PROGRESSIVE CONSUMPTION: STRATEGIC SUSTAINABLE EXCESS

by

Daniel J Bonham

B.F.A. ARCHITECTURE
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FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARCHITECTURE
AT THE
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JUNE 2007

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Progressive Consumption: Strategic Sustainable Excess

by

Daniel J Bonham

Submitted To The Department Of Architecture On May 24, 2007 In Partial Fulfillment Of The Requirements For The Degree Of Master Of Architecture

ABSTRACT

Trends in the marketplace show that urban dwellers are increasingly supporting locally produced foods. This thesis argues for an architecture that responds to our cultures consumptive behaviors. Addressing the effects of consumption in the contemporary urban environment and ultimately developing an architecture that facilitates the consumption levels we have become accustomed to with sustainable business and community based systems.

The building is a new market model, built around the idea of delivering fresh produce and local food directly to consumers; the primary means for which this is done is thought the production oriented, on site agriculture. This direct-to-consumer model of food production is facilitated by hydroponics coupled with grow rooms and the benefit of a controlled environment. With the production and transportation of agriculture being highly energy intensive, produce flavor and consistency benefit greatly from a hyper-localized agricultural system.

Unlike consumer products which require complex supply chains and distribution networks for rapid market response and vast pooling of knowledge and resources. Agriculture has the advantage of having the ability to be produced in nearly any locale and at almost any scale, from window box to industrial mega-farm. As the model years of tomatoes don't change, the only evolution in the facility or the product would be to increase efficiencies. The most viable move toward progressive modes of consumption is this new hyper-local market model.

Thesis Supervisor: Yung Ho Chang
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OUTLINE

I. Thesis: With production and transportation of agriculture being highly energy intensive, hyper-local production modes could greatly reduce levels of energy consumption. This project is a critique of contemporary production modes through a new market model focused on delivering super-fresh, local food directly to consumers.

II. Consumption

A. Social drivers
B. Psychological drivers
C. Agricultural consumption

III. Urban Agriculture Case Studies

A. The Food Project
    1. Community outreach
    2. Entrepreneurial strategies
B. Not A Cornfield
    1. Site
    2. Community
C. Vertical Farm Project
    1. Societal need
    2. Technical support

IV. Site / Density & Opportunity

A. Opportunities in the Code
B. Opportunities Somerville
C. Constraints

V. Building / New Market model

A. Networks / Systems
B. Community

VI. Process

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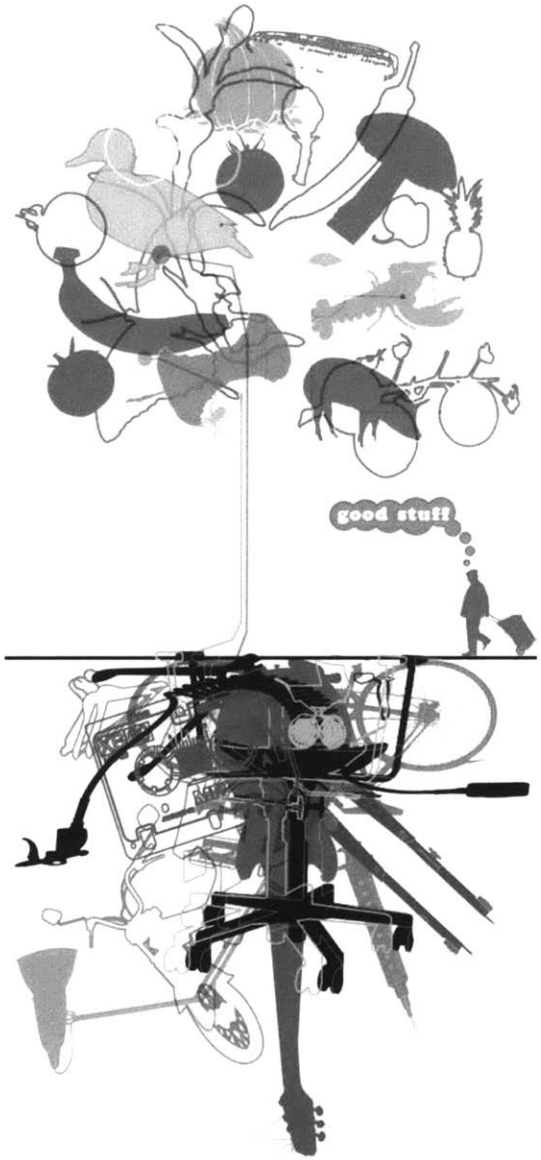
For Sara



progressive consumption

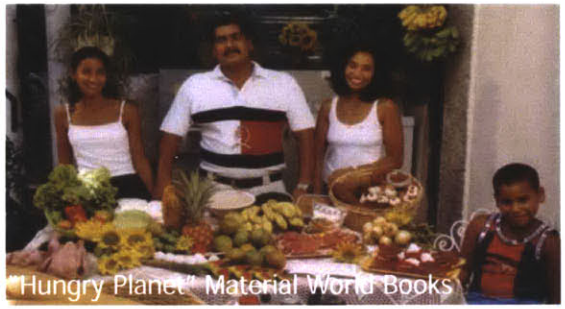
sustainable excess

"... The real issue is not consumption itself but its patterns and effects"
Human Development Report 1998 Overview, United Nations Development Program (UNDP)

This research for the Masters of Architecture Thesis evaluates our society's relationship to consumption and the emerging consumer demand for locally produced food. There are two fundamental categories of consumption, consumption driven by desire and consumption driven by necessity. Consumption based on satisfaction rather than need is fueled by our culture, the big box retailers and new product launches. Sustaining consumption is the essences of life; food, air, water etc. Both are integral parts of our daily lives perpetuating life and providing gratification in a time when we have become reliant on instant fulfillment.

As our society consumes more, architectural and infrastructural mechanisms have developed that support consumption. The food we eat the cars we drive and the music we listen to, all are fulfilling certain needs in our daily lives. With the production and transportation of agriculture being highly energy intensive, production modes could benefit greatly from localized versus remote production. Unlike consumer products which require complex supply chains and distribution networks for rapid market

dawn view


"Hungry Planet" Material World Books

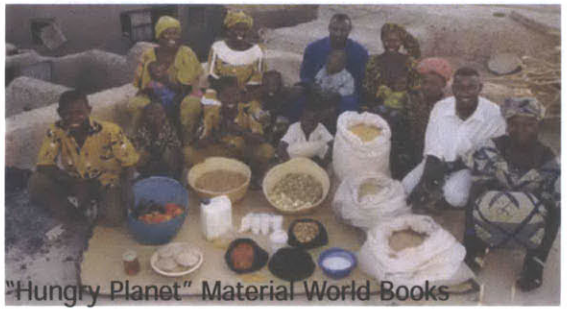
response and vast pooling of knowledge and resources. Agriculture has the advantage of having the ability to be produced in nearly any locale and at almost any scale, from window box to industrial mega-farm. In addition, as the model years of tomatoes don't change, the only evolution in the facility or the product would be to increase efficiencies.

Trends in the marketplace show that urban dwellers are increasingly supporting locally produced foods. This thesis argues for an architecture that responds to our cultures consumptive behaviors. Addressing the effects of consumption in the contemporary urban environment and ultimately developing an architecture that facilitates the consumption levels we have become accustomed to with sustainable business and community based systems.

The research establishes a theoretical and practical framework for the project outlining the psychological, sociological, architectural, and economic manifestations of consumption. Hoarding, asceticism, debt, and addiction are al stimulus for my research in to the effects of consumption. Identity, gender, class, race, and education all influence our consumptive decisions. I am pursuing an architecture that efficiently facilitates the patterns of contemporary life. The architectural manifestations of these ideas are new housing typologies, new zoning regulations, or possibly a new business model.

Consumption

Our culture today has an insatiable appetite for new material goods. The generally acknowledged problems of consumer culture; raw material depletion, carbon emissions and energy consumption have drawn much attention; unfortunately they cannot be solved with an architectural reaction. Urban agriculture, as a strategy for sustainability, has primarily been implemented in small neighborhood community gardens, with gardeners principally acting as consumer and producer in a closed production loop. Recent trends in the market place have changed many consumers' attitudes toward imported foods. Increasingly, consumers have recognized the need for locally produced food. As demand for these local crops has increased, so have the methods for bringing them to the table. The growth of organic, boutique food stores and Community Supported Agriculture demonstrate the viability of locally produced food as a business model. In contrast, factory farms are not only energy intensive but create foods with poor flavor and nutritional value.

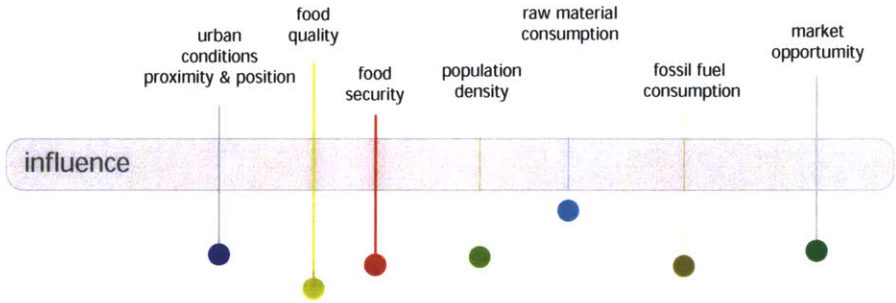


"Hungry Planet" Material World Books

"Hungry Planet" Material World Books

Physiologically

Consumption activates the release of the neurotransmitter dopamine in the human brain. This release links both sustaining and satisfying consumption to pleasure. Essentially consumption makes us happy and while the drivers differ, the result is the same. Can a garden be grown in a junkyard; will warehouses double as green houses? How can a home be designed to accommodate a tighter proximity to our beloved stuff? Rather than making a value judgment on our relationship to consumption, this project seeks balance between the acquisition and maintenance of our consumptive behaviors, bringing the food production as close as possible to the place of consumption.



Agriculture

With out the necessary means to sustain food consumption cities have traditionally looked to the outskirts for food production. Urban settlement and development have driven the producers farther and farther from the urban core. Our food is traveling great distances to reach our markets; this solution provides less flavorful food and consumes more energy than is reasonable to continue. Food from large industrial farms serving urban people remotely from across the country and around the world may be all that is attainable in our super markets. Recent trends in the marketplace and social movements have changed many consumers' attitudes toward imported foods; they have recognized the need for local produce food for both its flavor and for reasons of sustainability. This attitude has been championed by the Slo Food movement, facilitated by farmers markets and Community Supported Agriculture (CSA) on the periphery of cities.

Urban Agriculture

Community gardens in the city. These gardens often serve as a community building public space where the necessity to work for a common goal brings a greater understanding of the community in which they are positioned. Throughout the world small neighborhood community gardens, with gardeners acting as consumer and producer in a closed production loop exist. Increasingly agriculture is used as an instrument for teaching communities about sustainable practices.

Community Supported Agriculture began independently in Japan and Europe in the mid 1900s due to demands on the urban land and questions about the origin of mass-market foods. Growers typically contract directly with customers sharing the risks, benefits of food production Organic or biodynamic farming methods are most popular on small scale commercial farms, and gardens can have successful, small-scale closed markets where the consumers pay for a share of the crop before the growing season begins, literally contributing seed money.

Three projects positioning themselves in the movement toward sustainable practices for agriculture in the city are; The Food Project, in Boston, Not a Cornfield in Los Angeles and The Vertical Farm Project from The Environmental Health Science Department of Columbia University. All of these projects have an agricultural component paired with community outreach, they are real, conceptual, and speculative, but all demonstrate the capacity that agriculture has to foster sustainable cities.

These projects bring up many questions about urban agriculture. How have we seen agriculture at play in urban environments does it have a presence in our paths? Are there any instances where agriculture has existed in the city with an agenda of production rather than social agenda? That is to say a purely utilitarian garden, not tended for aesthetic reasons and not part of a community program? Can the farmers market replace the super market during peak harvest? Do neighborhoods have the capacity to be self-sustaining, partially of wholly?

The Food Project

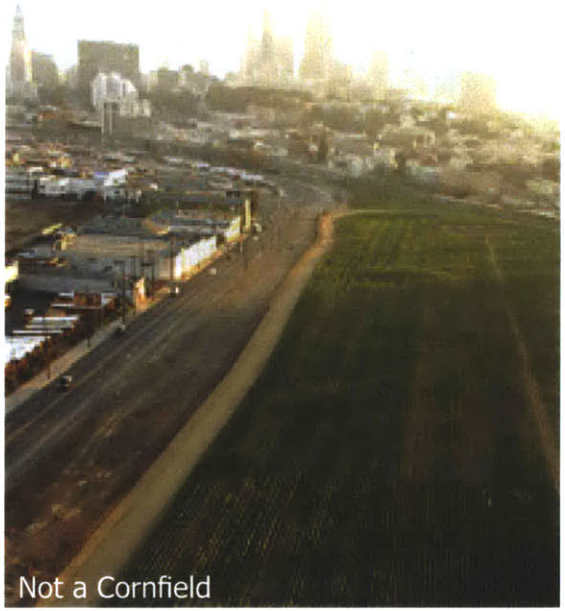
Urban Agriculture, Case 1

In Boston, The Food Project serves a model for community outreach, through the education of teens and residents about the benefits of locally grown foods. This project serves to feed the community through CSA and hunger relief while providing jobs and activities in depressed areas of Boston. Founded in 1991 by Ward Cheney who wanted to help youth who felt isolated from their surroundings in both the city and the suburbs with intentions of growing a thoughtful and productive community of youth and adults from diverse backgrounds who work together to build a sustainable food system. Since 1991, The Food Project has engaged up to 100 teens per growing cycle in personal and social change through sustainable agriculture.

Considerable thought has been placed on the entrepreneurial aspects of food production, income-generating ventures like natural salsa, catering, and farmers markets act as the conduit for over 200,000 tons of produce grown each year. The idea of sustainability reaches beyond merely gardening, sustaining economic growth, and donation to community services. Members run workshops on building community gardens, testing soil, farmer training, and building local agriculture systems. In the works, The Food Project plans to double its size and production and promote more community groups based on this model.

Urban Agriculture, Case 2

The Not a Cornfield project in Los Angeles by architect / artist Lauren Bon exhibits the 400-year evolution of a site from agricultural, to industrial, to park. Community involvement and discourse about the past and future of a site was furthered by planting corn on 32 acres of land devoid of development near down town L. A. on the historic and geographic center of LA. At the base of the extension of the Santa Monica Mountain range, 150 feet from the Los Angeles River. Near the Tongva village site where in 1781 Spanish explorers settled L. A. ½ mile away. Adjacent to Chinatown, settled in 1850 Early 1900s became stockyard. Long referred to as "the cornfield" because corn has been intermittently been growing there for the last 100 years or so. In 2001, the site was designated as The California State Historical Park the formal park is slated to be completed in 2010.


Not a Cornfield

In an attempt to build a contemporary relationship between the site and this project was conceived as a source of contemporary and historical context, bringing closure to the cornfield as empty lot. Lauren Bon calls the Not a Cornfield project an "ephemeral sculpture"... "not public art" the mitigation from Brown field to parkland was begun with more than 1,500 truck loads of topsoil to begin the transformation. The scheme consisted of planting roughly a million corn plants resulting in 60 million kernels at a value of $3,557.75 if sold on the commodities market. The principle tenants were the activation of a void space before its transformation into an urban public space.

Not a Cornfield

Stemming from this the Community Seeds program is starting a healing garden in another void within the city under the Spring Street Bridge the seeds from this garden will be given out to community members. The corn kernels from the site were then distributed to areas in transition; a Lakota reservation in South Dakota, Solar One (the world's largest solar collector in the Mojave Desert), uranium-trailing dumpsites in Utah and at Rocky Fats nuclear facility near Boulder CO.

Initially met with much suspicion and hostility from many in the local community who felt that the field should not be loaned to an outsider for publicity or personal gain, they felt that the process was undemocratic. Protests were held at the opening ceremony as community members voiced their concerns. It is unclear the amount of impact this had on the next years activities but community participation was a major aspect of Not a Cornfield. Local residents were encouraged to be involved with a series of activities. Special focus was placed on serving the communities of downtown Los Angeles, Chinatown, William Mead, Lincoln Heights, Solano Canyon, and Cypress Park. Cornfield activities include artists, writers, poets, musicians, and storytellers who help define these neighborhoods. Open screen and open mic, evening showing of short films, songs, thoughts and experience were shared through the biweekly open mic sessions. Now near the site is a community garden with corn, beans, and squash.

Urban Agriculture, Case 3

The Vertical Farm project proposes the development of industrialized farming within the city. This speculative project outlines the potential for sustainable and profitable farming for densely populated areas like New York City and Beijing. The researchers who developed the proposal believe it to be the solution to much, if not all of the world's poverty and hunger problems. Vertical Farms: The proposal from Dickson Despommier and his Medical ecologies class at Columbia University investigated and proposed a vertical farm as a means to meet rising food demands and decreases in available land.

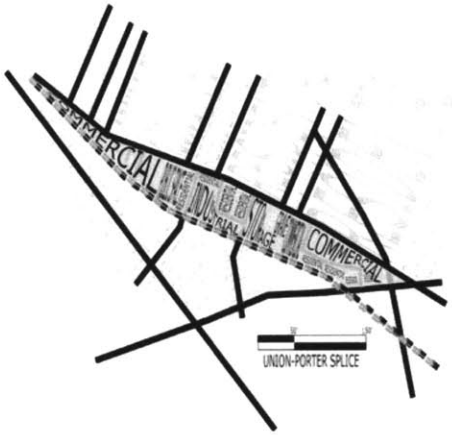
Vertical Farm

Presently over 80% of the worlds, agriculture land is already in use. With population increases comes the rise in consumption of these lands and the increased volatility and potential for shortcomings from the agricultural supply chain. The project calls for a new type of indoor farming, rather than continuing the existing production modes of horizontal hot houses, the proposed model is vertical farming. The scheme suggests that technology paired with free market enterprise can provide year round harvesting within urban cores. Hydroponic growing of foods, organic poultry and fish production, zero net emissions, closed loop water recycling and reuse of municipal wastewater. A tall order but the research team contends that this is the ultimate solution for sustainable cities.

Vertical Farm

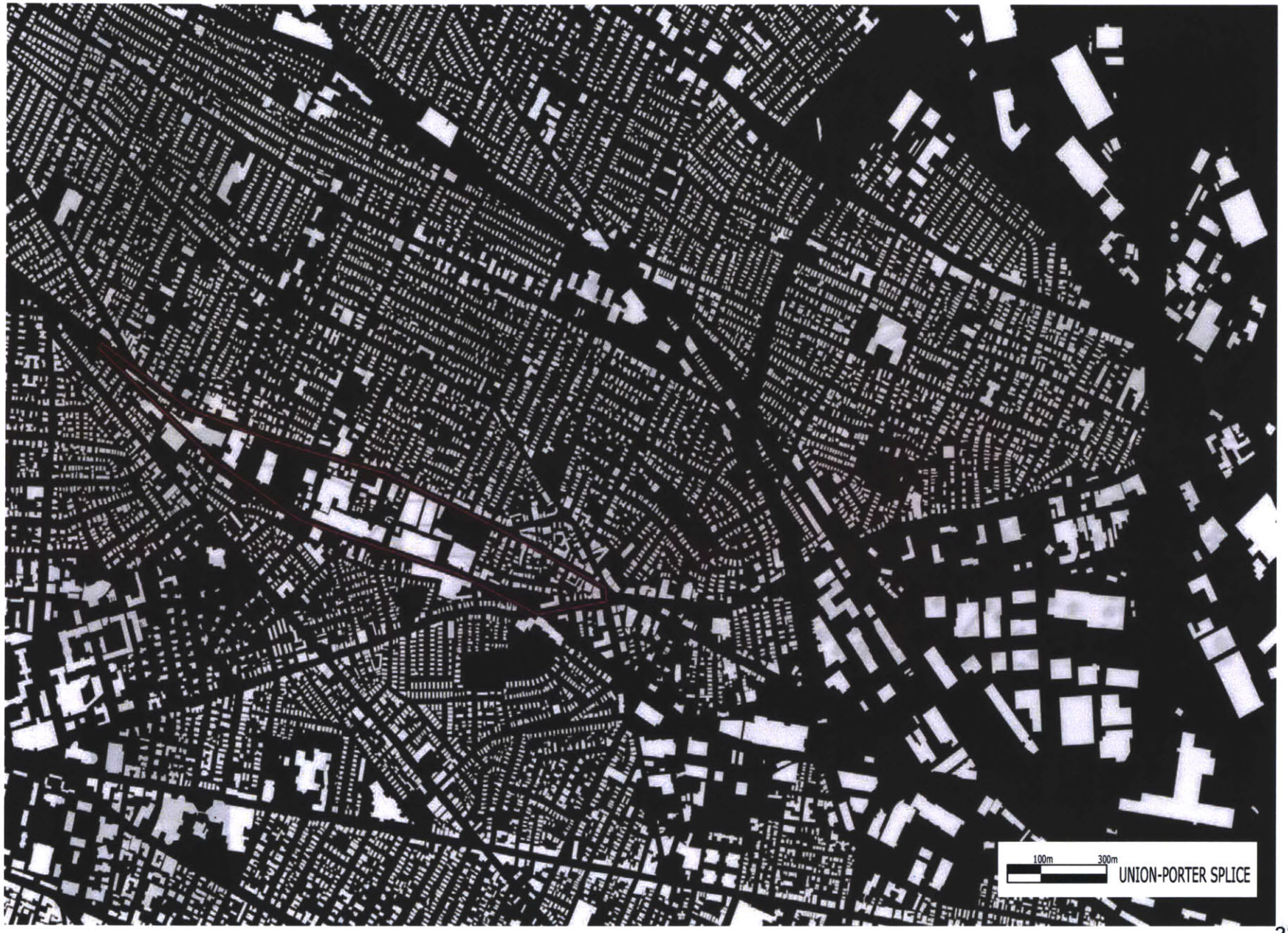
The current research suggests that the economics are realizable and profitable with renewable energy generation eliminating utilities expenditures. If the teams' research is correct, corporate investors would be willing to sponsor this project due to the income potentials of vertical farming and its position as a unique investment opportunity capable of revolutionizing the agricultural production mechanisms currently in place. Prime locations for the buildings are named as New York City, Beijing, Mali, Cuba, Japan, Iceland and the potential for floating vertical farms.

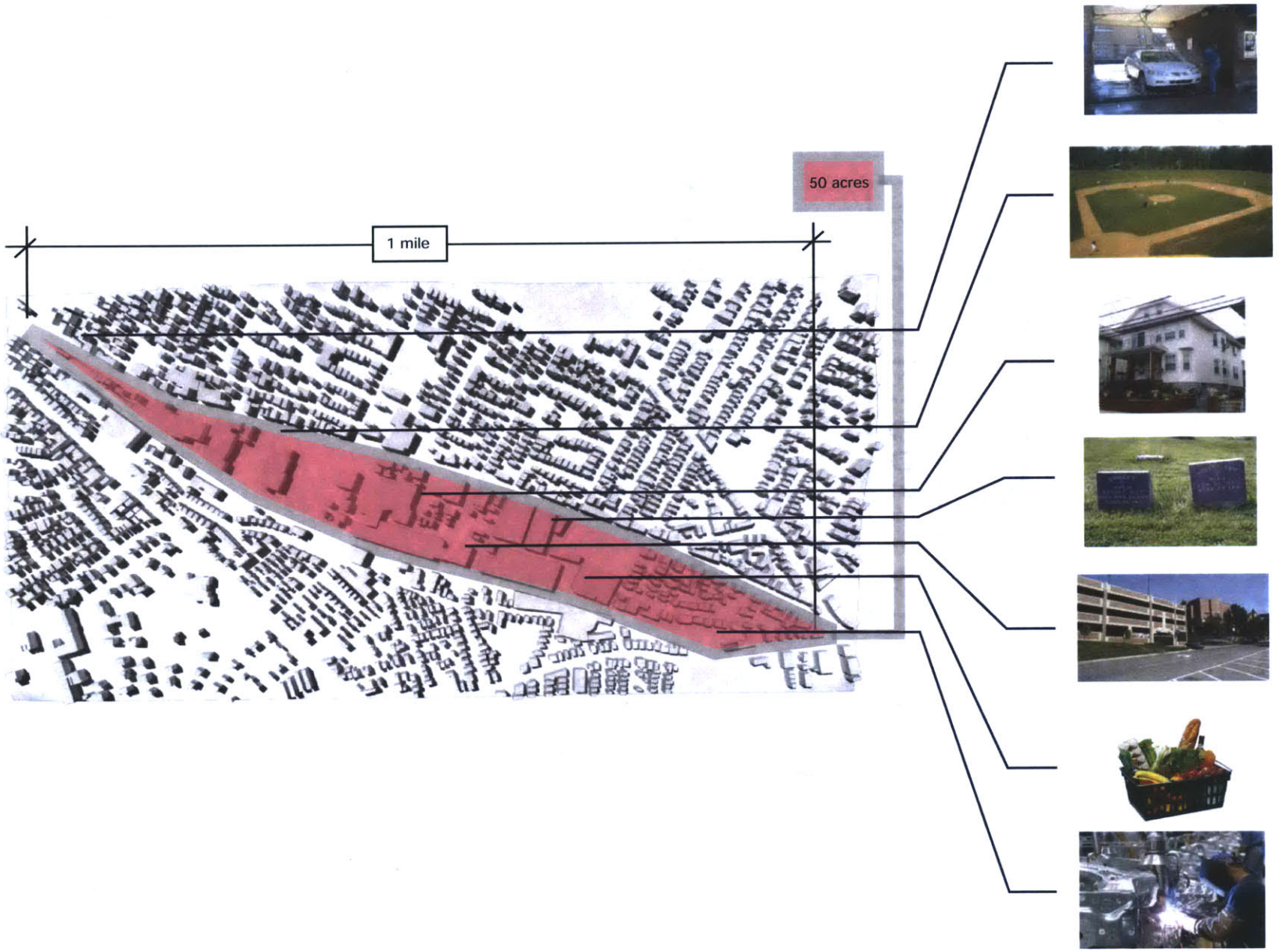
For the project to move into a feasible position much planning is necessary to assess the sanitary requirements, public health regulations, civil engineering requirements, regional planning bylaws, and building codes. These issues would be locale sensitive so a site would have to be determined. On a broader scope, the energy management engineering needs to be studied and economists are needed to measure benefits. The data from Dr. Despommier's researchers indicates that the Vertical Farm would be self-sufficient through a methane digester capable of producing a surplus of 26.5 million kWh per year. According to Boston Housing Authority, that amount of energy could power 1300 public housing units each year.

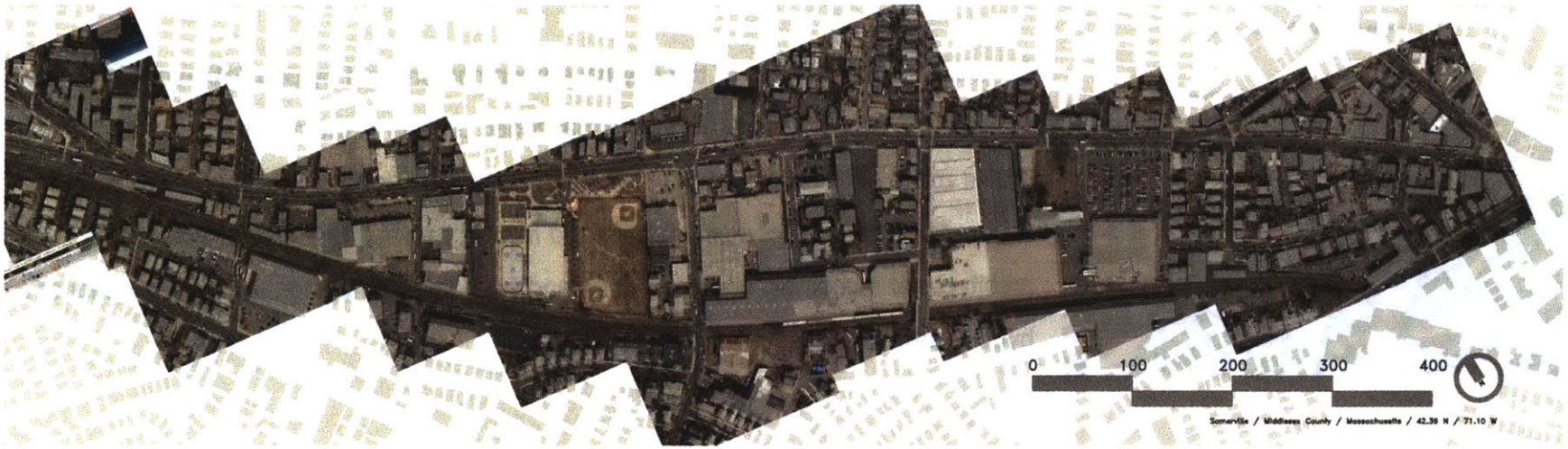


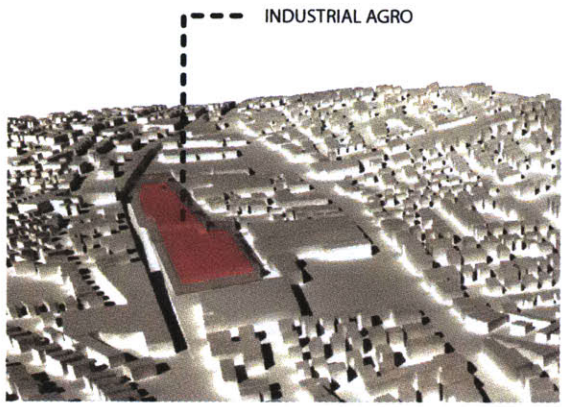
Site

Across America, junk yards and manufacturing sites suddenly find themselves in the midst of residential neighborhoods. Options for mitigation of these sites, which may not be suitable for residential development, are limited. Public space is one option; however, the economic return on parkland is generally prohibitive. These sites are continuously being enveloped by residential development: more people, more roads, more buildings, and less space. Skirting cities and infrastructure, inside of the urban environment, this proximity makes for prime areas of agricultural production.

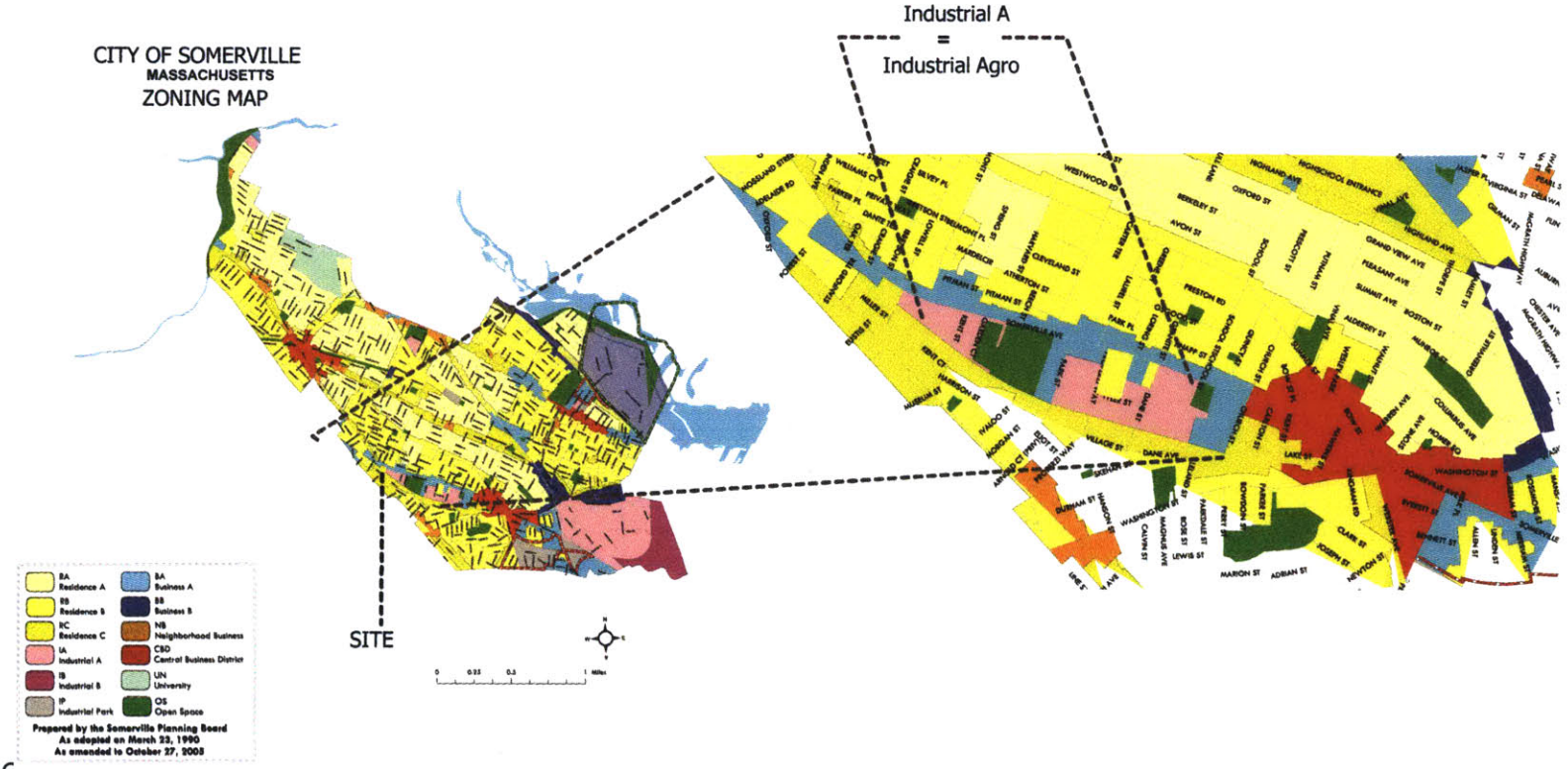

100m
300m
UNION-PORTER SPLICE

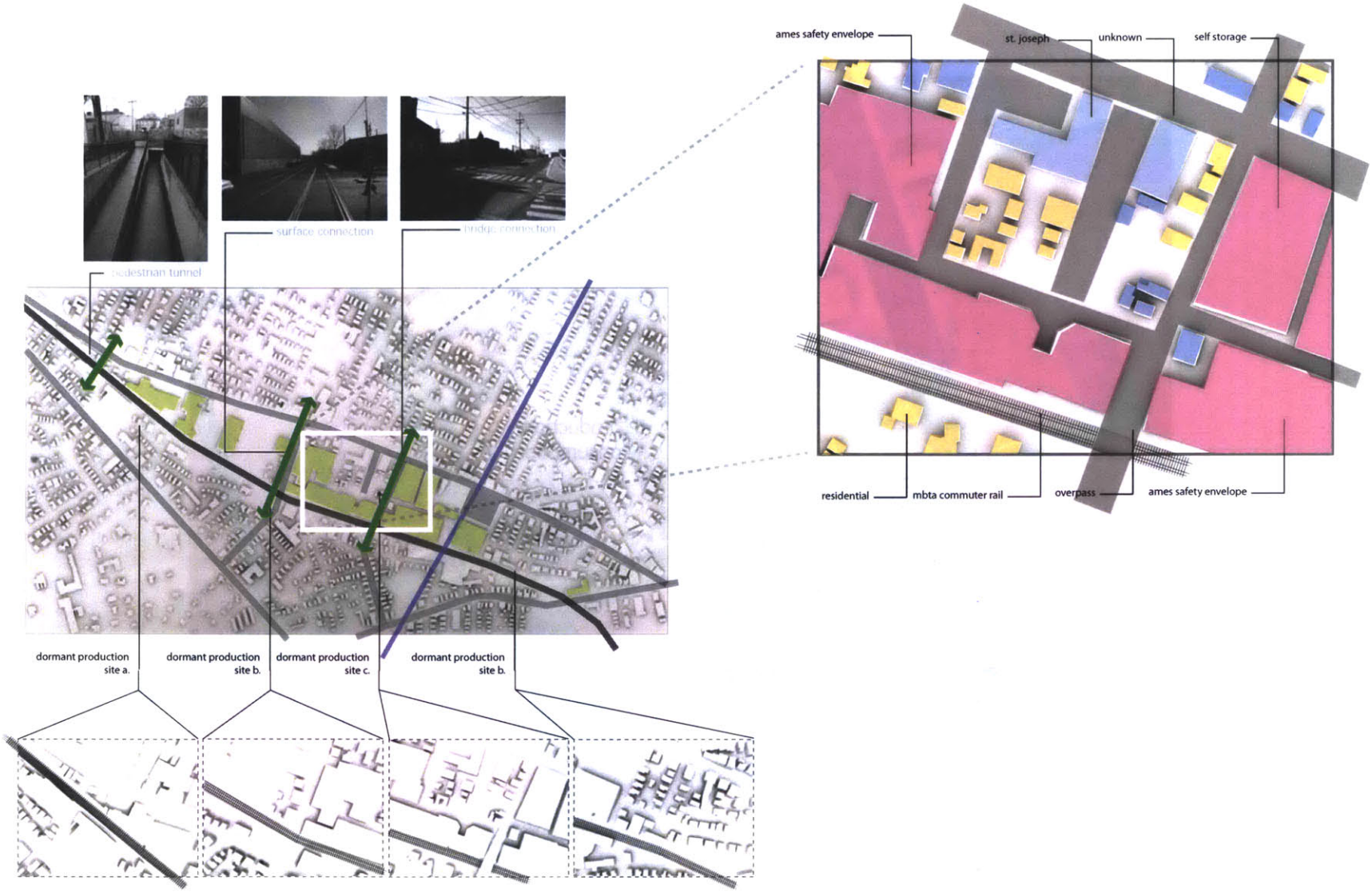

50 acres
1 mile

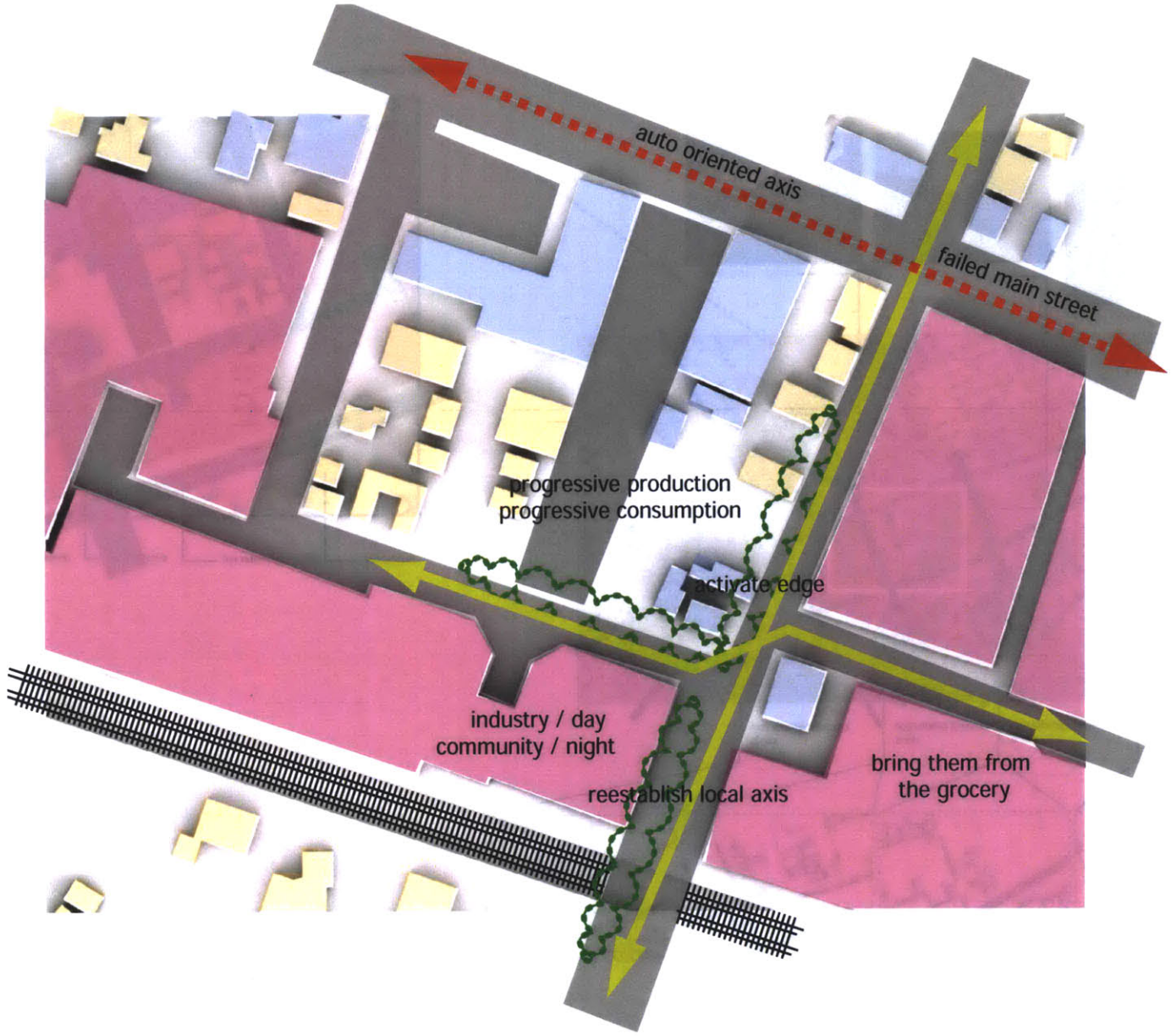

0
100
200
300
400
Somerville / Middlesex County / Massachusetts / 42.39 N / 71.10 W



Formerly industrial areas of the city have been compressed by population growth. Loss of industrial economies has left industrial zoned parcels in the midst of neighborhoods. These zones offer an opportunity for local, sustainable food production as the market demands for reasons of sustainability and market trends. This thesis develops an architectural model for food production and economic stimulation for the remnants of a bygone industrial era.

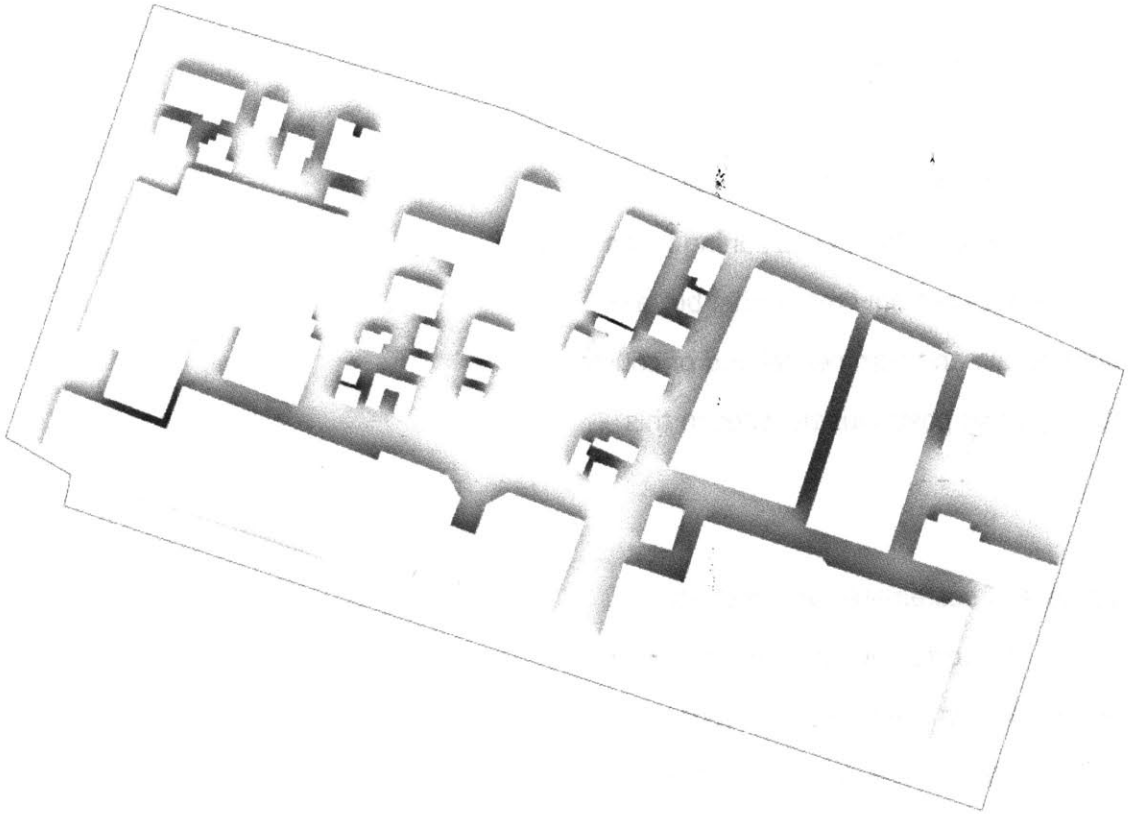



pedestrian tunnel
surface connection
bridge connection
dormant production site a.
dormant production site b.
dormant production site c.
dormant production site b.
ames safety envelope
st. joseph
unknown
self storage
residential
mbta commuter rail
overpass
ames safety envelope


auto oriented axis
failed main street
progressive production
progressive consumption
activate edge
industry / day
community / night
reestablish local axis
bring them from
the grocery

This specific site is a compressed splice that stretches from Porter Square to Union Square in Somerville. Flanked on the north and south by dense residential neighborhoods the splice is nestled within some of the densest residential areas in North America. A variety of classes and races represented as the mixed zoning lends itself to lower income residents. The splice encompasses not only residential but also light industrial, junk yards, recycling centers, auto repair, and commercial and of course self- storage. At least one developer is currently injecting postindustrial sites in this area with housing.

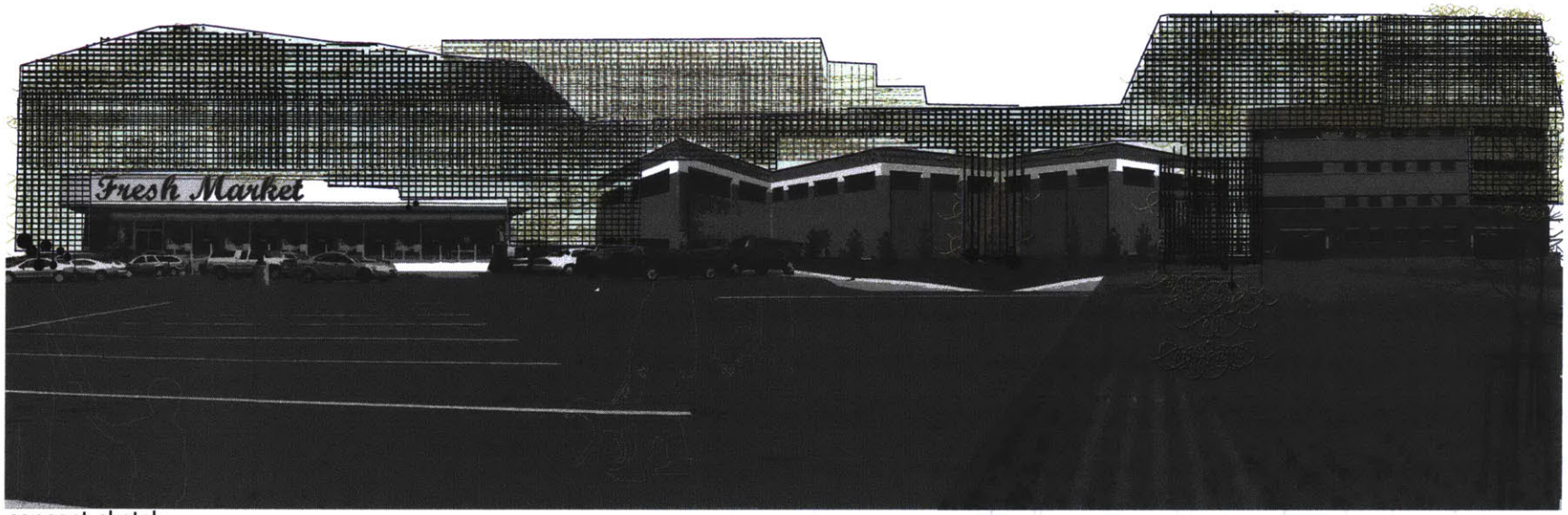
Urban fringe areas offer opportunity for development of sustainable architectural solutions to meet demand for locally produced food. Opportunities exist within the linear site for transverse stratification of program as well as linear segmentation. Two general strategies suggest exploration at a variety of scales. The primary axis on the site runs east west and follows the commuter rail line and the main access routs along the site. Conversely, the vertical stratification of the site suggests a finer grained solution, one that begins to establish connections with neighborhoods divided by their shared industrial past.



Building

The product of the thesis is a building that efficiently supports the growth of food, and gets its energy from the digesting of waste products from the facility and potentially the surrounding buildings. The building offers a framework for profitable community based business models. In order to promote the ideas imbedded in this thesis the building functions as a hyper efficient production facility as part of a scheme to promote the benefits of locally produced food.

Consumers are demanding locally produced food; architecture cannot only facilitate the growth of the food but also foster greater understanding of ones position within society. Acting as a nexus for neighborhood activity the architecture developed will offer scaleable solutions to the problem of providing locally produced food in urban areas. Part, grow room, part market and part public space, metaphorically; a farm stand on steroids, taking advantage of every available technology. The program will consist of food grow space to support surrounding homes. Market for selling the produce and products from local producers, this aspect will enhance the viability of the facility by increasing income potentials. The third component is an interpretive center where the community can come to learn about food and energy production and consumption.



concept sketch

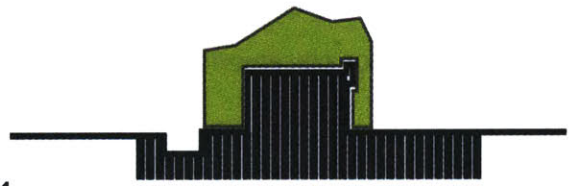
Fresh Market

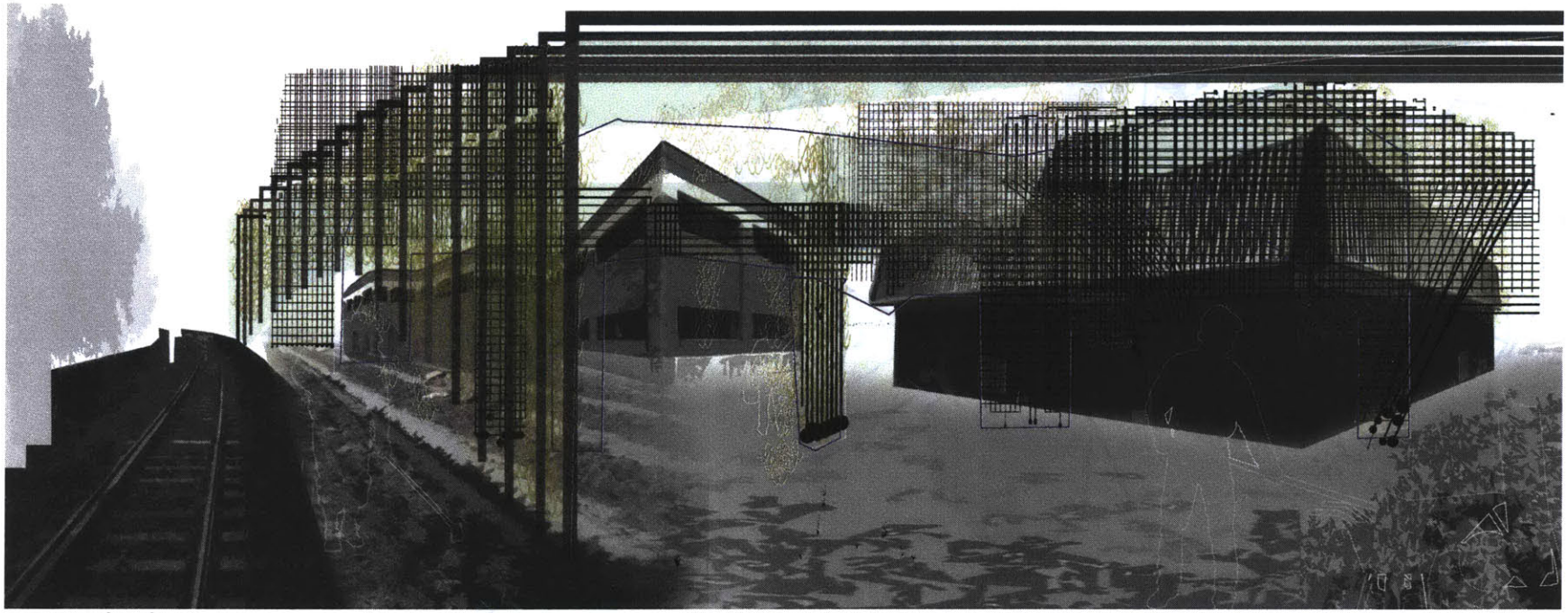
An critique of consumer culture through a new market model built around the idea of delivering super-fresh produce and local food directly consumers. The facility has three primary functions A: growing produce B: selling local food C: Community do-it-yourself.

The facility operates as apart of a system of networks of support and distribution; the regional network of farms and manufacturers, a local network of neighborhood farmers and the hyper-local, on site production. This system is based on commerce but has provisions for education and support for the surrounding community. The environmental or ecological system of the building is supported by a living machine, methane digester, hydroponic networks, and sunlight. All of this operates within a reticulate (network) structure which allows for differential floor placement, increasing sunlight access for the entire building.

The principle function of the Fresh facility is for the provision of locally produced food the primary means for which this is done is thought the production oriented growth of food. The sales of which primarily happen on site. Current hothouse facilities are able to produce large amounts of crops as well as profits for their owners. Crops with a high yield under hothouse conditions include lettuce, tomatoes, cucumbers, and others. This direct to consumer model of food production is facilitated by intensive hydroponics coupled with l.e.d. grow rooms and the benefit of controlled environment.

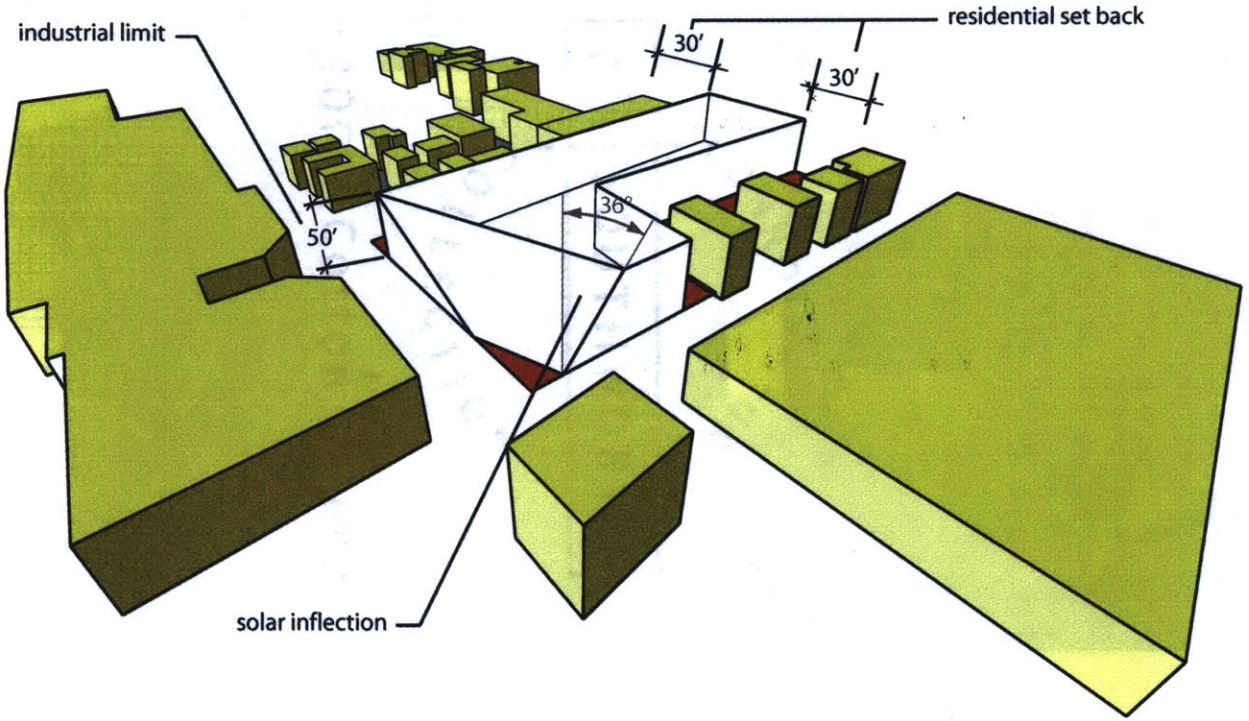
The market facility consists of retail sales, a café, and a restaurant. Retail sales occur in two modes; the first mode is the typical protocol for markets, a self-service grocery, as you would expect. The second mode is for the consumer to pick the produce themselves from the plants in the growing areas. The customers become the harvesters cutting out all typical conduits of delivery. The primary market serves as a full service grocer, specializing in locally produced goods. The products sold here come from the hyper-local (inside the facility) as well as from local, regional farms with in 100 miles of Somerville. The restaurant and café serve seasonally changing menus using regional suppliers. In cases like coffee where no local equivalent can be made every measure will be taken to insure that importing and roasting is done locally to promote local economies. Since the sustainability of local economies is as important as local ecologies, care is taken to ensure that local producers are owed and operated by local constituents.





concept sketch

massing envelope



SOMERVILLE ZONING ORDINANCE (SZO)
Adopted March 23, 1990
As amended through January 26, 2006

ARTICLE 8: DIMENSIONAL REQUIREMENTS

SECTION 8.5: TABLE OF DIMENSIONAL REQUIREMENTS

	DISTRICT IA	IB	IP
A. Minimum lot size (s.f.)	NA	NA	10,000
B. Minimum lot area/dwelling unit: 1-9 units (s.f.)	875	NA	875
10 or more units (s.f.)	1000	NA	1000
C. Maximum ground coverage (%)	80	80	65
D. Landscaped area, minimum percent of lot	10	10	10
E. Floor area ratio (F. A. R.)	2.0	2.0	1.5
F. Maximum height stories/ feet	50 (20)	50 (20)	3 (4) 45 (4)(20)
G. Minimum front yard (ft) (5a)(5b)(5c)(17)	NA	NA	15
H. Minimum side yards (ft) (5b)(6) (10)(17)	NA (12)	NA (12)	NA (12)
I. Minimum rear yards (ft) (5b)(13) (14)(15) (17)	NA (12)	NA (12)	15 (12)
J. Minimum frontage (ft)	NA	NA	NA

NA = Not Applicable

LIGHT INDUSTRIAL

15,250 sqft

6,230 sqft

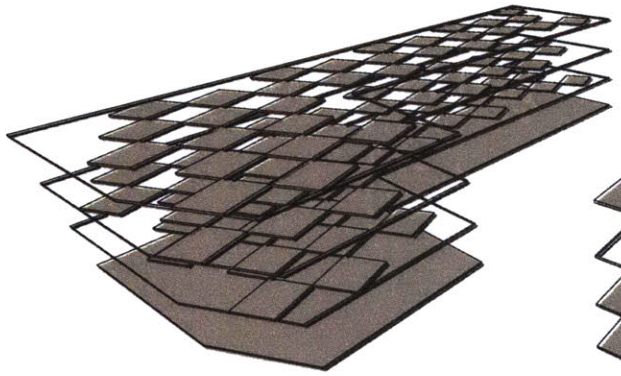
38,000 gross sqft maximum

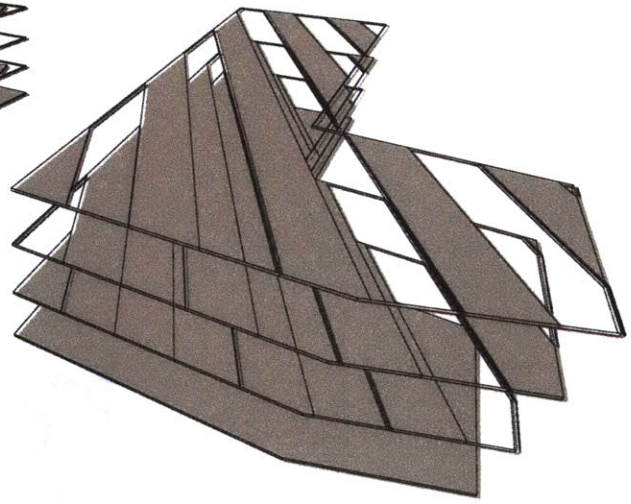
8.5.20. Height Limit for Structures Abutting Residential Districts: Where a lot abuts an RA, RB or RC zoning district line, any structure within thirty 30' of said district line shall be limited to 3 stories and 40' in height.

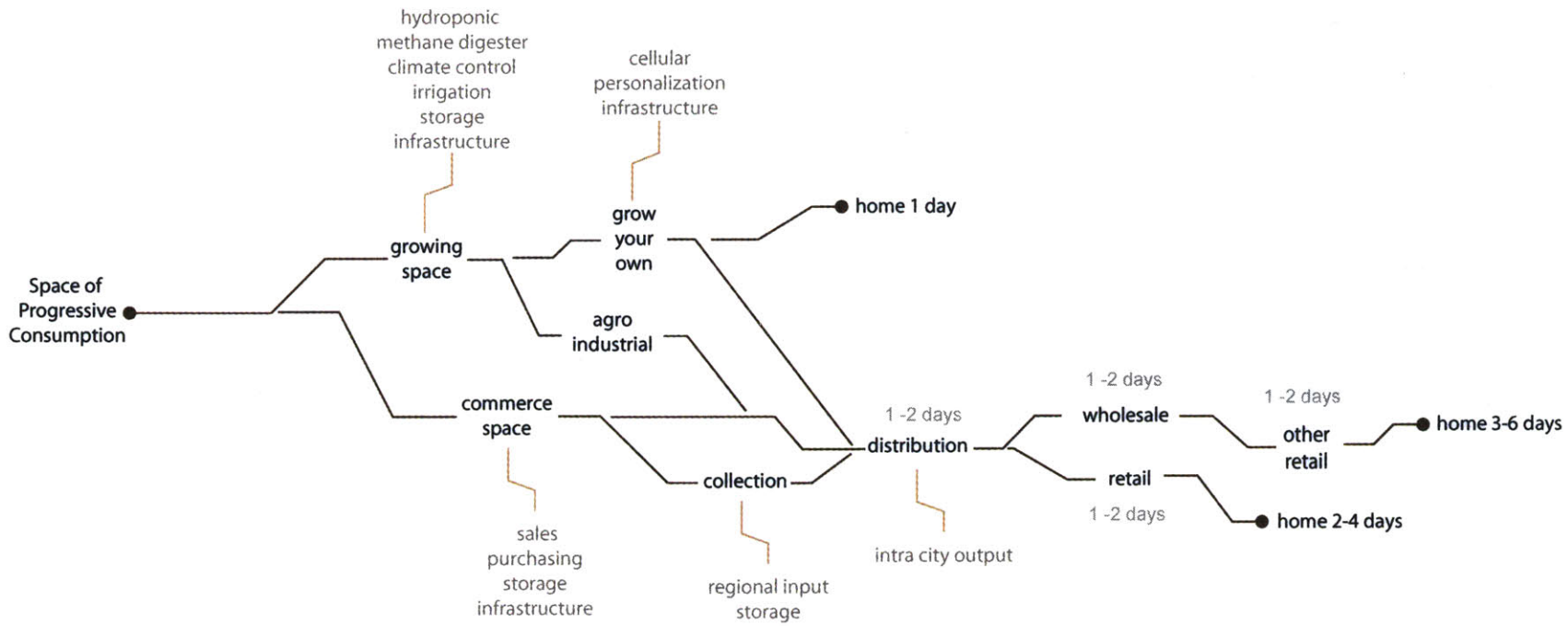
$$\frac{\text{38,000 gross sqft maximum}}{\text{total lot size: 19,000 sqft}} = \text{f.a.r. 2.0}$$

if the ground floor is the full 15,250 sqft then 22,750 must be divided between the remaing flooor areas
if 4 floors each would be 7,580
if 3 floor each would be 11,375

f.a.r. permutations






hydroponic
methane digester
climate control
irrigation
storage
infrastructure
cellular
personalization
infrastructure
Space of
Progressive
Consumption
growing
space
grow
your
own
home 1 day
agro
industrial
commerce
space
collection
1 -2 days
distribution
1 -2 days
wholesale
1 -2 days
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retail
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retail
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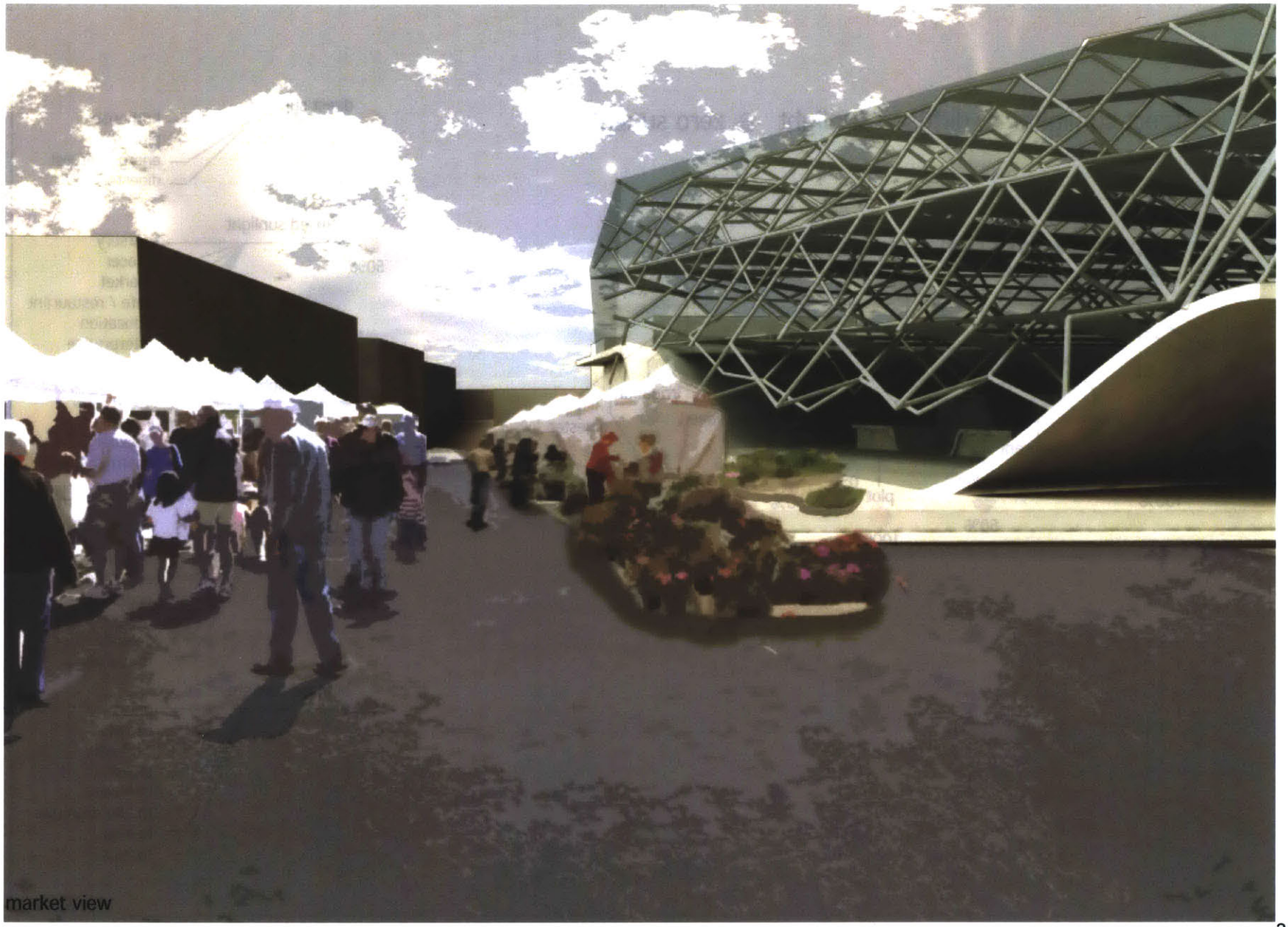
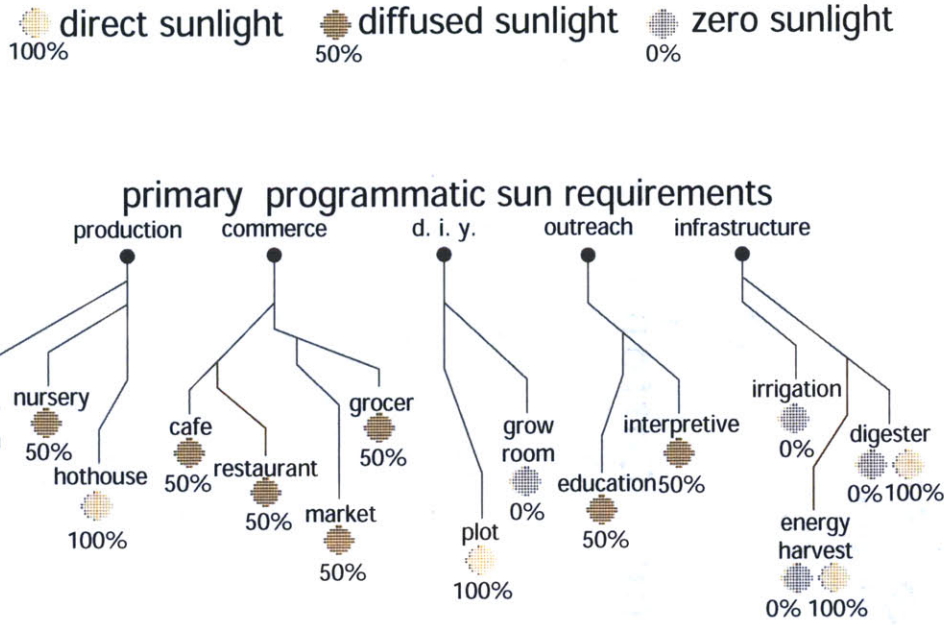
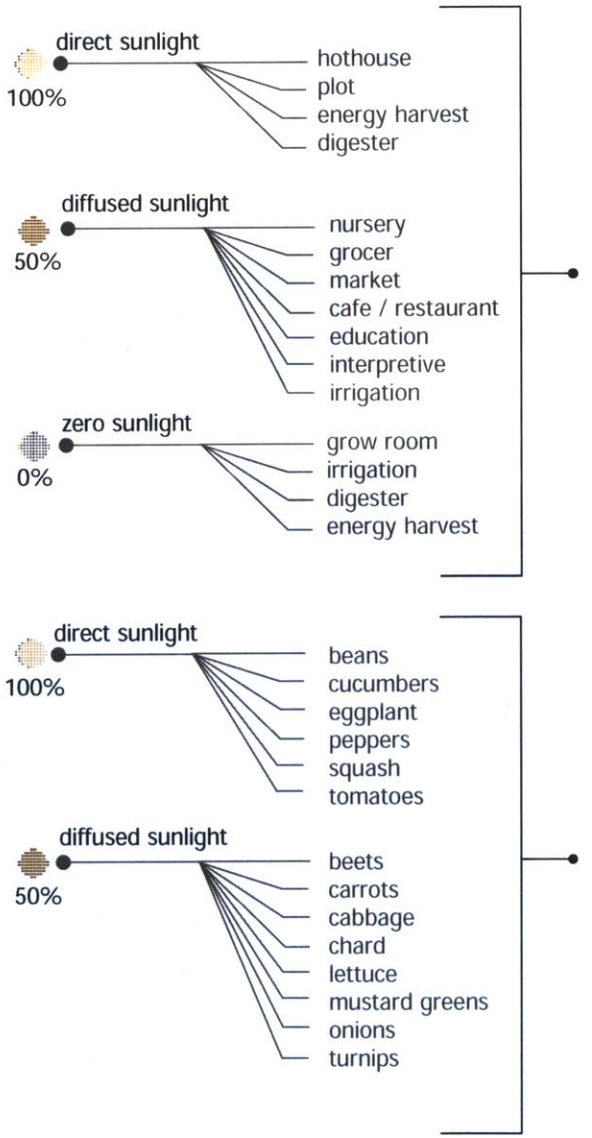
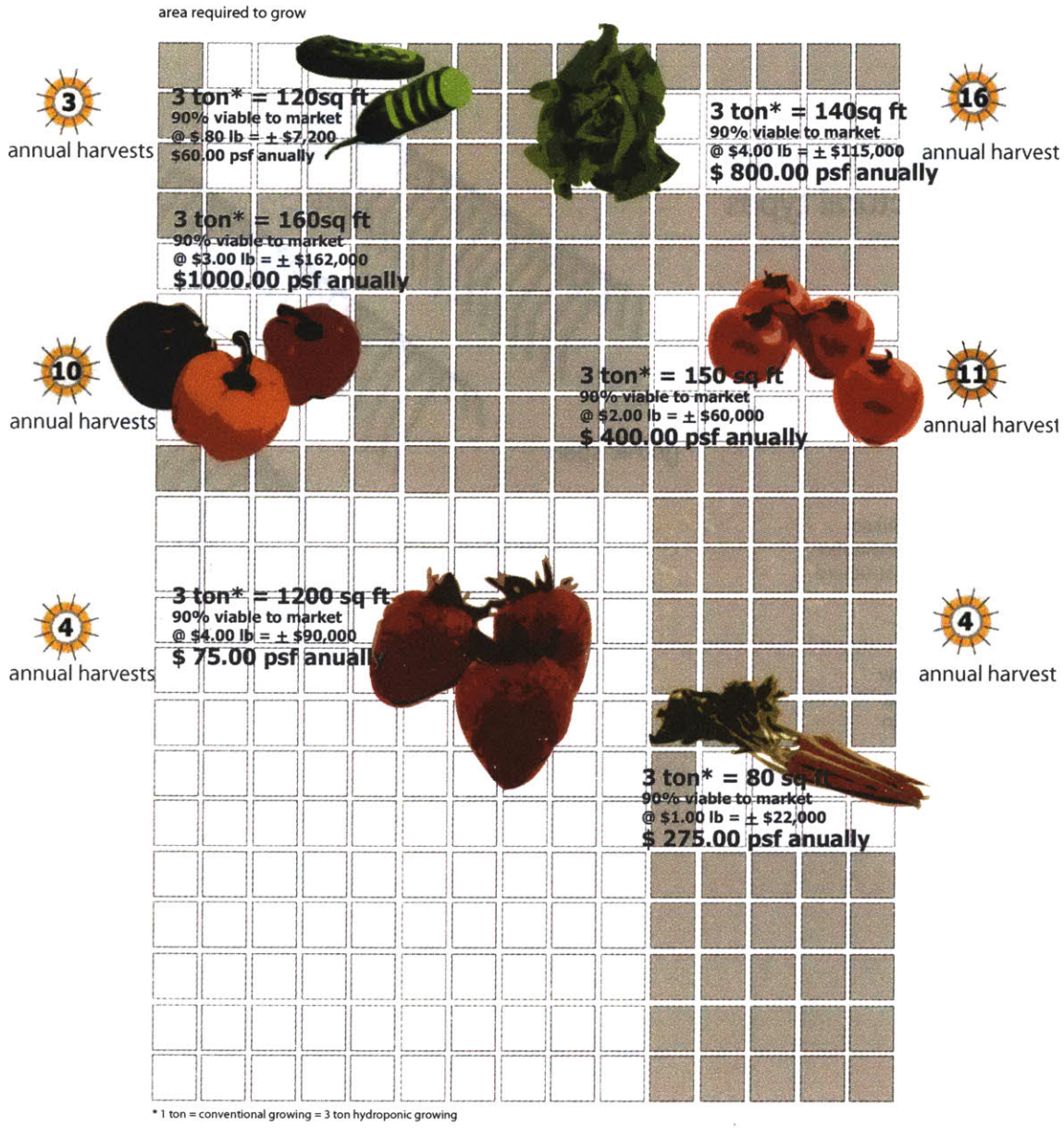
home 2-4 days
sales
purchasing
storage
infrastructure
regional input
storage
intra city output



market view

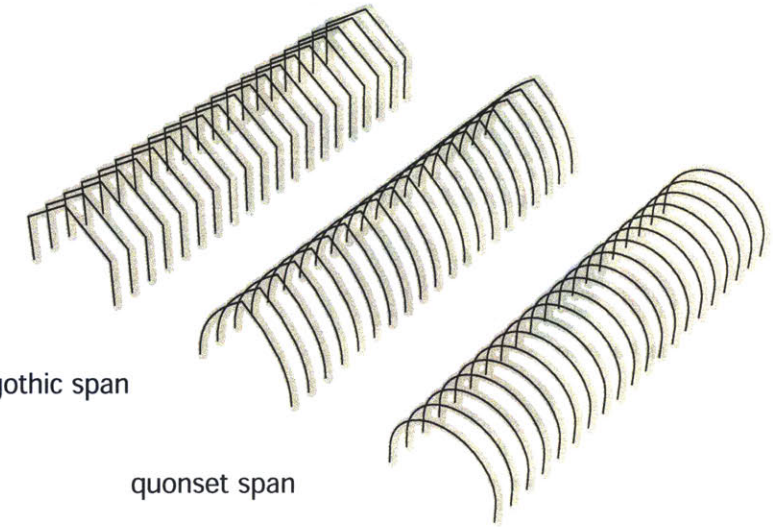

direct sunlight
100%
diffused sunlight
50%
zero sunlight
0%
primary programmatic sun requirements
production
commerce
d. i. y.
outreach
infrastructure
grow room
0%
nursery
50%
hothouse
100%
cafe
50%
restaurant
50%
grocer
50%
market
50%
plot
100%
grow room
0%
education
50%
interpretive
50%
irrigation
0%
energy harvest
0% 100%
digester
0% 100%

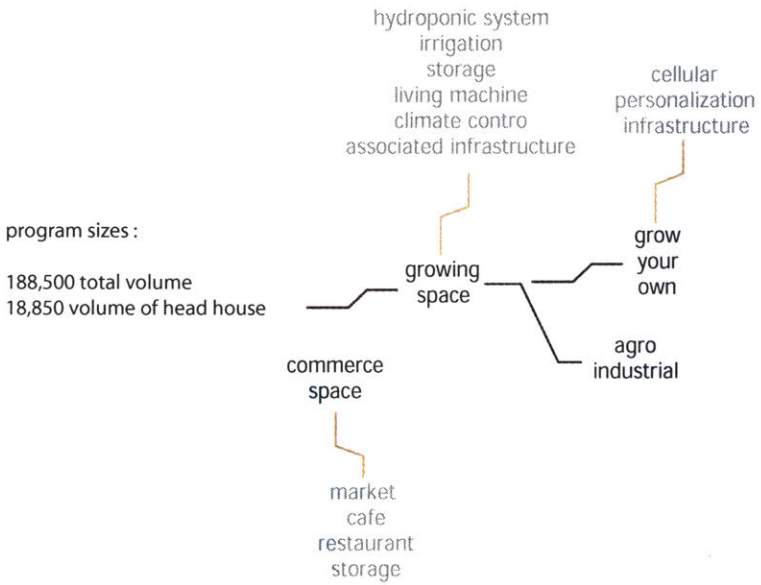

direct sunlight
100%
hothouse
plot
energy harvest
digester
diffused sunlight
50%
nursery
grocer
market
cafe / restaurant
education
interpretive
irrigation
zero sunlight
0%
grow room
irrigation
digester
energy harvest
direct sunlight
100%
beans
cucumbers
eggplant
peppers
squash
tomatoes
diffused sunlight
50%
beets
carrots
cabbage
chard
lettuce
mustard greens
onions
turnips



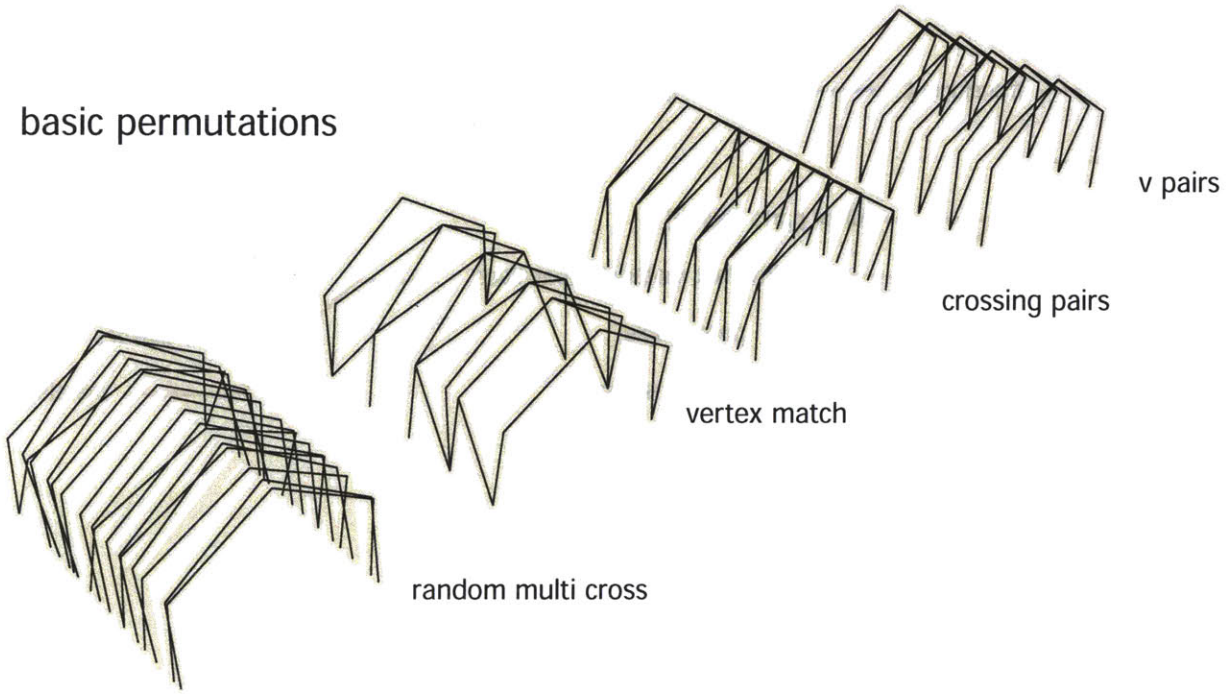
spiro:
professor at harvard, foodie
walks the 15 blocks to the market

typical hot house structural types





basic permutations



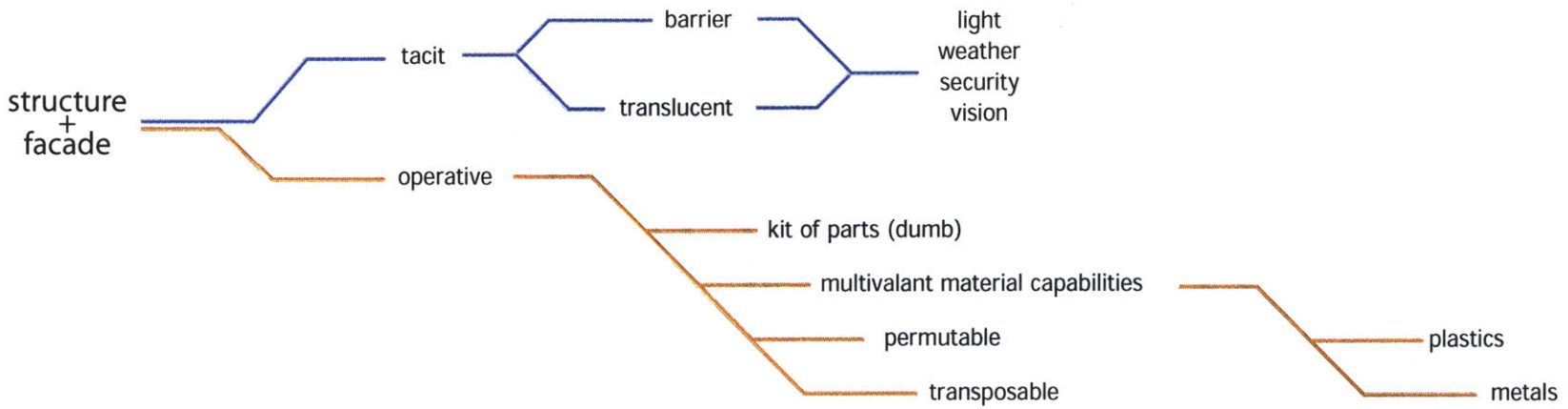

structure
+
facade
tacit
barrier
translucent
light
weather
security
vision
operative
kit of parts (dumb)
multivalant material capabilities
permutable
transposable
plastics
metals

photo: db

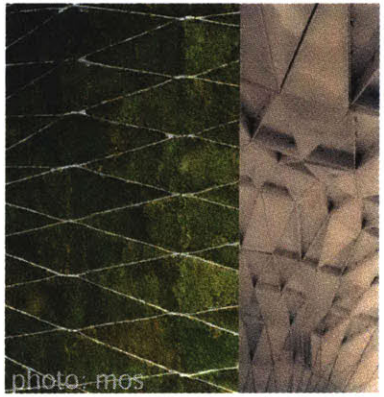


photo: mos

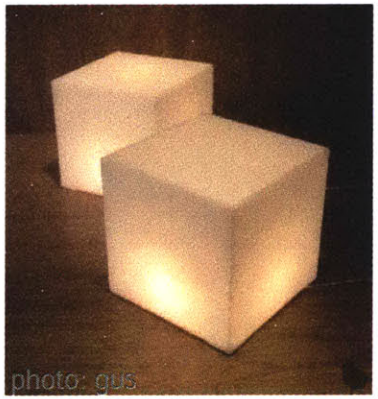
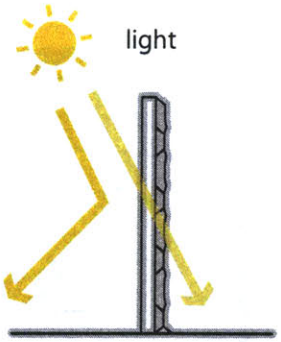
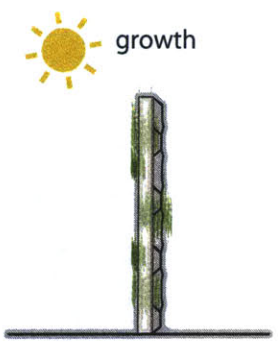
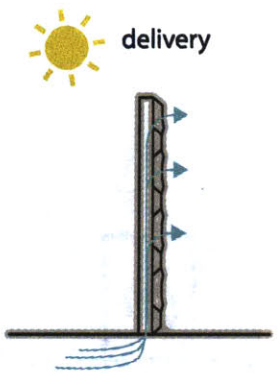


photo: gus

photo: h.h. plastics







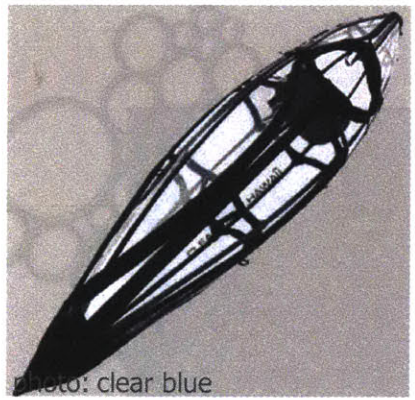


photo: clear blue

photo: polyfab

photo: office da

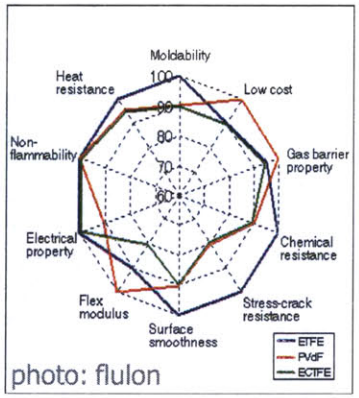
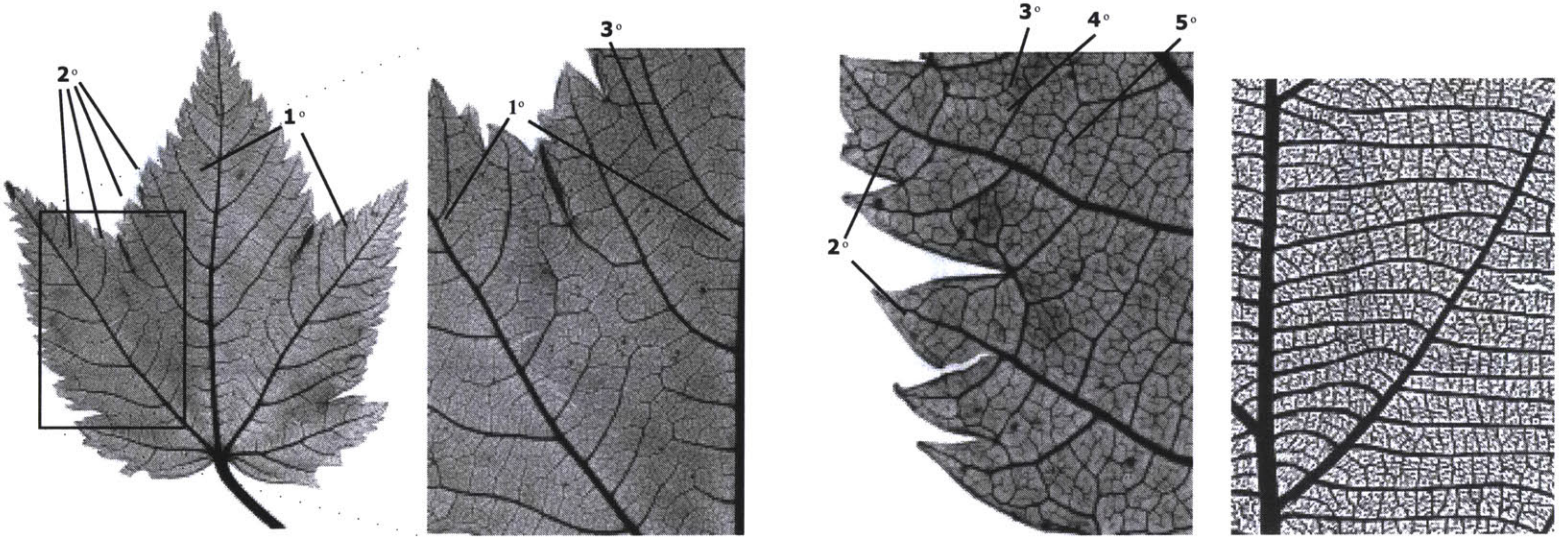
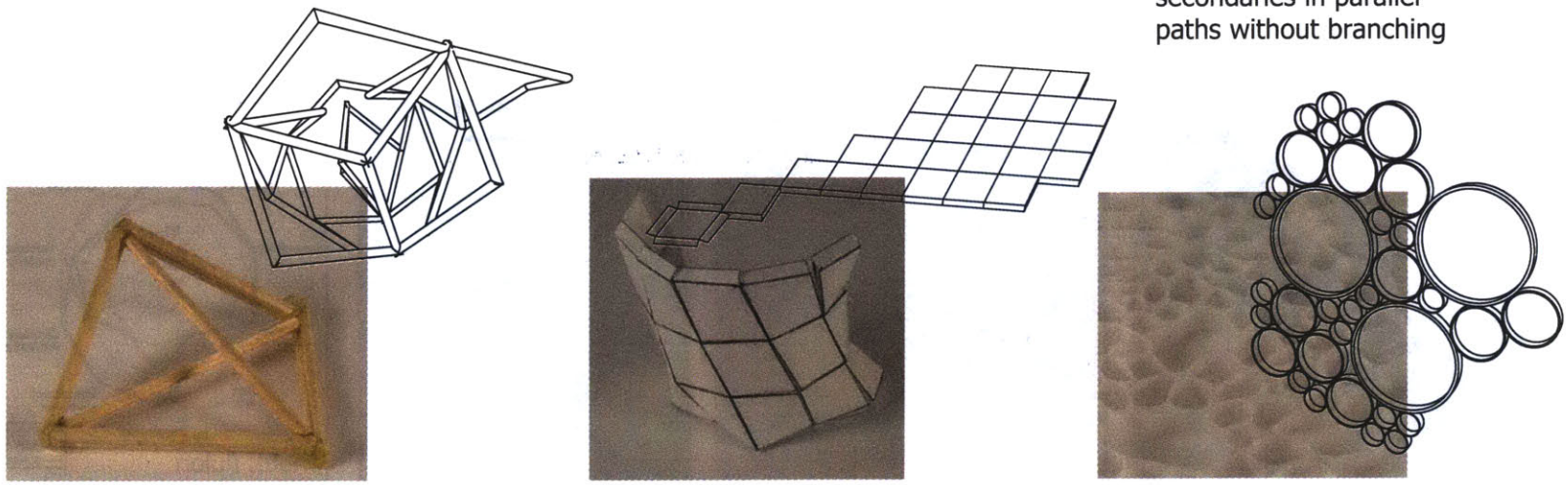


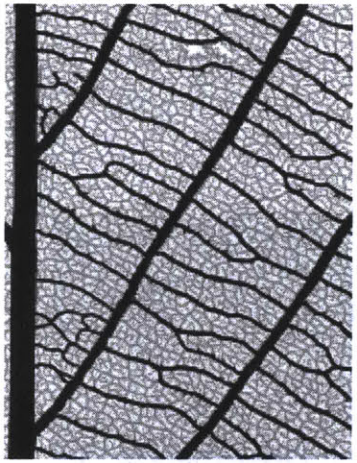
photo: flulon



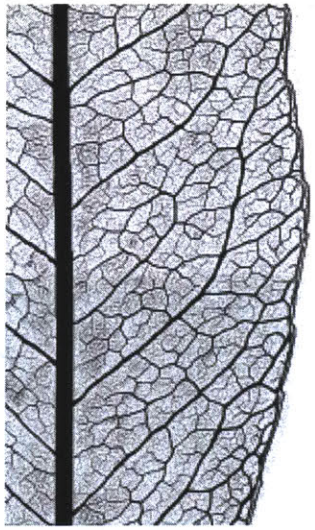
adapted from: Smithsonian Institution.

opposite percurrent tertiaries cross between adjacent secondaries in parallel paths without branching

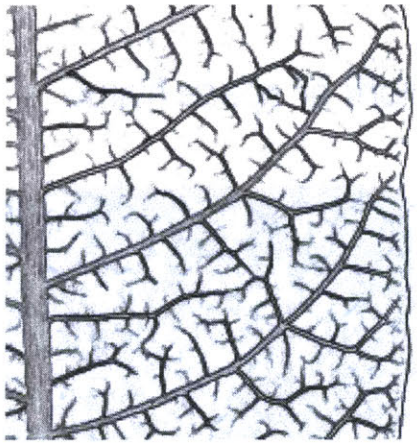




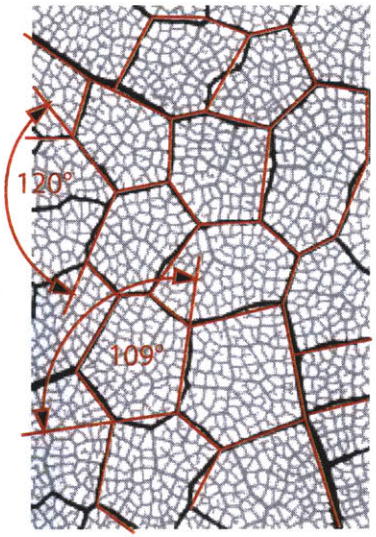
opp/alt -tertiaries
have both opposite precurrent & alternate precurrent



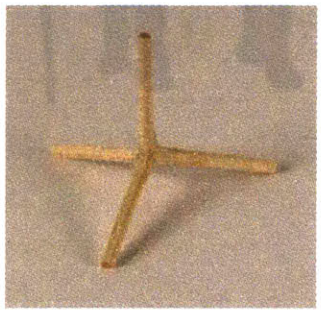
random reticulate tertiaries anastomose with other 3° veins or 2° veins at random angles



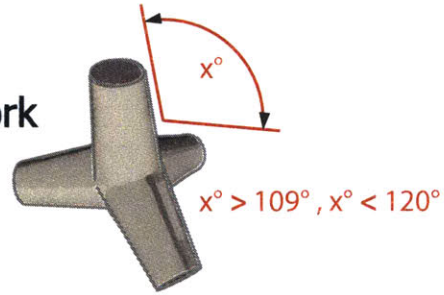
dichotomizing tertiaries branch freely



regular polygonal reticulate tertiar anastomose 3° veins to form polygons of similar size and shape

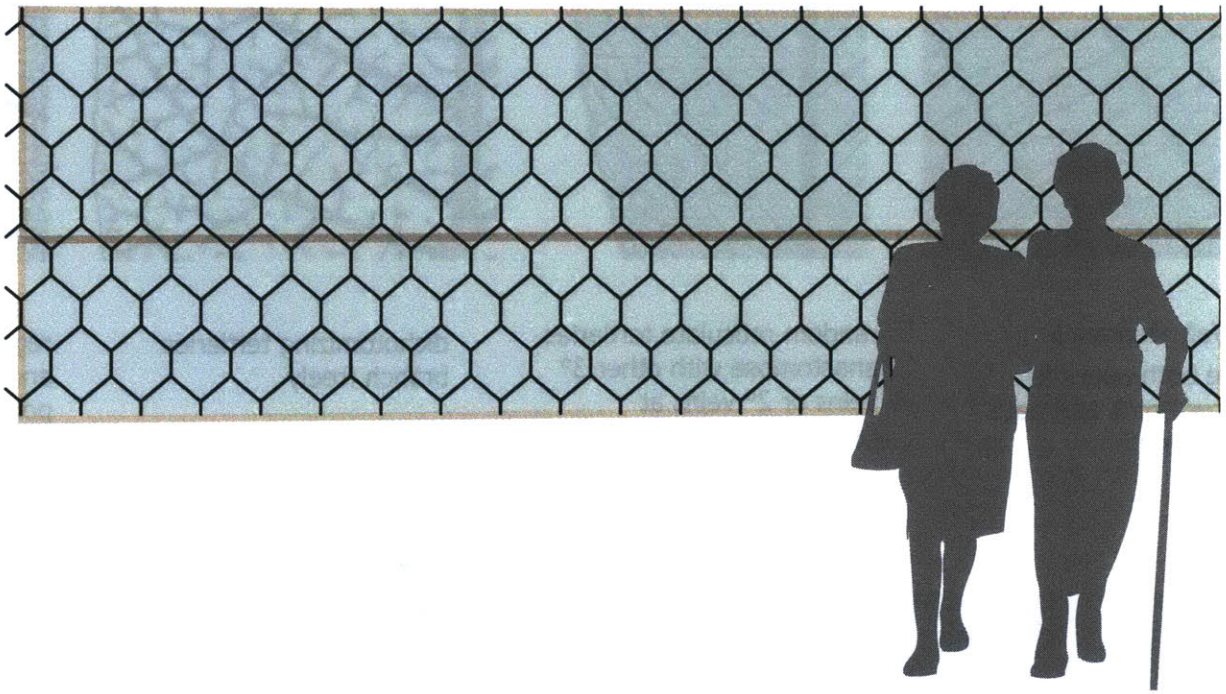


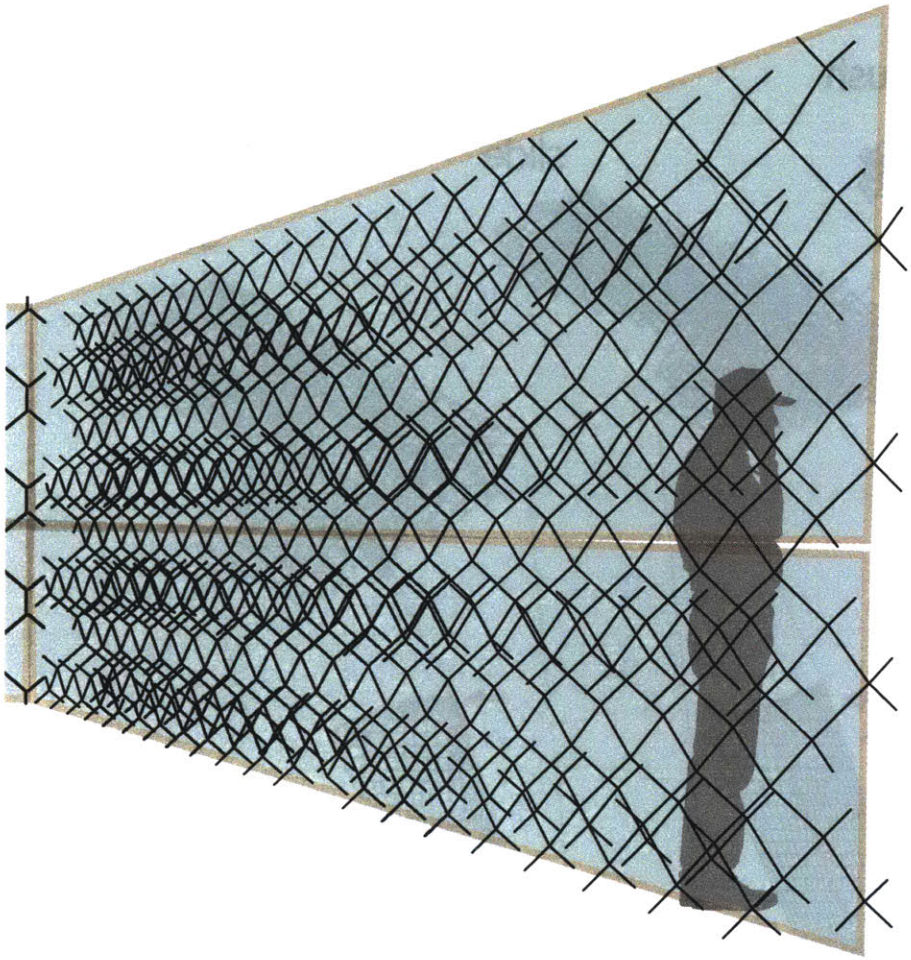
tetrapod network

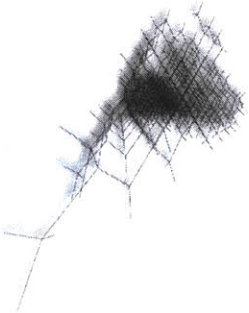


hector:
works in retail, lives 2 blocks away
has own garden at home

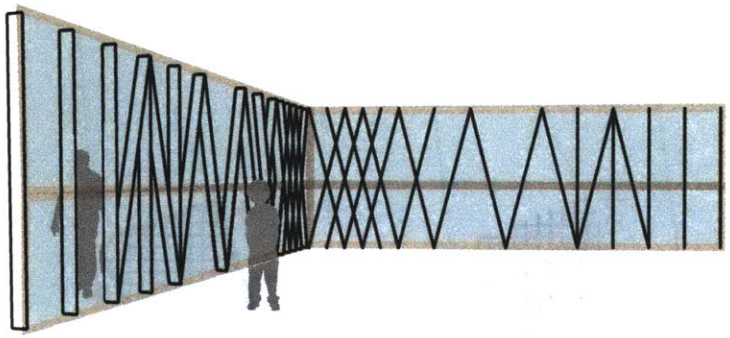
network or space frame

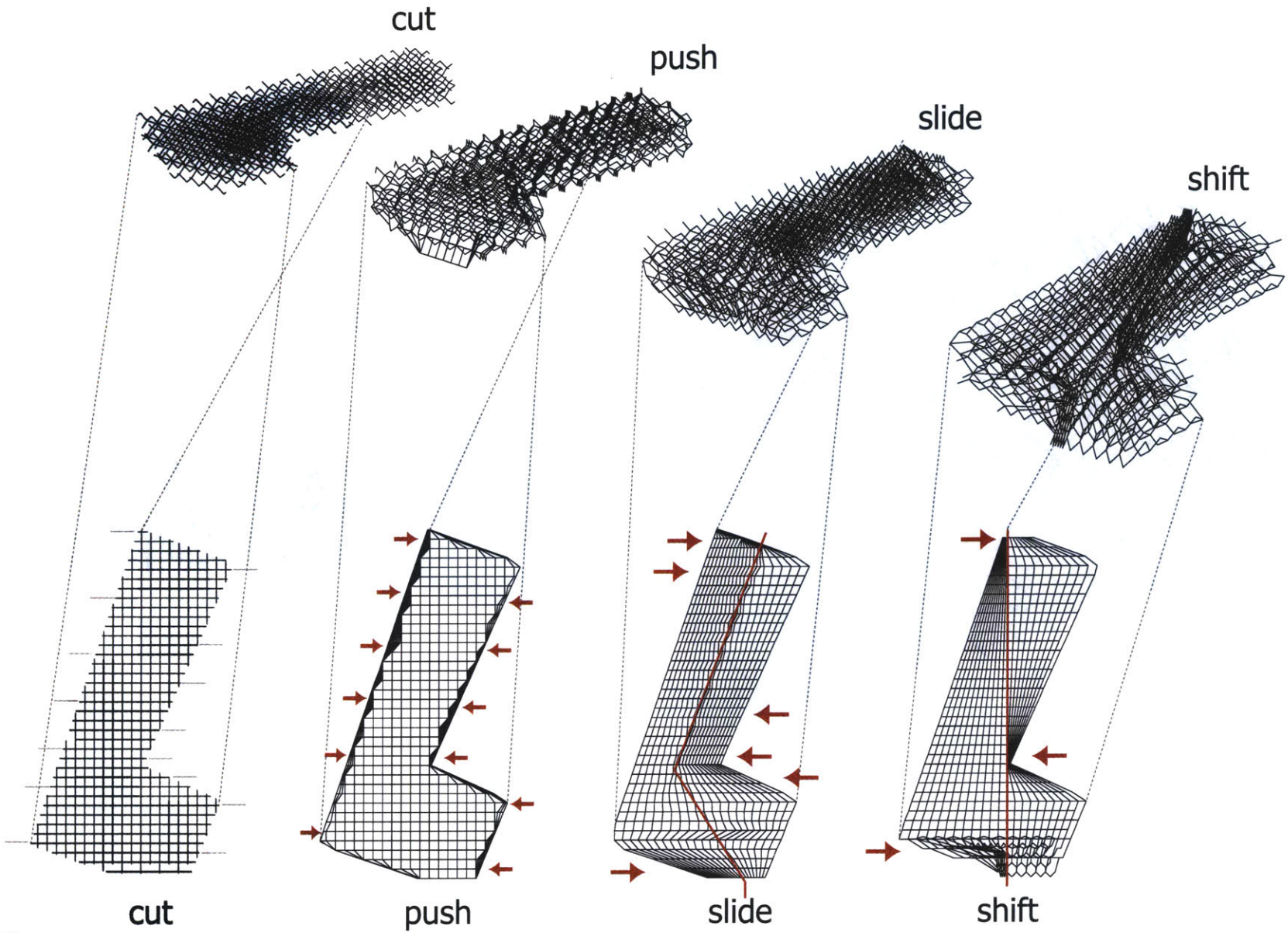


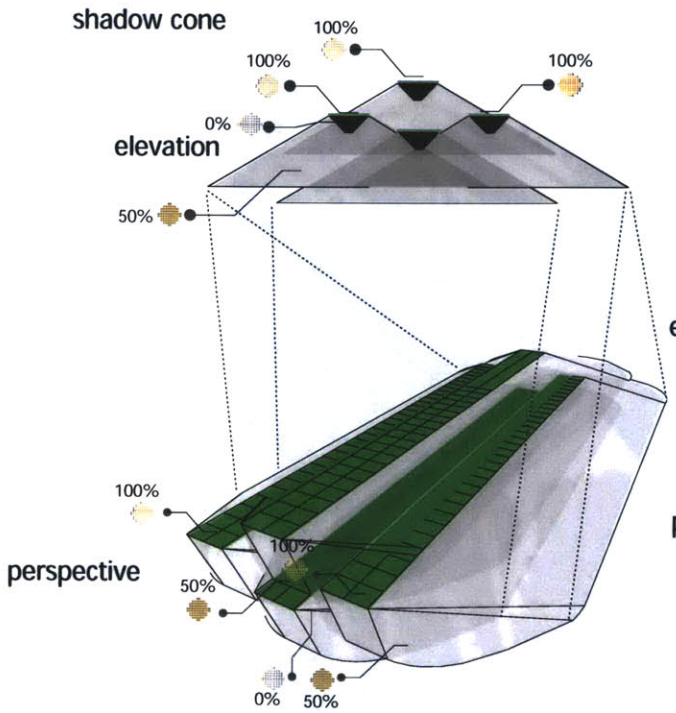


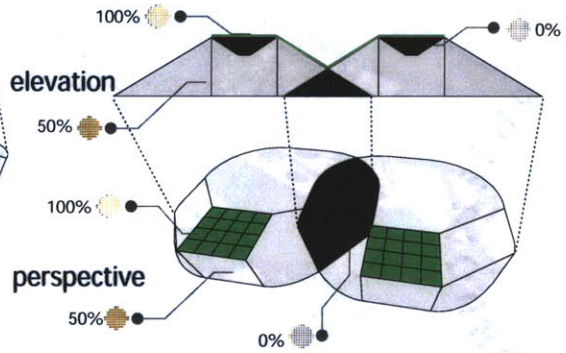


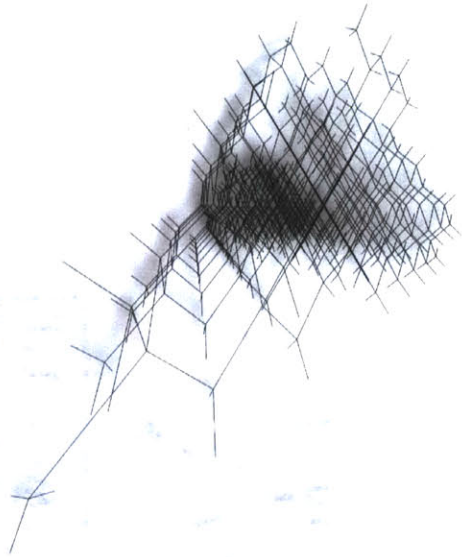
stick or cell frame



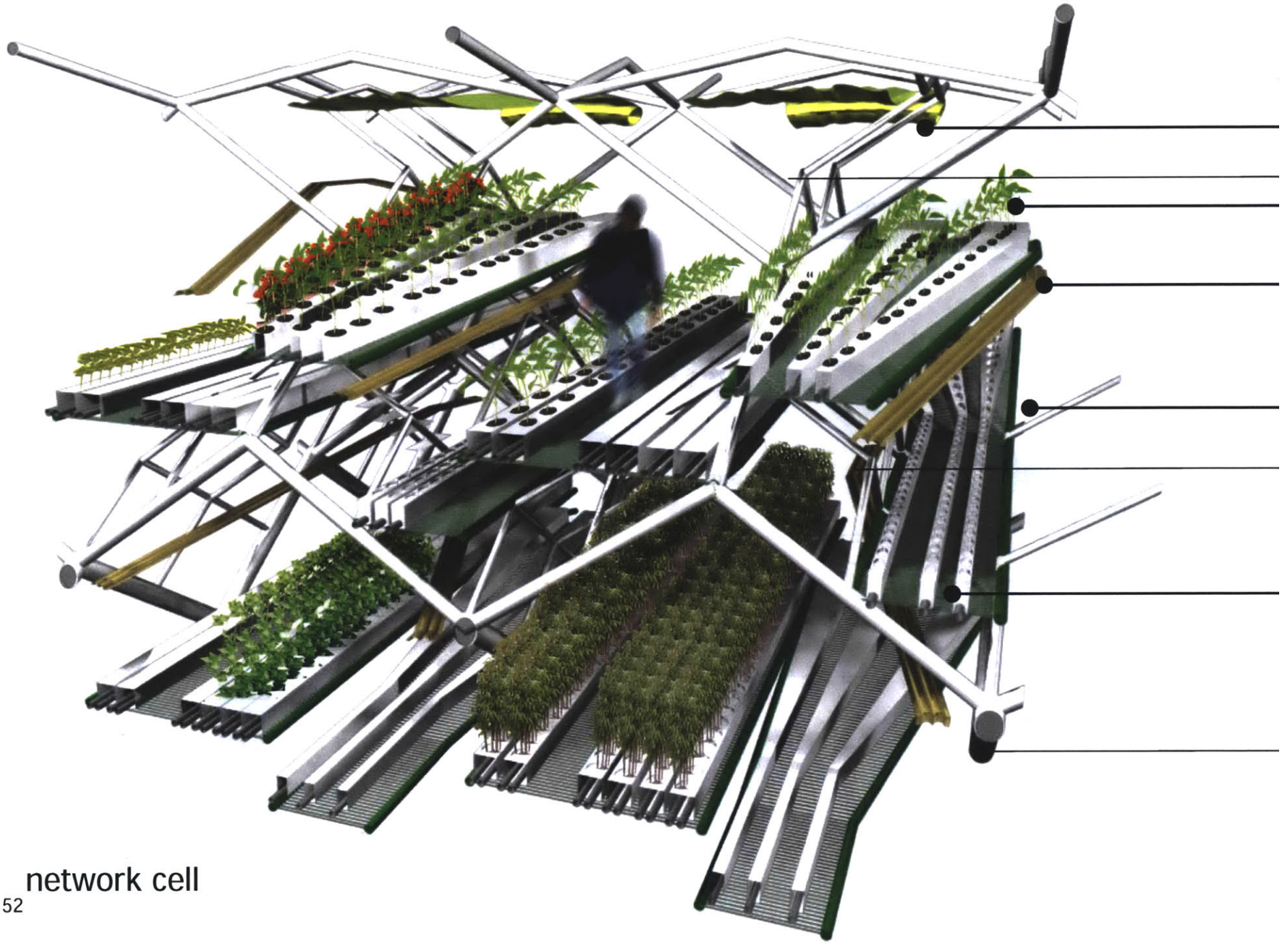

cut
push
slide
shift
cut
push
slide
shift







paul:
on fixed income, a disabled veteran
rents outdoor plot



network cell

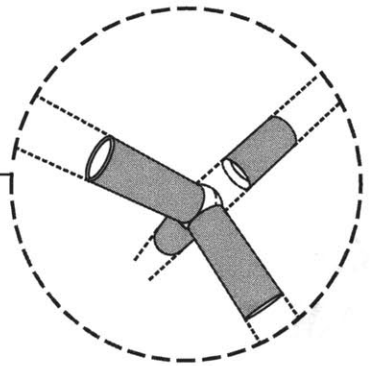
solar reflection / heat retention fabric

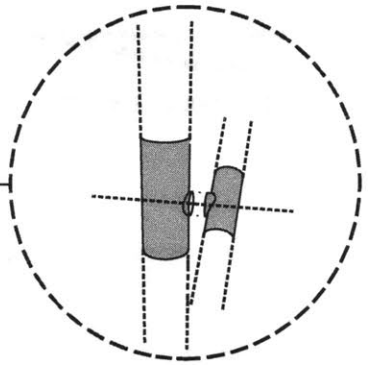
moveable hydroponic tray

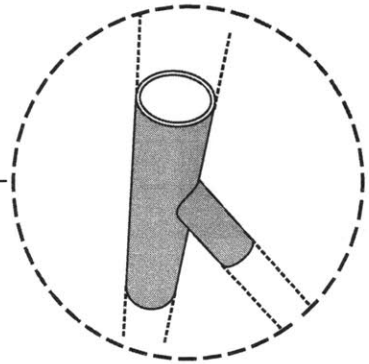
led grow lights:
2 red 10W / 1 blue 2W psft

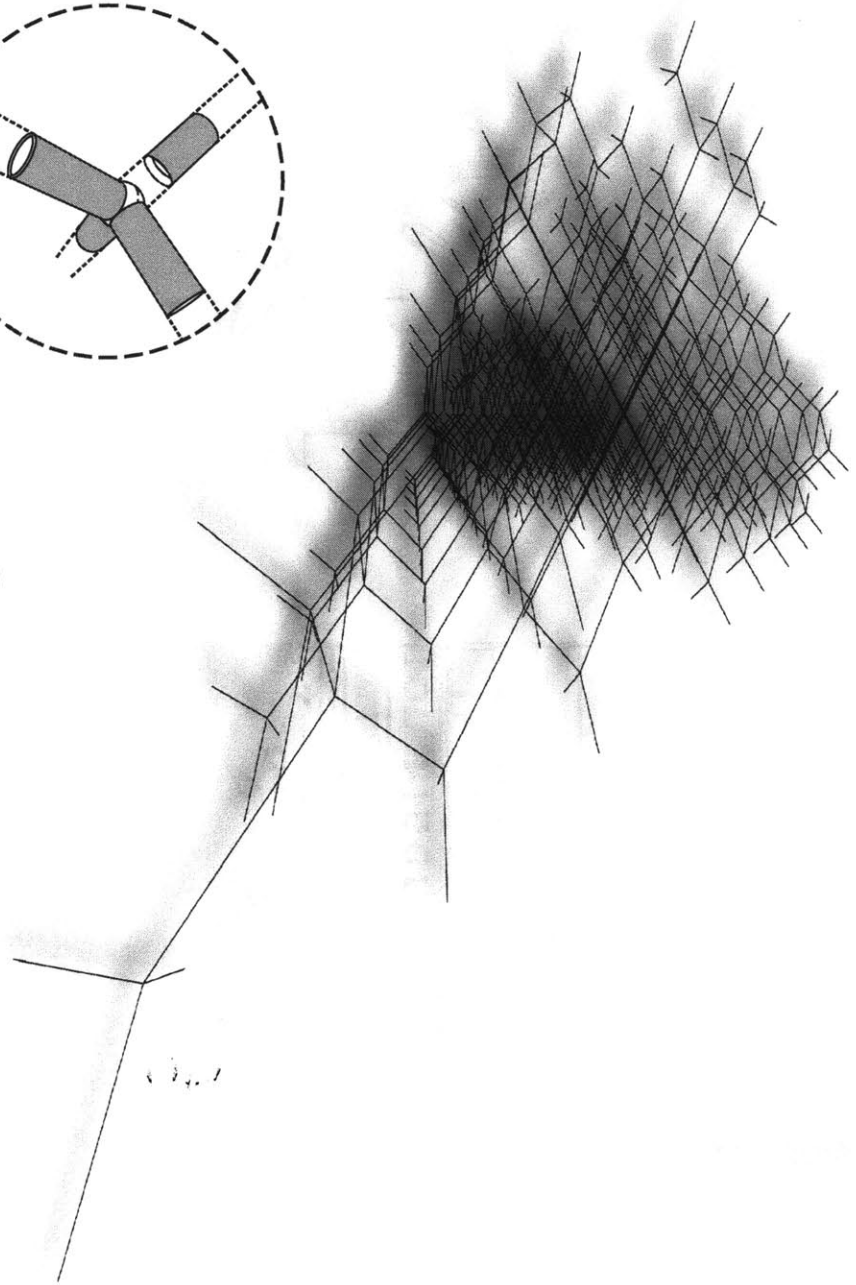
steel frame

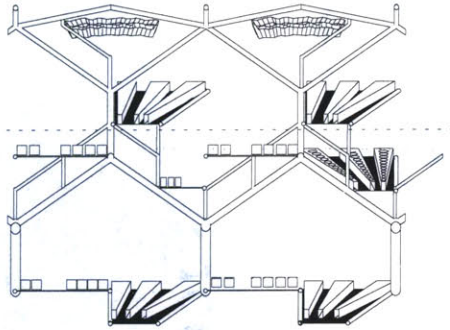
pultruded wide t-bar grating



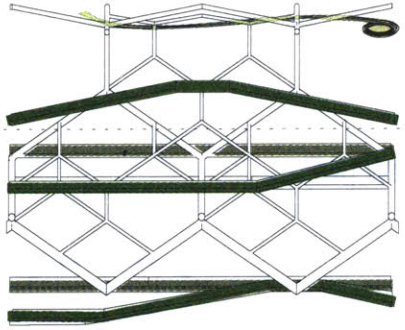




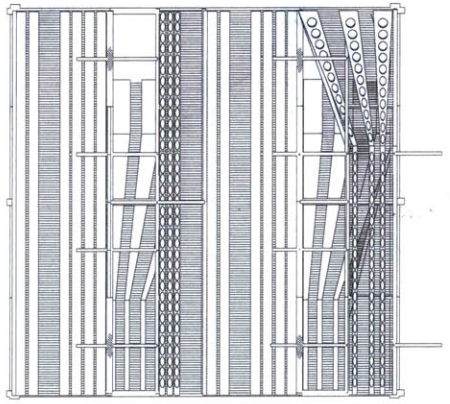




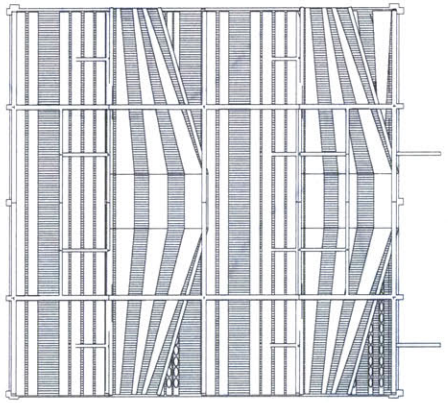
east west section



north south section



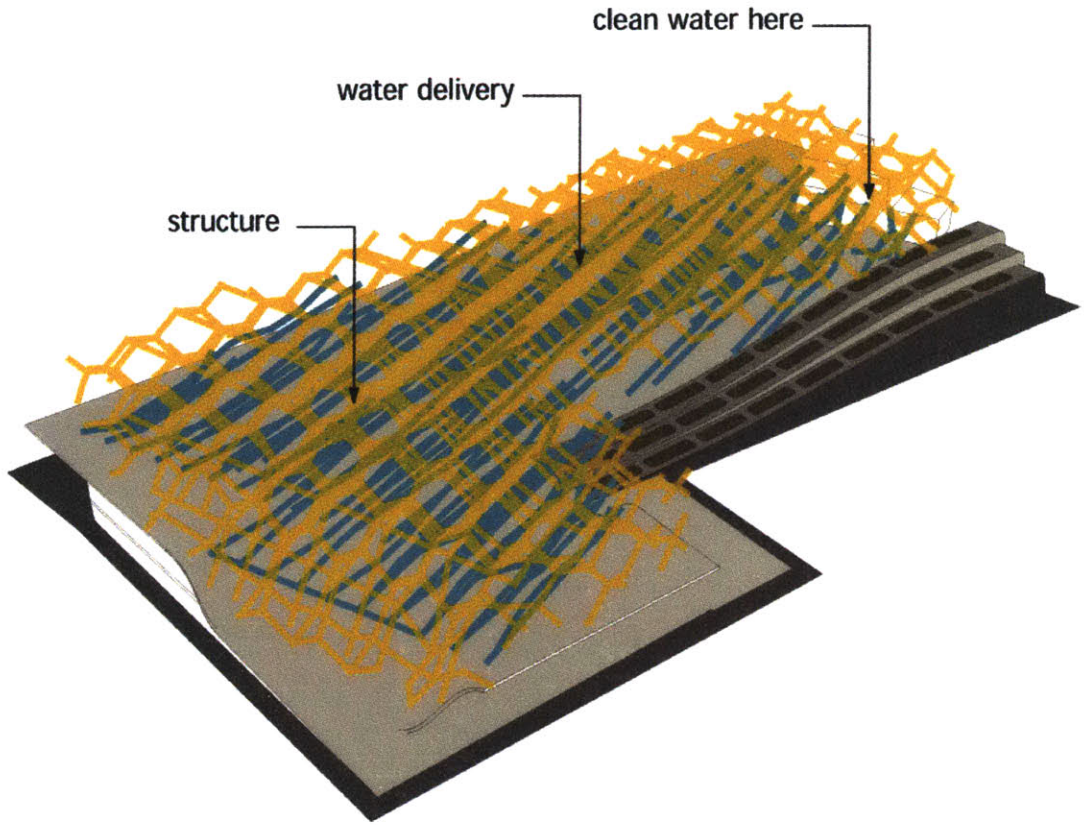
mid cut



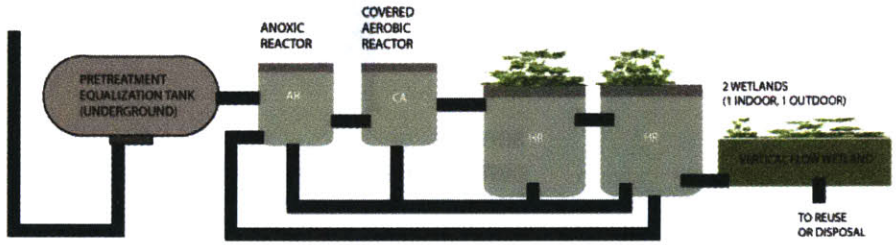
top view

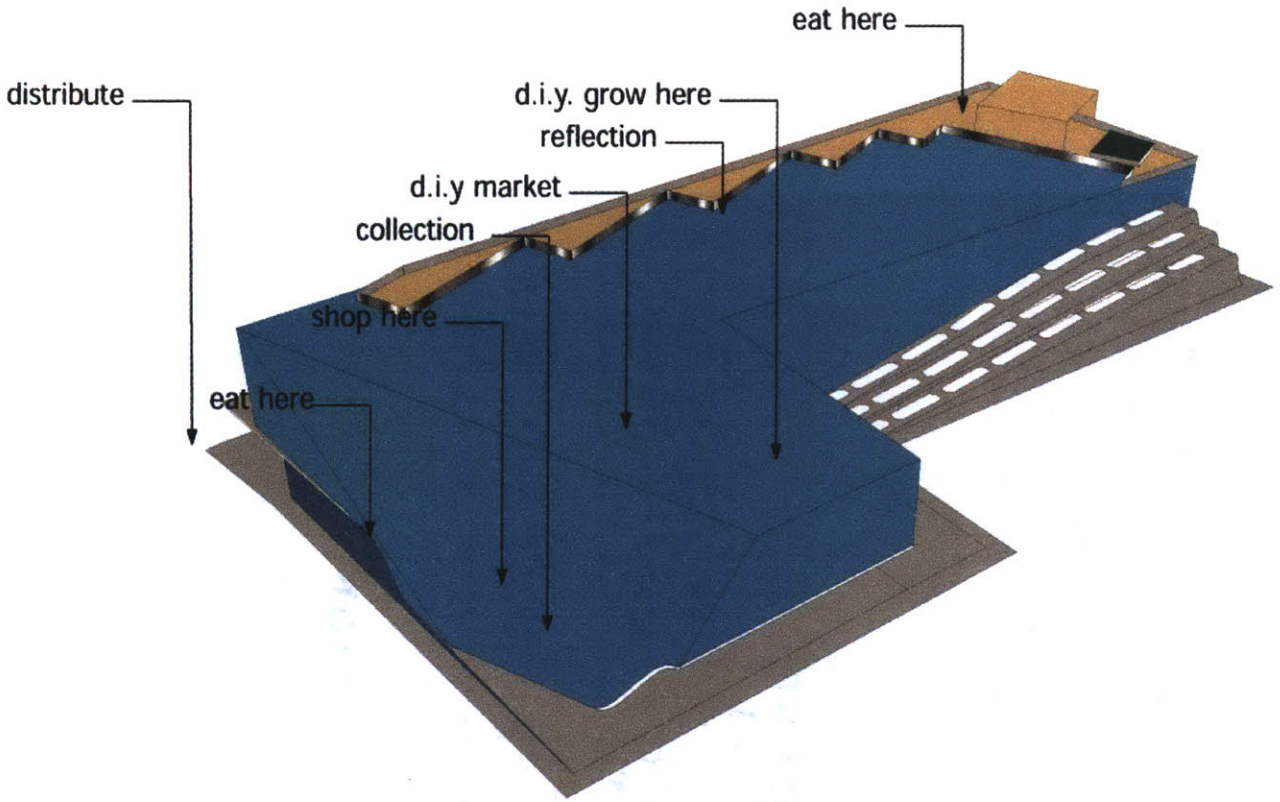
network cell

serena:
comes on saturday for the farmers market
loves the restaurant



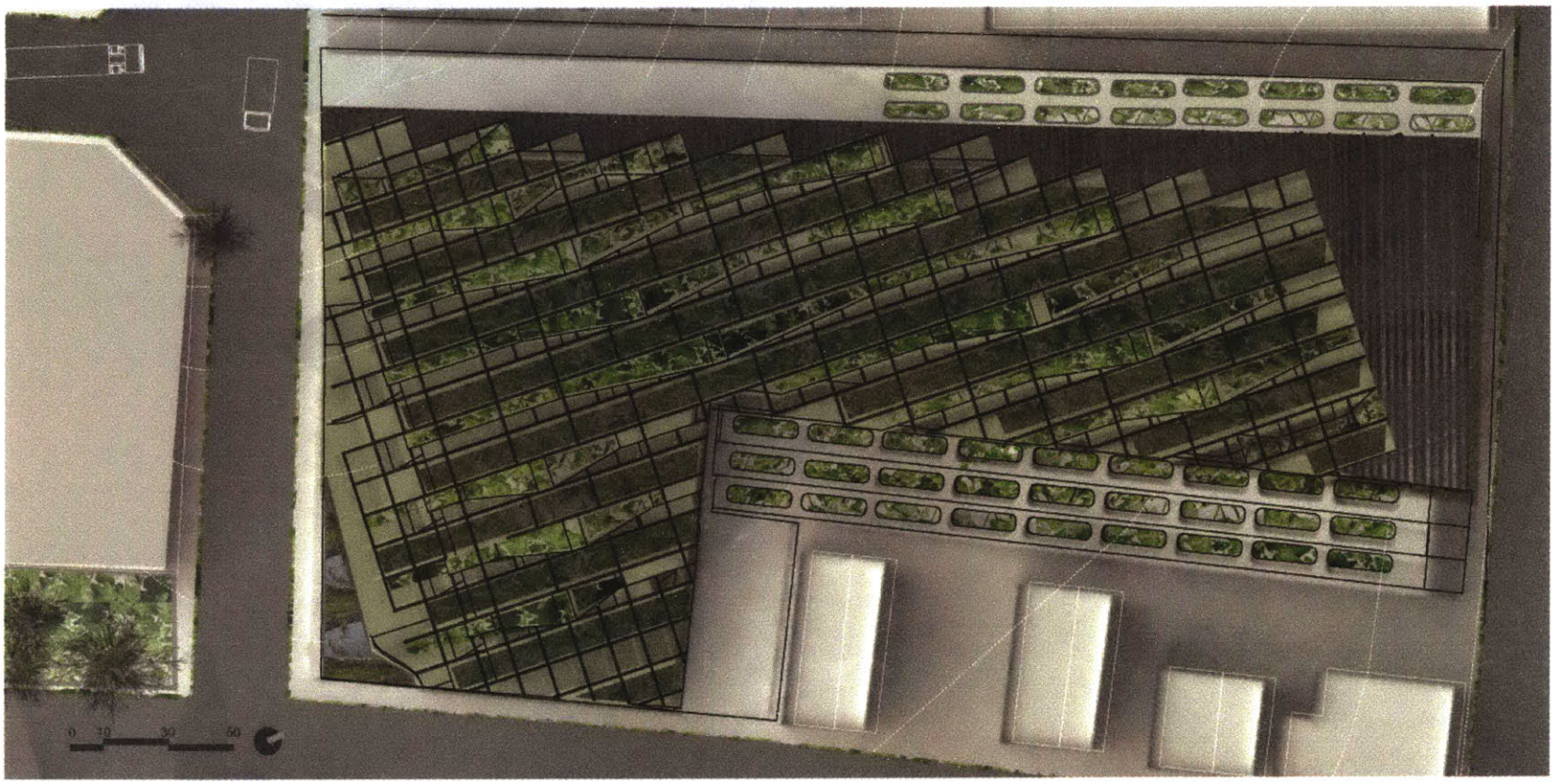
water treatment / digester



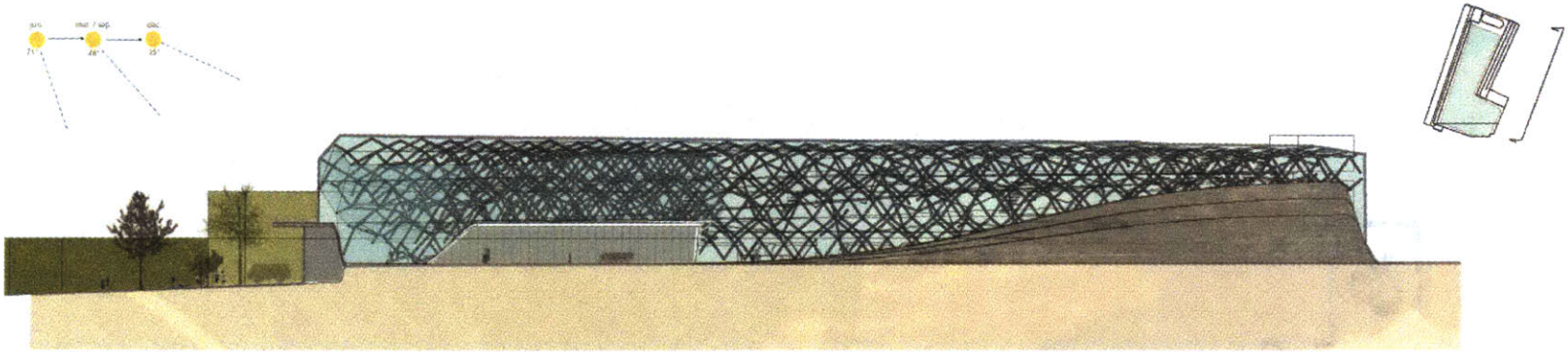


edna:
just like fresh foods

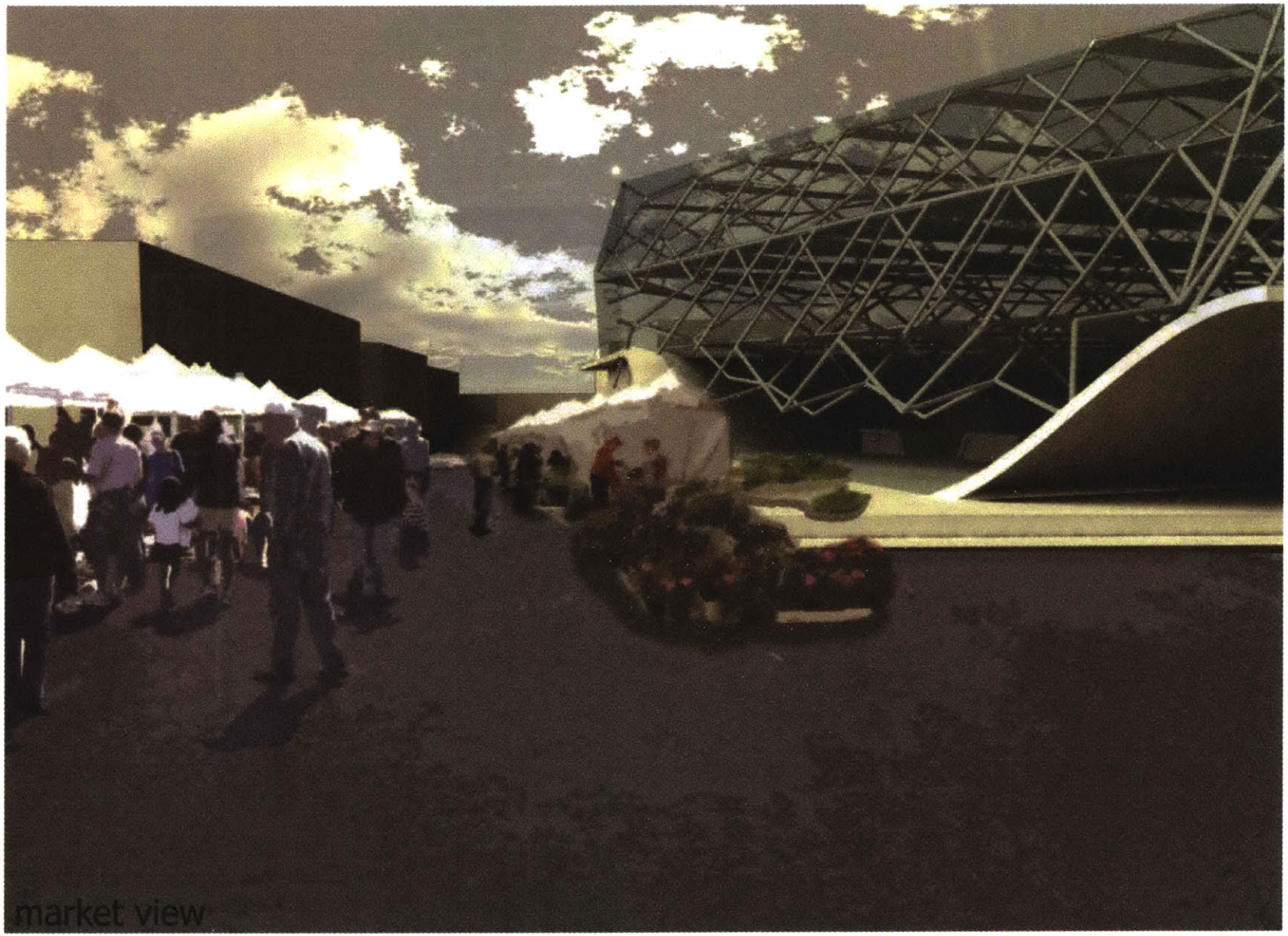
plan @ + 50'

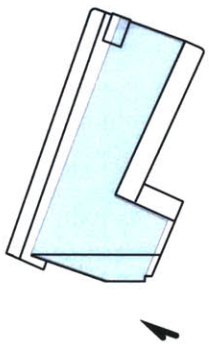


east elevation

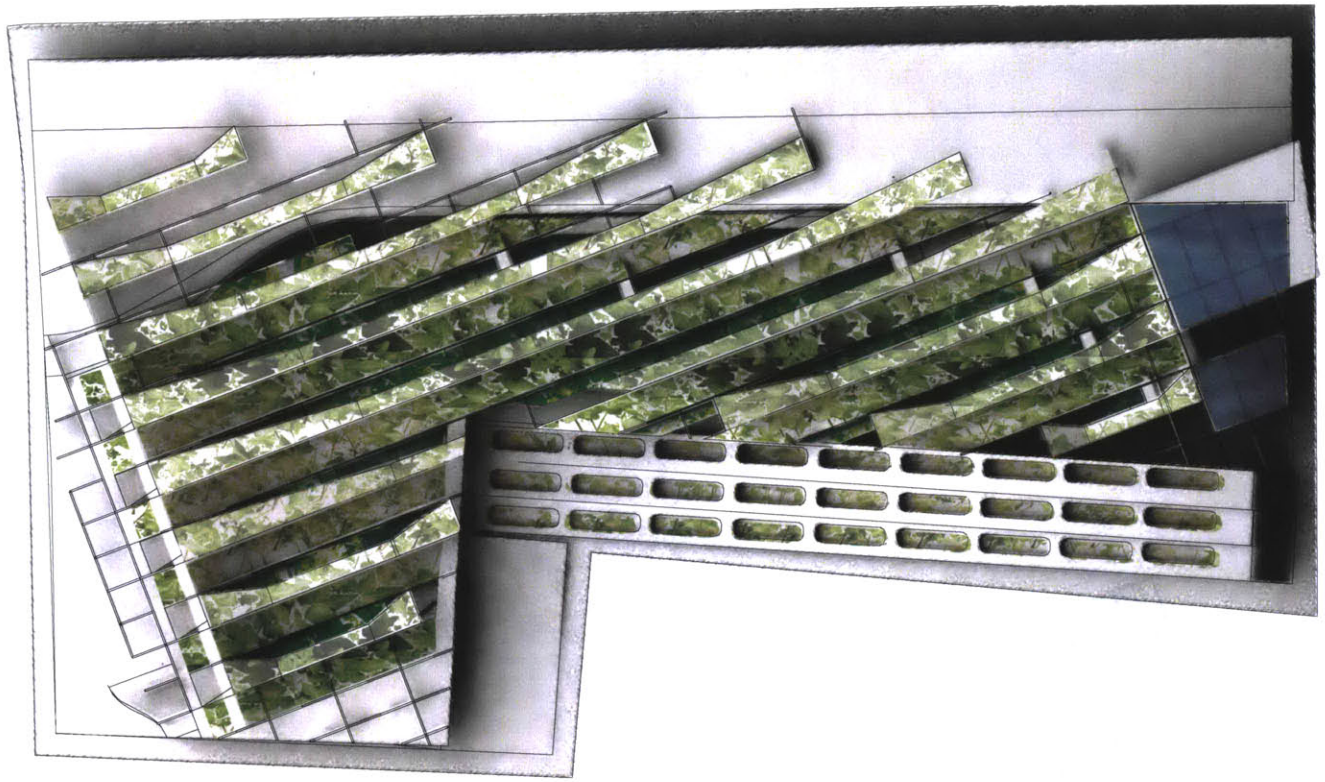


ben:
student at tufts works in cafe
part of personal sustainability directive
plans to go into the peace corps

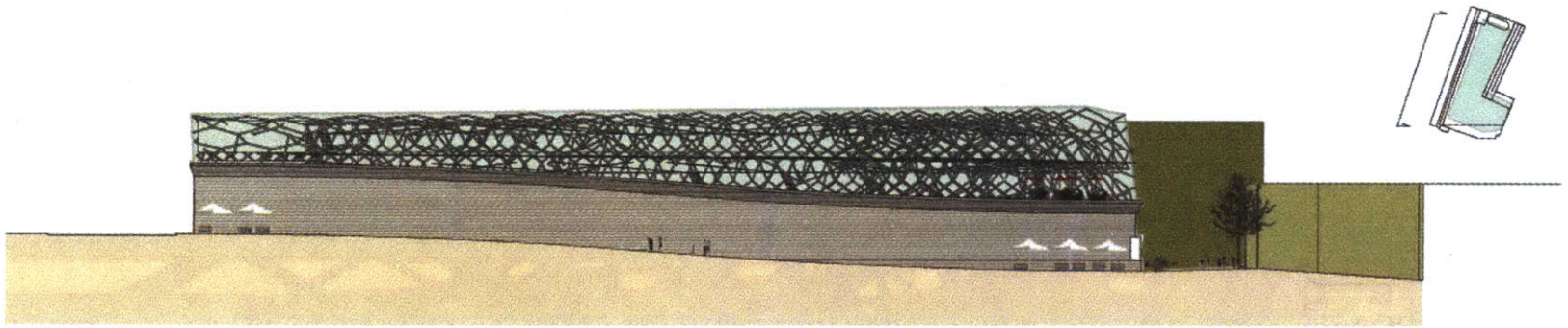

market view



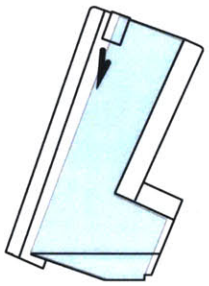
plan @ + 20'



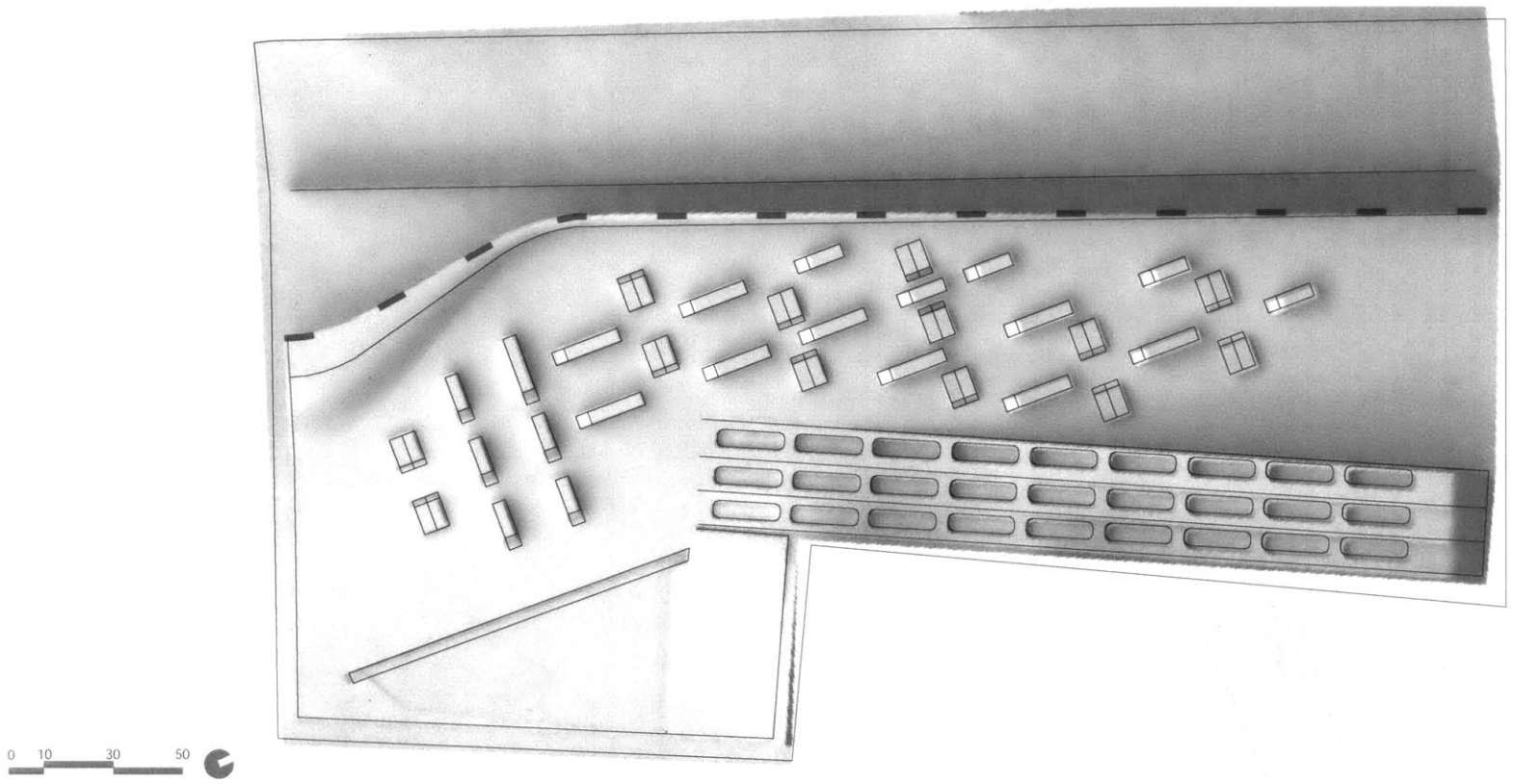
west elevation



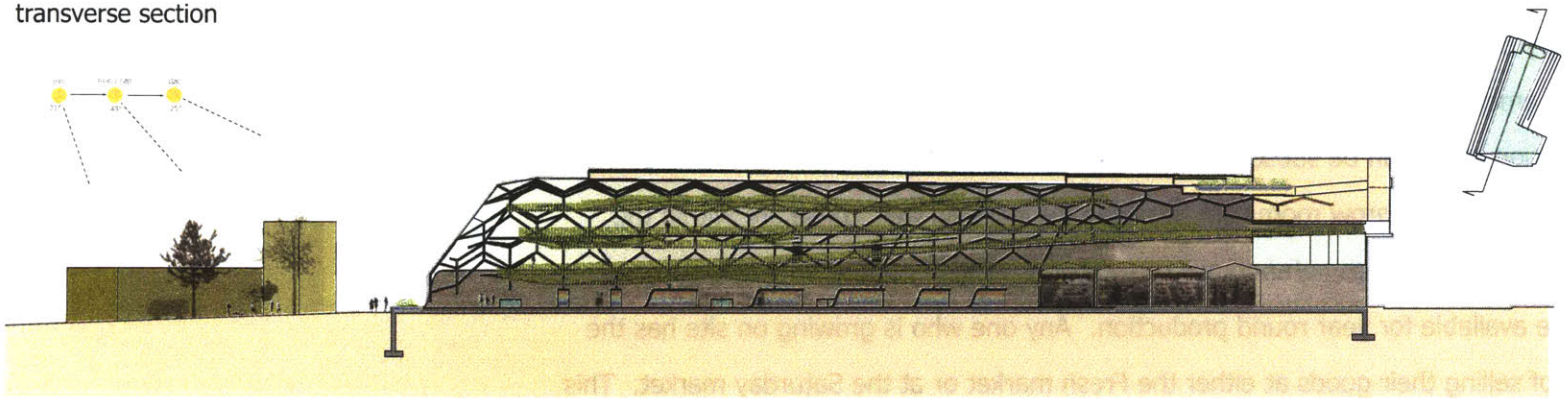
grow space view



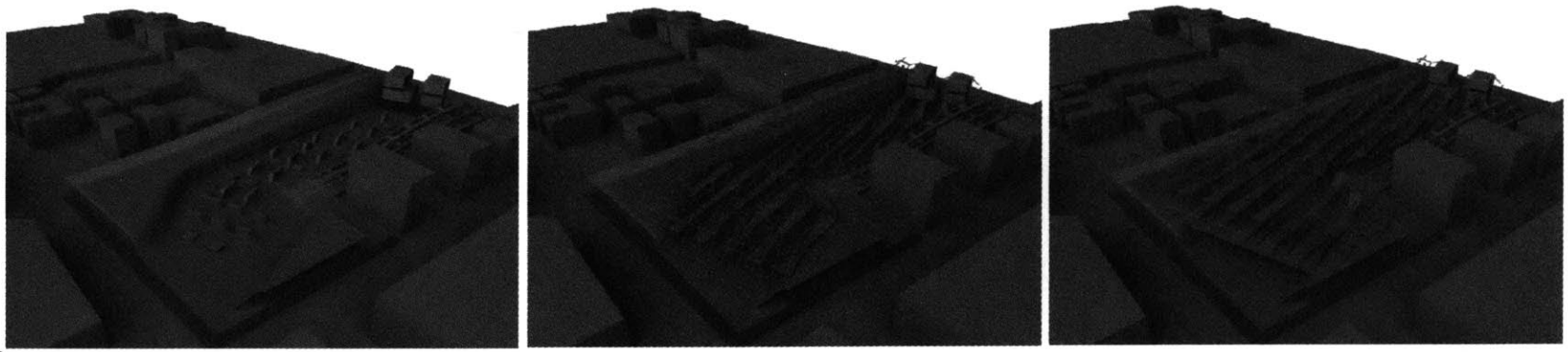
plan @ + 10′



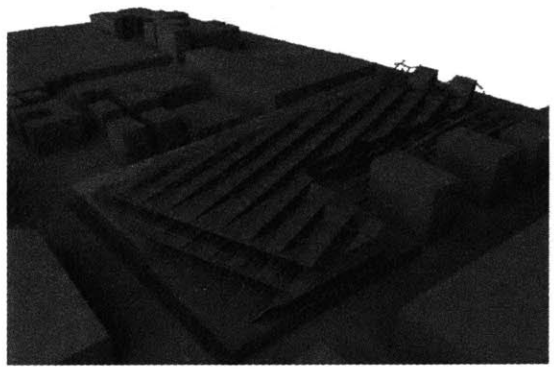
transverse section

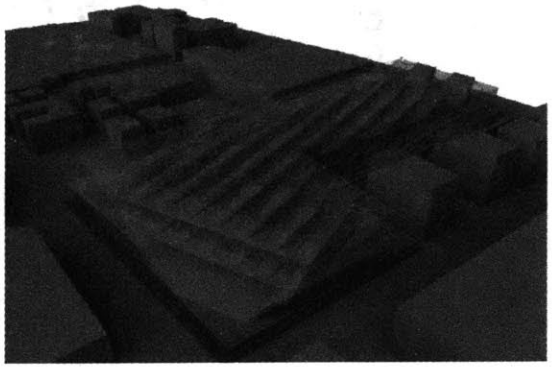


There are two types of community based gardening with in the facility. First at the periphery of the building is a landscape for community gardening. Plots are leased and the amenities of the larger facility can be used, water, composting, seedling and germination areas can be subscribed to on an as needed basis. Within the facility production oriented grow rooms are available for lease as well, these are within the hothouse but operate as autonomous grow rooms. These more production-oriented bays are available for year round production. Any one who is growing on site has the option of selling their goods at either the Fresh market or at the Saturday market. This provides an outlet for surplus goods and potential relief from the cost associated with leasing a plot or grow-room.

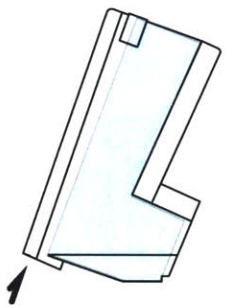


Additionally this facility has a social agenda; to promote local agriculture as a business and as a method of sustenance. Through the Fresh market citizens can learn how to start their own garden or grow room. Student groups will be able to tour the facility learning about hydroponics, waste management, compost and renewable energy. The facility will serve as a teaching lab where sustainable practices will be honed and then disseminated to the community.





loading dock view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Process

Decreasing the distance from the designers hand to the end product is the principal aspect of my approach to design. Through the distillation of architectural production, efficiencies can be achieved giving the designer a greater degree of control over the product. Strategies are architectural in nature but draw on the fields of real estate development, marketing, computation, as well as those traditionally associated with artisans and craftsmen. Be it the development of a grammar, working through the critical path or the molding of clay, there is a moment when ones response to the problem is no longer the action but the reaction. Ultimately, the designer is able to answer a design problem due to a conceptual or physical proximity to each layer of design production.

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