re-imagining the middle landscape

An Exploration of the Inhabited Envelope and an Industrialized Framework for Dwelling

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abstract

This thesis seeks to tie into the underlying ideology of the middle landscape that has shaped housing development in the United States up to this point, and re-imagine its physical manifestation. An incremental approach is taken in imagining what housing might be in America, considering our myths surrounding the single family house, micro and macro community creation, density, sustainability (regarding the economics of the home and country, as well as our place in an ecosystem), emerging timber construction of tall buildings, and industrialized methods of building.

A mix of passive and active green building strategies are employed in making an expanded or "inhabited envelope", which surrounds a 22-story mass timber modular mid-rise residential tower in Red Hook Brooklyn. The base of the tower and development of the city block include a cooperative factory for wood based production, innovative bike storage, bike repair shop, shared use digital fabrication lab, shared use shops (wood, metal, and upholstery), loading dock, laundry, gym, shared use office space, and café.

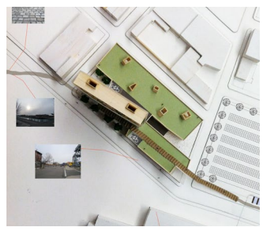

Fig. 1 Site Model Roof Plan Photo

Fig. 2 CLT Photo (Green & Karsh pg. 37)

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preface

In the current proliferation of ideas regarding the making dwelling in North America many have missed a crucial part of our history, which informs every part of our current society; the not so distant beginning of things in what we now know as the United States. The essay that follows was written in a formative graduate seminar "Architecture & Urbanism", in my first year pursuing my Masters of Architecture at Virginia Tech's School of Architecture + Design, it speaks to the confluence of forces again at work in our society and forms the theoretical basis of my thesis work.

"Re-imagining the Middle Landscape"

The middle class exodus to the suburb of the last century was the realization of utopian principles seated in the idealization of nature and the moral obligation of women in the home. Though it has stratified the city and created dissonant sectors of development, the suburb still holds sway as the desirable location for the most prosperous members of our society. This leaves inner cities vulnerable to social degradation, blighted forgotten neighborhoods and creates sprawl outside of the city. Even still we must acknowledge the enormously successful creation of a "middle landscape" and an architecture befitting its purpose if we are to begin addresses the ills of sprawl and urban blight. The utopian ideals of the house set in nature are indelibly written on our social conscience and must not be railed against as an enemy but redeemed in the re-imagining of the "middle landscape". Thomas Jefferson, Alexander Jackson Davis, Andrew Jackson Downing, Ralph Waldo Emerson, Frederick Law Olmstead, Catherine Beecher, and Harriet Beecher Stowe are of paramount importance in understanding the flourishing of the suburb in America and perhaps give clues to the re-imagining of our way settlement.

"The utopian ideals of the house set in nature are indelibly written on our social conscience and must not be railed against as an enemy but redeemed in the re-imagining of the 'middle landscape'."

"We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness."
-Declaration of Independence

From the time Thomas Jefferson penned these famous words in the Declaration of Independence America has been on a journey of nationhood, ever striving for the ennobling of the human spirit and the searching out of a democratic architecture amenable to this aim. Jefferson set the precedent for the individual farmstead and the proliferation of arcadia across the west with the Louisiana Purchase and the Land Ordinance of 1785. Envisioning a land of cultivators self sufficient and free because of the resource of land. The gridiron stretched into a seemingly endless western frontier, intended for an educated populace, the west was rife with opportunity for the establishment of a continuous "middle landscape". Drawn from ancient ideas of a mythic arcadia this new land of promise was to enliven its inhabitants by the great expanse of nature's wild and be tamed just enough so as to offer the ideal of connection to both nature and society. This was to be the assurance the democracy so dearly won would survive the test of time and tumult.

Each man would be given opportunity to claim his part of the returned Eden many believed America was destined to become. The ideal of the honest farmer is personified in our heroes such as George Washington, shown in illustrations as hardworking, honest, man who tills his own soil, someone who takes authority only for the protection of his people and when danger subsides relinquishes the same. Again with Honest "Abe" Lincoln, a common man of hardy stock who plowed his own fields and read by candlelight at night, a self educated cultivator exemplifying the best life to produce moral fortitude. John Locke summed up the early mythology of America when he said,"In the beginning all the world was America". With the laying of the gridiron across the west America forever broke the standard mode of European settlement and began its own unique utopian settlement pattern.

"Each man would be given opportunity to claim his part of the returned Eden many believed America was destined to become."

Quotes are taken from the highlighted red text from the essay at right.

Fig. 3 Lyndhurst for George Merrit, Tarry Town, NY, 1865(www.metmuseum.org)

During and after this time English picturesque landscapes and landscape paintings had a profound affect on the arts and architecture in America. We see after its initial copying the development of a uniquely American expression and fascination with dynamic composition and the idealization nature. Some the most notable American to produce original work were artists from the "Hudson River School" Thomas Cole, Frederick Church, Thomas Moran and poets and scholars such as Walt Whitman, Ralph Waldo Emerson, Henry David Thoreau, and Margaret Fuller. Emerson in his essay Self Reliance wrote in challenge to the prevalent euro centrism.

"Our houses are built with foreign taste; our shelves are garnished with foreign ornaments; our opinions, our tastes, our whole minds lean, and follow the Past and Distant... The soul created the arts wherever they have flourished. It was in his own mind that the artist sought his model. It was an application of his own thought to the thing to be done and the conditions to be observed. And why need we copy the Doric or Gothic model?... if the American artist will study the precise thing to be done by him, considering the climate, the soil, the length of day, the wants of the people, the habit and form of the government, he will create a house in which all these will find themselves fitted." -Emerson

Fig. 4 Blythewood Estate Gatehouse, Annandale 1841 (www.newburghdrc.org)

In the realm of architecture two men who took up the challenge and succeeded where Alexander Jackson Davis and Andrew Jackson Downing. A. J. Davis was a prolific and inventive architect of the time and deftly designed both houses and public edifices, giving life to his ideas in exquisite picturesque drawings. He helped give rise to the American bracketed style in his design for the Gatehouse at Blithewood Estate, and popularized the now ubiquitous board and batten siding. He used the dynamic composition of the picturesque aesthetic and local materials to root his houses to the landscape and create a since of place in a vast country.

Andrew Jackson Downing, a very talented landscape architect, worked with A.J. Davis on the publishing of some of the most influential designs and ideas of a domestic architecture suitable to America. He published The Architecture of County Houses in 1850, and voices the ideal of he and Davis's, ground breaking architecture for the common man,

"...the condition of the family home — in a country where every man may have a home –should be raised, till it shall symbolize the best character and pursuits, and the dearest affections and enjoyments of social life."
-Downing, The Architecture of Country Houses

preface

"…. the first suburb to embody the vision of a middle landscape for all and gave visible form to the idealization of the home of each citizen set dynamically in nature."

"…. further immortalized the single family dwelling in the American psyche."

"The advent of the railroad, rotary saw mill, the wire nail, and the balloon frame made house construction fast and affordable."

"…mass industrialization…"

" Because of their simplicity they offered the arcadian ideal Jefferson so greatly hoped for, in that their simplicity actually afforded to the everyman self-reliance and the chance to create your own utopian 'middle landscape'."

Quotes are taken from the highlighted red text from the essay at right.

The design for the Small Bracketed Cottage, from the same book, was a truly American one; its basic lines give shape too much of our current vernacular and perhaps best realizes Emerson's call to an uniquely American house. Many of the cottage designs are in the Gothic and Italianate styles, stemming from a sentiment of an order of association rather than the higher order of classical harmonic proportions being more appropriate to the architecture of the cottage; the designs were primarily constructed of wood and gave rise to carpenters gothic and some ownership of the style.

With the help of builder and friend of A.J. Downing, Llewellyn S. Haskell, Downing began designing the first picturesque suburb. Although not the first suburb, Llewellyn Park, in West Orange, NJ was the first suburb to embody the vision of a middle landscape for all and gave visible form to the idealization of the home of each citizen set dynamically in nature. Sadly Downing died during this time and A. J. Davis had to take over design, however, many of the houses of A. J. Downing are thought to have already been of Davis's conception. To this day it still provides a true middle landscape for 173 homes and is a cherished place to live.

With the popularization of empiricism through the writings of John Locke, his ideas of the mind as a blank slate to be written on with the pen of experience and the liberal philosophy of John Stuart Mill and Jeremy Bentham propounding the voluntary self governance of individuals in society, came the rise of the woman as the priestess of the home. The woman was the sacred teacher and molder of children in their formative years in which they developed the moral character that would carry them the rest of their life for the betterment of society or to its destruction. Catherine Beecher and Harriet Beecher Stowe gave clarion voice to these sentiments and helped widely popularize the absolute importance of the domestic economy in the home with the publishing of their book in 1869, American Woman's Home: or, Principles of Domestic Science; Being a Guide to the Formation and Maintenance of Economical, Healthful, Beautiful, and Christian Homes. Beecher was the first of the functionalist and designed a model house the kitchen in the center and by de facto the duties of the woman, touted sunlight, nature, and fresh air as the necessities of healthful wholesome living. Her house had ducted air and a central heating and cooking stove through which air was ducted, water was heated, and the bread was baked. Through Beecher's and others work the preeminent role of the woman in the home became a part of Christian theology and further immortalized the single family dwelling in the American psyche.

Concurrent with ideological and architectural development in housing was the industrialization of its building process. The advent of the railroad, rotary saw mill, the wire nail, and the balloon frame made house construction fast and affordable. In the 1830's building and loan associations started forming to finance home building. The picturesque suburb with its winding streets and rural connotation, analogous to the winding paths of the English picturesque garden, started to pop up all over the country. Some of the finest examples are Frederick Law Olmstead and Calvert Vaux's Riverside, Illinois and Richard Morris Copland's Oak Bluffs, Martha's Vineyard, Massachusetts.

The next major event in the evolution of the suburb was the post World War II mass industrialization of the housing industry and William Levitt's vision of a home for the everyman. The formation of the Federal Housing Authority, Federal Savings and Loan Insurance Agency, and the 30 yr. mortgage enabled young couples returning from the war to buy the affordable houses of Levitt and others. This fostered upward mobility and by the creation of home equity and thus personal wealth. Though the houses were quite simple little boxes they took on character with the picturesque landscaping very popular even today and the addition of sometimes-whimsical ornament. Because of their simplicity they offered the arcadian ideal Jefferson so greatly hoped for, in that their simplicity afforded to the "everyman" self-reliance and the chance to create your own utopian "middle landscape".

"Rural Architecture is, indeed, so much more a sentiment, and so much less a science, than Civil Architecture, that the majority of persons will always build for themselves, and unconsciously throw something of their own character into their dwellings. To do this well and gracefully, and not awkwardly and clumsily, is always found more difficult than supposed." -Downing, The Architecture of Country Houses

Indeed the sentiment of the suburb and by extension its search for the "middle landscape" have been thus far a rural sentiment. Though the suburb has all to often been designed "awkwardly and clumsily" the realization of its utopian ideals has fostered the American Dream and so it is certainly tied to many of our triumphs as a nation and our coming to the forefront of the World as well as to some of our failures. Our suburbs have now been over scaled and overpriced, filled with houses both to complex and much to simple all at once. We have priced many of our people out of the housing market and by extension the chance to realize their own utopia. An architectural as well as societal mélange has developed and is evidenced in both sprawl and urban blight. In speaking of societal betterment A. J. Downing writes:

"And, as the first incentive towards this change is awakened in the minds of most men by the perception of beauty and superiority in external objects, it must follow that the intent manifested in the Rural Architecture of a country like this, has much to do with the progress of its civilization." -Downing, The Architecture of Country Houses

Perhaps the suburb is not the villain but the loss of vision as to the idealistic triumph it was and is in the best cases and, what its root intentions are in the worst. If we again look at the champions of the "middle landscape" in the suburb (A. J. Downing & A. J. Davis) and its champions in the city, Frederick Law Olmstead & Calvert Vaux; if we can remember the fulfillment of Utopian intentions in the picturesque landscape in Central Park and the same underlying ideals in Levitt town, we may then be able to re-imagine a true "middle landscape" in both our suburban sprawl and our urban blight, perhaps we too can appeal to the underlying sensibilities of our countrymen and "awaken in the minds of most men" a sense of what our desolate places might become, what our houses might look like, and what our lives might be.

Fig. 5

Fig. 5 "The Small Bracketed Cottage", The Architecture of Country Houses , 1850 Google e-book

Fig. 6 "1-5 A. J. Davis Presents a Promotional Plan for Llewellyn Park, New Jersy, 1857", (www.travel-studies.com)

preface
(summary)

With this in mind I began to imagine a new way forward for housing in America, striving to create simple industrialized dwellings that gave place for a great degree of individualization. Each design move made was vetted until it at least began working on an ideological, functional (useful to the inhabitant and site), structural, economic and climatic level. Cues were taken from Levitt's very simple houses set in a malleable yard. These little houses and much of our vernacular construction gave men and woman a place to create their own little paradise. The fruition and perversion of our utopia has outstripped our transportation, resources and land; it is time for a new mode of development amenable to the current conditions. This project seeks to re-imagine the ideals that initially helped make the United States one of the most desirable countries in which to live and to ask much more of them than previous generations.

I was vitally interested in creating healthy, vibrant communities that foster relationships both with the environment and each other. The units are meant to nurture family and community in the city and are designed on the premise that a strong home is the basis of a strong society. These aims are made paramount by the growing recognition of widespread societal problems (i.e. shootings, divorce, mental illness, etc.). Sentiments regarding woman and men's roles have changed greatly since the time the opening essay referenced, however the importance of rearing our young and the environment in which we do so has not diminished. While architecture cannot solve our problems, it can provide a structure for existence more conducive to a life of hope and happiness.

We are on the cusp of another industrial revolution in construction, one using digital prototyping, CNC processes, high performance standards, and many other changes in our methods of construction. This plays strongly into my exploration of a wood module with some assembly required. In this wave of technological advances, the human touch and imprint on our buildings is still very important in combatting a sterile soulless built environment. The idea of "some assembly required" strives to maximize the strengths of the hand and the machine/robot, hoping to find place for both. In my design process I have struggled to find the balance of the same, trying always to shift from the computer to the hand and vice-versa.

In the face of a decreasing middle class and a population increasingly demanding urban living (a rental dominated housing demographic) the issues of urban housing cost and ownership are of great importance. Home equity has traditionally been the primary source of wealth building in this sector of society and has offered stability for the citizens as well as the country. The recent collapse has called this into question. While there are many reasons, questionable banking among them, the residences built were too large, inefficient and not sustainable in purchase price or upkeep (energy and maintenance costs).

In light of these concerns, exploring the use of industrialized housing solutions becomes a necessity. At present industrialized modular construction competes with standard methods on the basis of a shorter time necessary for construction, which creates savings enough to make it viable and lowers inconvenience. By using an exposed mass timber structure and eliminating the typical secondary layer of finishes, the cost to the consumer may drop. Mid-rise housing is the most amenable typology for this study, as an industrialized process needs economies of scale to be effective.

The thesis is set in Red Hook, Brooklyn and the program consists of a mid-rise residential tower, factory for wood based production, innovative bike storage, bike repair shop, shared use digital fabrication lab, shared use shops (wood, metal, and upholstery), loading dock, laundry, shared use office space, and café. I based the program on the "Timber in the City" Competition held by the ACSA, and submitted an entry. Wood was specified as the primary material for the structure which seemed right in two ways. First, wood has been the dominate residential building material in North America for centuries and engenders a certain connotation of "home", and second, emerging timber technology offers a renewable alternative to standard concrete and steel construction of tall building and has a much lower embodied energy. The competition program brought together the issues set forth in the beginning essay as well as previous research and work I had done, and provided a framework to study the issues of housing in North America.

After participating in a research intensive at Skidmore, Owings and Merrill, the summer before my thesis year and struggling with issues of steel modular construction, I became intrigued with the idea of a wood module. I started researching emerging timber technology and was struck by its ability to take on the characteristics of a heavy timber building. This eliminates the necessity of drywall or intumescent paint for fireproofing the steel modules require due to large wood members ability to form a char layer that meets a two hour fire rating. This allows freer design, material honesty and a dust free assembly line (components are sanded and finished before assembly). The module structure becomes the interior finish of the base housing units lowering initial cost and allowing individualization by the owner. The exposed structure allows different finishes and cabinetwork to be easily attached and re-configured over time. Another benefit offered by mass timber construction is the transferability of our current construction workforce's skills in its making.

The expanded envelope surrounding the modules plays a vital part in the life of the building providing: a climatic buffer from the natural and man-made (buffers city noise and visibility) elements, an urban lawn equivalent, a place for operable vertical gardens giving place for individual expression and supplemental food production, air purification (from vegetation), and a scaffold for construction, maintenance and systems updating. This buffer space or inhabited envelope is not heated and cooled but stays temperate by passive and active strategies and becomes part of the living space at most times of the year, acting as a green house in winter (capturing the sun's warmth and that lost at the units perimeter) and allowing cross breezes and shading in the summer. These attributes accelerate construction time and increase safety (built in scaffolding), and lower life cycle costs by decreased grid dependence and maintenance difficulty (easy access).

In conclusion, I have employed all of these means in an effort to compete with or even beat the cost of more traditional and less energy efficient constructions to make available housing that operates on a fraction of the typical energy costs, interacts more peacefully with our environs, and does so without completely sacrificing the ideology that has surrounded the making "home" in America. I have set the dwelling in a per-formative middle landscape (a kind of tamed nature that has a filtered relationship with the city and the "wilderness"), hoping it may connect our past with a bright future, creating a vertical grid of opportunity, a manifest destiny toward the stars.

Fig. 7 Sketch of the beginning thinking of the inhabited envelope.

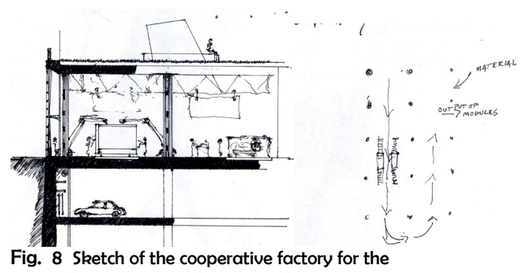


Fig. 8 Sketch of the cooperative factory for the production of the mass timber housing module.

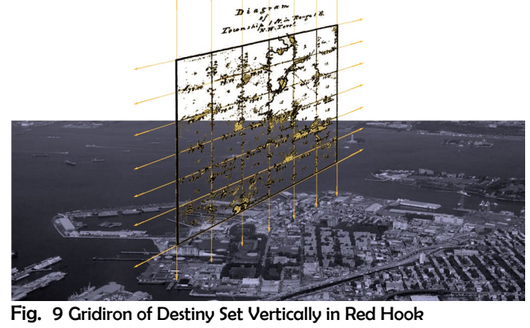


Fig. 9 Gridiron of Destiny Set Vertically in Red Hook Brooklyn (rhedbrooklyn.org and history.mcc.edu).

Fig. 10 Initial tower section sketch over 3D model export.

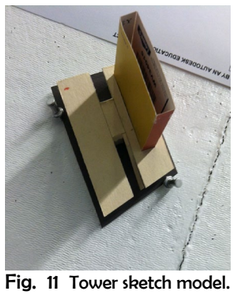


Fig. 11 Tower sketch model.

preface
(method of study)

This diagram was a guide to cycle through the concerns of my thesis and check each facet was considered adequately. While the layout of the book may seem partially sequential there was a very cyclical aproach and each part of the research and design was revisited many times. Not specifically mentioned in the method of study diagram was a great deal of research regarding precedents, mass timber technology, industrialized housing, and current steel module construction. These are however, fleshed out in the rest of the book.

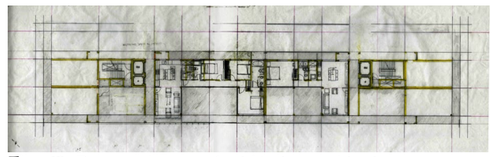


Fig. 12 Process plan on 14' grid to insure shipping req. were met.

program-Use

sketch
diagrams
sensory
plan
(mix)

/experiance
/use mapping
/kinetic living space
/ffe-activity
/vegetation-Implications of a buffer zone

site/context

drawings
diagrams
axon
ortho
(small)

/demographics
/urban fabric and massing
/scale city, street, building
/community connection & catalyzation
/transit, ingress, egress
/urban visualization
/climate

performance

simulation
physical model
cad model
sensory drawing
(mix)

/climate
/light
/scale city, street, building
/thermal
/sound
/view

overall

model
diagrams
sketch
section
(small)

/systems
/structures
/enclosure
/modular stacking

tectonics

sketch
diagrams
model
section
axon
(mix)

/fabrication
/assembly
/material
/composition (wall-floor-ceiling)-exterior|interior
/tactile nature

preface
(precedents & findings)

Adolf Loos's thinking on worker housing complimented my own thoughts on housing and was an inspiration. Below is a translated quote from a biographical work on Loos.

"According to the first World War engaged L. to 1924 in mass housing, 1923/24, he was the chief architect of the settlement office of the City of Vienna. He designed spacious terrace houses for workers' housing, which should enable the children in the city a safe stay in the fresh air. Its terraced apartment building represented a compromise between a barracks housing with apartments and a garden complex with single-family homes, which he regarded as the only correct and socially appropriate solution to the workers' housing problem. In this sense, he created several versions of small village houses. An especially economical type of house he patented in 1921."

(Behal, Vera J., „Loos, Adolf", in: Neue Deutsche Biographie 15 (1987), S. 149-152 [Onlinefassung]; URL: http://www.deutsche-biographie.de/pnd11857423X.html)

Below are some of the findings from surveying many previous mid-rise housing examples. Represented are some of the more relevant precedents that had an influence on my work and the beginnings of their expression in my thesis work.

- Importance of sectional variation in making dynamic living environs.
- Finding a means of making each unit somehow unique to the inhabitant.
- Providing a yard equivalent for each unit as a space of individualization.
- Giving place for individualization of each unit.
- A vibrant mix of ages and stages life from the young, to the married with kids to the old.
- Tying the tower housing into a vibrant podium.
- The possibilities of a courtyard like space in a modern dwelling.

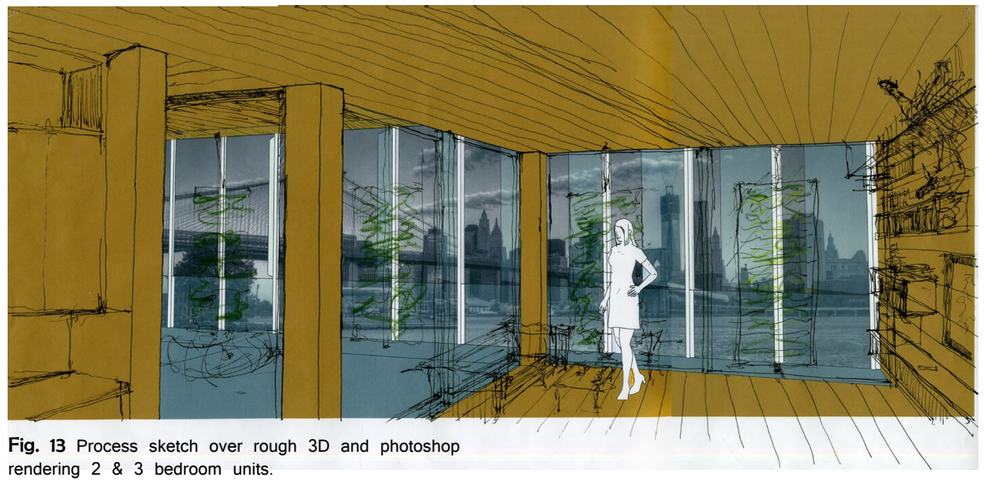


Fig. 13 Process sketch over rough 3D and photoshop rendering 2 & 3 bedroom units.

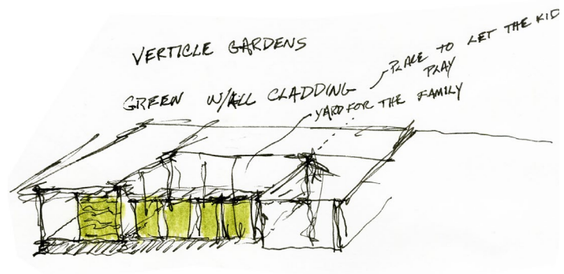


Fig. 14 Sketch exploring implications of an infill structure around the modules.

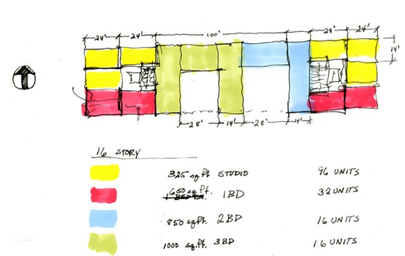


Fig. 15 Beginning diagram of the mid-rise tower and its cross section of unit sizes and prices.

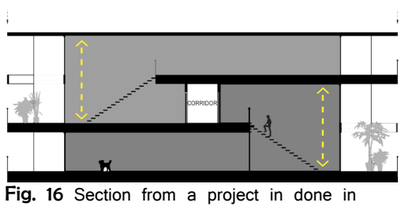


Fig. 16 Section from a project in done in conjunction with SOM exploring a Unite' concept in steel modules and the finding of section as a huge benefit to the units.

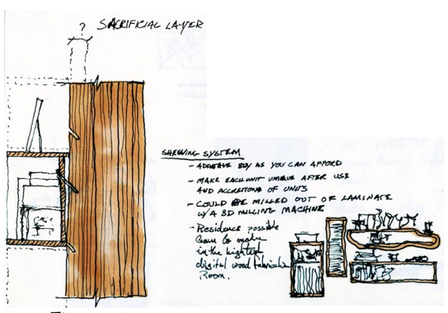


Fig. 17 Beginning ideas for the malleable wood structure becoming framework for individualization.

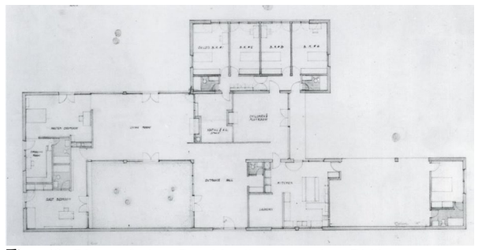


Fig. 18 Plan of the De Menil house by Philip Johnson (http://s873.photobucket.com/user/berginarchitects/slideshow/Philip%20Johnson/deMenil%20House/?albumview=slideshow).

Fig. 19 Photograph of the De Menil house by Philip Johnson looking into the couryard (http://s873.photobucket.com/user/berginarchitects/slideshow/Philip%20Johnson/deMenil%20).House/?albumview=slideshow).

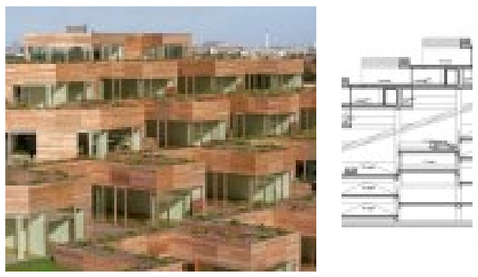


Fig. 20 Big Architects' Mountain Dwellings (http://www.archdaily.com/15022/mountain-dwellings-big/).

Fig. 21 Ludwig Mies van der Rohe's Lafayette Park Chicago, IL, a very successful mixed income housing development (www.lynnbecker.com).

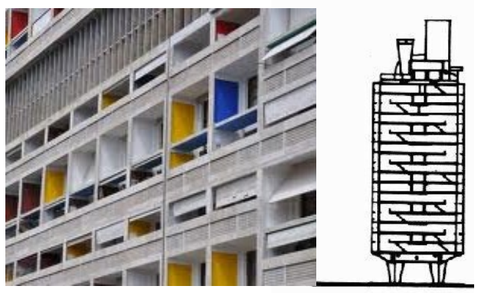


Fig. 22 Le Corbusier's Unite' de Habitation in Marsaille left (agingmodernism.wordpress.com/), right (greatbuildings.com).

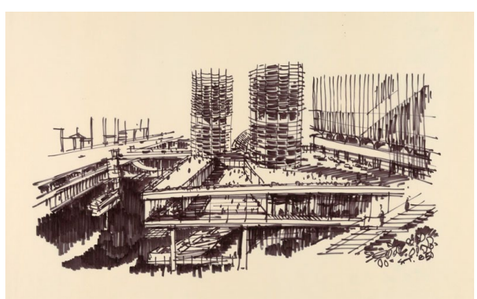


Fig. 23 Bertrand Goldberg, American (1913-1997). Marina City, Chicago, IL, 1985. Marker on trace. The Art Institute of Chicago, Archive of Bertrand Goldberg, gifted by his children through his estate, RX23664/75.57. (http://arttattler.com/).

the american dwelling

Beginning sketches in the exploration of the inhabited envelope and its relationship to the residences and the mid-rise towers place in the context of Red Hook, Brooklyn.

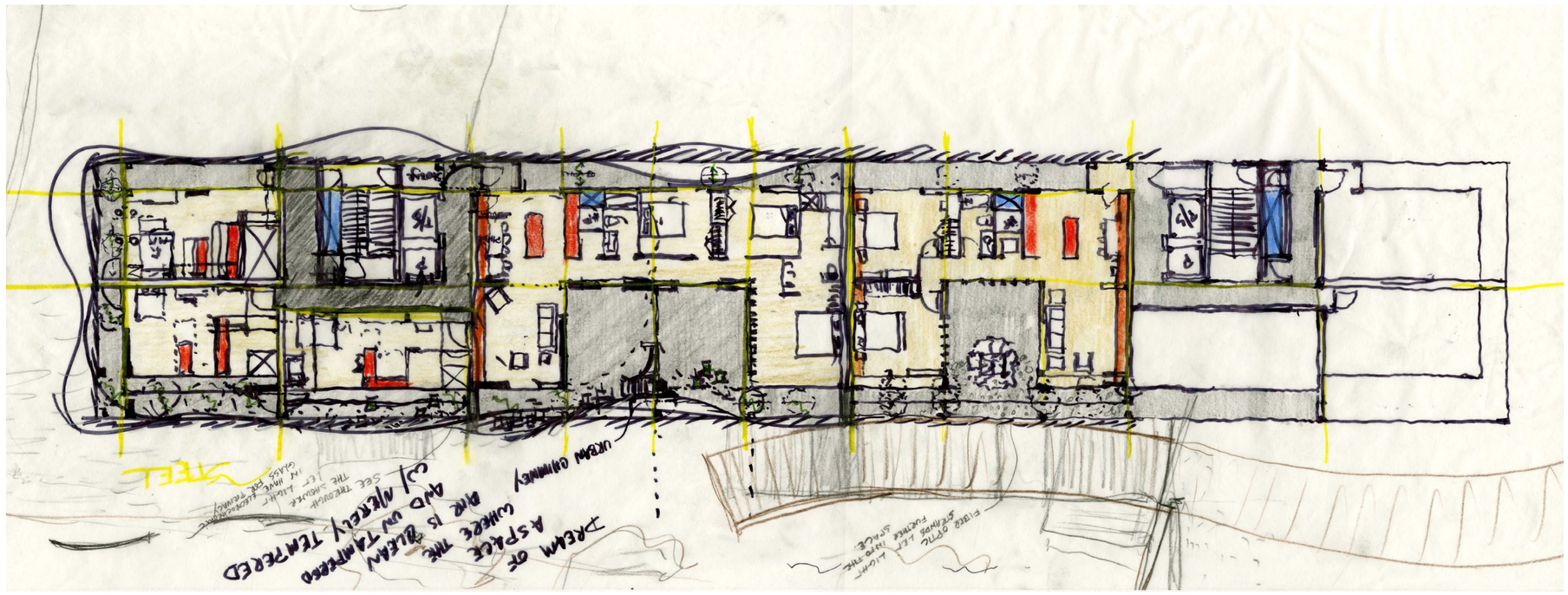


Fig. 24 Progress Sketch Plan.

Fig. 25 Initial Urban Perspective Sketch Over 3D Model Print Out, NE Corner.

the american dwelling

In re-imagining the American dwelling, I sought to understand the elements that make home ownership desirable. The diagram below represents my thinking regarding physical conditions that make up the realization of ideological aims. I tried to incorporated these elements in the mid-rise tower. Though the car and the unit do not have the same proximity (there is a parking garage and rotary bike storage in the podium) and the inhabited envelope is not the size of a suburban yard, the units do function similarly to that of a single family dwelling.

It became apparent the sectional change of 24" at the perimeter of the units was not sufficient in the courtyard like spaces to provide an urban yard equivalent. Staggered 2-story spaces in the inhabited envelope of the 2 & 3 bedroom units solved this problem and allowed for more sunlight , a tree, vertical neighbor creation and more. It is hoped that this will allow a greater sense of ownership similar to that of the single family home and form a possibly less transitory more accountable urban social fabric.

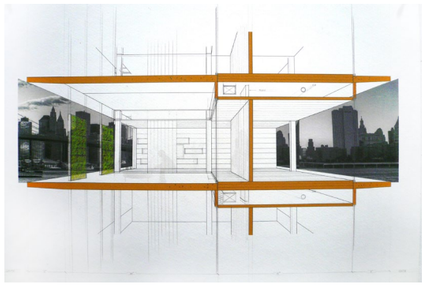


Fig. 26 Section perspective with the initial courtyard like space.

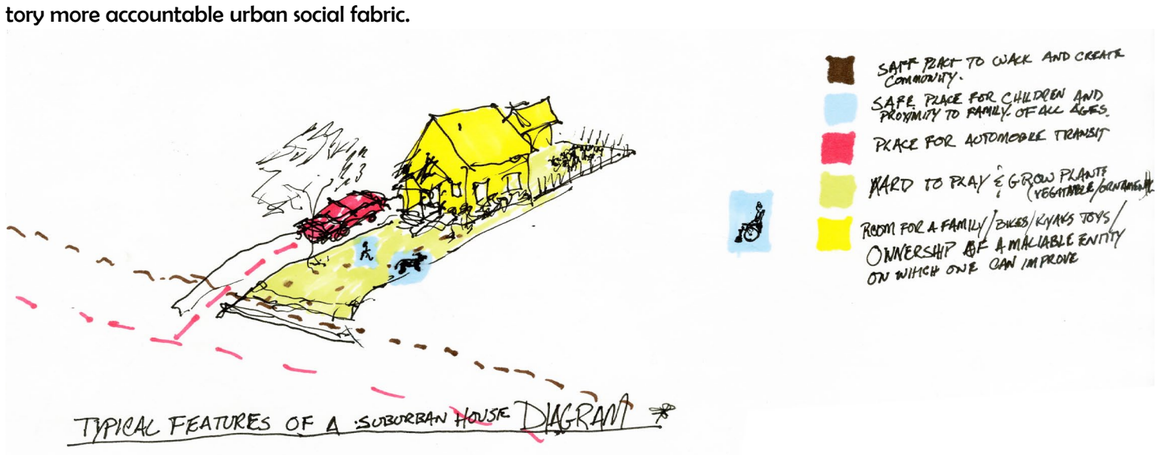


Fig. 27 Isometric Diagram Exploring the Elements that Make Up the American Dwelling.

notes:

1. Urban attic helps alleviate storage concerns and the removable storage units allow access to the utilities for construction and maintenence.

2. The inhabited envelope gives a yard equivalent, the vertical garden give place for individualization and their ability to rotate allows the creation variable ancillary spaces to the domicile, and many other benefits (See pages 8&9).

3. The thickness of the mass timber structure combined with the built in cabinetwork gives a strong sense of threshold and there would be some individualization of entry to each unit.

4. The double height interlocking spaces give the sectional quality similar to walking outside of a house and allows the development of vertical neighbors.

5. The adjacent studios allow for mix of incomes and the possibility of multi generational living on a floor.

6. Garden shed/closet.

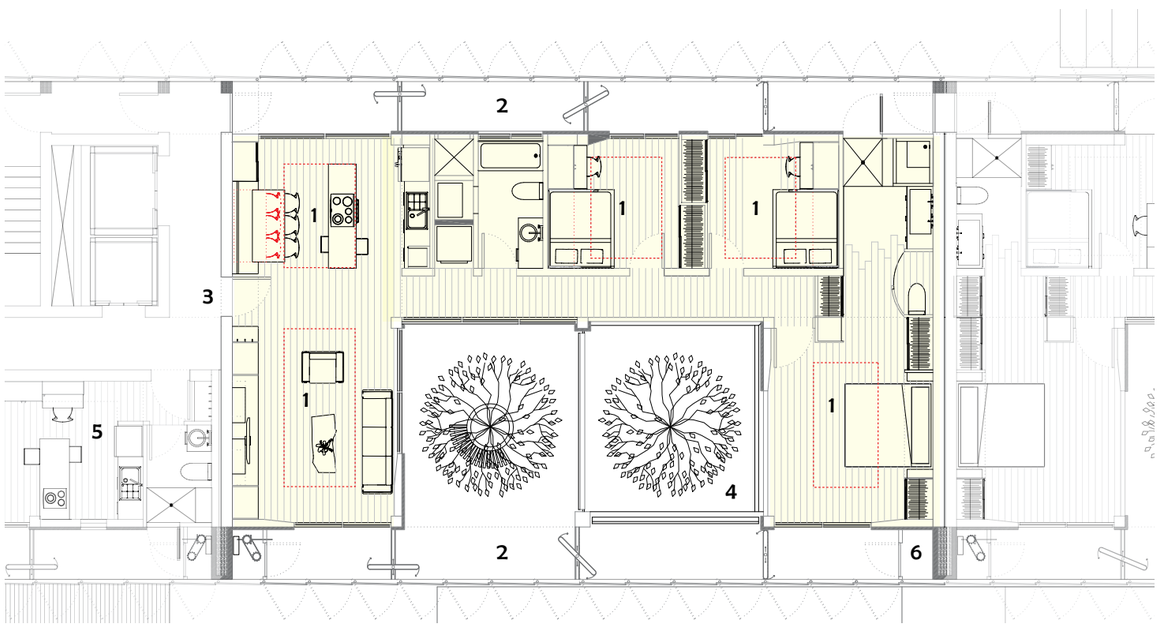


Fig. 28 Plan of a typical 3 br. unit with left half of the staggered 2 story space occupiable.

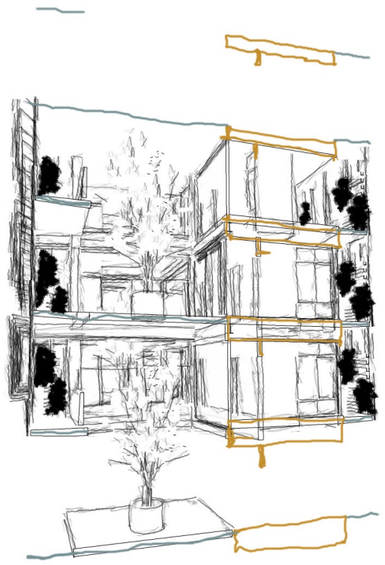


Fig. 29 Sketch diagram of the 2-story Inhabited envelope spaces in the 3 br. units.

Fig. 30 Perspective rendering looking at the 2-story Inhabited envelope spaces in the 3 br. units.

the american dwelling

This is a possible senerio of the lives of some of the residence living in the tower, and how they interact with one another in the framework provided. It demonstrates the cross generational life the unit mix enables; encouraging families to support their old and befriending those without family in close proximity. There are many benefits for everyone involved; the old don't get lonely, the young get advice, and the families get help with the kids, etc.

Father: John works at the new wood building systems factory located at the base of the tower built with the wood modules he helps make everyday. He is a cabinet fabricator and has a share in the cooperative factory. He works hard to make the coop a profit to get his dividend for the garden he takes great pride in. He and Molly (his wife) have made a little paradise inside their tower dwelling and love raising their two kids in Red Hook new water front development.

Mother: Molly: runs a small consulting firm using their home office and the shared use office space in the base of the tower. She loves having her mom close by to baby sit while she works. She also loves her mother having her own studio close by to keep some separation and make caring for her mother in old age a viable option.

Son: Billy, loves to go play with his friends on the playground located on the factory's green roof while his parents workout in the gym located on floor adjacent. More than that though he loves to play with his friend Maggie who lives in the unit below he often goes to the spot where the railing is lower and yells through the tree to see if he can come down and play.

Grandmother: Lillian, lives on the same floor of the tower in a studio apartment. She comes and helps with kids often, but if she or her daughters family needs space she can escape back to own little place where she loves tending her verticle kitchen garden. She helps run the Red Hook Community Garden outreach program and supervises the kids enrolled in replanting the garden walls of those less inclined to garden living within the tower.

Neighbor: Ron, lives the in one of the studios in another studio on the same floor. He works at a local architecture firm and is collaborating with John on a furniture line. They are prototyping the pieces in the shared use digital fabrication lab. They have become friends and Ron comes over often with some of the produce from his garden walls to contribute for dinner.

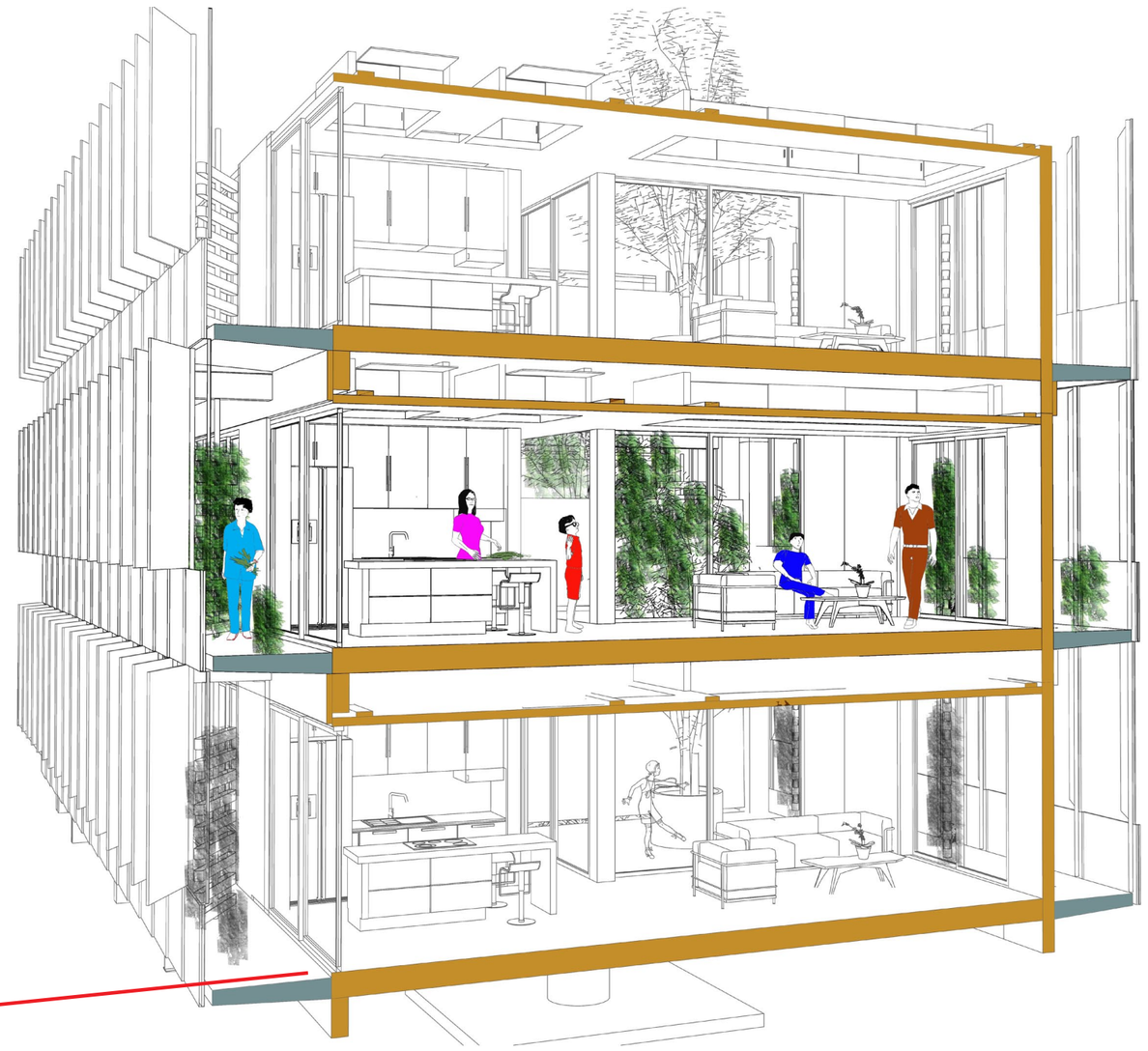


Fig. 31 Section perspective rendering looking at the kitchen and living room spaces in the 3 br. units.

Fig. 32 Typical tower floor plan.

the inhabited envelope

The inhabited envelope is principally the enlargement of a double layered skin. The perimeter of the unit is the insulated skin and the glass greenhouse like enclosure forms the perimeter of the climatic buffer. This provides a framework for living which makes it a choice to expend energy to maintain a controlled environment and keeps at least a relatively comfortable state with minimal energy input into space conditioning. As architects it is our responsibility to design structures that set up a poetic and performative dialectic with the local climatic forces instead of a hermetic separation. While this space functions on many levels this section will focus on its performative possibilities and the details of its components.

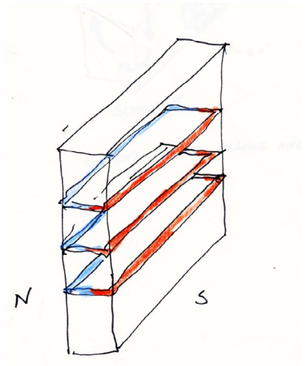


Fig. 33 Buffering the inhabited envelope by amplifying the thermal mass of its concrete floors through radiant lines.

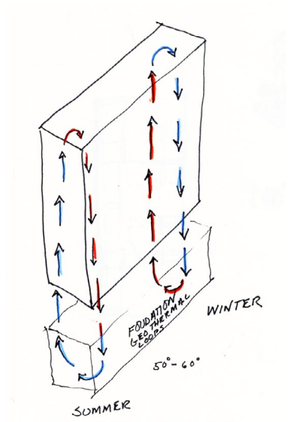


Fig. 34 Geo-thermal piles lower HVAC loads.

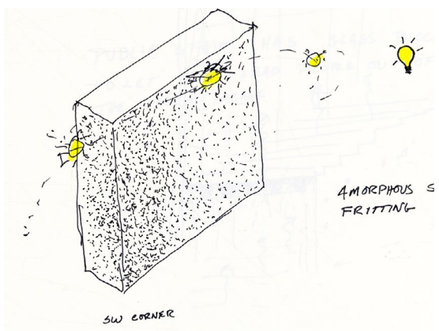


Fig. 35 Amorphous photovoltaic fritting calculated for shading and power production.

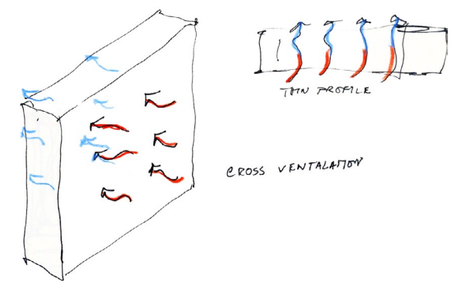


Fig. 36 The thin profile offers cross ventilation.

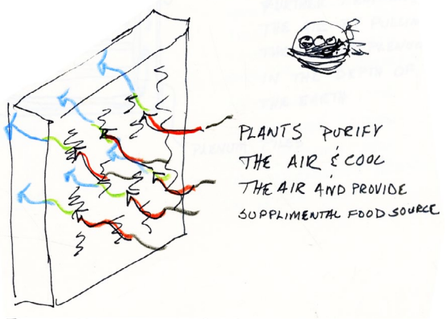


Fig. 37 Vegetation purifies the air as it passes through.

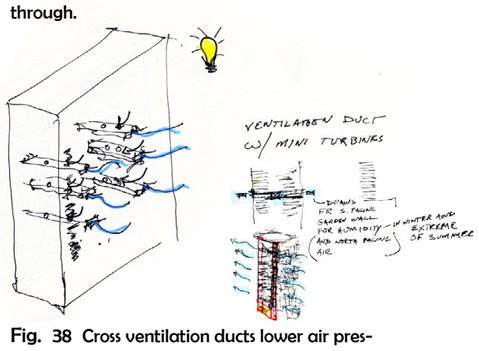


Fig. 38 Cross ventilation ducts lower air pressure across the long face of the tower and allow ducted cross ventilation in the studios.

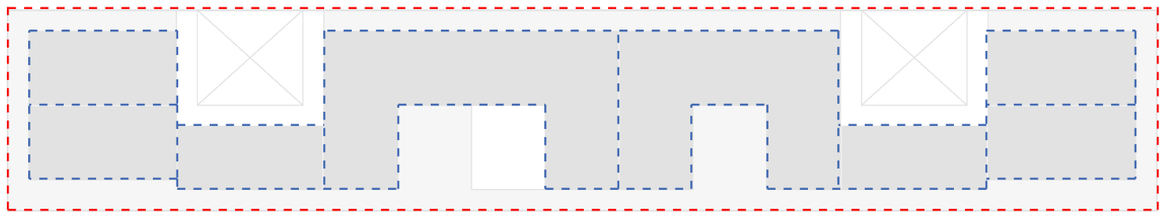


Fig. 39 Diagram of the insulated unit perimeter and the vertical glass louvre enclosure of the inhabited envelope.

Fig. 40 Photo of sketch model showing the inhabited envelope.

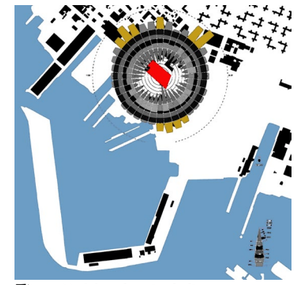


Fig. 41 March wind diagram.

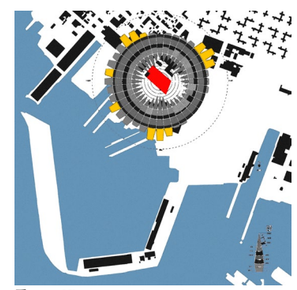


Fig. 42 June wind diagram.

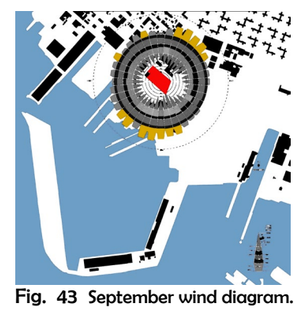


Fig. 43 September wind diagram.

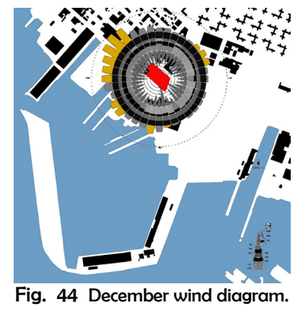


Fig. 44 December wind diagram.

the inhabited envelope

Below is the manifestation of the ideas laid out in the previous discussion of the possibilities offered by an inhabited envelope. The building envelope is a set of discreet units with relatively simple operation that amplify passive environmental strategies. The inhabited envelope floor is composed of precast concrete with radiant lines to take full advantage of its thermal mass in buffering the climate surrounding the units.

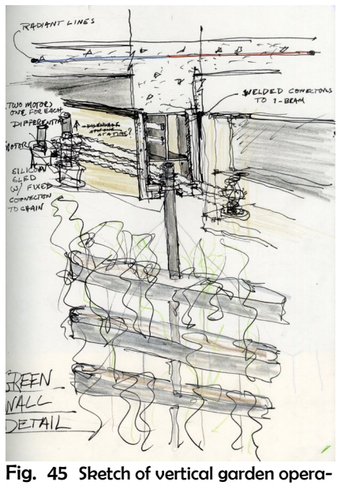


Fig. 45 Sketch of vertical garden operation and its motor and track.

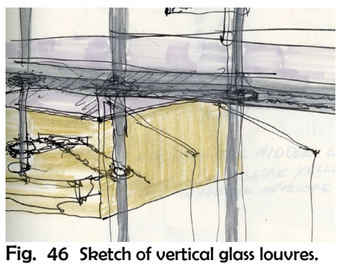


Fig. 46 Sketch of vertical glass louvres.

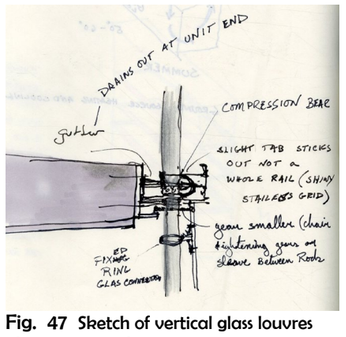


Fig. 47 Sketch of vertical glass louvres aluminium track.

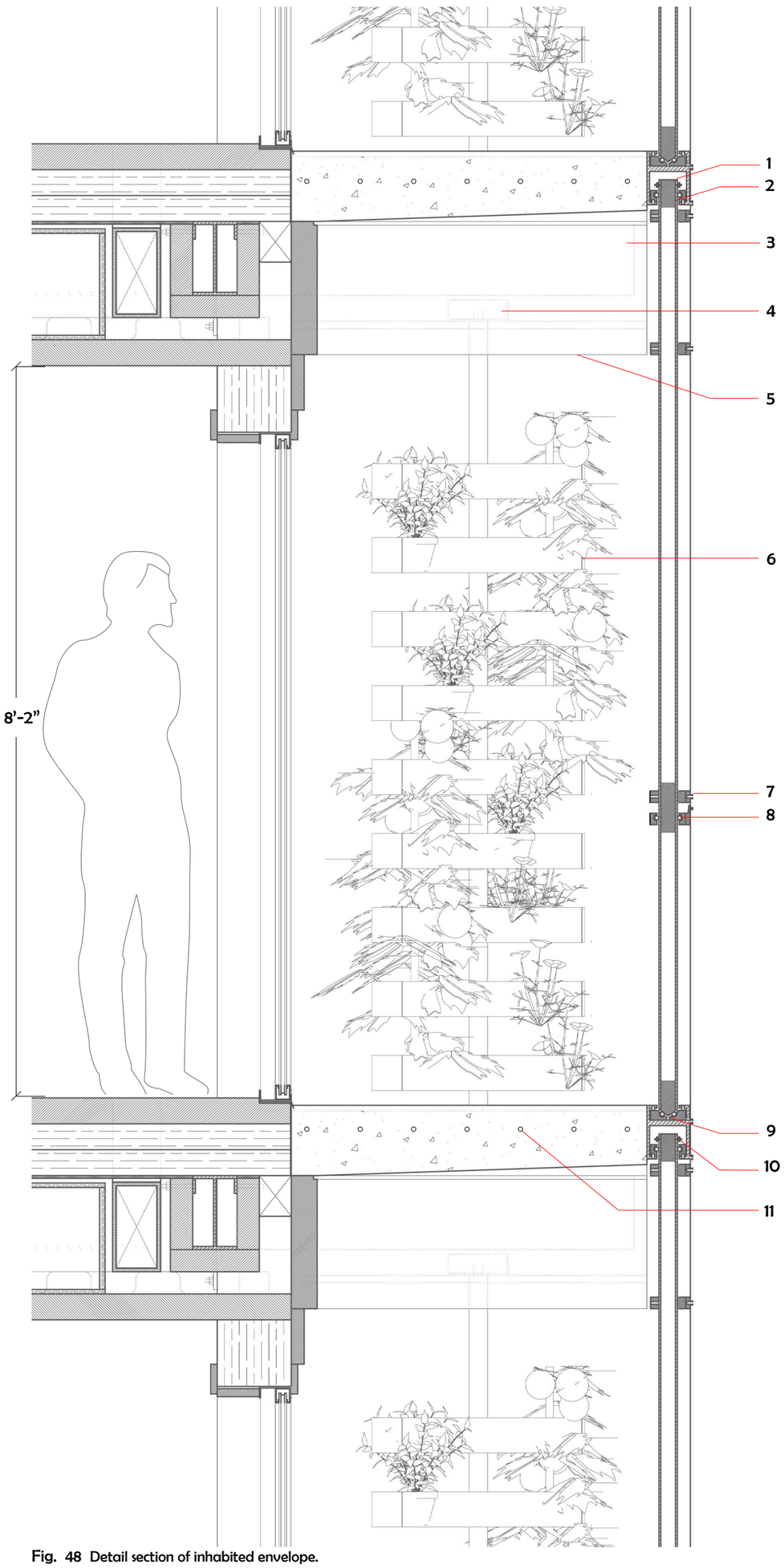


Fig. 48 Detail section of inhabited envelope.

notes:

1. Gear and chain assembly opens the operable top section of the vertical glass louvres.
2. Ball bearing aluminium puck locked in place with set screws.
3. Steel gerberet under wood shroud.
4. Motor and track operating the vertical garden wall.
5. Wood shroud (3" thick wood forms fireproofing).
6. Vertical garden wall.
7. Aluminium fixed ring and bar assembly for glass attachment to vertical stainless rod.
8. Aluminium ring and bar assembly with ball bearing center allows bottom section of glass rail assembly to remain stationary and the operation rod to rotate.
9. Compression bearing puck slides in rail and is fixed in place with set screws.
10. Aluminium rail.
11. Radiant lines.
12. Bottom guide rail for vertical gardens forms the of the precast inhabited envelope floor and protects and insulates the radiant line joints.
13. 1/2" glass of the vertical louvre assembly.
14. Siding, battens, and vapor barrier are installed as much as possible in the factory. The remaining trim etc. is installed from the inhabited envelope floor after structure is attached. Closed cell foam insulation used between battens.

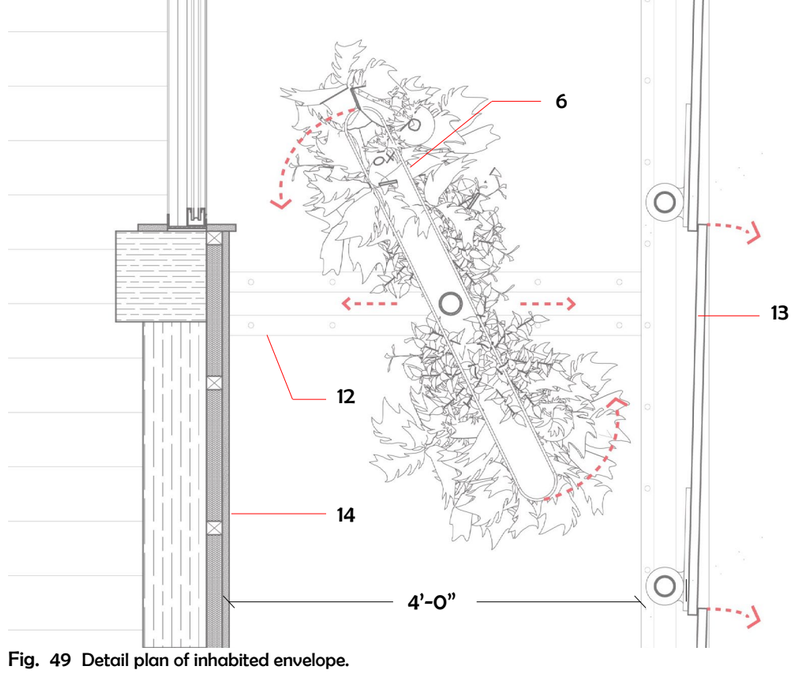


Fig. 49 Detail plan of inhabited envelope.

the module & the tower
(mass timber research)

My principle reference for the mass timber tower structure was THE CASE FOR Tall Wood BUILDINGS by Michael C. Green (mgb ARCHITECTURE + DESIGN) and J. Eric Karsh (Equilibrium Consulting). This was a 'Case Study' project funded by the Canadian Wood Council (CWC), the Wood Enterprise Coalition (WEC), and Forestry Innovation Investment and was published February 2012 as sharable resource for non commercial endeavours. In the Report they propose the use of emerging timber products, Cross Laminated Timbers (CLT), Laminated Veneer Lumber (LVL), and Laminated Strand Lumber (LSL), and steel sections to form a timber panel and steel frame. The wood products have a similar material property strength of concrete and need the steel to provide enough ductility to the structure to withstand the forces on tall buildings. Due to the mass of the timbers proposed (7-10.5" thick) the wood acts like a heavy timber and forms a fire rated char layer in the event of a fire. They propose designing a sacrificial layer of wood that would char during a fire and then be replaced. The sacrificial layer is deducted from the member for structural calculations. They developed four tower options, option 1 (12-story), options 2&3 (20-story), and option 4 (30-story). I referred to the 20-story options for the development of a 22-story modular wood residential tower. Wood tower construction is not allowable by code in the United States at this time, however the United Kingdom, Norway and New Zealand have no limits if sufficient research is presented. As more research is done and mass timber buildings built this will become a standard mode of building the world wide.

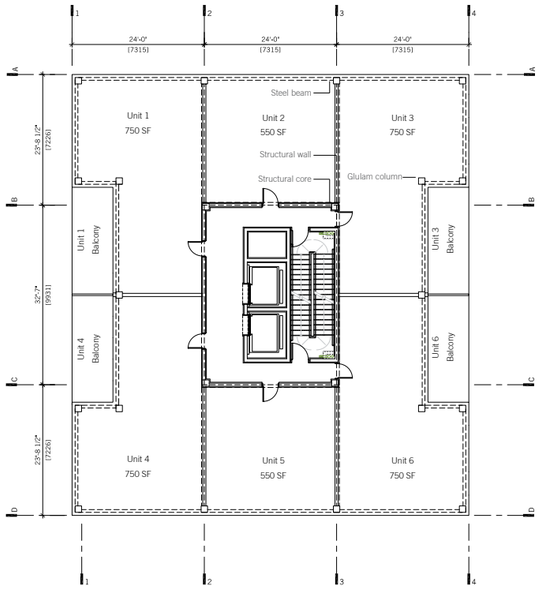


Fig. 50 Tower option 2 (Green & Karsh pg. 71).

Fig. 51 CLT panel photo (Green & Karsh pg. 37).

Fig. 52 LVL panel photo (Green & Karsh pg. 39).

Fig. 53 Moment frame formed at the door openings in the mass timber core (Green & Karsh pg. 95).

Fig. 54 Interior photo of 1 3/4" = 1' model exploring mass timber structure.

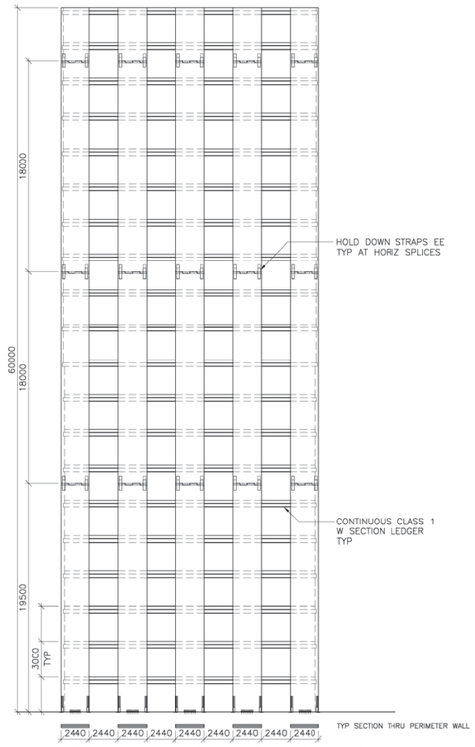


Fig. 55 Tower option 2 (Green & Karsh pg. 81).

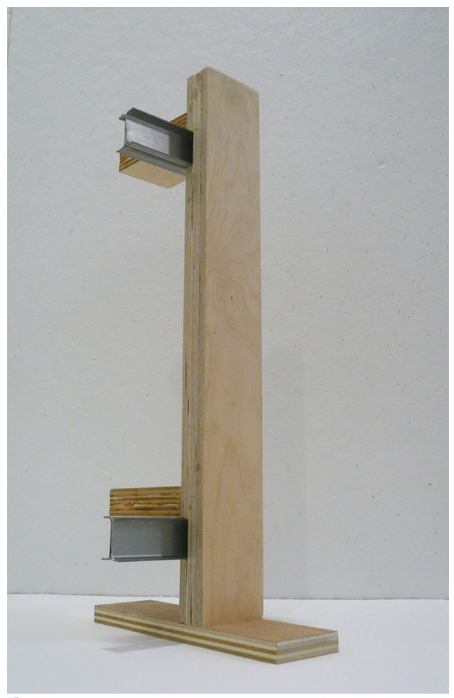


Fig. 56 Exterior photo of 1 3/4" = 1' model exploring mass timber structure.

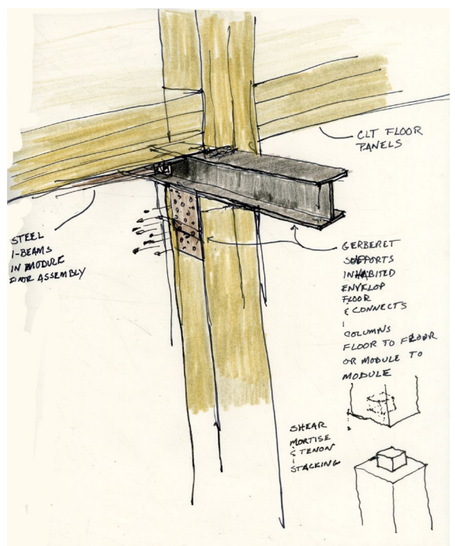


Fig. 57 Sketch of steel gerberets.

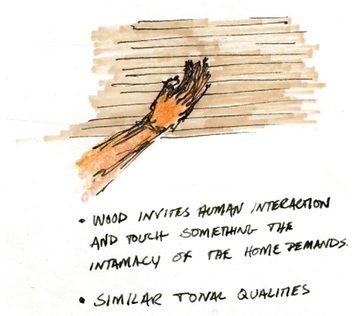


Fig. 58 Sketch of the potentials of wood and its invitation and its relation to human touch.

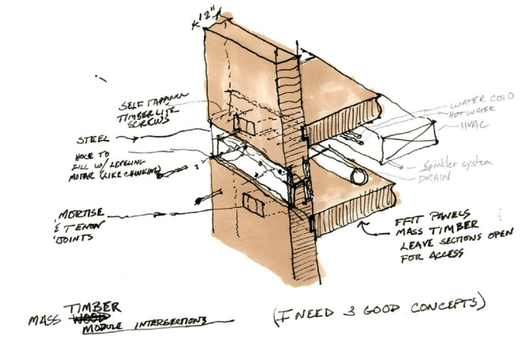


Fig. 59 Sketch of beginning thoughts of a mass timber module.

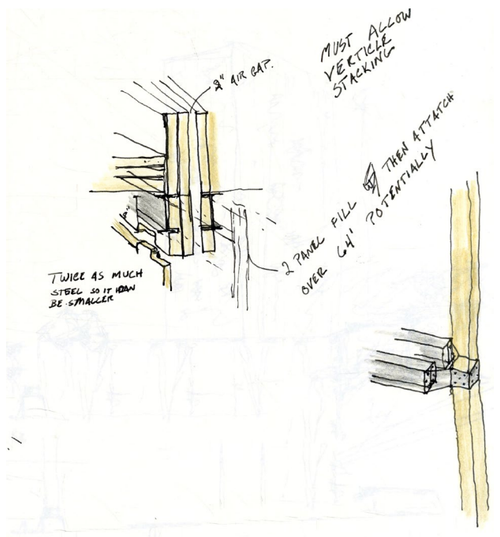


Fig. 60 Sketch of module to module connections.

the module & the tower
(mass timber module)

Fig. 61 Mass timber modules stack similarly to steel with the use of a halo (image from a steel module research at SOM).

There are two basic types of wood modules the first type is one which the whole living arrangement fits within the confines a singular module. The second is a composition of living modules adjacent to a singular smart module containing all of the appliances and major services, (i.e. plumbing, hvac, av, ect.). Every module has a certain amount of “urban attic “ or loft storage. The void waiting for the storage units allows access for utility hook up module to module and module to core. These excellent storage units slide in after hook up and slide out when maintenance is necessary. The module dimensions are 11’x14’ in section and never more than 42’ long adhering to standard shipping dimensions and removing the need for a low bodied trailer.

The module is not completely finished, it comes partially finished with all of the remaining parts stored within, excepting the pre-cast concrete panels that form the floor of the inhabited envelope. As the tower rises the remaining parts are installed easily from the scaffolding formed by the enlarged envelope, in addition any future maintenance is made easy by the steel, wood and concrete enclosure. All exposed steel outriggers and gerberets are encased with pre-made wood components shipped within the unit during transport. The wood components fireproof the steel and provide the tracking system for the vertical gardens. The bottom track of the vertical garden unit forms the joint in the pre-cast concrete floor of the inhabited envelope.

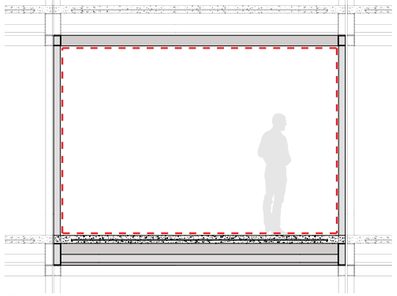


Fig. 62 Cross section of steel module.

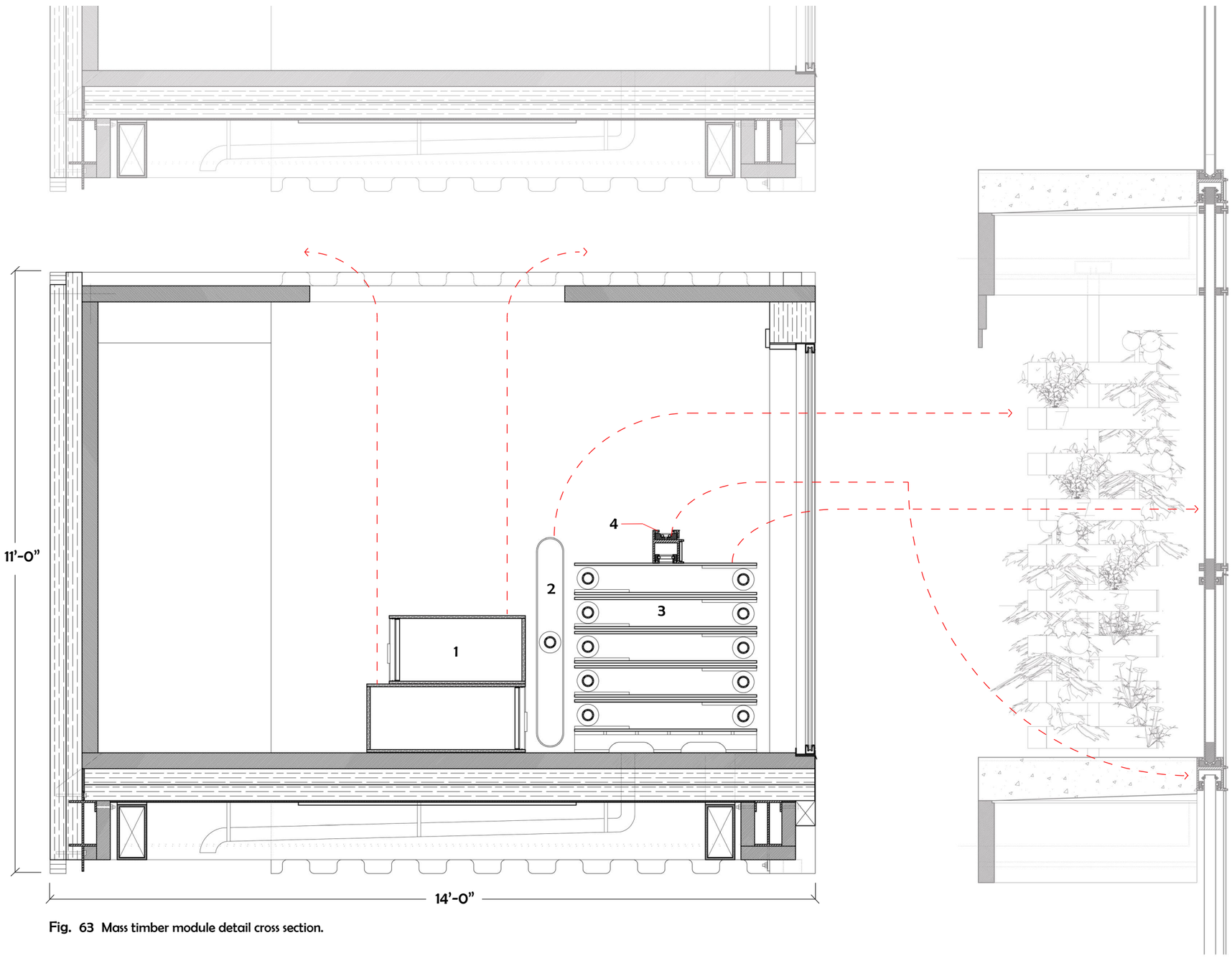


Fig. 63 Mass timber module detail cross section.

notes:

1. Removable storage units in the urban attic.
2. Vertical garden walls.
3. Glass and aluminium curtain wall assemblies.
4. Aluminium rail for the curtain wall.
5. All other necessary siding, trim, all exterior fixtures, and any other parts necessary to complete the module are stored in the module during shipping and tower erection, and installed from the inhabited envelope floor.

Sacrificial Char Layer

the module & the tower
(tower structure)

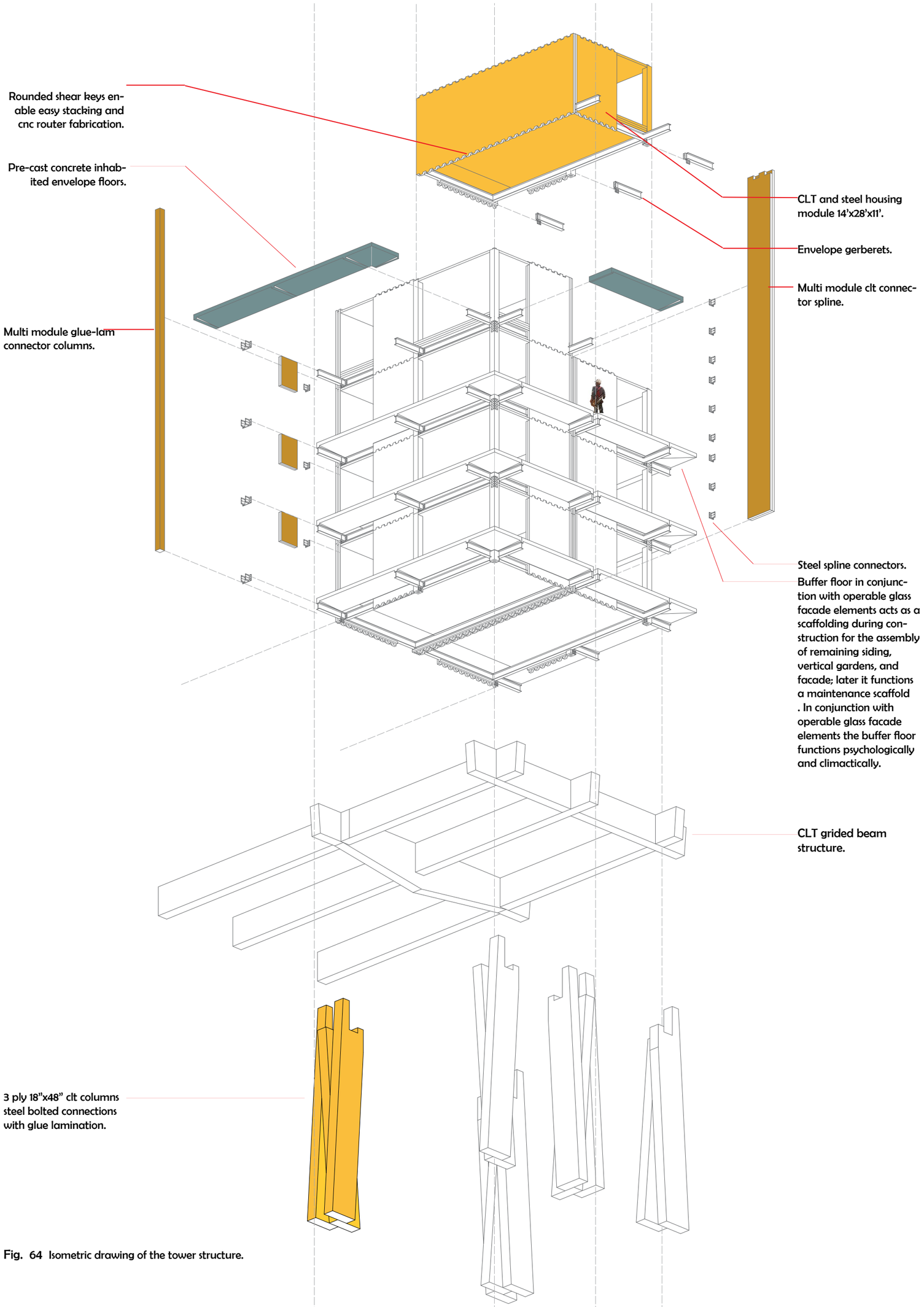


Fig. 64 Isometric drawing of the tower structure.

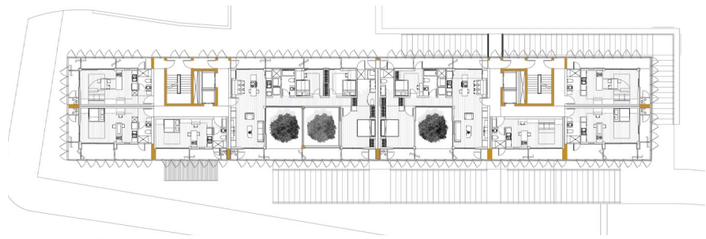


Fig. 65 Four story connector splines.

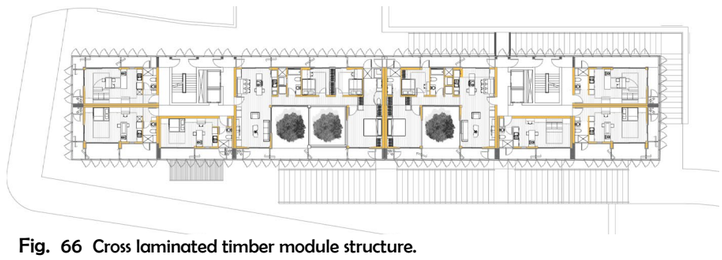


Fig. 66 Cross laminated timber module structure.

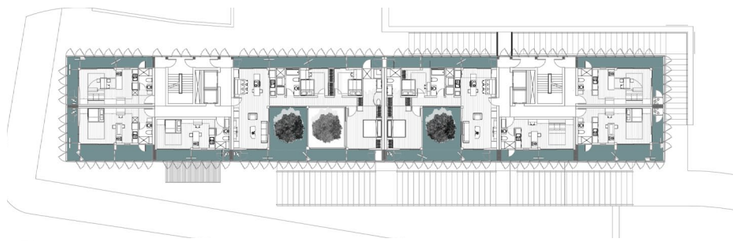


Fig. 67 Pre-cast floor panels for inhabited envelope.

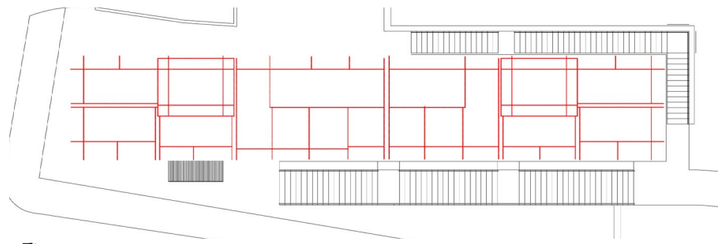


Fig. 68 Steel w-section beam diagram.

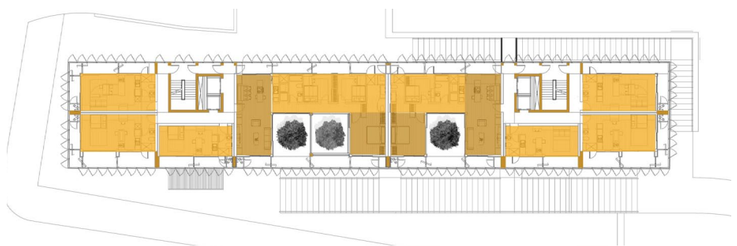


Fig. 69 Module mix service (wet, hvac, av, etc.) served or living.

the module & the tower
(model)

Fig. 70 Sketch model, view of corner studio.

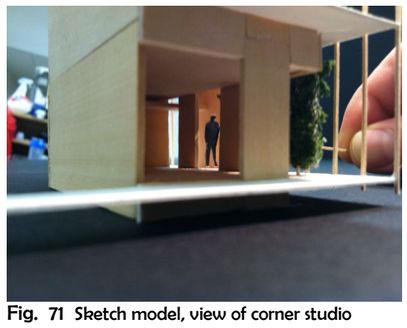


Fig. 71 Sketch model, view of corner studio interior.

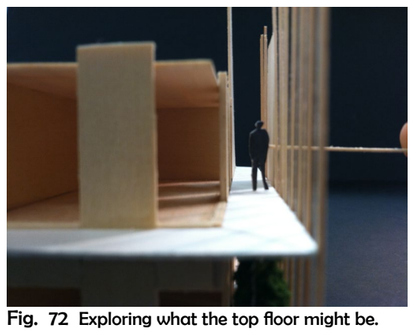


Fig. 72 Exploring what the top floor might be.

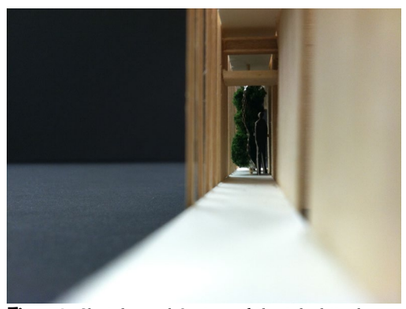


Fig. 73 Sketch model, view of the inhabited envelope.

Fig. 74 Sketch model, exploring openings onto the inhabited envelope.

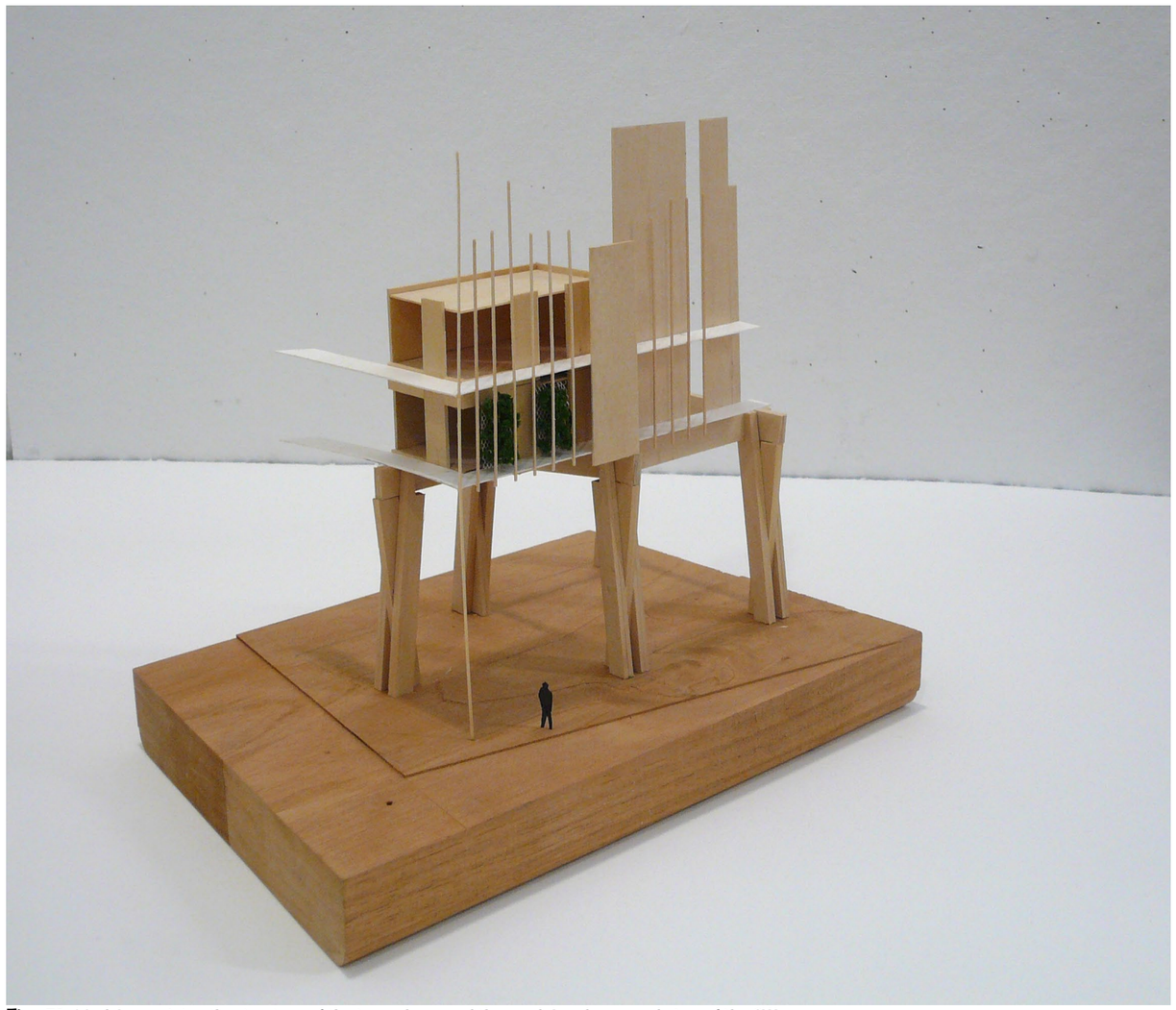


Fig. 75 Model examining the structure of the tower base and the modules, downward view of the SW corner.

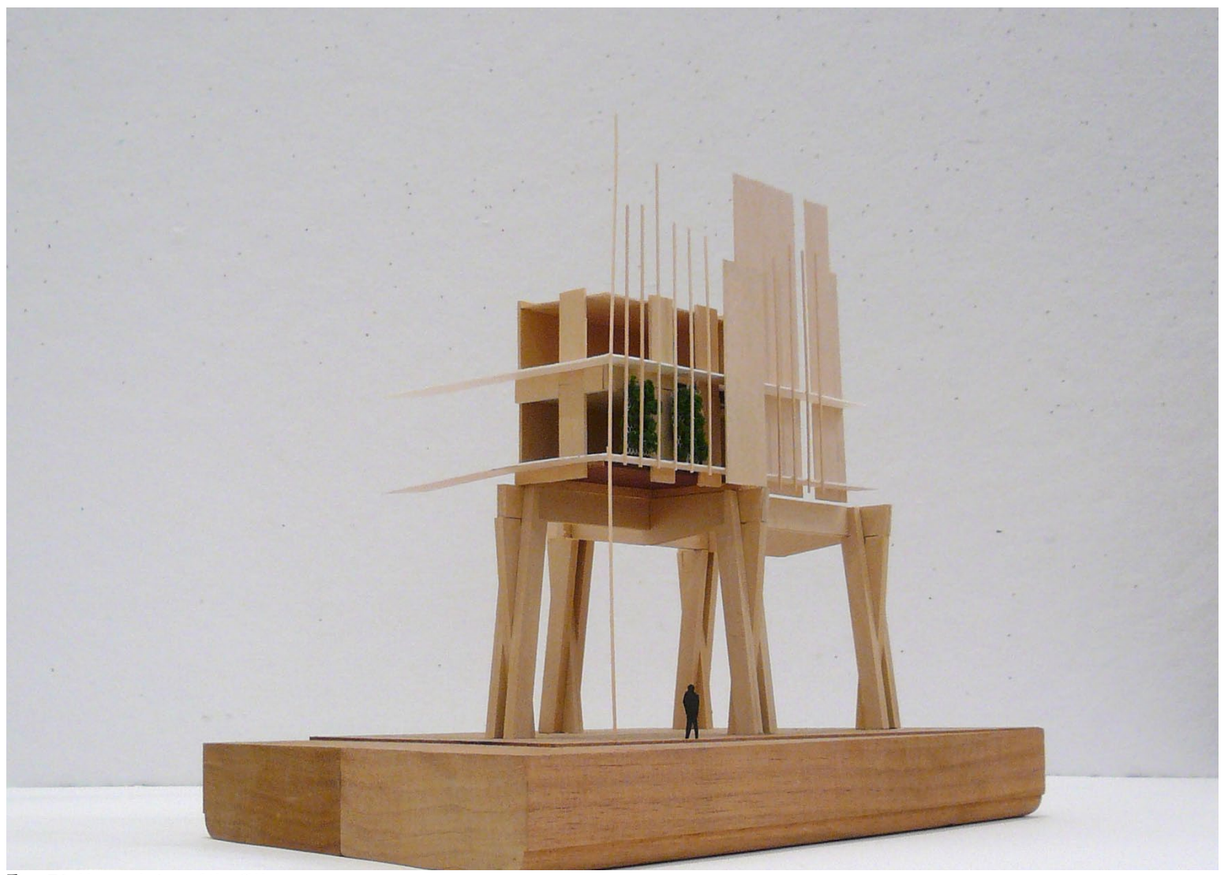


Fig. 76 Upward view of the SW corner.

the urban context

Red Hook Brooklyn is a vibrant old industrial neighborhood. The site is located across the street of a very large Ikea. The storied Red Hook ball fields, the new costal walking and biking path (along the docks behind Ikea and out the iconic “hook”), and the community garden located in block adjacent to the site were three important parts of the urban fabric surrounding the site. I identified these as priority elements to tie into my site proposal. The nearest subway stop is located at the Carrol street (F & G lines) station 1.4 miles away, there is a B61 bus stop in front of Ikea. The distance to the nearest subway station was a driving factor in providing an innovative bike storage solution in the competitions program. Super markets, schools, and health facilities are all located with .5 miles of the site and include the Fairway Market and the Brooklyn Health Center.

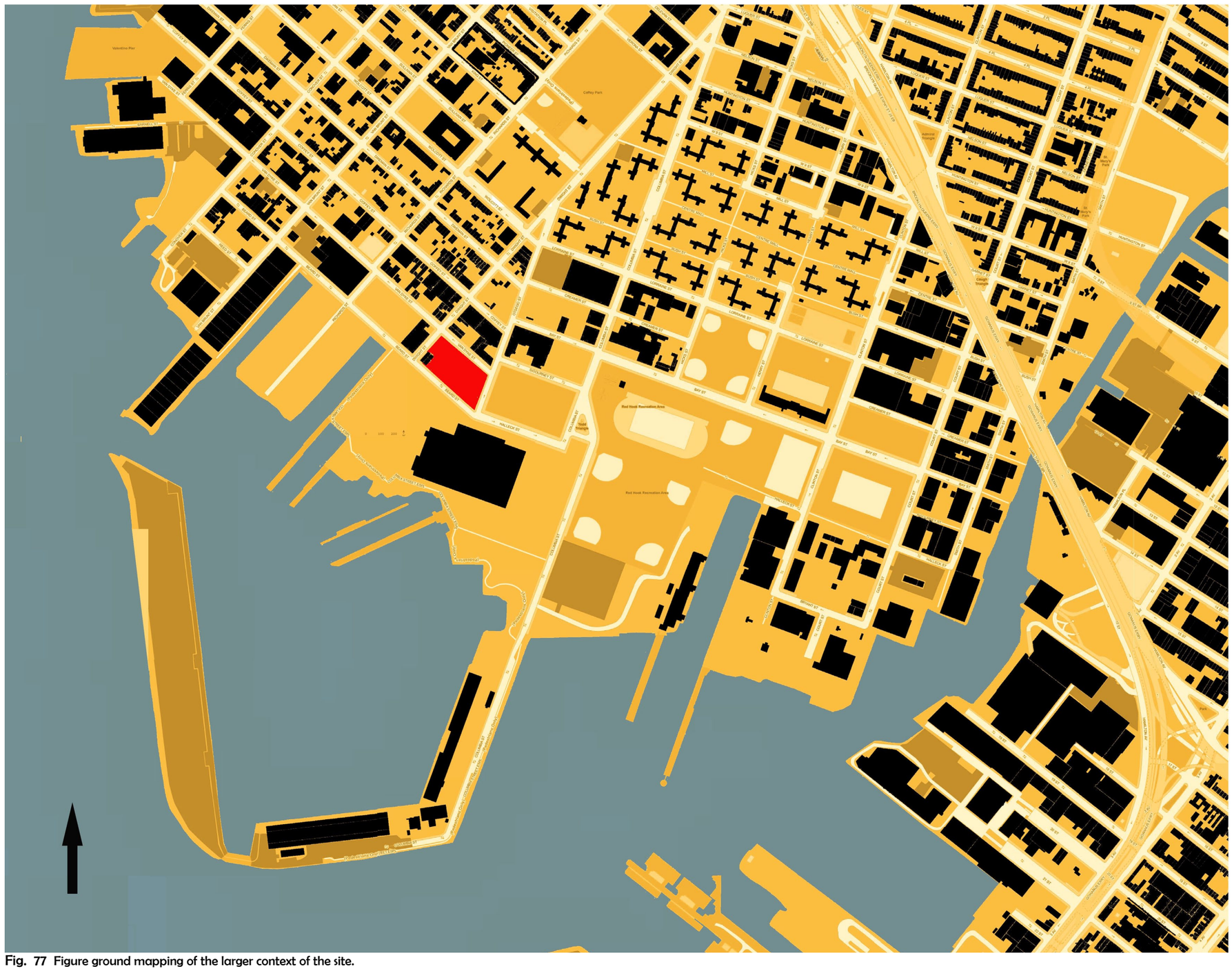


Fig. 77 Figure ground mapping of the larger context of the site.

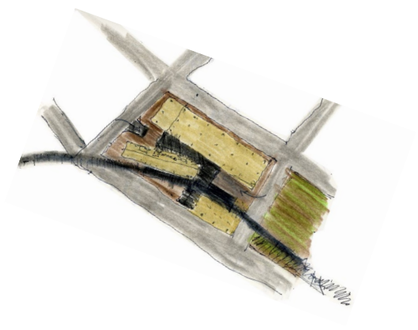


Fig. 78 Sketch thinking of the building as a forest meeting the craggy rock.

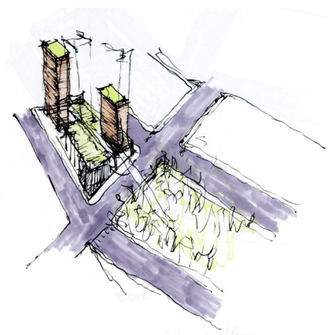


Fig. 79 Massing option two.

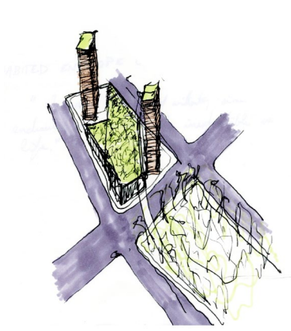


Fig. 80 Massing option three.

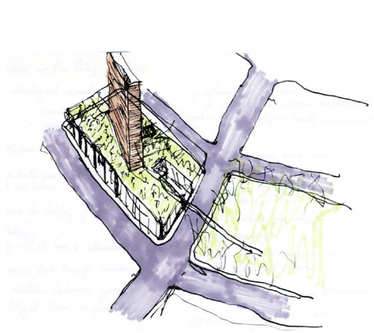


Fig. 81 Massing option four.

Fig. 82 Sketch of SW corner of the tower.

the urban context

As mentioned in preface, the program consists of a mid-rise residential tower, factory for wood based production, innovative bike storage, bike repair shop, shared use digital fabrication lab, shared use shops (wood, metal, and upholstery), loading dock, laundry, shared use office space, and café. I based the program on the "Timber in the City" Competition. Employing a cooperative businesses model will give employees part ownership, helping engender a sense of pride and ownership in the neighborhood. The shared use shops will provide an avenue for entrepreneurship by decreasing the amount of start up capital necessary to start a small business. The project follows fairly closely the program of the competition seen at left.

competition program

residence

Studio	325 sqft	100 units	32,500 sqft
1 BD	650 sqft	35 units	22,750 sqft
2 BD	850 sqft	25 units	21,250 sqft
3 BD	1000 sqft	15 units	15,000 sqft
Laundry			750 sqtf
Recreation (indoor)			2,500 sqft
Lobby / Mail			1,500 sqft
Residential Subtotal			96,250 sqft
Mechanical		4%	3,850 sqft
Circulation		10%	9,625 sqft
Parking		58 spaces	
Residential Total			**109,725 sqft**

bike

Workshop / Maintenance Area		2,000 sqft
Main Bicycle Storage		5,000 sqft
Shop Storage		3,000 sqft
Restrooms		300 sqft
Entry Ram		750 sqft
Protected Bike Parking		3,000 sqft
Bike Shop Total		**14,050 sqft**

wood

Main Production Area		20,000 sqft
Research Workshops		3,000 sqft
Material Storage Warehouse		12,500 sqft
Showroom		2,500 sqft
Offices		2,500 sqft
Restrooms / Kitchen		500 sqft
Wood Production Subtotal		41,000 sqft
Mechanical	4%	1,640 sqft
Loading Dock	2000 sqft	2,000 sqft
Wood Production Total		**44,640 sqft**

digital

Main Production Area		6,000 sqft
Workshops / Classrooms		2,800 sqft
Material Storage		1,500 sqft
Showroom / Exhibition Space		2,000 sqft
Offices		1,200 sqft
Digital Production Subtotal		13,500 sqft
Mechanical	4%	540 sqft
Loading Dock (may be shared w/ other facilties)	300 sqft	300 sqft
Digital Production Total		**14,340 sqft**

gross sqft 182,755

Fig. 83 Red hook circa 1950 (justanotherbrooklynblog.blogspot.com)

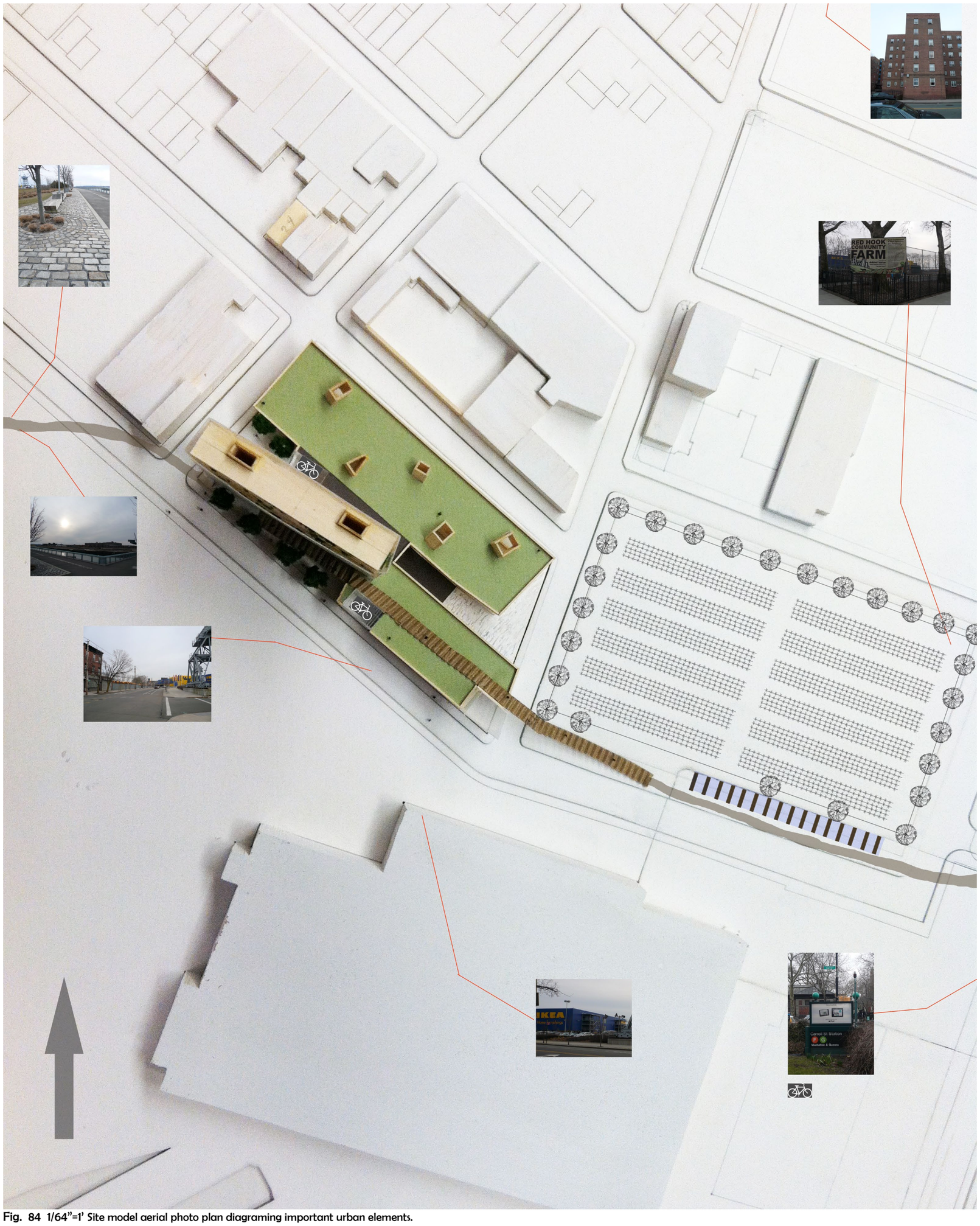
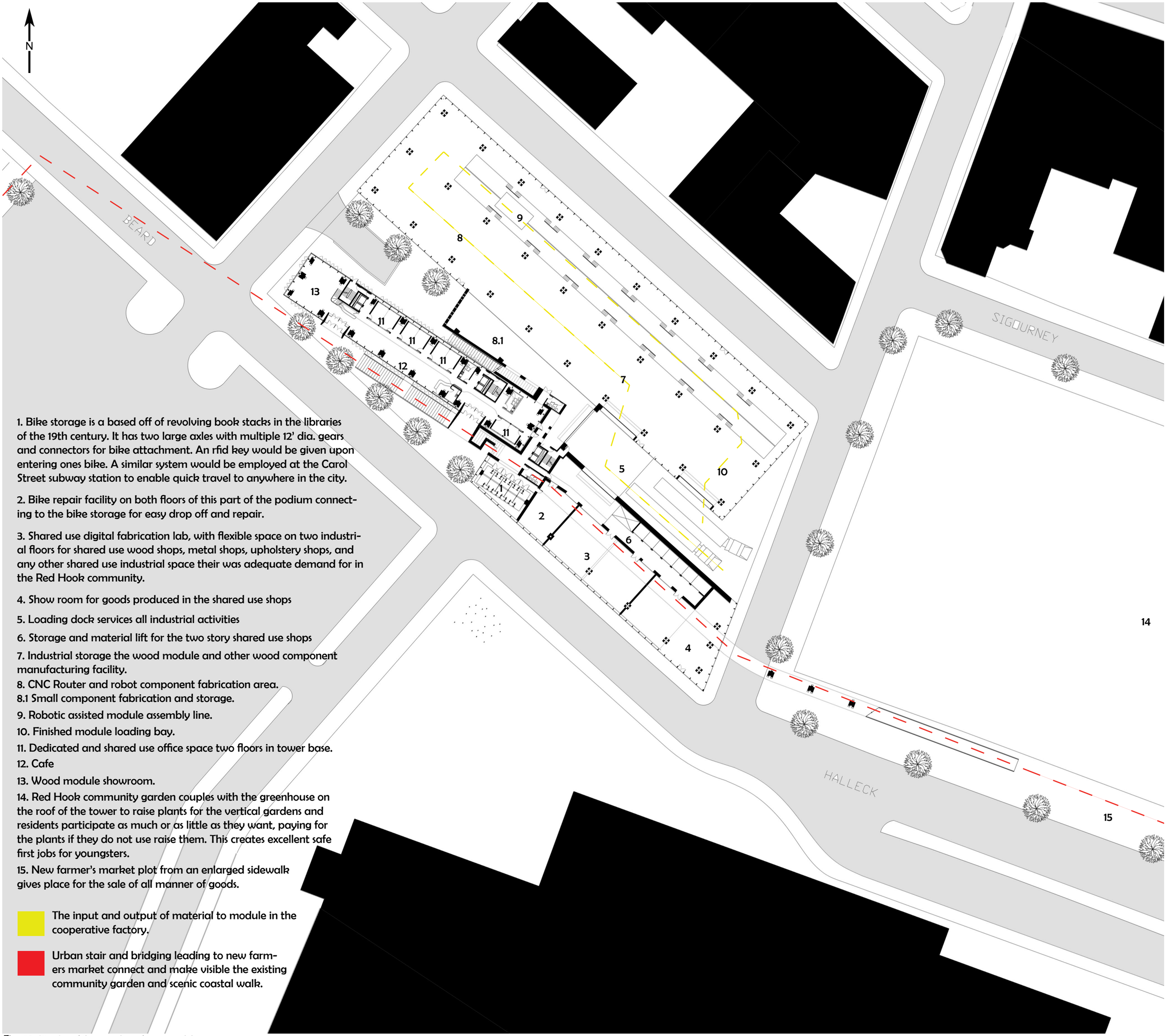


Fig. 84 1/64"=1' Site model aerial photo plan diagraming important urban elements.

the urban context
(site plan)



1. Bike storage is a based off of revolving book stacks in the libraries of the 19th century. It has two large axles with multiple 12' dia. gears and connectors for bike attachment. An rfid key would be given upon entering ones bike. A similar system would be employed at the Carol Street subway station to enable quick travel to anywhere in the city.

2. Bike repair facility on both floors of this part of the podium connecting to the bike storage for easy drop off and repair.

3. Shared use digital fabrication lab, with flexible space on two industrial floors for shared use wood shops, metal shops, upholstery shops, and any other shared use industrial space their was adequate demand for in the Red Hook community.

4. Show room for goods produced in the shared use shops

5. Loading dock services all industrial activities

6. Storage and material lift for the two story shared use shops

7. Industrial storage the wood module and other wood component manufacturing facility.

8. CNC Router and robot component fabrication area.

8.1 Small component fabrication and storage.

9. Robotic assisted module assembly line.

10. Finished module loading bay.

11. Dedicated and shared use office space two floors in tower base.

12. Cafe

13. Wood module showroom.

14. Red Hook community garden couples with the greenhouse on the roof of the tower to raise plants for the vertical gardens and residents participate as much or as little as they want, paying for the plants if they do not use raise them. This creates excellent safe first jobs for youngsters.

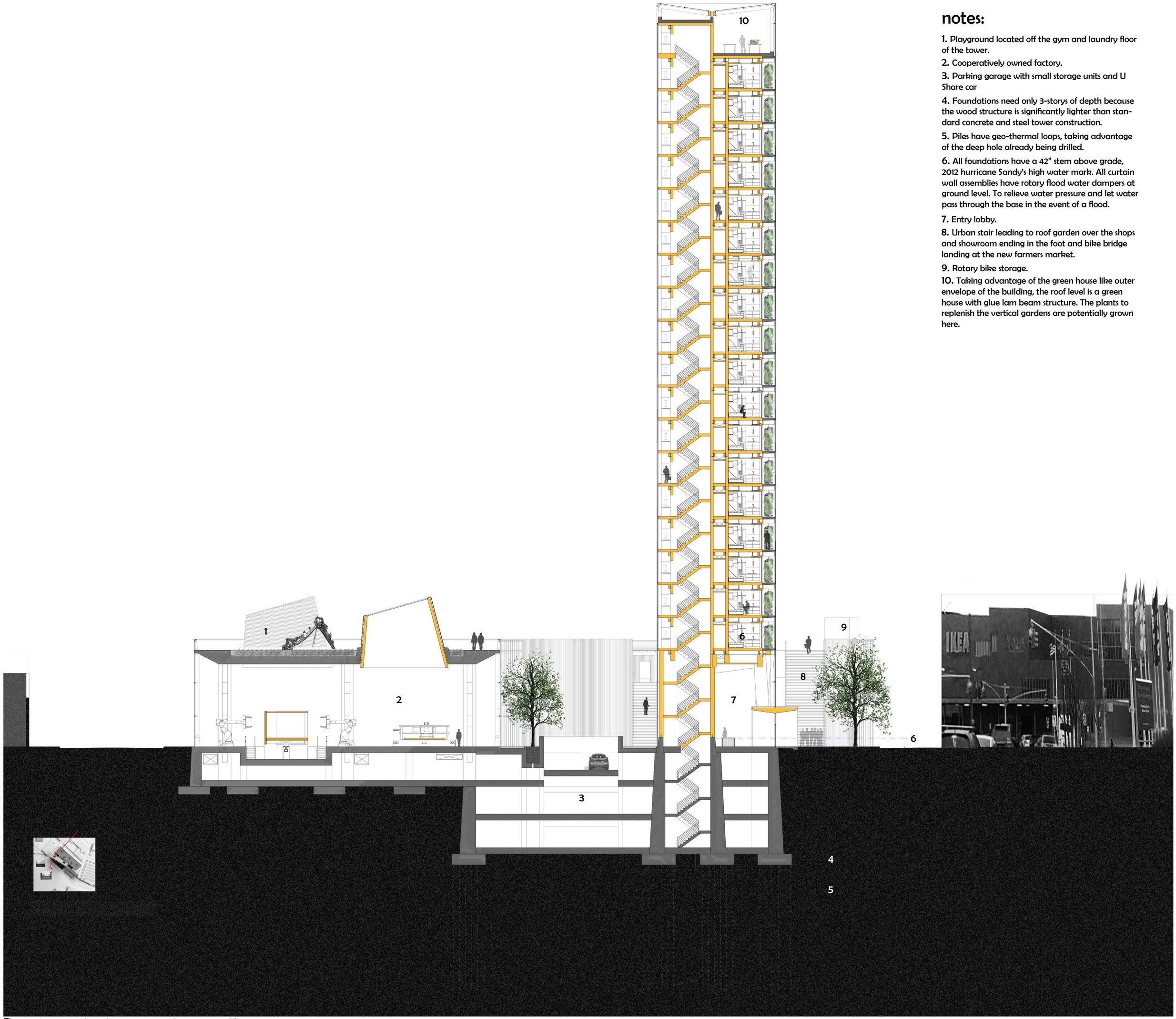
15. New farmer's market plot from an enlarged sidewalk gives place for the sale of all manner of goods.

The input and output of material to module in the cooperative factory.

Urban stair and bridging leading to new farmers market connect and make visible the existing community garden and scenic coastal walk.

Fig. 85 Site plan of the tower base, factory, and shops.

the urban context
(site section)



notes:

1. Playground located off the gym and laundry floor of the tower.

2. Cooperatively owned factory.

3. Parking garage with small storage units and U Share car

4. Foundations need only 3-storys of depth because the wood structure is significantly lighter than standard concrete and steel tower construction.

5. Piles have geo-thermal loops, taking advantage of the deep hole already being drilled.

6. All foundations have a 42" stem above grade, 2012 hurricane Sandy's high water mark. All curtain wall assemblies have rotary flood water dampers at ground level. To relieve water pressure and let water pass through the base in the event of a flood.

7. Entry lobby.

8. Urban stair leading to roof garden over the shops and showroom ending in the foot and bike bridge landing at the new farmers market.

9. Rotary bike storage.

10. Taking advantage of the green house like outer envelope of the building, the roof level is a green house with glue lam beam structure. The plants to replenish the vertical gardens are potentially grown here.

Fig. 86 Site section through tower entry, parking entry, and factory.

Fig. 87 View of SW corner.

the urban context

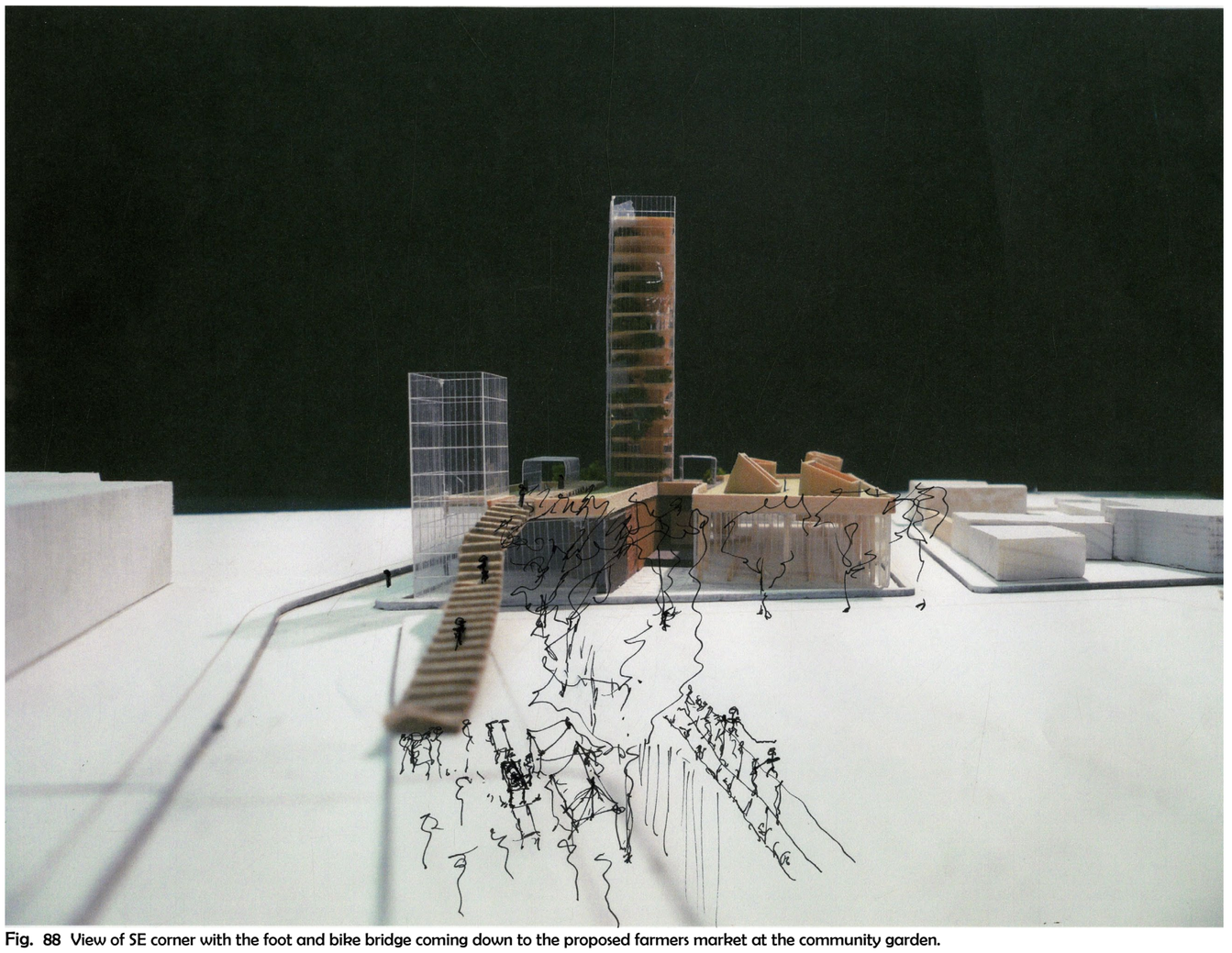


Fig. 88 View of SE corner with the foot and bike bridge coming down to the proposed farmers market at the community garden.

Fig. 89 Close up view of SW corner.

Fig. 90 View of NW corner of the factory.

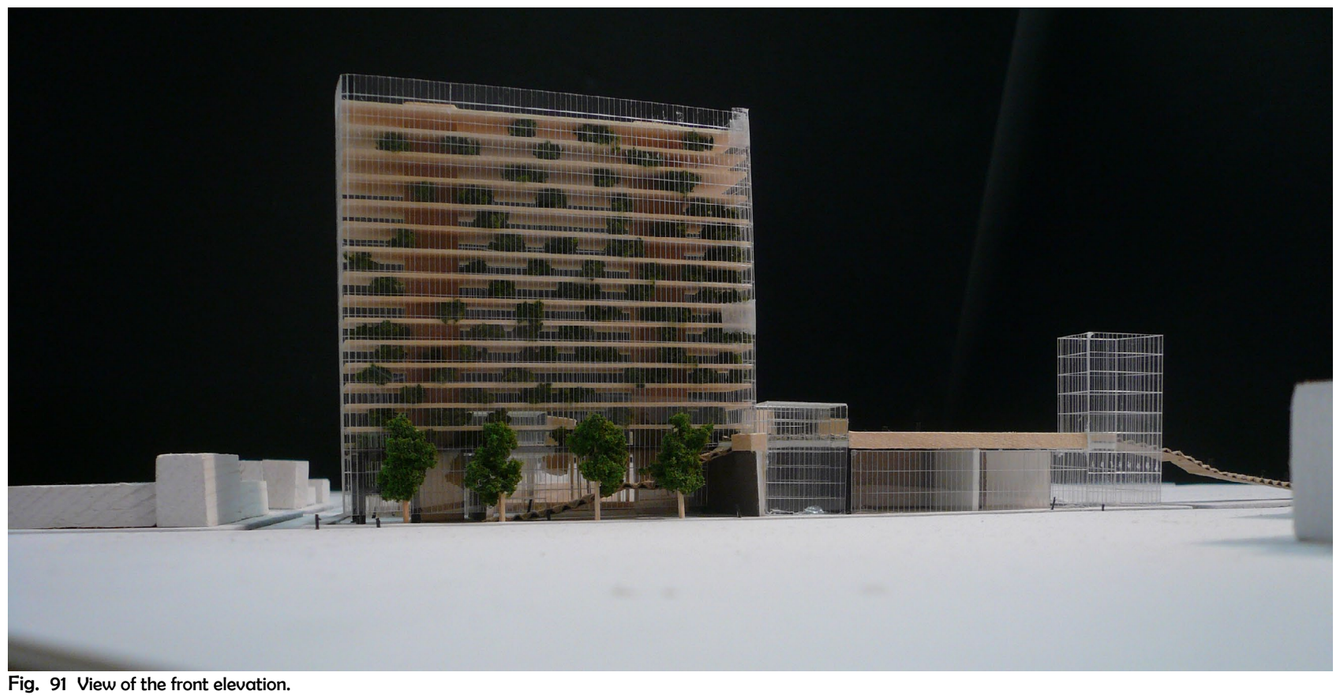


Fig. 91 View of the front elevation.

the units
(3 bedroom)

notes:

1. Entrance off core.
2. Magnetic lock fire doors open during a fire and allow access to both cores typ.
3. Urban attic storage typical.
4. Dining table slides in over built in seating when extra seating is not needed.
5. Murphy bed with desk or shelving when folded for day use.
6. Utility chase for all services with easy access from inhabited envelope.
7. HVAC unit fed with geo thermal loops in tower foundation via utility chase.
8. Stackable washer and dryer.
9. Translucent isulated walls, changes to glass doors in units with tree on right.
10. Utility closet for motors operating the glass louvre system.
11. Garden shed/closet.
12. Vertical gardens offer transformable space, shading and many other benefits (see pg. 9-10).

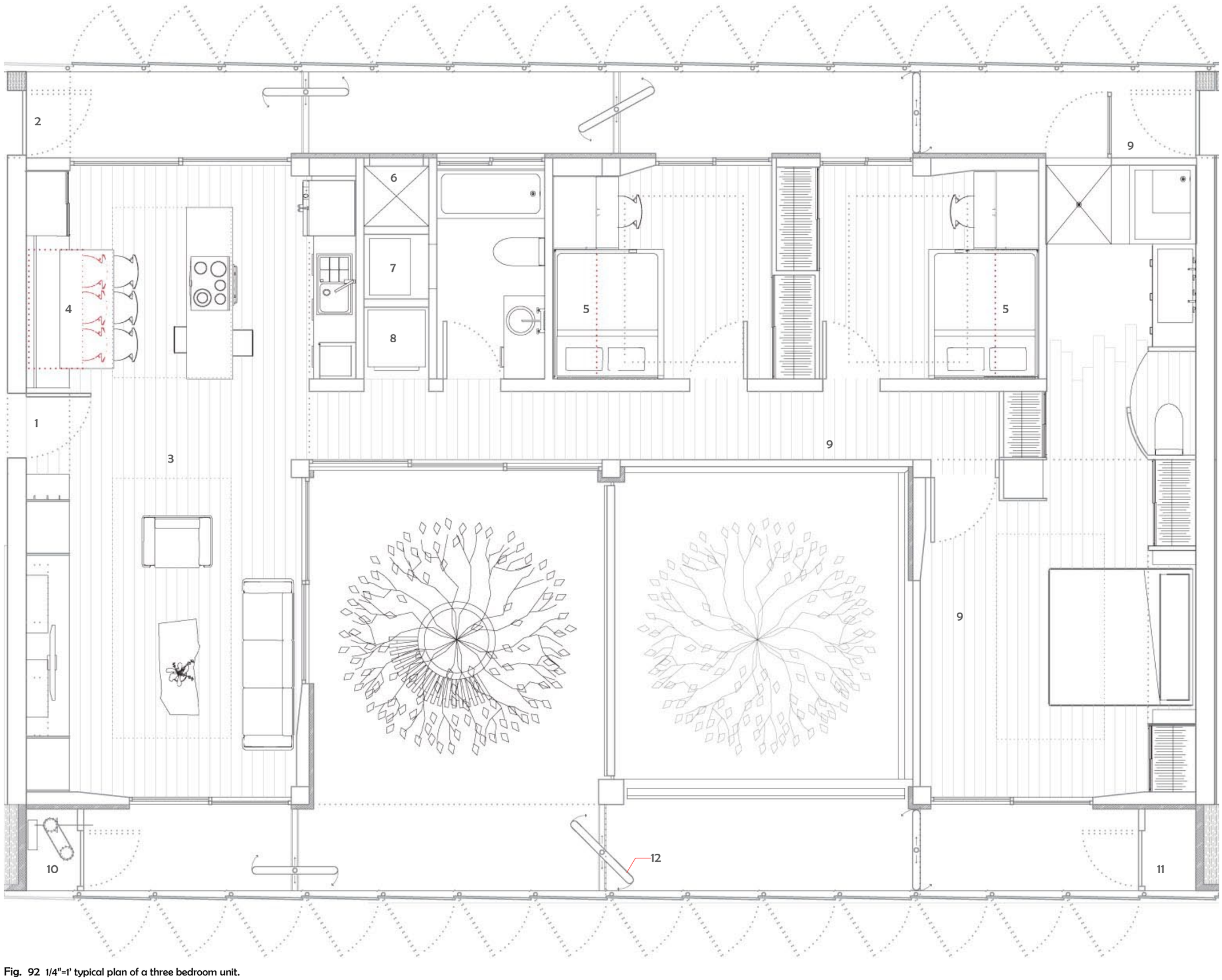


Fig. 92 1/4"=1' typical plan of a three bedroom unit.

the units

Fig. 93 View looking into the staggered 2-story inhabited envelope of the 3-bedroom units, 2-bedroom units are similar w/ only one bay of 2-story space.

Fig. 94 Typical kitchen and living area of two and three bedroom units.

the units
(2 bedroom)

notes:

1. Entrance off core.
2. Magnetic lock fire doors open during a fire and allow access to both cores typ.
3. Urban attic storage typical.
4. Dining table slides in over built in seating when extra seating is not needed.
5. Murphy bed with desk or shelving when folded for day use.
6. Utility chase for all services with easy access from inhabited envelope.
7. HVAC unit fed with geo thermal loops in tower foundation via utility chase.
8. Stackable washer and dryer.
9. Translucent insulated walls, changes to glass doors in units with tree on right.
10. Utility closet for motors operating the glass louvre system.
11. Garden shed/closet.
12. Vertical gardens offer transformable space, shading and many other benefits (see pg. 9-10).

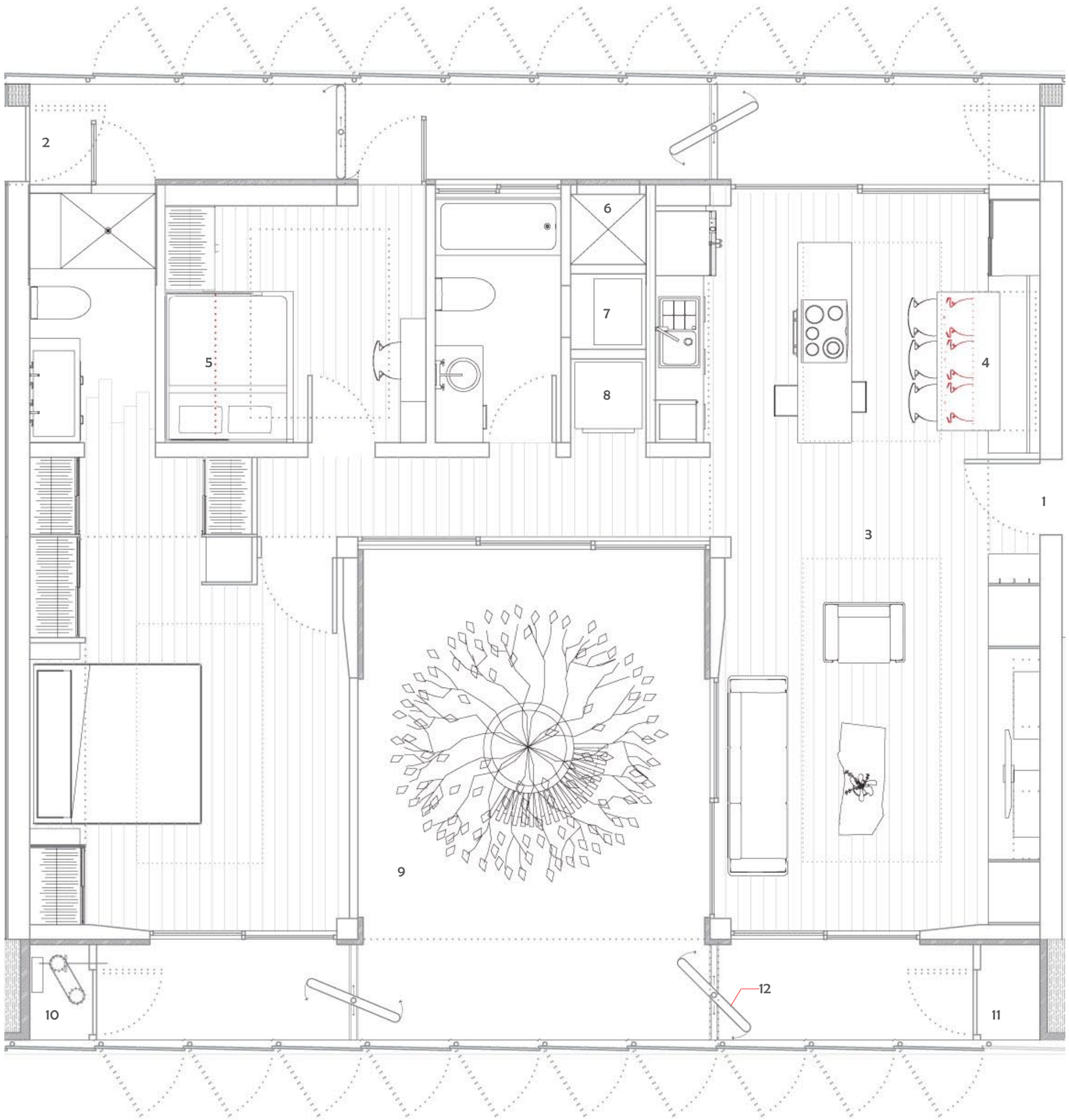


Fig. 95 1/4"=1' plan of two bedroom unit.

Fig. 96 Rendering considering the tower in another part of NYC and cities in general.

Fig. 97 View of the inhabited envelope of the three bedroom unit, two bedroom is similar with only one deep bay.

the units
(studios)

notes:

1. Entrance off core.
2. Furniture nested.
3. Urban attic storage typical.
4. Nested dining and coffee table deployed.
5. Murphy bed with couch when folded for day use.
6. Vertical gardens offer transformable space, shading and many other benefits (see pg. 9-10).
7. HVAC unit fed with geo thermal loops in tower foundation via utility chase in core.
8. Utility closet for motors operating the glass louvre system.
9. Translucent insulated walls.
10. Audio visual wall.
11. Laundry on the third floor of the tower opening onto the roof gardens.
12. Entry shoe cubby with coat rack and hat and glove storage above.

day

(configuration)

night

(configuration)

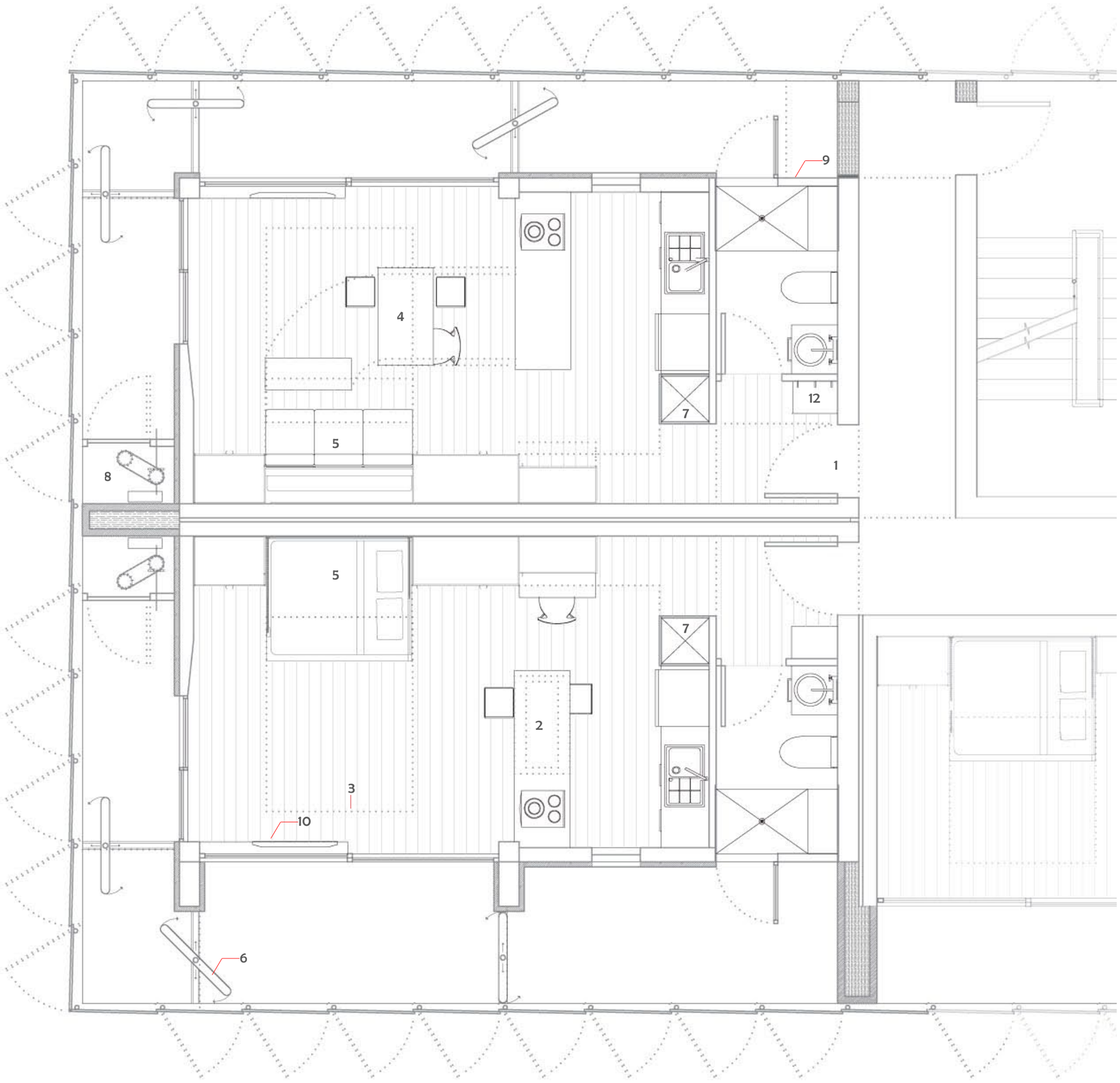


Fig. 98 1/4=1' Plan of typical studios.

the units

Fig. 99 View of corner studio with an optional structural configuration.