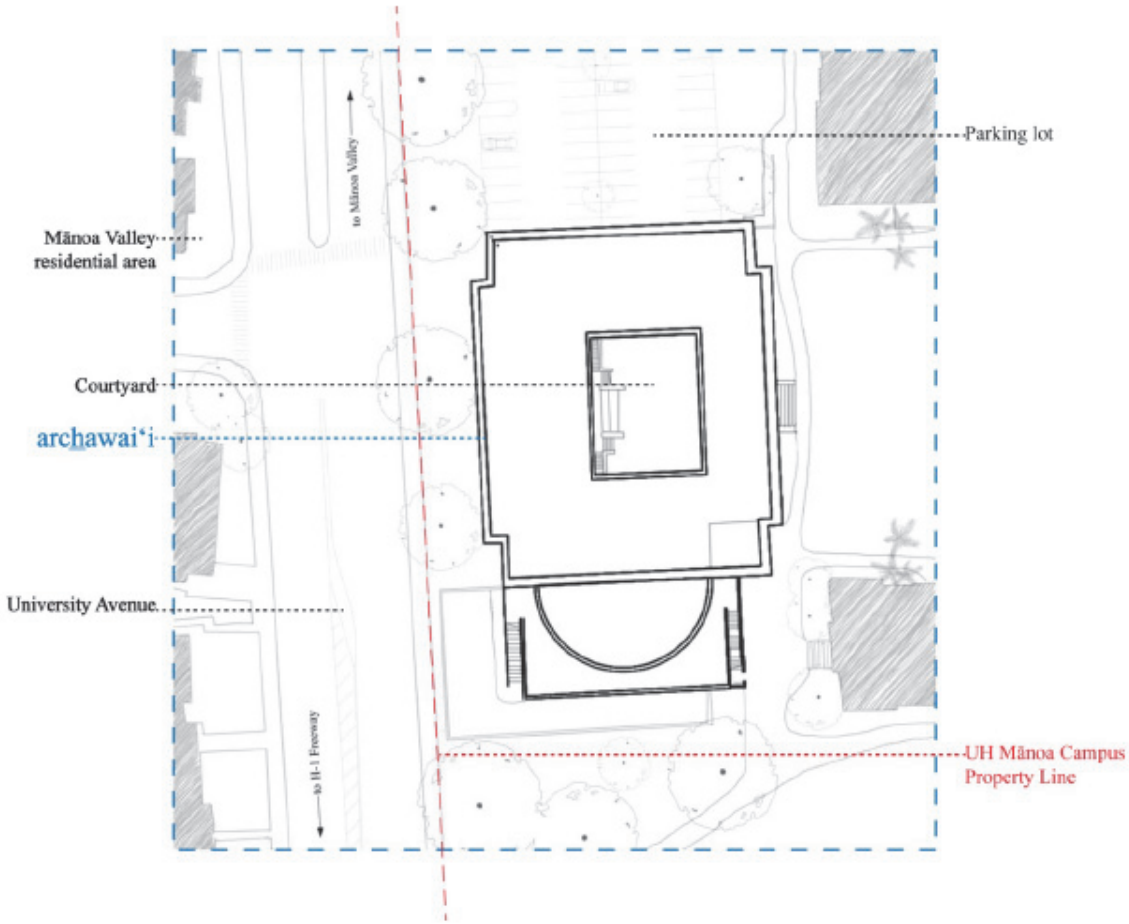


Fig. 174 Architecture building roof plan

The most crucial of the proposed individual projects in the courtyard is a shade/rain structure. It rains frequently in Mānoa Valley, and is very hot and humid during the day. For the courtyard to be a functional space when it's raining, or during the heat of the day, there needs to be shade – a lot of shade!

Next, there is paining that needs to be done. Then, of course there is lighting. Some of the light fixtures in this building are literally falling off the walls, so it would be an excellent project, but one fixture would be too little, all of them would be too much, and replacing half of them would be weird. Also, lighting could be integrated into the shade structure, which doesn't exist yet.

Another proposed individual project is a projector and screen for classes, presentations and movie nights. Viewing angles, seating and proper lighting (during the day and night) must all be considered within the design of the general layout of the courtyard. Also, a projection screen without a shade structure in place would be able to be used at all during the day or at night if it were to rain.

Landscaping, which will hopefully mean more than potted trees, will be an important part of the courtyard projects. This should be master planned with the rest of the courtyard.

The last project proposed in the courtyard project was a café. Given the complexity, scale and need of the school, I chose to do the café.

LOCATION, LOCATION, LOCATION…OF THE CAFÉ

On the third floor, there are possible locations for the café, but that would mean that the use would either be limited to architecture students, or there would be non-architecture students roaming around through the third level of the school. If the use is limited to architecture students, it would be more difficult to keep the café operational, as this would limit the amount of sales. Without steady business, it would be difficult to manage the supply and demand because there would be less money coming in. More business will allow for more consistency and power to control the quality of product.

At the moment, anyone is allowed on the third floor, but there is an unspoken studio watch force protecting the student's valuables and projects. The school has roughly two hundred students and after first year, everyone knows who everyone else is, if not by first and last name, by an internalized facial recognition system. If a lot of

students from outside the architecture school were roaming the third floor looking for coffee and hanging out, it could cause the students to lose their keen sense of facial recognition and the school would be open to unassuming assailants.

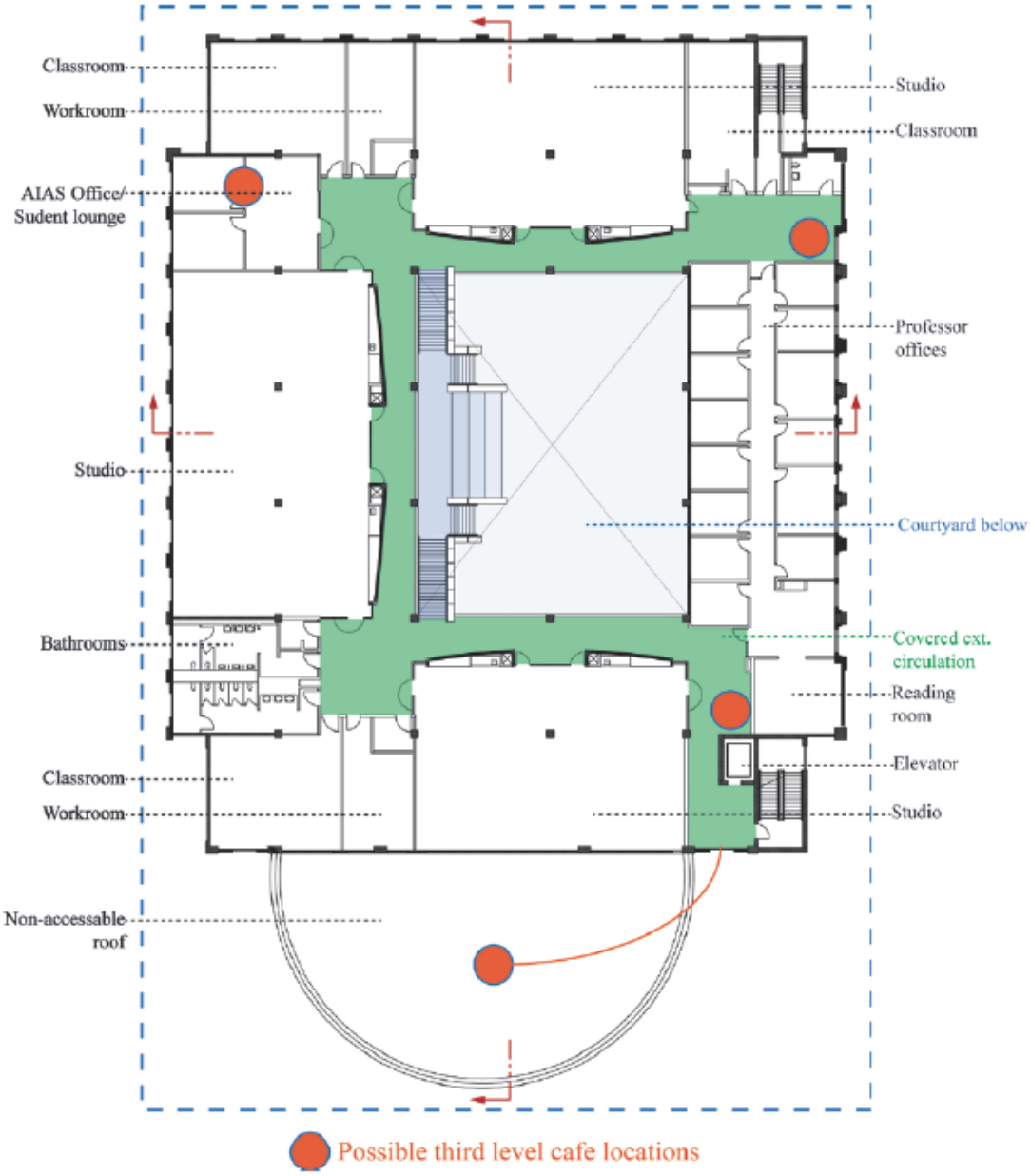


Fig. 175 Architecture building third level plan

If a café were to go on the third floor, I would put it on the non-accessible roof, and of course also make it accessible. Non-accessible is the wrong word, a person can get on there if they have enough ingenuity and don't mind getting dirty, but it's not readily accessible. If a hole were to be made through the south wall near the elevator, there could be stairs up to the roof, following the exterior curve. I think putting a café here would rival any café in the world: it would have a clear 180 degree view featuring downtown Honolulu, Diamond Head, and the ocean. The roof area was not built for normal use and would require some work to make it habitable. With my limited schedule and budget, a café on the roof deck is not feasible, but it would be incredible. Unfortunately, the search moves to the more practical areas on the second floor.

On the second floor there are a lot more opportunities for the location of the café, each with advantages and disadvantages. The areas in the covered circulation are the most desirable, both because of the protection from the elements and because the location is close to the courtyard, but not inside the courtyard.

There are two areas inside the courtyard that would be really nice, but without cover they are not functional, and if I were to build any structure to protect these locations from sun and rain it would compromise the freedom for future work in the courtyard and would increase the scope of my project.

The other two locations considered are within currently operational rooms, the north location is the old computer room that now functions as a classroom and model storage area. Putting the location here would make the north side of the building (where many of the building's classrooms are located) much louder if people were ordering and

loitering around the café. This tells me that the two locations on the north side, both the covered circulation and classroom areas, are probably not the best location.

The other interior space that could house a café is the current computer lab. Before the computer lab moved to this location, it was a dark room and had the necessary space and utilities to run a full kitchen; however, now it is full of servers and a lot of work would have to go into making this location work. This leaves the south covered circulation area and the exterior lanai. For the reasons that the covered circulation areas work, the exterior lanai does not, it is hot and would require a shade structure, and it is not adjacent to the courtyard area.

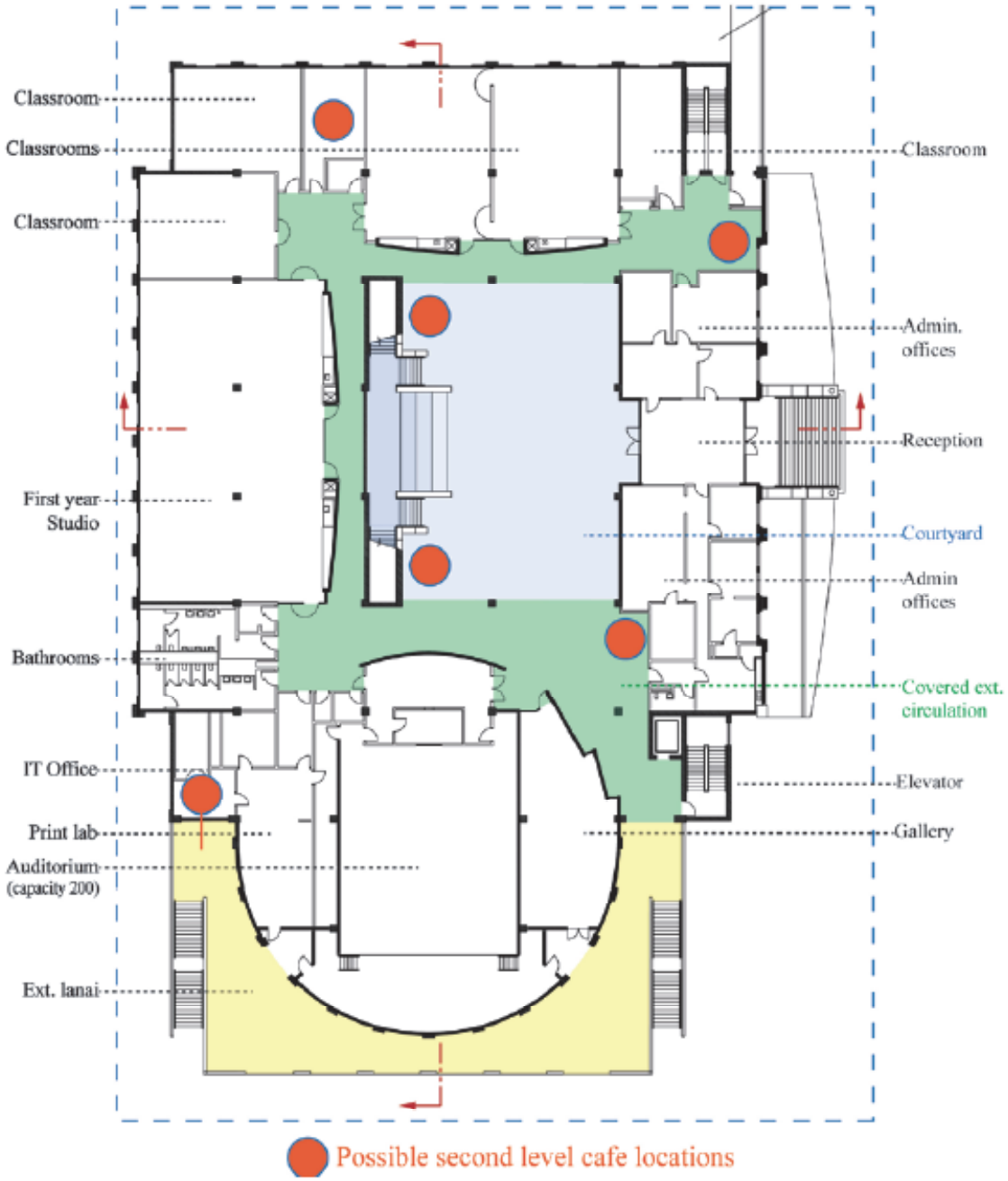


Fig. 176 Architecture building second level plan

Fig. 177 Architecture building sections

Using intuition and logistics to analyze the possible locations showed the positive and negative attributes of each of these possible spaces. In the end I proposed the café's location in the south-east part of the building just outside of the courtyard. Analysis of the flow of circulation of student's entry and exit into the architecture building shows that most of the students enter and exit through the south entry, which includes the elevator and stairs on the south side. The middle entrance, which is supposed to be the main entrance, is used mostly by new students that don't know where they are going. The ramp entrance on the north side is mostly used by architecture students, or other students that come from the north side of Campus.

In the end, it moved to a different location.

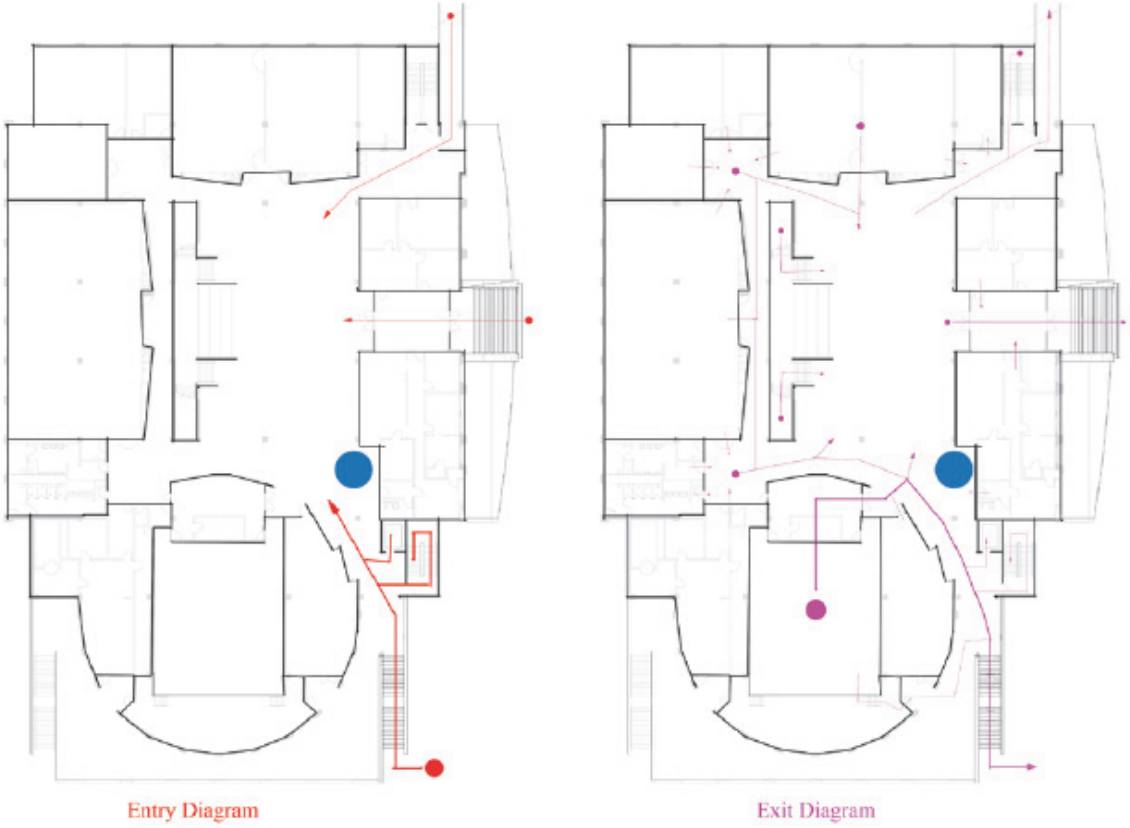


Fig. 178 Main path of travel passes by proposed café location

Since I have never designed a café and have no idea how to begin, I took a look at a few café's in the Mānoa area. The first café, we will call this Café A is located a few blocks from UH Mānoa, and is my favorite café in the area, and possibly in the entire world. The reason this café is great is because of the atmosphere they create. One of the baristas, I will call him Freddy, said: "[big name coffee shops] are all about speed, and how they can move customers through faster. This is great, but sometimes quality is sacrificed for money and that is not right. When you move too fast you forget things, sometimes they forget to put the espresso into drinks, it sounds crazy, but it is true."

Freddy is known for the designs that he makes in the top of customers foamy beverages. As I sat and watched him make his coffee art he explained, "the level of care is just higher here, it is something that [big name coffee company] can never compete with. We don't have lines too often, but we stay busy because people like what we do here."

I asked Freddy about the setup of the barista area, what he likes and what he would change. He responded after brief thought, "It is not so much the layout that is important, it is the flow. Each barista has to create their own flow, that's very important, and even though two baristas can make the same drinks, everyone makes them a little different." It didn't seem like the machines could be moved easily, so I assumed Freddy meant that each barista had to find a flow within the layout they are given.

Freddy went on to talk about word of mouth and how important it is to have a consistent product. They don't make food at this café and the private owner does not want to. Café A does one thing, and they do it very well.

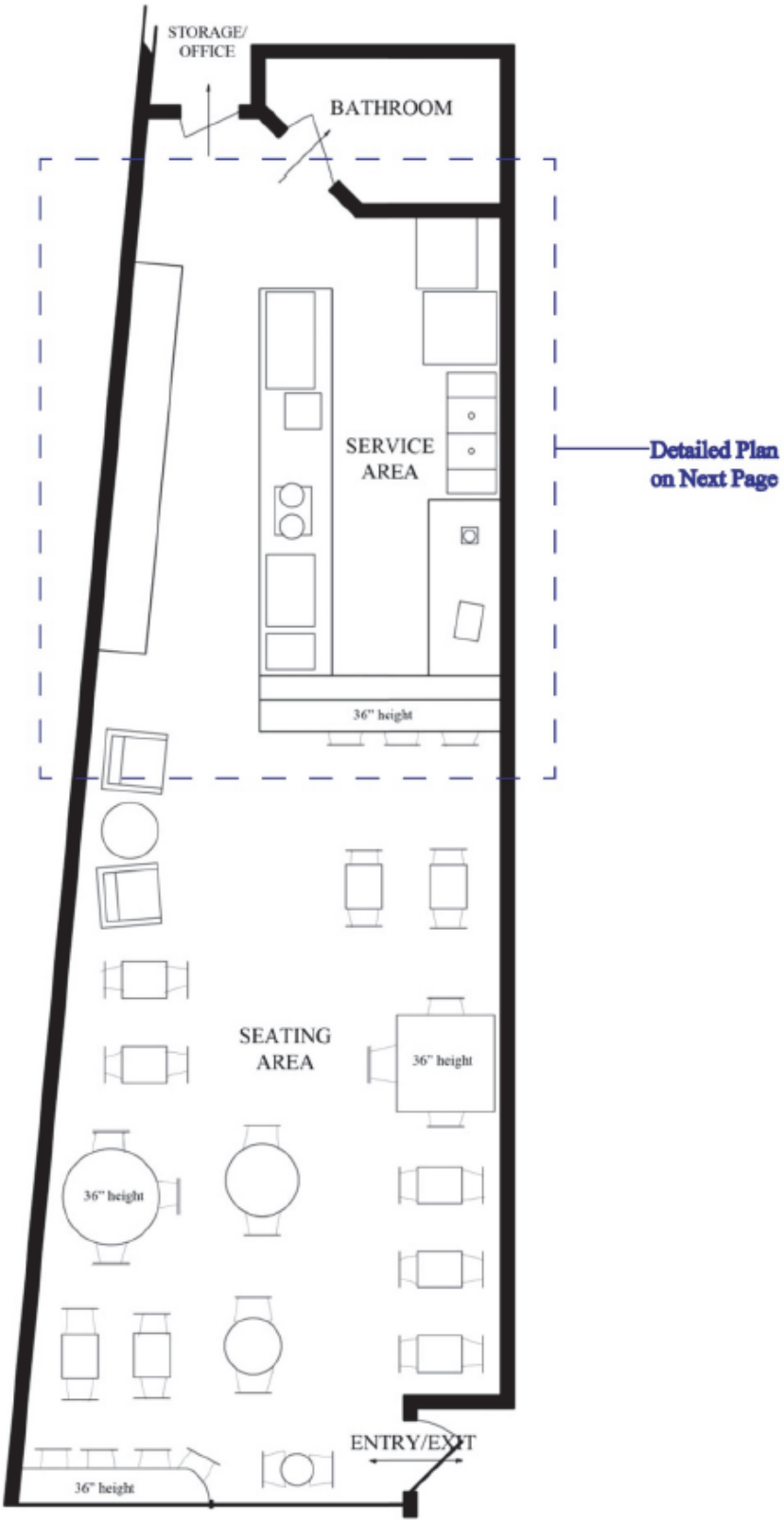


Fig. 179 Café A - general layout

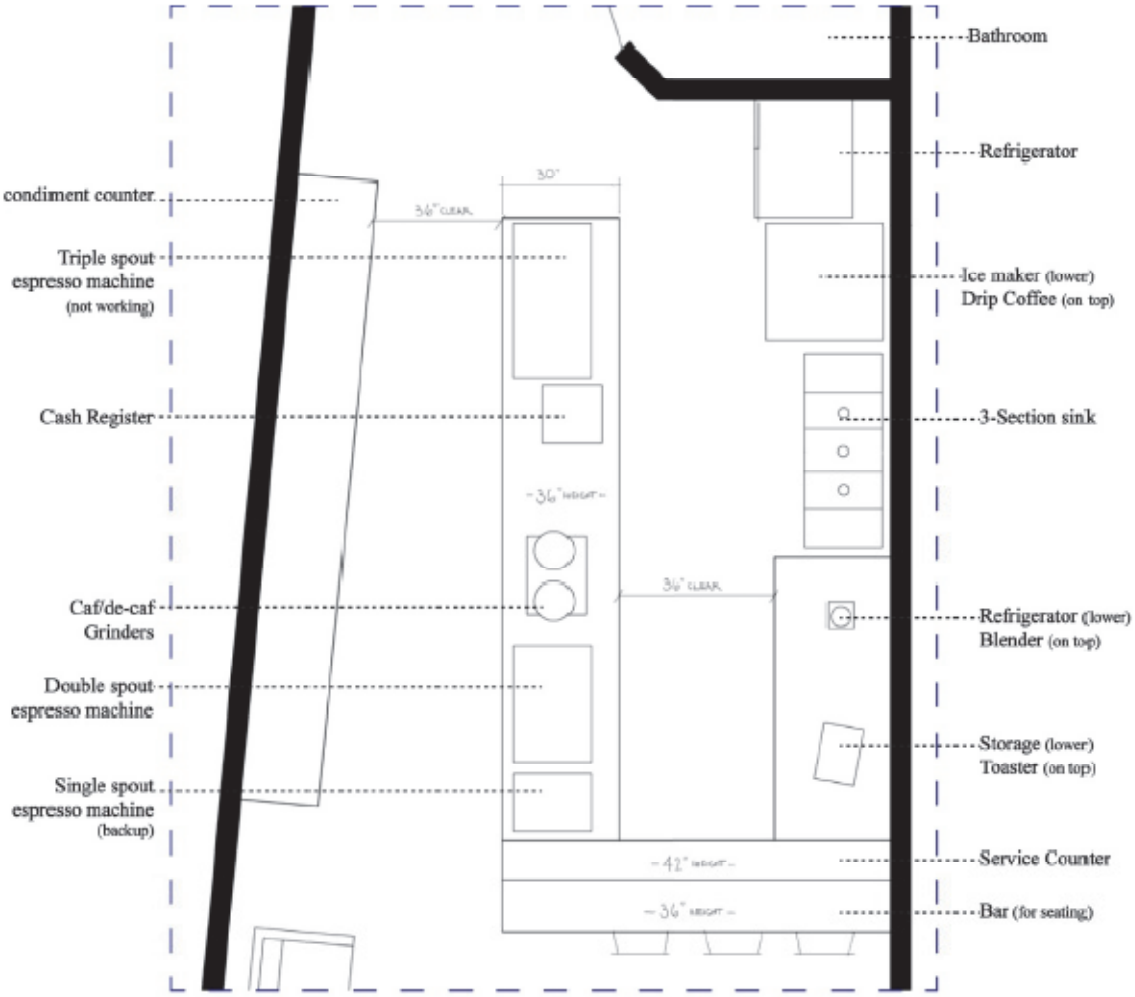


Fig. 180 Café A - detail plan of service area

I sat down to sketch these drawings and perceive the atmosphere of the café. I heard quiet conversations that I couldn't make out. Then a coffee grinder followed by an espresso machine. A smile came to my face as I smelled in the rich aroma of coffee. As the espresso machine stooped I noticed ambient noise from the refrigerators and air conditioning; then typing from nearby students studying or maybe scrolling through Facebook posts. A girl walked in wearing heals and clicked her way across the dark

laminated wood floor to the register. She ordered, and I kept sketching. There was soft, warm artificial light filling my sketchbook, and light shadows cast from the natural light flooding the café from the floor to ceiling windows next to the front door.

The subtle details all blend together with an eclectic mix of low music in the background. I am not sure that I have ever thought about why I enjoyed working here. It always seemed like a time warp, in a good way, I have finished large amounts of my thesis in this very café. Maybe I always knew it had to do with all these things, including the amazing coffee, but it was fun to just sit and absorb it all instead of having to focus on other work.

A lot of good reconnaissance came from Café A. I learned a lot about the hardcore barista, and what it means to really care about coffee. They have three espresso machines, one that does not work, one that has two spouts and gets used every day, and one that has one spout and is used as backup (for when their main one breaks). There is a small three section sink, blender, toaster (they have bagels and muffins that are purchased for sale), an ice maker, drip coffee maker and dispenser, an espresso bean grinder, and lots of refrigerator space. Everything they have, with the exception of the broken espresso machine, is used to its capacity, and it works well for them.

I moved on to the next café, located on the UH Mānoa campus. Café B is a last resort of when I am in need of coffee. I have been there a handful of times and still have yet to experience a great cup of coffee from them. Most of the time it is drinkable, sometimes it is not. The reason this is important is because the quality of coffee could possibly connect to the design of the café itself.

The gentleman I talked to at Café B, I will call him Willy, was a very nice young man. He said he was not a barista for life, and works here because he needed a job. I asked him about the layout and his drink making flow (I was learning the barista language). Willy said, "It's just really small! We get busy here in the morning and have 4-5 people working at the same time and we don't all fit in here." He spread his arms to show how tight it was and continued, "The other thing is our [espresso] machine faces backwards, so when you get an order you have to turn around to make the drink. [the bigger name coffee shops] have their machines so they can face the customers, I think that works a lot better."

Willy went on to explain how they are part of a bigger company that runs most of the food businesses on campus. Because of this they are hired and work to make money, not to make excellent coffee. The large company seems to be less connected to the product and more to the production. Also, they share a kitchen and prep area with the shop next to them, where a large sink and the ice maker are located. Willy pointed to the little sink, "we have that, but it is a pain to have to go back to the kitchen."

Willy said all the food in the display cases is ordered from a bakery, and they don't actually make any of it. I was surprised at how large the sparsely filled food display was.

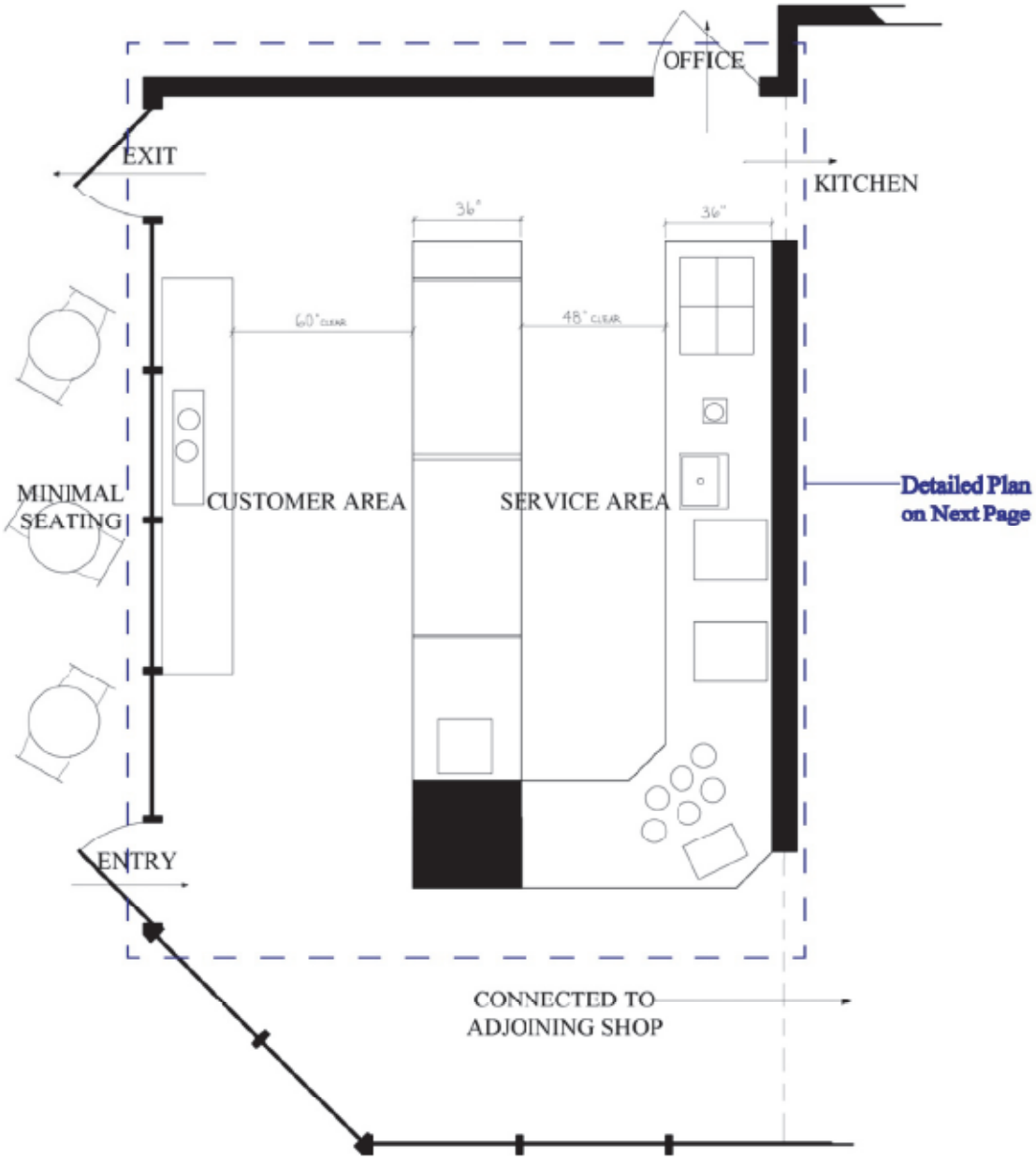


Fig. 181 Café B - general layout

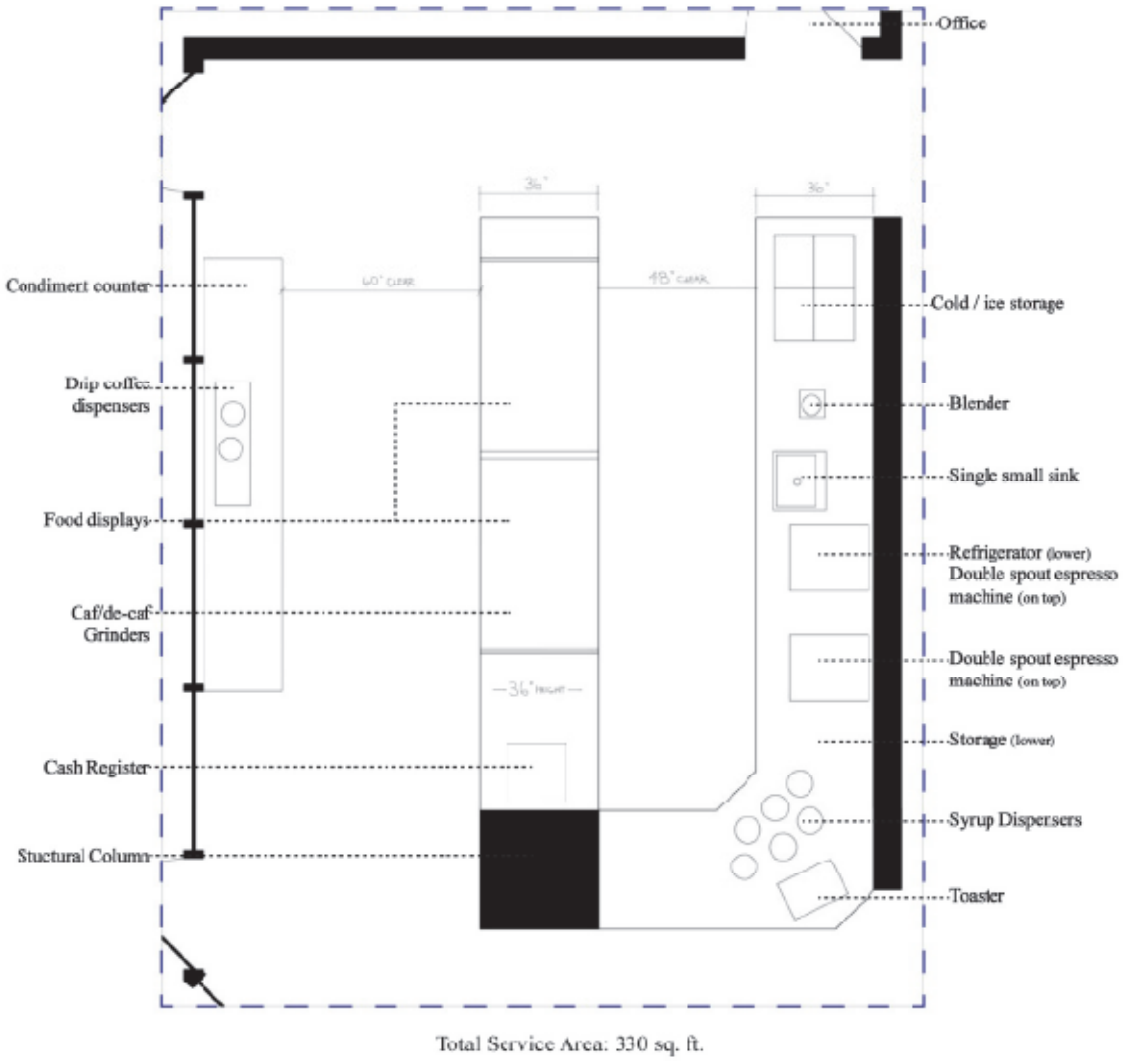


Fig. 182 Café B - detail plan of service area

I stood to sketch because there was not any seating in the café, and I honestly didn't want to absorb the atmosphere. They had similar accoutrements to Café A, but were missing the larger sink and ice maker. The space for what Willy considered necessary elements, even though they were located in the next room, seemed to be replaced with two large food displays. The worst part is, the amount of food in both of these displays would have fit in one with room to spare.

I feel like the information gathered from Café B was really helpful. As I was thanking Willy for his time he offered me some pastries for the road. I was impressed with how nice he was and thought that the level of care for the customers is present, but the quality of coffee is still lacking. Although the quality of product can be traced directly back to the lack of hardcore love for coffee from the management, some design changes might help make the employees feel like they are 'real' baristas, who can flow with the rest of them.

I headed over to the last place for the day, Café C. This café is buried deep in the heart of one of the buildings on the UH Mānoa campus and most closely resembles what I think can be expected out of this project as far as scope, not necessarily quality. I have had coffee from this place at least five times and have not been able to finish any of them. I have deemed it unfit for consumption and had previously refused to return. With that said, I have gone back because of the convenience.

I bought a bottle of water and started to talk with the nice lady who was working there; her name could have been Maria. We talked about the function of the café and I was surprised that I had to keep refocusing her on the coffee. She kept getting side tracked, "if you have supplies it's good, but we run out constantly. I work alone and have to call over to [a larger company] to bring me sandwiches, ice and other supplies when I run out." The management of this café is the same structure as Café B, but it is a different large company that owns it.

Maria continued to talk about the problems, most of which were unrelated to coffee making, "we get busy in the mornings, my goal is to keep the line down and move

people so I can make everyone happy. Sometimes this dumb credit card machine acts up and the line piles up. But students are happy with what we do here."

We went on to talk about the sink, which was ridiculously small. Maria said that it a drain was hooked up over the summer because the board of health told them they had to, before the water drained into a bucket and they dumped it in the bushes nearby. We never were able to talk about flow or much about coffee at all, and it suddenly dawned on me: this is not a café (at least not for coffee). The focus of this café is to provide an extension of another collection of shops on campus. They are more concerned with selling sandwiches and soda in a remote location than providing quality coffee.

The accessories stepped down, even from what Café B had, which was already barely sufficient. Ice is brought in from across campus along with all the other supplies, and not always promptly. There is a large food display, also not full of food. They also provided soda, bottled water and energy drinks, but started to seem more like a convenience store than a café. There was a single espresso machine, faced "the wrong way," no ice maker, one small sink, and no blender.

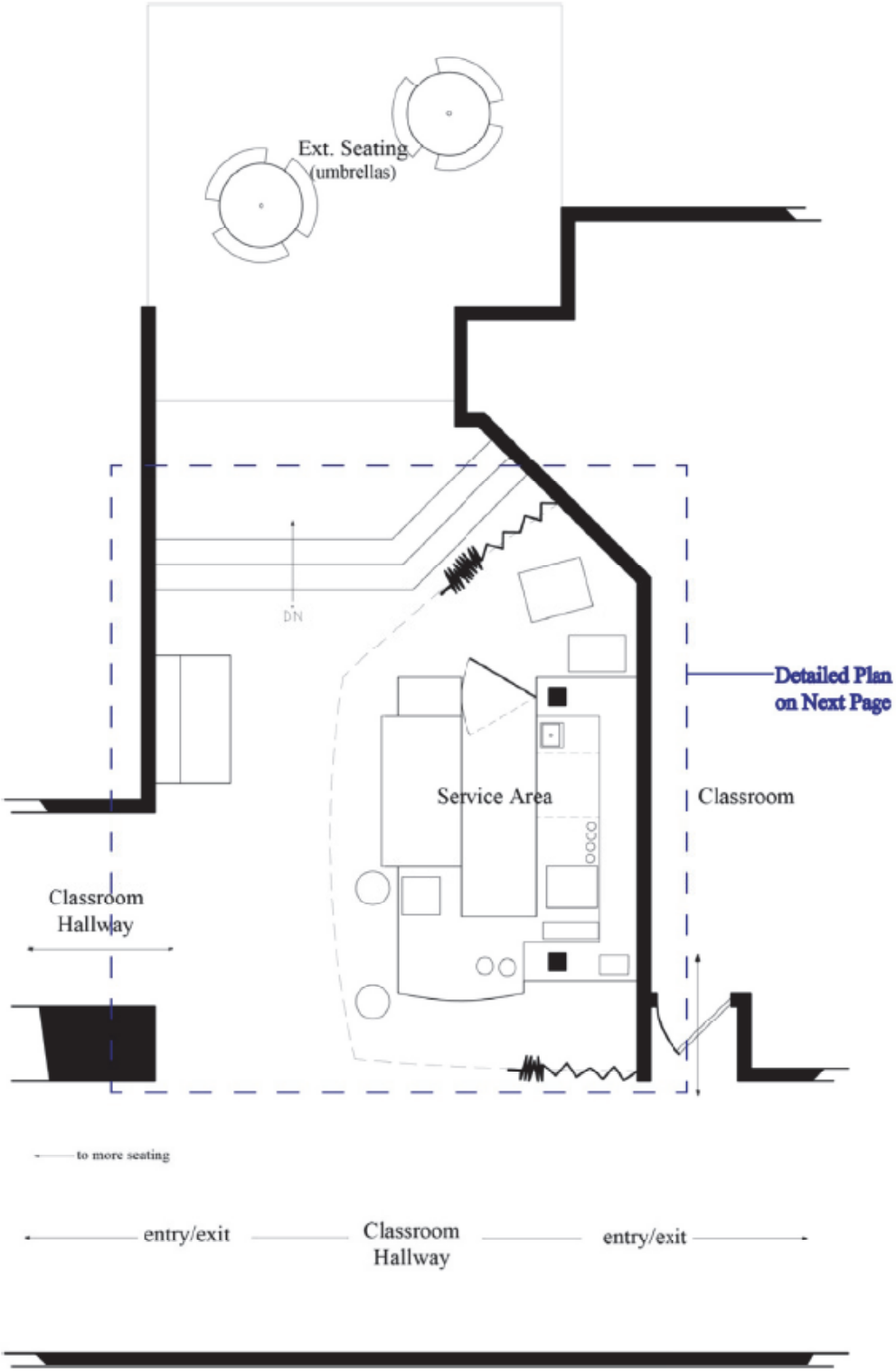


Fig. 183 Café C - general layout

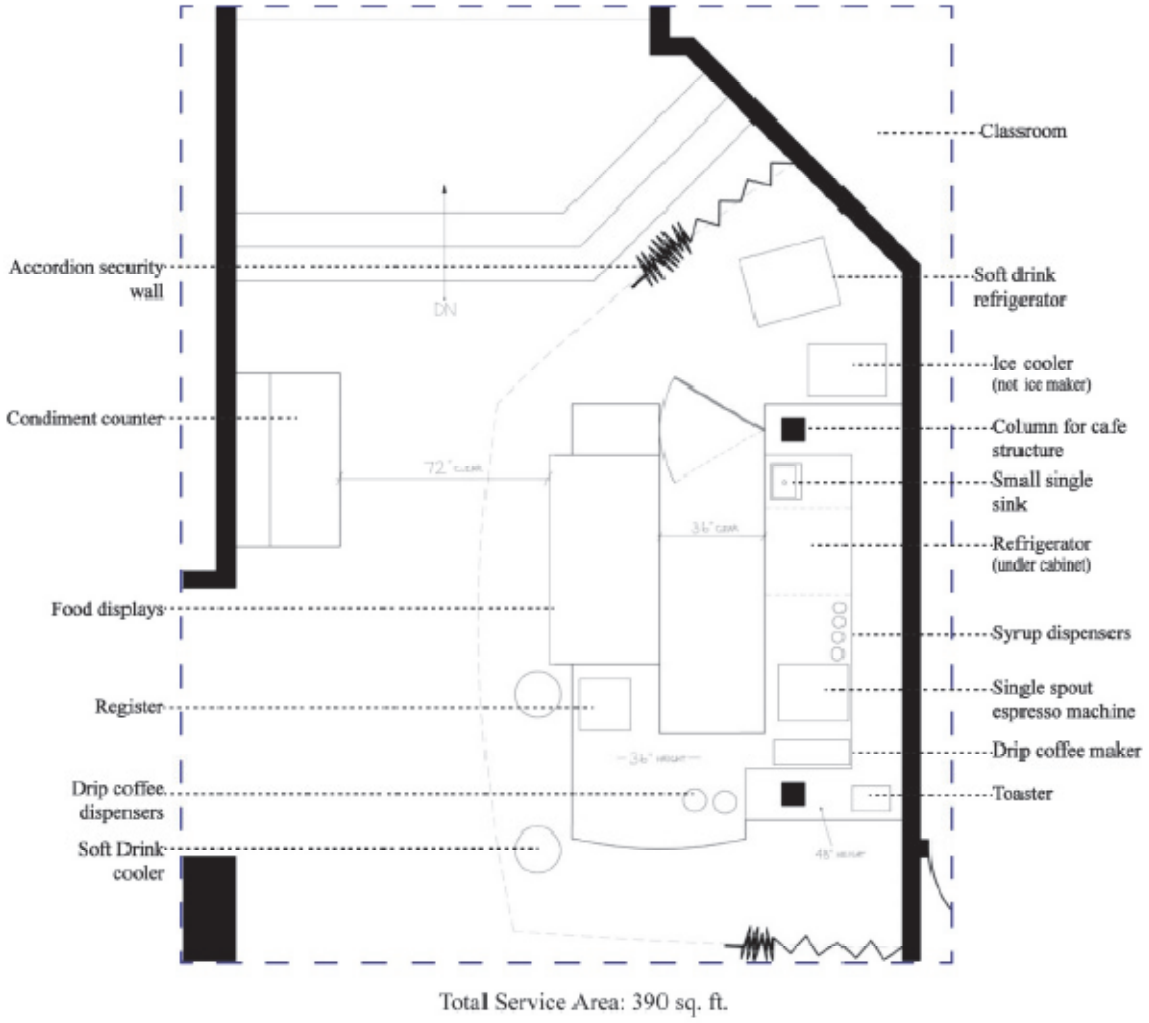


Fig. 184 Café C - detail plan of service area

After Café C, I started to think that food is what kills the true café, or at least caring equally about food and coffee. The culture is just strange to me, but it makes sense because a good cup of coffee is increasingly hard to find: coffee is what brings people in, and what brings them back. This exploratory mission into cafés is where the design process started, which has more to do with coffee and equipment than design.

Café A seemed to care more about one cup of coffee than the other two places have ever cared about anything they have sold. While this seems crazy, it leads me to believe that a café must be coffee centered, and run by a hardcore barista who puts quality of product over quantity of items sold. All three places sell food, none of them make their food, and one is clearly superior.

Since I cannot control how the café is managed, I can at least learn from these cafés to adjust the program to fit the clients (AIAS's) needs. In our first meeting the client was adamant about having good coffee, even talking about the source country of the beans. If this is the case, I can immediately reject a large food display case. Although the client wants to sell food, the coffee is a priority, and any food sold will be purchased, not made.

In Hawai'i, where it is perfectly hot and humid most days of the year, iced coffee is obviously very popular. Although two of the three cafés functioned without ice makers, both complained about the immediate availability of ice. Also, the storage containers for their ice were just as large as most ice machines, so if the budget permits, an ice maker should be provided.

The first café had separate grinders and coffee makers, I am not educated on the difference in quality between an integrated grinder in the coffee maker and separate machines, but obviously both will need to be included whether together or separately. Perhaps the decision will be based on the client's choice of espresso machine, if there is not an integrated grinder there will need to be room for a separate one.

I am realizing now that I have to talk to my client with the recent illumination of the world of coffee cafés. I need to ask about what specific machines are necessary to

accomplish the menu desired and start sizing these out as I work through the design and layout of their café. Also, whether they are going to have a cash register or cash box, and if they have thought about credit cards, which seems really intense for a non-profit café that is just starting out.

Also, I need to talk to my contractor about feasibility of plumbing and electrical in the proposed location. If I go to the client and tell them that there should be a sink an ice maker and sixteen espresso makers and then find out from my contractor that it's not possible to do any of that, I am going to be in a bad place. Where do I go first?

I went to take a look under the proposed site area and it looks like there is plumbing stubbed up for a bathroom and a fire hose in the near vicinity, so I have to ask the contractor if the water and drainage from the sink can be tied into that somehow. Also, this would mean coring through the precast concrete slabs, so I have to ask if that is something that can be done.

Over dinner the other night I talked to Daryl Arita, from Arita Poulson General Contracting. I mentioned that I might have to core through precast concrete panels for plumbing and electrical. He explained that they would need to be x-rayed first to make sure that one of the tension wires are not hit, because if any of those are compromised, the panel could explode. At least I know that it is possible, now I need to find out it if is feasible within my budget and schedule.

I talked to my client today, she was excited to see me, but seemed very busy. We talked about the location of the café and my thoughts on the layout based on the precedent studies. We agreed to meet the next day to go over the menus she is thinking

about and the plans that I am suggesting. Her energy is really helpful to staying excited about this project even though there is a lot to do, and a lot riding on the completion.

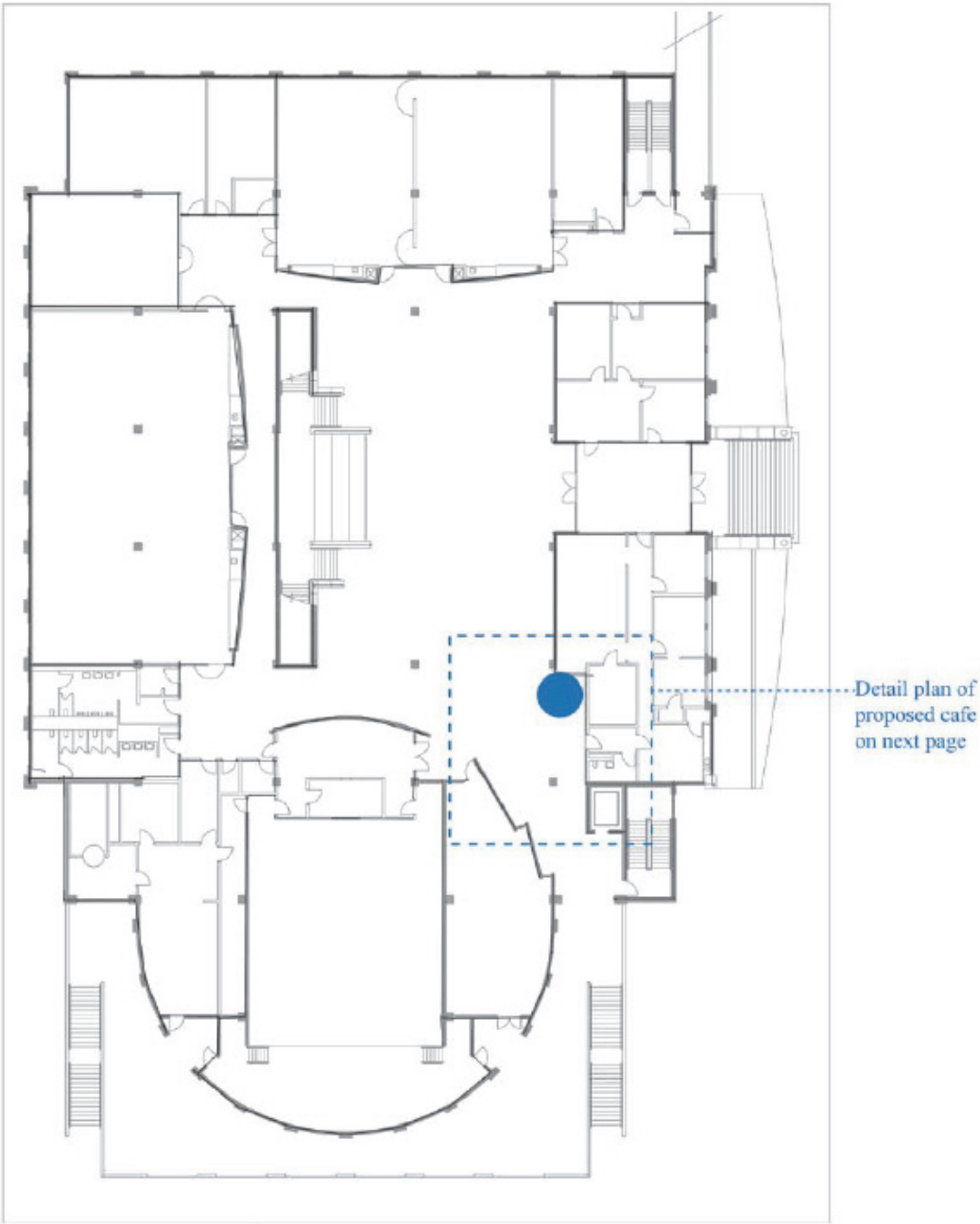


Fig. 185 Architecture building - second level plan

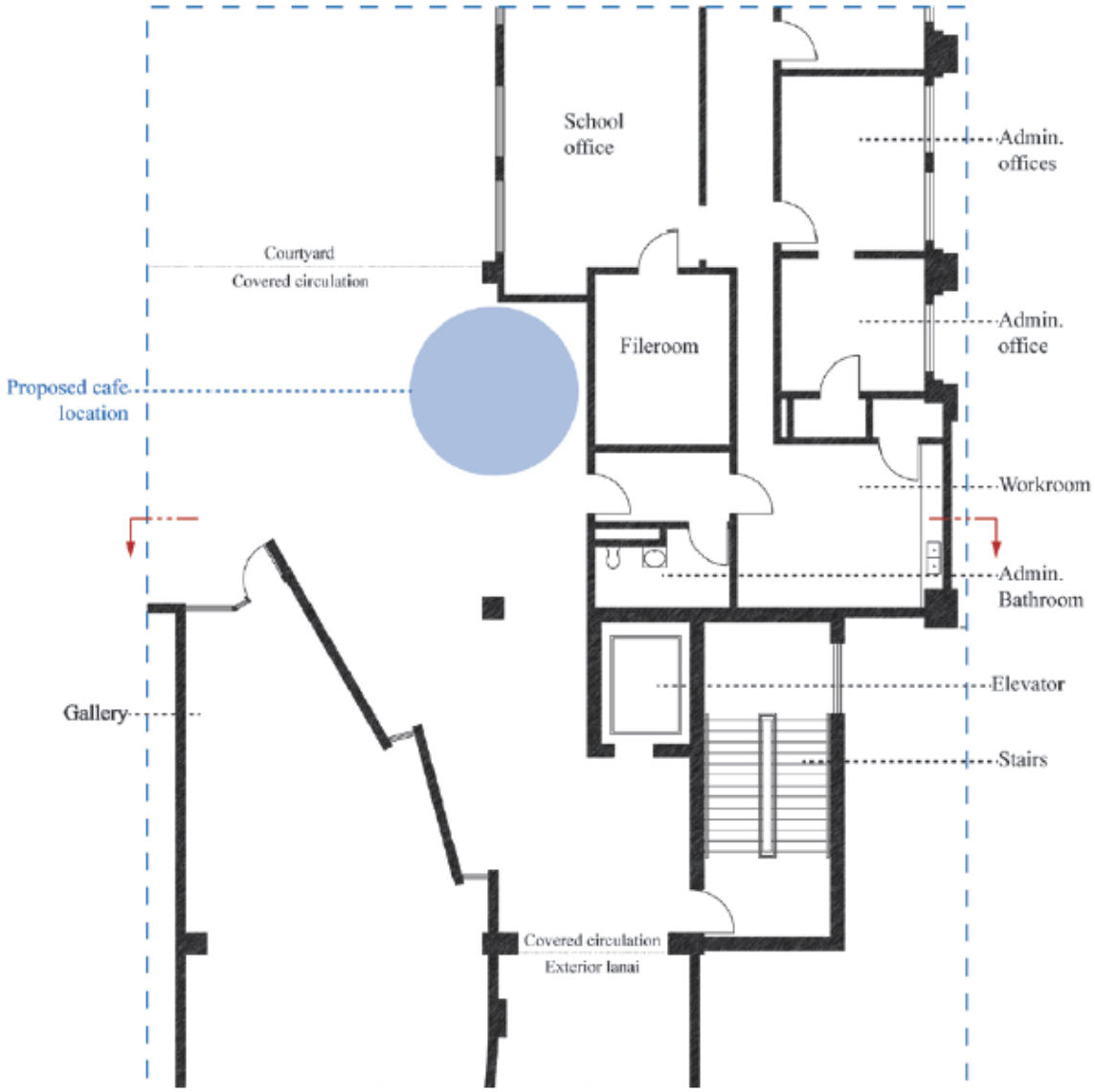


Fig. 186 Architecture building - detail plan of proposed café location

I also emailed Randy Lau of Designer Built Systems, Hawaii (DBS Hawaii) who has offered to help me with resources for this project. Although he is not going to directly build the project with me, he has agreed to facilitate the use of his shop and craftsman for me to work with in the fabrication process, and a job number through his company so I

can order materials for the project. I am planning on emailing drawings to him when I can to talk about the feasibility of the utilities for the machines.

To get ready for the meeting with the client tomorrow I started sketching and modeling. First I laid out the three key machines that make the 'static' part of the café, the fridge, ice machine and sink, and then I started building a cover for it that will move out to be the counter when the café is operational. This will protect the café when it is not in use, and double as a bar height work area for students when the café is not in use.

The front of the bar will have wood linked together and stacked with glass. This will create a sense of screening, layering and texture instead of making a flat plywood backing to the counter. The wood will hopefully have a natural edge on one side, and be intermittently layered horizontally with the glass. The natural edge of the wood will contrast the smooth edge of the glass and will be translucent during the day and illuminated at night. It's difficult to model randomness digitally, because it is very time consuming. However, since natural variation can be built in the field quite easily, modeling a simplified version of the intention is a great way to understand how the pieces can be put together.

Over the last week, working through all the details I found out that I have many more clients that one student from AIAS. I gathered all the information from the case studies and analysis and put it into a proposal to get approval to build. The process is proving more difficult than I had originally intended.

APPENDIX B

Submittal of program and design of fixed vs. mobile kiosk

What is this proposal for?

This is a proposal for a café on the second floor of the School of Architecture at the University of Hawaii at Mānoa.

Goals of this proposal

The goal of the proposal is to get a consensus on the location of the café and whether it should be fixed (build-in) or mobile (able to be closed up and moved). The proposal presents two locations each with the possibility of a fixed or mobile café for a total of four schemes.

The four design schemes do not differ greatly because the ultimate design requires a decision where and what will be designed. If a fixed café is chosen, the location will dictate the look and feel of the café. If a mobile café is chosen, available utilities in each location will dictate the function, thus affecting the form, of the café.

Program

AIAS Hawai'i desires a café to sell coffee, snacks and various accoutrements to the students of UH Mānoa SoA. The café will function as a permanent daily fundraiser for AIAS Hawai'i, a non-profit organization. Stephen Larson will be responsible to deliver a design and build-
out of the café in accordance with AIAS Hawai'i's wishes and budget. Megan Rhoden will be responsible for the daily operation and will manage the financial and operational side of the café, and will appoint and train a successor before she graduates.

Minimum requirements

- Espresso machine
- Refrigerator
- Container for ice
- Lit sign for AIAS advertising
- Trash receptacle
- Storage (cups, coffee, and various accessories)
- Prep space for coffee

Desired additions

- Ice machine
- Sink

Contents

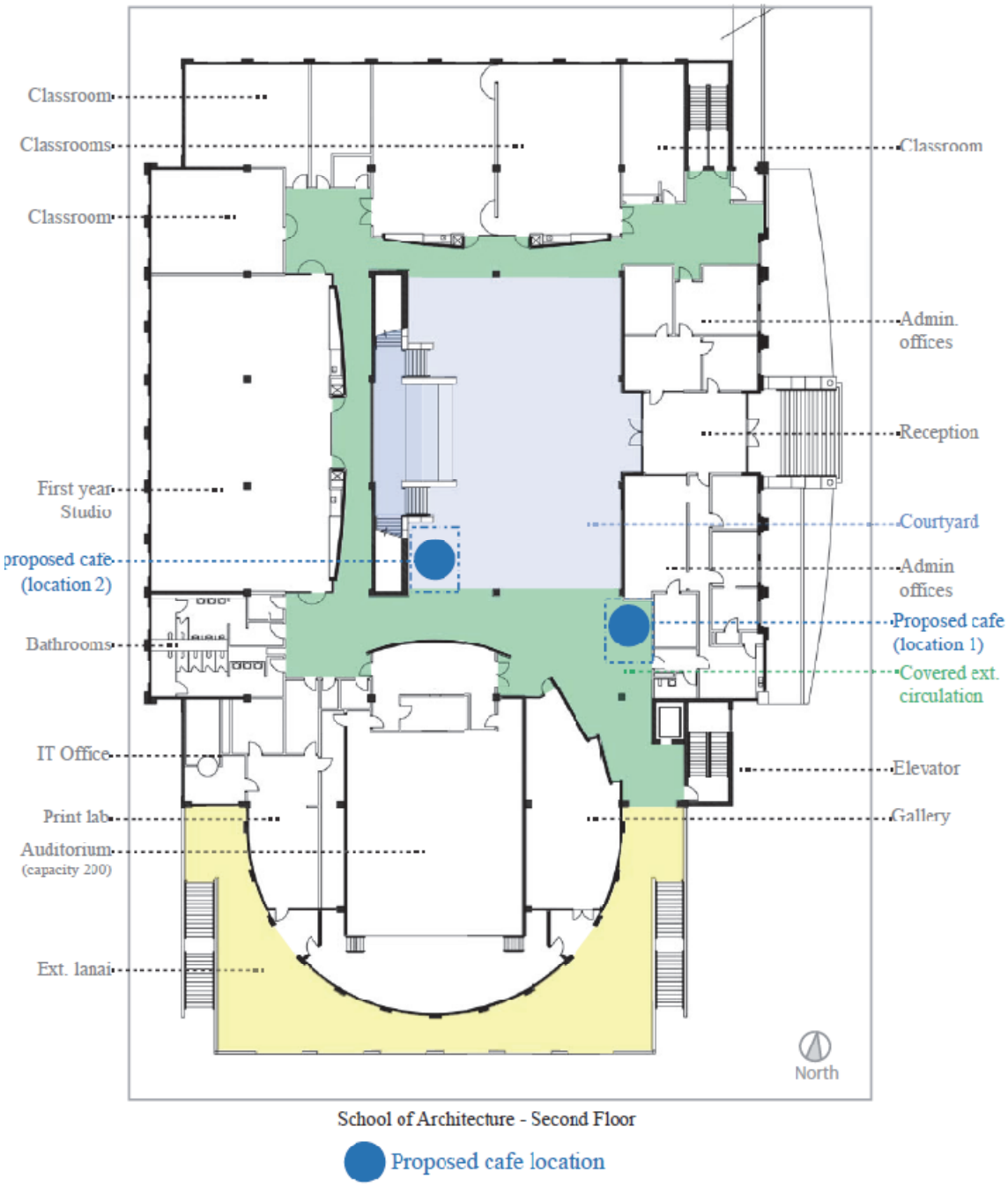


Fig. 187 Cafe locations

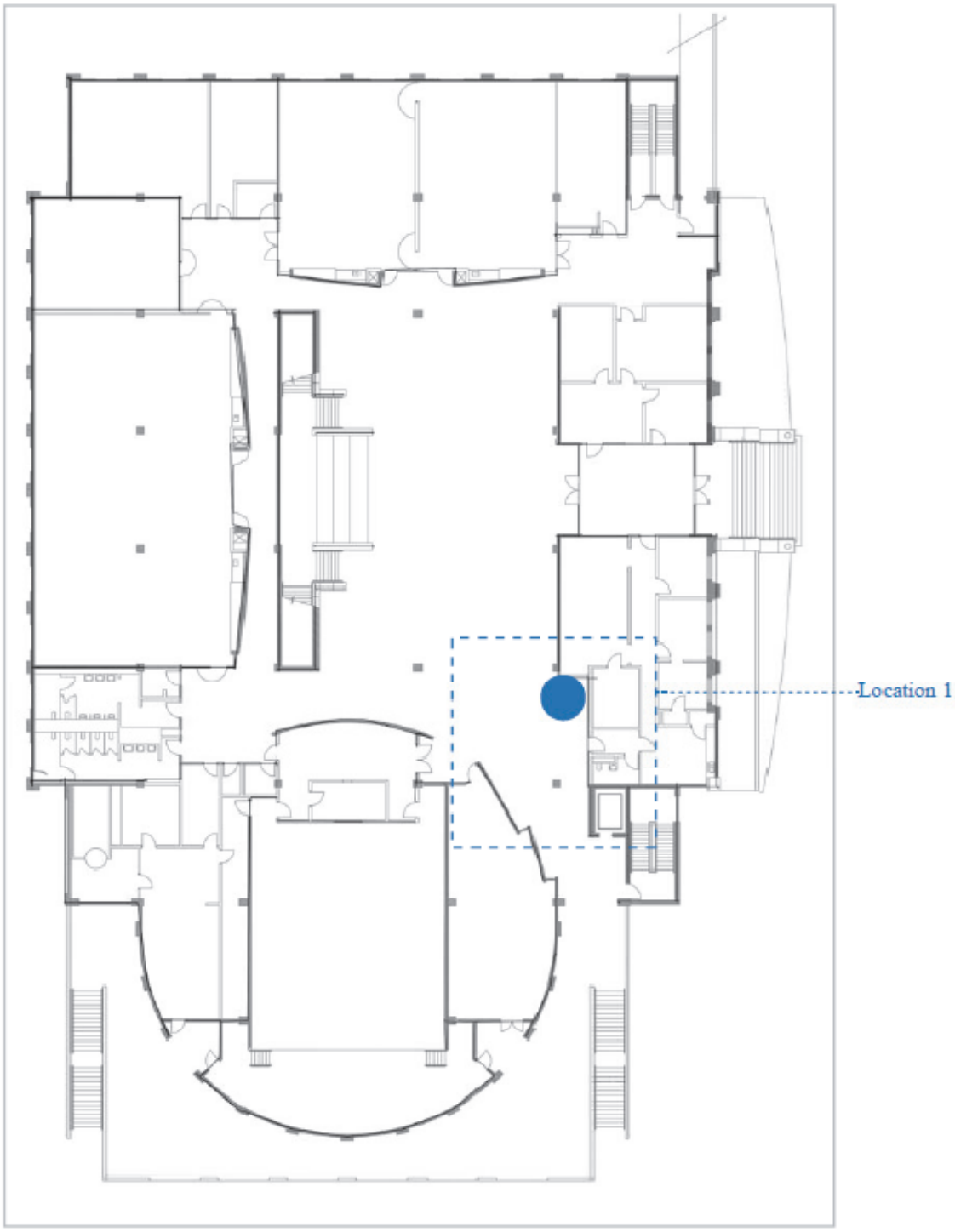


Fig. 188 Scheme 1 (location 1 - fixed cafe)

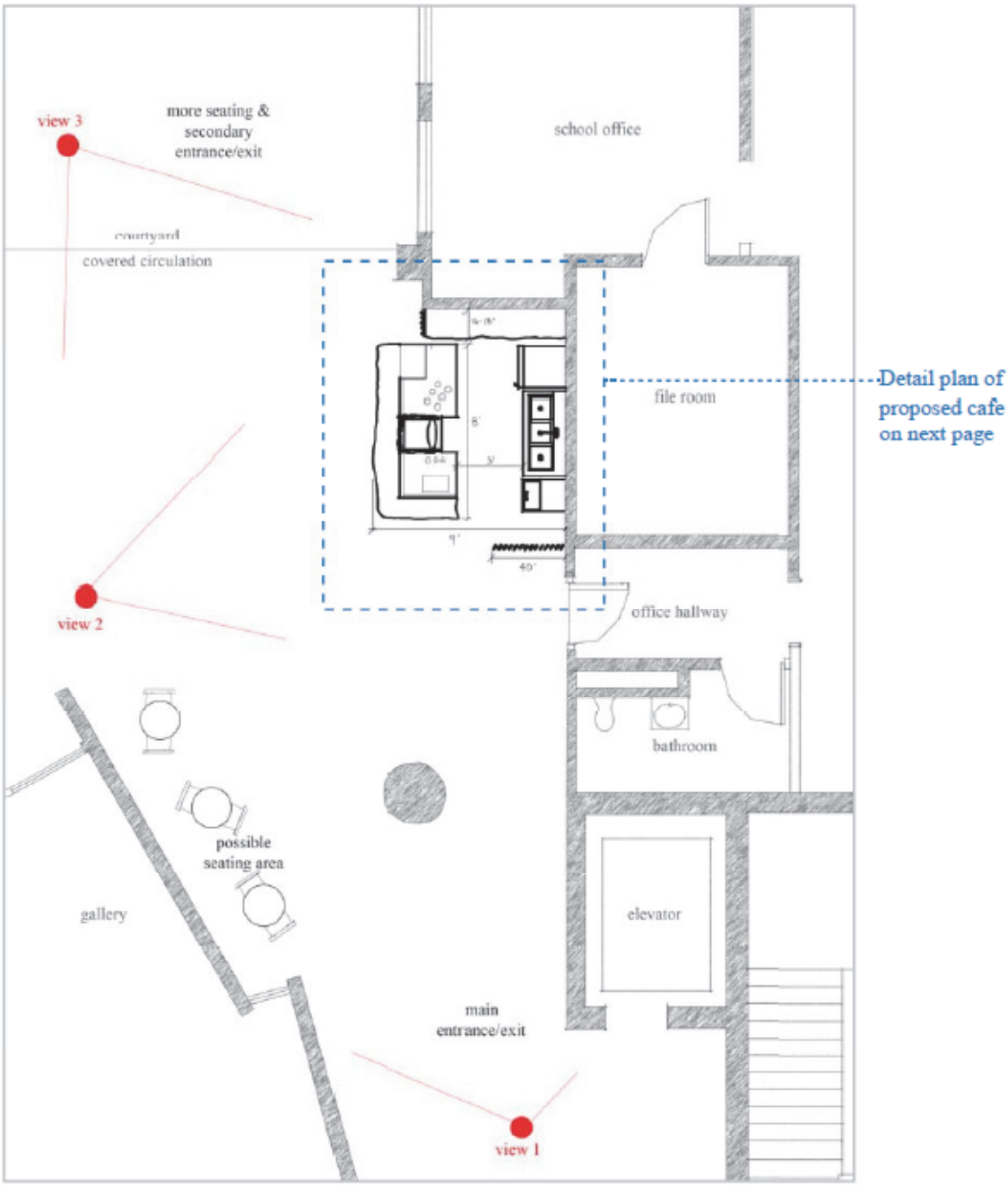


Fig. 189 Scheme 1 (location 1 - fixed cafe)

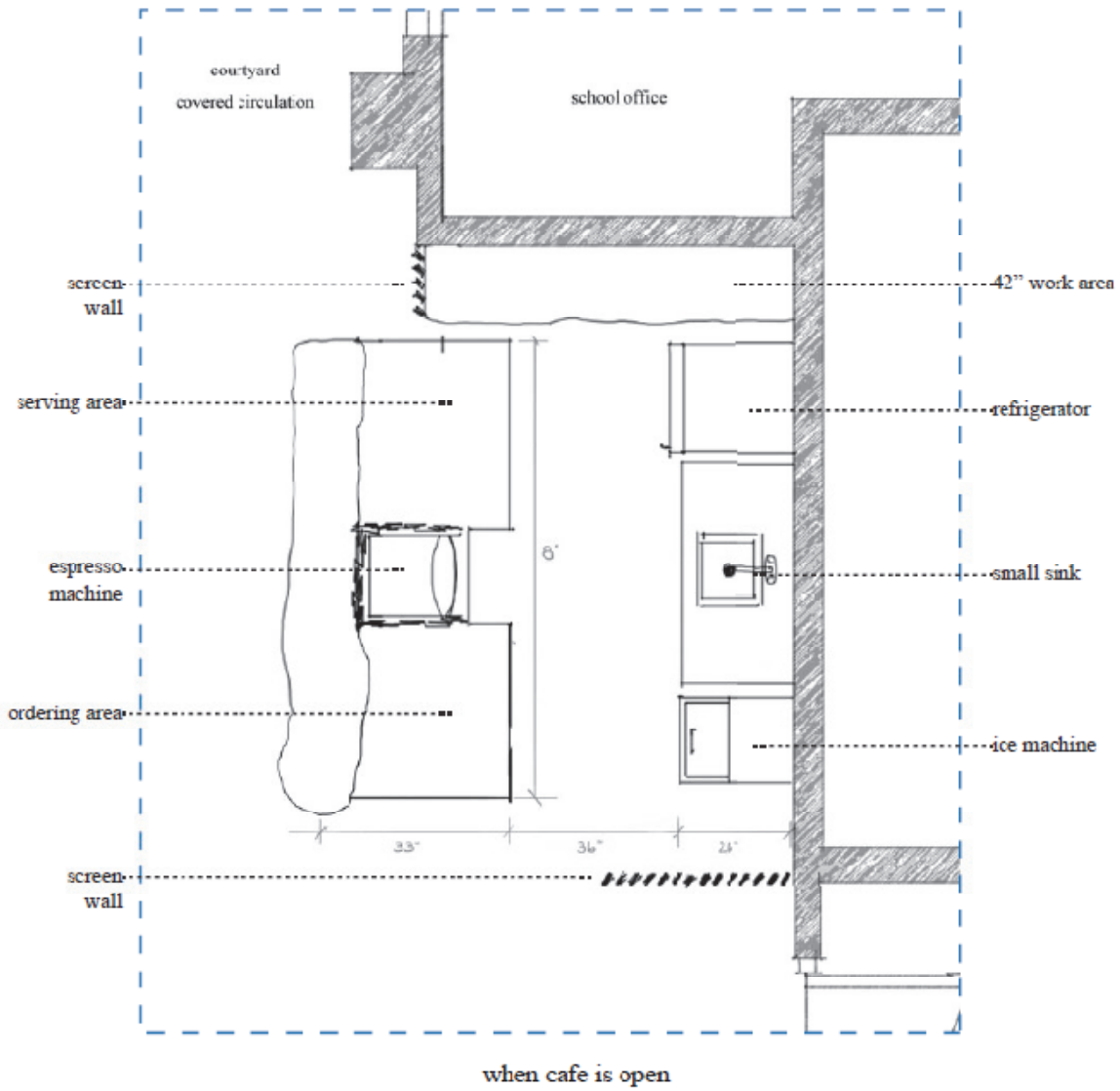


Fig. 190 Scheme 1 (location 1 - fixed cafe)

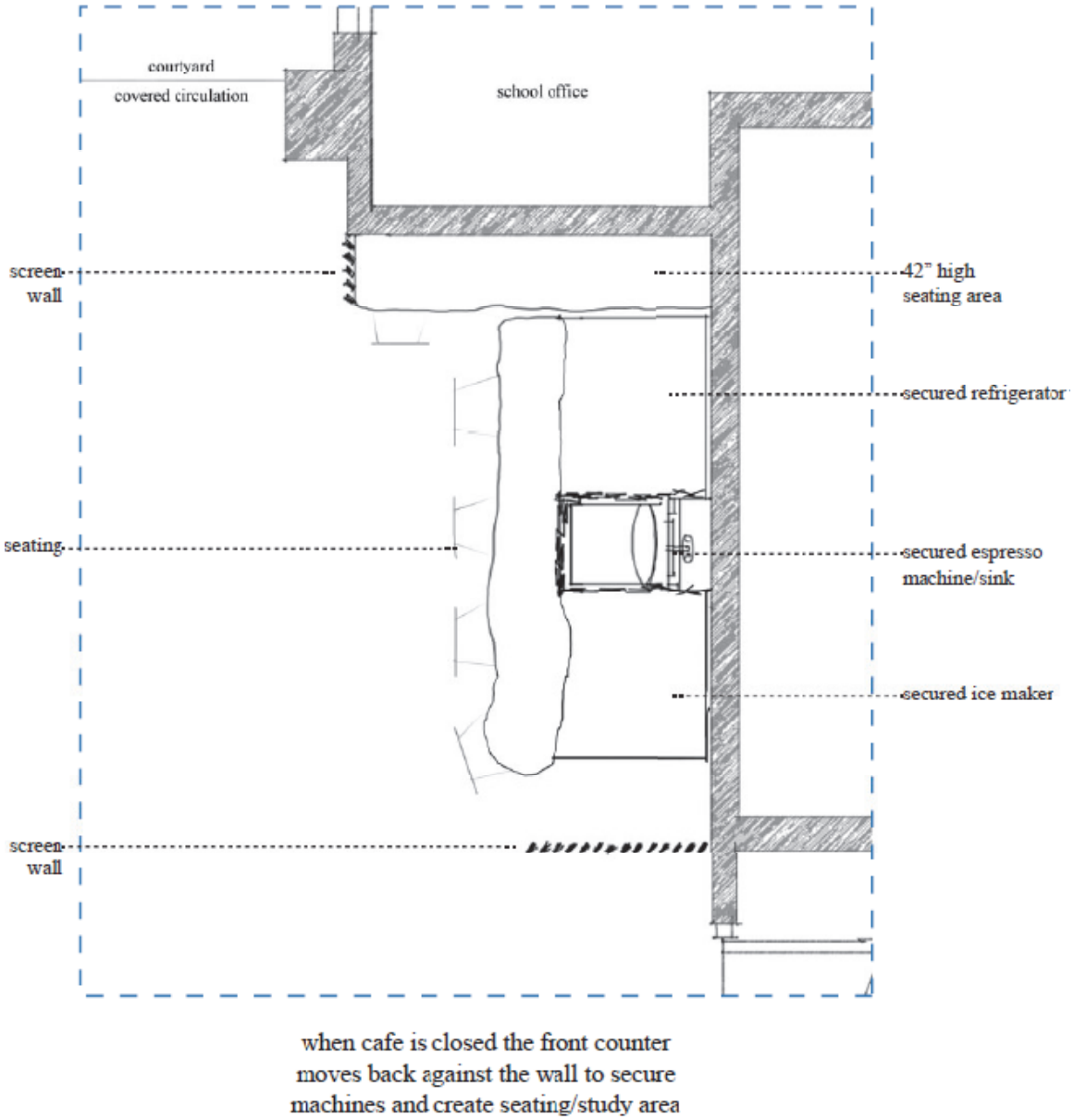
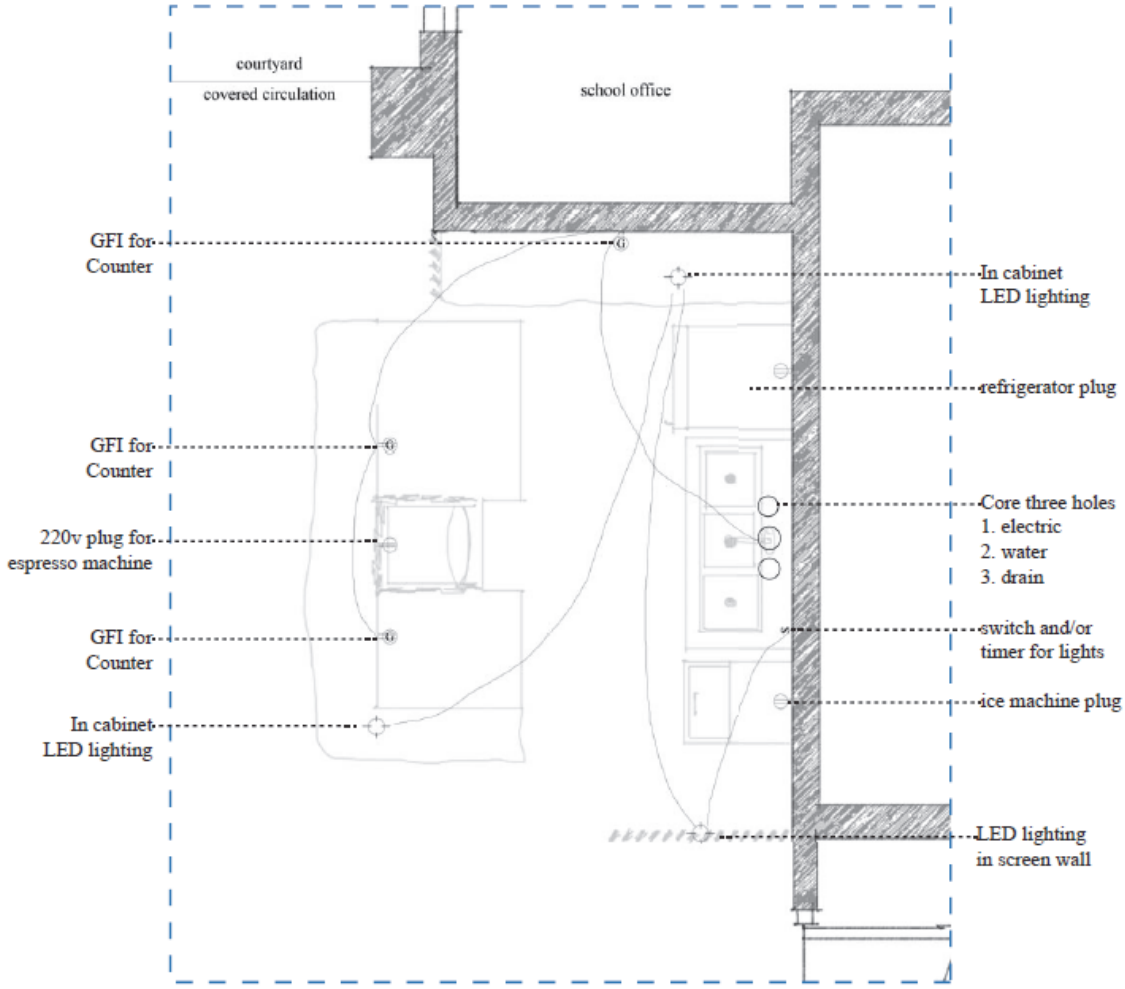


Fig. 191 Scheme 1 (location 1 - fixed cafe)



Plumbing - *3 machines*
sink (need water, need drain)
ice machine (need water, need drain)
espresso (need water, need drain within 5 ft.)

Electrical- *4 circuits*
#1: - 3 to 5 countertop GFIs
#2: - refrigerator 120v plug
3-4 LED lighting areas (may need to better define power needs of these lights)
#3: - ice machine 120v or 220v plug
#4 - espresso 120v or 220v plug

Fig. 192 Scheme 1 (location 1 - fixed cafe)

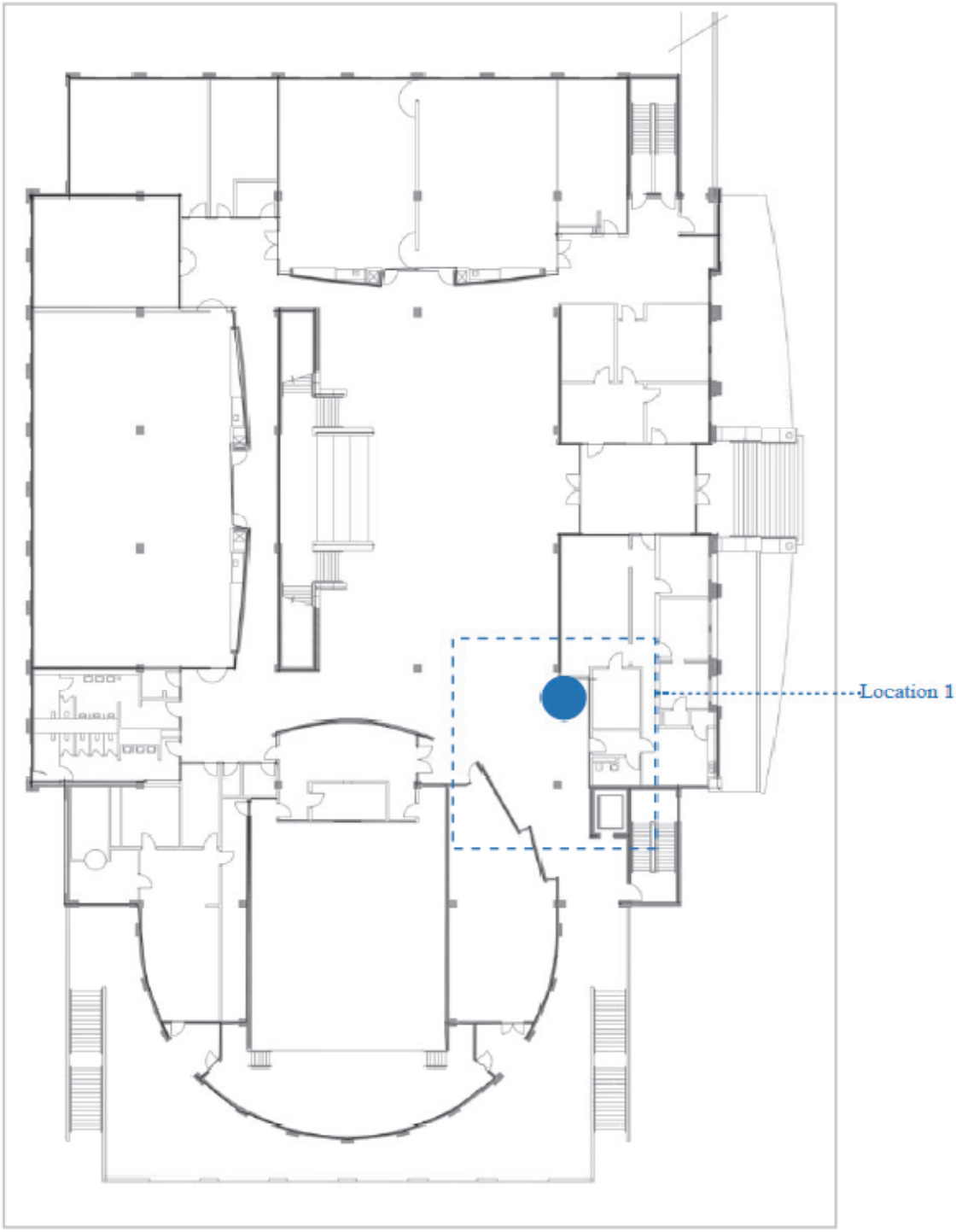


Fig. 193 Scheme 2 (location 1 - mobile cafe)

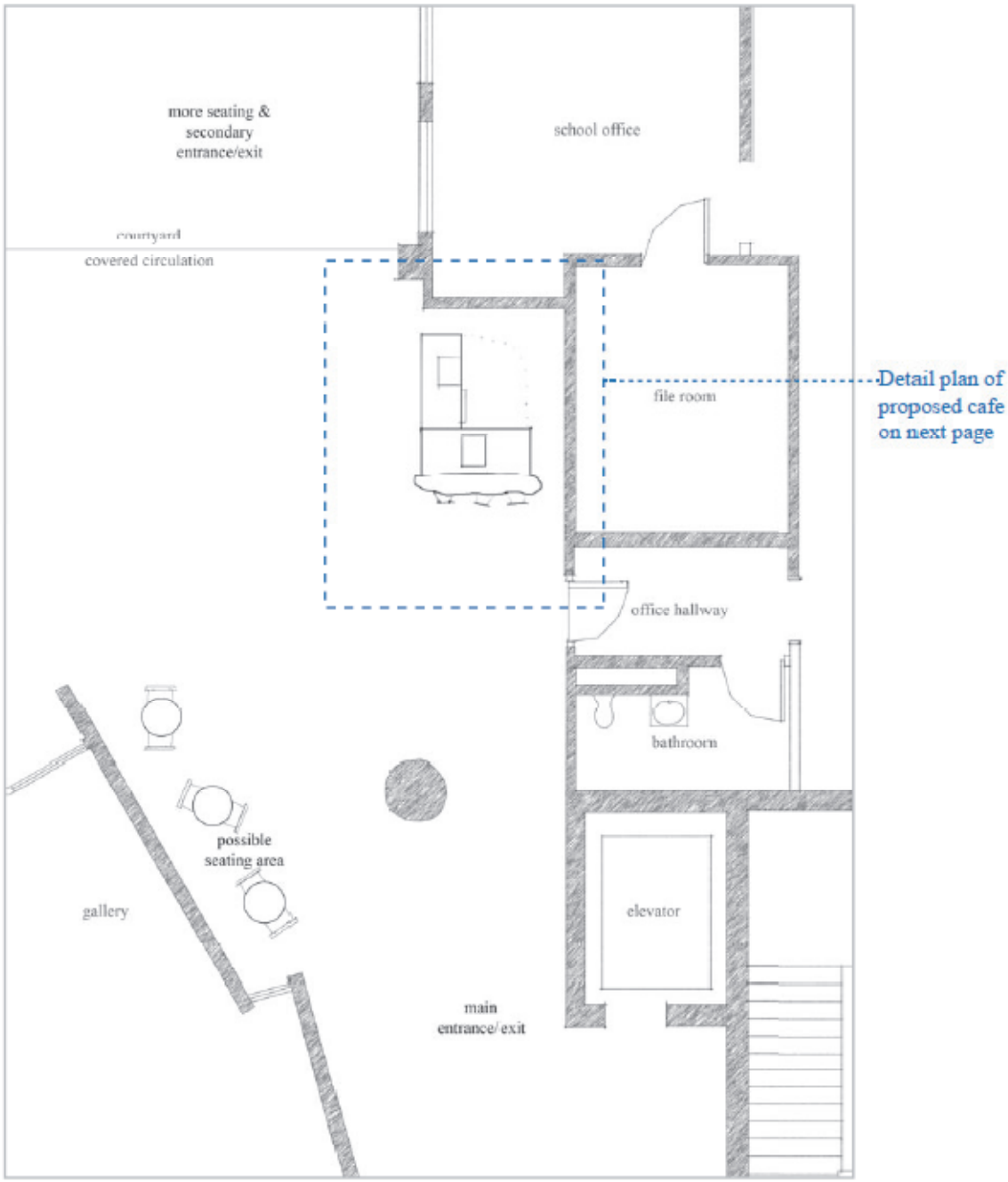


Fig. 194 Scheme 2 (location 1 - mobile cafe)

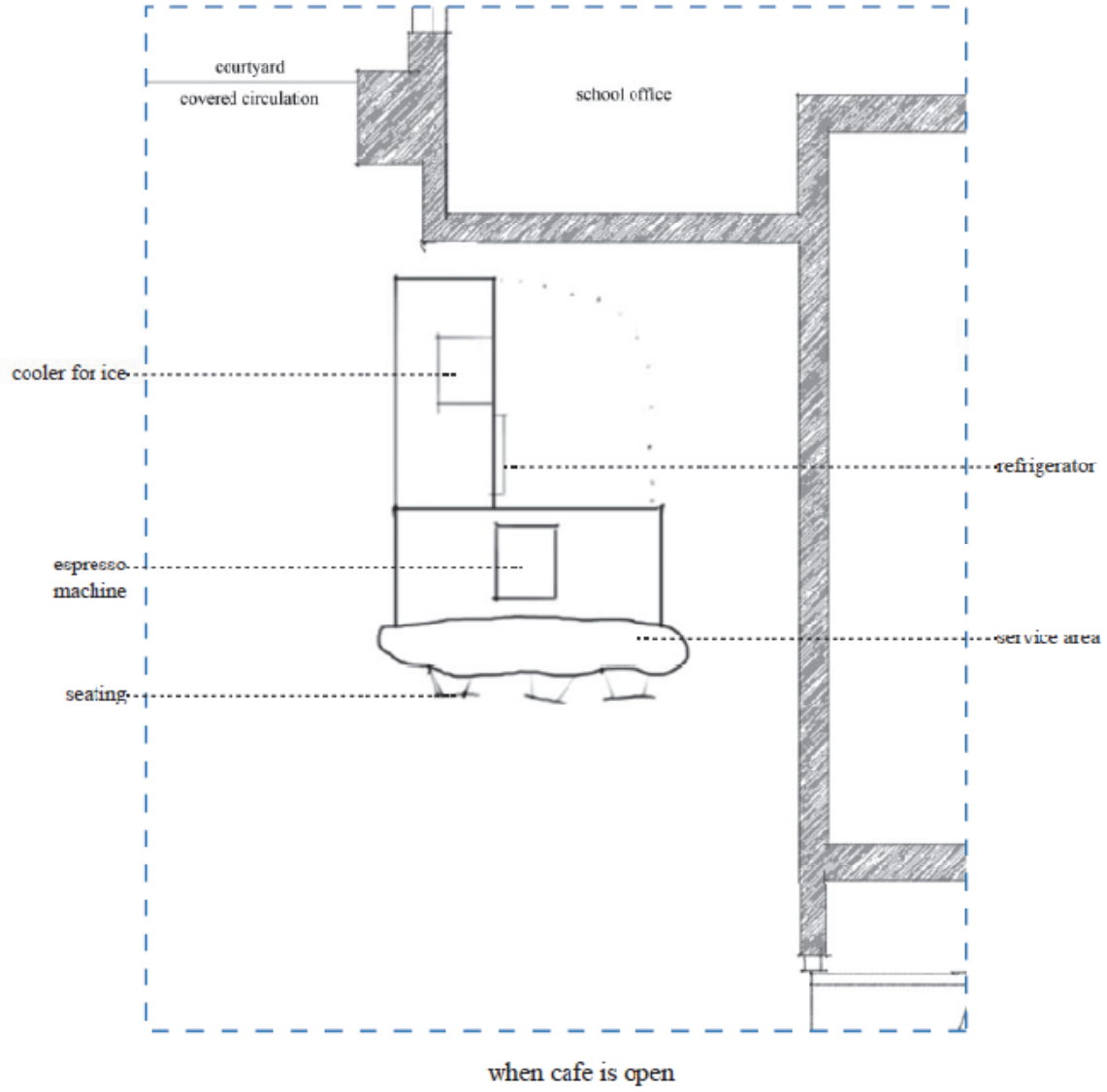


Fig. 195 Scheme 2 (location 1 - mobile cafe)

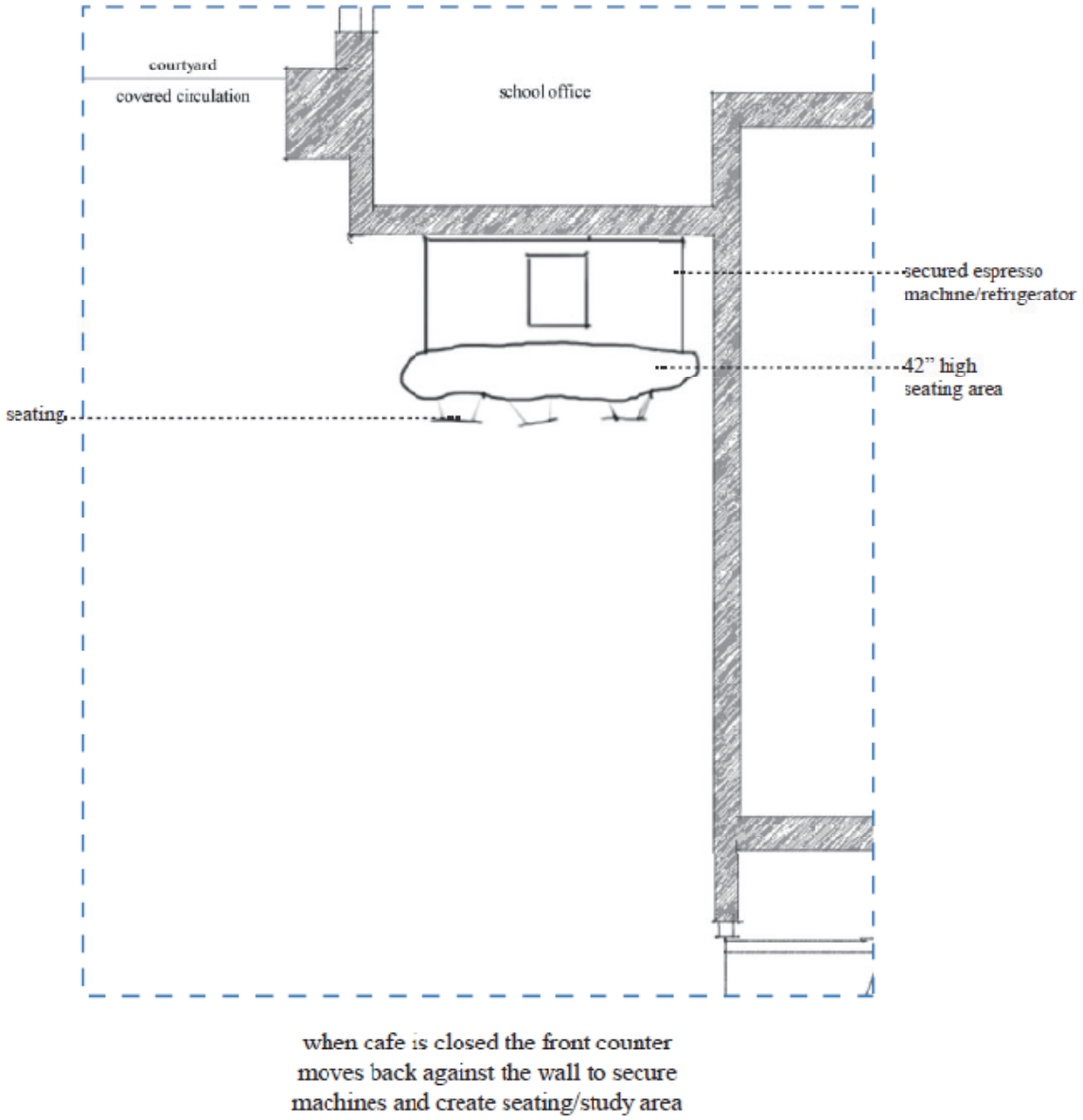
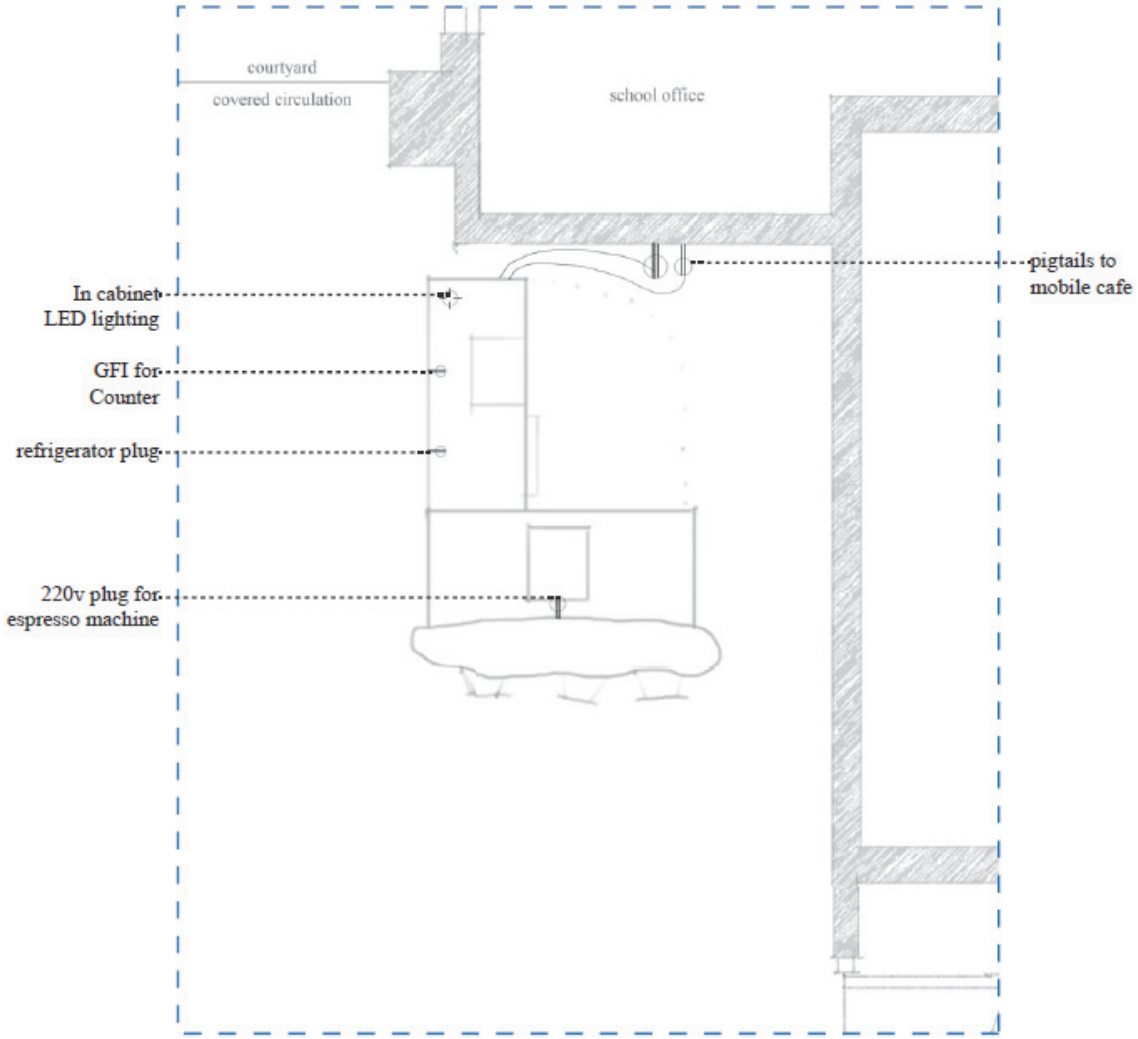


Fig. 196 Scheme 2 (location 1 - mobile café)



Plumbing - *1 machine*

espresso (3/4 water line, drain within 5 ft.)

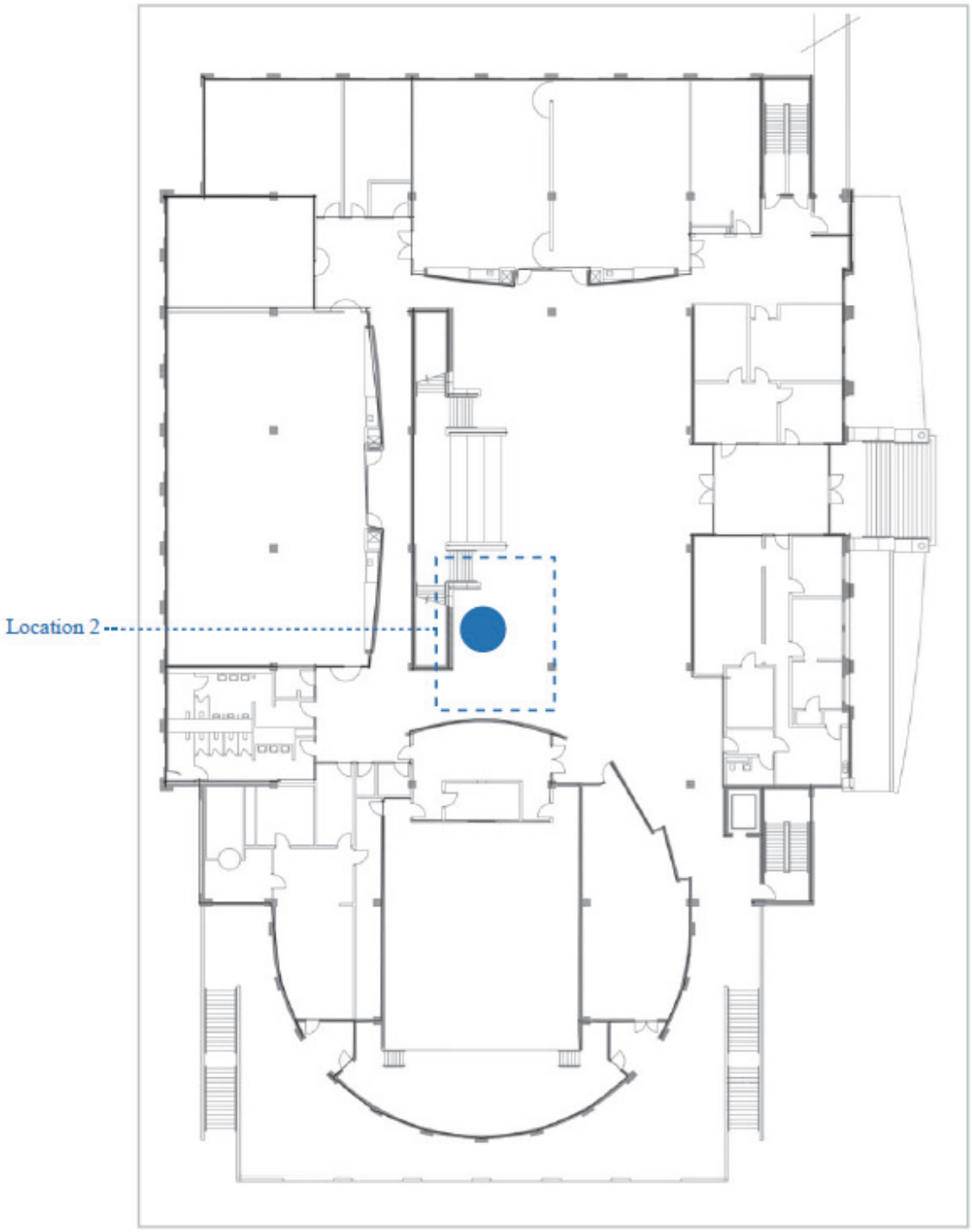
-no water in this location, put 5-gallon water container in cabinet with pump
-no drain in this location, put waste container in cabinet

Electrical - *2 circuits total*

#1: - 1 countertop GFI
- refrigerator 120v plug
- In cabinet LED lighting (may need to better define power needs of these lights)

#2: - espresso 120v or 220v plug (dedicated circuit)

Fig. 197 Scheme 2 (location 1 - mobile cafe)



School of Architecture - Second Floor

Fig. 198 Scheme 3 (location 2 - fixed cafe)

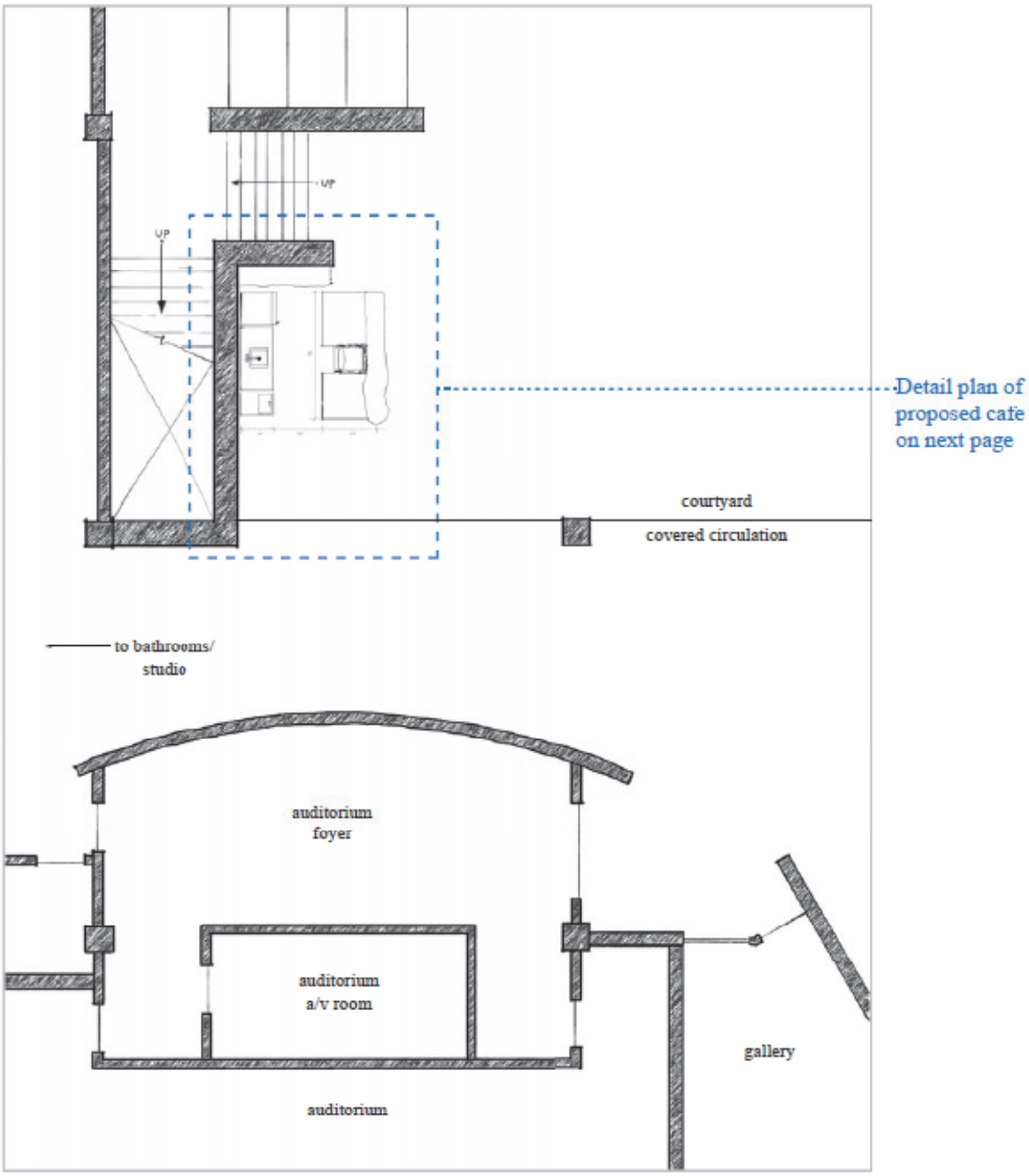


Fig. 199 Scheme 3 (location 2 - fixed cafe)

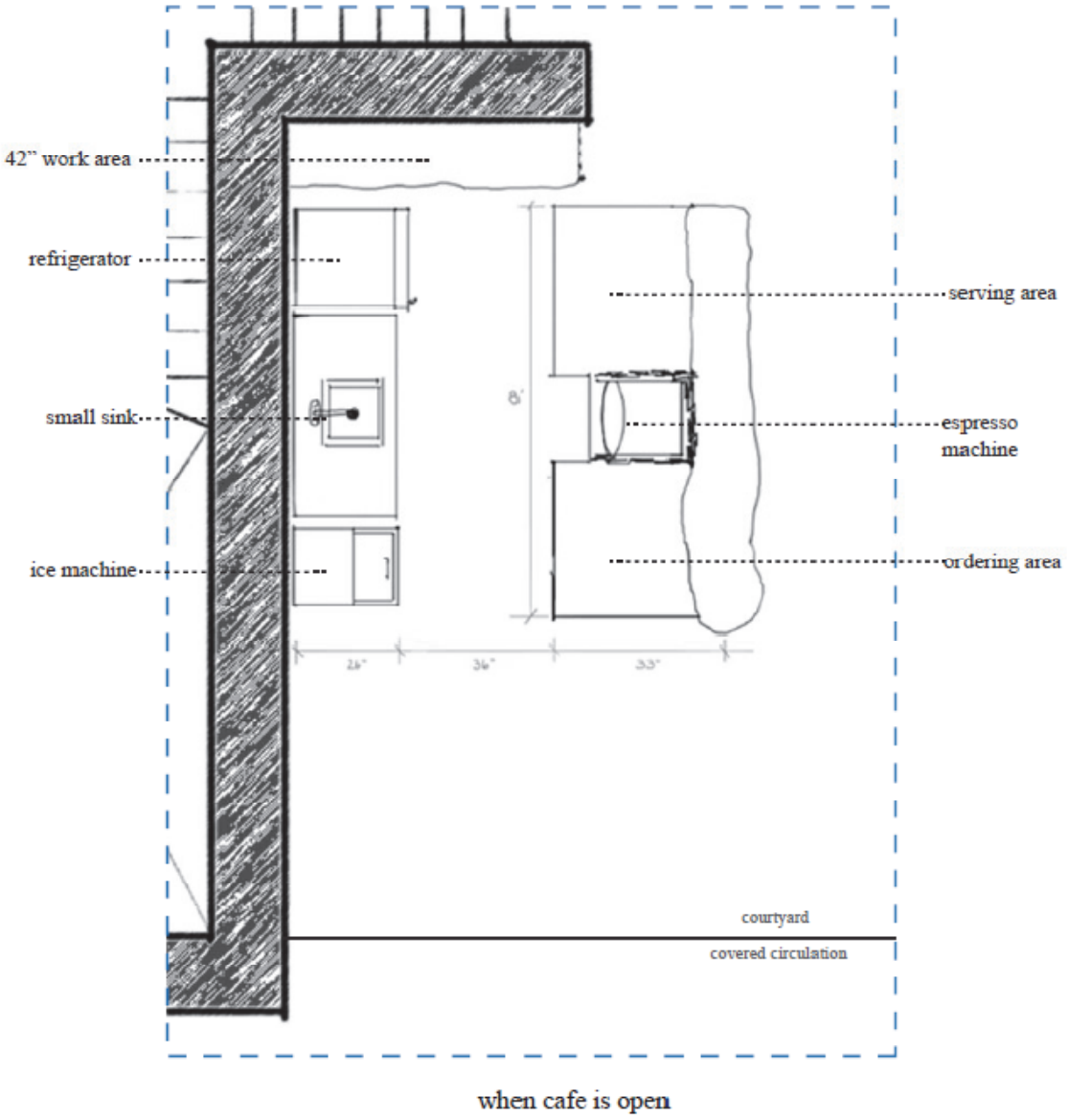


Fig. 200 Scheme 3 (location 2 - fixed cafe)

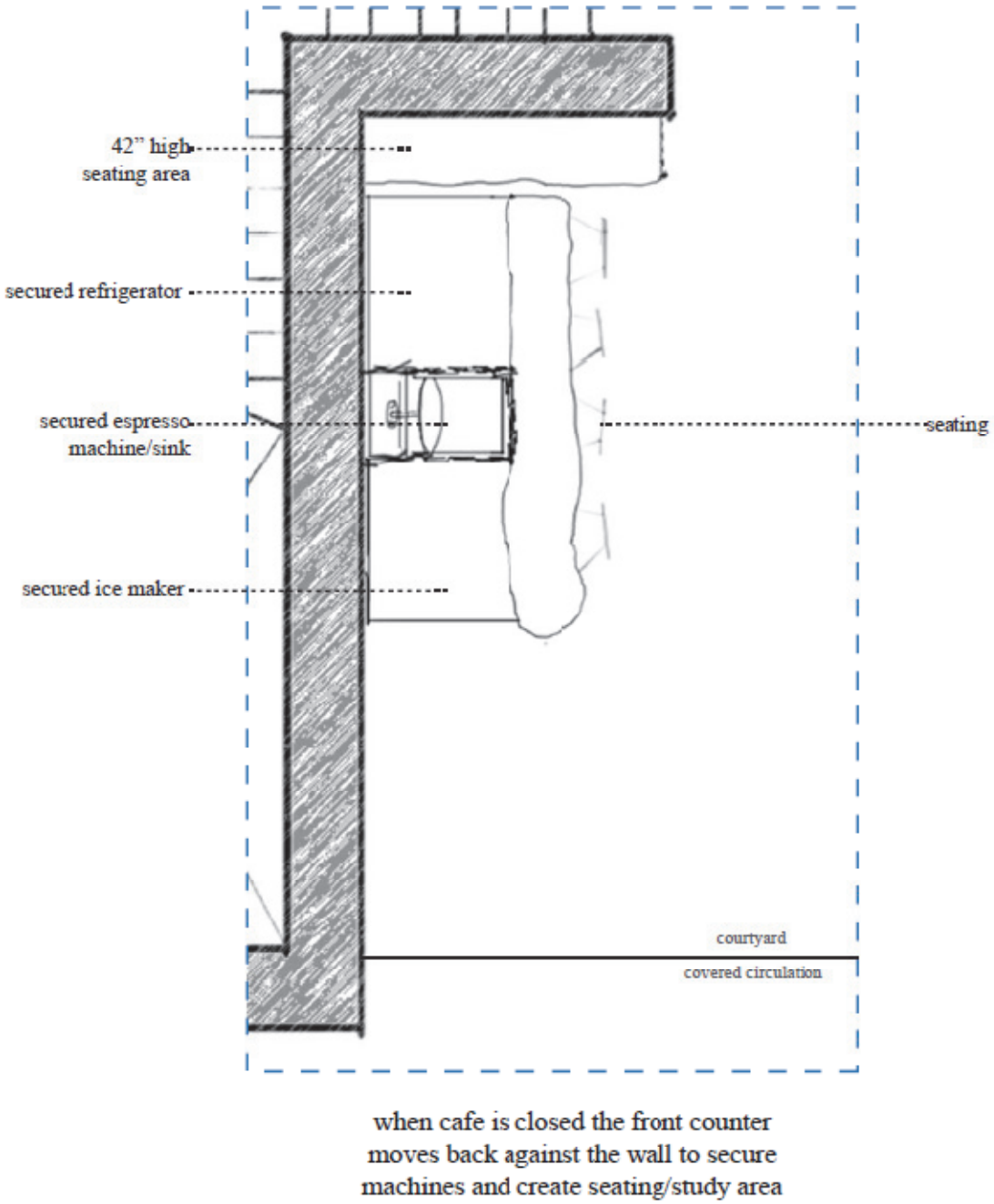
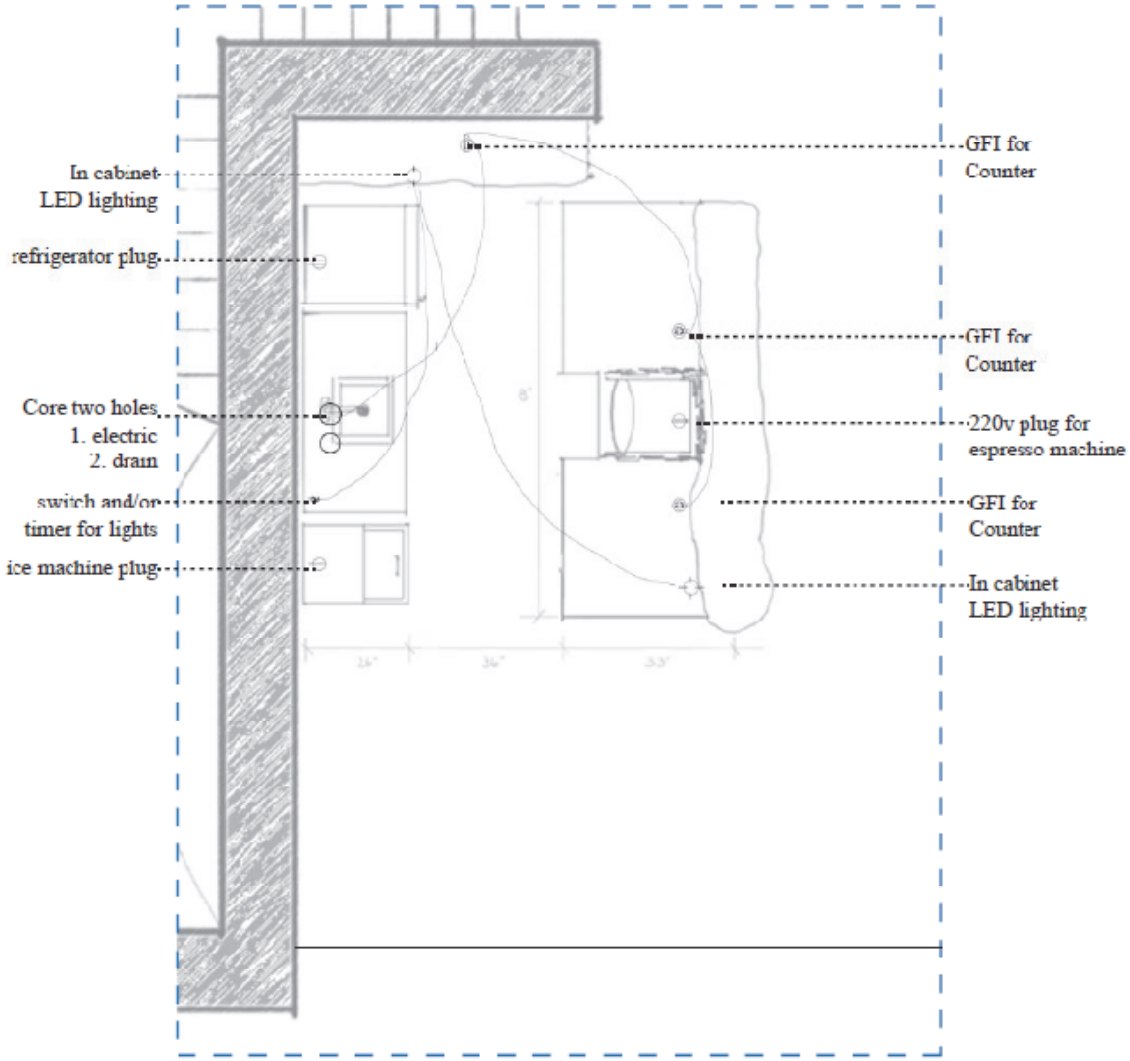


Fig. 201 Scheme 3 (location 2 - fixed cafe)



Plumbing - *3 machines*

sink (have water, need sewage)

ice machine (have water, need drain)

espresso (have water, need drain within 5 ft.)

Electrical *4 circuits*

#1: - 3 to 5 countertop GFIs

#2: - refrigerator 120v plug

3-4 LED lighting areas (may need to better define power needs of these lights)

#3: - ice machine 120v or 220v plug

#4 - espresso 120v or 220v plug

Fig. 202 Scheme 3 (location 2 - fixed cafe)

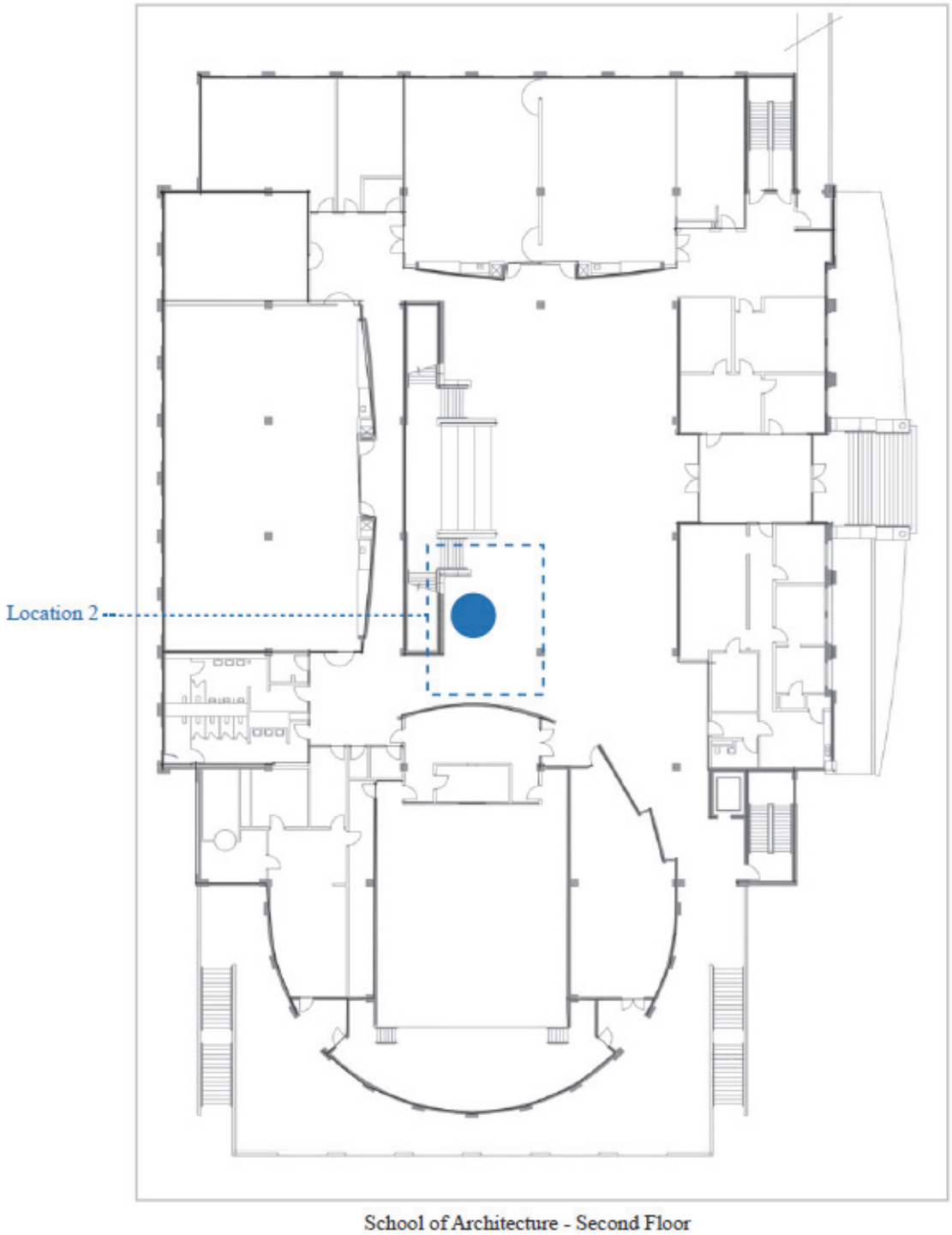


Fig. 203 Scheme 4 (location 2 - mobile cafe)

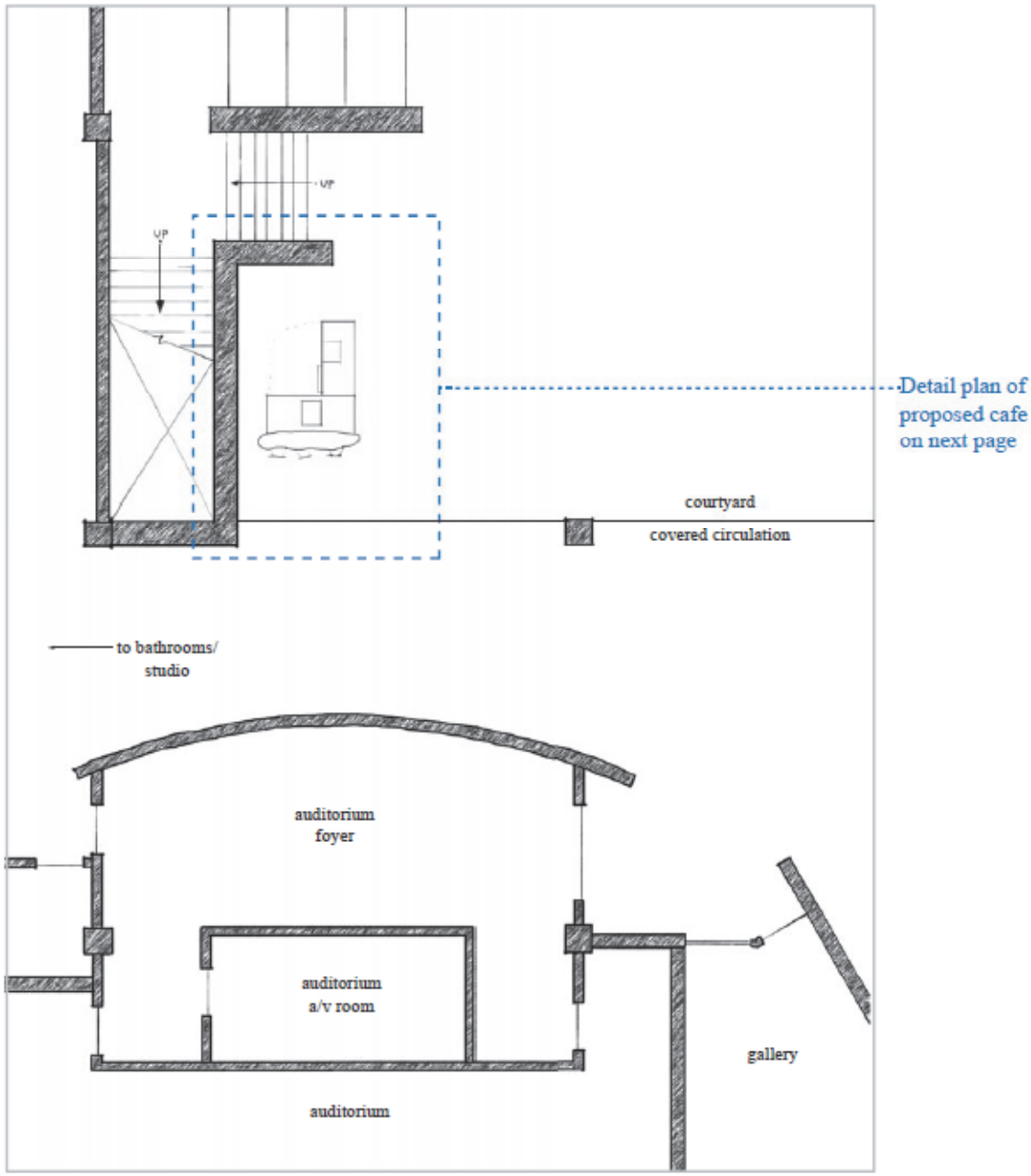


Fig. 204 Scheme 4 (location 2 - mobile cafe)

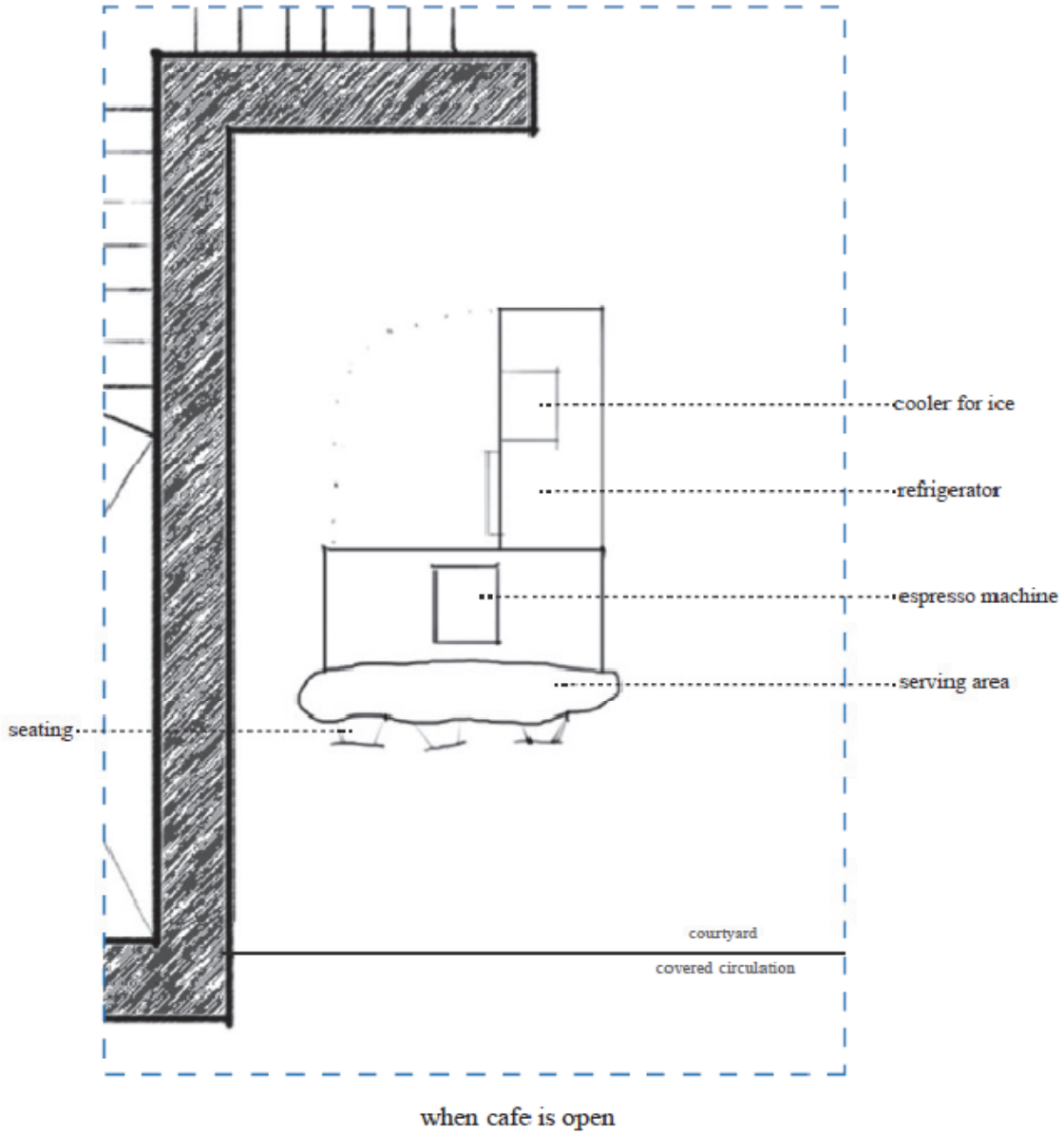


Fig. 205 Scheme 4 (location 2 - mobile cafe)

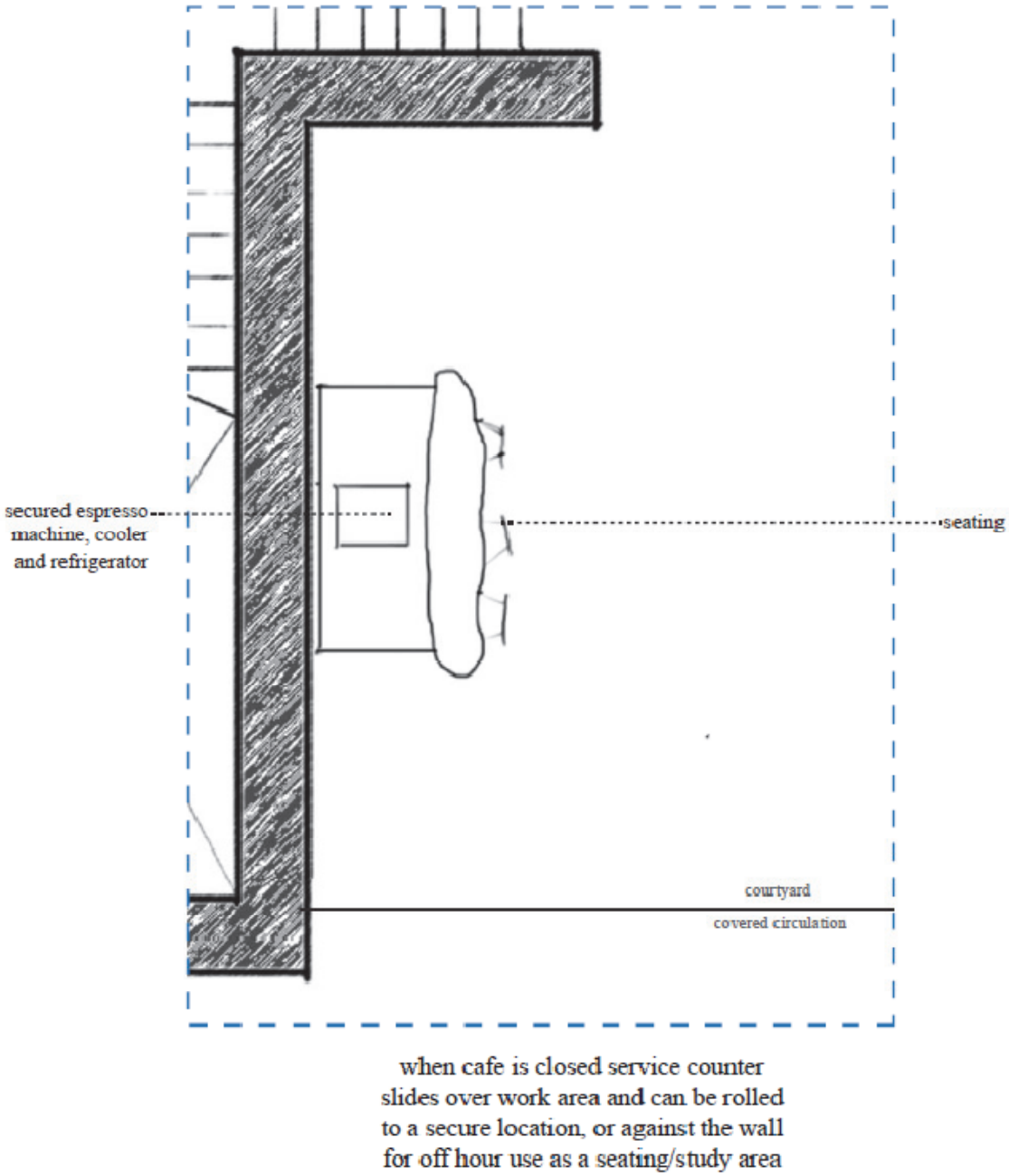
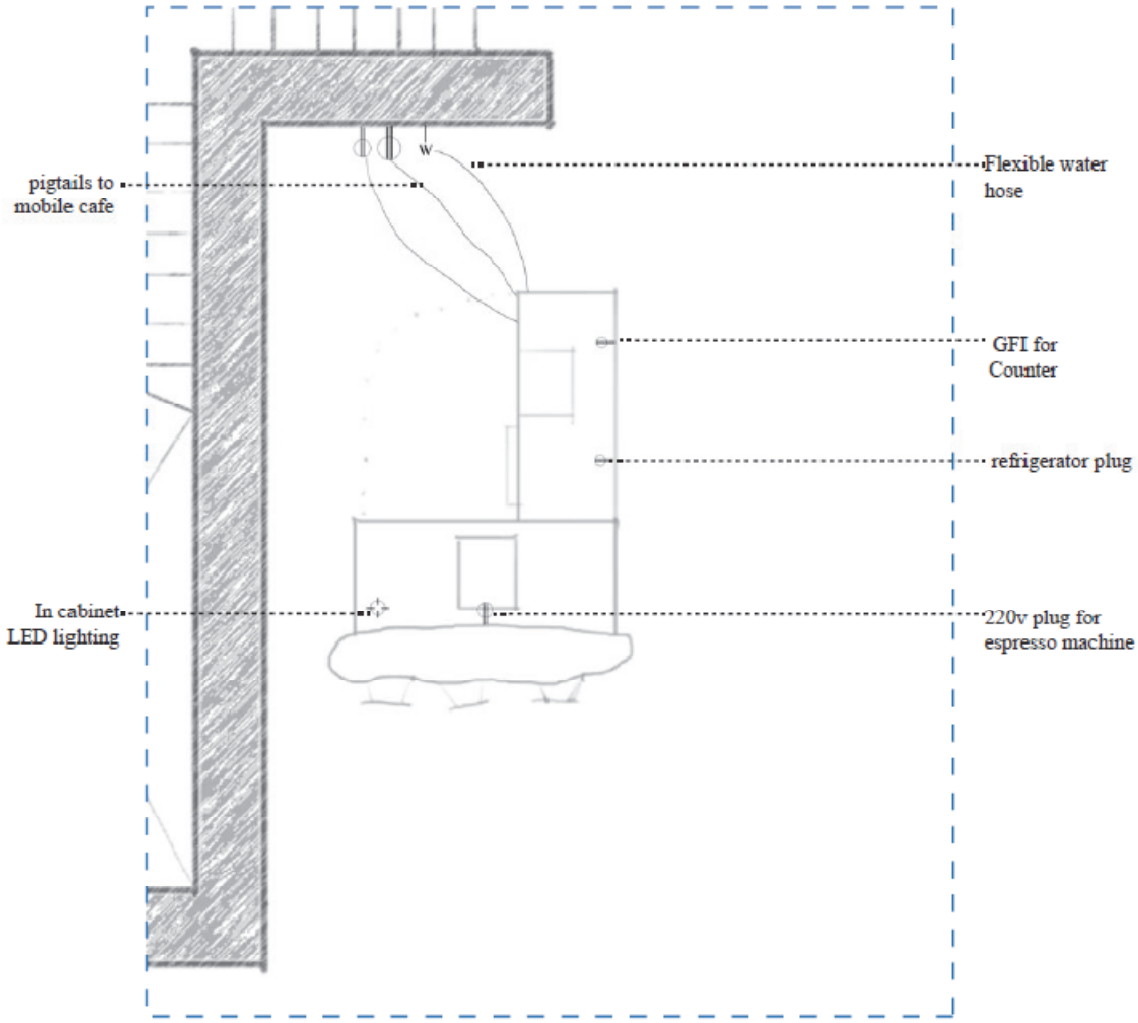


Fig. 206 Scheme 4 (location 2 - mobile cafe)



Plumbing - *1 machine*

espresso (3/4 water line, drain within 5 ft.)

- there is water in this location, run flex hose with quick disconnect
-no drain in this location, put waste container in cabinet

Electrical - *2 circuits total*

#1: - 1 countertop GFI
- refrigerator 120v plug
- In cabinet LED lighting (may need to better define power needs of these lights)

#2: - espresso 120v or 220v plug (dedicated circuit)

Fig. 207 Scheme 4 (location 2 - mobile cafe)

UH Mānoa Soa Café proposal

Pro and Cons of Location 1+2

Location 1

Pros –

- Ideal location for events/lectures (this location is used currently for temporary bar after events)
- Already covered, so additional shade/rain structure doesn't have to be built.
- Will not hinder future plans for courtyard, because it is not located inside the courtyard.
- Centralized location that serves the courtyard and allows for flow and circulation.

Cons –

- No water in this location, water would have to be brought in and waste would need to be dumped daily, or the equipment would need to be permanently tied into plumbing.
- Could cause circulation problems when classes let out of the auditorium (this would only be a problem if the café had a long line and people were standing in the way)

Location 2

Pros –

- Water in this location
- Would help get traffic away from auditorium and out of main circulation area
- Could possibly work well for events/lectures as well (if it were covered)
- Shade/rain structure could be immediate opportunity for a design competition for the students
- Centralized location that serves the courtyard and would allow for flow and circulation

Cons –

- Not covered (a roof structure to provide shade and rain protection is necessary)
- Not ideal for events (assumed)
- Could possibly impose on future courtyard master plan

UH Mānoa Soa Café proposal

Pros and Cons of Fixed vs. Mobile café

Fixed

Pros –

- Allow for future growth, not everything (ice maker and sink) have to be installed immediately.
- AIAS feels that a café will be a permanent addition to the school, and the fixed café would require less labor for daily operation and events
- We are in negotiations to get the espresso machine, sink and ice maker donated by a local restaurant supply company. So the additional machines would only cost for utility work.
- At location 2, water is already there, and the espresso machine can drain into a bucket, so the sink can be cancelled and no additional plumbing would be necessary.
- At location 1 there is not water, so if water is to be brought in, it wouldn't take that much more effort to bring a drain in.

Cons –

- More upfront costs, labor and commitment from the school and advisory council (this would be mitigated in location 2 by phasing the installation of machines and waiting until machines/labor can be donated, in location 1 there is an immediate need for water)

Mobile

Pros –

- Less upfront labor and costs
- Ability to get rid of it easier if the café never gets used
- Ability to move locations (if locations have proper power)

Cons –

- additional power is necessary for the espresso machine, so even if it is "portable" it will have to stay in one location (unless multiple locations are made to accommodate it). It may as well be designed to be in one location.
- A mobile cart has to be mobile. By design it is 'site-less' and although a few locations can be considered as its 'site' it is autonomous. Future growth would mean getting rid of the mobile coffee cart and building something else.
- More labor/cost required for operation (On most mobile carts, this is fulfilled with a 5-8 gallon bucket and a pump, with an additional bucket for the drain. This would mean that ice and water would need to be brought in daily and waste would need to be dumped.)

UH Mānoa Soa Café proposal

Suggestions

Each scheme presents different problems and solutions, but there are similarities in the project that should not distract from the goal of this proposal.

- The power requirements for commercial espresso machines are greater than what is available in any location
- All the café designs will be able to be secured and used when the café is not open
- Not all options are presented, as hybrids solutions of course exist within the possible solutions and phased growth

My recommendation is to go with a fixed café that can evolve as needed if there is growth in the café. The best suited location for this is one that balances the upfront cost with the amount of labor required to run the café.

With regard to a mobile café - eventually a sink and ice maker may be wanted in the café area - if it is not designed to accept these additions, the solution would be to re-design and re-construct, or live with it. The mobile café needs to be small enough to push together and push around. The fixed café has a moveable front counter that secures the machines when the café is not in use.

Considering the analysis of the building and program I believe that scheme 3 (location 2 – fixed café) can offer the most towards to successful completion and future use of this café project. I suggest that it should be built in phases, starting with the minimum program requirements and adding the desired additions as or if they are needed.

Also, this will provide an immediate need for a design competition for the roof of the café. The competition can be held in November 2011 and be built by the students who win over the winter break or in spring 2012.

APPENDIX C

Kiosk Project Schedule: Proposed vs. Reality

Proposed Schedule for deisign+construction of Coffee Kiosk

For meeting on October 20, 2011

Sept. 22 – Oct. 18	Pre-design, program, and material studies (27 days)
Oct. 19 – Oct. 20	Concept sketch, general plan for frame (2 days)
Oct. 20	final proposal meeting with committee (1 day)
Oct. 21	construction starts
Oct. 21 – Oct. 25	Build frame and mill kiawe and bar top (5 days)
Oct. 24	order countertop + canopy with dimension from frame
Oct. 26 – Oct. 29	Put façade together, fabricate plex panels, install panels, Install façade, fabricate plex inserts (4 days)
Oct. 30 – Nov. 1	install counter top and bar top, begin electrical (3 days)
Nov. 2 – Nov. 3	install canopy, install lighting in counter (2 days)
Nov. 3 – Nov. 6	install machines, finish electrical, move to location, get supplies (4 days)
Nov. 7	test operations
Nov. 8 – Nov. 10	make minor adjustments if needed
Nov. 10 – Nov. 15	finalize documentation

Actual Schedule for deisign+construction of Coffee Kiosk

For meeting on November 15, 2011

Sept. 22 – Oct. 18	Pre-design, program, and material studies (27 days)
Oct. 19 – Oct. 20	Concept sketch, general plan for frame (2 days)
Oct. 20	final proposal meeting with committee (1 day)
Oct. 21	construction starts
Friday, Oct. 21	wood milling progresses slowly, ¼ of wood rough cut on ban saw
Saturday, Oct 22	top and bottom of frame welded, modified for fridge to fit. Wood milling slows to a stop, burned through 2-blades and tire came off
Sunday, Oct 23	Frame is finished, and thoroughly tested. New blade and tire for ban saw prove that the ban saw is underpowered and cannot finish the job. Called a friend with a bigger ban saw in a different shop. Also discussed and tested backlit wood detail with wood that was cut.
Monday, Oct. 24	Monday, continued to cut wood on terrible ban saw. Frustration sets in. paining welds on frame with galvanized paint.
Tuesday, Oct. 25	materials for rods were prepped and discussed. Recoated frame and ordered countertop. Thinking about canopy design. (behind proposed schedule with wood)
Wednesday, Oct. 26	Went to new shop with better ban saw, cut the rest of the wood. (one day behind proposed schedule)
Thursday, Oct. 27	Installed rods for connection between wood and frame. Continued to mill wood: riped, joined, planed, debarked and sand 150 pieces of the hardest wood I have ever seen. Coated rod welds with galvanized paint. (two days behind proposed schedule)
Friday, Oct. 28	Same day, no sleep. Continued to mill wood, recoated welds. (3 days behind proposed schedule)
Saturday, Oct. 29	Install wood: choose placement, cut, drill holes, place. Number and remove all wood. Finish sand and lacquer (two coats), it was a late night

Sunday, Oct. 30	Two more coats of lacquer on kiawe pieces through the day. Cut, sand and lacquer bar top. Install wood/plex at night
Monday, Oct. 31	Begin wiring LED panels. Picked up countertop.
Tuesday, Nov. 1	continue wiring and soldering over 600 LED connections. Got some supplies for fabricating sinks.
Wednesday, Nov. 2	cut out for sinks, began to discuss plan for canopy. Finished wiring LEDs, (catching up, only 1 day behind proposed schedule now)
Thursday, Nov. 3	installed LED panels, began electrical, plumbing. Got supplies for canopies
Friday, Nov. 4	continued on electrical and plumbing. Prepped for panel construction.
Saturday, Nov. 5	Installed machines, began canopy construction. Continued with electrical/plumbing.
Sunday, Nov. 6	finished canopy to be painted. Finished electrical/plumbing, cart ready to be installed at school. Began to finish writing thesis, culture shock…coming back to writing after being in the field for what felt like months. (back on schedule besides canopy, made a choice to wait for next weekend to install)
Monday, Nov. 7	Continued to work on thesis (documentation), coated panels again
Tuesday, Nov. 8	finished thesis document, coated panels again.
Wednesday, Nov. 9	Work on presentation and wired switches for lighting. Rivet panels, ready to be installed
Nov. 10 – Nov. 11	Worked on presentation, and got much needed rest, finish some minor details
Saturday, Nov. 12	Install canopy and kiosk
Sunday, Nov. 13	test operations, make minor adjustments with contractor and someone who knew how to operate the espresso machine
Monday, Nov. 14	test drink recipes and plan presentation with barista
Tuesday, Nov. 15	passed Final Defense!

CREDITS

I would first like to acknowledge my parents, David Bruce and Gilee Ann Larson, first of all, for having me, but also: without your unyielding help, love, guidance, encouragement, and support, I would not have had the freedom to pursue this journey with all of my heart. Thank you.

David Boney, you gave me your heart for building and encouraged me to pursue architecture. You are my father in many ways, and I now know why I started this journey. You, Mama and Papa were all feeding me the words to finish this thesis. Thank you.

Jeremiah Gruenberg and Tony Potter, because you took the time to get me through the initial shock of writing this massive thesis, and clarified the idea of unity between the architect and contractor, not to mention the help with editing! Thank you.

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My committee, need I say why? For committing to a work with me till the end. For trying to correct my stream of consciousness, graciously sitting for presentations where I had nothing to present, and way more that I would rather not discuss, ever. Thank you.

Janice Shon for getting my back, I will always be your friend. Kalani Pahoa, Peru brought us together, I am so lucky to have you in my life. Everyone who has been with me since day one (even the ones that did not make it, you know who you are). It has been…interesting. Thank you.

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James Murray for always being my brother, friend, and contractor without reservations (sometimes against your better judgment). Uriah Bagley, I honestly could not have completed this project without you. Thank you both for committing without knowing what you were getting into, and freely giving your time, energy, and talent without expecting anything in return.

Luis Longhi, for opening your house, heart, and life to me – helping me fall in love with her – usted es mi papá. Byoungsoo Cho, for allowing me the opportunity to study and 'be around.' I submit this thesis as merely a glimpse into both your processes and lives. The fine things that detain the passersby fade away – they have no hold on the eternal. I am humbled and grateful for the opportunities you have both given me. Thank you.

To all my family and friends who I could never forget, and will always love, if you were disappointed that your name is not in here, please let me know and I will write a page about all the ways you have personally helped me become who I am today. I would not be here without you. Thank you.

LIST OF ILLUSTRATIONS

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