a galveston beach house

an exploration of proportion, material, and volume

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thesis submitted to the faculty of the virginia polytechnic institute and state university in partial fulfillment of the requirements for the degree of Master of Architecture in Architecture

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blacksburg, va

material, volume, proportion, galveston, residence

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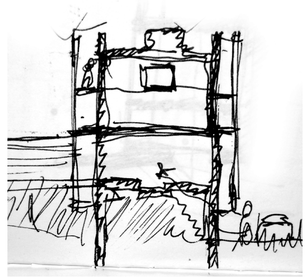
abstract

this house began as a desire to place a single floating mass on the horizon, but became an exploration of proportion, material, and volume, and how they relate to each other.



sketch

acknowledgements

those who have inspired and supported me

my dad, i'm not sure you ever really understood what i was doing in architecture school, but i was making As, so it didn't matter
my mom, thank you for your strong emotional support
my brother, Jake, you were in some way supportive

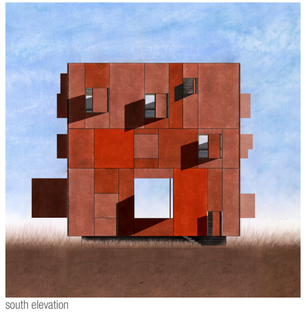
patrick doan, hans rott, scott gartner, steve thompson, bill galloway, rodney hill, marcel erminy, michael o'brien

leesa vardeman, vlk architects, the entire ramirez family

context rendering

contents

concept image



south elevation

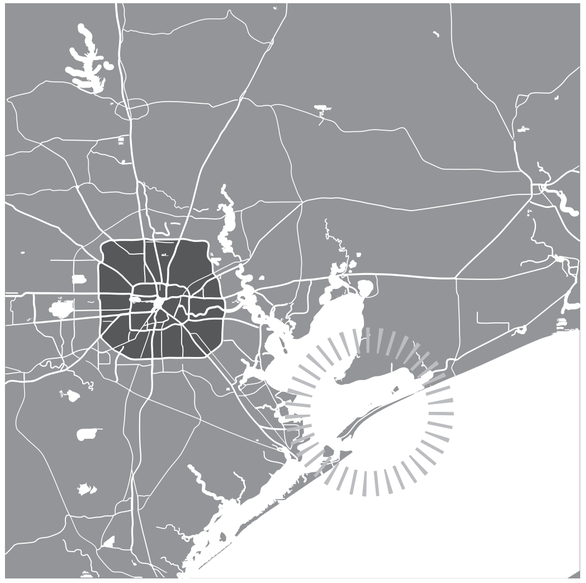
introduction

the project began with a desire to build a house for my mom, angela, and step dad, koy, in a small coastal community of gilchrist, texas. this place is not a shining jewel of a resort, but it has and continues to be a special place to our family. my parents are avid readers and love hosting friends, family and guests any time the opportunity presents itself. the only design guideline i initially set was to create a single monolithic volume on the horizon that contained a more complex volumetric quality within it. the characteristics of my parents, the qualities of the place, and my early design intent were the starting point for this thesis.

context

the site is in the town of gilchrist, texas on the bolivar peninsula, a few miles northeast of galveston island. the maps to the right show the site in a series of scales: the state of texas, houston, bolivar peninsula, and the immediate site.

texas



houston

bolivar peninsula

site

context

gilchrist, texas is a small community of perpetual beachgoers. several generations of my family have been vacationing here, and i have been a part of that tradition for 25 years. the beach is not posh and glamorous, but of a more unrefined nature. this place is filled with people who love good company, fried seafood, blistering sun, and cold beer. my parents would love to retire to this place that they have been visiting with their parents and children for so many decades. this project was inspired by that desire. the photos to the right were taken in 2011.

typical beach house

gilchrist

gilchrist

gilchrist

context

unfortunately, this great place sits in a dangerous hurricane zone. two major hurricanes have devastated this area this century. the hurricane of 1900 passed over galveston, bringing with it 145 mph winds and 15 feet storm surges. it is still regarded as the deadliest natural disaster to hit the united states, taking as many as 12,000 lives. More recently in 2008, hurricane ike tore through galveston with 145 mph winds and 17 - 22 feet storm surges. both hurricanes wrought massive amounts of destruction to the area, but this community still thrives. the photos to the right depict the damage of gilchrist after hurricane ike.

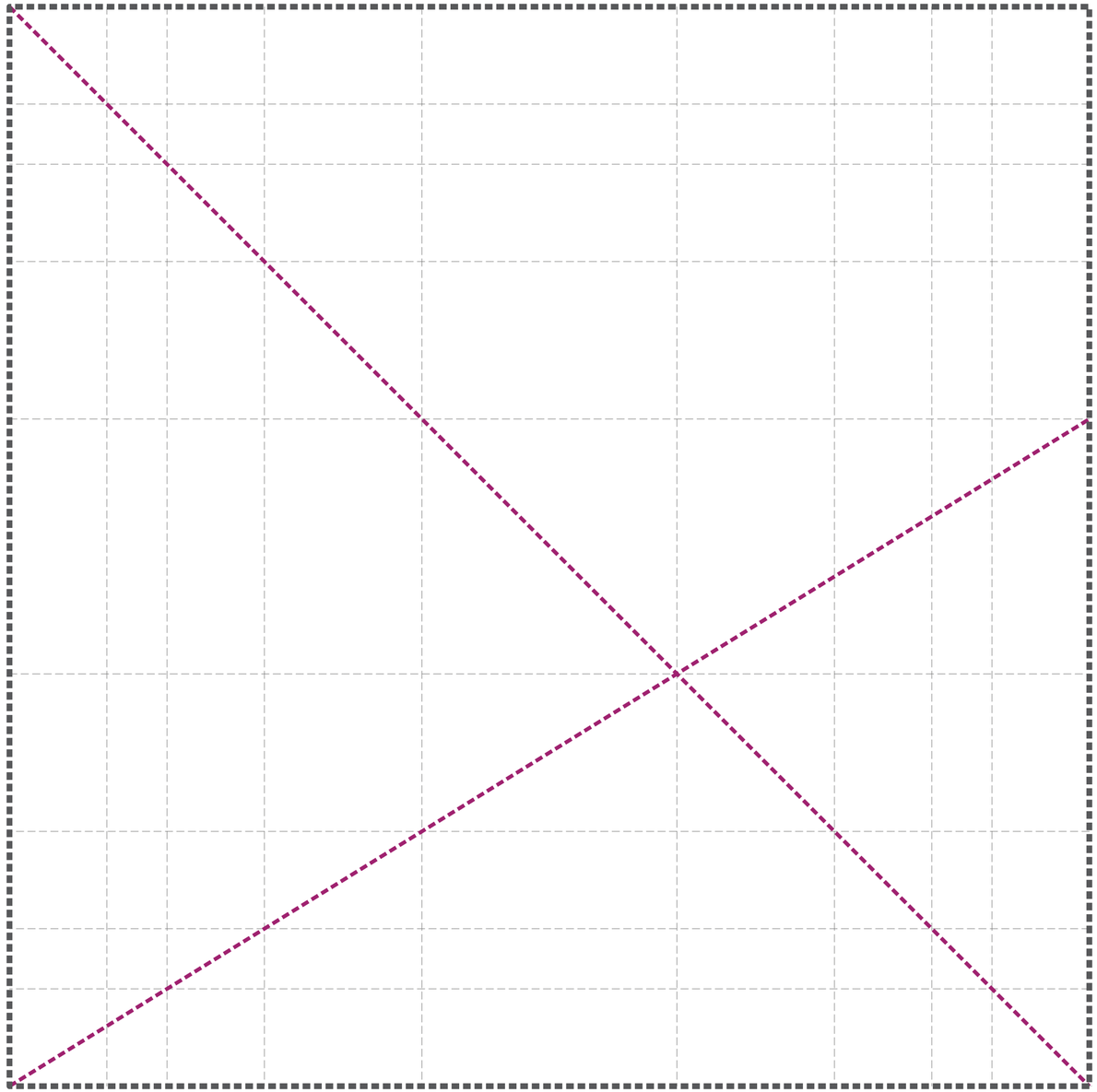
damage in gilchrist

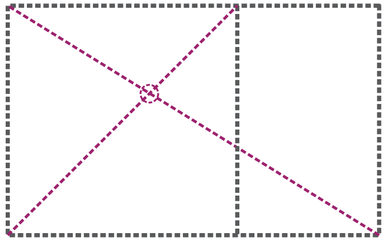
flooding in gilchrist

damage in gilchrist

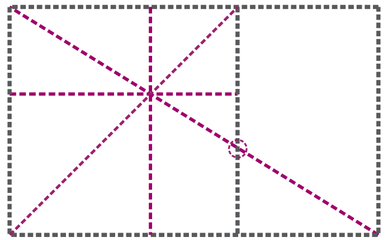
proportion

a proportion grid system (right) was developed based upon the golden ratio, 1.618:1, that acted as a template for placing and sizing elements of the building. the proportion system was implemented first in plan but then propagated to the sections and elevations as i became more comfortable using it. the project quickly became an exercise in proportion and how far it could be implemented in the design. there is a problem with using grids to layout spaces and that is the question of how to place a wall on a grid line while maintaining the strict proportional relationships. in this house, i used a grid dimension to create a thickened closet wall. the white oak closet walls act as sound buffers and service conduit between the occupied spaces.

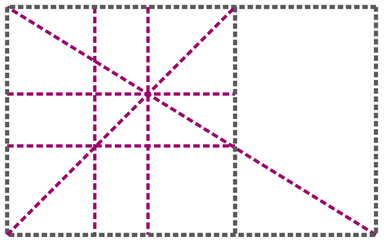




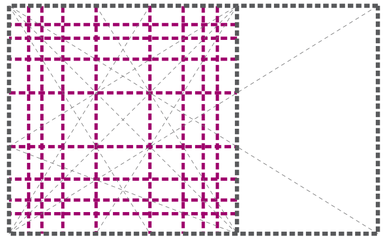
01. create
the golden rectangle is created. the intersection of the square and rectangle diagonal create a grid point.



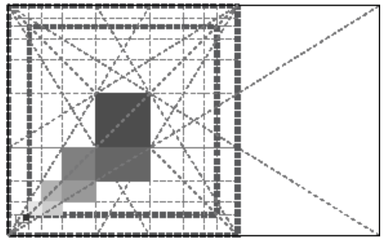
02: extend
lines extend vertically and horizontally from that grid point.



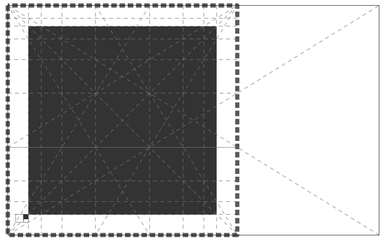
03: divide
the grid is divided further.



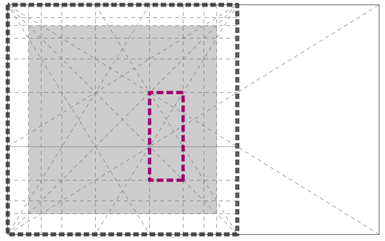
04: main grid
after extending square and rectangle diagonals from each corner, the main grid lines are established.



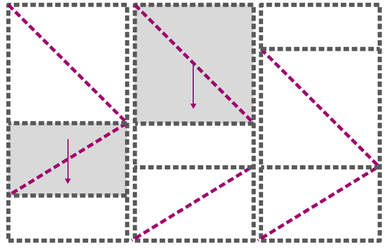
05: boundaries and dimensions
the bold dashed lines show the inner and outer boundary lines. the colored squares highlight common dimensions that recur throughout the project.



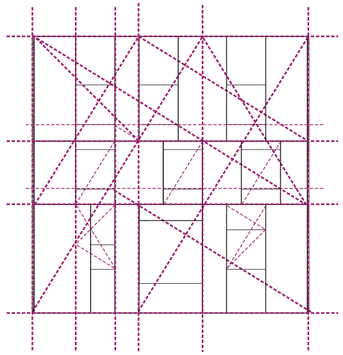
06: volumes
the dark square shows the area selected for the interior wooden volume, and the dashed line shows the corten boundary.



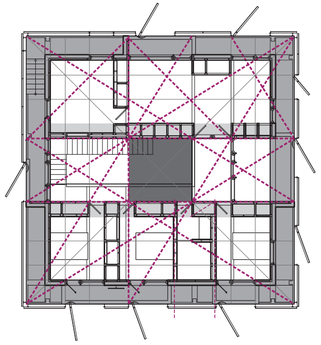
07: grid combinations
the pink rectangle is a combination of 2 grid dimensions.



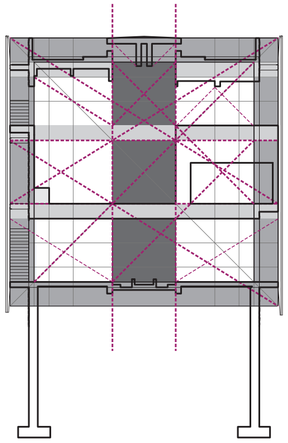
08: grid manipulation
grid dimensions can be shifted to create different arrangements. this applied more directly to the elevations.



09: elevation
south elevation with overlayed construction lines



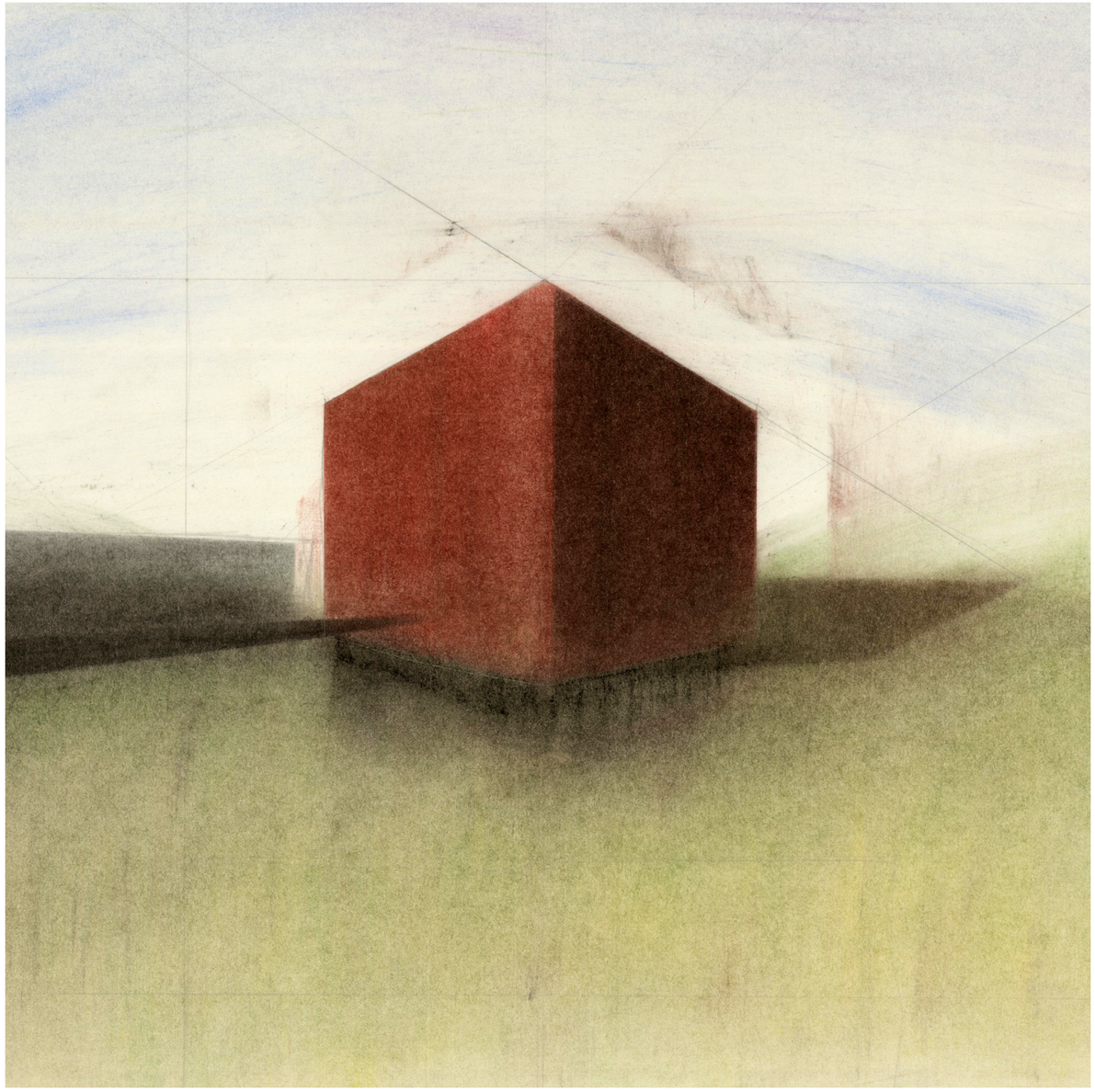
10: plan
second floor plan with overlayed construction lines. the light grey boxes represent the major closet walls of the floor. the darker grey border shows the grid dimension selected to define the interstitial space.



11: section
section with overlayed construction lines. the light grey boxes represent the structural depth of the floor. the darker grey border shows the grid dimension selected to define the interstitial space.

material + volume

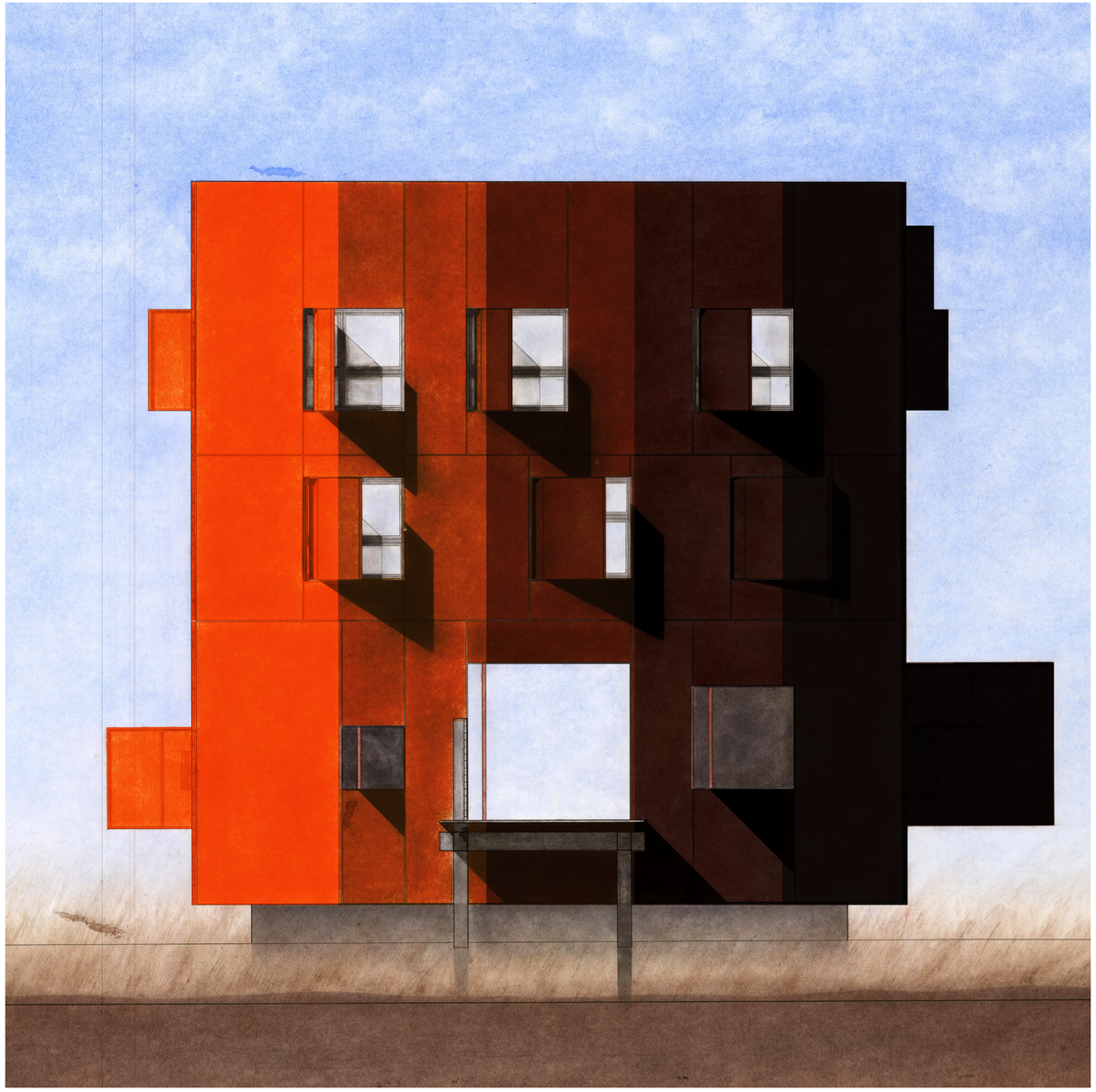
throughout the project, material became a way of defining volumes. the house became a series of 3 nested volumes each with their own distinct material quality. the corten steel wraps the board formed concreted which holds up the cedar and oak box.



corten box

1/8" = 1'

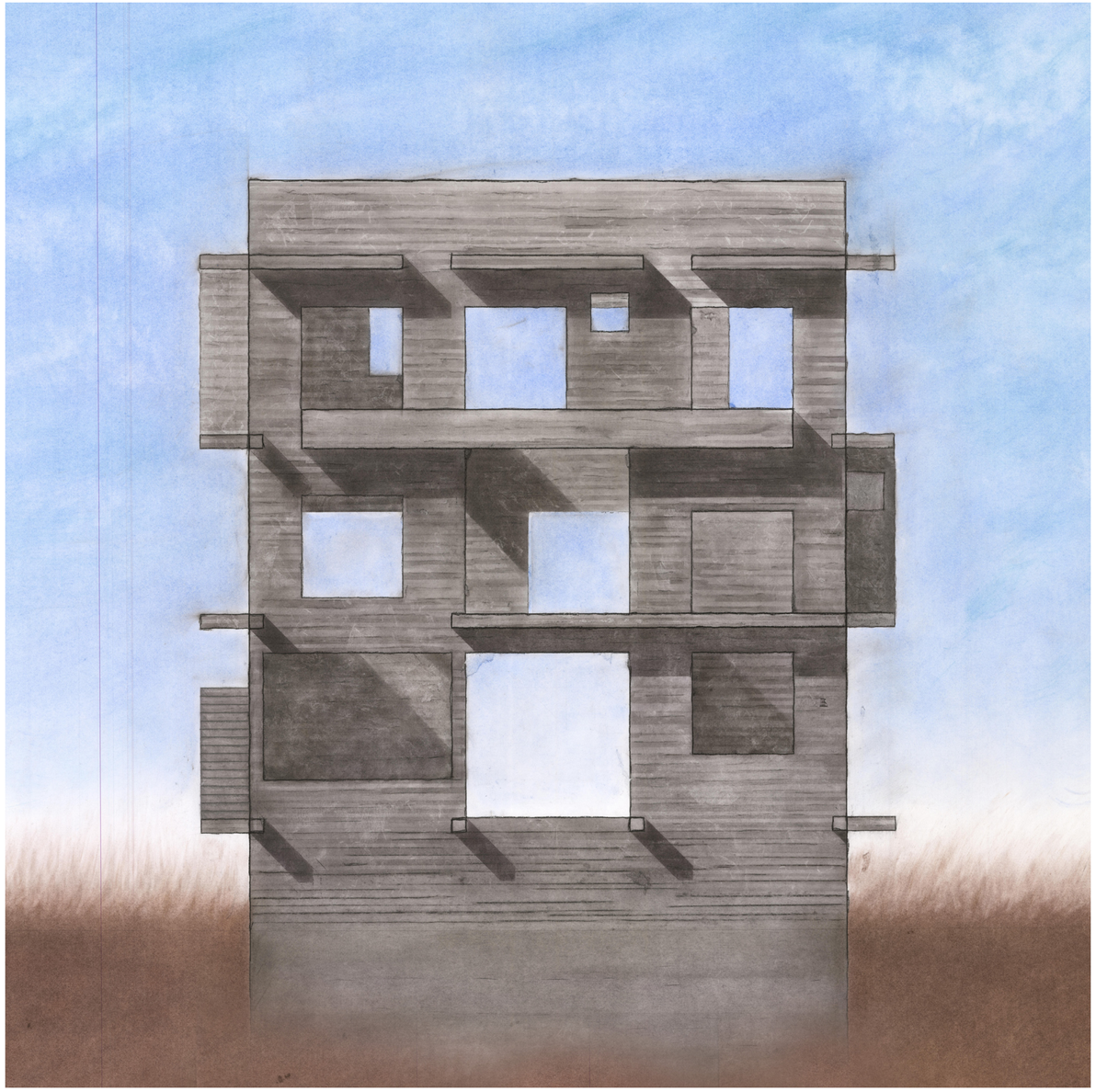
the corten steel skin presents a rough, unrefined solid mass to the exterior which contradicts its light weight steel construction. the steel is installed with a bright orange crust, but over the next decades the corten weathers, forming a darker, hardened crust. the color of the corten acts as a visual time line of the house's lifespan. the steel shell is meant to act as the first protective barrier to the elements, providing an inhabitable interstitial space between the steel and concrete. It will receive a large amount of direct light, radiate heat, and create a thermal updraft in the interstitial space.



concrete box

1/8" = 1'

the concrete box is cast in place using horizontal board forms which create an undulating series of relief and projection on the surface. the changing sun altitude throughout the texas seasons would create a different shadow pattern on the wall throughout the year. concrete porches and beams extend outward and receive the corten shell, creating an occupied interstitial space. the concrete shell acts structurally as a hollow column, holding the inner wooden box above the flood plane. the wooden box sends the loads horizontally to the concrete shell which transfers the forces vertically to the pile caps underground. the footing of the foundation wall was placed in reference to the "wash out" associated with flooding. wash out refers to the large amount of soil that is swept from the mainland back to shore as the flood waters recede back into the ocean.



wooden box

1/8" = 1'

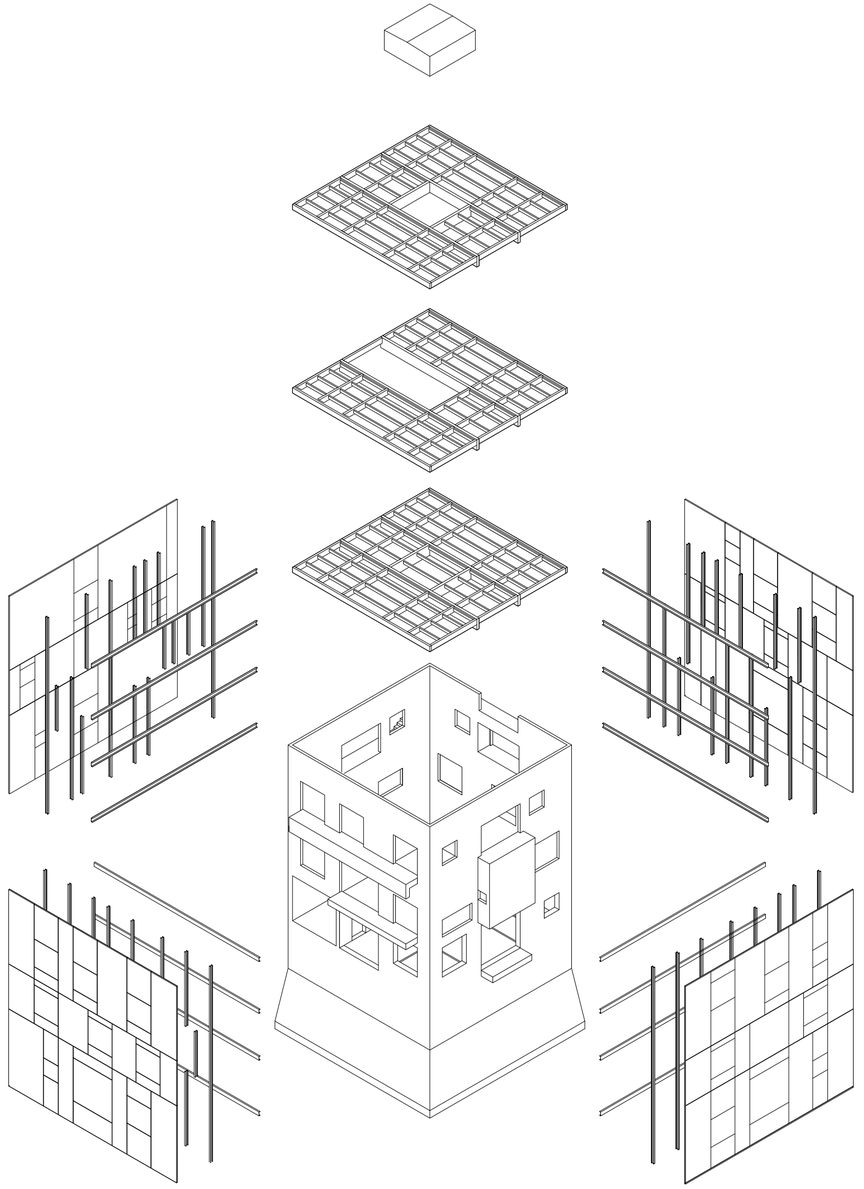
the inner most volume is the cedar and white oak box which defines the interior spaces and marks the actual building envelope. the floor and roof structure are red cedar glulam framing with cedar decking, and the infill woodwork is white oak. the two woods were chosen for their strength, natural rot resistance, and contrasting visual qualities. the color difference was incorporated as a subtle way to distinguish structure from infill. a major component of the infill condition is the closet wall that acts as a buffer between public and private spaces. the flood plane is an important datum to build above in this area. the drawing to the right shows the wooden box in relation to the 22 feet of flood waters cause by hurricane ike.

material + volume

this image shows the three volumes as you step further into the building.

exploded axon

the diagram shows the three main volumes of the house and a more detailed view of the corten skin construction.



site plan

1" = 400'

the house is situated on an undeveloped 220 acre plot of land. the plot is relatively flat although there is a canal bisecting the site longitudinally for water retention. the approach is on a crunchy gravel path starting from the northwest and heading southeast towards the shore. the house can be seen from a distance as a small rusted box on the horizon. the path ends at a gravel fore court for parking. now the corten box can be seen at full scale sitting above the tall texas grass. on the other side of the box, a wood and concrete boardwalk extends over the grassy field to the shore. along the boardwalk is a patio and a cubic shower room.

context rendering

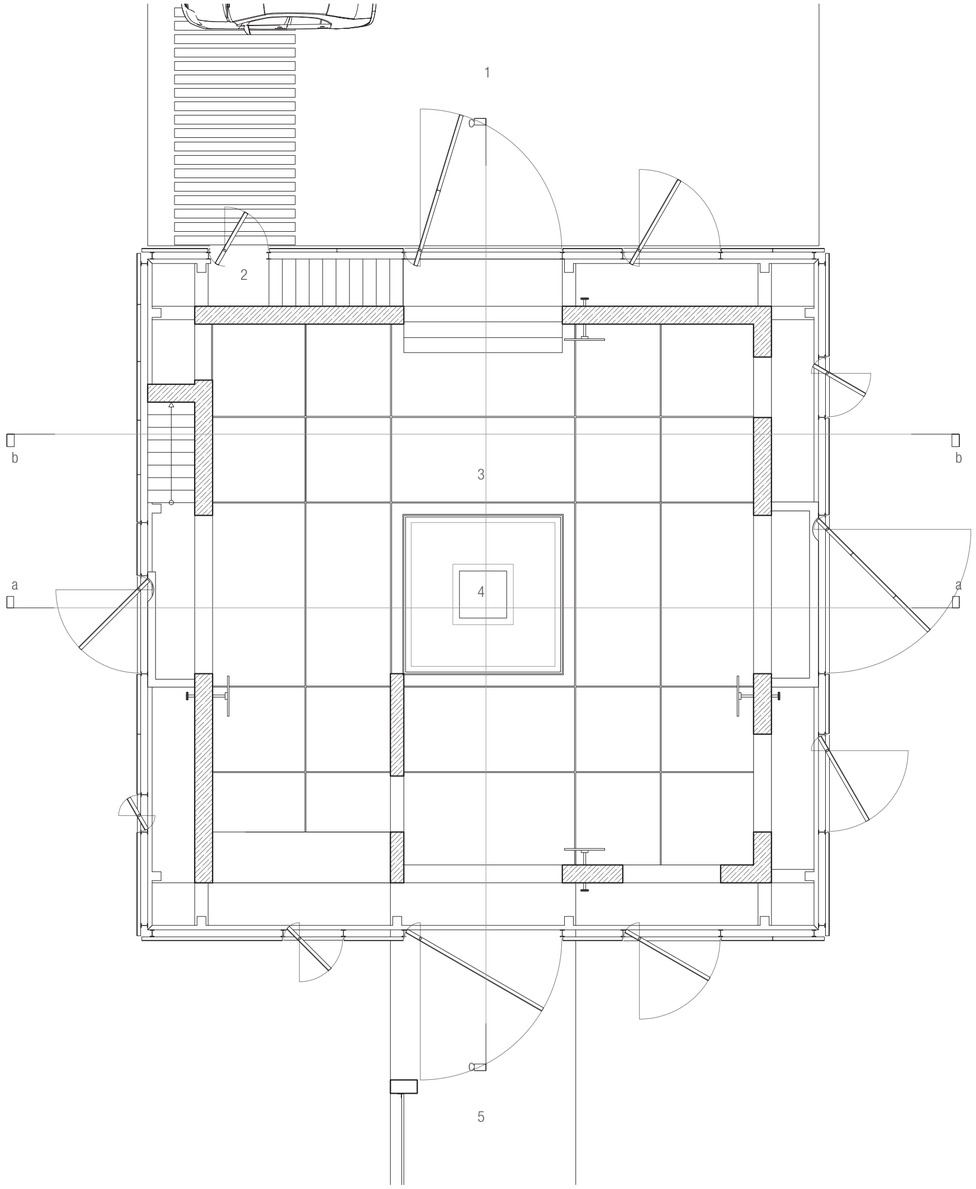
the house is intended to appear as a monolithic steel box floating above the grass. the concrete walls behind the corten would be shaded at the base and obscured from view, emphasising this floating steel cube.

ground floor plan

1/8" = 1'

a corten panel on the northeast acts as an entrance gate into the interstitial space. upon entering, a concrete stair is revealed that brings you up to the open air ground floor. little is revealed about the house at this point, but the act of passing through the two volumes is established right away.

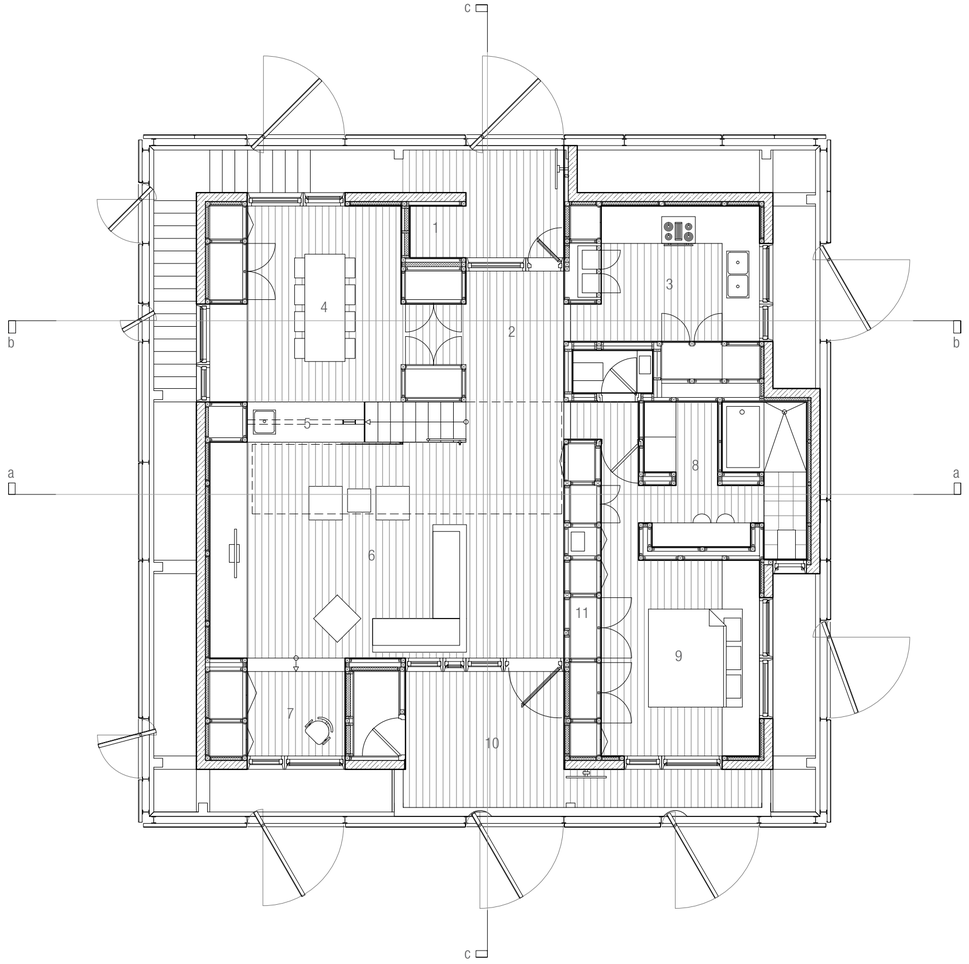
01 parking
02 entrance gate
03 ground floor
04 reflection pool
05 boardwalk



first floor plan

1/8" = 1'

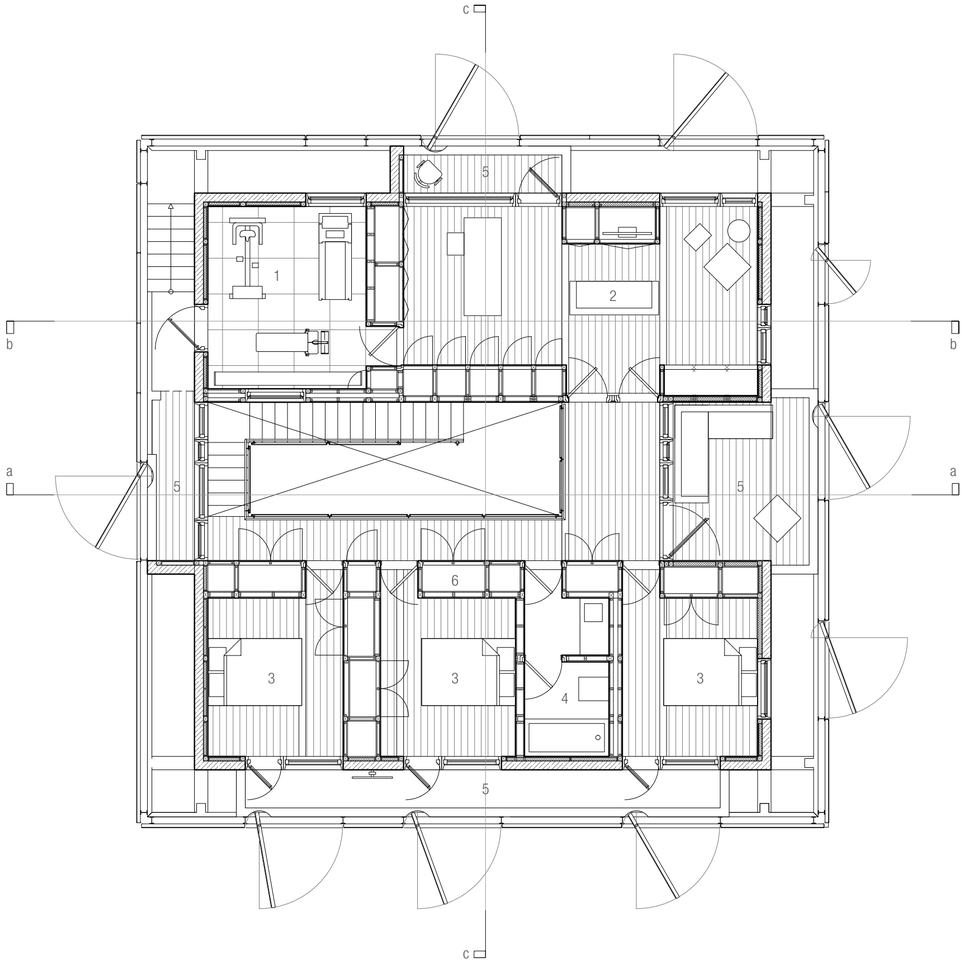
01 mud room
02 foyer
03 kitchen
04 dining room
05 bar
06 living room
07 reading nook
08 master bath
09 master bedroom
10 balcony
11 closet wall



second floor plan

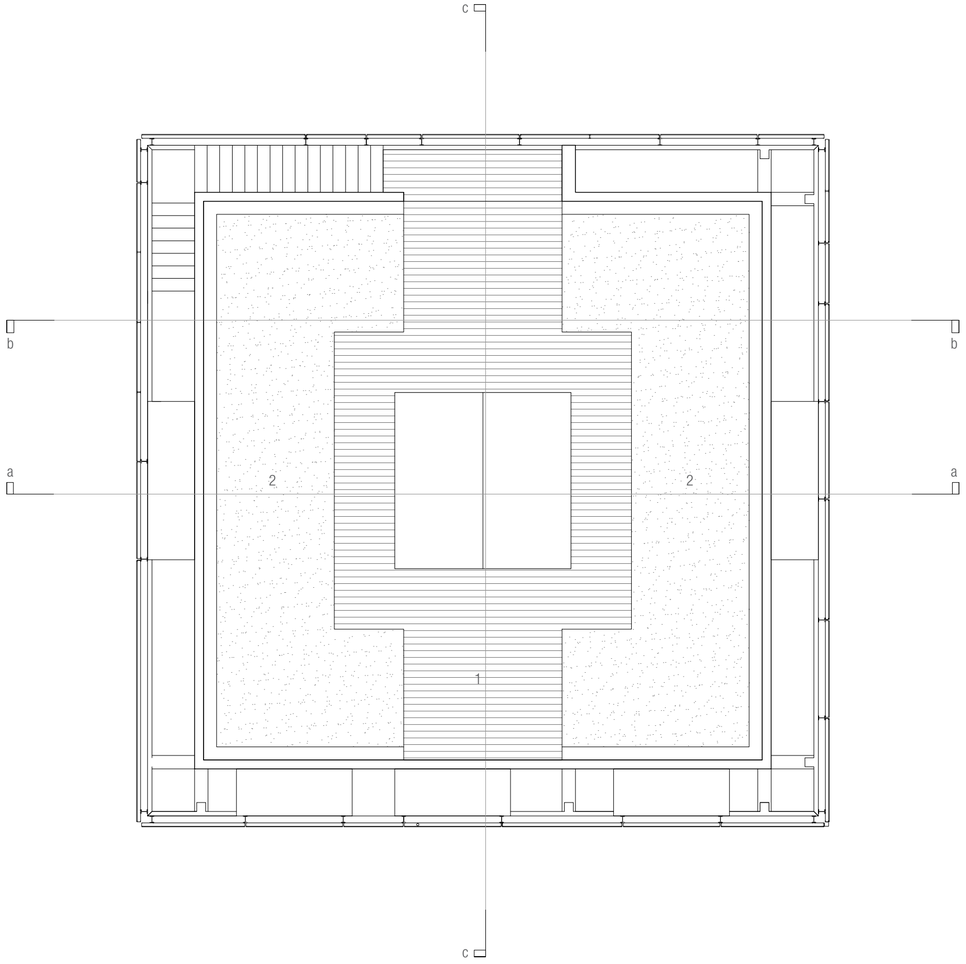
1/8" = 1'

01 fitness room
02 reading room
03 guest bedroom
04 guest bathroom
05 balcony
06 closet wall



roof plan
1/8" = 1'

01 sun deck
02 green roof



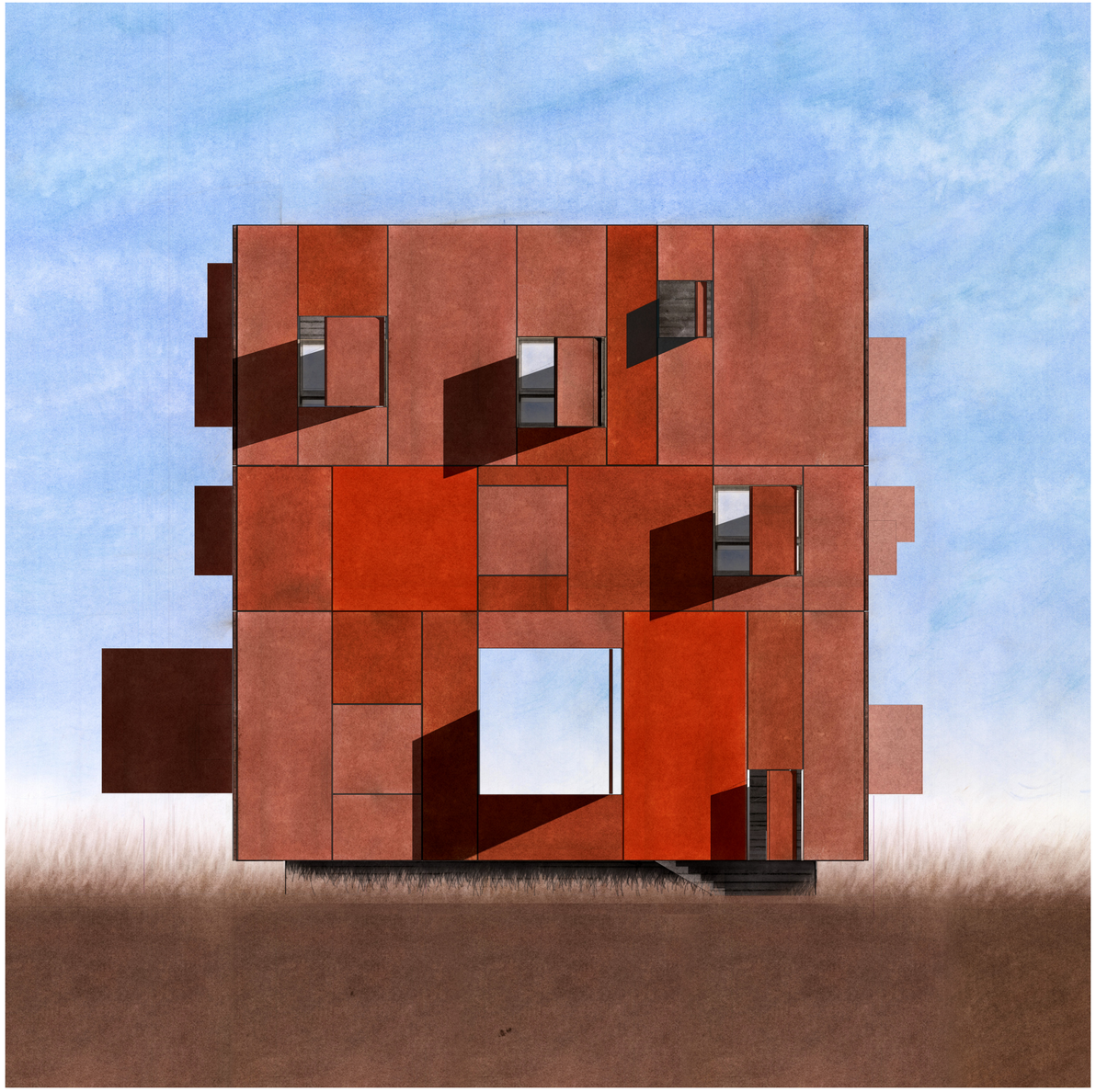
context rendering

the house is completely isolated on the site. the 50' cube appears as a small object on the horizon. the crunchy gravel path is to the right of the cube and the boardwalk is to the left.

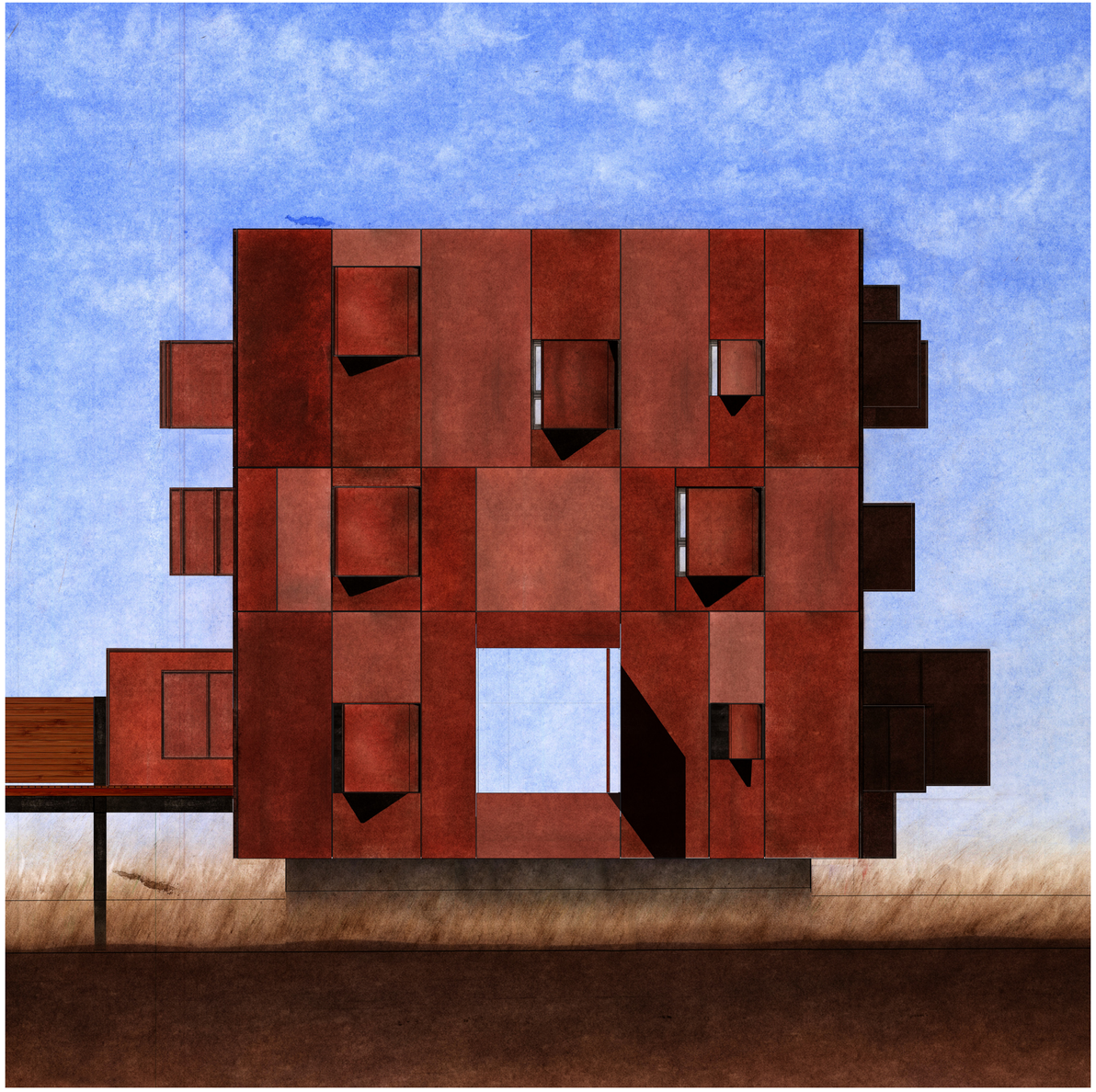
north elevation

1/8" = 1'

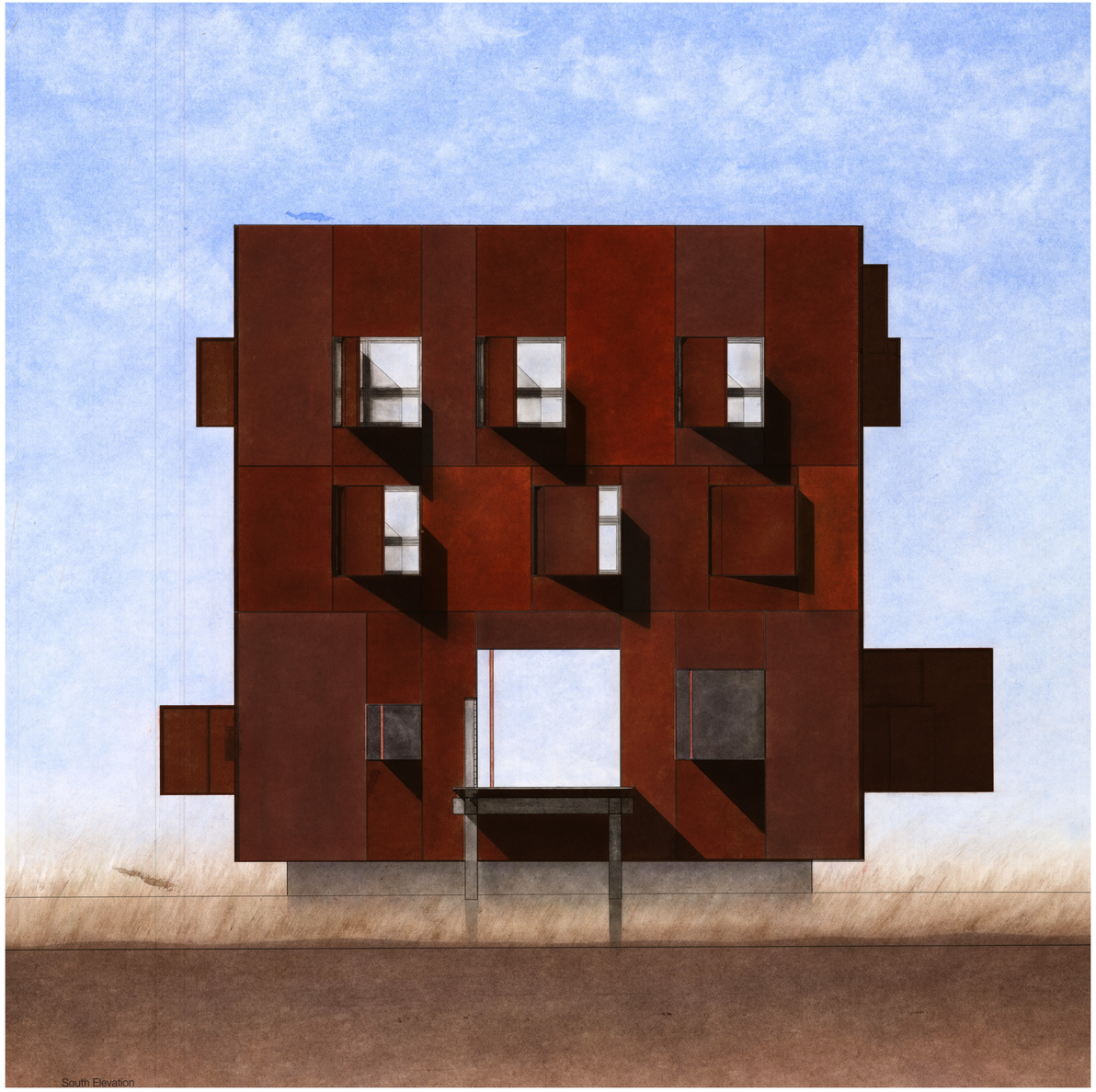
in terms of composition, the elevations became directly analogous to the proportion grid. the division of the facade into three main horizontal sections reflects the position of the floor structure of the wooden box.



east elevation
1/8" = 1'

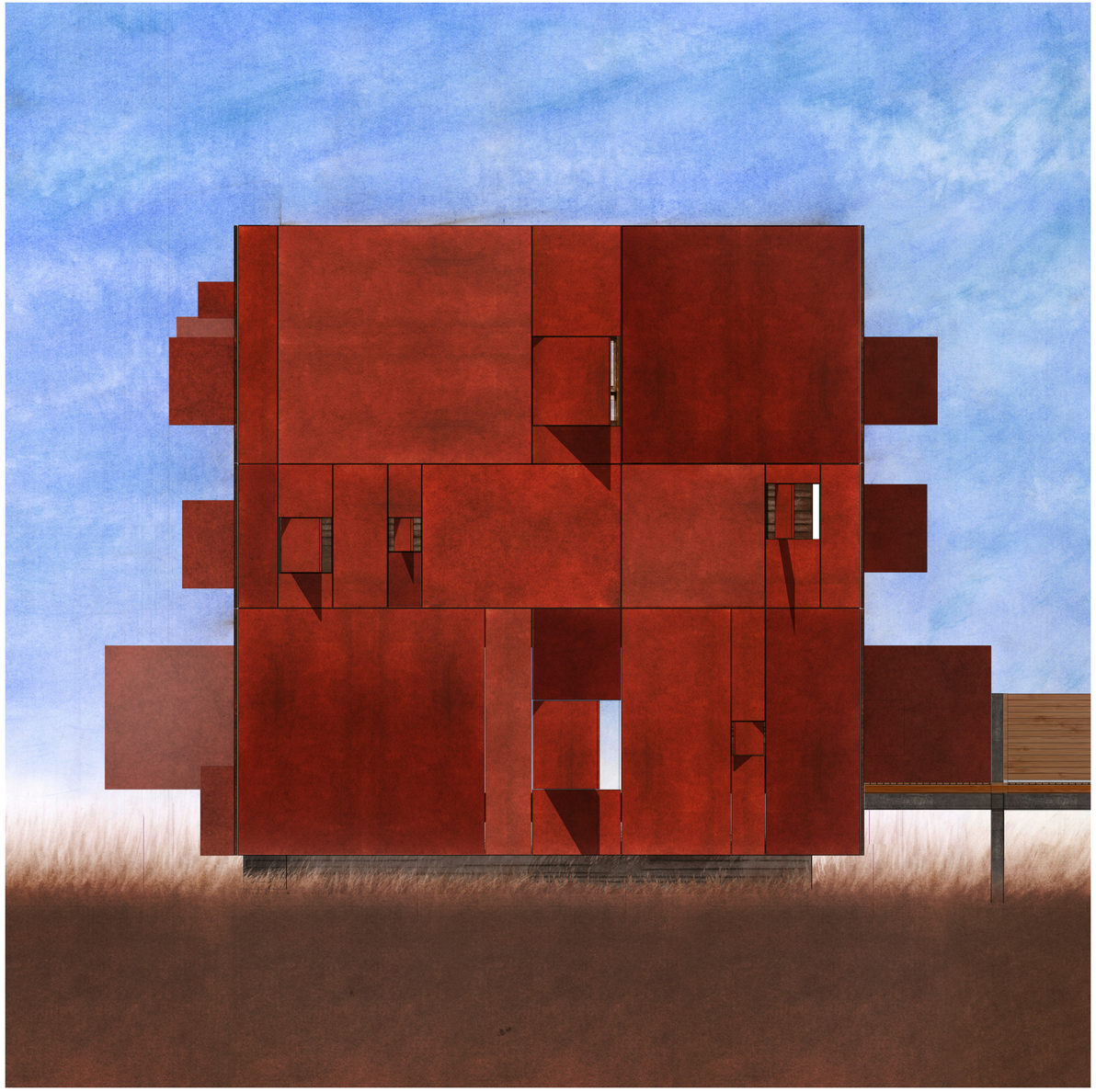


south elevation
1/8" = 1'



South Elevation

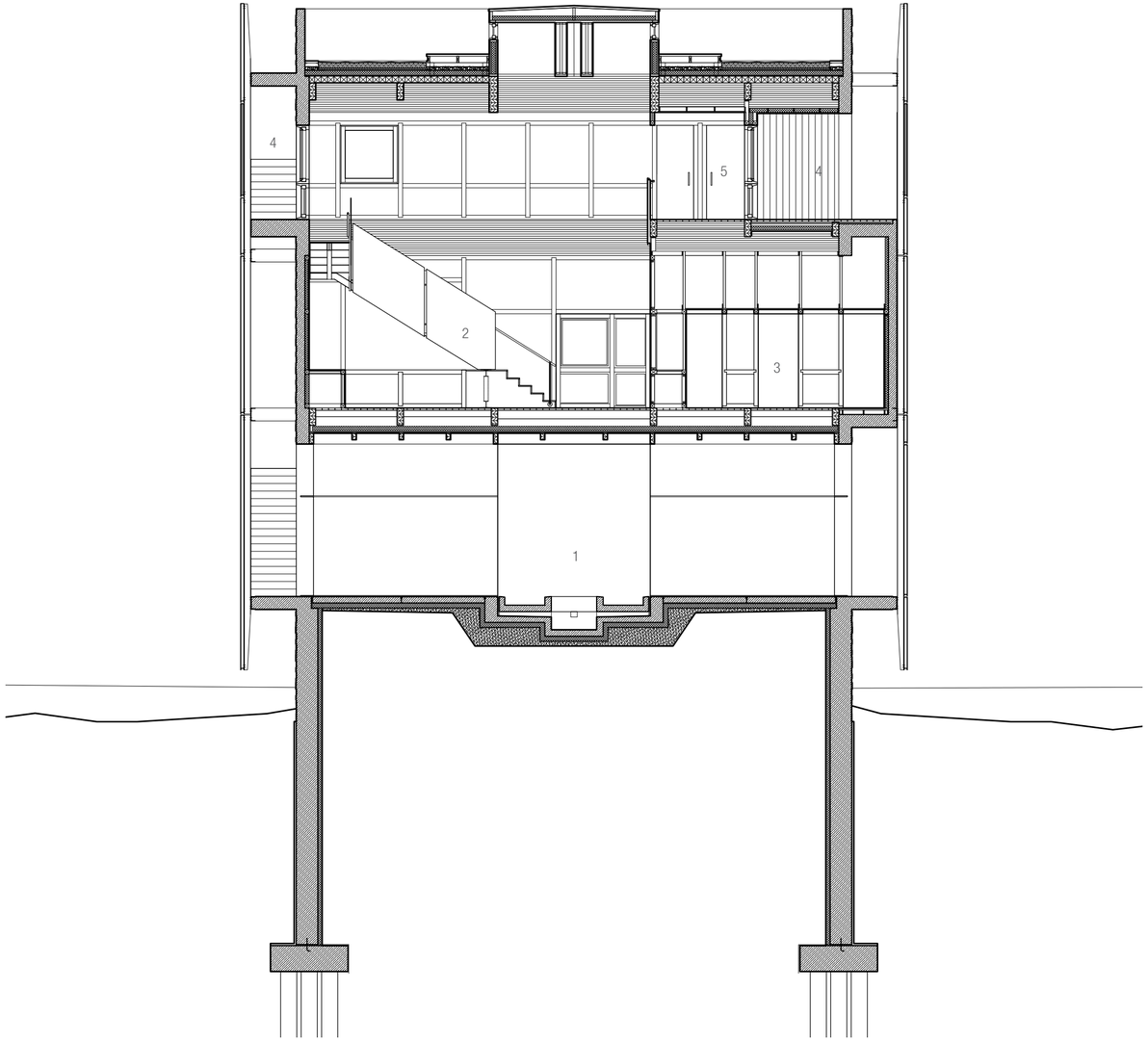
west elevation
1/8" = 1'



section a

1/8" = 1'

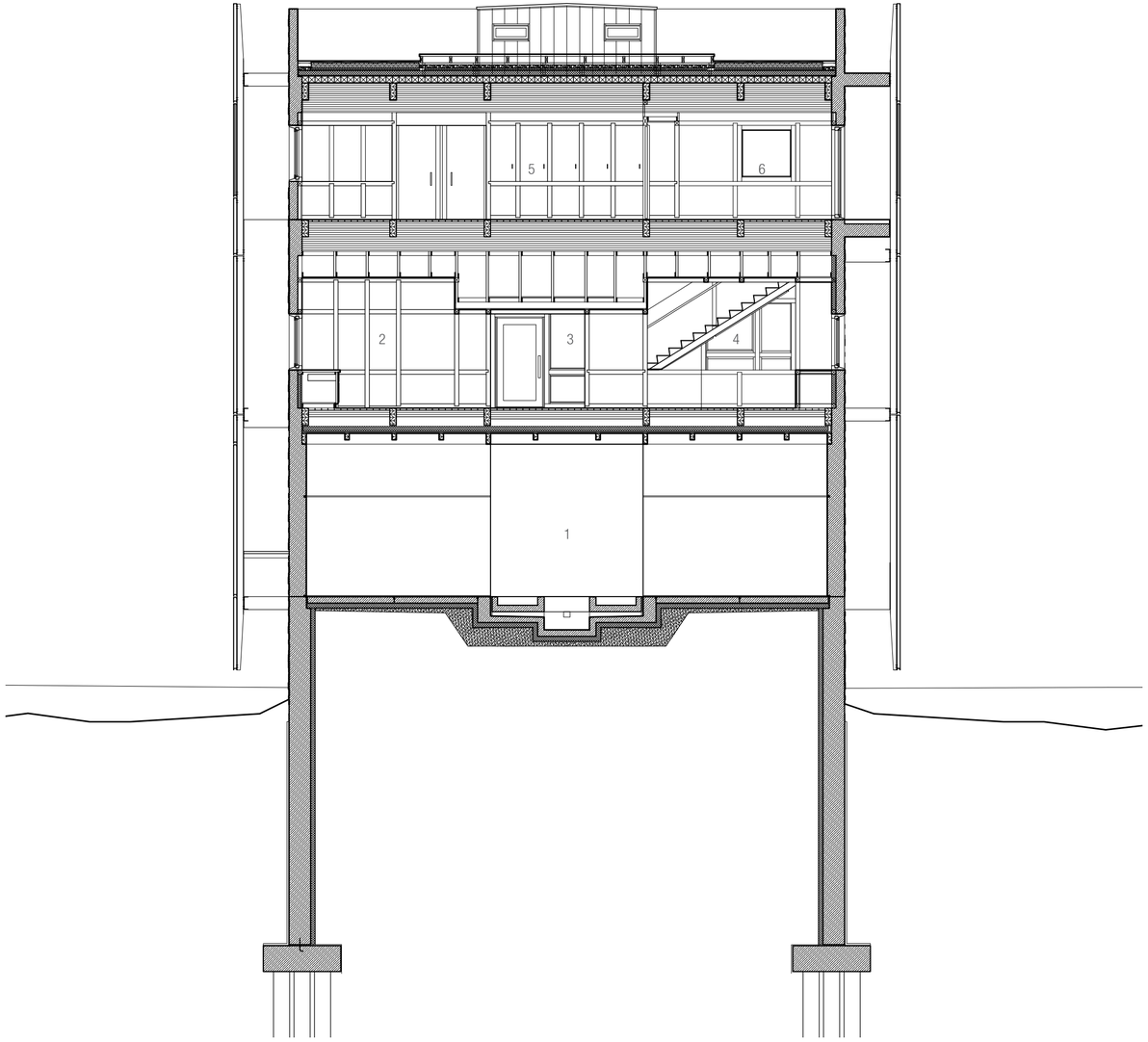
01 open porch
02 living room
03 master bathroom
04 balcony
05 catwalk



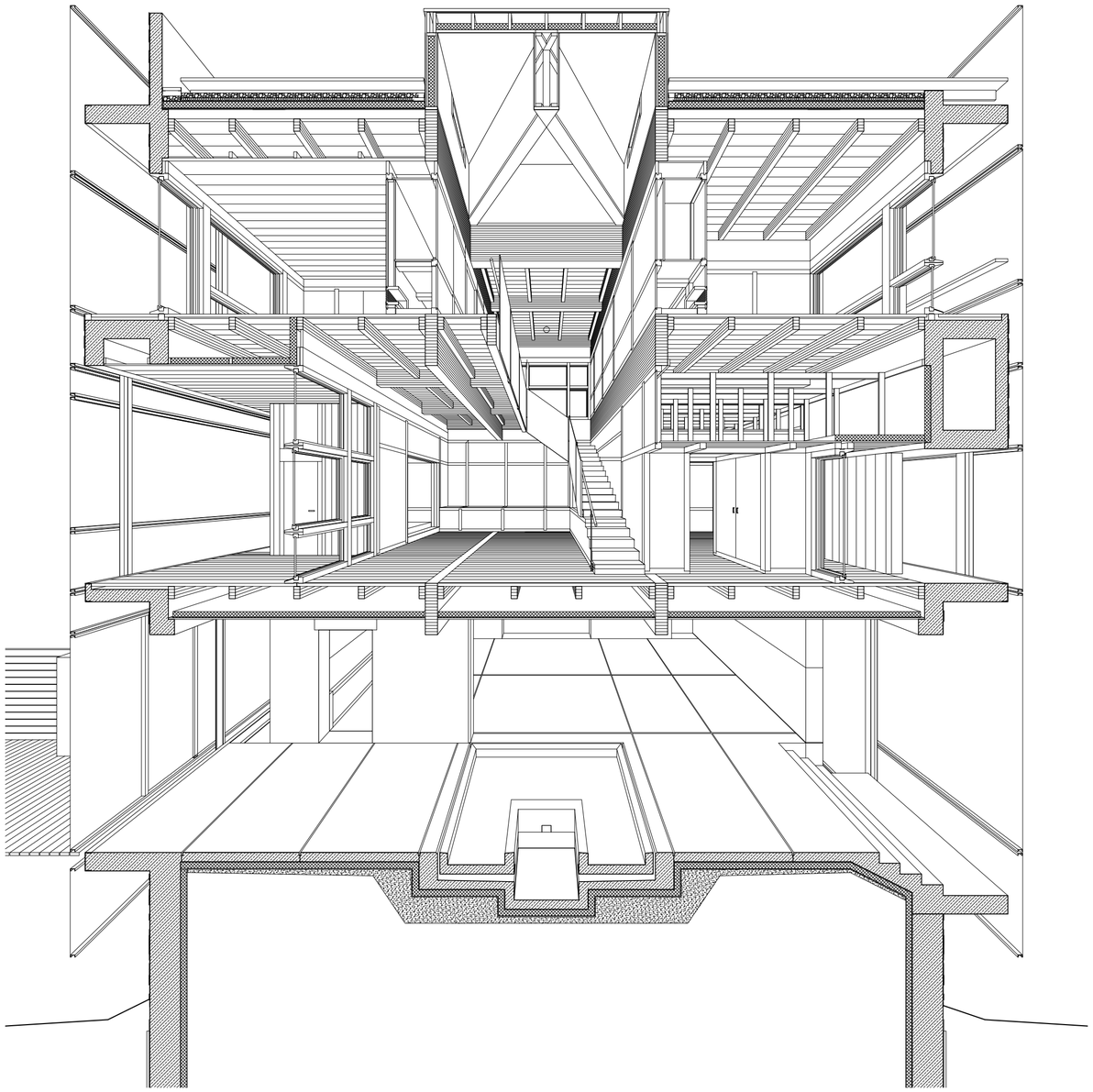
section b

1/8" = 1'

01 open porch
02 kitchen
03 foyer
04 dining room
05 reading room
06 fitness room



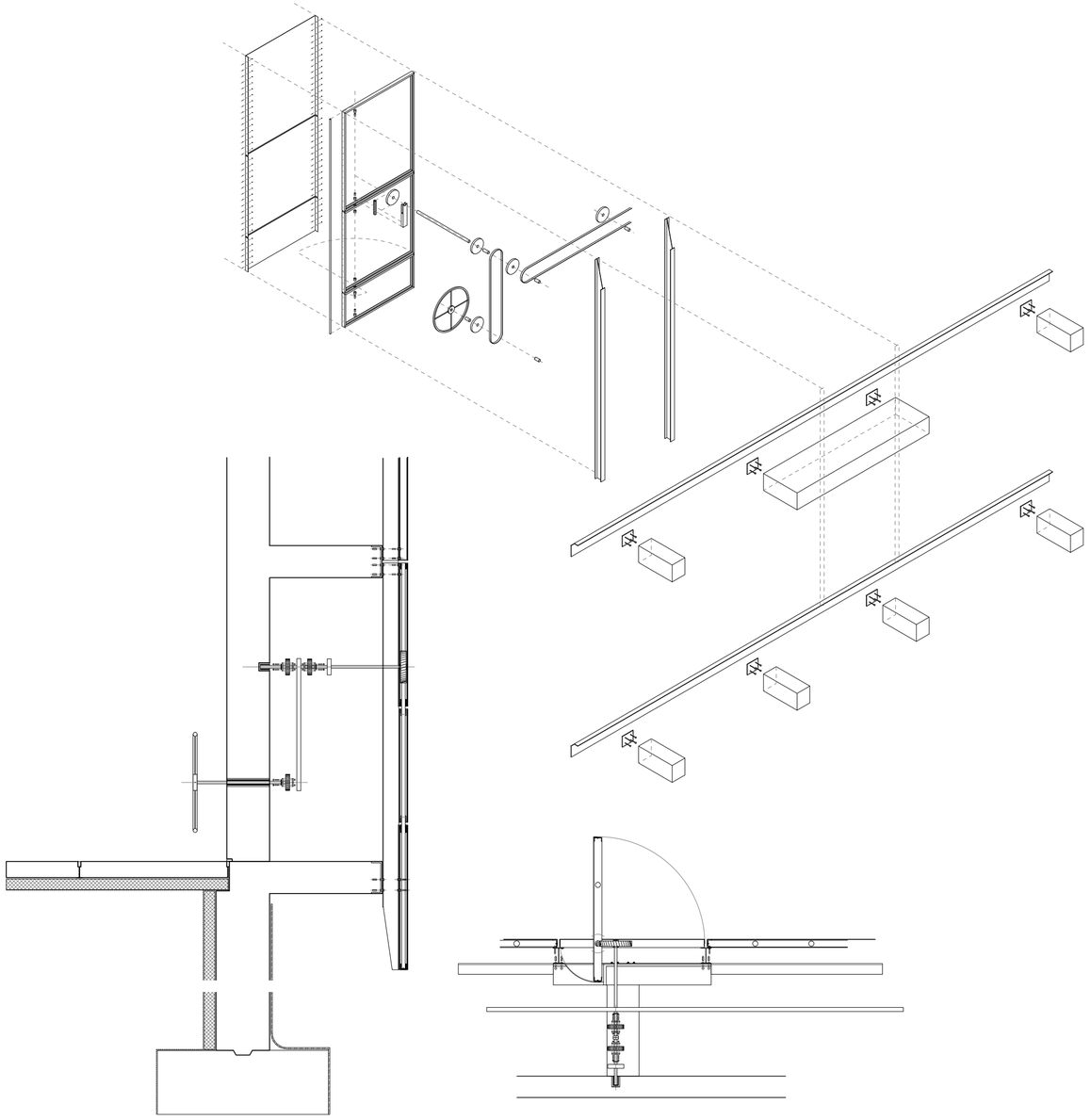
section c perspective
3/16" = 1'



corten details

1/4" = 1'

since the steel can get so hot during the day, pushing the operable panels open by hand would be unpleasant, so they are daisy chained together by a series of gears and belts which are operated by a large flywheel.



references + credits

media + illustrations

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appendix a: list of figures