architectural efficiency

designing with user productivity in mind

[Architectural Efficiency: Designing With User Productivity In Mind]

A Design Thesis Submitted to the
Department of Architecure and Landscape Architecture
of North Dakota State Univerisity

By

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for the Degree of
Masters of Architecture

Primary Thesis Advisor

Thesis Committee Chair

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“ Productivity is never an accident. It is always the result of a commitment to excelence, intellignet planning, and focused effort.”

- Paul J. Meyer
  American Entrepeneur & Author

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figure 0 still pots

[thesis abstract]

Workplace productivity is important to the success and operation of any business. If a business can maximize its productivity, it is more likely to succeed and grow. This is especially true in the restaurant and manufacturing industries. My thesis explores the relationship between architectural design and productivity in the setting of a distillery and restaurant located in the town of Golden, Colorado. The layout of my design aims maximizes productivity by creating work areas and service areas that provide employees with the necessary goods and tools to complete their tasks and satisfy customers.

figure 1 london distillery company

[theoretical narrative]

As architects our job is to design spaces in such a way that every detail is meticulously thought out. We must thoroughly plan and design buildings as to avoid problems that could occur when the time for construction rolls around. We design buildings so that every room and space works together to create a unified architecture. However there are a few details we can sometimes overlook depending on the end use of the building. The main being how users of the space flow from room to room while completing whatever task that they need to, in other words; work flow, more specifically workplace productivity.

Workplace productivity may not matter as much in spaces like museums, churches, and schools; where the bulk of the users are not creating goods or carrying out service related tasks. Where it is important is in the manufacturing and restaurant industry; where the employees' main goal is to create goods or provide a service in a timely and efficient manner.

My thesis aims to answer the question; "what design techniques can be implemented to increase workplace productivity?" The building typology I am examining this question through is a distillery and restaurant located in golden, Colorado. I plan on researching and exploring the spatial relationship between the user and the space they are interacting with. I will look at case studies of successful distilleries and restaurants and explore their successes and what could be done to improve on their notable design. My research will include a study on employee traffic patterns in manufacturing operations, and an in-depth look into the timeless art of whiskey and spirit distillation.

Through my research and exploration I hope to gain a better sense of how architecture can establish productive spaces. I also hope to develop more questions concerning productivity during this project, which in turn will allow me a greater understanding of design as a whole.

[typology]

whiskey distillery

unifying idea

a space that incorporates efficient workspace design ideas to maximize employee productivity while still achieving maximum product quality and interaction with visiting customers.

tasting room

need

over the past 10 years the market for high quality, craft whiskeys has exploded. the gross sales for whiskeys in 2002 was around $400 million, by 2013 it exceeded $1 billion (esquire, 2014). As a result of increased sales, the supply of high quality whiskeys has started to dwindle. by maximizing distillery productivity, demands can be more easily met.

restaurant

justification

the process for creating whiskey is notoriously lengthy, both in the steps that need to be taken, but also in time. The aging process starts at a minimum of 3 years and has no maximum. while there is no way to make whiskey age faster, there are ways to maximize the pre-aging production by intelligent space planning that allows employees to work as efficiently as possible.

figure 2 barrel testing

[typology research]

figure 3 westland lobby

case study 1 : westland distillery. seattle, washington

figure 4 exterior 1

case study 2 : mackmyra gravity distillery . gävle, sweden

figure 5 lolo table

case study 3 : lolo american kitchen. stillwater, minnesota

[westland distillery . seattle, wa]

figure 6 westland tasting room

figure 7 westland fermentation room

architect:	urbanadd
typology:	distillery
size:	14,000sq.ft
year:	2013

introduction & discription:

"this adaptive reuse of a timber warehouse structure, built in 1914 and originally used for manufacturing cranes by seattle's ederer crane company, is the new home of westland distillery. the design team focused on weaving the guest tour experience seamlessly into the fermenting and distillation processes, offering guests a unique perspective on the time-honored art of making whiskey."

- mark ward, principle at urbanadd

"Behind an elegant yet raw tasting bar and whiskey library, the facility houses a 6,000-liter mash house and a world-class still room comprised of a 7,560-liter wash still and a 5,670-liter spirit still. The barrel room holds upwards of 100 barrels waiting to be filled and aged in Westland's Rackhouse on the Olympic Peninsula. Staff offices are located on the mezzanine, above a state-of-the-art climate-controlled QC lab. Materials such as reclaimed, rough-hewn timber and raw steel were utilized to respect the owners' family history in the logging industry and to recall the existing warehouse timber structure" (archdaily, 2014)

r e s e a r c h f i n d i n g s

c o m m o n : this project features all the parts necessary for a distillery to operate. it includes the mash house, still house, wash still, barrel room, bottling machinery and a quality control laboratory. the spaces are laid out in a way that allows employees to move through them easily.

u n c o m m o n: the thing that sets westland apart from most traditional distilleries is that the layout of the public spaces (for visitors) flows nicely into the production area. most distilleries either separate their retail space from the production spaces or they don't open their doors for tours.

a r c h i t e c t u r a l i n f o r m a t i o n:

s t r u c t u r e : timber frame post and beam with brick interior and exterior walls

n a t u r a l l i g h t : natural light only enters the space through the front facade of the building. the production spaces use exclusively artificial light

m a s s i n g : massing consists of a singular large rectangle. the project was a renovation of an existing historic building

c i r c u l a t i o n s p a c e : circulation is very open throughout the building. in the public areas there are large doors to help maximize flow the same can be said about production areas. this allows employees maximum space to complete their tasks.

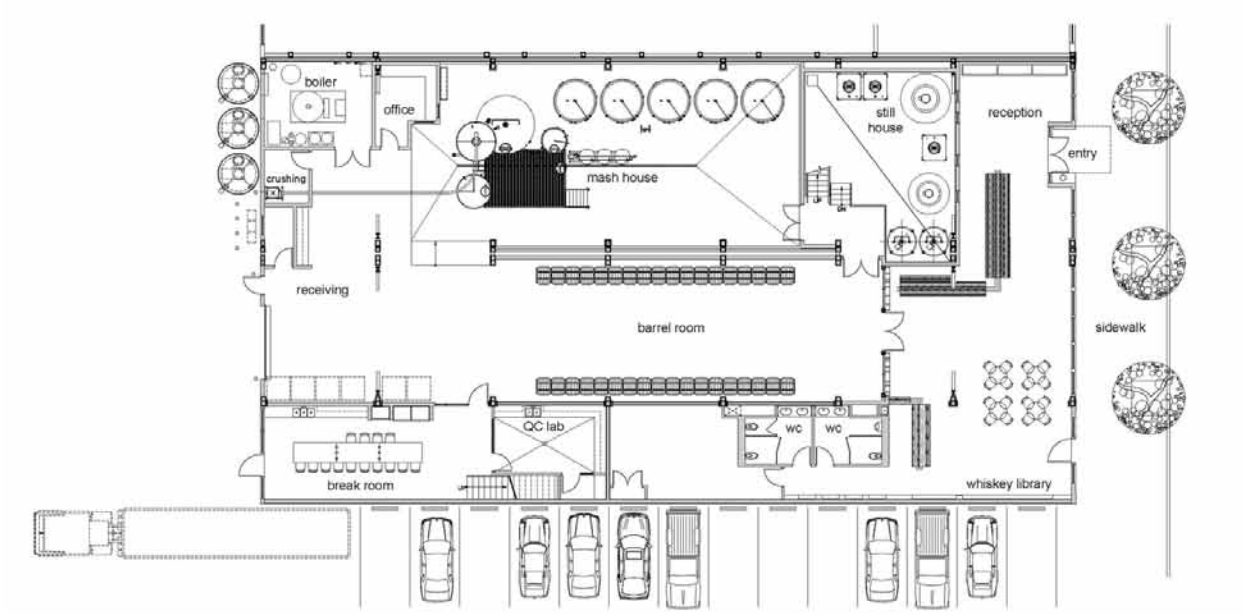


figure 8 westland floor plan

g e o m e t r y : the interior geometry was designed with production in mind. there are no sharp corners that create unusable spaces.

h i e r a r c h y : the production area has been given the highest level of importance. this is because its the space the produces the goods that the company profits off of. following the production space is the visitor reception and tasting room. this room while at the front of the building is not as important as the production area.

r e s p o n s e t o t h e s i t e : since the building is located in commerical area, the surrounding area is completely hard surface. that being said the exterior finishes of colored metal fit in with the surrounding buildings.

case study conclusion

after examining all of the design elements like the open floor plan of the production area and the integration of the visitor area into the disitillation process, i have a better understanding of the layout of a small distillery that still provides a connection with visitors. the westland distillery has given me great insight into a compact distillery that still provides employees with ample workspace and still connects the public into the distillation process.

figure 9 westland exterior

[mackmyra gravity distillery.gävle, sweden]

figure 10 mackmyra exterior

architect:	tea
typology:	distillery
size:	16,000sq.ft
year:	2011

introduction & discription:

“Mackmyra Svensk Whisky’s new distillery just outside of Gävle was inaugurated in December 2011. It’s an industrial building designed around the production process but with the visitors in mind. Here you will be able to follow the production, which is led by gravity, from milling and mashing the malt at the top to the distillation and filling of the casks at the bottom” (archdaily, 2012).

“The goal of the design has been to give the building a unique character, based on the unusual contents, which can support Mackmyra’s identity and convey their mix of playfulness, craftsmanship and good quality production. The exterior malt silos and elevator are wrapped in a lightweight steel structure that embraces a precast concrete volume. The building opens up via a glass facade, exposing the processes inside towards what will be the square of the Whisky Village and future expansions. The glass façade leans forward making it both more transparent from the ground and effectively screens off solar heat radiation, while responding to the variable space requirements of the inside” (archdaily, 2012).

r e s e a r c h f i n d i n g s

c o m m o n : this distillery shares the same basic equipment as the westland distillery in seattle, washington. it also has a strong connection between the production space and the visitor areas.

u n c o m m o n: while the mackmyra distillery may have the same basic equipment as other distilleries, that is where the similarities end. the mackmyra distillery uses the idea of gravity in its design. the distillation process starts at the top floor and finishes on the bottom floor with the bottling of the whiskey. it is a very innovative way of planning a distillery, the design allows the production areas to be stacked and in turn reduce the footprint of the building.

a r c h i t e c t u r a l i n f o r m a t i o n:

s t r u c t u r e : the mackmyra distillery is made up of site-cast concrete and steel beams and columns. the exterior and interior walls are concrete, while the floor is made up of either galvanized steel grates or concrete.

n a t u r a l l i g h t : the building has a massive glass wall that lets in ample amounts of natural light. it is also pitched forward to help reduce solar radiation. (figure 14)

m a s s i n g : the massing of the building consists of two large rectangles. one standing vertically while the other protrudes at a slight angle out of the veritcal mass. this creates the sloped glass wall.

c i r c u l a t i o n s p a c e :

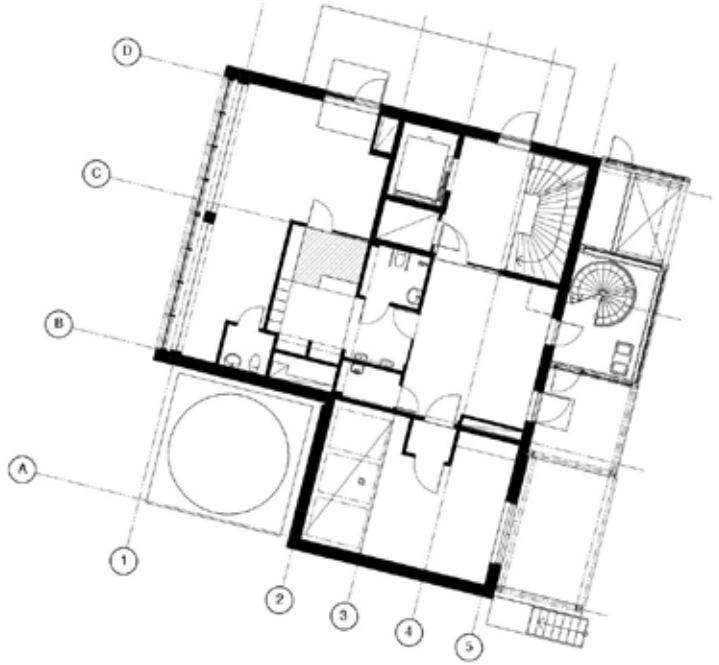


figure 11 lower levels plan

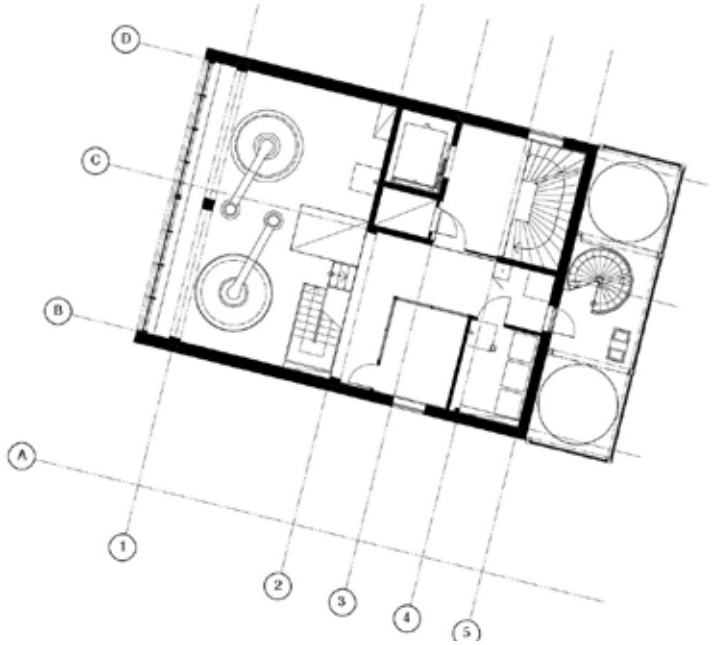


figure 12 upper levels plan

c i r c u l a t i o n s p a c e : the mackmyra distillery relies almost exclusively on vertical circulation to move employees and visitor from floor to floor. once on the desired floor the layout is fairly open, allowing easy access to the distillation equipment.

g e o m e t r y : the exterior of the building is rectilinear in its design. it features grid patterns on the windows and the stamped concrete. it use primarily right angles to create boxes within the interior.

h i e r a r c h y : the hierarchy of spaces starts from the top and works its way down, it goes downward from floor to floor in the same way that materials move downward towads completion.

r e s p o n s e t o t h e s i t e : the mackmyra distillery is the first building built on to a site which will hold what the company calls a whiskey village. the whiskey village will house multiple buildings including restaurants and entertainment spaces. i believe that the building draws its tall linear shape form the tall pine trees that are abundant to the site. the relatively small footprint minimized the removal of existing trees. the design, while stark in comparison to the natural surrounding landscape, actually feels like it belongs where it was built.

c a s e s t u d y c o n c l u s i o n : after studying the vertical circulation and vastly different method of distilling i have new knowledge of distillation process along with how easily employees move throughout the space. they start their day at the top of the building and work downward after completing each step of the distillation process. that sort of work flow is something that could be introduced into my design.

figure 13 natural light

[lolo american kitchen . stillwater, mn]

figure 14 lolo interior

architect:	haf group
typology:	restaurant
size:	1850sq.ft
year:	2014

introduction & discription:

lolo is located on main street of downtown stillwater minnesota. the restaurant occupies the lower level of what appears to be a historic downtown building. however, looks can be deceiving. the building was actually constructed in 2013 but is designed to fit within the cities renaissance zone.

the atmosphere of lolo is lively and busy. their are two bar tops, one over looking the food prep area and the other in front of the actual bar. there are small tables and a few booths that line the north wall of the restaurant. the lay out is compact in order to fit as many customers as possible but at the same time providing an efficient layout for customers and wait staff to navigate.

i chose to research lolo as a case study for one simple reason; it is constantly busy. they clearly have a system down that satisfies customers and keeps them coming back.

r e s e a r c h f i n d i n g s

c o m m o n : lolo shares similarities to the fargo restaurant jl beers. they are both particularly narrow buildings, while lolo seats more people the atmosphere is similar. lolo features and open kitchen attached to a food prep and storage area. guests can watch their meal being prepared from start to finish.

u n c o m m o n: lolo is unique in the fact that it fits so many people into fairly small space without compromising comfort and efficiency. the space is laid out so that the wait staff have minimal distance to travel from the kitchen to the tables. the tall ceilings open up the space and make it feel larger than it actually is.

a r c h i t e c t u r a l i n f o r m a t i o n:

s t r u c t u r e : steel post and beam with masonry front and side walls.

n a t u r a l l i g h t : the front entrance to lolo is made of storefront glazing, which provides ample natural light to the front half of the restaurant.

m a s s i n g : like the westland distillery lolo is made one of one large rectangular mass. this allows it to blend in with the historic downtown facade.

c i r c u l a t i o n s p a c e : the circulation space of lolo is linear. it moves from the entrance facing main street to the rear exit on the ally behind the building. restrooms are located on the path to the rear exit. it is a easy space to navigate and allows for efficient movement of people.

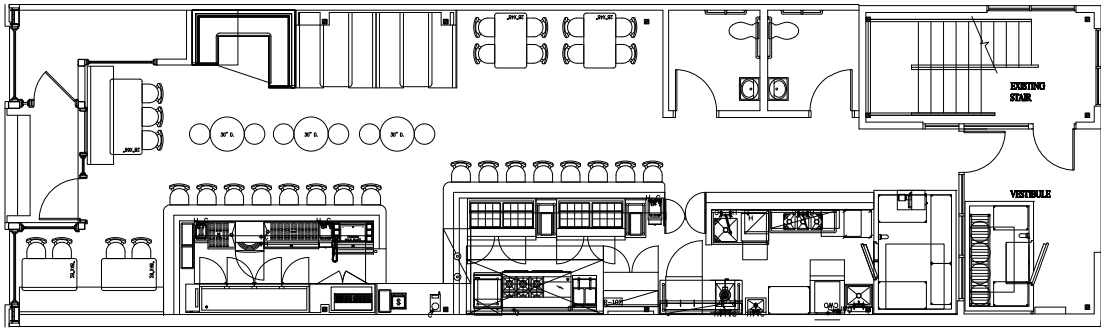


figure 15 lolo floor plan

g e o m e t r y : the geometry of lolo is rectilinear and linear. all of the separate service areas are rectangularly shaped and set against the south wall. this leaves the majority of the floor open for seating.

h i e r a r c h y : all of the spaces with the exception of the restrooms and cold storage share the same level of importance. the idea behind lolo was to create a space that ties the dinning area and kitchen into one cohesive space.

r e s p o n s e t o t h e s i t e : as stated earlier, lolo falls within the downtown stillwater renaissance zone. the mandated that the design follow the same style as the buildings surrounding it. the result is a restaurant that appears as if it was a historic reuse project.

c a s e s t u d y c o n c l u s i o n : my exploration of lolo has showed me how to effectively condense a design into a limited amount of space while still allowing space for customers and employees to efficiently move through out the restaurant. i plan to include layout choices from lolo into my design process.

[typological summary & case study series]

westland distillery

this project showed me how a simple spatial layout for distillation rooms can allow employees enough space to complete their tasks in a timely manner. the spaces in the westland distillery we scaled proportionate to the size of the operation being run. i plan incorporating the simplified layout ideas that westland has in place into my design and plan on continuing research on how simplification of spaces can ultimately lead to increased efficiency.

mackmyra distillery

the mackmyra distillery demonstrated to me how a non-typical layout for a distillery can actually function. with their use of vertical circulation from stage to stage of the distillation process, it demonstrated that the layout of a distillery is not fixed in tradition, and can in fact evolve. the vertical circulation also proved to be an efficient way of working. employees start form the top and work downward as they complete each step of the process, letting gravity assist in their work.

lolo american kitchen

the simple linear layout at lolo american kitchen showed me how to maximize efficiency in a space limited by size. the idea of a single circulation space that runs form the front to the rear of the building demonstrates that simplicity has a place in efficient work flow. there is no need to create complicated circulation patterns, their complexity will end up slowing down the user and minimizing they overall productivity

figure 16 scotch bottles

i plan on using all of the information and research from these three case studies and putting it to use in my design program. the westland and mackmyra distilleries taught me more about the variety of layouts that can be used in the placement of distillation equipment along with the steps that go into creating whiskies and spirits. lolo american kitchen showed me that linear circulation paths provide ample room to move through a small space while still allowing for maximum circulation

figure 17 scotch glass

[major project elements]

parking :

the site will feature two separate parking lots. one for employees located to the rear of the building, and one for customers adjacent to the front façade.

reception area:

the space where guests will be greeted by hosts and hostesses. it will also provide seating for guests waiting for tables or tours to begin.

dining rooms :

dinning space for costumers

restrooms:

the building will feature separate bathrooms for employees and customers.

kitchen space & food prep:

a space where employees can quickly and efficiently cook and prepare meals for guests.

cold storage:

refrigerated storage for perishable food used in the kitchen.

t a s t i n g r o o m & w h i s k e y l i b r a r y :

a space where guests can try and sample the various spirits that are being distilled. t office space for the owner to conduct business. he space will also double as an event venue that can be rented out for private parties

o f f i c e s p a c e :

office space for the owner to conduct business.

b r e a k r o o m :

the break room will provide a space where employees can relax and rest between processes.

g r a i n & r a w m a t e r i a l s t o r a g e :

humidity and temperature controlled area for storing grains and the other raw materials that are used in the distillation and fermentation process.

m a s h h o u s e :

this space contains grain processing equipment and the mash pots. this is where the grains are ground down to form “grist” and then added to hot water in order to convert the starches in to sugar for the fermentation process. this liquid is called “wort” (distiller).

f e r m e n t a t i o n r o o m :

this space houses the fermentation tanks. the wort is transferred to fermentation tanks where the wort will be mixed with yeast. the yeast breaks down the sugary wort and starts producing alcohol. after 2-3 days the wort has been transformed into a low abv (alcohol by volume) liquid. this is now referred to as the “wash” (distiller).

s t i l l h o u s e :

this space contains two different types of stills. a still is where the wash is heated and the alcohol is separated into the form of a vapor. this vapor is collected and cooled to make the final product. ahe two types of stills are pot stills and column stills (distiller). see figure for description.

b a r r e l s t o r a g e :

this room is essential to the whiskey making process. this room will be humidity and temperature controlled to help with consistency of flavor. this will also be the largest space, as to hold a very large number of barrels.

q u a l i t y c o n t r o l l a b :

this room will be used for testing the various spirits that have been produced.

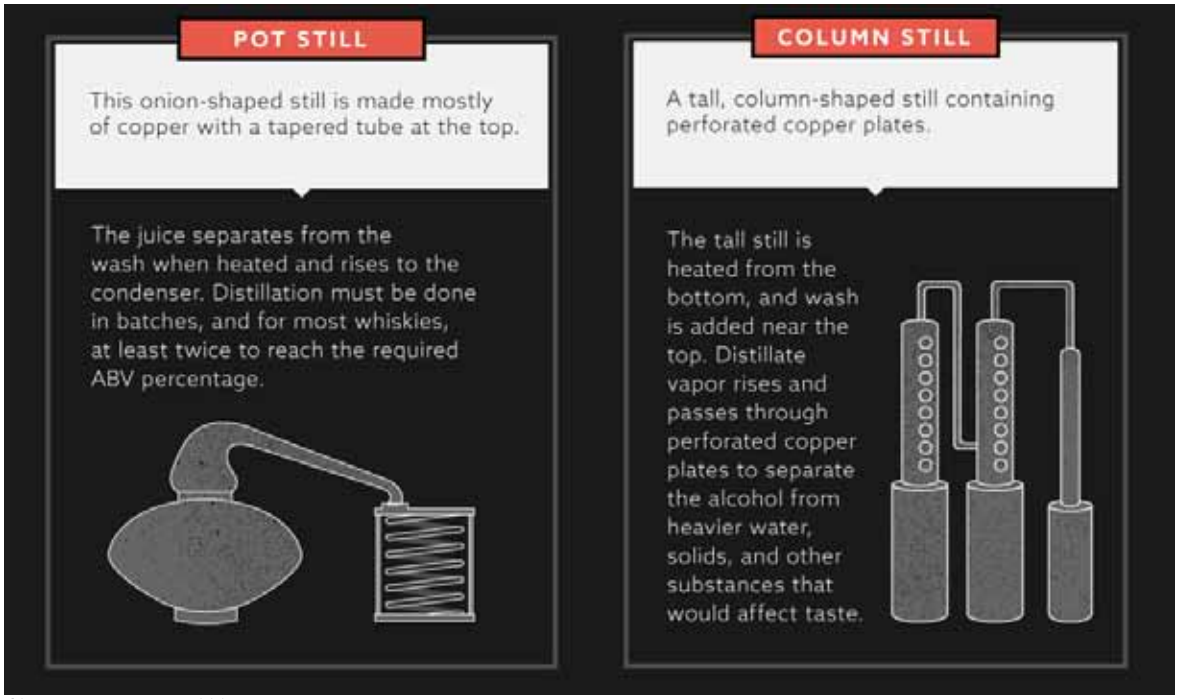


figure 18 stills

b o t t l i n g r o o m :

this room is where the whiskey is transferred form their barrels to be bottled and packaged.

m e c h a n i c a l r o o m :

the space that will house all of the different mechanical systems needed for production and operation of the distillery and restaurant.

l o a d i n g d o c k & r e c e i v i n g :

the loading area for receiving and sending goods. this will be located on the backside of the building along with the employee parking lot.

figure 19 column stills

[user / client description]

owner:

lookout mountain distillery co.

the name for the company comes from the mountain that shadows the town of golden, colorado; lookout mountain. the main goal of lookout mountain distillery co. is to provide the highest quality and locally sourced whiskeys and spirits in the state.

user groups	8
owner	1
master distillers	3
kitchen staff	5
wait staff	10
receptionist	1
general manager	1
restaurant guests	80
tour group capacity	10
total occupency (estimate)	119

employees:
the distillery.

the distillery side of the company will be run by the owner and the three master distillers. a spatial layout that maximizes work flow will be crucial for them to efficiently complete their tasks. they will also be in charge of tour groups.

the restaurant.

the restaurant will be operated by the general manager along with the five cooks, ten wait staff and one receptionist. their main goal is to efficiently and quickly produce high quality meals and service to dinners. the layout of the restaurant, bar and kitchen spaces will designed in a way that allows employees to maximize their productivity. therw will be a small employee parking spot located towards teh rear of the building.

customers:

lookout mountain distillery co. aims to please customers who are both connoisseurs of whiskey and spirits, along with the more uneducated consumers from all walks of life. customers will be able to access the production areas while on a guided tour. they will have access to the restaurant, bar, tasting room and public rest rooms. street parking is plentiful around the site.

peak usage:

distillery : 7am - 5pm

restaurant : 5pm - 12am

[site]

regional:

the site is located in golden, colorado, a city to the west of denver. it is located in the rocky mountain region of the united states.

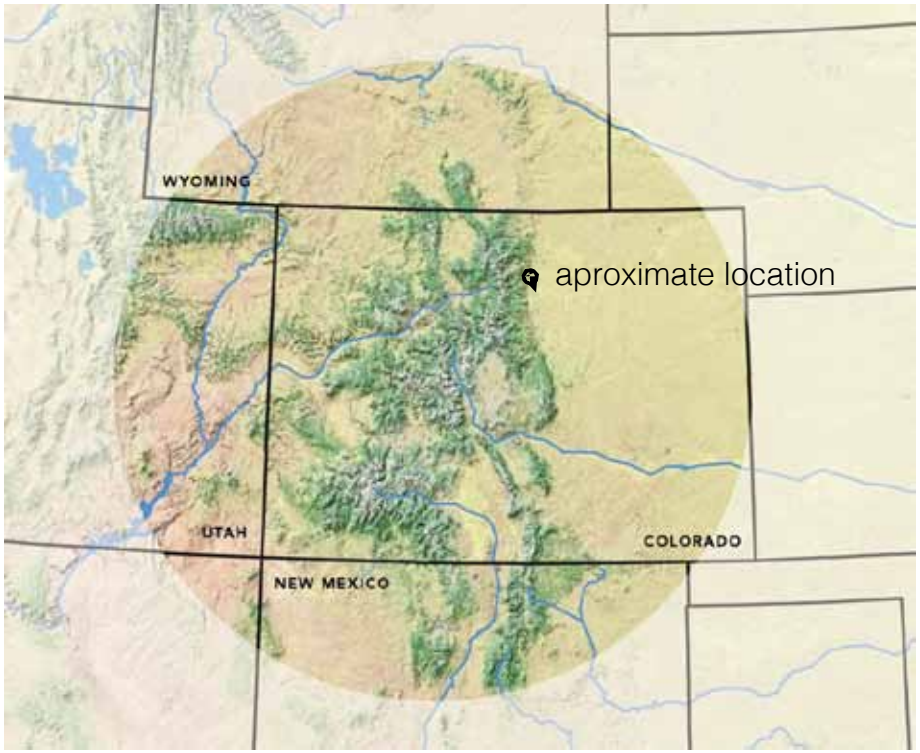


figure 20

city:

based in golden, colorado, the lookout mountain distillery is located just west of the sprawling metropolis of denver. this location allows easy access for customers that don't live directly in golden.

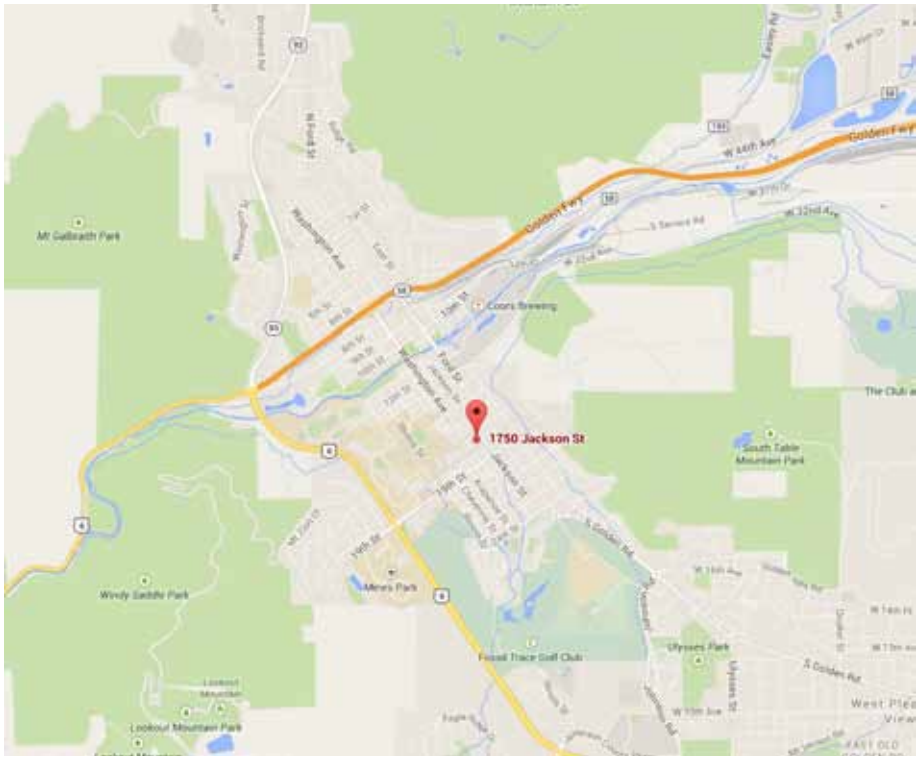


figure 21

[1750 jackson street. golden, co]

the site was chosen because of its close tie to the downtown area. located just half a block off of washington street, the main street of golden, the site offers ample street parking along with easy walkability access for pedestrians and bikes. the town of golden is very active and most people walk to where ever they need to get, so walkability is important. the site was also chosen for its close location to lookout mountain, the inspiration for the name of the distillery. the site has bus access on the northeast corner.

site area: 68,250 sq.ft.

figure 22

[site views]

north

figure 23

southwest

figure 24

southeast

figure 25

northwest

figure 26

[project emphasis]

workplace productivity

i plan on using this project as a vessel to explore the architectural relationship between spatial layout and workplace productivity. as a designer i am constantly faced with the task of arranging spaces in ways so that they flow and work together as a whole. i aim to create a design that not only maximizes work flow but also creates spaces that employees actually want to be in. by giving employees a nice place to work, translates into better customer service and in turn a more pleasurable customer experience.

community connection

i want to explore ways of really tying the building and site into the city. its so often that we see buildings that apear as if they were built without any consideration of the surrounding are. i want my design to connect with the community that it is being built in.

sustainable design

by incorporating locally made products and building materials into my design, i intend on reducing the buildings impact on the surrounding environment and the global environment. i will incorporate high-quality materials into my design so that the building can continue to function for years to come.

figure 27 wooden pavers

[goals of the thesis project]

figure 28 barrel storage

academic goals

with this project i really want to push myself to explore the idea of spatial planning as much as possible. throughout the past 4 years of school we have always talked about the importance of the relationship between the space and the user. how we can implement different design techniques to draw different emotions and actions out of the end user. frank lloyd wright would intentionally make doorways and hallways very low, as to drive the user through them and into the spaces. but we have talked very little on the subject of how design can positively impact the users productivity. my main goal is to discover and implement design cues to maximise the end users level of productivity.

professional goals

having worked in a small design build firm over the summer between 4th and 5th year, i have learned a lot about solving problems within existing spaces. i like to think of my thesis and just another design problem that needs to be solved. by exploring the relationship between spatial layout and workplace productivity, i will gain invaluable knowledge that i can carry over to my professional career. i strongly believe that maximizing the productivity levels of certain spaces such as restaurants, offices, and manufacturing facilities will help the companies that occupy them succeed in the future. i plan on using my research in future projects that i will work on in my professional career as an architect.

personal goals

over the course of the past 4 plus years of school i have learned so much about architecture, yet i still have so much to discover after i graduate. when i look back on past projects it is amazing the amount of progress that i have achieved. when i look back at this project in the future i hope that i get a feeling of satisfaction knowing that this was my gateway into the professional world. i want to strengthen my drawing and sketching techniques over the course of this project by incorporating as many hand illustrations as possible. i am also considering hand rendering the entirety of my final boards.

figure 29 label making

[plans for proceeding]

research direction

research for this project will be conducted throughout the entire design process. i will look to multiple case studies that deal with the elements of my project. this will include restaurants, distilleries, manufacturing plants, and sustainable design. by looking at past projects and designs i can gain a sense of what is important when planing out my project. i intend to gather information from a mix of articles and publications in both physical and digital form. researching spatial relationships will be a key part of my project due to the significance to my thesis.

design methodology

the design methodology i will utilize over the course of this project will start out with research so that i can start to put together a design program and design directions. the research i gather over the course of the year will guide my design and eventually produce the final design. when i start in on the design process i like to study the site and determine where i want to place my design. i also take design cues from the surrounding area and from the research i have conducted. i do a lot of sketching and manipulation of forms with the computer. these will eventually turn into the final product.

design documentation

over the course of the design i will document all of my research and compile it into one comprehensive article that i will use to guide my design. i do a lot of sketching, i will make a digital compilation of these images to include in the final project book. i will also photograph physical models that are produced throughout the design process. these photos will also be used in the final project document. all of the work done over the semester will be sorted through and decisions as to what will be included in the final book will be made.

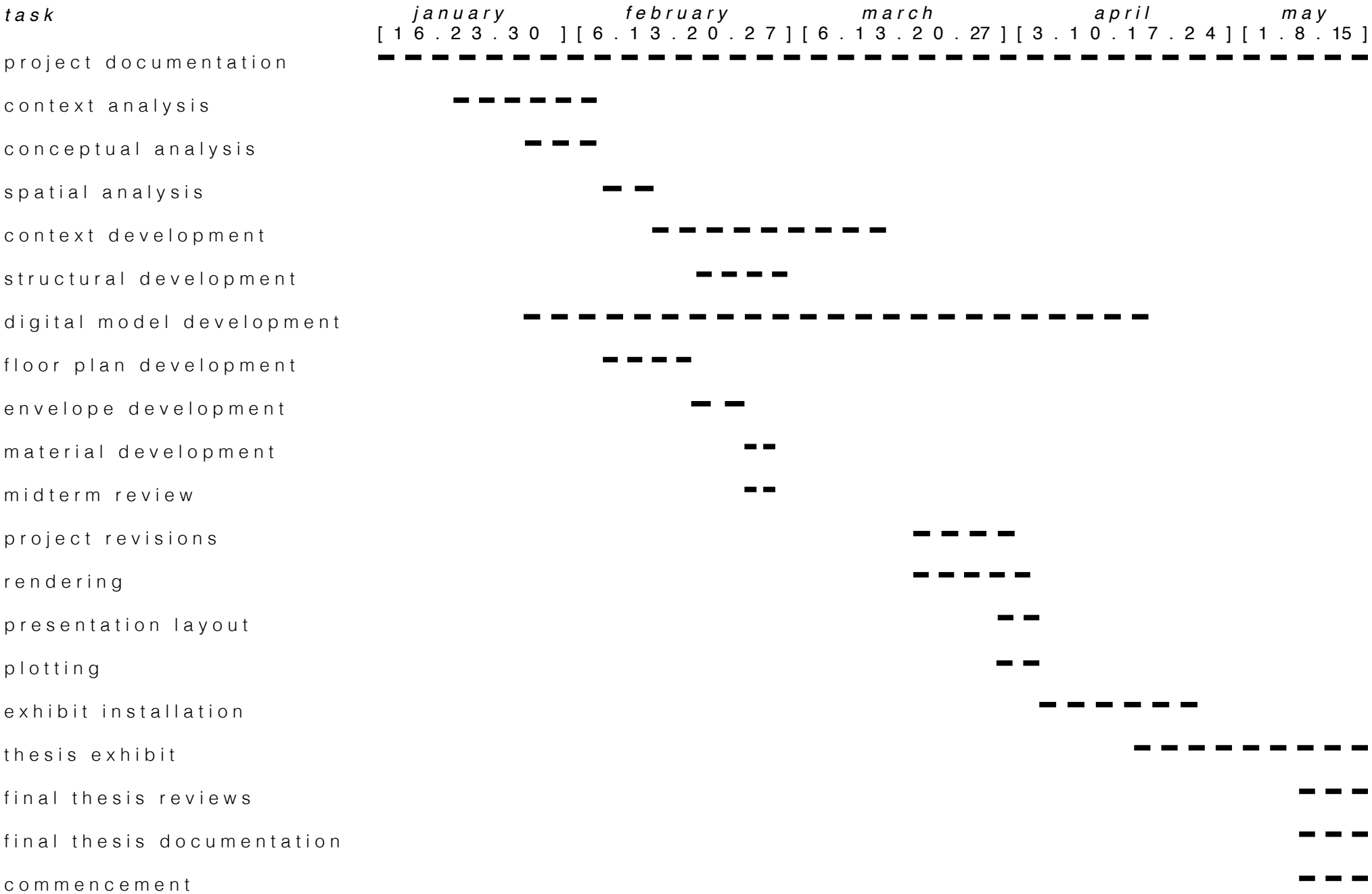
figure 30 lagavulin 16

[schedule for proceeding]

task	*days*	*completion*
project documentation	119	05.11.2015
context analysis	21	02.02.2015
conceptual analysis	14	02.02.2015
spatial analysis	7	02.09.2015
context development	14	03.09.2015
structural development	7	03.09.2015
digital model development	84	04.22.2015
floor plan development	21	03.02.2015
envelope development	14	03.11.2015
material development	7	03.11.2015
midterm review	7	03.13.2015
project revisions	21	04.22.2015
rendering	14	04.15.2015
presentation layout	7	04.22.2015
plotting	7	04.24.2015
exhibit installation	3	04.27.2015

thesis exhibit	20	05.15.2015
final thesis reviews	8	05.07.2015
final thesis documentation	1	05.11.2015
commencement	1	05.16.2015

figure 31 london distillery company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february
march
april
may
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project documentation
context analysis
conceptual analysis
spatial analysis
context development
structural development
digital model development
floor plan development
envelope development
material development
midterm review
project revisions
rendering
presentation layout
plotting
exhibit installation
thesis exhibit
final thesis reviews
final thesis documentation
commencement

[p r o g r a m]

[theoretical premise/unifying idea research]

figure 32 bourbon glass

i n t r o d u c t i o n : As stated earlier, my thesis aims to explore the relation ship between architectural design and workplace efficiency. The follow research has given me insight into those relationships and will in turn help me strengthen final design and program.

space planning fundamentals: Space planning is important to any design, but is esspecially important when designing a space that is inteneded to maximize efficiency. In an excerpt from the *Architects Handbook of Professional Practice* they discuss the importance of propperly arranging spaces around three main connection types: **Essential**, **Important**, & **Convenient**. This will play a key role in my spacial layout. Essential connections will involve close proximity between raw material storage and production spaces, in both the distillation area and the restaurant side. Important connections will include making sure that the owner has direct view and means of interacting with the managers, distillation team, restaurant staff and customers. Convenient connections will deal with connections between customers, and the manufacturing process.

figure 33 barrel transport

spacial relationships: The relationship between storage and mash house differs from the relationship between the mash house and the still house. Large quantities of raw materials must be physically moved from storage and into the pots in the mash house, this requires that an open floor plan be used. When the refined mash is sent to the still house for distillation, it is mechanically moved through large diameter pipes, this removes the need for an open plan, and allows for a more intimate connection between the two spaces, one where only people need pass through. This is demonstrated in the Westland Distillery in Seattle Washington. I intend to used this hierarchy when planning my design.

figure 34 woodford reserve

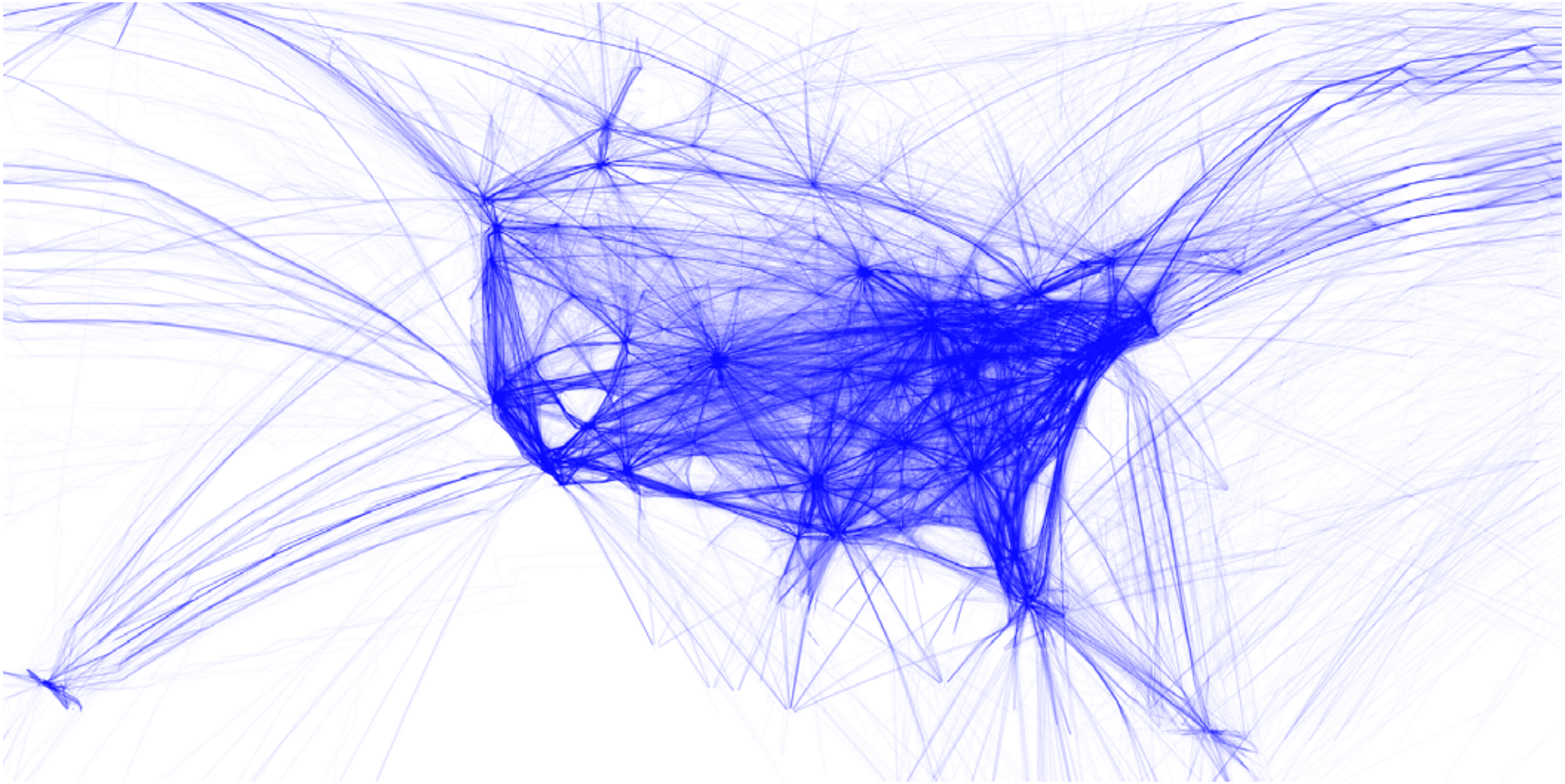
e f f i c i e n c y : “the ability to do something or produce something without wasting materials, time, or energy. (Merriam-Webster)”

e f f i c i e n c y : Modern commercial efficiency relies two major aspects, allowing for future growth and the idea of different parts acting as a whole. Planning for future growth is incredibly important in a manufacturing industry such as distilling. I intend to create a design that will easily allow for expansion when the time comes. This can be done by creating a system of modular units that can be interchanged when the demand for more space increases. Distillation is a process that involves many processes that all work towards a final end product. The layout of my design will follow the same ideology. A complex space with many parts working together with one goal in mind.

figure 36 the oban distillery

workspace productivity: Apart from architecture, I am also an avid wood worker. I have spent countless hours in numerous woodshops over the years, including working professionally in one for 2 years. Over those two years, I experimented with different shop layouts that would help me produce work in a quick and efficient manner. I figured out that if I had the tools specific to the task I was working on within a 3 - 4 ft radius, I could work at maximum productivity. I believe that this can be applied to the various work spaces in the distillation process. By providing employees with as many tools and goods as possible within 3 - 4 ft radius will help increase the efficiency of their movements. I will need to experiment with layouts to create workspaces that provide the needed tools without creating a cluttered space.

figure 37 barrel wood



traffic patterns : By looking at traffic patterns of existing spaces with similar typologies, I aim to discover unnessecary patterns and use that data to aid in my design. I have not had a chance to tour existing distilleries, but I am setting up tours for two distilleries over winter break. The data and conlusions I draw from those tours will be added to this section at a latter time.

figure 38 flight patterns

the work triangle : When designing a kitchen it is crucial to plan it around what is called the “work triangle.” That being the distances from the sink to the stove to the refrigerator. The National Kitchen & Bath Association states that “The sum of the work triangle’s three sides should not exceed 26 feet, and each leg should measure between 4 and 9 feet, and that no major traffic patterns should cross through the triangle.” (Kitchens) This can be applied to my project. Through the design process I aim to devlope my own ideal “work triangle” for the distillery industry

figure 39 pouring a drink

summary of research: the goal of this research was to help me better understand what goes into making an efficient space. I chose topics to research that I thought would be relevant to my unifying idea or efficiency. I have gained insight into topics that directly pertain to efficient design.

figure 34 bushmills

summary of research: As a designer, I now have a better understanding of how a space can be designed with traffic patterns in mind. By creating a hierarchy of spaces that become more condensed and restricted as the distillation process progresses, I believe that a greater production efficiency can be met.

figure 41 highland park

figure 42 ron swanson

[project justification]

In 2008 US Whiskey and Bourbon distributors reported gross revenues of 1.8 billion US dollars. In 2013 they reported total gross revenues of 2.5 billion. That is an increase of 35% over the course of 5 years, and those sales continue to increase. Of that 35% increase, the majority of it was attributed to greater sales of high-end and ultra premium bourbons and whiskeys (US Council). Those are the same kinds of bourbons and whiskeys produced by small craft distilleries though out the country. Due to the naturally long aging process of whiskey and bourbon, the supply of these spirits is drying up. The need for more distilleries, especially distilleries that can manufacture in the most efficient way possible are necessary to keep up with the demands of society.

figure 43 bottling

figure 44 teeling whiskey

Due to these increased demands I feel as though there is a strong justification to my project. Not only is it justified financially, but also by the need for greater efficiency to keep up with demand. By creating a building plan that can increase worker productivity, increase sustainability, and can be easily scaled to keep up with future demands, I aim to hopefully develop a standard that can be implemented into the real world someday.

[historical context]

The first written reports of whiskey being produced go all the way back to the late 1400s when Scottish and Irish monks began searching for a new alcohol after a shortage of grapes decimated the wine industry (Whiskey facts). They found that they could create a new alcohol out of grain, which was readily available.

Whiskey and Scotch continued to rise in popularity until 1541, when King Henry VIII dissolved all of the monasteries in Scotland and Ireland. This forced the former monks to start privately producing scotch, and in turned forced them to spread their knowledge across all of Scotland (Whiskey facts).

After a heavy tax was imposed on unlicensed distilleries and breweries, a large underground network of illegal distilleries started to emerge, and the term moonshine was born.

figure 45 old distillery

figure 46 bootlegging

At the same time in the United States people started to produce their own version of Scottish whiskey, which they called Bourbon.

After the ban on Scotland ended in 1823, scotch started to increase in popularity. This led to the invention of the “Continuous Still”, a device which allowed distillers to make scotch must faster, and at a much higher level of quality.

When prohibition went into effect in 1920, there was a huge decline in American bourbon manufacturing, legally that is. Prohibition led to rise in underground/backwoods operations, and the phrase “bootlegging” was born. After prohibition ended in 1933, bourbon and imported scotch whiskey has been continuously growing in popularity. In 2009 Scottish distillers exported 1.1 billion bottles of scotch worldwide. It is a ever growing market, and more distilleries are needed to keep up with demands.

[cultural context]

People have been drinking scotch and whiskey since the 1400s. It is a part of nearly every culture in the world. For some they serve as medicinal treatments. For others it is a way of life. For instance, Scotch is a national alcoholic drink of Scotland.

If you go up and down the west coast of Scotland, there are hundreds of towns that all have operational distilleries in them, and they each manufacture their own unique flavors of scotch.

figure 47 tasting

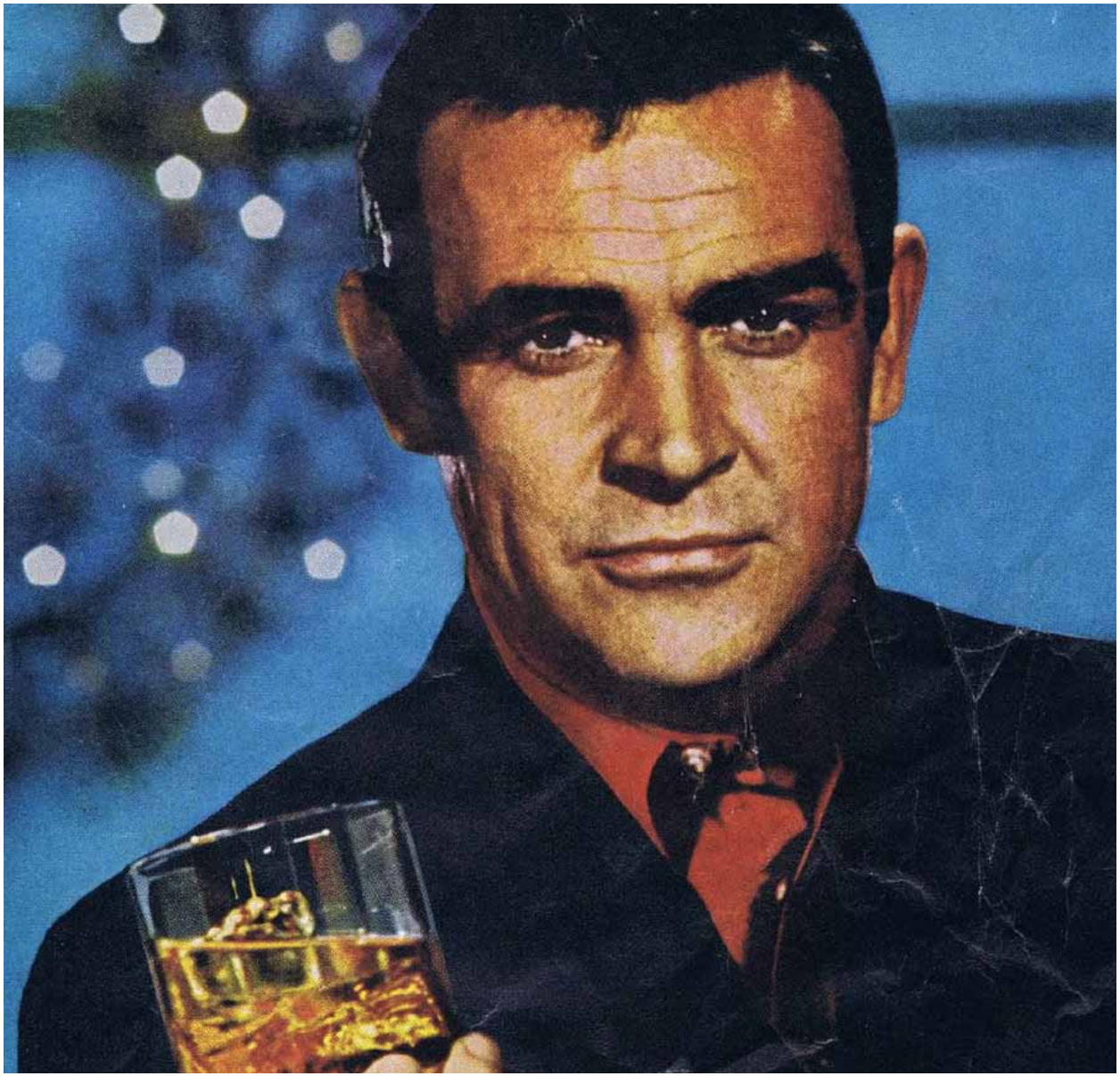


figure 48 sean connery

In the US, especially the Southern United States, we produce bourbon.

Bourbon is very similar to scotch, except that instead of grain being used as the main ingredient, corn is used. This produces a different taste that is traditionally American.

Distilleries are a part of life for some people. the need for a more efficient, and refined manufacturing space is needed to maintain the traditon and help it survive to the next generation.

[site analysis]

site plan: The site I chose for my project is located in Golden, CO. Golden is located 30 minutes to the west of downtown Denver. The specific site that i chose in Golden is located 1750 Jackson Street. The site was chosen because of its close tie to the downtown area. Located just half a block off of Washington street, the main street of Golden, the site offers ample street parking along with easy walkability access for pedestrians and bikes. The town of golden is very active and most people walk to where ever they need to get, so walkability is important. The site was also chosen for its close location to lookout mountain, the inspiration for the name of the distillery. The site has bus access on the northeast corner.

figure 49 site plan

s i t e s e c t i o n : The topography of Golden is relativly hilly. The town is located in the valley between several mountains. The site that i chose has a decent amount of grade to it. This can be seen in the following images.

built features: Currently the site sits vacant. There are no built structures that currently occupy the site. However, the site is overgrown with brush and other naturally occuring vegetation. There are two buildings directly to the west of the site. There are also buildings to the north and south, and a parking lot across the street to the east.

figure 51 built features

light quality: In the summer months, the light is very warm in color and direct due to the southern location of Golden, CO. On a clear day the sun is very intense and direct. It can be quite warm due to the elevation. During the winter months, the light is cool in color.

v e g e t a t i o n : The site is overgrown with small trees, brush and weeds. The site is located in the downtown area of Golden. It was cleared at an earlier point in time for future development, but has sat unused for some time.

w a t e r : There is no moving or standing water naturally occuring on the site. Clear Creek cuts through the heart of Golden. It is located to the north west of the site. Due to the slope of the site, all rain water run off flows east off the site, and into the catch basins located on the street.

figure 54 golden hotel

w i n d : Looking at the collected data from the NREL Solar Radiation Research Laboratory, located in Golden, wind primarily comes from the west. With wind speed ranging from 0 - 18 meters per second (see windrose on pg 84-85). The site itself is fairly well protected from westward winds by two buildings located just to the west of the site. Vegetation offers minimal protection from the wind.

figure 55 green wall

human characteristics : The site appears to have been cleared for development 10-15 years ago, but was never actually built on. There is alot of activity surrounding the site. There is a bus stop on the east side of the site. Golden has fairly heavy foot traffic due to the small size, so people can be seen walking around the site at all times of the day.

d i s t r e s s : the site has clearly sat abandoned for many years. It is completely overgrown with small trees, brush and other plants. The roads and sidewalks surrounding the site are only a few years old and so minimal signs of wear. The buildings around the site are also well maintained. This will help my new design fit more cohesively into the built environment.

figure 57 distressed chernobyl

s o i l : According to the USDA Natural Resources Conservation Service, the soil composition of my specific site is made up of two main soil types. 68% of the soil is composed of Ascalon Sandy Loam. It is a well draining soil that has a capacity of .6 - 2.00 inches per hour. The other type of soul that makes up 30.2% is called Denver-Kutch-Urban Land complex. It is also a well draining soil and features a capacity of .6-2.00 inches per hour. It is also noted that the soil in Golden is frost free for a period of 126-142 days.

utilities : The site has easily accessible gas, electric and water hook ups. The gas hookup is located in the southeast corner of the site. Electrical hookups are located in the southwest corner, and water hookups are located on the east side of the site.

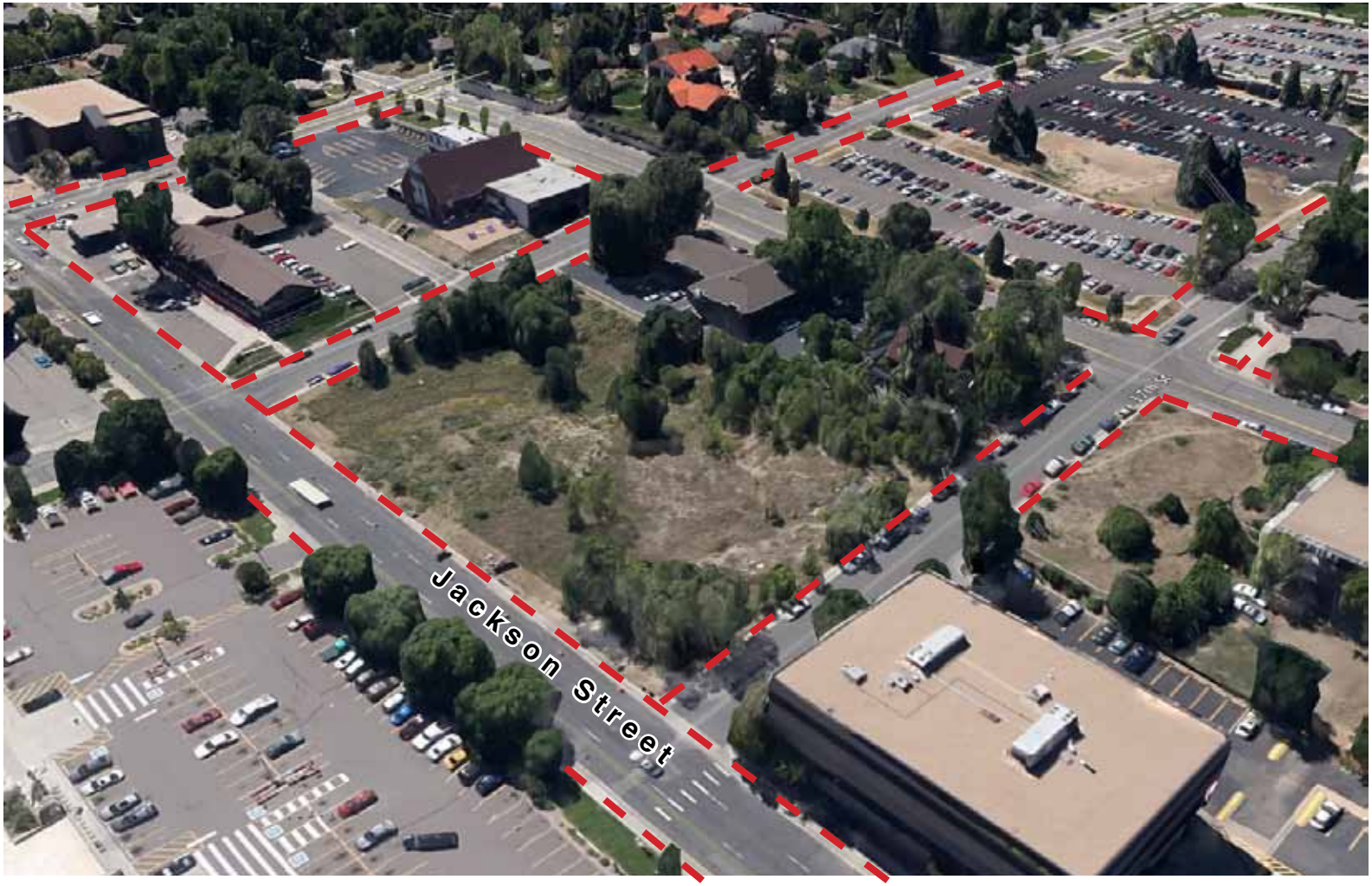
figure 59 utilities map

primary streets

secondary streets

vehicular traffic : The site is easilly accessed from the north, south, and east side. Jackon Street, which runs along the east, is a 3 lane one way running to the south. Jackson street is one of the bigger roads in Golden, and is typically busy during the day. the streets to the north and south are smaller and provide vehicle parking.

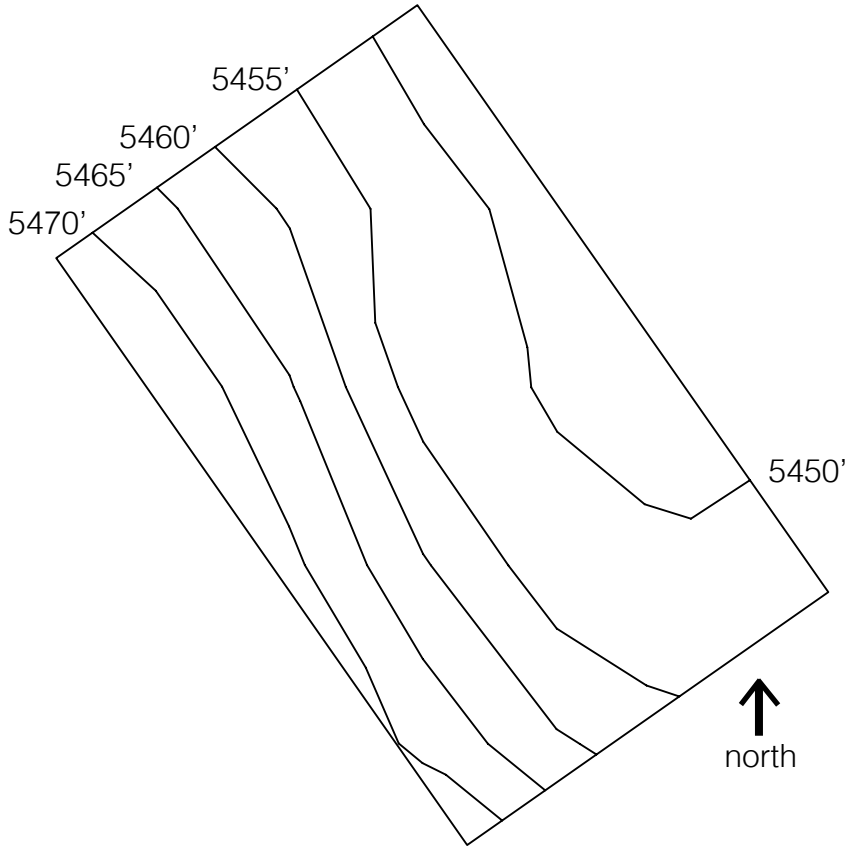
figure 60 vehicular traffic map



pedestrian traffic

pedestrian traffic : The site is easilly accessed from the north, south, and east side. Jackon Street, which runs along the east, is the most heavily traveled street. People can be seen at all hours of the day walking along Jackson Street. The surrounding streets also feature sidewalks. There is a bus stop located on Jackson Street.

figure 61 pedestrian traffic map



t o p o g r a p h y : The site has about 25’ of change over 200’ giving it a slope of roughly 6.5 - 8% depending on the location. This makes for a site that is easy to maneuver on. Work with the topography will directly impact my final design. I plan on designing a system that has minimal impact on the site.

figure 62 topography map

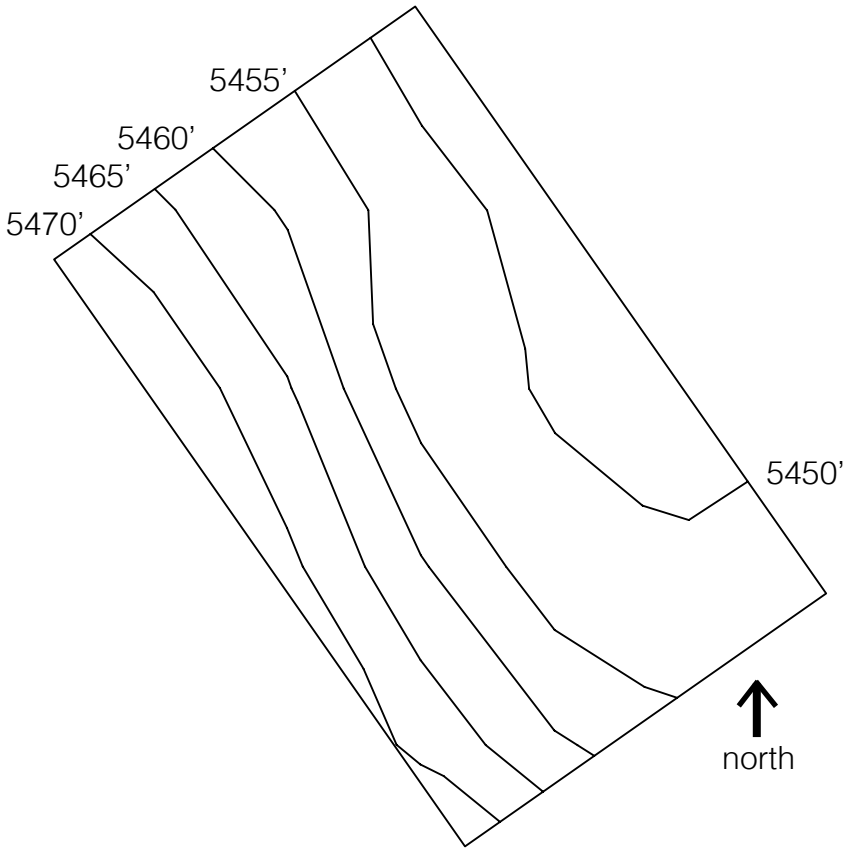
site character : The main thing that this site has going for it is the location. Being located in a downtown area without any built features is really convenient. It means that demolition of an existing structure is not required. Another characteristic of the site that will play into my design is the topography. It can help create some interesting spacial movements and design forms. The site currently sits vacant and is overgrown.

figure 63 chernobyl flowers

m a p s : Utility map.

m a p s : Site map. This contains existing buildings surrounding the site, roads, vegetation and bodies of water

figure 65 site map



m a p s : Topography

figure 66 topography map 2

m a p s : Aerial Photos

figure 67 aerial views 1

m a p s : Aerial Photos

figure 68 aerial views 2

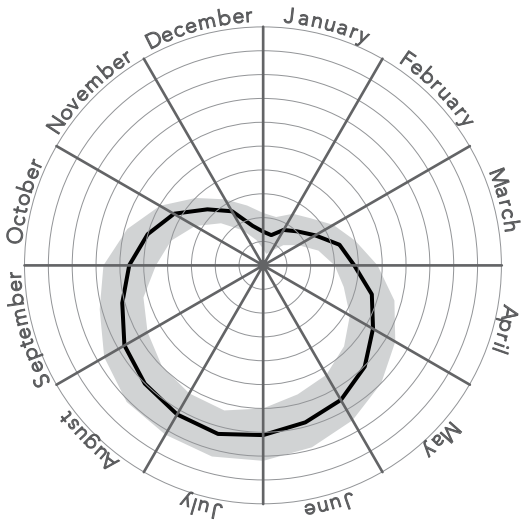
n o r t h

s o u t h w e s t

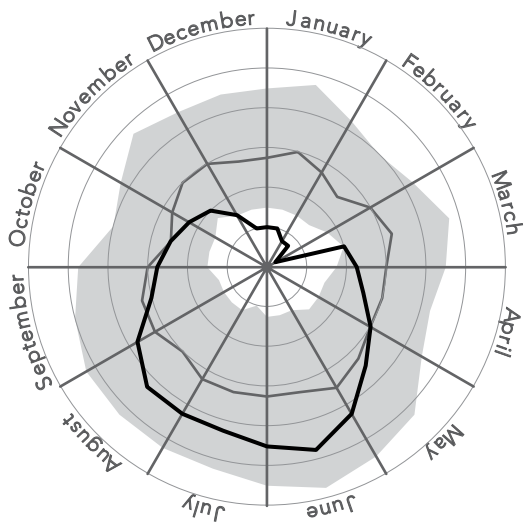
s o u t h e a s t

n o r t h w e s t

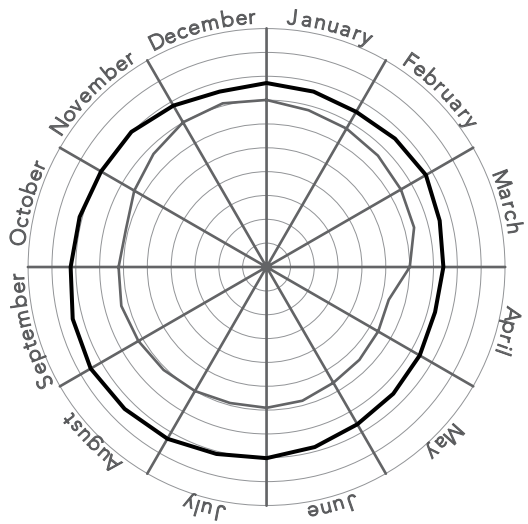
site reconnaissance : The picures in this program have been taken from google earth and and will be replaced with images I will take over winter break when I visit the site.



TEMPERATURE (0-100° F)
— CITY AVERAGE
● TEMPERATURE RANGE

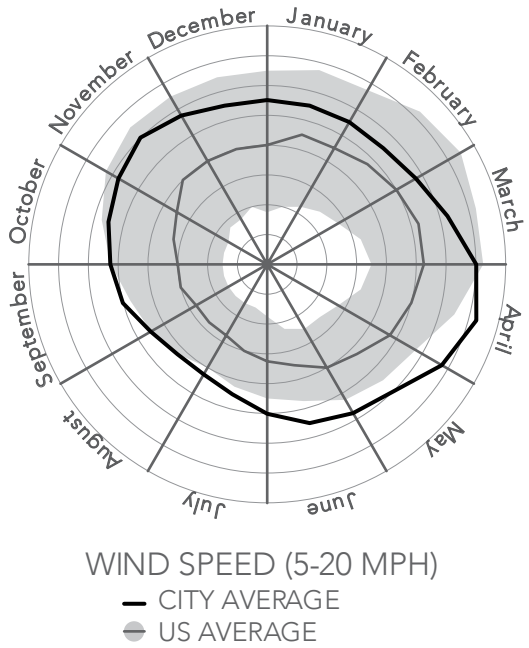


PRECIPITATION (0-6 IN.)
— CITY AVERAGE
— US AVERAGE

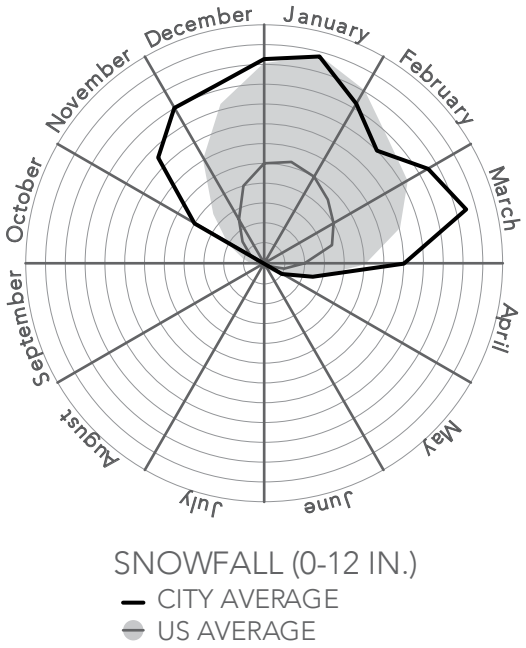


HUMIDITY AT TIME (30-100%)
— 9:00
— 15:00

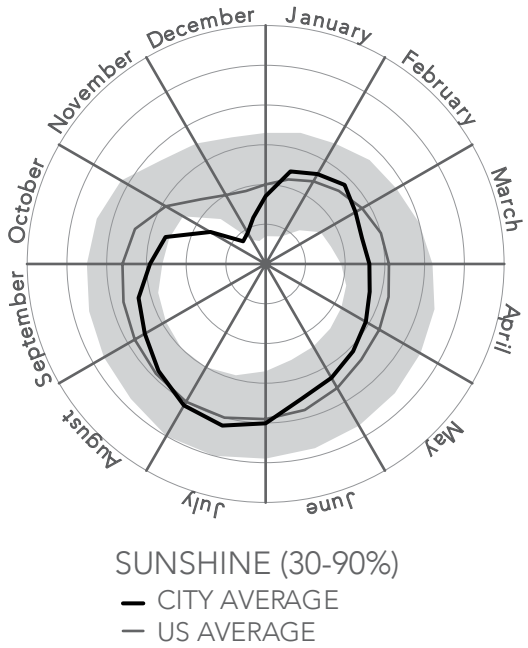
c l i m a t e d a t a : Temperature, Precipitation & Humidity



WIND SPEED (5-20 MPH)
— CITY AVERAGE
— US AVERAGE

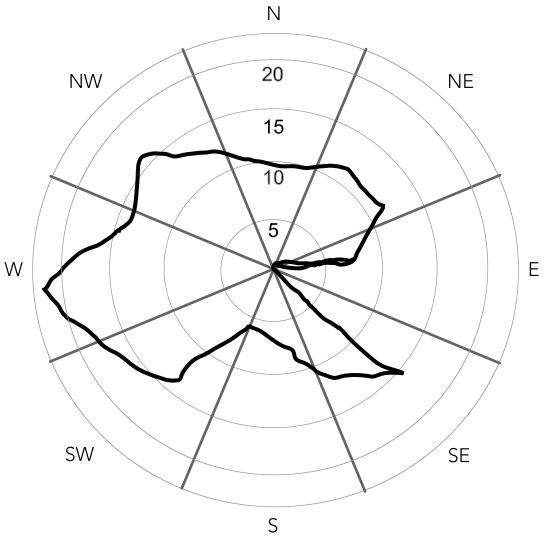


SNOWFALL (0-12 IN.)
— CITY AVERAGE
— US AVERAGE

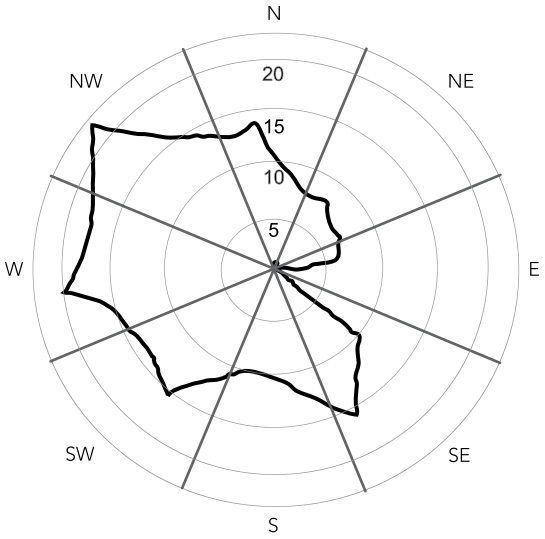


SUNSHINE (30-90%)
— CITY AVERAGE
— US AVERAGE

c l i m a t e d a t a : Wind speed, Snowfall, & Sunshine

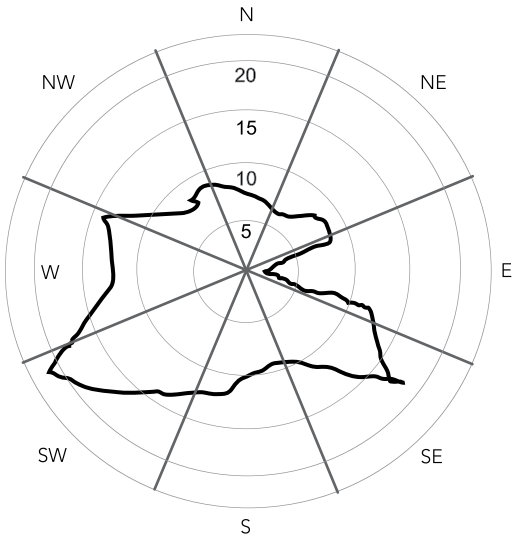


spring solstice

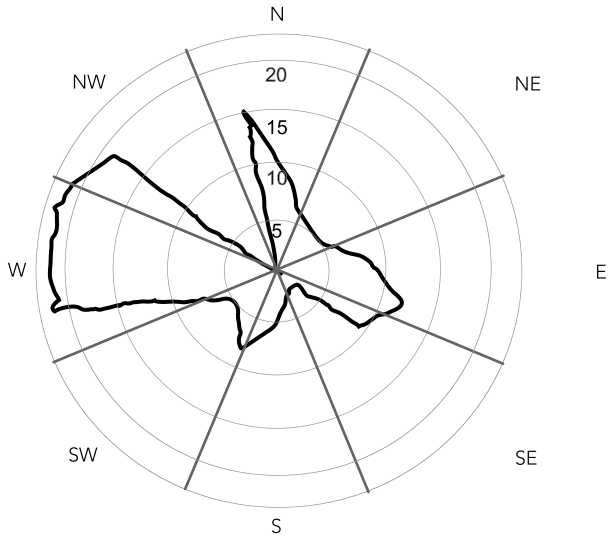


summer solstice

c l i m a t e d a t a : Windrose



fall equinox



winter solstice

c l i m a t e d a t a : Windrose

[building program]

figure 74 glengoyen distillery

[distillery program]

figure 75 scottish distillery

lobby : approx. 750-1000 sq. ft. The lobby will be where guests first experience the distillery. This is where tours will start and end. There will be a seperate entrance for the restaurant portion of the building

figure 76 industrial lobby

tasting room / gathering space : approx. 950-1200 sq. ft. This area will be used for tours and tasting of the final products. It can also be rented out for corperate events and parties. Will feature warm light and rustic accent peices. Furnature will be wooden with leather accents.

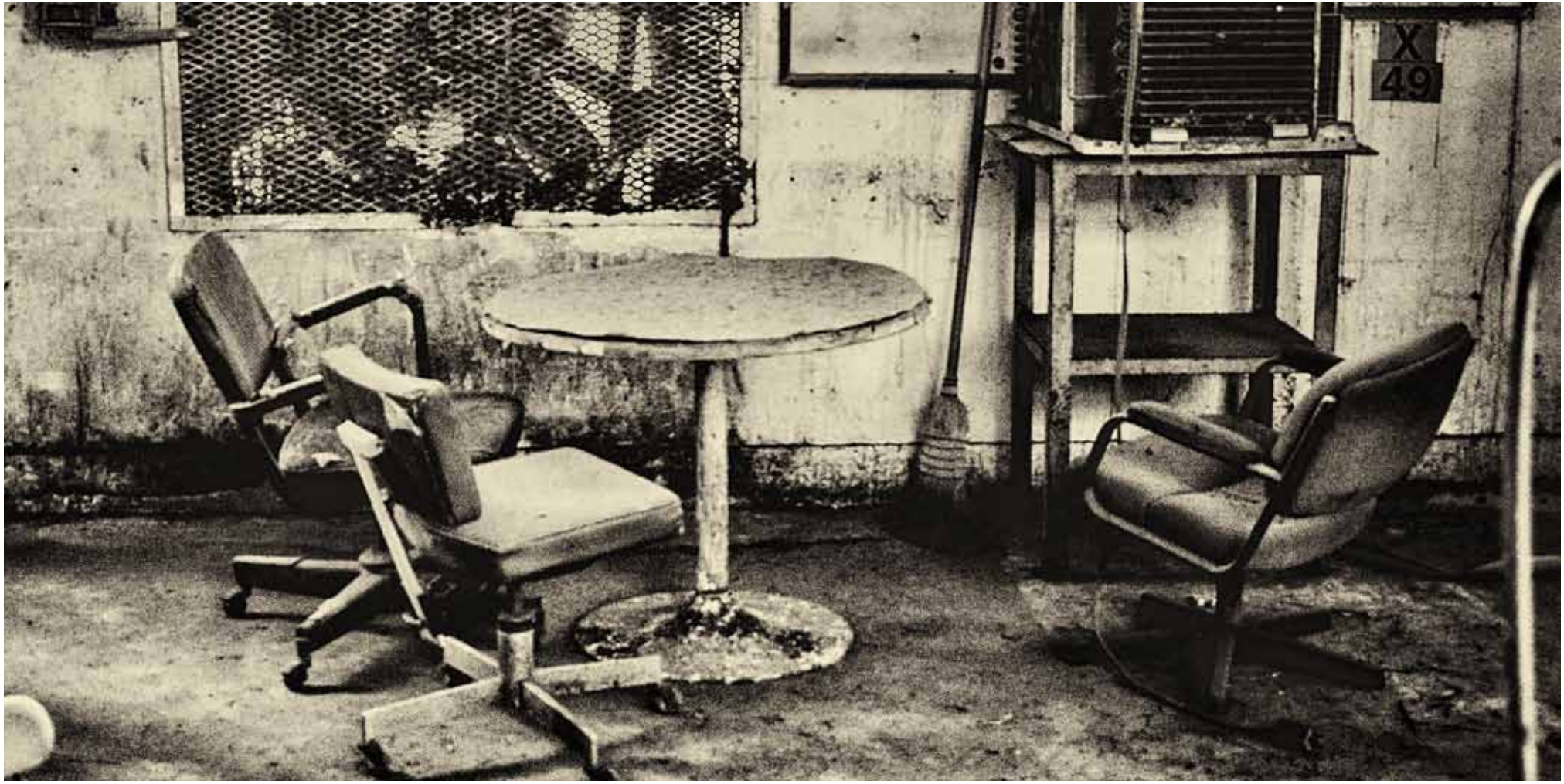
figure 77 vermont tasting room

r e s t r o o m s : approx. 500 sq. ft. (per set of restrooms) The building will feature two sets of restrooms, private and public. The employee restrooms will have locker spaces for employees to use during the day. The employee restrooms will be connected with the main distillery space and breakroom. Public restrooms will be connected to the tasting room and conference space.

q u a l i t y c o n t r o l l a b : approx. 500 sq. ft. This will be connected to the main distilling room. Quality control tests will be made here along with testing new and different flavors and styles.

o f f i c e s : approx. 500-750 sq. ft. The offices will over look both the distillery and restaurant sides of the building. They will most likely be placed on a second floor.

figure 80 office space



b r e a k r o o m : approx. 250-400 sq. ft. This will be connected to the main distilling room and employee restrooms.

figure 81 breakroom

r e c e i v i n g / s t o r a g e : approx. 2000 sq. ft. This is one of the most important spaces in the building. It is where raw goods enter and are stored. It will be 2 stories tall, with custom adjustable storage racks.

figure 82 glenmorangie barrels

m e c h a n i c a l : approx. 1200-1500 sq. ft.

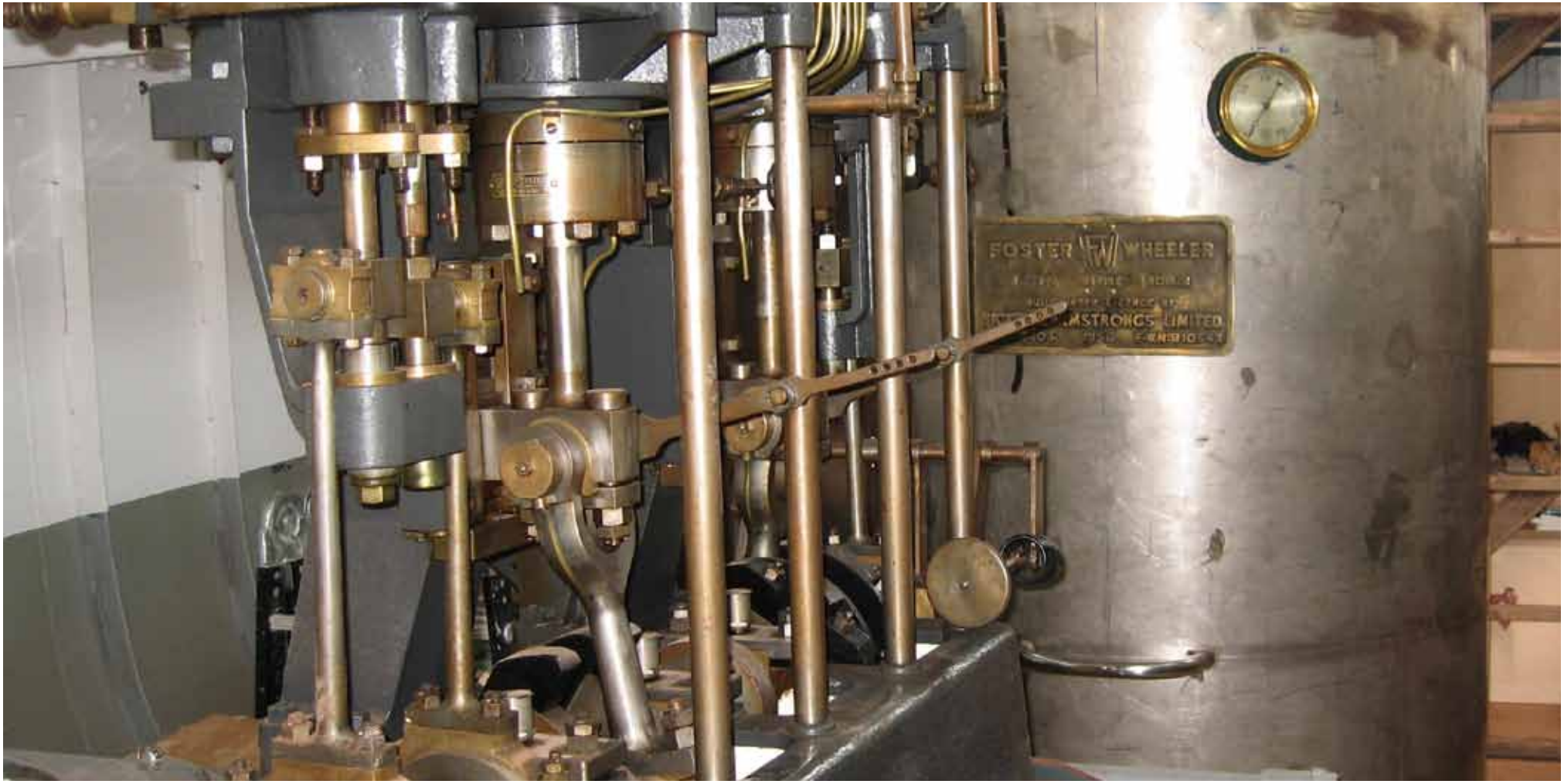
figure 83 mechanical space

m a s h h o u s e : approx. 1500-2000 sq. ft. This space will house the equipment needed in the first process of distillation. It will feature intellegent space planning that aims to increase productivity. It will be connected to the receiving and storage areas.

figure 84 mash house

s t i l l h o u s e : approx. 1500-2000 sq. ft. This space will house the equipment needed in the second process of distillation. It will feature intellegent space planning that aims to increase productivity. It will be connected to the mash house.

figure 85 still pressure



b o i l e r r o o m : approx. 250-500 sq. ft. This will contain the boilers and heating equipment need in the distillation process. It will also help provide heat for the entire building.

figure 86 vintage boiler

barrel storage : approx. 1250-2500 sq. ft. This area will provide a climate controlled aging space for barreled whiskey. It will be connected to the bottling area. It will require a separate HVAC unit and controls.

figure 87 barrel room

b o t t l i n g : approx. 750 sq. ft. This area will house the equipment for the final bottling and label production. It will be connected to the receiving bay and the barrel storage room.

figure 88 bottle caps

[restaurant program]

figure 89 restaurant

l o b b y & w a i t i n g a r e a : approx. 200-400 sq. ft. This is where guests will first experience the restaurant and bar attached to the distillery. It will feature warm lighting and industrial finishes. It will feature plush leather furniture for guests waiting for seating.

b a r : approx. 400-500 sq. ft. It will feature views of the distilling process and the restaurant.

figure 91 whiskey bar

d i n n i n g a r e a : approx. 1500 sq. ft. The dinning area. The design will be modern industrial with copper, wood and leather accents to play off the timeless art of whiskey making.

k i t c h e n : approx. 500-750 sq. ft. The kitchen will be connected to the dinning room, but will also be visible to dining guests. It will be laid out in a linear manner to help things flow more efficiently.

r e s t r o o m s : approx. 500 sq. ft. (per set of restrooms) The building will feature two sets of restrooms, private and public. The employee restrooms will have locker spaces for employees to use during the day. The employee restrooms will be connected with the kitchen space. Public restrooms will be connected to the dinning room.

receiving & cold storage : approx. 500 sq. ft. This is where goods are accepted. It will be connected to the kitchen area.

figure 95 loading

total restaurant space : approx. 4000 sq. ft.

total distillery space : approx. 14000 sq. ft.

total building area : approx.18000 sq. ft.

restaurant cost : approx. 4000 sq. ft. x $170 = $680,000

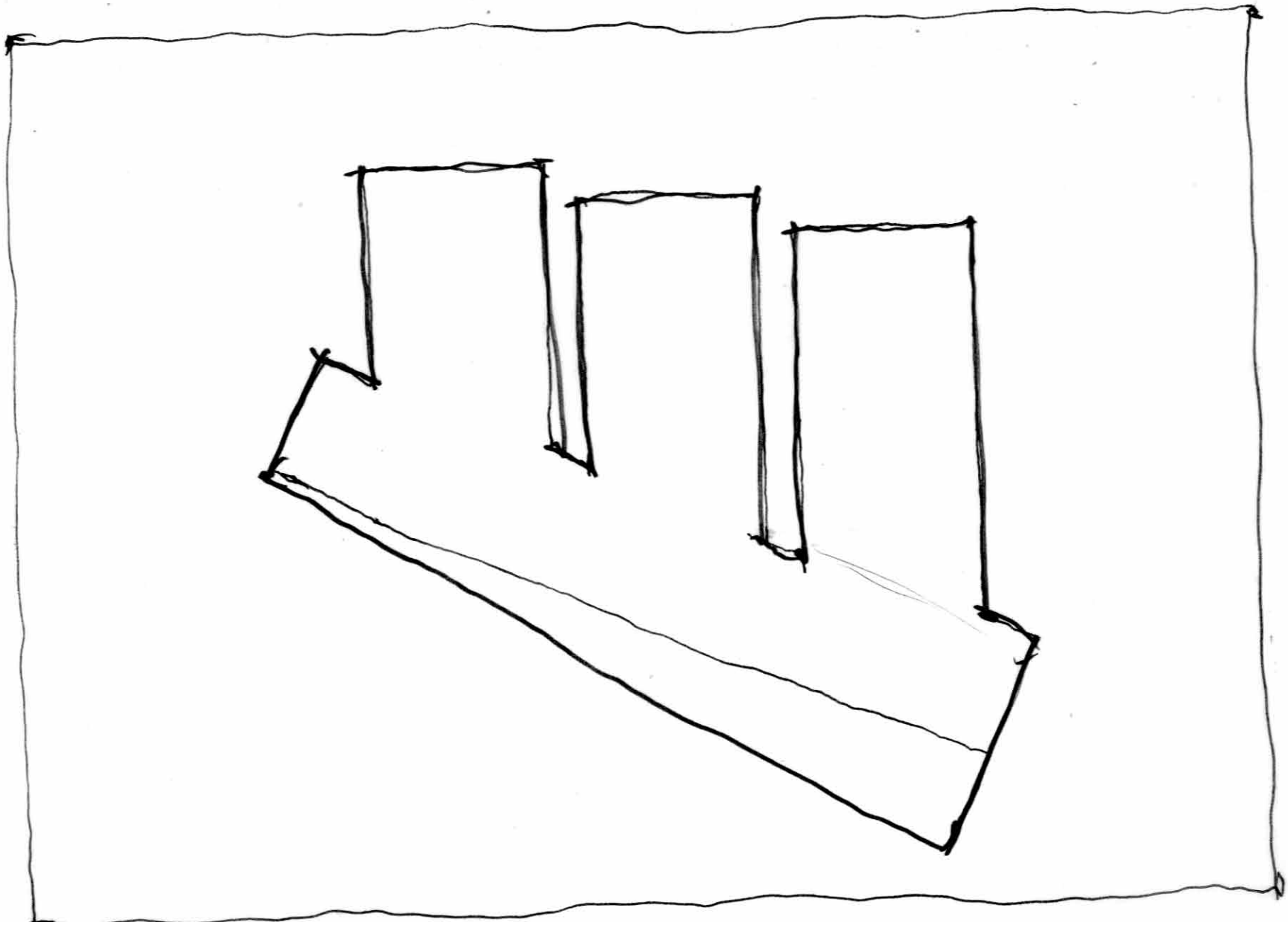
distillery cost : approx. 14000 sq. ft. x $35 = $490,000

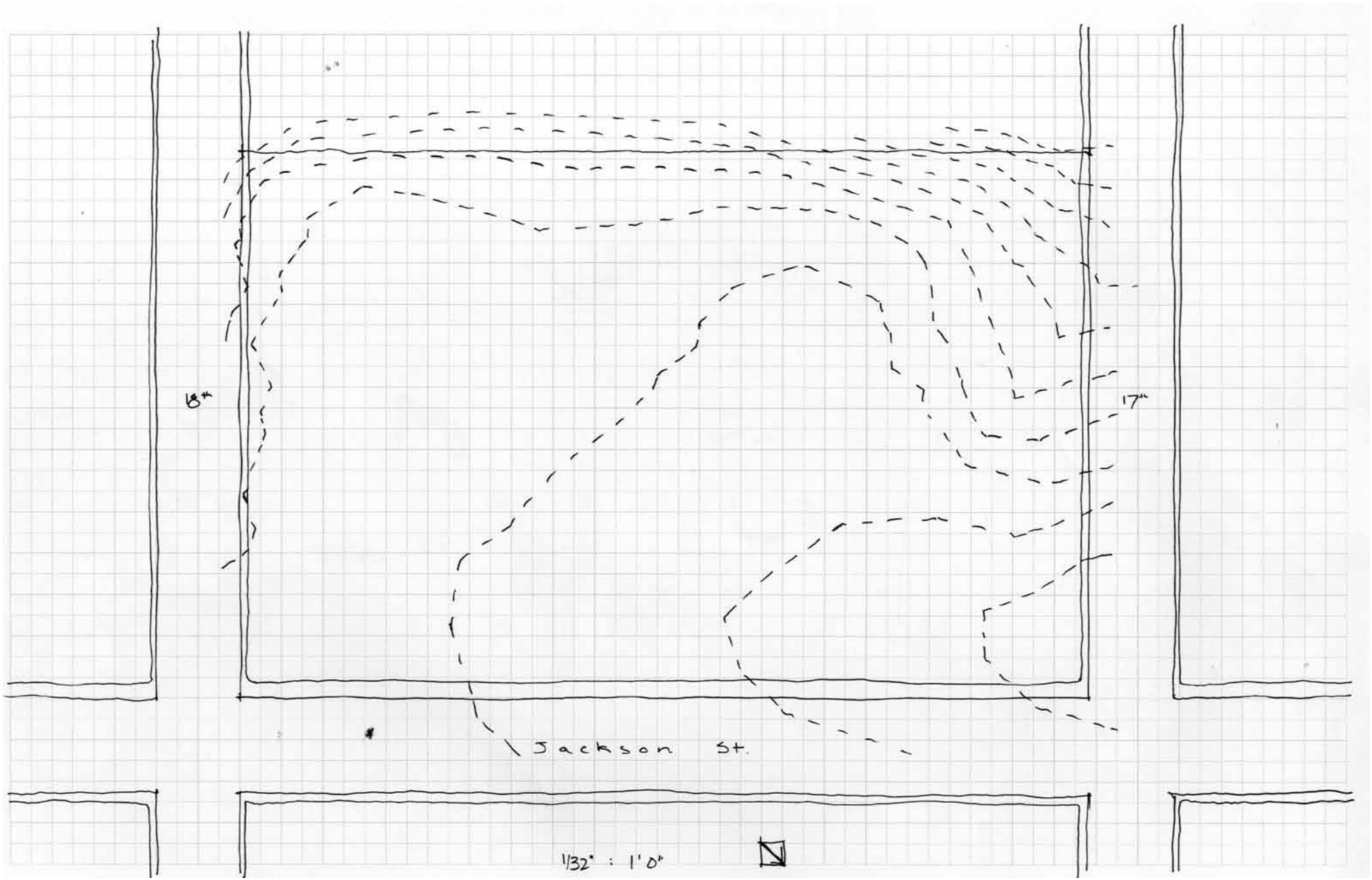
distillery equipment : approx. $1.5 million

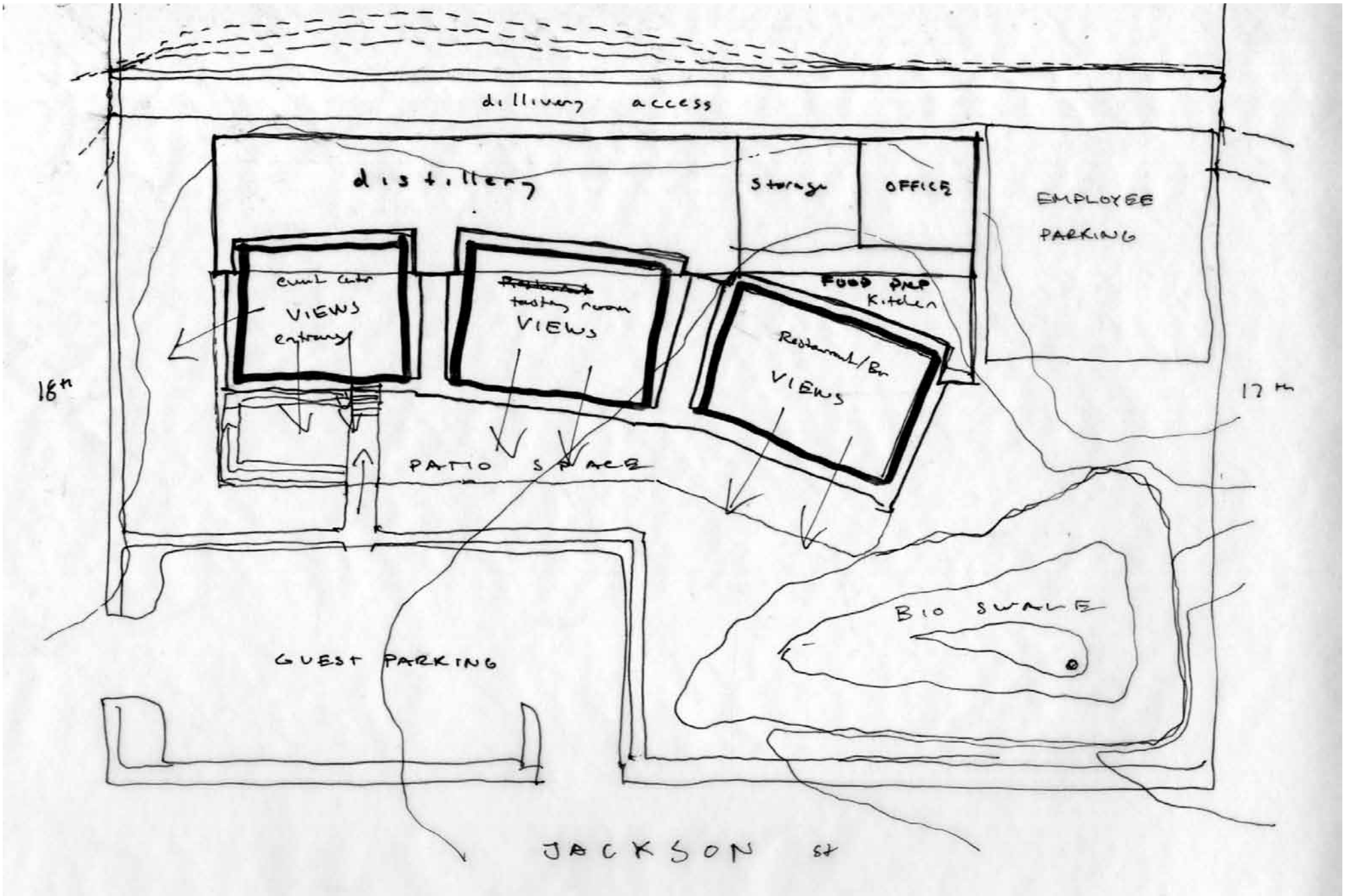
total building cost : approx. $2.8 million

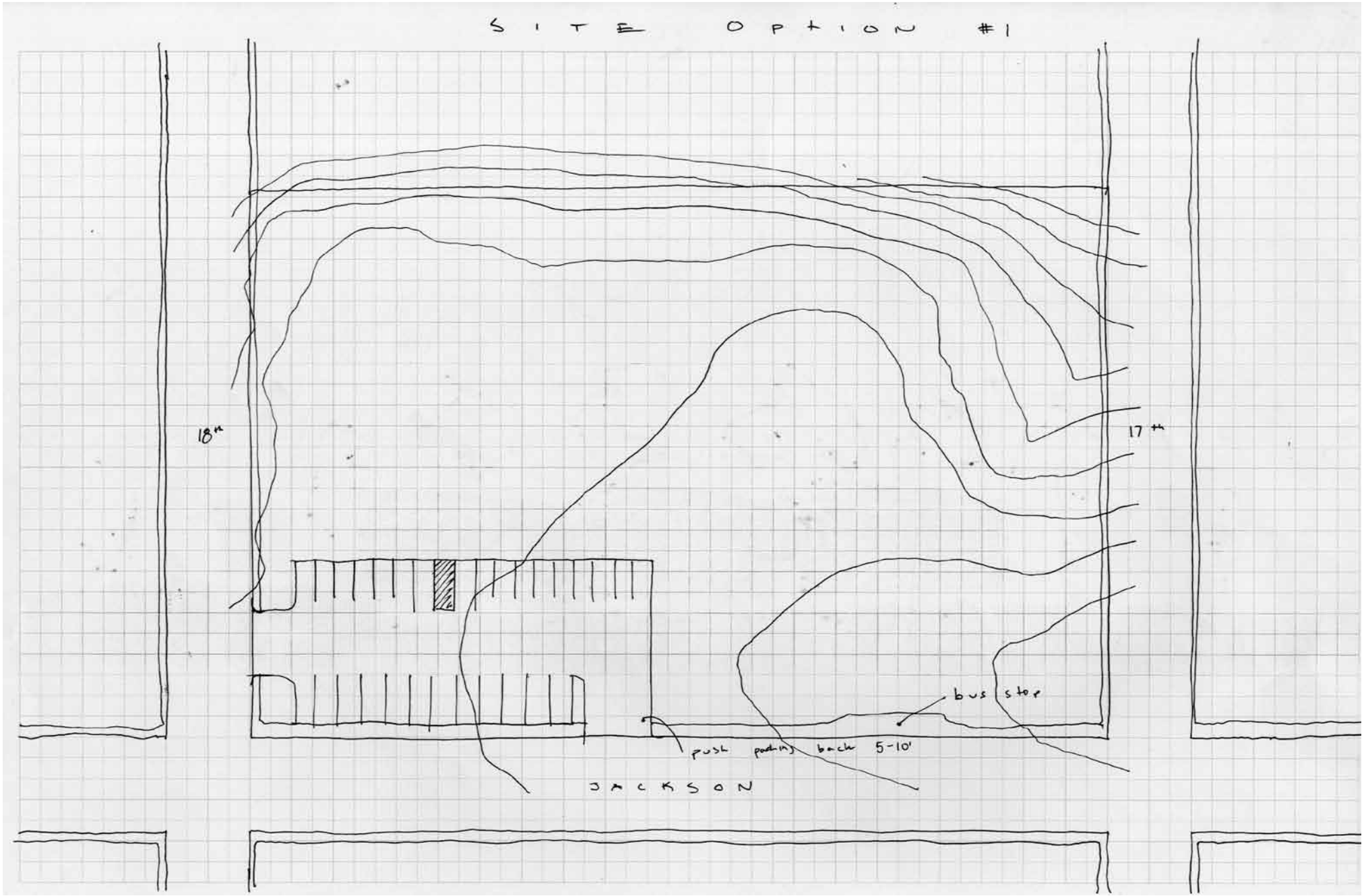
figure 96 distillery space

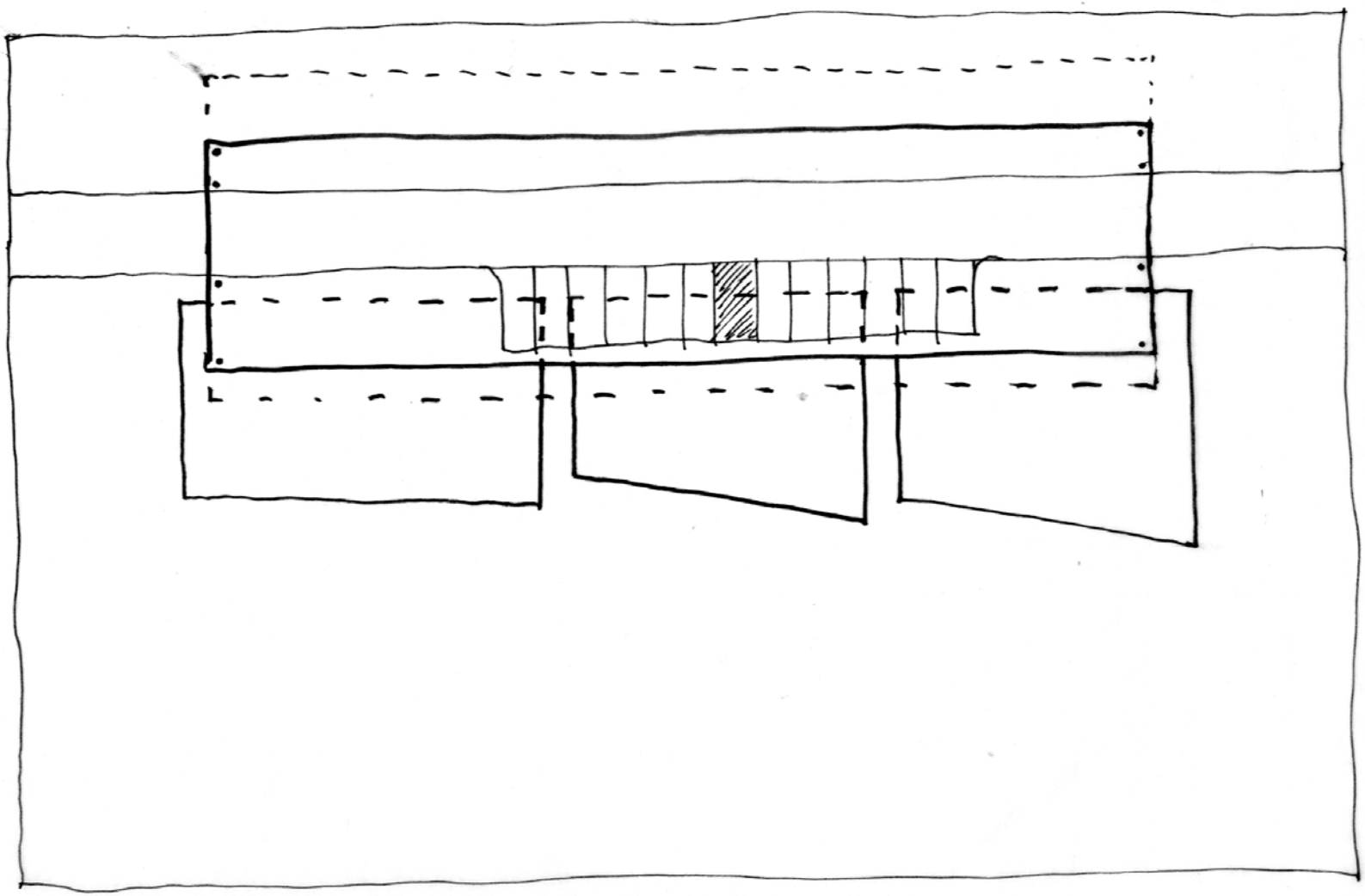
[process documentation]

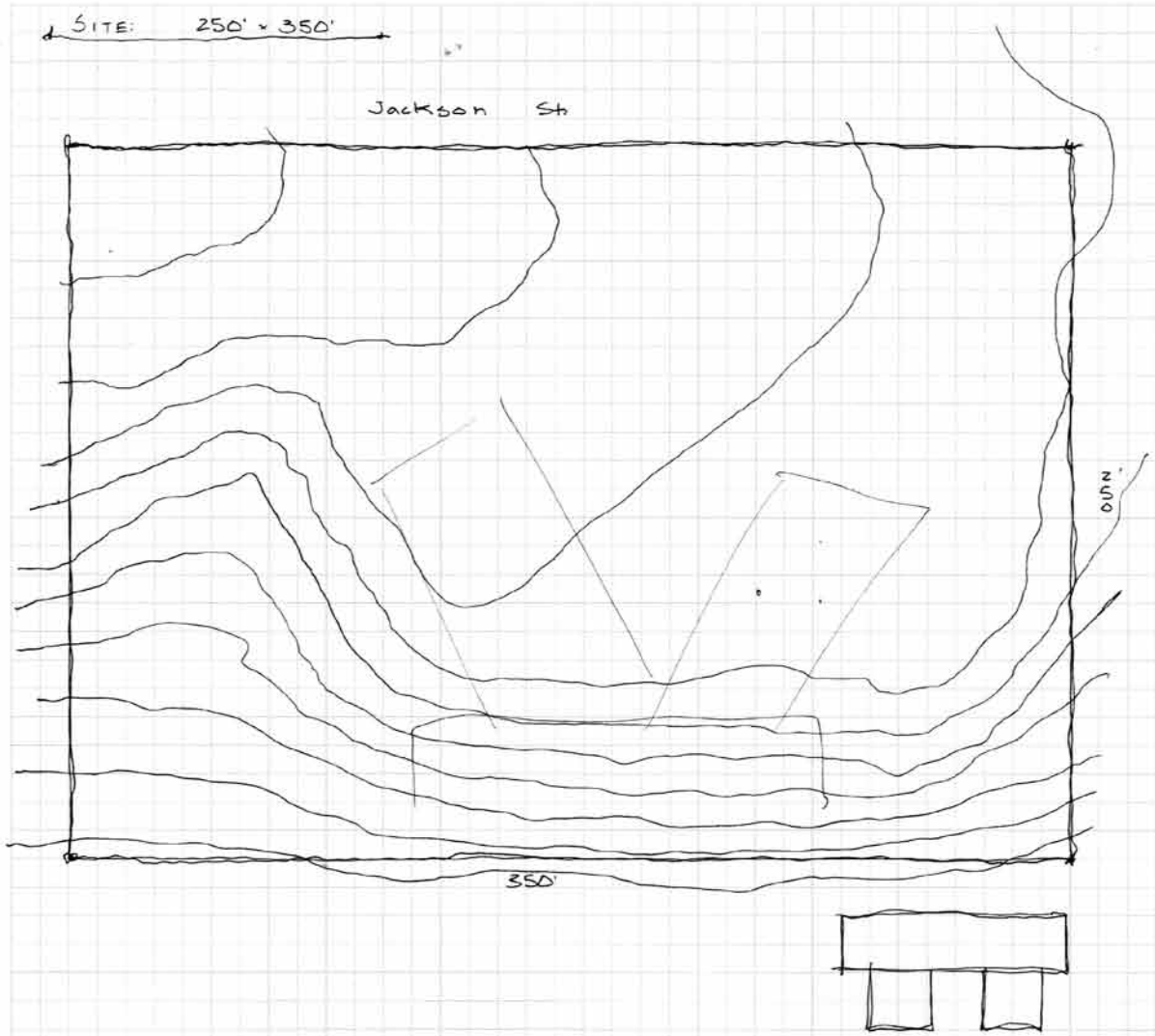



18"
17"
Jackson St.
1/32" : 1'0"


delivery access
distillery
storage
OFFICES
EMPLOYEE PARKING
VIEWS
tasting room
VIEWS
FOOD PREP
Kitchen
VIEWS
18th
17th
PATIO SPACE
BIO SWALE
GUEST PARKING
JACKSON st


SITE OPTION #1
18'
17'
bus stop
push parking back 5-10'
JACKSON





Site plans
- irregular elements
- special volumes
- drainage patterns

0

325 x 325

Jackson ST : 40'

18m 32'

17m 32'

27 Stalls
2 ADA

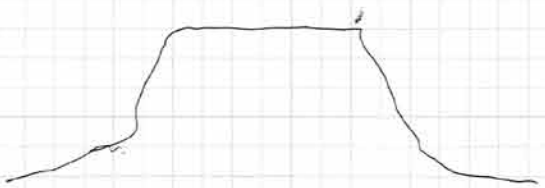
Washington: 46'

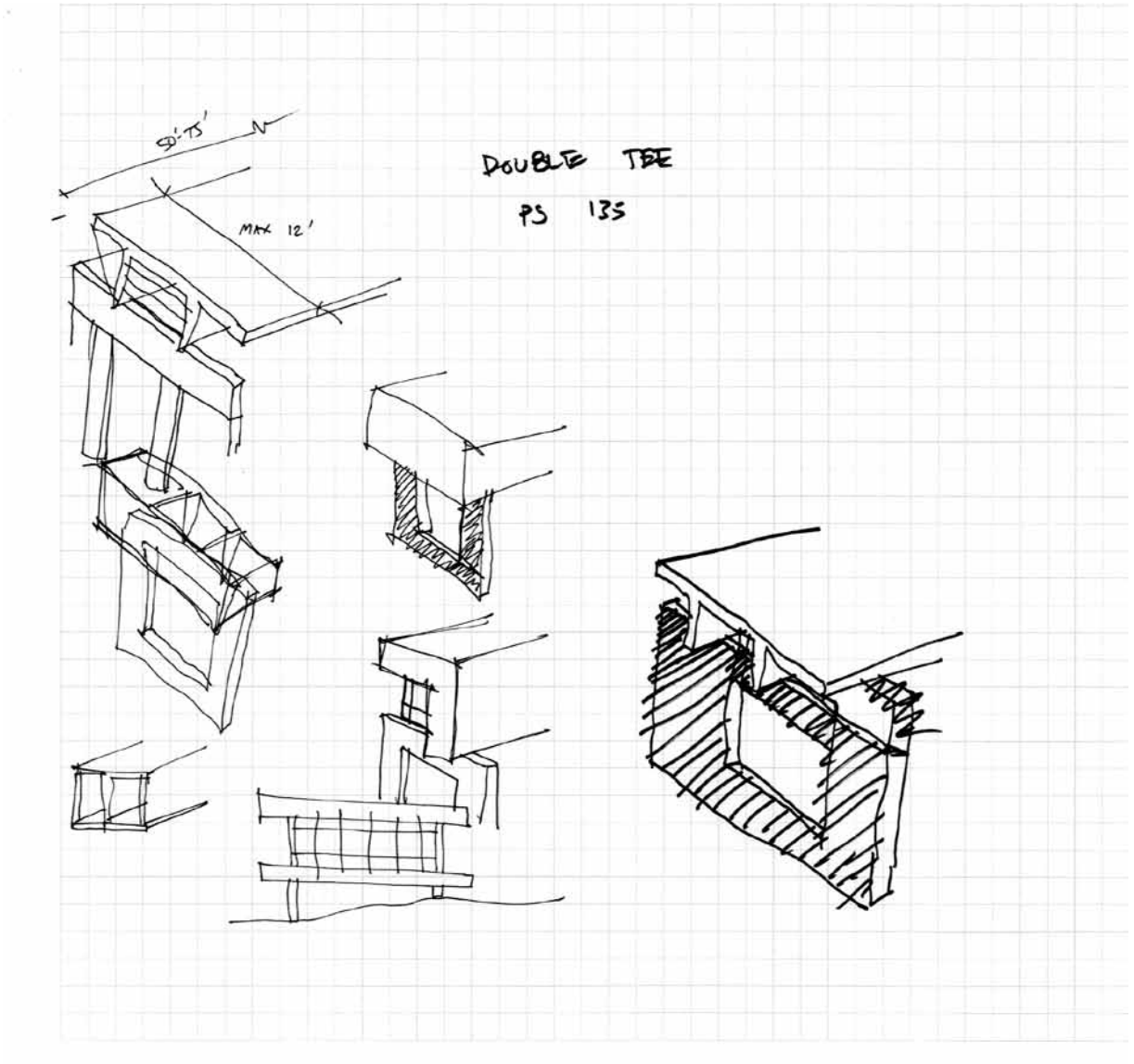
Standard: 9' x 19'
compact: 7.5' x 15'
ADA : 16' x 19'

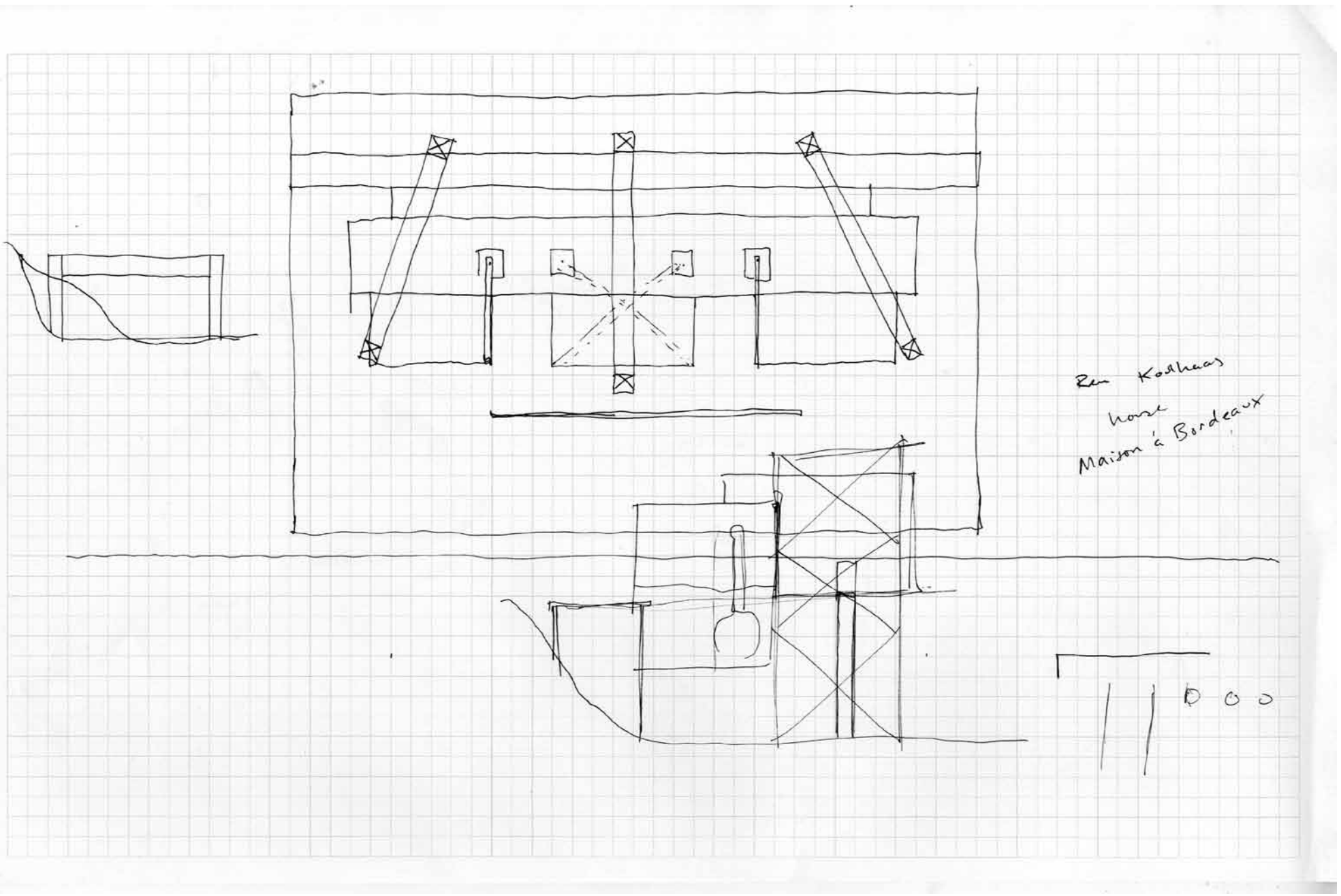
325 x 210

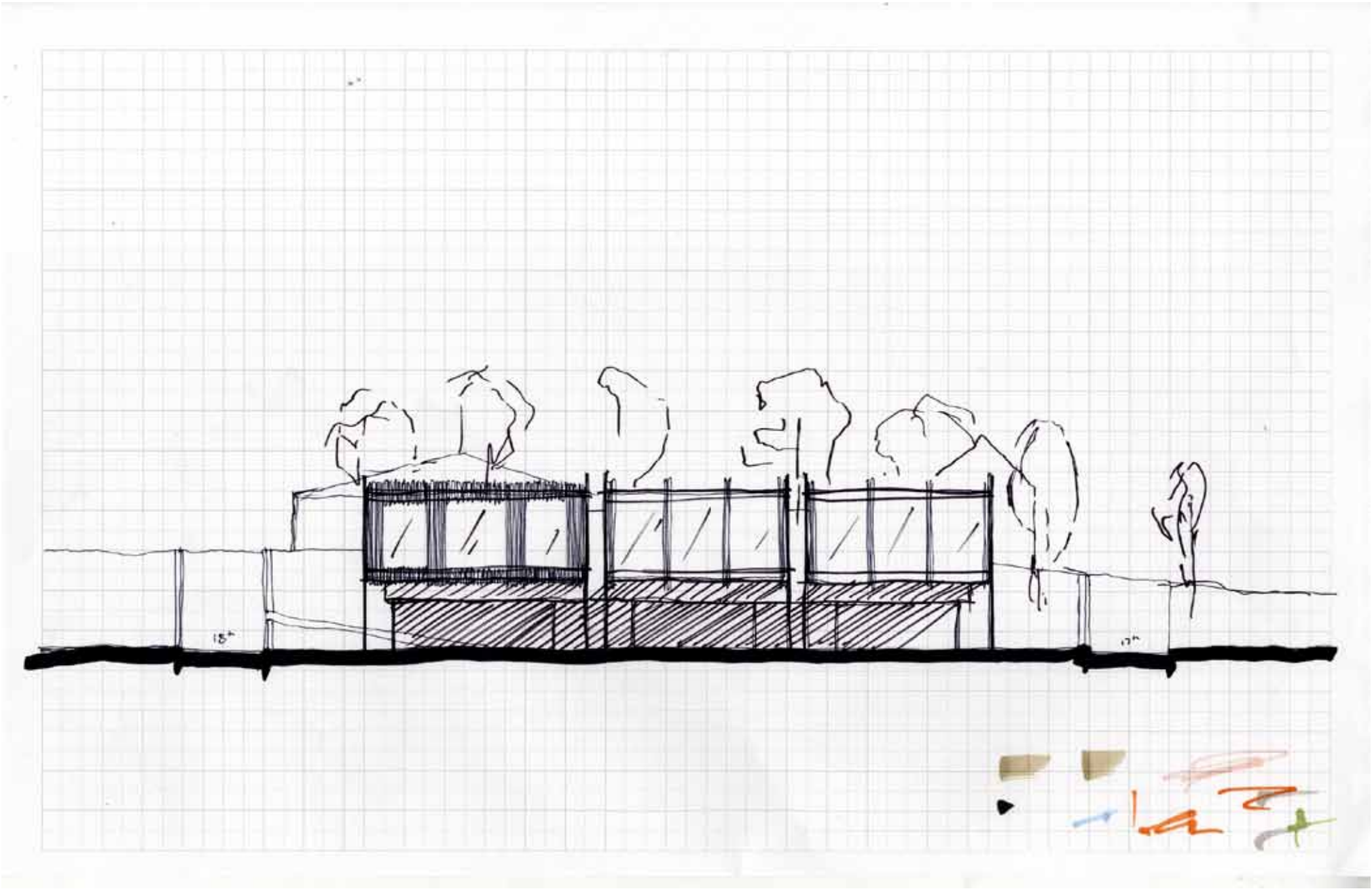
Parking stall requirements

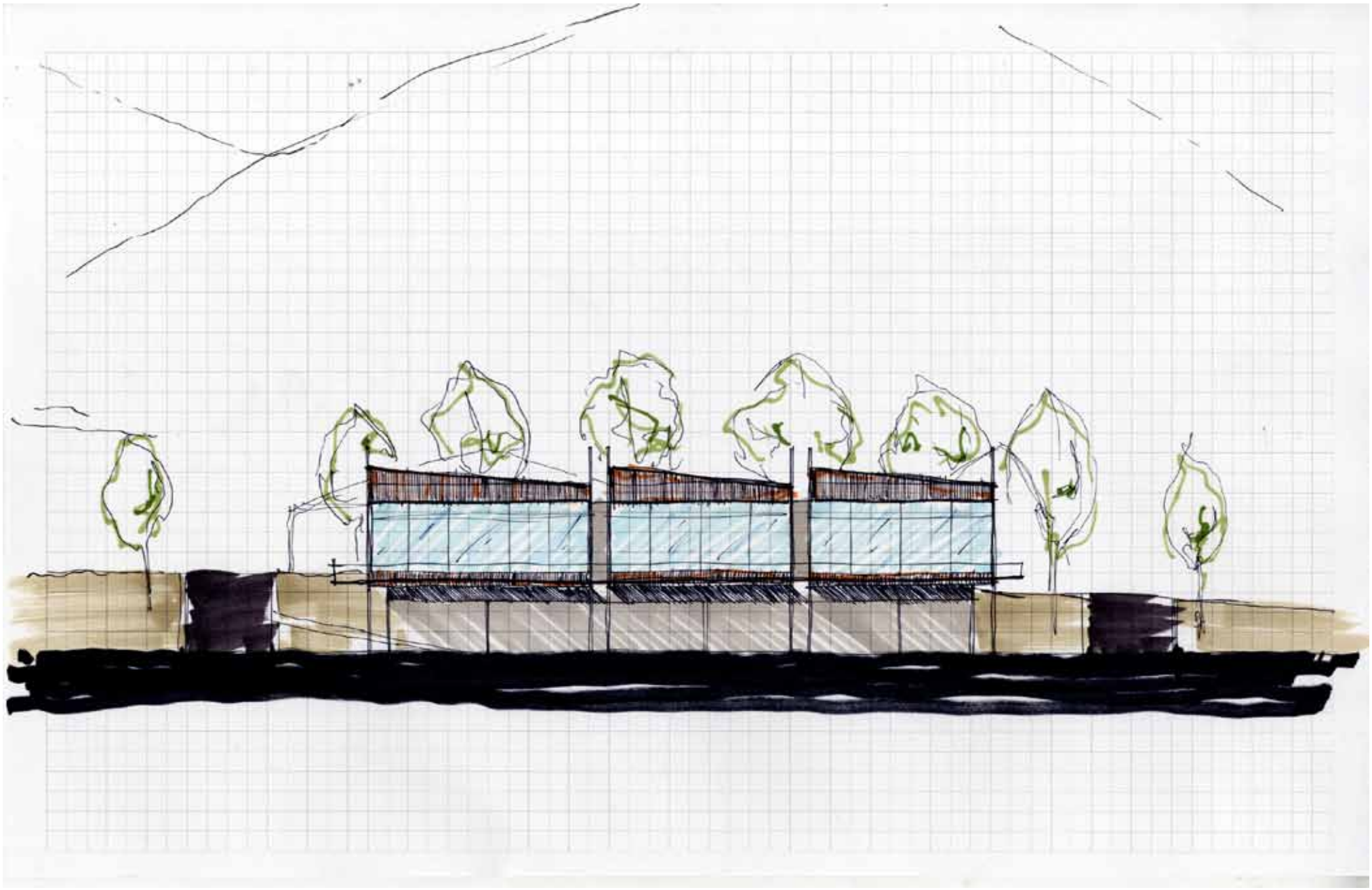
Restaurant 1 stall per 3 seats.

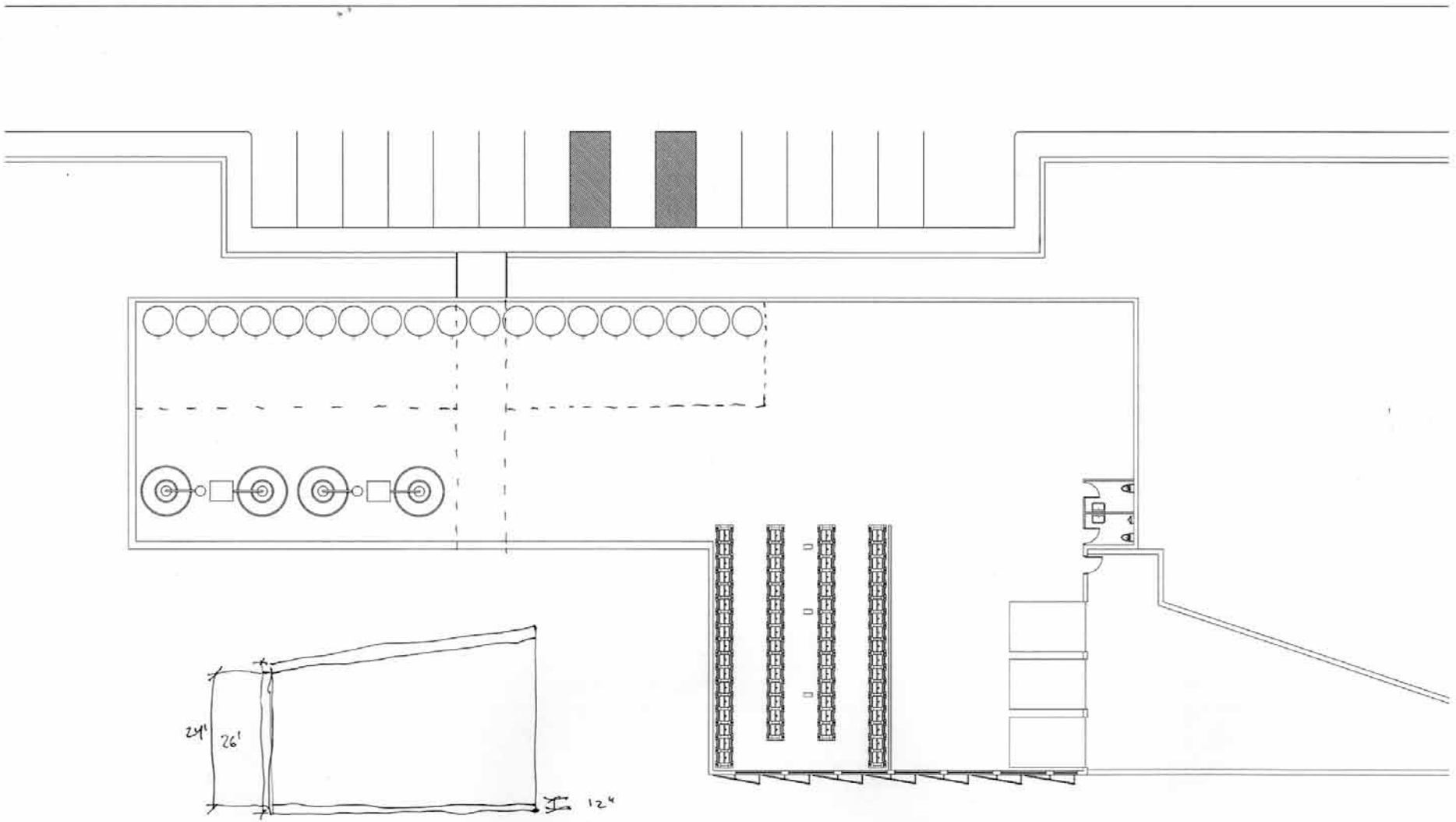


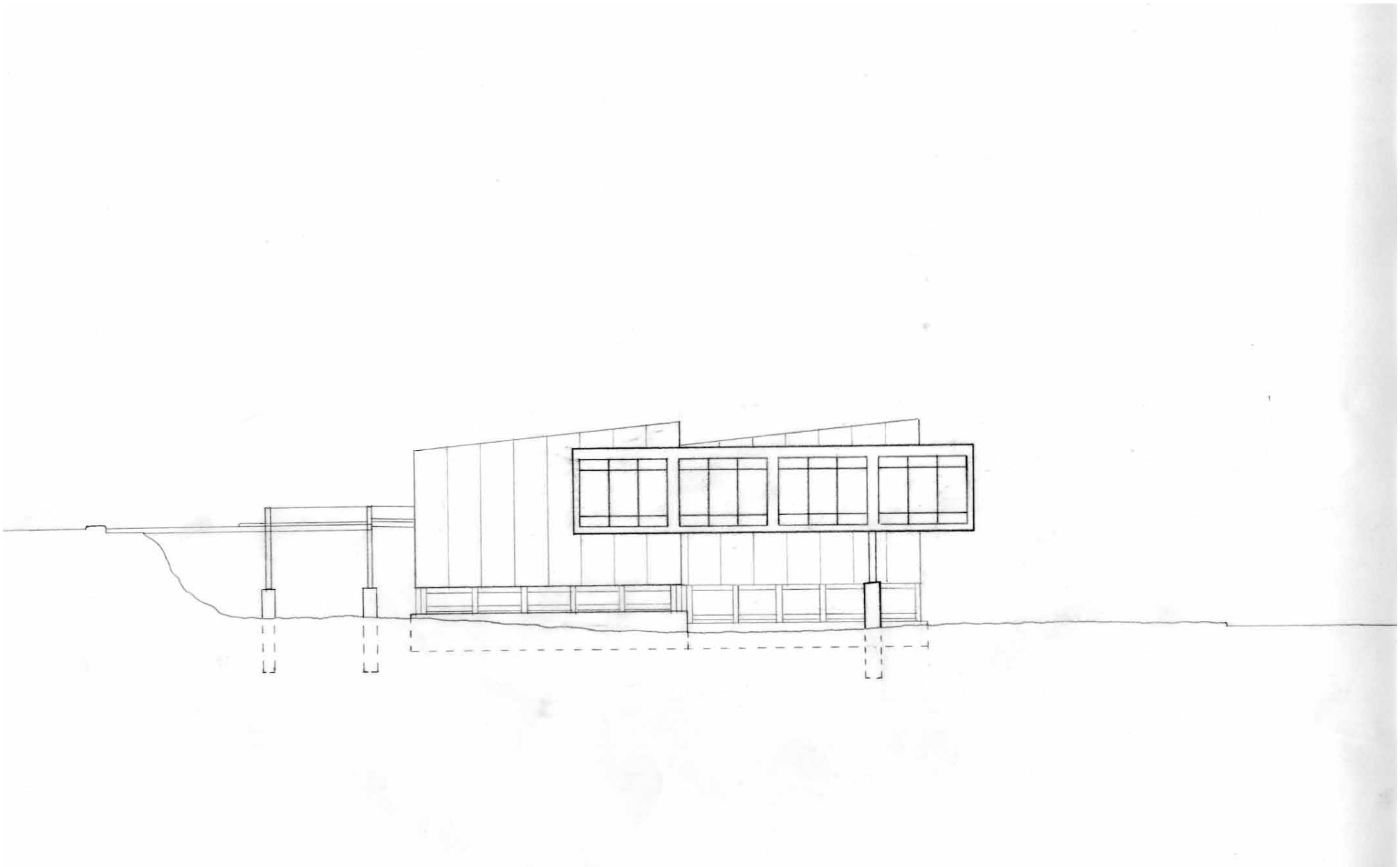

50'-75'
MAX 12'
DOUBLE TEE
PS 135

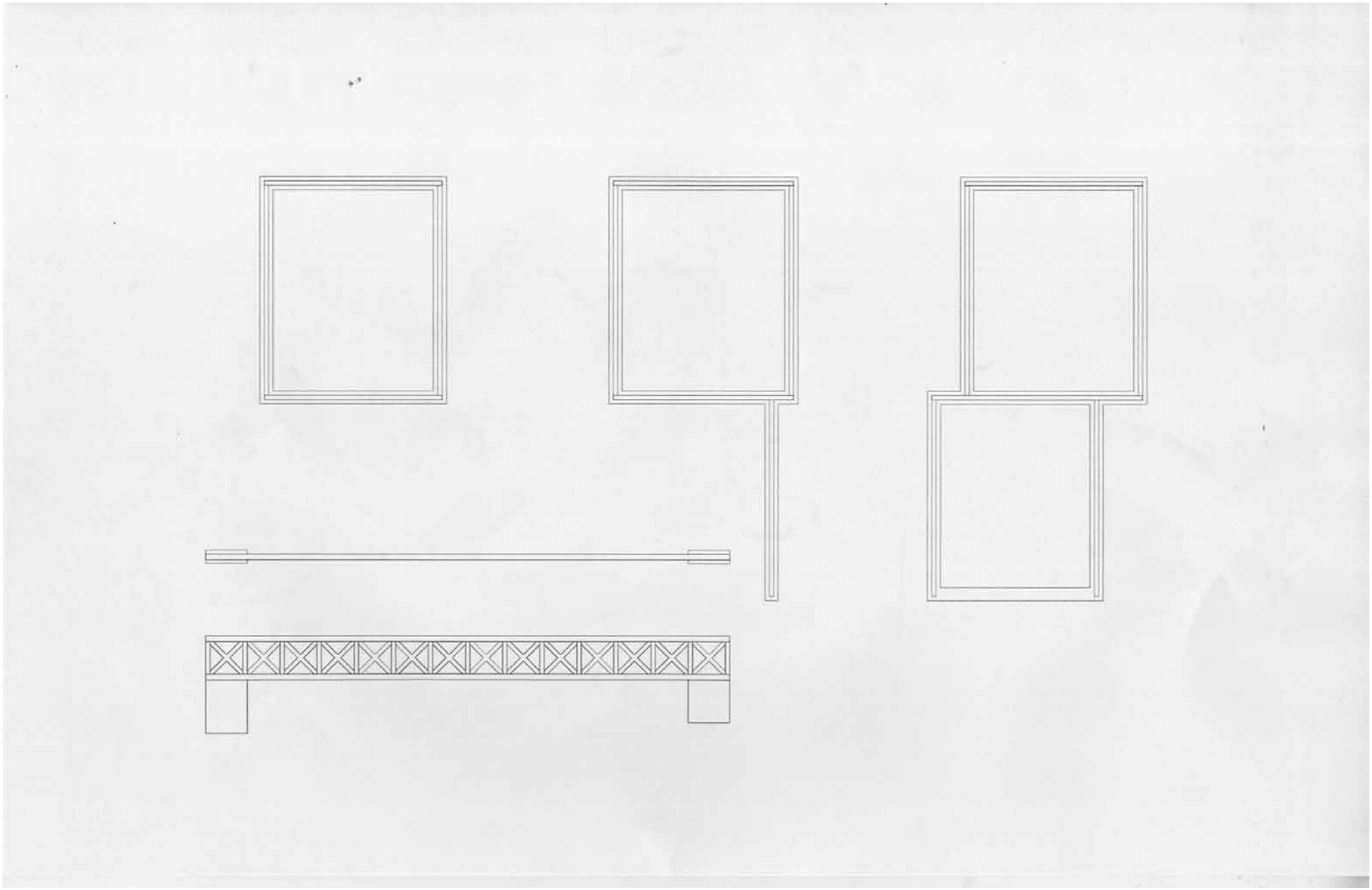

Rem Koolhaas
house
Maison à Bordeaux

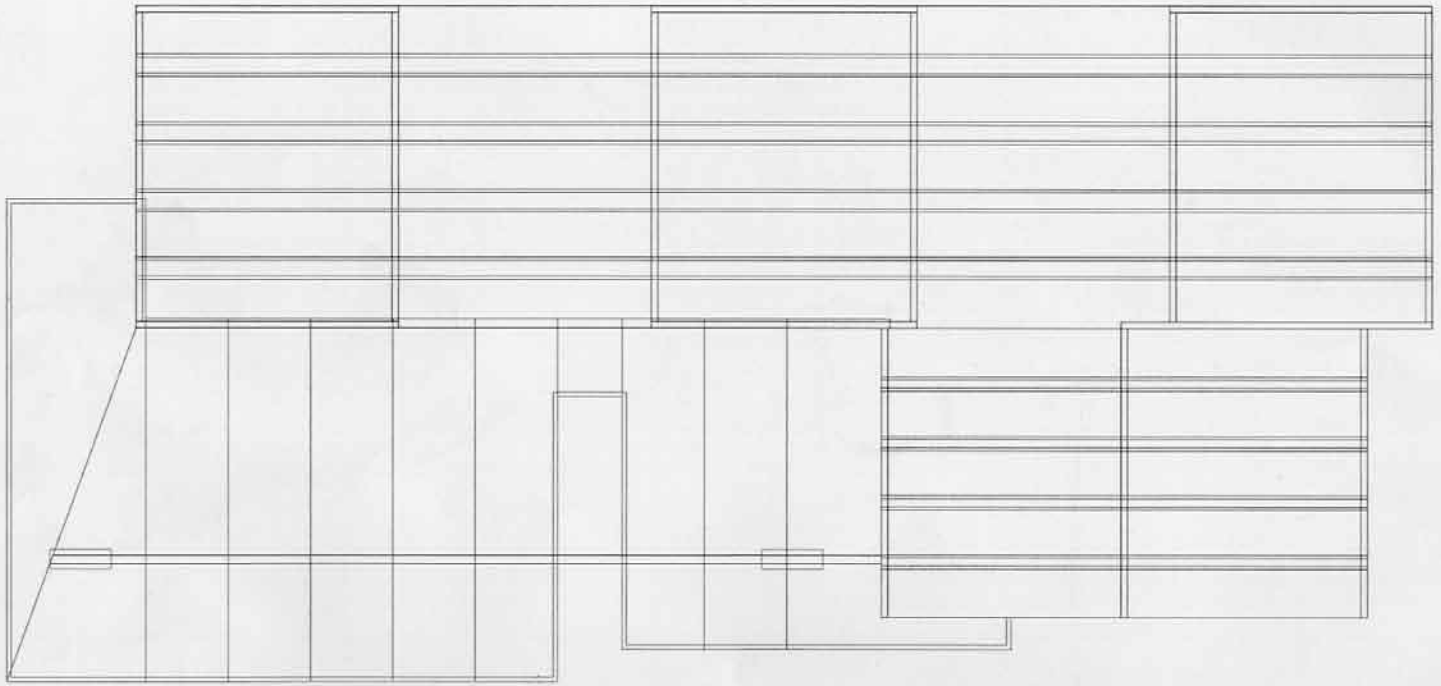


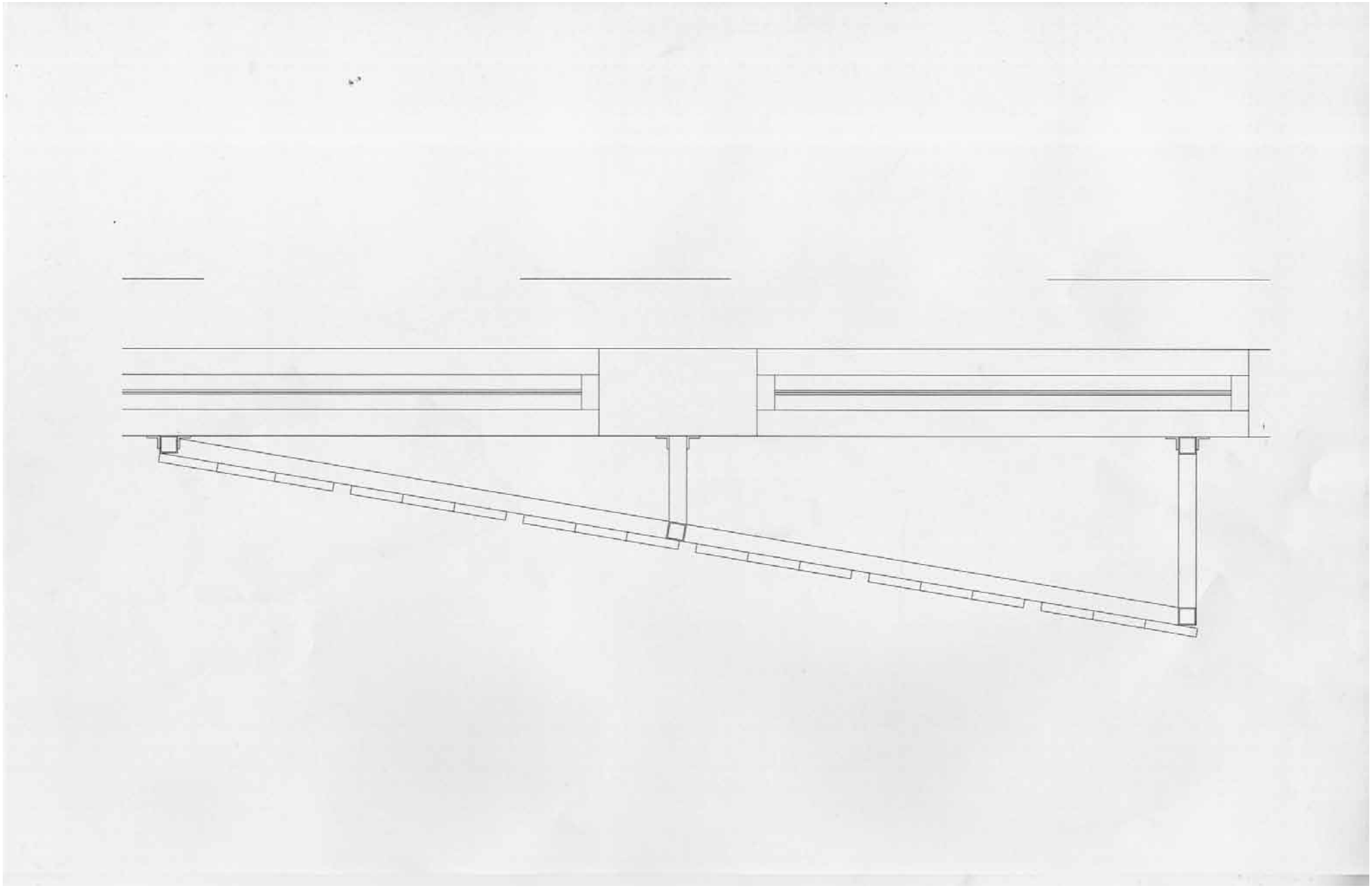


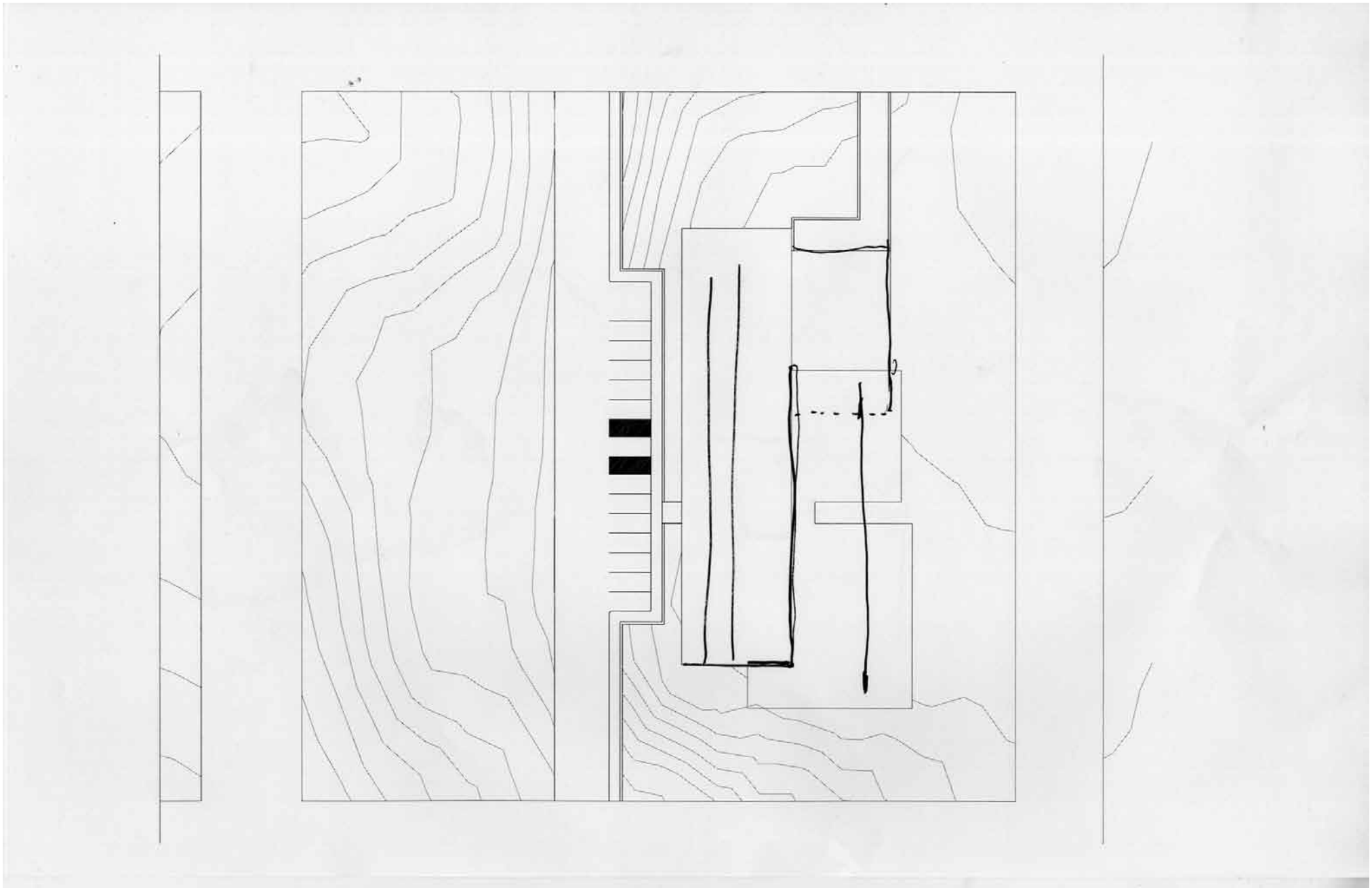

24'
26'
12'
$358, 78
DUE APRIL 15

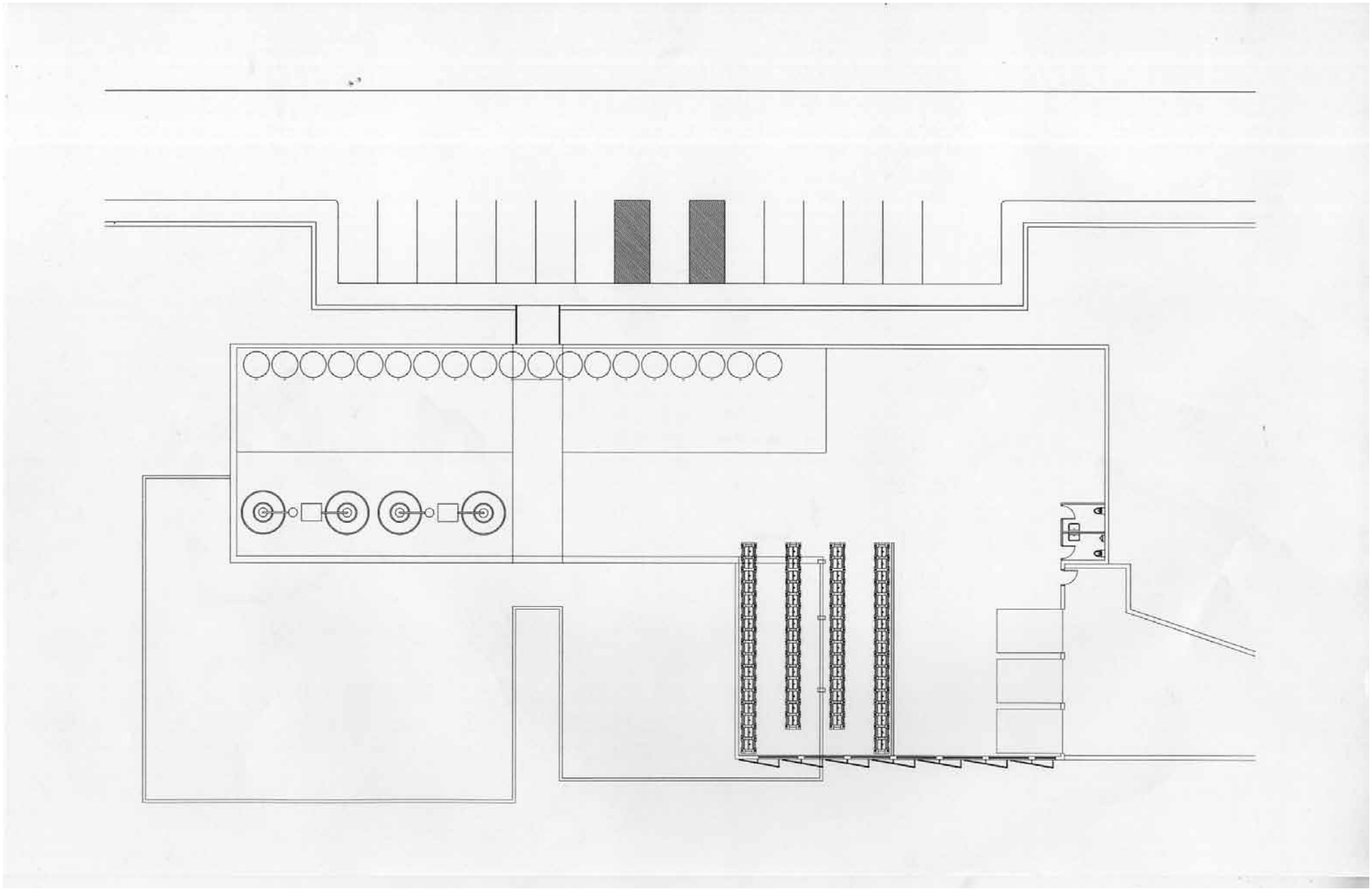


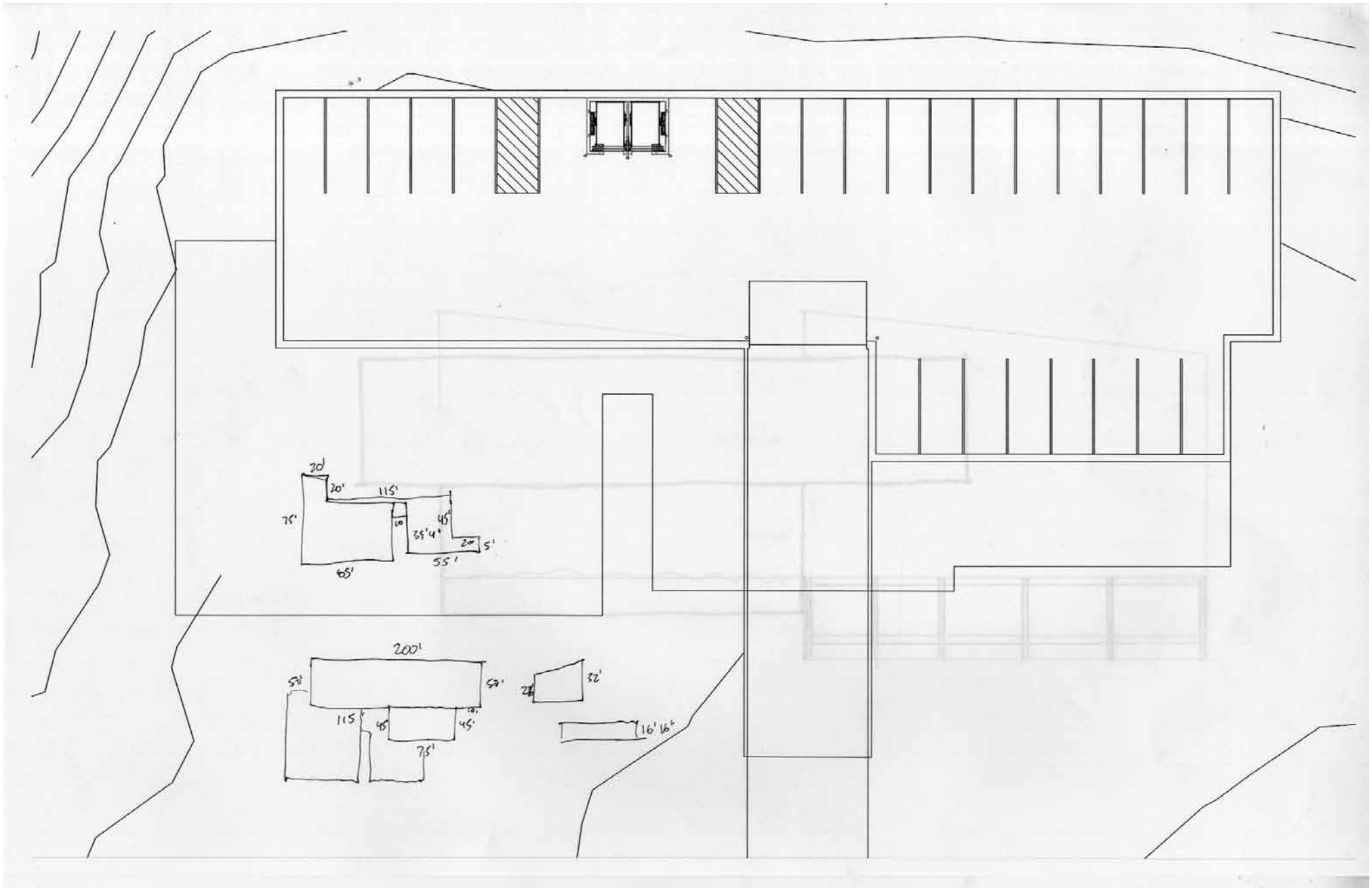


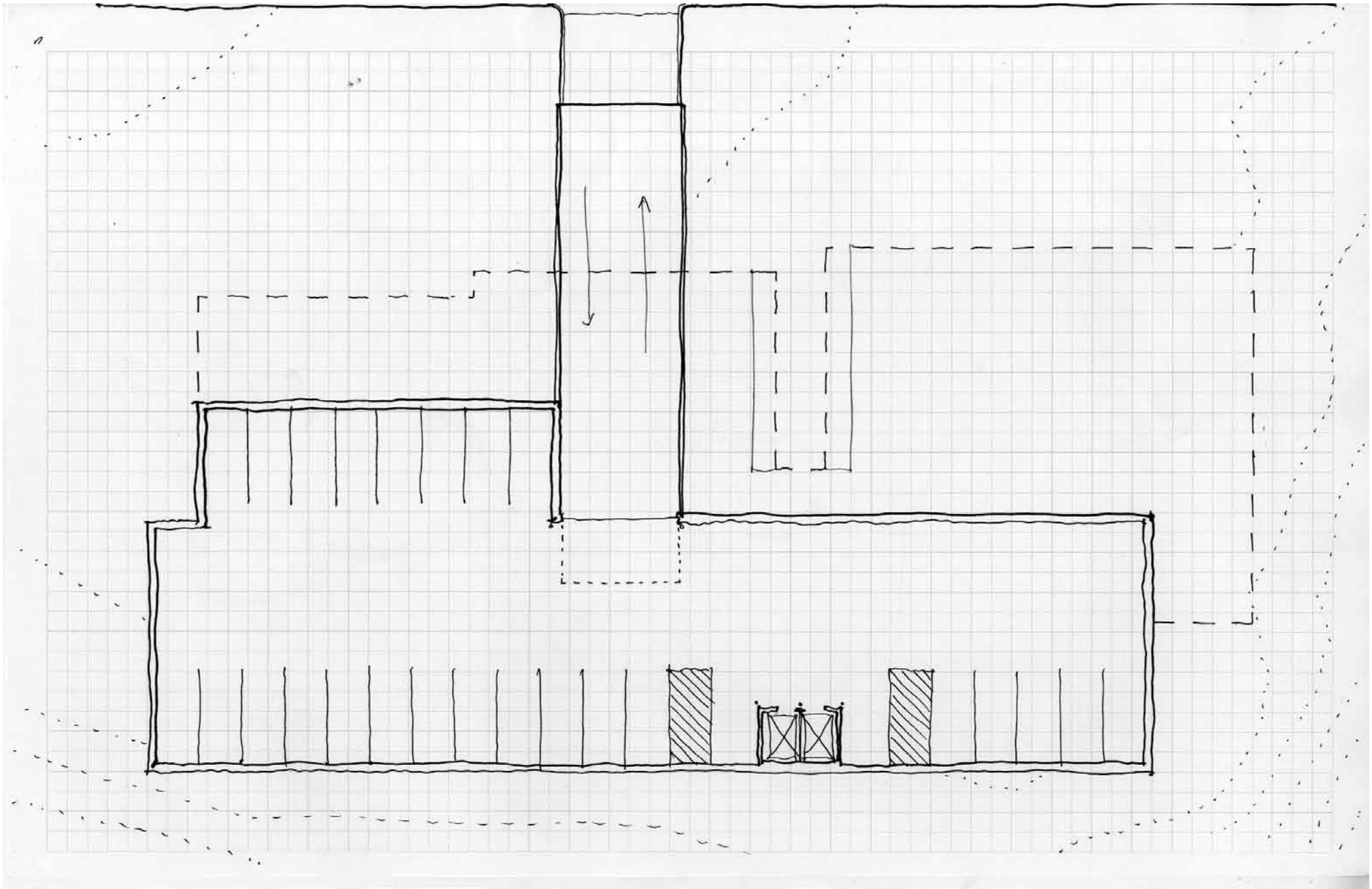


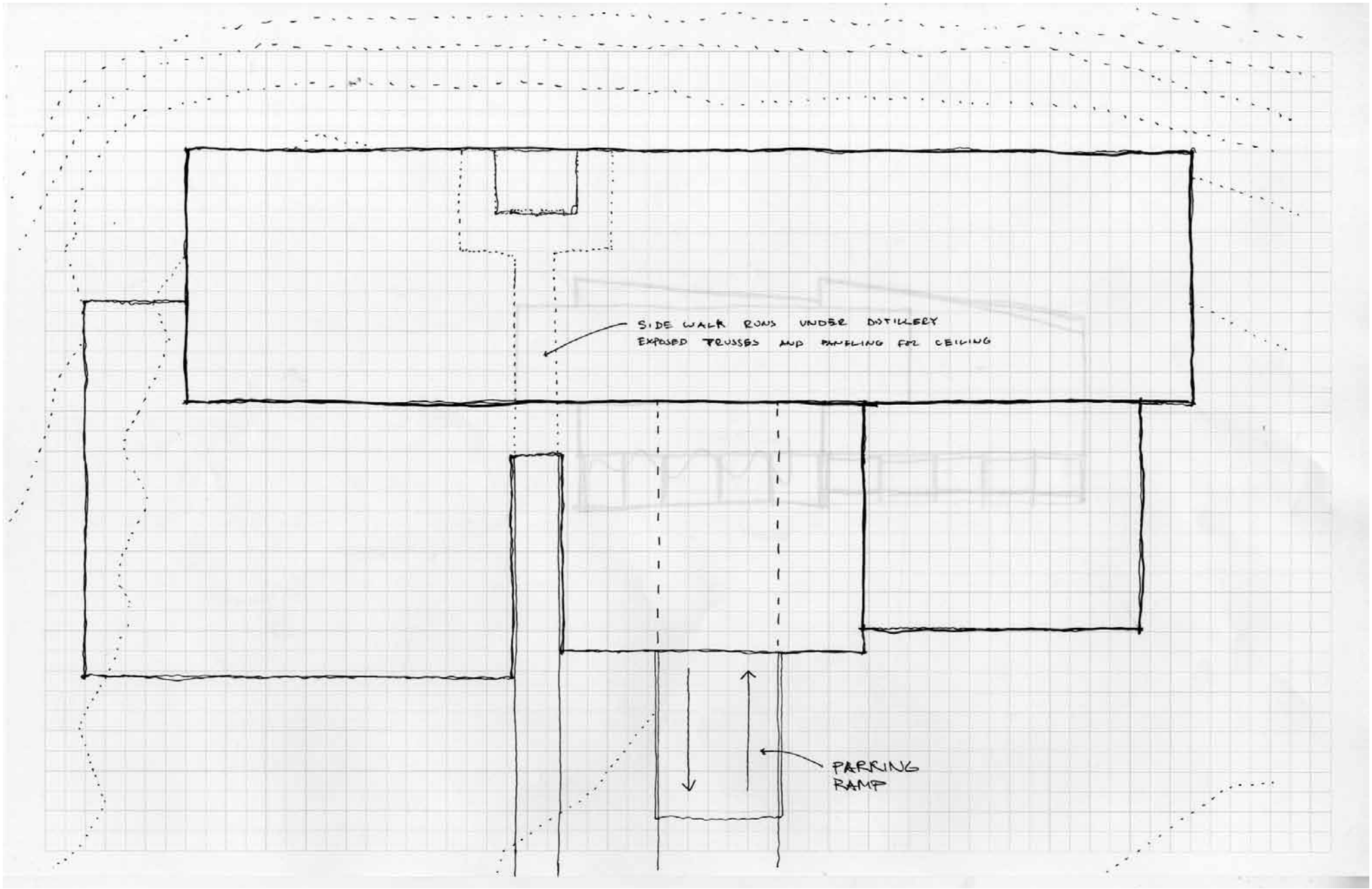







20'
20'
115'
75'
10'
45'
35'4"
20'
5'
55'
65'
200'
50'
50'
115'
45'
10'
45'
75'
32'
16'16"




SIDE WALK RUNS UNDER DISTILLERY
EXPOSED TRUSSES AND PANELING FOR CEILING
PARKING
RAMP

[project boards]

STILL HOUSE PERSPECTIVE

ARCHITECTURAL EFFICIENCY : DESIGNING WITH USER PRODUCTIVITY IN MIND

THEORETICAL ABSTRACT

Workplace productivity is important to the success and operation of any business. If a business can maximize its productivity, it is more likely to succeed and grow. This is especially true in the restaurant and manufacturing industries. My thesis explores the relationship between architectural design and productivity in the setting of a distillery and restaurant located in the town of **Golden, Colorado**. The layout of my design aims maximizes productivity by creating work areas and service areas that provide employees with the necessary goods and tools to complete their tasks and satisfy customers.

THEORETICAL NARRATIVE

As architects our job is to design spaces in such a way that every detail is meticulously thought out. We must thoroughly plan and design buildings as to avoid problems that could occur when the time for construction rolls around. We design buildings so that every room and space works together to create a unified architecture. However there are a few details we can sometimes overlook depending on the end use of the building. The main being how users of the space flow from room to room while completing whatever task that they need to in other words; work flow, more specifically workplace productivity.

Workplace productivity may not matter as much in spaces like museums, churches, and schools; where the bulk of the users are not creating goods or carrying out service related tasks. Where it is important is in the manufacturing and res- taurant industry; where the employees' main goal is to create goods or provide a service in a timely and efficient manner.

My thesis aims to answer the question; "What design techniques can be implemented to increase workplace productivity?" The building typology I am examining this question through is a distillery and restaurant located in golden, Colorado. I plan on researching and exploring the spatial relationship between the user and the space they are interacting with. I will look at case studies of successful distilleries and restaurants and explore their successes and what could be done to improve on their architectural design. My research will include a study on employee traffic patterns in manufacturing operations, and an in-depth look into the timeless art of whiskey and spirit distillation.

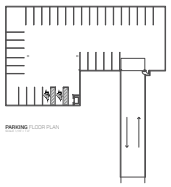
SITE : 1725 JACKSON STREET, GOLDEN COLORADO

The site was chosen because of its close tie to the downtown area. Located just half a block off of Washington Street, the main street of Golden, the site offers ample street parking along with easy walkability access for pedestrians and bikes. The town of golden is very active and most people walk to where ever they need to get, so walkability is important.

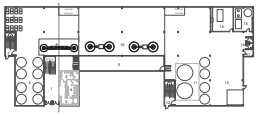
WEST ELEVATION

SOUTH ELEVATION

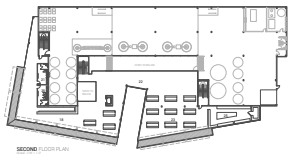
NORTH ELEVATION



PARKING FLOOR PLAN

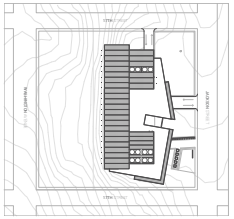


FIRST FLOOR PLAN



SECOND FLOOR PLAN

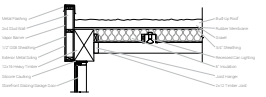
SECOND FLOOR PERSPECTIVE



SITE PLAN

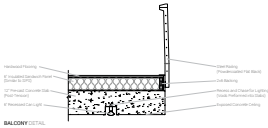
EXTERIOR PERSPECTIVE

BALCONY PERSPECTIVE

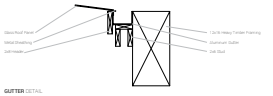


ROOF/STOREFRONT DETAIL

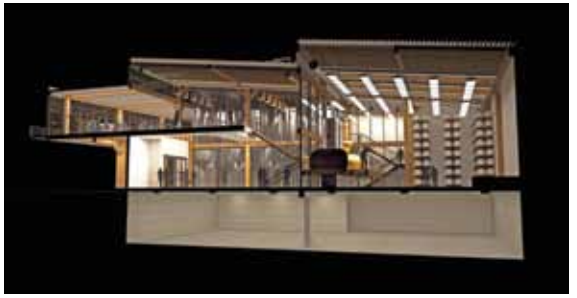
STORAGE TANK DETAIL



BALCONY DETAIL



GUTTER DETAIL



SECTIONAL PERSPECTIVE

[display image]

[appendix]

figure 97 still two

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[previous studio experience]

fall 2011

Rhet Fiskness

tea house . fargo, nd

boat house . minneapolis, mn

spring 2012

Stephen Wischer

twin house . fargo, nd

music centre . fargo, nd

fall 2012

Mike Christensen & David Crutchfield

askanase hall remodel . fargo, nd

spring 2013

David Crutchfield

space centre resort . truth & consequences, nm

folk art museum . chicago, il

fall 2013

Bakr M. Aly Ahmed

highrise . san francisco, ca

spring 2014

Paul Gleye

studio abroad

urban infill . schaerbeek , brussels , belgium

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"NDSU has prepared me for the real world in ways i never thought possible."