2018

Snacking in Bed: Blending Residential and Agricultural Typologies

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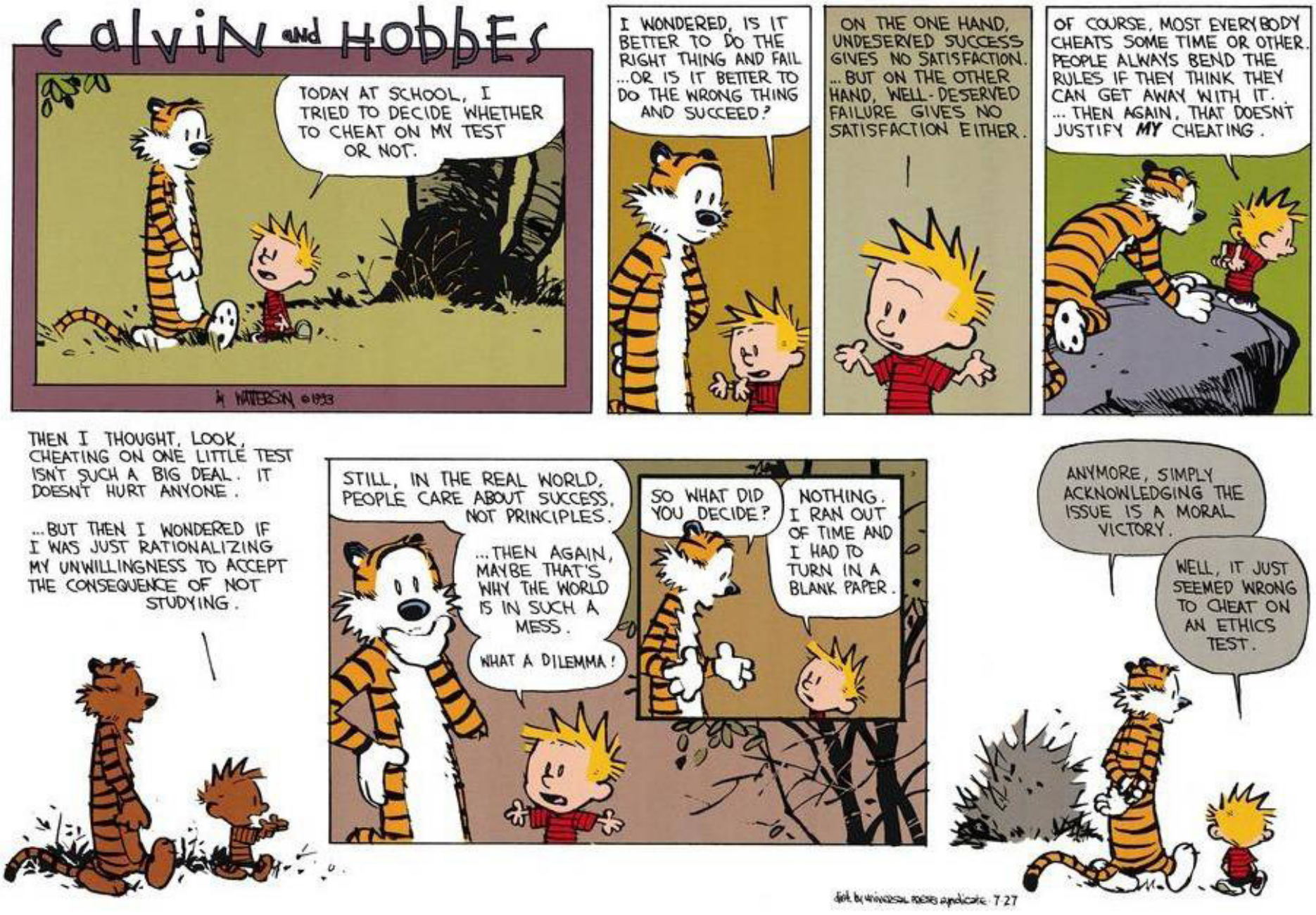
SNACKING IN BED:

BLENDING RESIDENTIAL AND AGRICULTURAL TYPOLOGIES


calvin and hobbes
TODAY AT SCHOOL, I TRIED TO DECIDE WHETHER TO CHEAT ON MY TEST OR NOT.
© WATTERSON 1993
I WONDERED, IS IT BETTER TO DO THE RIGHT THING AND FAIL ...OR IS IT BETTER TO DO THE WRONG THING AND SUCCEED?
ON THE ONE HAND, UNDESERVED SUCCESS GIVES NO SATISFACTION. ...BUT ON THE OTHER HAND, WELL-DESERVED FAILURE GIVES NO SATISFACTION EITHER.
OF COURSE, MOST EVERYBODY CHEATS SOME TIME OR OTHER. PEOPLE ALWAYS BEND THE RULES IF THEY THINK THEY CAN GET AWAY WITH IT. ... THEN AGAIN, THAT DOESN'T JUSTIFY MY CHEATING.
THEN I THOUGHT, LOOK, CHEATING ON ONE LITTLE TEST ISN'T SUCH A BIG DEAL. IT DOESN'T HURT ANYONE.
...BUT THEN I WONDERED IF I WAS JUST RATIONALIZING MY UNWILLINGNESS TO ACCEPT THE CONSEQUENCE OF NOT STUDYING.
STILL, IN THE REAL WORLD, PEOPLE CARE ABOUT SUCCESS, NOT PRINCIPLES.
...THEN AGAIN, MAYBE THAT'S WHY THE WORLD IS IN SUCH A MESS.
WHAT A DILEMMA!
SO WHAT DID YOU DECIDE?
NOTHING. I RAN OUT OF TIME AND I HAD TO TURN IN A BLANK PAPER.
ANYMORE, SIMPLY ACKNOWLEDGING THE ISSUE IS A MORAL VICTORY.
WELL, IT JUST SEEMED WRONG TO CHEAT ON AN ETHICS TEST.
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1-ABSTRACT

Rocinha Favela, Rio De Janeiro, Brazil

“Bigness no longer needs the city: it competes with the city; it represents the city; it preempts the city; or better still, it is the city.”

“Without a theory of Bigness, architects are in the position of Frankenstein’s creators: instigators of a partly successful experiment whose results are running amok and are therefore discredited.”
-Rem Koolhaas

Shinonome Canal Court Tokyo, Japan

2 - PROBLEM DEFINITION

PROBLEM STATEMENT

The global population has been increasing exponentially over the last one hundred years and has done so at a staggering rate; in 1927, the human population of the Earth was estimated at two billion, in 1960, it had grown to three billion, and in 1999, it was already at six billion and with no sign of slowing. Presently, the world population stands at approximately seven billion, thus continuing this growth trend. Perhaps worse is that there are places like India where the population is so incredibly dense, that there is almost no hope to adequately house everyone with the space provided. Add to this the need for greater management of food supplies and resources and the issues compound. Great technological leaps in agriculture over the last 100 years have allowed countries to generate massive reserves of food at any point throughout the year. Despite these feats, much of that food is wasted while widespread hunger remains a problem.

Architecture has the capability to serve as the jumping point in the resolution to both of these problems. Advances in both urban housing strategies and modern landscape technology presents the opportunity for architects to design buildings that not only provide a place to live, but also the means to live.

This of course begs the question; how can architecture balance the needs of urban housing while still allowing the land to be productive?

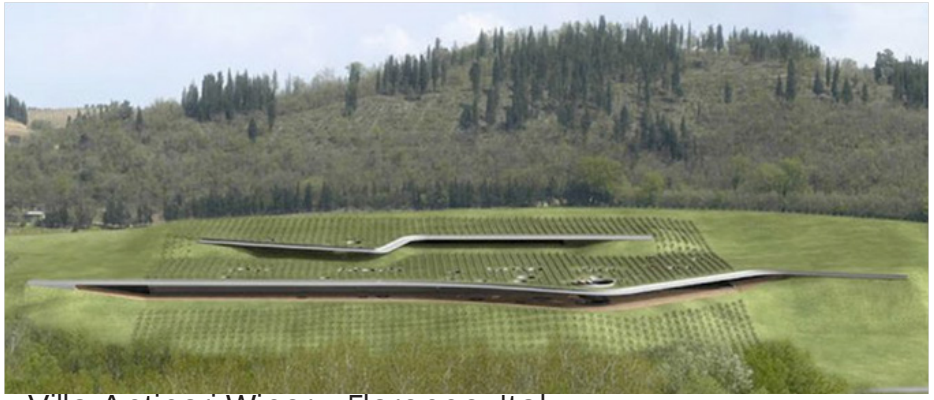
The answer to this problem is one that will likely need to change over a larger expanse of time. Architecture can only make so many strides before cultural norms and issue begin to limit the capabilities of designers. Even if the ideal form of housing is built tomorrow, there is no guarantee that it will be used. If the units are slightly too small or the location of the units is not right, then the social climate will not accommodate the advancements. Architecture will need to take careful steps in order to find the best ways to align the wants of people with the needs of urban planning.

That is not to say progress cannot be made. Architecture can begin to take the steps necessary and pave the way for continued advancement of this productive housing typology. High density housing needs to take on the responsibility of providing users not only a home, but also the essentials of life. The end goal will be to create a self serving building that supplies the occupants with all the produce they need; a city designed with this in mind will have the potential to grow to much larger scales and densities, without needing expansive reserves of supporting land. Of course, this is a big step to take all at once. Presently the need for architecture is to develop the means of designing housing situations that supply occupants with a set percentage of agricultural produce. Over time, the normalization of this housing typology will allow it to become the backbone of urban design and be accepted as the social standard for housing.

“Historically, architecture has been dominated by two opposing extremes: an avant-garde full of crazy ideas, originating from philosophy or mysticism; and the well organized corporate consultants that build predictable and boring boxes of high standard. Architecture seems entrenched: naively utopian or petrifyingly pragmatic. We believe there is a third way between these diametric opposites: a pragmatic utopian architecture that creates socially, economically and environmentally perfect places as a practical objective. At BIG we are devoted to investing in the overlap between radical and reality. In all our actions we try to move the focus from the little details to the BIG picture.”

- Bjarke Ingels

Noblerot Restaurant & Rooftop Garden, Portland, Oregon



Villa Antinori Winery, Florence, Italy

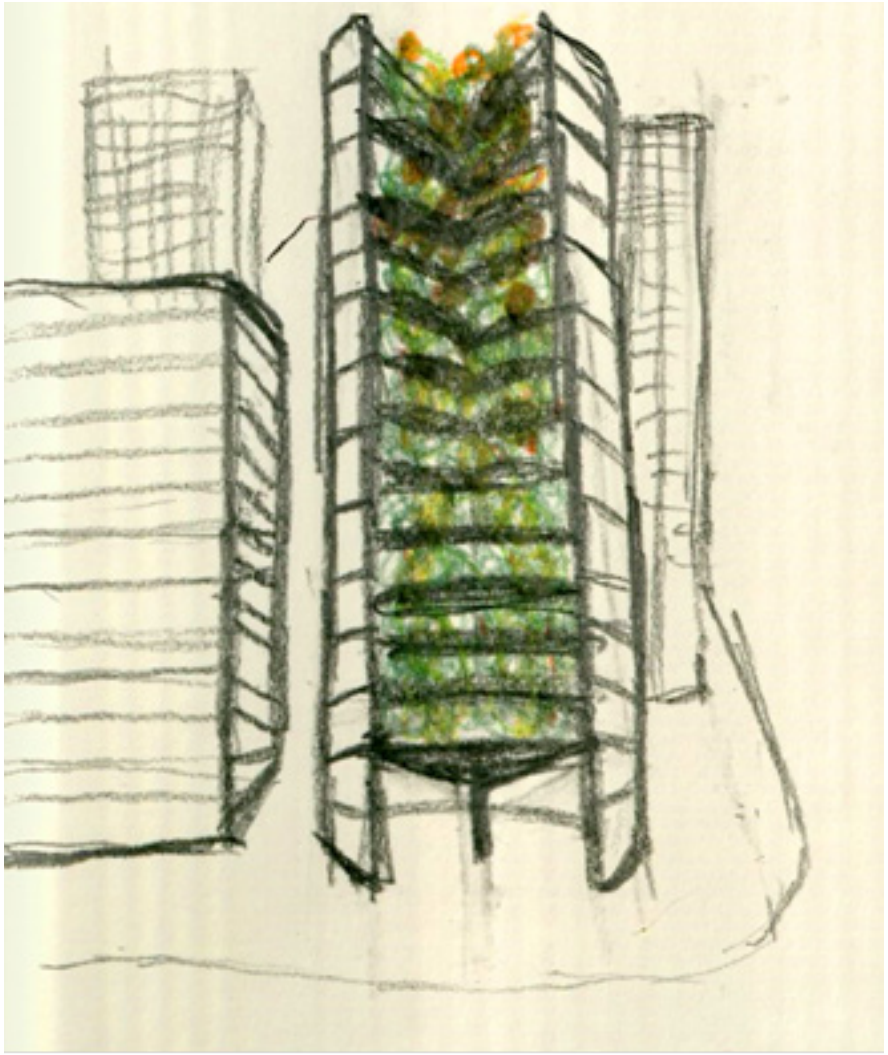
High density housing needs to take steps to become self serving by incorporating a full range of resource management services into a highly efficient housing structure. Successful architecture must meet at the intersection of needs and wants. In the United States, this is a glaring issue where housing tends to fall on either end of the density spectrum, but rarely meets in the middle. The U.S. suffers from sprawling suburban neighborhoods where every family maintains an under utilized piece of land, as well as overly dense urban centers that are devoid of human and environmental consideration. Architecture needs to begin to bridge this gap in order to lay the groundwork for the future expansion of cities and to provide a greater meaning to residential architecture. Urban areas in particular must begin to think about the way land is used and how buildings occupy and use it. Modern developments have allowed buildings to efficiently provide more than one service to the people which is vital to planning a city with appropriate density. There is now the ability to design a building that is not only an apartment complex but also an office, a garden that provides food while also acting as a public recreation space. These multi-use buildings need to become the norm in order to balance the needs and wants of people.

Cities like Burlington, Vermont have already seen the merit in these endeavors and have begun to restructure their urban centers in response. One example of Burlington's Legacy Project Action plan is the re-purposing former coal factories into housing projects as well as transforming these buildings into flood management systems.

Buildings like the Villa Antinori Winery have begun to investigate how a building can merge with the landscape while also producing food. This winery in Italy is buried into the hillside which allows it to maintain a vineyard. Buildings like these need to become the norm rather than applauding the occasional occurance. The typology of the productive housing development is one that needs to be the next architectural movement in order to set a new social norm and pave the way for future urban growth.

4 - THESIS PROPOSAL

The building will be one that blends the residential and agricultural typologies. The project will explore the generation of a productive residence in an urban setting. The thesis analyzes the cultural conditions of such a building and how it might fit into the urban fabric of a city. In addition, it will investigate the scaling of such a building and how a plot of land will answer to population density as well as agricultural use. A standardized set of building layers will be clearly defined as a rationale for designing a building that conforms to the site and cultural concerns. The summation of these considerations and intents will be a building that supplies the community with a food-producing building and recreational landscape while also serving the urban needs of the environment.



5 - SITE SELECTION

CRITERIA

CLIMATE: In consideration of the agricultural aspect of the program, the building will want to have a temperate climate that has more productive growing seasons. A site with a full range of seasons will be ideal for this type of program in order to test the thesis against an intensive and varied climate. Greenhouse technologies can be implemented to supplement growing seasons and increase diversity of agriculture.

SETTING: The project statement dictates the need for an urbanized setting. In order to fully consider the building as a solution to the future housing and land use concerns. The program will be most successful if a site is located on the fringe of a city where it has ample space to test the ideas but also a strong relationship to an existing urban center. The fringe-based location will also be important in consideration of the growth of the city; as the urban center grows, the building will become a foothold within a densifying area and ideally shape the way the surrounding context evolves.

SIZE: The agricultural characteristics suggest the need for a medium to large lot, which is unlikely to be found in an established urban center, which reinforces the need for a site located on the outer edge of a city. Multiple smaller sites can also be used to achieve the same effect, or to create a more dispersed building that may be more in line with a housing complex.

> "The minimum amount of agricultural land necessary for sustainable food security, with a diversified diet similar to those of North America and Western Europe (hence including meat), is 0.5 of a hectare per person. This does not allow for any land degradation such as soil erosion, and it assumes adequate water supplies. Very few populous countries have more than an average of 0.25 of a hectare. It is realistic to suppose that the absolute minimum of arable land to support one person is a mere 0.07 of a hectare–and this assumes a largely vegetarian diet, no land degradation or water shortages, virtually no post-harvest waste, and farmers who know precisely when and how to plant, fertilize, irrigate, etc. [FAO, 1993]"

Nutritional based needs for 1 person for 1 year (Mini Farming, Self sufficiency on a 1/4 acre)

- Veggies: 456 lbs
- Fruit: 365 lbs
- Wheat, corn, oats, rice: 250 lbs
- Lean mean and eggs: 159 lbs

A 200 person residential program would require roughly 34 acres to be fully sustaining. 50% of this requirement would be approximately 17 acres. For the purposes of this thesis, the goal will not be to produce 100% of a person's diet, but rather use the agricultural aspect to reduce economical strain on the building's residents.

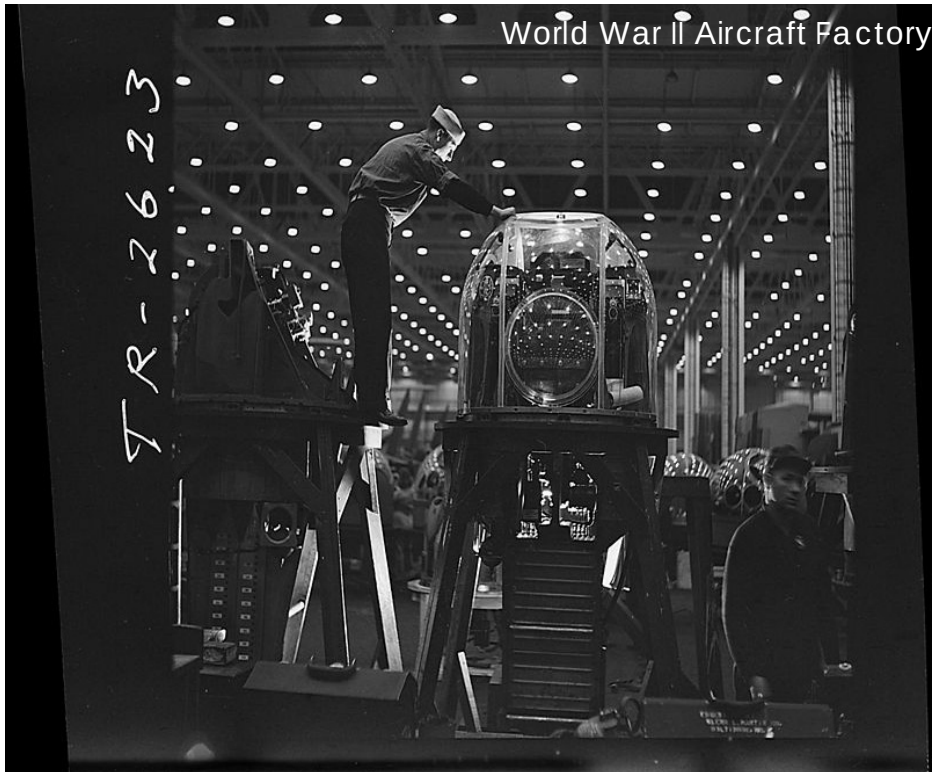
BALTIMORE, MARYLAND

Baltimore was founded in 1797, when Baltimore town merged with Fells Point. Baltimore is a historically a working man's city that has roots in a variety of trades including flour and linen. The introduction of railroads saw to a boost in the city's economy at a time when it had begun to falter and helped to revolutionize business and managerial practices. The port became a staple to the city's economic growth as it allowed the city to take part in a variety of industries including tobacco, grain, autmobiles, and tin and sheet-iron ware products. The boom of these markets allowed Baltimore population, and subsequently housing structure, to expand and between 1869 and 1896.

Around this time, Baltimore was poorly managed and had begun to fall behind in infrastructural technologies when compared to other major cities such as Chicago or New York. In 1904, the city suffered The Great Baltimore Fire which razed 70 blocks and 1,526 buildings. While it was a major crisis, it allowed to city to begin to restructure itself; Baltimore began to focus on resolving its issues such as sanitation and water supply. These adjustments following the fire allowed the city to catch up to some of the modernization efforts of the era.

World War II brought large amounts of industry to Baltimore, which served as a hub for massive war production endeavors. The leading factories were Bethlehem Steel's Fairfield Yard, a ship manufacturer on the southeastern edge of the harbor, and Glenn Martin, an aircraft plant northeast of downtown. These, along with other war-based factories and industries, brought between 150,000 to 200,000 workers from surrounding southern countries to Baltimore. The city continued to expand with the influx of war workers and during this time and brought about new housing developments.

Baltimore following The Great Baltimore Fire



World War II Aircraft Factory

As Baltimore and its population grew, the diversity of the city began to vary. Historically, the city has always been heavily mixed in its demographic; the civil war and the events leading to it demonstrated the ethnic diversity of Baltimore and the political strife that came with it. In the 1800's, Baltimore found itself as a city with mixed feelings about enslavement. Unlike other cities of the time, there were some black citizens of Baltimore who had gained freedom and some that still found themselves as slaves but regardless of their situation, they found more freedom than other places of the time. During this period there was also an influx of German and Irish immigrants who helped to saturate the labor market, which was particularly difficult on the black economy. Leading up to the Civil War and even following it, Baltimore had the highest African American population.

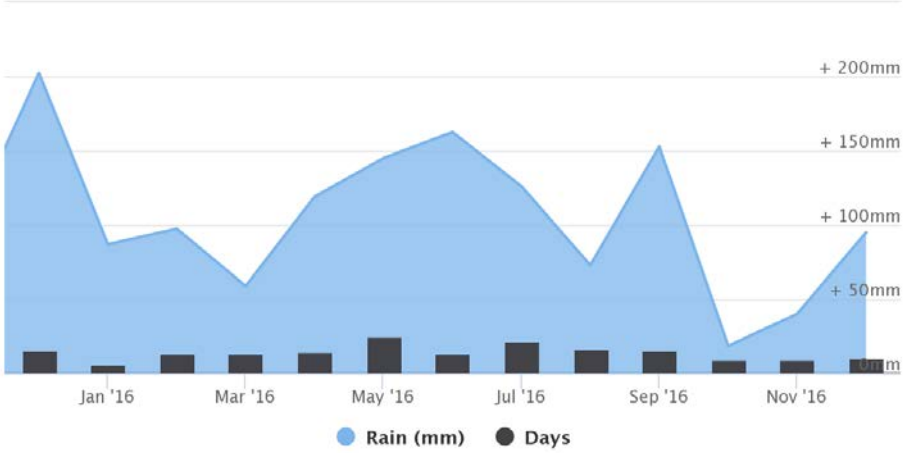
Similar conditions persisted throughout the early 1900's and into the post World War II area. Following the war, the civil rights movement began with Baltimore at the center. The African American demographic of the city began to protest for their rights and organized one of the first sit-ins at Read's Drug Store. The racial divide continued following Martin Luther King's death, which sparked riots throughout Baltimore and left six dead, 700 injured, and 5,800 arrested. The riots escalated to the point where 6,000 Army troops were required to reign in the city, which had become drastically divided.

At around the same time drugs had become a major problem, with heroin being the biggest. The 1960's saw to a drastic rise of heroin addiction and accompanying it an increase in drug-related violence and burglaries. To make matters worse, a failed attempt to integrate school systems caused white flight from public schools which led to many urban schools becoming reliant on government aid and lacking sufficient funds to provide proper education.

Race relations sparked again in 2015 following the death of Freddie Gray while in police custody. The case caused outrage among the black community and resulted in riots that began peacefully, but turned violent following Gray's funeral.

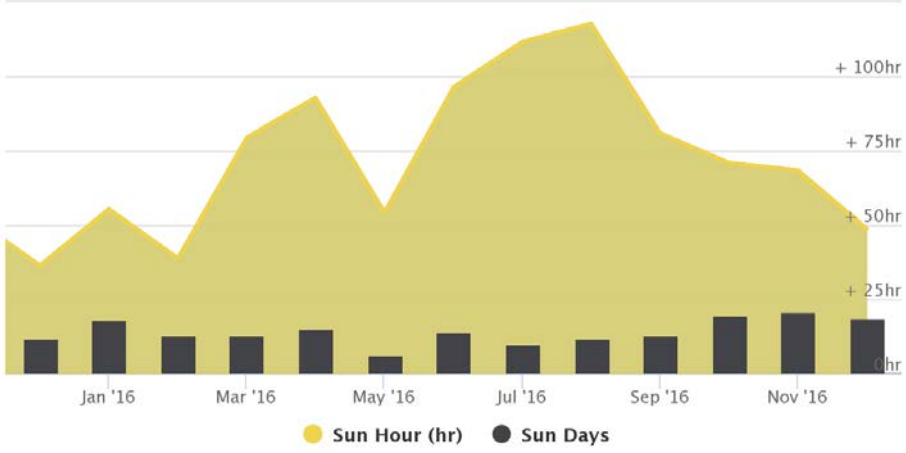
Baltimore, Maryland

Average Rainfall Amount (mm) and Rainy Days



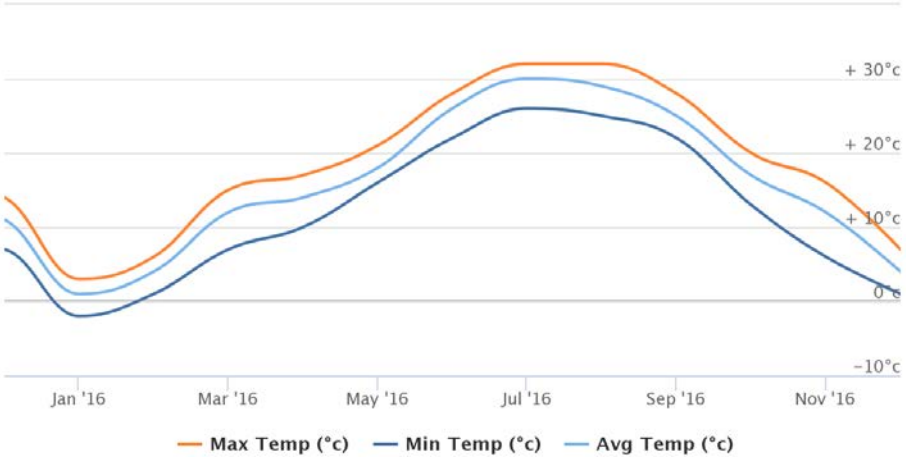
Baltimore, Maryland

Average Sun Hours and Sun Days



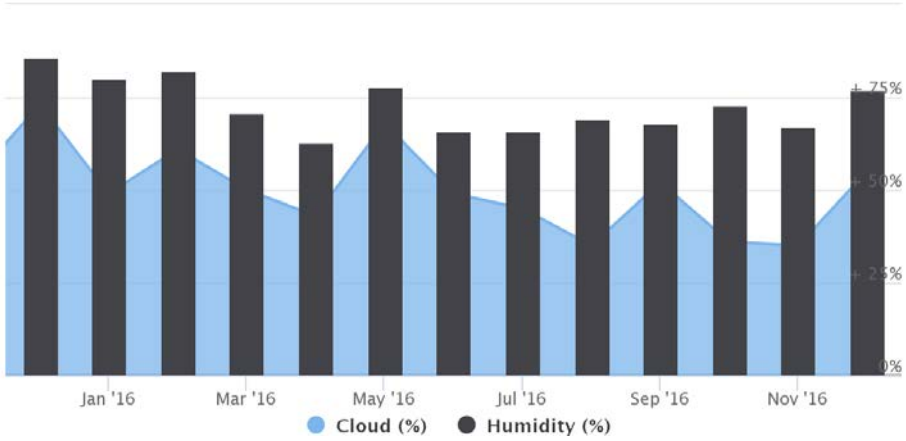
Baltimore, Maryland

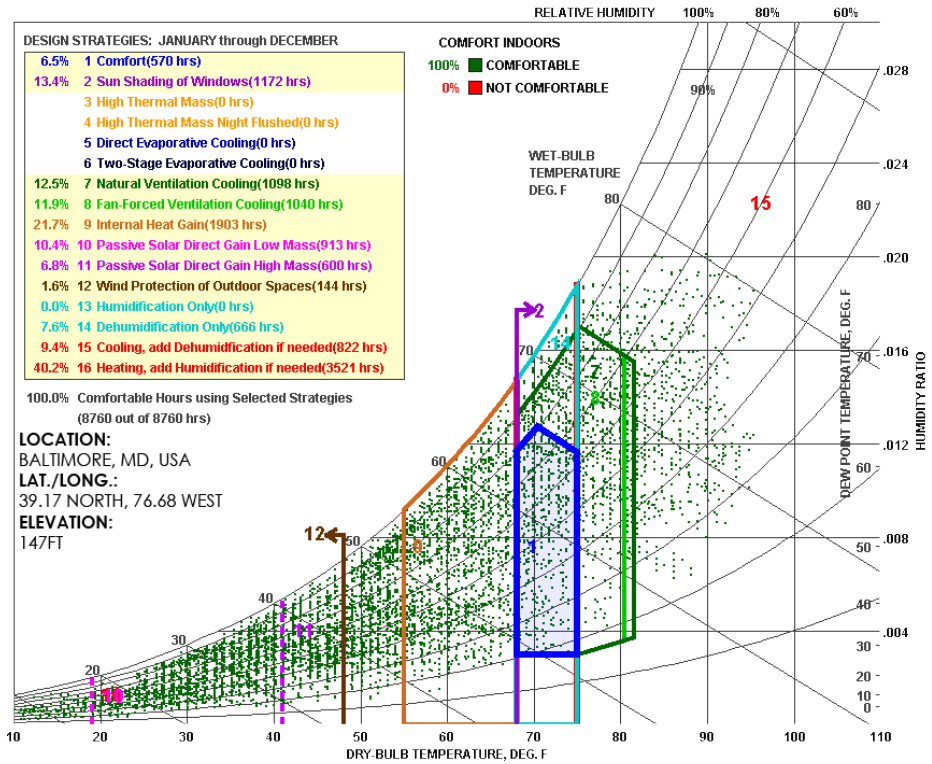
Max, Min and Average Temperature (°c)

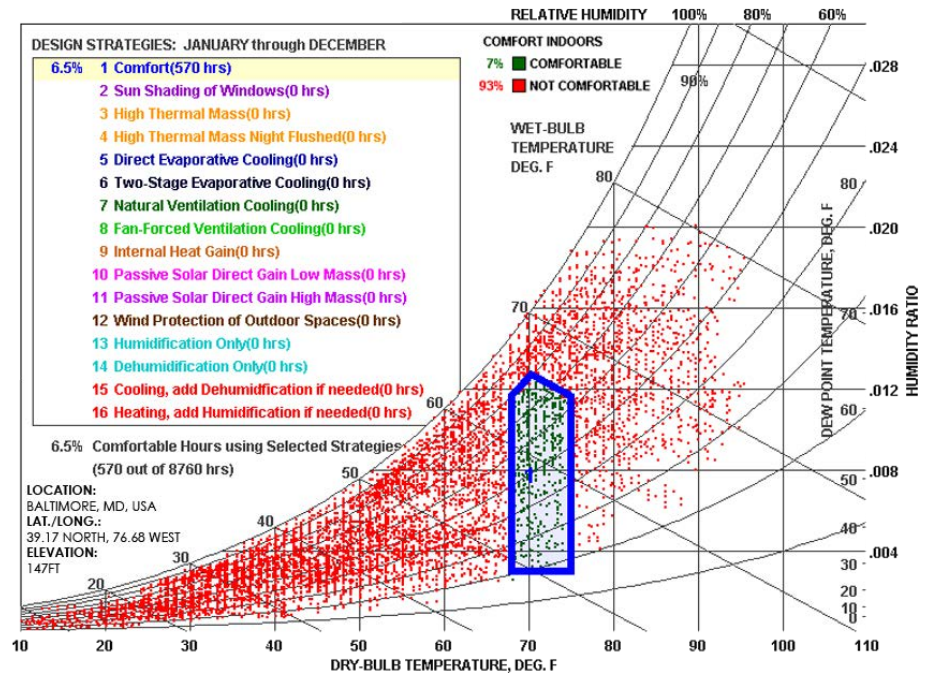


Baltimore, Maryland

Average Cloud and Humidity (%)







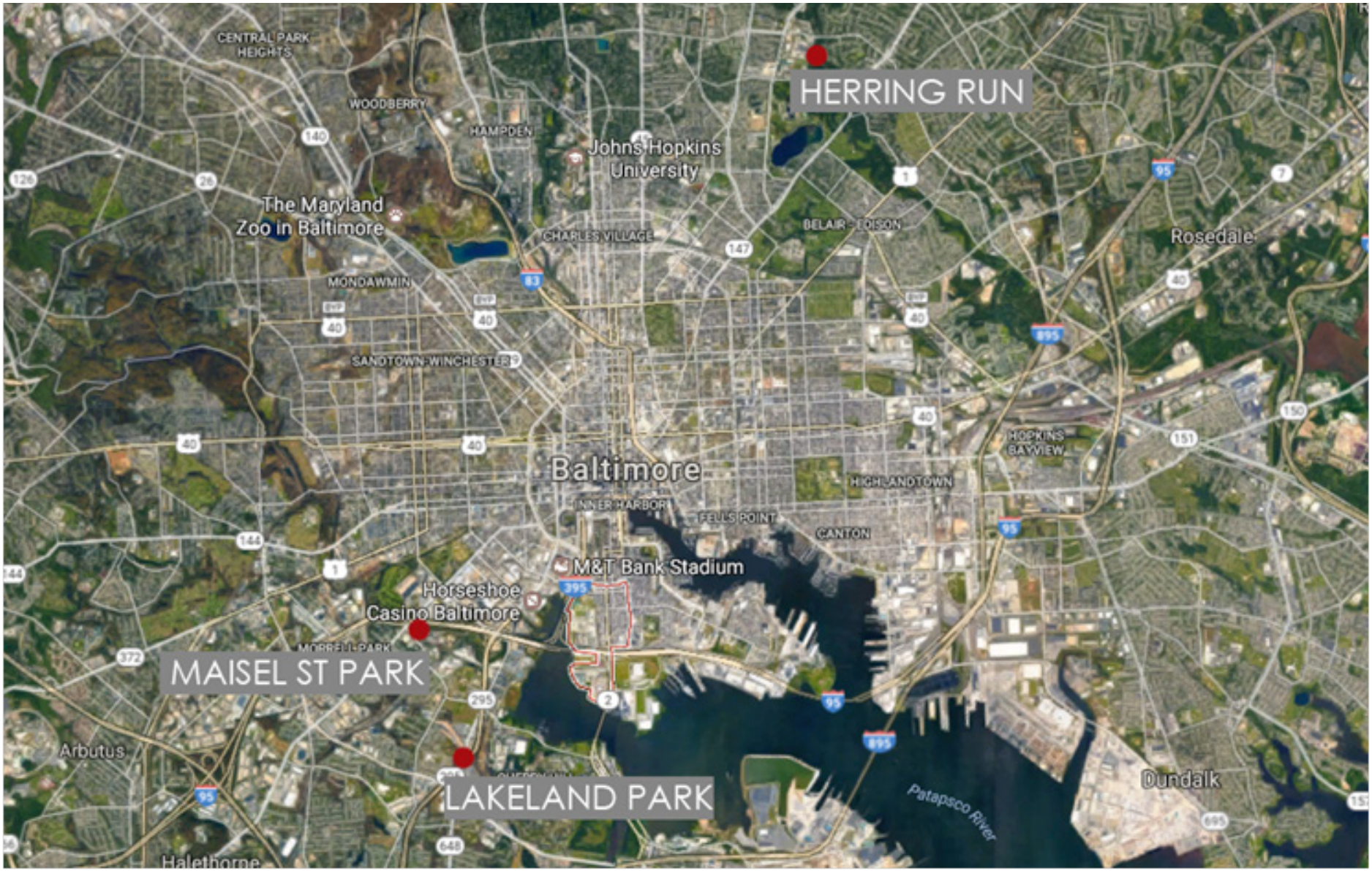
Baltimore's climate encompasses all four seasons and lies in a humid subtropical climate zone. The city experiences a range of temperatures, with the lowest tending to be around 20°F and the highest reaching above 105°F. The region tends to experience warmer temperatures, and higher humidities that range from 70%-80%.

The winters see average temperatures of approximately 38°F with highs of about 50°F. While the winters tend to be on the warmer side, there is still sporadic snowfall that averages out to 20 inches yearly, though there are significant variations in this number. The heat island effect plays a notable role in winter precipitation as the denser parts of the city may reduce the amount of snowfall.

Spring is also a relatively warm season, though it also exhibits some of the more extreme weather. Spring sees the most frequent and highest amount of precipitation throughout the year and is typically experienced as rainfall. Baltimore frequently receives up to 6 inches of precipitation throughout the spring season, which at times can cause flash flooding. Baltimore is susceptible to severe winds and even tornados at times.

Summers in Baltimore are hot and humid with temperatures averaging at 80°F. The high temperature in combination with the high humidity leads to summer thunderstorms.

Late summer and early autumn are when hurricanes are the most likely to occur which may also cause flooding throughout the city. Like spring, autumn tends to be warm and experience significant precipitation.



6,301 O'DONNELL STREET, BALTIMORE, MARYLAND, 21224

In consideration of the site, two major factors played a role: the size of the site, and the proximity to the center of the city. The size of the site needed to be large enough to facilitate both an agricultural program, as well as a residential. The intention of the thesis is that these two programs overlap, but in order to properly consider both to a full degree there would need to be ample space for them to operate as well as to maximize density. Proximity to the heart of Baltimore is important to the urban growth aspect of the thesis. The site needs to be one that is within an area of expansion for the city in order to support the concept of long term building use. In addition, the location must also accommodate the scale and typology of the building within the local context.

LAKELAND PARK

Located in Southern Baltimore
Site adjacent to Lakeland Park
Adjacent to Baltimore Washington Parkway
Approximate 1.1 acres (49,250 sq ft)

The first site accommodated the proximity requirements and is adjacent to major access roads. This location is also near public parks, which is ideal for a housing development. Despite these perks, the site is too small for the program.

MAISEL ST. PARK

Located in the Southwest region of Baltimore
Adjacent to I-95
Near industrial, retail, and single home residential
Multiple joined lots. Potential 7 acres (300,650 sq ft)

The Maisel St. location improves on the size of the lot and maintains a closer proximity to the hub of Baltimore than Lakeland Park. This said, the context of the neighborhood is not correct for the scale of the program.

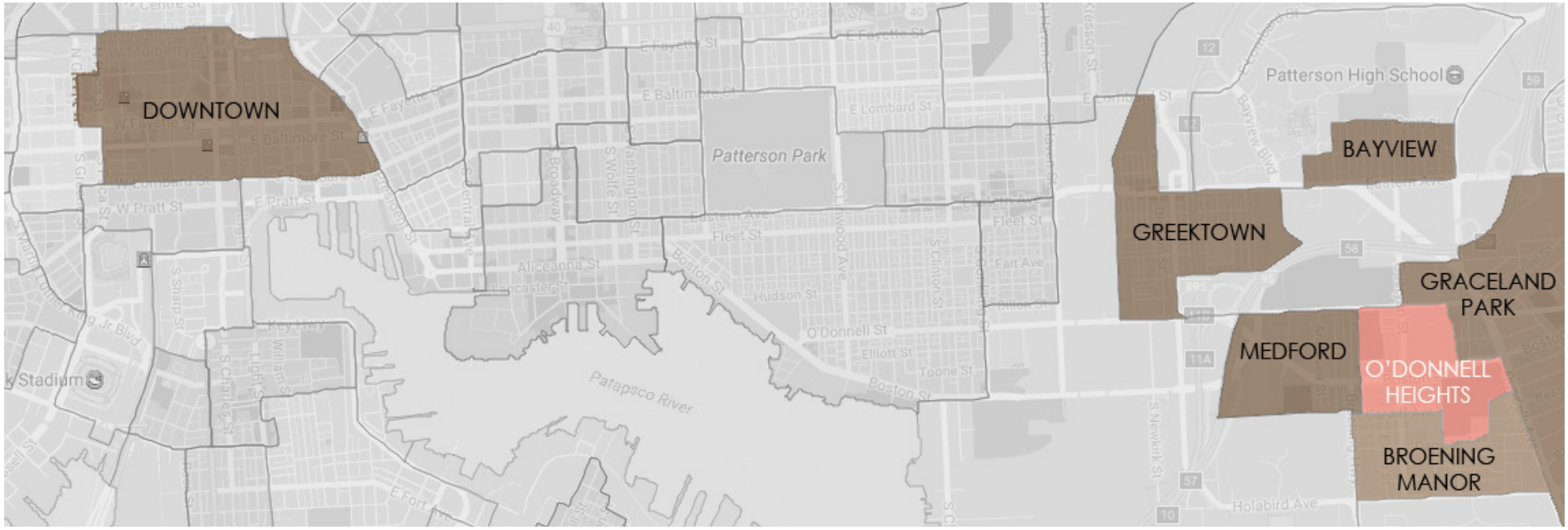
HERRING RUN

Located on the Northeast end of Baltimore
Adjacent to Herring Run watershed
Adjacent to Morgan State University
Meeting point of large scale development and single home residential
Approximately 5.6 acres (244,320 sq ft)

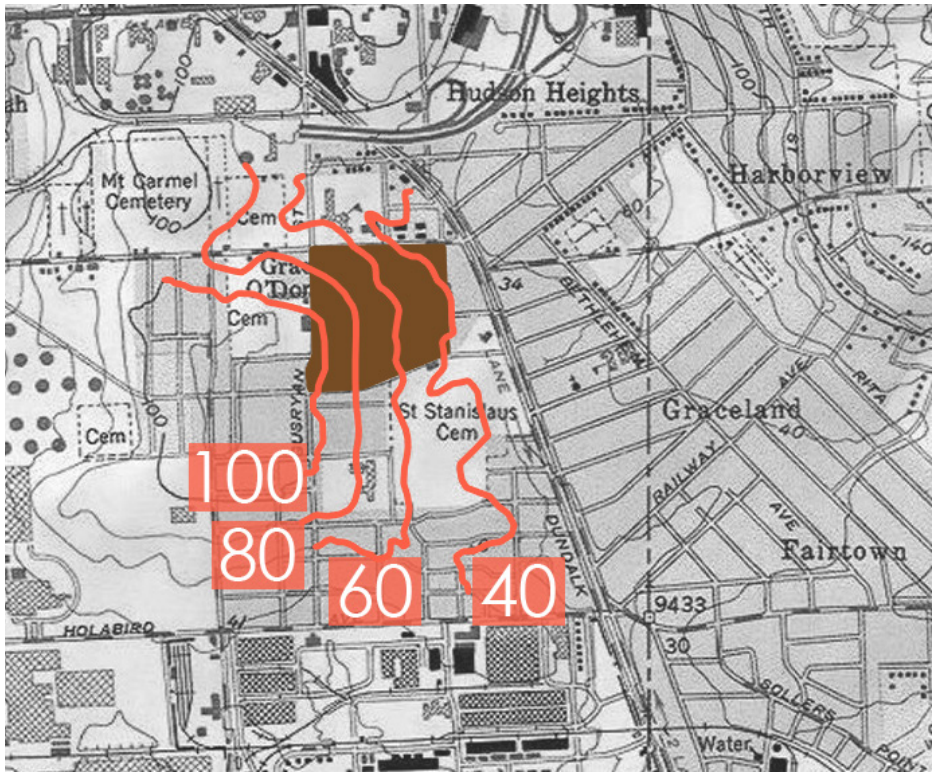
The third site better considered the context of the neighborhood as it is located at the transition between a large scale college campus and single home residences, though the site size needs to be expanded upon.

O'DONNELL HEIGHTS, BALTIMORE MARYLAND, 21224

The neighborhood is names for a public housing project that lands on the Eastern edge of Baltimore county. During World War II when Baltimore saw a large influx of migrant workers, the city expanded and many new housing projects were built to accommodate the growth. O'Donnell Heights was one of these neighborhoods. Originally built as a 900 unit neighborhood, the development was renovated in 1983 and consisted primarily of rowhouses. Following 2007, O'Donnell heights began a new wave of development where many of the existing housing units were demolished in or to allow for construction of mixed-income housing.


DOWNTOWN
Patterson Park
Patterson High School
BAYVIEW
GREEKTOWN
GRACELAND PARK
MEDFORD
O'DONNELL HEIGHTS
BROENING MANOR
Patapsco River


ST MATTHEWS CEMETERY
MT CARMEL CEMETERY
OHEB SHALOM CEMETERY
GRACELAND PARK-O'DONNELL HEIGHTS ELEMENTARY SCHOOL
SWARTZ CEMETERY
BOY'S AND GIRL'S CLUB
6,301 O'DONNELL ST, BALTIMORE, MD 21224
SAINT STANISLAUS CEMETERY
HOLABIRD ELEMENTARY
SUN PRODUCTS CORPORATION
RESIDENTIAL AREA



6,301 O'DONNELL STREET, O'DONNELL HEIGHTS

The O'Donnell heights site is significantly larger than the previous ones at 28 acres. The selection of a site with such a large area resulted from the conclusion that the scale of the program would require twenty or more acres in order to appropriately tackle the thesis. On top of this, the site is maintains a sixty foot slope across the length of the site, which is ideal for an agricultural program.

The context of O'Donnell heights worked in favor of the program for multiple reasons. The site acts as a transition between a commercial/industrial zone and a residential zone which justifies the scale of the program. The location is adjacent to multiple public cemeteries, two elementary schools, and a boys and girls club which are vital for any housing project. Though it is on the Eastern edge of Baltimore, the surrounding area is still undergoing development and expansion.


994 ft
1,230 ft
1,001ft
1,135ft
28 ACRES TOTAL
1,219,871 SQ FT

SOIL DATA

SOIL TYPE	AREA (ACRES)	SITE COVERAGE	CORROSION OF CONCRETE	SEEDLING MORTALITY	SURFACE TEXTURE	pH (1:1 WATER)	SLOPE RANGE	DRAINAGE
KEYPORT 15UB	14.5	51.7%	HIGH	LOW	LOAM	4.7	0 TO 8	WELL
UDORTHENTS 42E	13.5	48.3%	HIGH	LOW	GRAVELLY SANDY LOAM	4.5	0 TO 35	VERY WELL

SOIL INFORMATION

KEYPORT - SYMBOL: 15UB

"The Keyport series consists of very deep, moderately well drained soils on upland foot slopes on the Coastal Plain. These soils formed in moderately fine textured, old fluvial sediments underlain by older deposits of silty clay, Slopes range from 0 to 15 percent.

Soils of the Keyport series are clayey, mixed, mesic Aquic Hapludults.

Typical pedon of Keyport loam, 0 to 8 percent slopes, about 50 feet north of connecting cemetery roads, 0.25 mile northwest of mausoleum on Wilkens Avenue, in Loudon Park Cemetery, in a wooded, undeveloped area...

The thickness of the solum ranges from 40 to 60 inches. Depth to unconforming, coarser materials is typically more than 5 feet. Reaction is strong acid to extremely acid in unlimed areas."

-Information from Baltimore Soil Survey

UDORTHENTS - SYMBOL: 42E

"This map unit is made up of earthen fill and nonsoil material that has been placed on poorly drained to somewhat excessively drained soils on uplands, terraces, and flood plains of the Coastal Plain and Piedmont Plateau. It is on sites of buildings, roads, railroads, recreation areas, and other uses. Areas range from 2 to 570 acres in size. Slopes are very complex and irregular. They range from nearly level to steep, but are dominantly nearly level to moderately sloping. The thickness of the fill varies, but is more than 20 inches. The source of the fill material in this unit is variable, mixed, organic, and inorganic waste from human activity and sandy, gravelly, clayey, silty, and micaceous soil material...

Typically, the surface layer is about 5 inches thick. It is very dark grayish brown gravelly sandy loam that has brick and glass fragments throughout. The subsoill fill material extends to a depth of 65 inches or more. It consists of stratified layers of strong brown, brown, pinkish gray, and gray sand, sandy loam, and gravelly sandy loam that has pockets of charcoal, ash, and brick fragments throughout....

Permeability and available water capacity are variable. in some highly compacted areas, water tends to pond on the surface under heavy rainfall.

Some areas of this unit are almost totally covered with buildings, asphalt, concrete, or other impervious surfaces. Most areas are subject to differential settling and, therefore, have poor potential for use as building sites... Many of the uncovered, nearly level areas, which contain only small amounts of coarse fragments are generally high in fertility and available water capacity and thus have potential for lawns, trees, ornamental shrubs, vegetable gardens and most recreation uses."

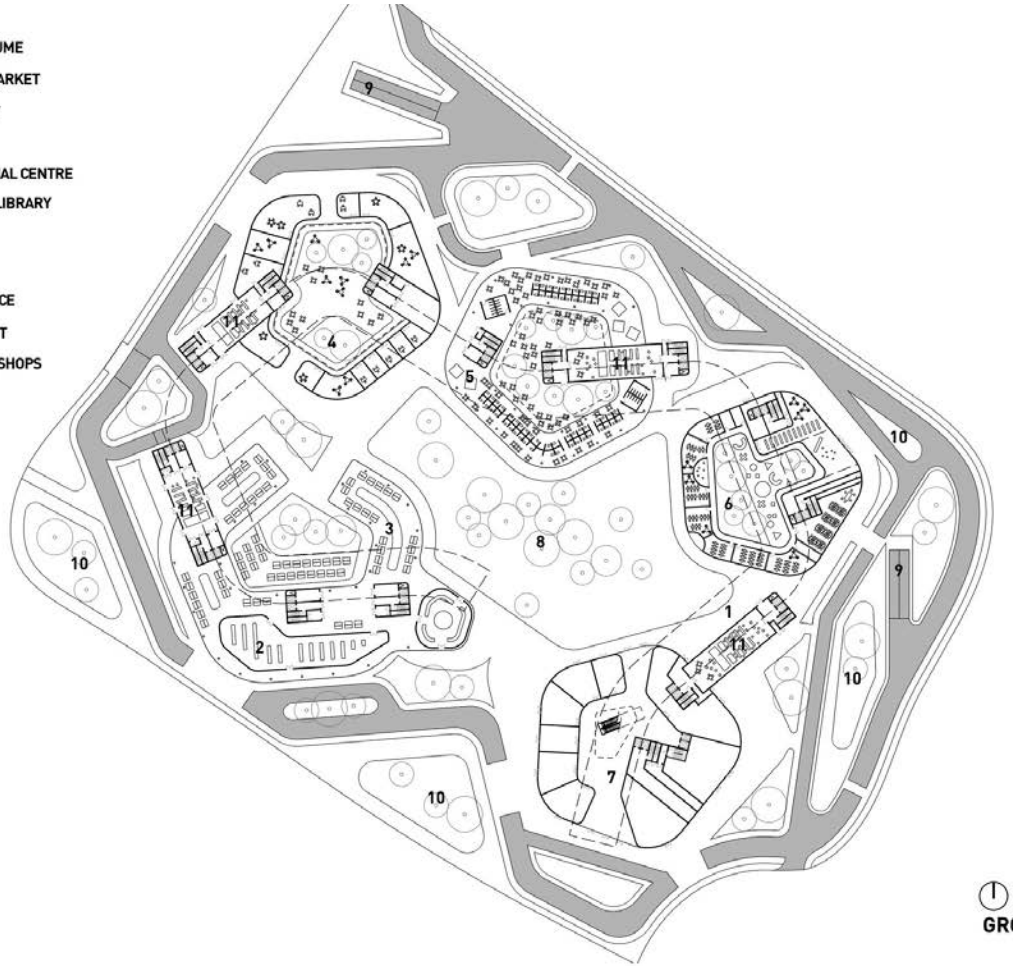
-Information from Baltimore Soil Survey

6 - ARCHITECTURAL PRECEDENTS

-SPARK ARCHITECTS - HOMEFARM

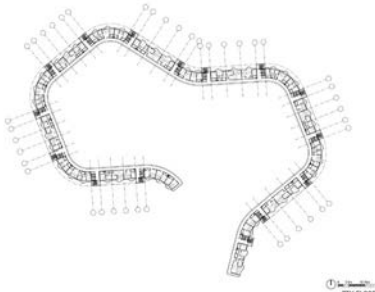
CONCEPT - SINGAPORE

1 RESIDENTIAL VOLUME
2 ORGANIC SUPERMARKET
3 PRODUCE MARKET
4 HEALTH CENTRE
5 FOOD COURT / SOCIAL CENTRE
6 KINDERGARTEN / LIBRARY
7 SENIORS' MALL
8 CENTRAL PLAZA
9 CARPARK ENTRANCE
10 WATER CATCHMENT
11 PACKAGING WORKSHOPS

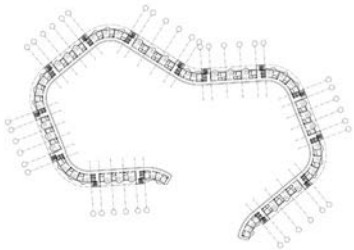


0 5m 10m 25m 50m

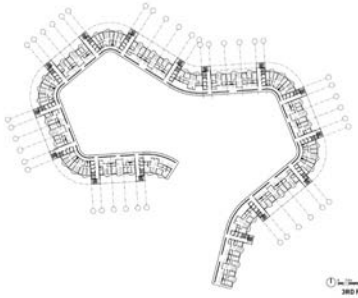
GROUND FLOOR PLAN



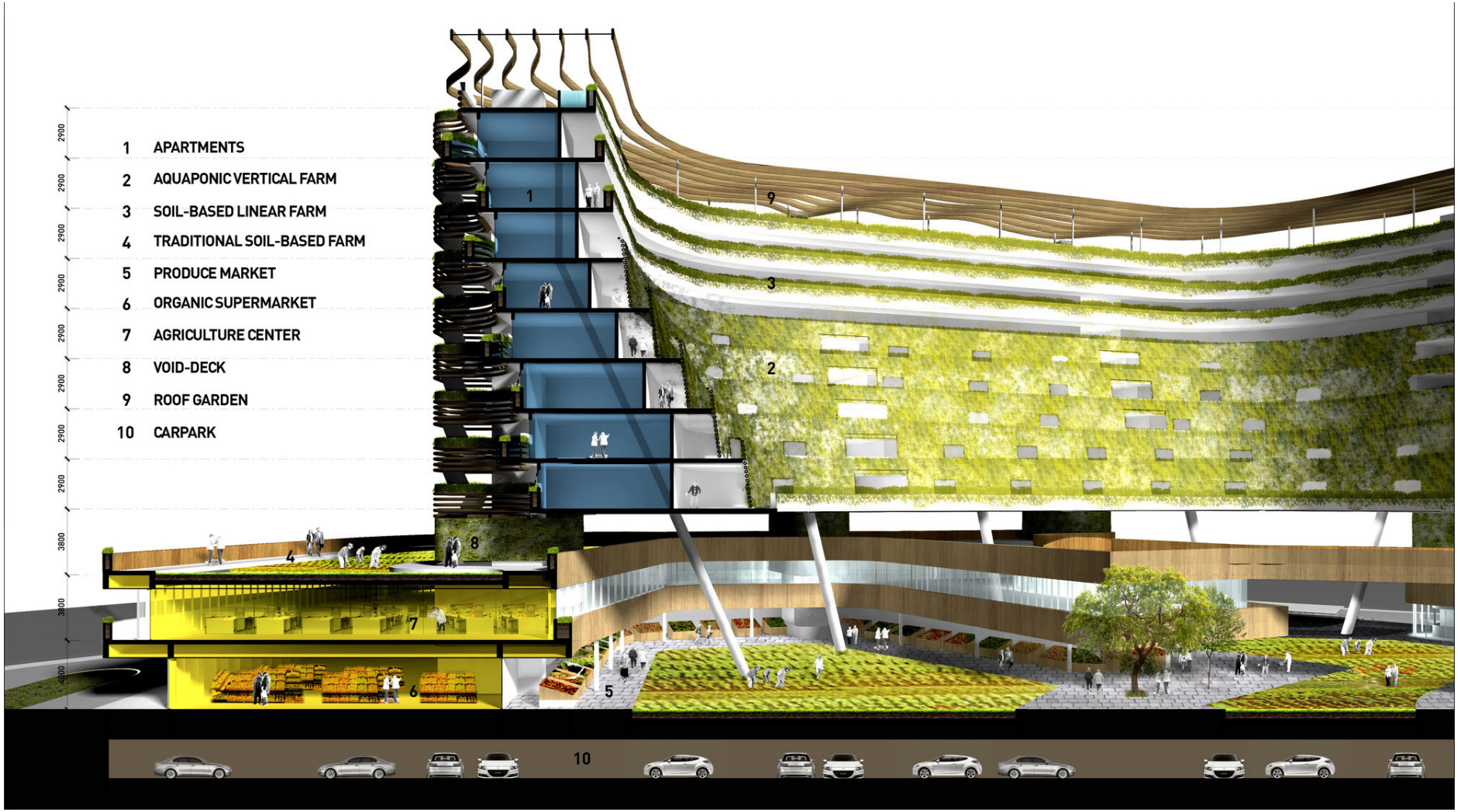
7TH FLOOR PLAN



9TH FLOOR PLAN

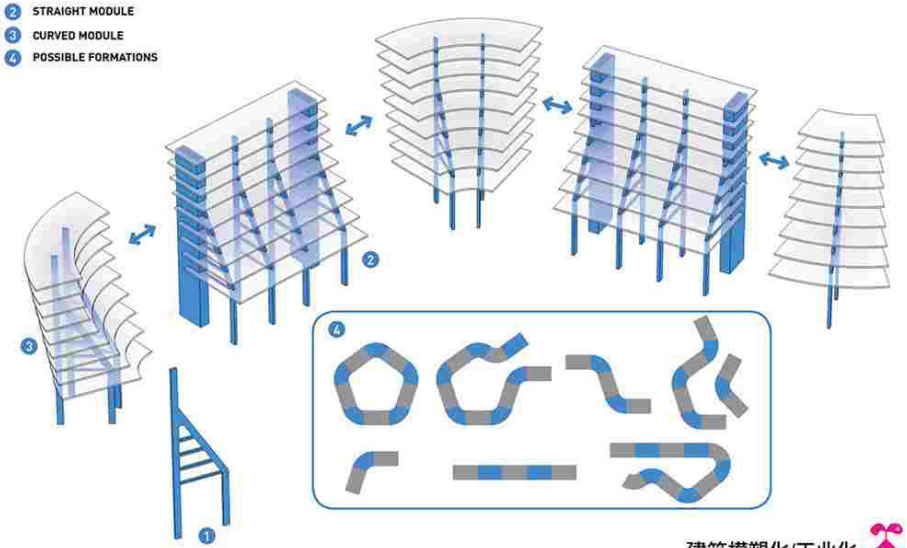


3RD FLOOR PLAN

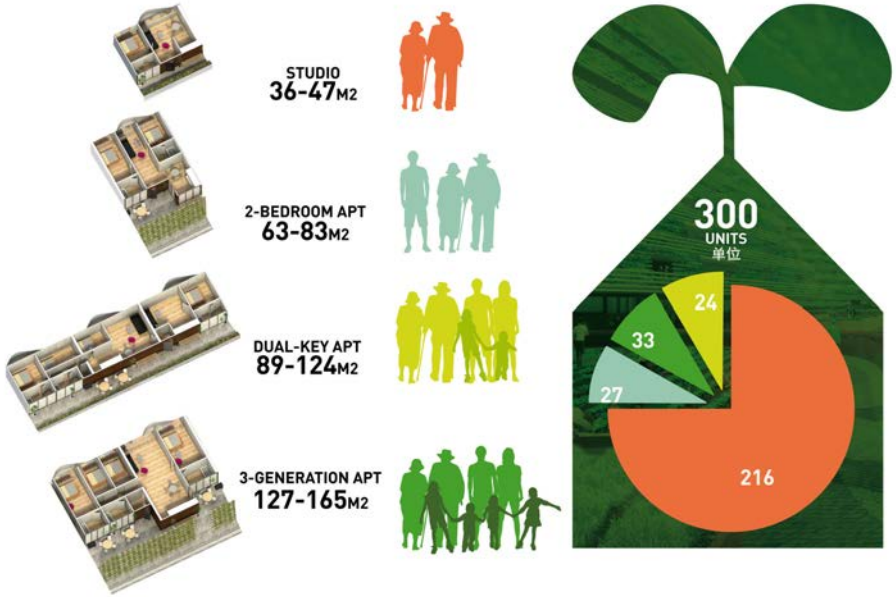


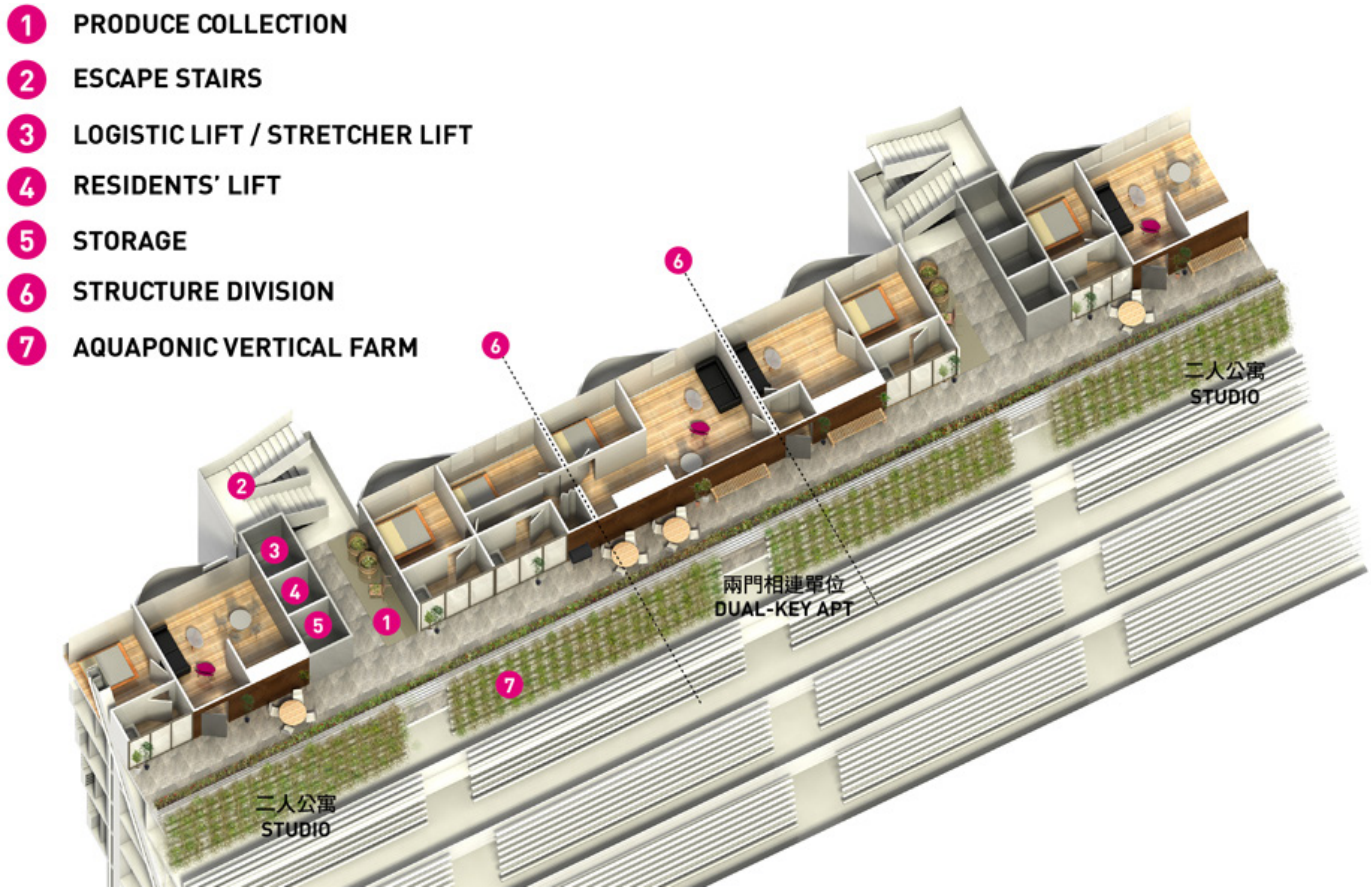
The housing proposal by SPARK architect aims to provide a potential solution to the Asia's financial retirement issues. In the recent decades, the median age of citizens has risen substantially to the point that in 2014 over 11% of Singapore's population was aged 65 or older, yet the support for these citizens has steadily decreased. Pair the declining support for retirees and elderly with the fact that Singapore imports 90% of their food and it becomes a financial crisis. SPARK's homefarm aims to combat these issues by designing a private housing project that incorporates an aquaponic and soil based agricultural sector. By implementing this into the housing scheme, the residents will have a means of producing their own food which will reduce the financial difficulties faced by the elderly and their families.

1. CONCRETE A-FRAME
2. STRAIGHT MODULE
3. CURVED MODULE
4. POSSIBLE FORMATIONS



建筑模塑化/工业化
BUILDING MODULARITY

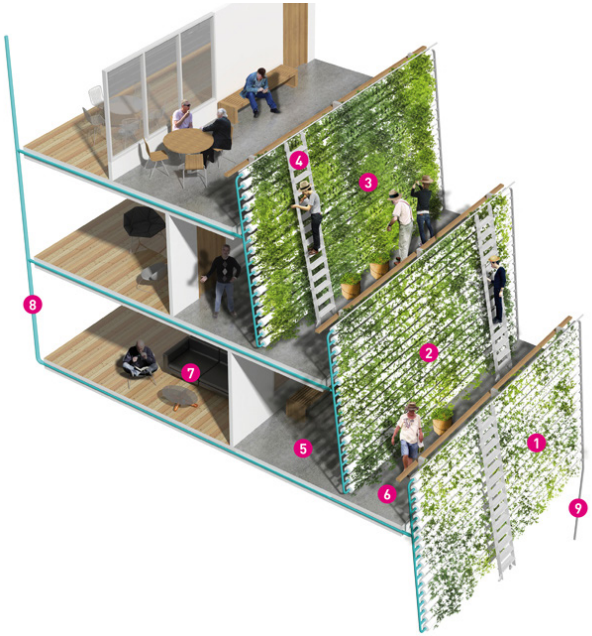




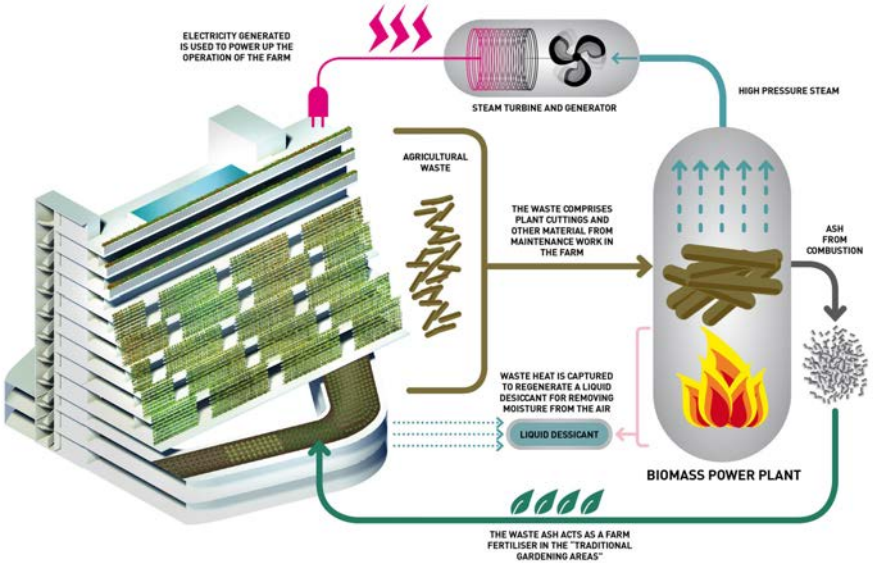
SPARK looked at the typical living conditions of families living in Singapore and designed the housing to fit those norms. The result is that the Homefarm includes a variety of housing schemes and spaces sized to fit varying number of occupants. SPARK found that the most common living unit type was where the elderly lived with spouse and kids, however they also noticed that non-traditional living arrangements, such as multi-family and multi-generational, were becoming increasingly more common.

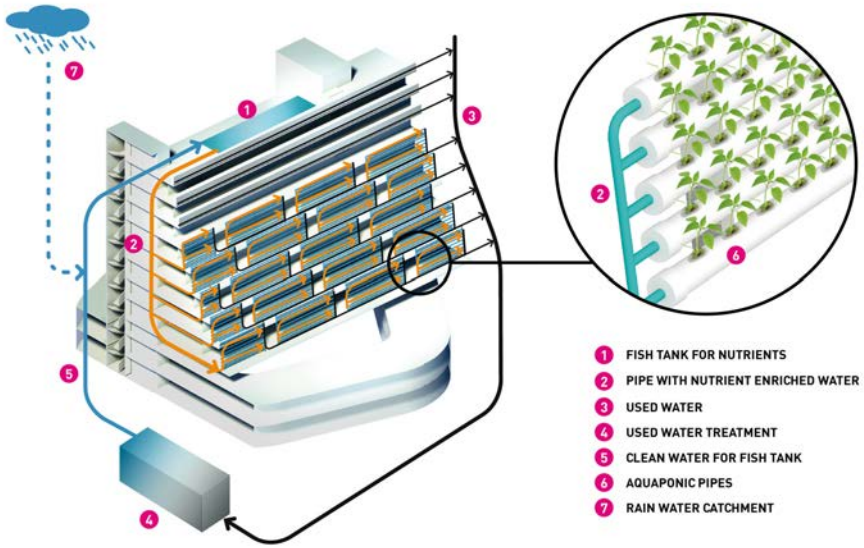
The focus on housing the elderly and providing them with a financial resource is not an idea independent to the Homefarm project. It actually stems from Singapore's Ministerial Committee (MCA) who set out to address the growing concern of financially insecure retirees. They developed a program that focuses on four main ideas, which Homefarm addresses in some way:

Enhance employment and financial security
Enable aging-in-place (with a barrier-free environment and essential services in the community)
Provide holistic and affordable healthcare and elder care
Promote active aging (to maintain physical and mental wellbeing and continue contributing to society)

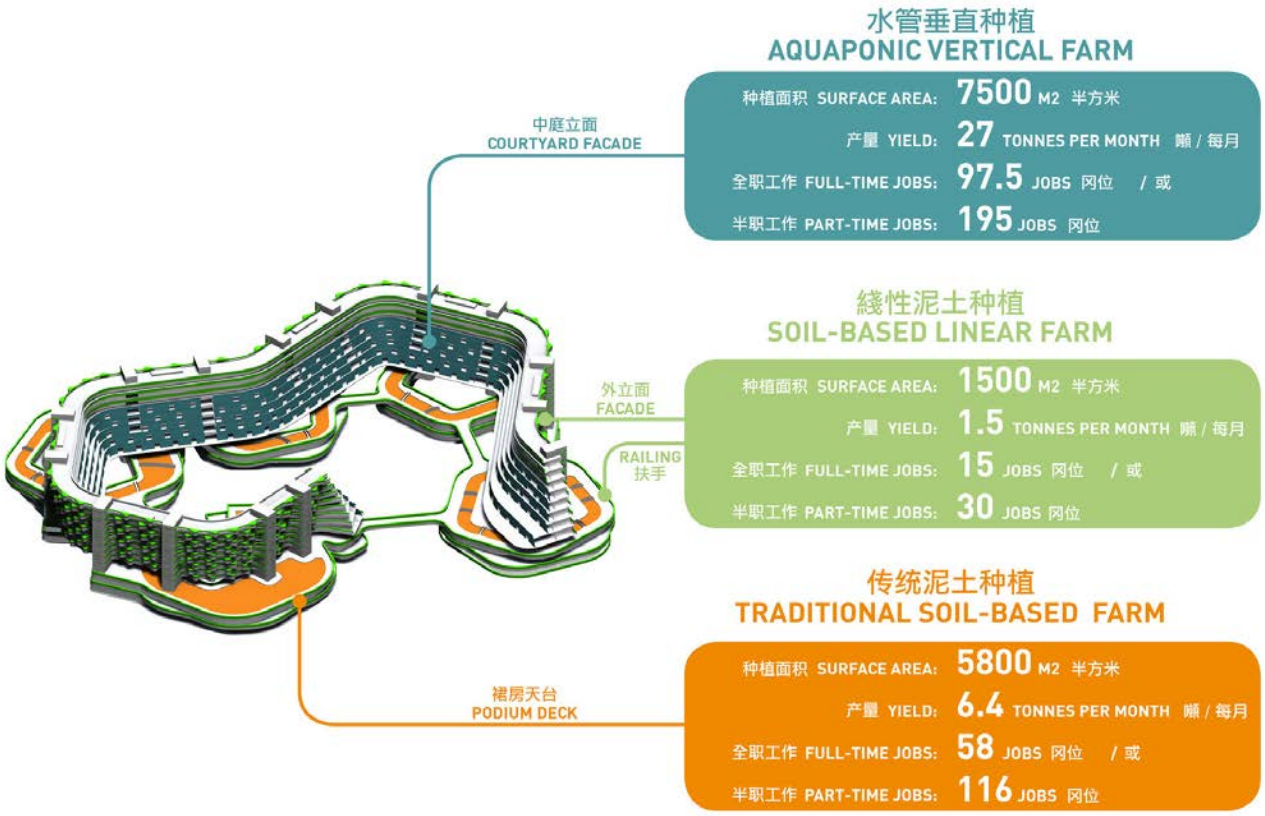


1. NEWLY PLANTED LEAVES
2. 15-DAY LEAVES
3. 30-DAY LEAVES, READY FOR HARVEST
4. HARVEST LADDER
5. COVERED WALKWAY
6. HARVEST CORRIDOR
7. APARTMENT
8. NUTRIENT WATER
9. USED WATER FOR RECYCLING





1. FISH TANK FOR NUTRIENTS
2. PIPE WITH NUTRIENT ENRICHED WATER
3. USED WATER
4. USED WATER TREATMENT
5. CLEAN WATER FOR FISH TANK
6. AQUAPONIC PIPES
7. RAIN WATER CATCHMENT



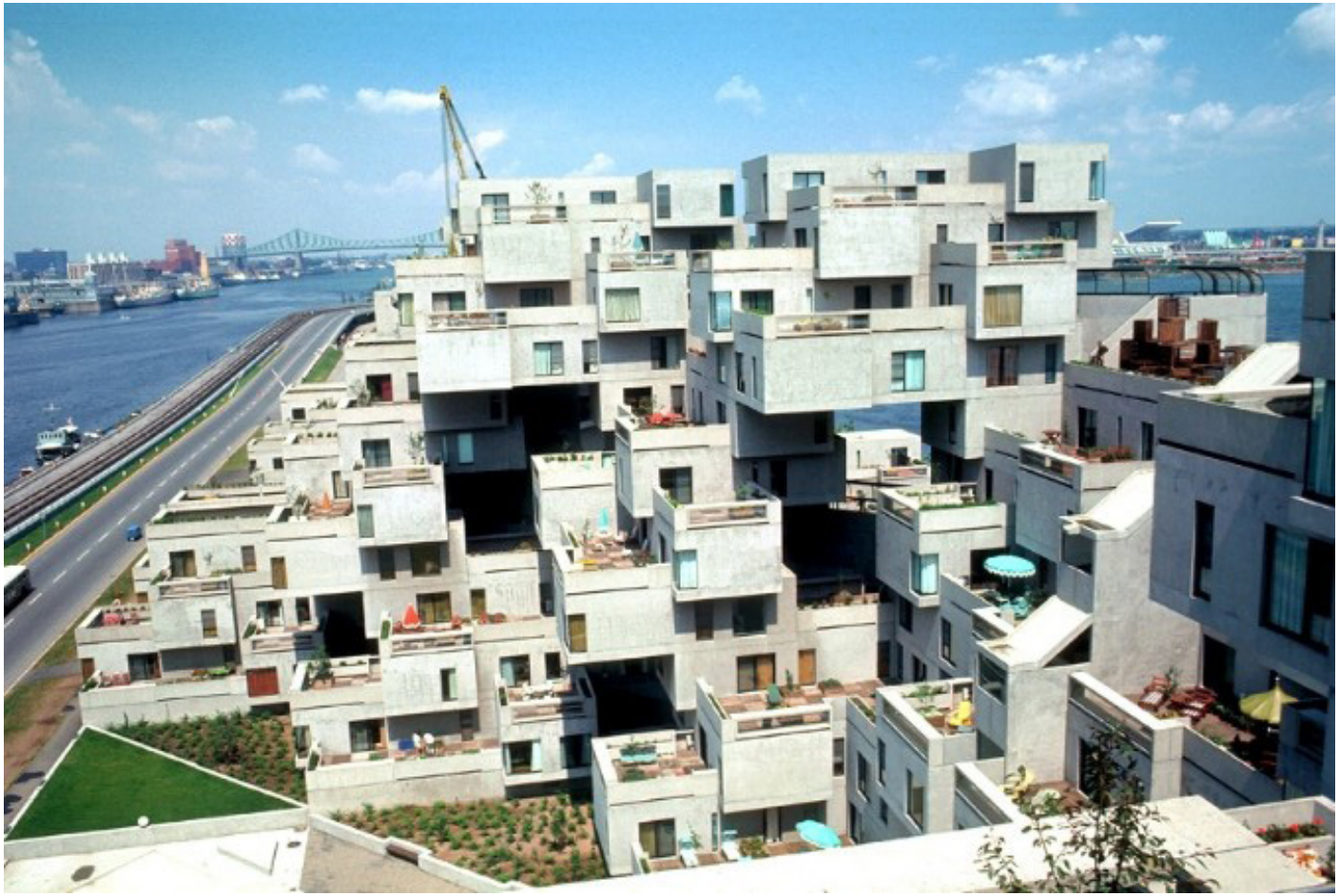
Homefarm's agricultural aspect is approached with multiple techniques: first is a spatially efficient aquaponic vertical farm, second is a soil-based linear farm, and this is a traditional soil-based farm. The aquaponic farm is a system that has already seen much use in Singapore where it often emerges as a rooftop system. In Homefarm, the aquaponic farm becomes a major facade on the interior face of the building. This allows it to be accessible from multiple levels, is highly spacially efficient, and acts as protection from intense solar radiation and heat gain. This system is supplemented by linear soil planters that can be incorporated along exterior walkways an onto the roof to continue to use public space in an efficient and productive way, while also allowing for a broader range of produce. Lastly is the traditional soul based farm which allows for added plant diversity as well as a vital landscape element for the courtyard aesthetic.

The agricultural aspect of Homefarm accomplishes multiple objectives: it first provides financial relief for the elderly in the means of self-sustained food production, it provides the occupants with an object of social interaction, creates a job and service that retirees can still provide without needing to be in the work force, and promotes physical and mental health through gardening. These traits make the Homefarm concept a revolutionary approach to housing, financial, social, and agricultural concerns.

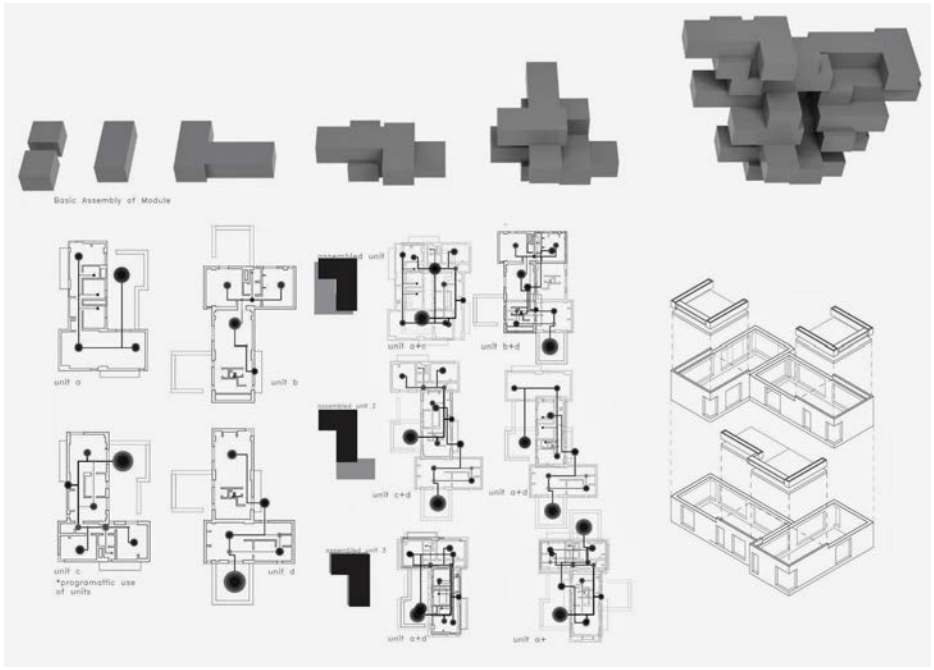
HABITAT 67

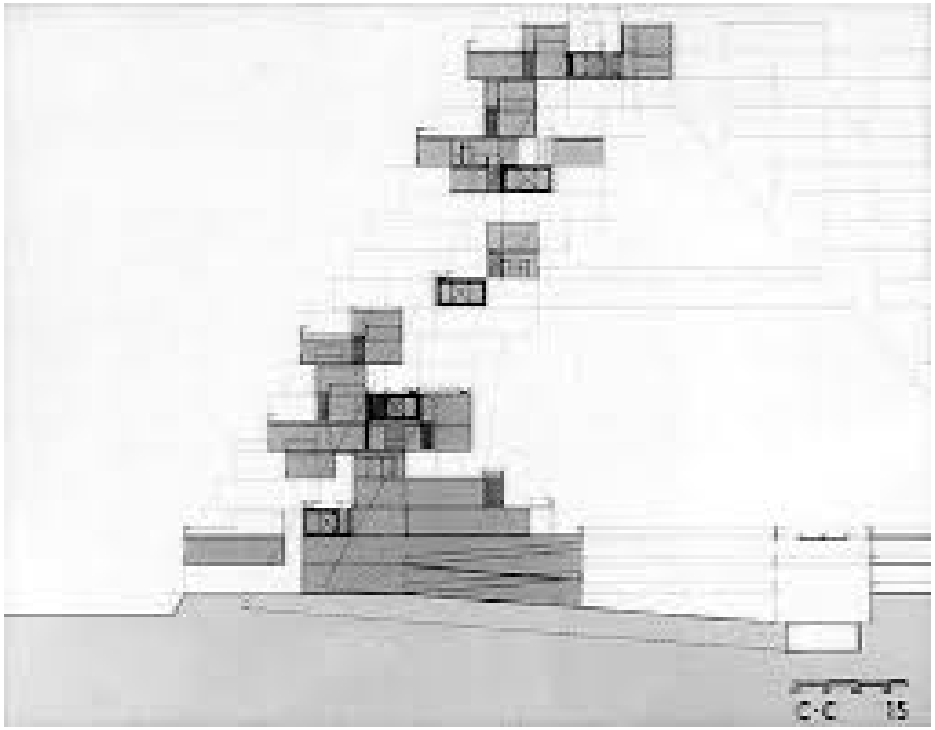
MOSHE SAFDIE - 1967 - MONTREAL, QUEBEC, CANADA

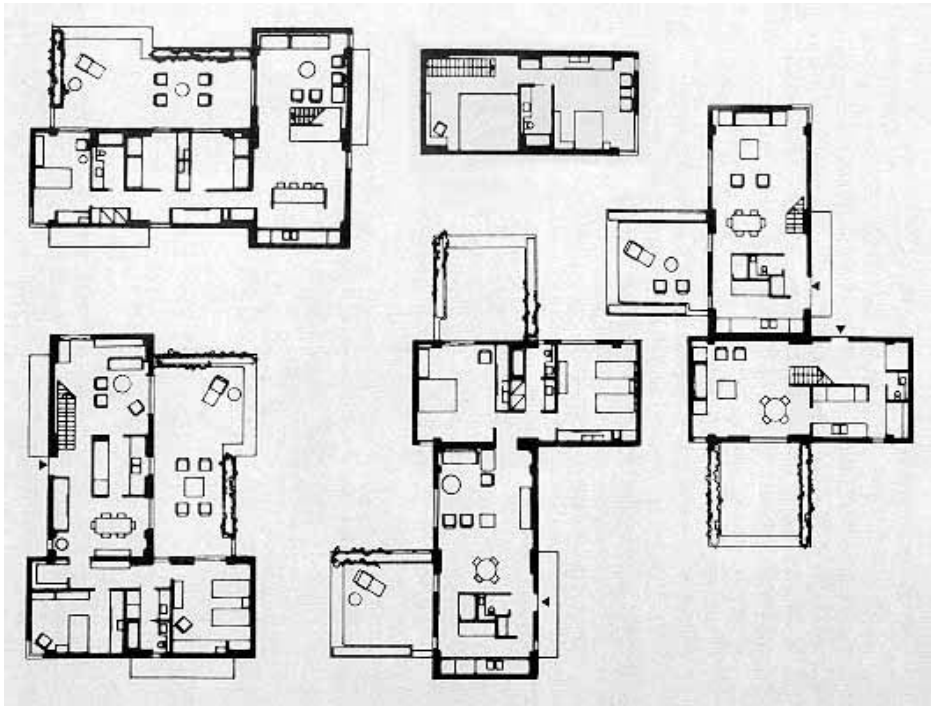
HABITAT 67

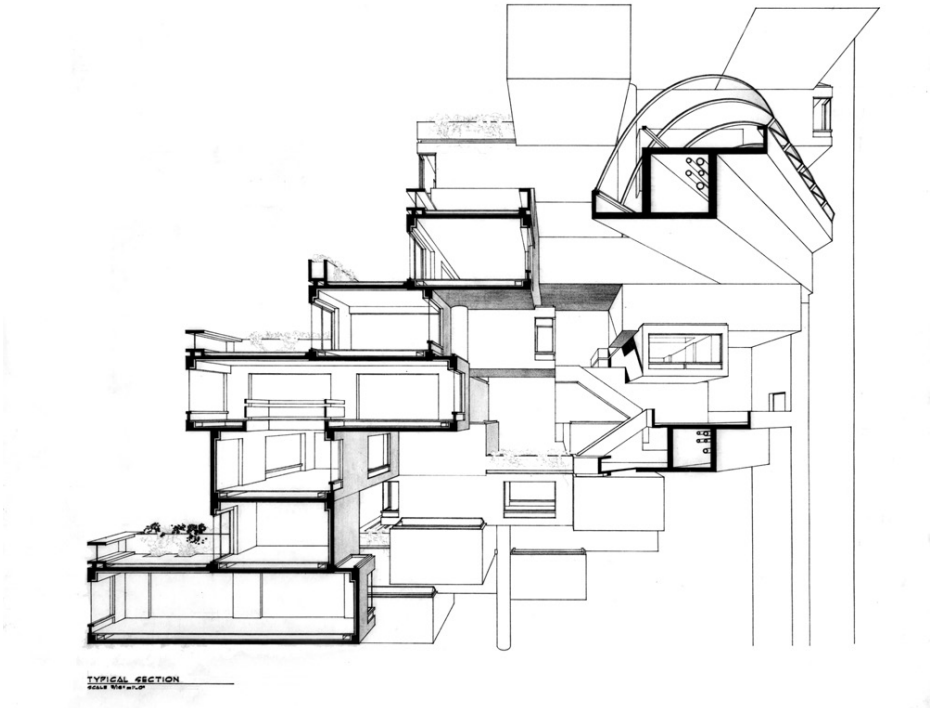


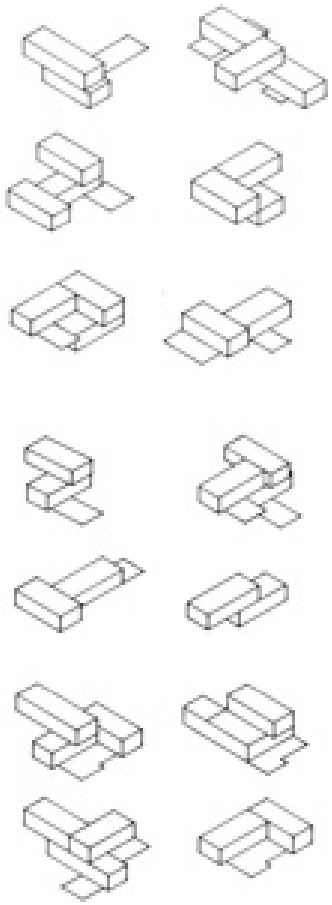
Moshe Safdie's thesis project in 1961 began with the idea of prefabricated living units stacked together and connected in order to create a housing complex that combined the nature, open space, and multi-level living of suburban homes, with the economic thought and density of apartment complexes. He sought to combine the best of both typologies and create a housing complex that could exhibit both. His design was experimental for the time and helped to inspire other prefabricated buildings such as the Nakagin Capsule Tower by Kisho Kurakawa. The design largely explored the ideas of prefabrication as a means of producing high-density and reduced cost housing without sacrificing design creativity, as well as the melding of the suburban housing typology with the urban context and structure.

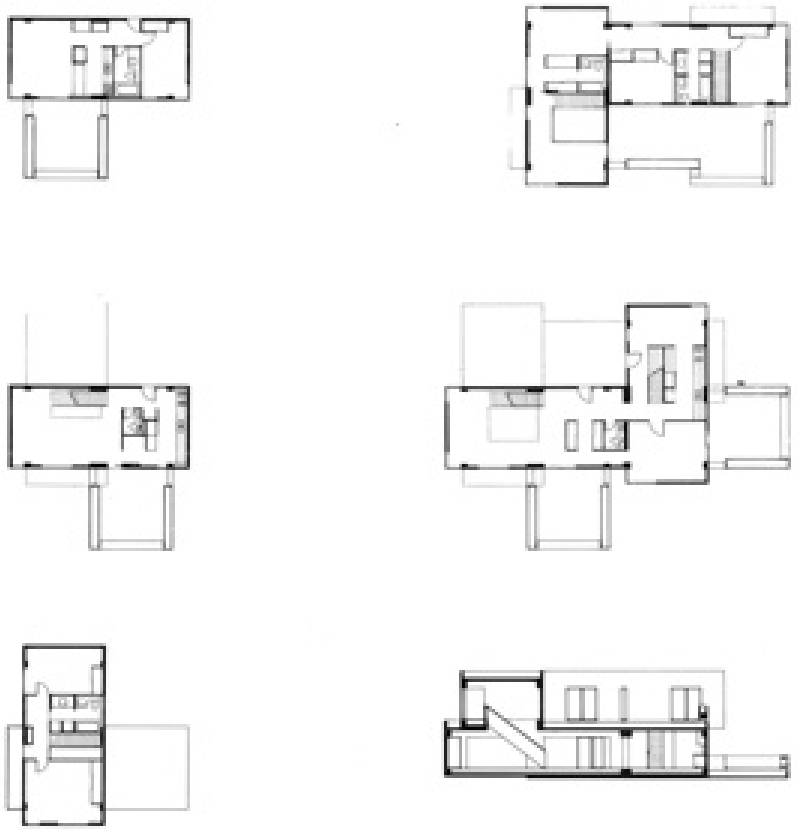

Basic Assembly of Module
unit a
unit b
unit c
unit d
*programattic use of units
unit a+c
unit b+d
unit c+d
unit a+d
unit a+d
unit a+





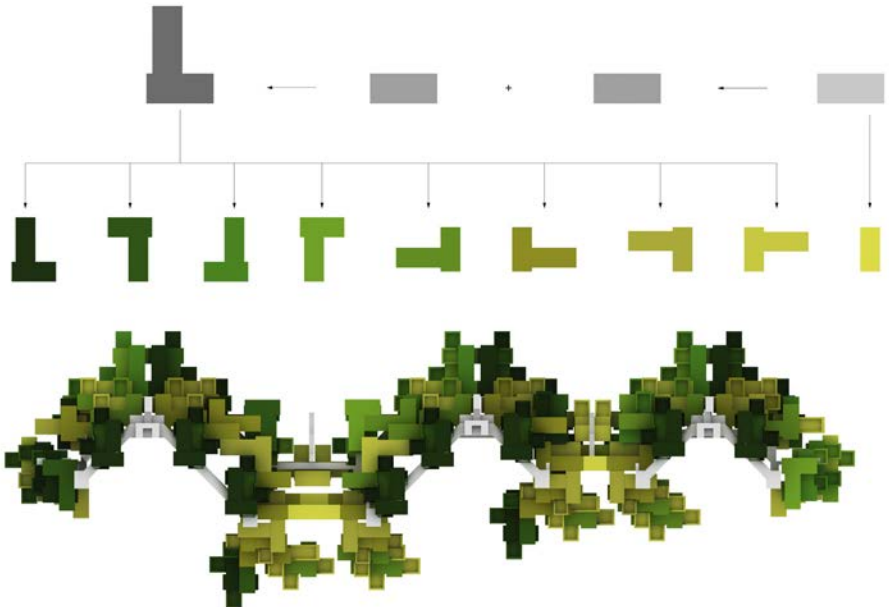

TYPICAL SECTION

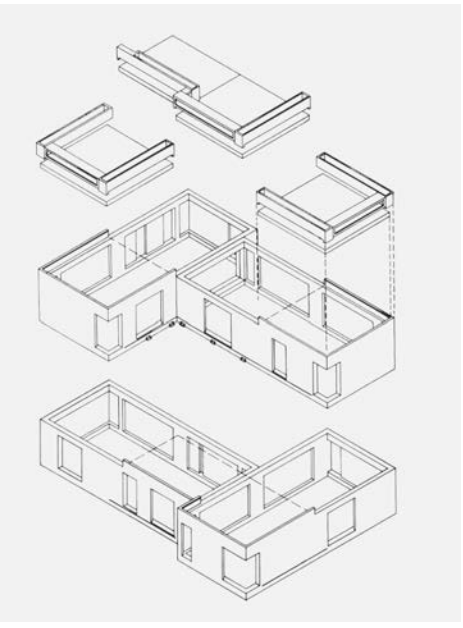




When he began to design it for Expo 67, the design consisted of and entire master plan with shopping centers, a school, and up to 1,000 living units. While the design was largely approved, Safdie was unable to achieve the original scale of the project.

The final design was reduced to 354 identical prefabricated concrete blocks where he created 158 living units by connected between 2-8 of them at a time. Each unit had its own access to a patio, which ranged in size from ~200 sq ft - ~1,000 sq ft. The stacking technique of the units created a 12 story building that allows for various configurations of interior spaces through the orientation of the blocks, while the negative spaces between the prefabricated units helps to create unique patio spaces and exterior views. The service and parking for the building is located on the ground level with pedestrian paths, corridors, and bridges connecting the living units.





"The prefabrication process of the 90-ton boxes took place on-site. The basic modular shape was molded in a reinforced steel cage, which measured 38 x 17 feet. Once cured, the concrete box was transferred to an assembly line for the insertion of electrical and mechanical systems, as well as insulation and windows. To finalize the production, modular kitchens and bathrooms were installed, and finally a crane lifted each unit to its designated position."

-From ArchDaily

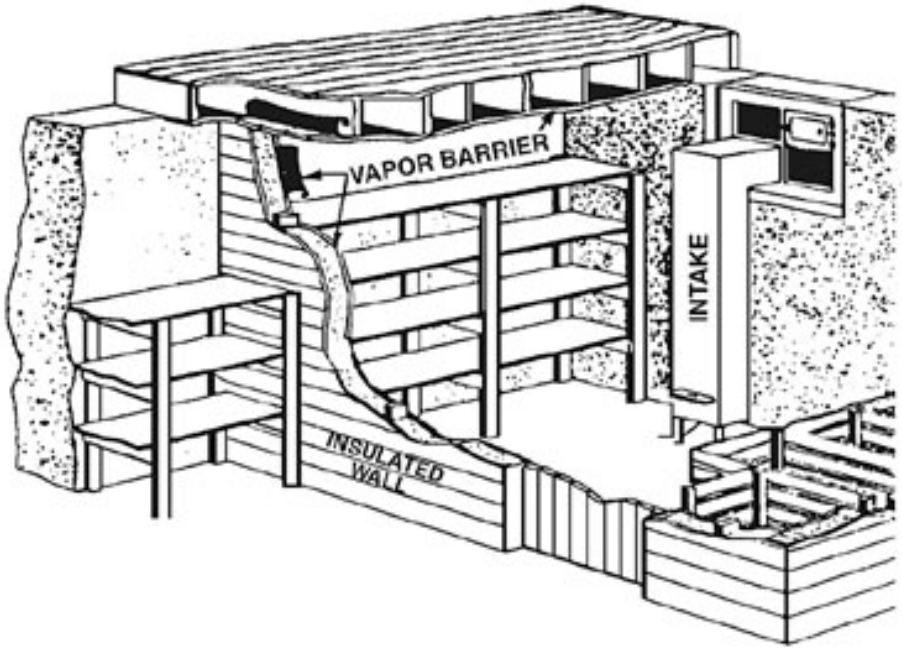
While prefabrication was intended to reduce cost, and in modern construction achieves this, the scale of the project prevented the economic advantage from coming into play. In turn this then limited further expansion of the building, as Safdie had hoped that this was phase 1 of the design.

Safdie's design helped to generate many new ideas regarding prefabricated construction and housing design; however, it unfortunately did not achieve all of the original goals. The idea of prefabrication as a means of designing more economically considerate buildings was strong, however it was limited by the scale of the project as well as the technology at hand. The discussion of cost also comes into play with the price of the units themselves. Part of the design intention was that the units would be able to have reduced prices, likely as a result of the construction methods, unfortunately the building has not preserved that idea. The units now range in price from $200,000 to recent price submissions of $1,000,000. While Safdie had not intended for the building to be public or affordable housing, it is unlikely that he was designing such a dense housing system for the upper classes.

ROOT CELLARS

COMPOSTING

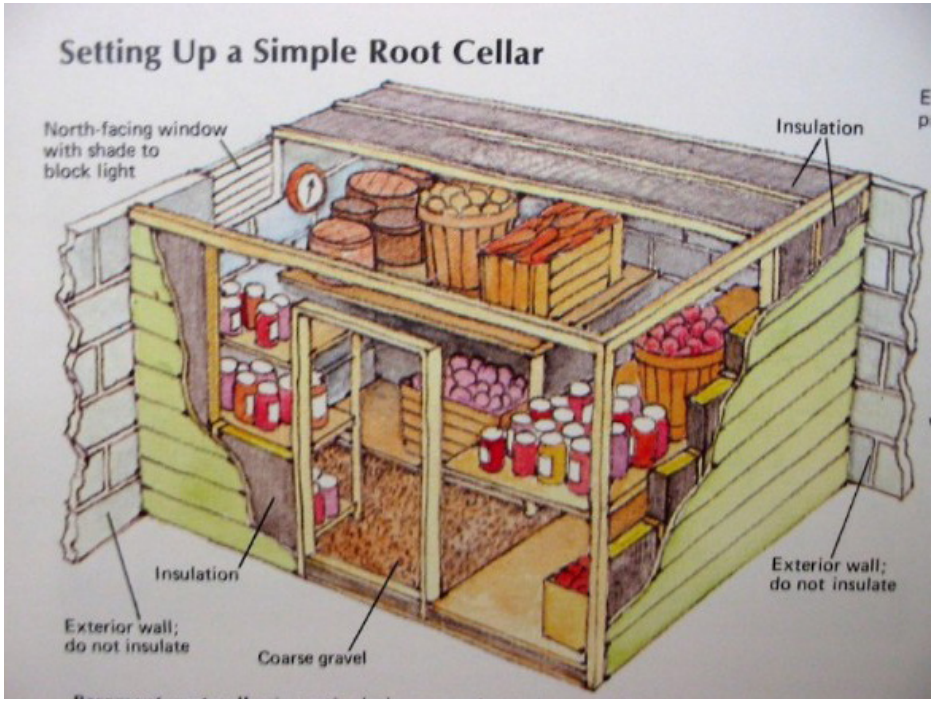
GREENHOUSES



ROOT CELLAR

Root cellars are an efficient means of food storage that do not require modern refrigeration technologies. Historically, root cellars have been used on small scales in the basements of homes, buried into hillsides, and even as independent structures. Root cellars tend to be low maintenance, require little energy to operate, and can be built and managed by the average homeowner.

Root cellars require control of four elements: **Temperature, Humidity, Ventilation**, and **Light**



TEMPERATURE

Temperature for the process is ideal at a 32° - 40°F system, this can usually be reached at ten feet below grade.
The entire space needs to be insulated in order to maintain a constant temperature throughout the year.
Packed earth or concrete flooring are standard for root cellars

HUMIDITY

Root Cellar Humidity is ideal at a range of 85%-95% in order to prevent moisture loss in the produce through evaporation.
One method of maintaining moisture in produce is to pack the produce in bins filled with wet leaves, which can be replaced every year and composted.

VENTILATION

In order to prevent food from spoiling, there should be proper ventilation to allow fresh air into the cellar, as well as to reduce the buildup of ethylene gas that is released by the produce.
Therefore fresh air should be brought in at the base of the room, and exhaust should be located at the top of the room.
Fruits tend to produce larger quantities of ethylene and should be separated from vegetables

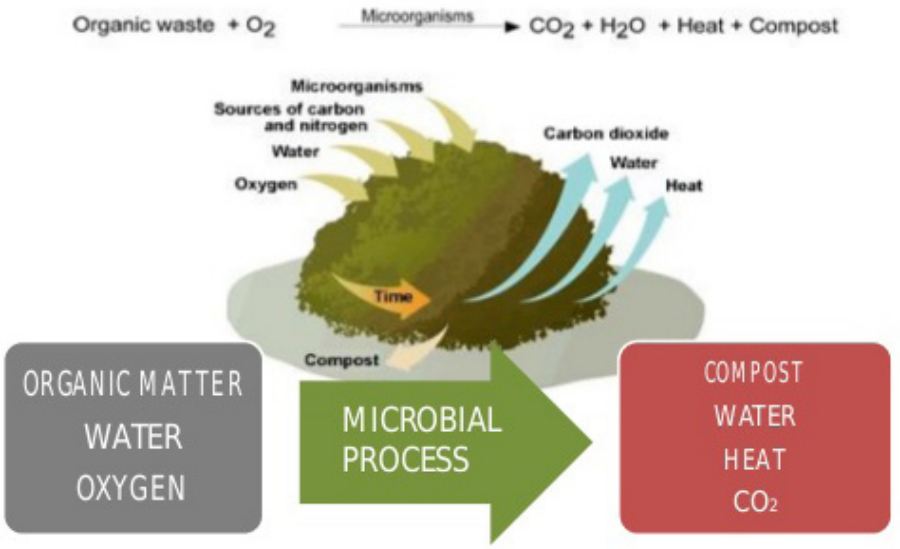
LIGHT

Root cellars should be enclosed to be dark the majority of the time as light allows produce to spoil or continue growing.
Typically there is only artificial light for when someone is present in the room, and designs avoid allowing natural light into the space.

COMPOSTING

Composting is a waste disposal process that has grown traction in both single family homes as well as urban centers. The process has found purpose as a efficient way of disposing of organic waste which is then turned into compost that can be sold for a profit. The composting process has become more efficient since this realization and therefore has become a staple for waste disposal. Composting is an aerobic process that utilizes micro-organisms such as bacteria and fungi to break down organic matter using carbon, nitrogen, water, and oxygen. The process will ultimately yield a compost that can be used for a variety of agricultural and gardening purposes.

The process is begun by gathering waste matter of varying particle sizes and organizing it into large piles so that the micro-organisms can begin to break down the material. At this stage, it is important to control many conditions of the composting piles such as its shape, height, pH level, particle sizes, nutrient levels, and to turn and mix the piles frequently. The retention time, which is the amount of time needed until a pile produces compost, typically depends on six factors: nutrients involved, moisture content, oxygen available, pH level, surface area of the pile, and temperature. Composting occurs the fastest with proper water content, carbon to nitrogen ratio, and frequent aeration are provided. Active composting can take between 2 weeks to 9 months depending on the conditions, and curing can take another one to four months.



CONDITIONS

There are a variety of types of composting techniques, though one of the common ones are windrows. Windrows are an system that uses long, narrow piles of regularly turned compost. They works best for yard and agricultural waste and can produce compost in three weeks with proper management. Windrows can be hundreds, and are typically three to twelve feet tall, and ten to twelve feet wide. Turning is done with special machinery and frequency is dependent on the qualities of the compost. The piles need to be turned twice a day for the first week, then every three to five days afterwards. While windrows require maintenance, they generally do not take lots of resources to manage and can generate compost in respective time frames.

Composting facilities usually require a 2-4% slope for drainage, minimal paving, and retaining walls for the piles. It is also vital to have planned areas for the raw material storage, processing, composting, curing, compost storage, and blending of the end product. The area is usually surrounded by perimeter berms as well as foliage to act as a site screen.

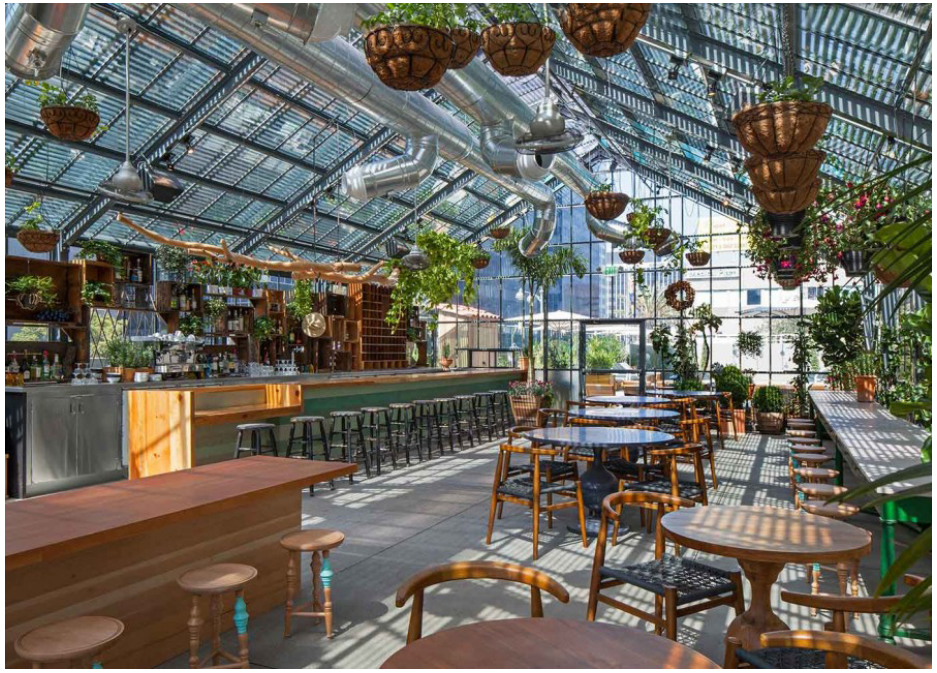
Controlling the conditions of the compositing process is important as improper management may lead to the piles giving off unpleasant odors and a decelerated retention time. Ingredients such as sawdust, leaves, crop residue, and fresh bedded manure typically do not generate foul odors and it is important to store these raw materials for as small an amount of time as possible. In addition, the piles should be maintained at approximately four-and-a-half feet tall, kept at 55% moisture, and turned about two times a week. Proper maintenance of the piles will prevent them from giving off foul odor.

GREENHOUSES

Greenhouses are a means of food production that allow for a greater variety of produce to be grown year round by creating a controlled climate in an enclosed area. Typically insulated glass enclosures, greenhouses principally operate by trapping heat into a growing space, thus generating a warm climate even during cold seasons. Historically, greenhouses have been used for hundreds of years and have been built at small and large scales.

For a greenhouse to work, it needs to be planned ahead with consideration of crop selection, growing periods, planting types (pots, beds, hydroponic, troughs), growing medium, growing system, and annual production. Larger scale greenhouses typically require approximately two acres of land for the appropriate facilities, should have a 1-2% slope for drainage and solar conditions, and have soil conditions suitable for crop growth. Associated facilities for the building are frequently interior and exterior storage, equipment storage, a maintenance shop, head house, and germination room.

Two types of greenhouses are common for larger scale operations: free standing and gutter connected. Free standing greenhouses are usually the least expensive option and designed in a quonset style with widths up to 34 feet, though certain gable style designs have the potential to span up to 60 feet. These types of facilities usually work best for facilities intended to be less than 10,000 square feet and are on sloped sites in locations with heavy snowfall. Gutter connected designs utilize similar design strategies, but use them at larger scales, typically greater than 10,000 square feet. These designs are spatially efficient as they can be constructed up to lengths of 300 feet and share adjoining walls. They also tend to be economically efficient, energy efficient, and are relatively easy to construct.



TECHNICAL

Glazing selection is an important aspect to consider as it has a direct impact on the performance of the greenhouse. Common glazing solutions are double poly, which is the most affordable option but sacrifices longevity, polycarbonate, which has a longer life and better performance at a higher price, and wide pane, which has a higher initial cost but is suitable to designs requiring greater amounts of light.

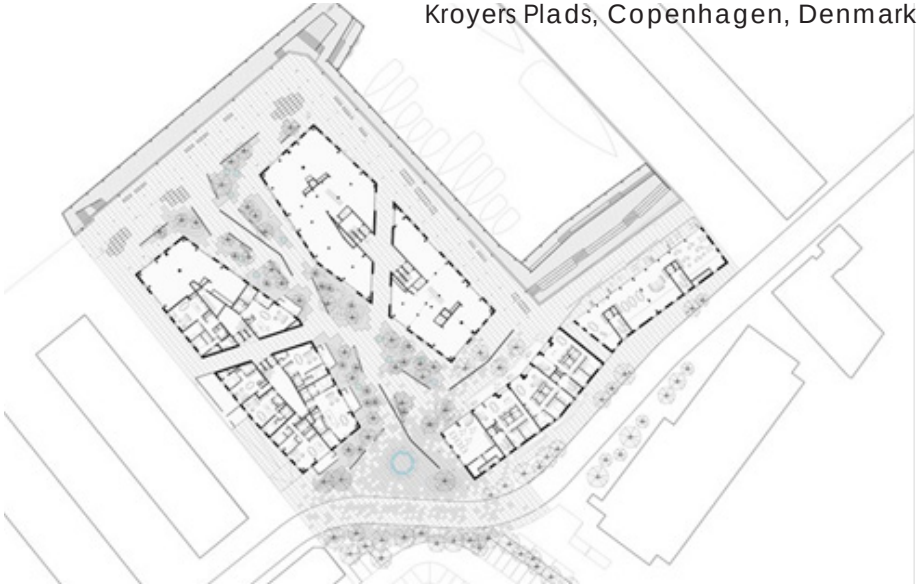
In a greenhouse it is important to control three conditions, light, heat, and cooling. Natural light is the typical design consideration and is resolved by the greenhouses itself, though at times it is also important to implement supplemental artificial light such as high pressure sodium fixtures with at least a 900 foot candle capacity. Heating is usually provided by water boilers which can provide varying amount of heat to specific bays of the greenhouse as a response to crop need. Greenhouses are usually under-floor heated for uniform room temperature and to prevent drying of the plants the water temp usually does not exceed 110° F. Lastly, cooling is sometimes required in a greenhouse, though ventilation is often a sufficient solution. Natural ventilation is usually preferable as long as wind conditions and climates support it. Otherwise typical fan-based systems include a horizontal airflow system, a fan/louver system, or evaporative systems suffice.

8 - ARCHITECTURAL PROGRAM

Kroyers Plads, Copenhagen, Denmark

"Of all the kinds of architecture in the world, it is house and home that we relate to most easily and generously. At heart we know that a house is much more than a machine for living. It has an emotional charge and depth, and it is a place of refuge and escape as well as a day-to-day experience."

Dominic Bradbury

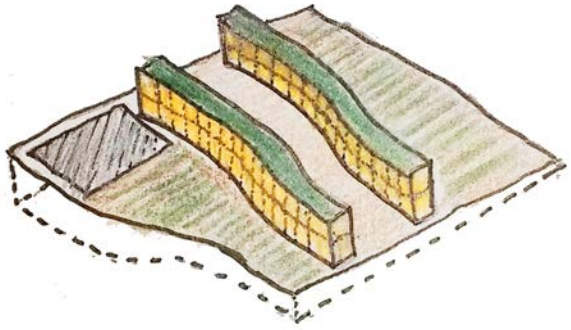


Kroyers Plads, Copenhagen, Denmark

CROP TYPE	POUNDS PRODUCED / ACRE	VOLUME FT^3
Corn	6,200	141.5
Tomato	(x3)..11,000	512.6
Onion	(x3)..19,000	4,500
Peppers	(x3)..6,900	632.8
Beans (Snap)	4,600	72.6
Beets	10,800	300.9
Broccoli	7,300	304
Cabbage	13,200	714.6
Carrots	19,400	503.6
Cauliflower	10,800	592.9
Cucumber	8,400	267.5
Lettuce	9,100	627
Pea	2,200	57.4
Spinach	(x2)..11,000	2,779
Squash	17,000	2,147

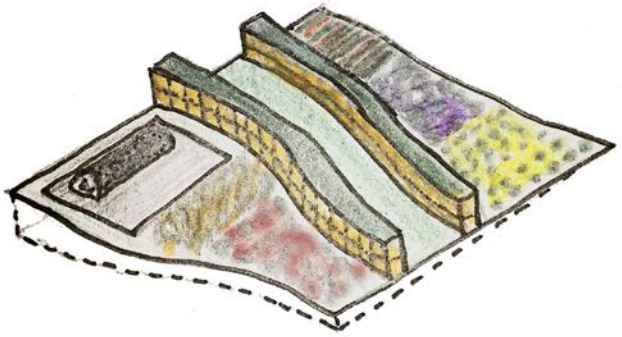
TOTAL AGRICULTURAL AREA.....22.4 ACRES (975,744)
TOTAL WEIGHT OF PRODUCE.....142,300 LBS
TOTAL VOLUME OF PRODUCE.....14,153.4 ft^3

PLANTING SEASON



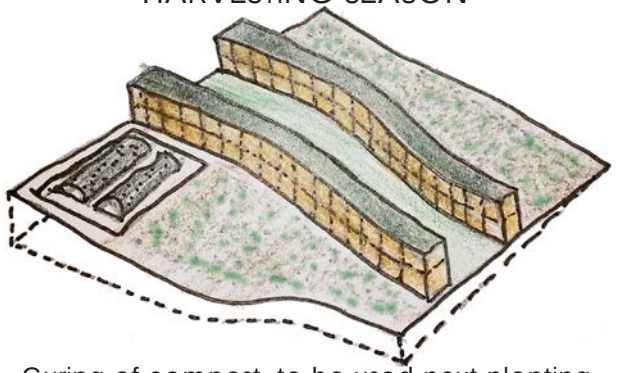
Accumulation of active compost
Crop planting period
Site foliage dormant

GROWING SEASON



Active compost maintenantce
Crops in growth periods or fully grown
Site foliage grown

HARVESTING SEASON



Curing of compost, to be used next planting season
Crops harvested, stored in root cellars
Site foliage grown and bloomed

RAW FEEDSTOCK WEIGHT

142,300 lbs of Produce
X 0.5% Factor (Inedible Plant Estimate)
71,150 lbs of Compostable Agricultural byproduct
475lbs of compostable waste per family yearly
X 400 Units
190,000 lbs of Yearly Compostable Waste

YEARLY FEEDSTOCK VOLUME

71,150 lbs of byproduct
÷ 1,000 lbs per $Yard^3$
71.5 $yards^3$/year of compostable material
190,000 lbs of byproduct
÷ 1,000 lbs per $Yard^3$
190 $yards^3$/year of compostable material
190 $yards^3$/year compostable waste
+ 71.5 $yards^3$/year compostable byproduct
261.5 $yards^3$/year of compostable material

YEARLY COMPOST YIELD VOLUME

261.5 $yards^3$/year
X 0.4% Volume reduction
104.6 $yards^3$/year of Finished Compost

BLENDED FEEDSTOCK VOLUME

261.5 $yards^3$/year compostable waste
X 0.8 Processed blending factor
X 27 ft^3 per yard
5,648.4 $feet^3$ on active windrow pad

WINDROW DIMENSIONS

120 ft long
X 6 ft tall
X 12 ft wide
5,702.4 avg ft^3/windrow

ACTIVE PAD DIMENSIONS

12 ft Window Width
X (2) 20 ft workpath width
X (2) 10 ft additional width
72' active workpad width
120 ft Windrow Length
X (2) 20 ft workpath length
160' active workpad length

72 ft active pad width
X 160 ft active pad length
11,520 ft^2 active workpad area

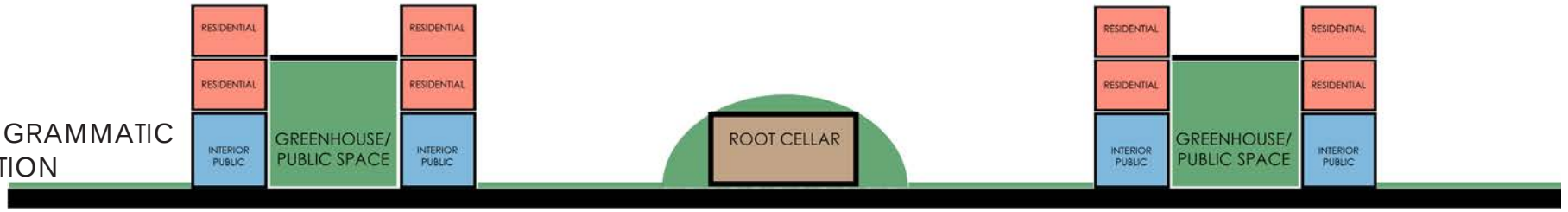
CURING PAD DIMENSIONS

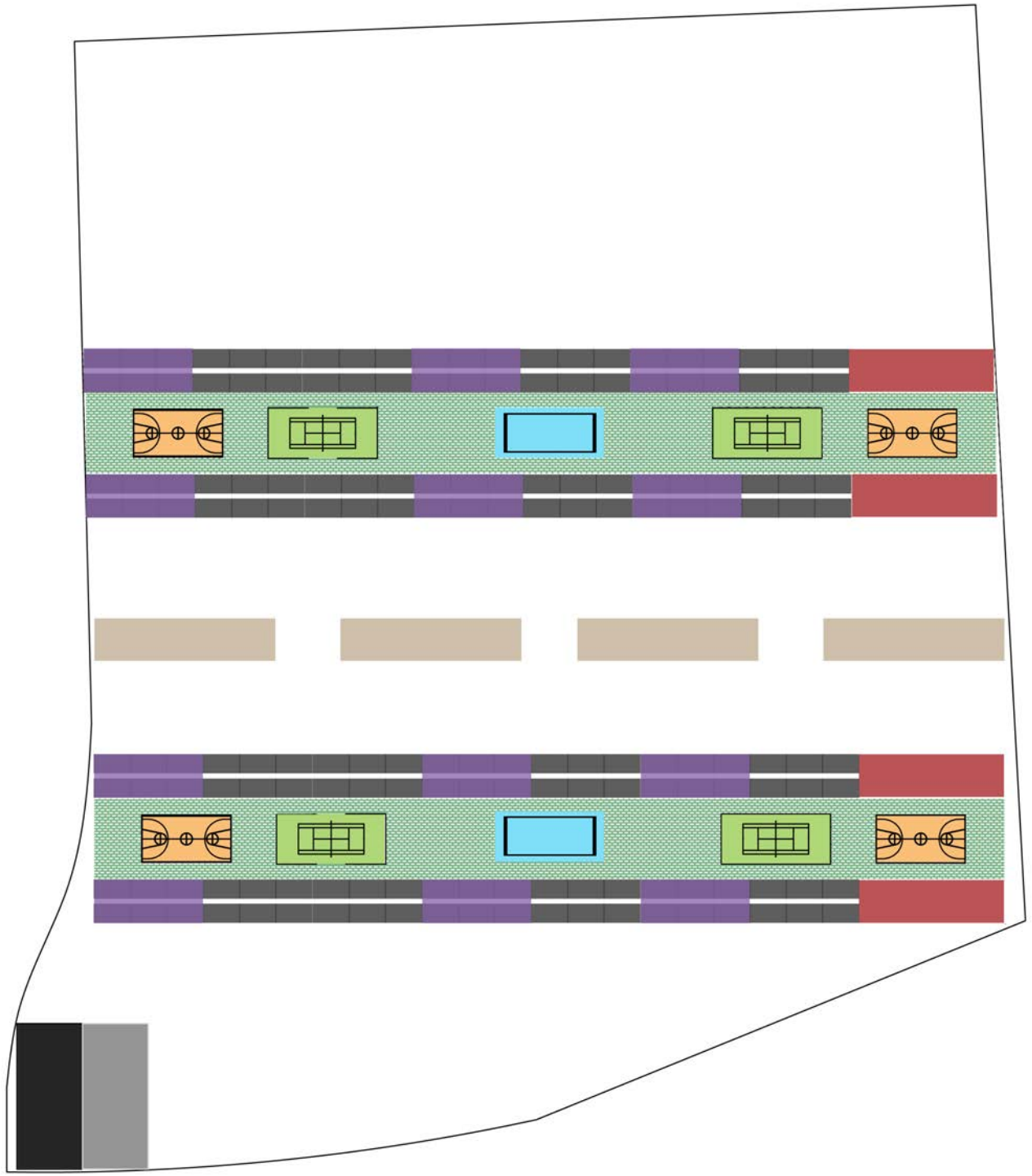
Curing windrow length is approximately
1/2 the size of composting windrows:
60' x 6' x 12' dimensions

60' Length
x 6' Height
x 12' Width
4,320 ft^2 Curing pad area

PROGRAM	SQ FT
400 Units @ 40x20 sf	320,000
1 Parking space per unit	160,000
Tennis Courts	4 @ 28,800
Basketball Courts	4 @ 20,000
Pool	2 @ 13,454
Interior Fitness Space	2 @ 11,520
Facilities management offices	
Individual offices	5 @ 400
Open office (15 desks)	1,000
Public Lounge	12 @ 5,760
Greenhouse	90,000
Greenhouse equipment storage	2 @ 7,680
Composting equipment storage	2 @ 7,680
Janitor Closet	4 @ 100
Mechanical Space	4 @ 250
Root cellar	4 @ 9,600
Active composting pad	11,520
Compost curing pad	4,320
NET SQUARE FOOTAGE	**493,628 FT²**
x 1.4 GROSS SF FACTOR	
GROSS SQUARE FOOTAGE	**691,079 FT²**
Total Site Area	1,219,871 sq ft
PERCENT SITE COVERAGE	**56.7%**
Site coverage of farmable land	22.4 acres
	975,774 sf
Agricultural Percent Site Coverage	80%

PROGRAMMATIC SECTION





PROGRAMMATIC
PLAN

PROGRAMMATIC SUMMARY

The program is driven by a desire for the building to serve the community as much as it serves itself. Given its size and central location within O'Donnell Heights, it is vital for the building to become a part of the neighborhood rather than an privitized zone within it. For this reason, many of the programmatic spaces in the building are developed as elements that are open to the public as well as the denizens of the building. The goal is to create a site that acts as a meeting point within the city where people can walk through the greenhouses, or meet for a game of tennis. By doing this, the community receives more than a new housing facility: they get an center of activity. In addition, the size of the site and the organization can allow for an alternate pedestrain path thus prioritizing the walking to bus stops or the apartment of a friend. By developing the bulding and site in this manner, a more complex urban fabric can be created that facilitates a more united community. People constantly coming and going to and through the site create a much more vibrant form of city living and create more opportunities for interactions between neighbors, a feature of living that modern society has set aside.

PROGRAM DESCRIPTION

LIVING UNITS

The 40' x 20'living units are uniformly sized and offer a full range of amenities including 1 bedroom, 1 bath, a full kitchen, and a living room. These units are sized to accommodate younger generations that would likely lead more active lifestyles, as well as elderly couples that have more free time to work with the agricultural element of the building. The uniformity of the units allows a consistent structure and organization to be developed throughout the building. The size of the units is intended to be efficient and responsible in an urban scale without being aggressively limiting the space of the occupant. As per zoning regulations, 1 parking space will be provided for every 2 living units. These spaces will be coved by the building structure.

ATHLETIC FACILITIES

Athletic facilities are incorporated into the building as a means of creating a meeting point for the surrounding area. Presently, there are not many public facilities in the O'Donnell Heights area and by integrating this type of program a more cohesive neighborhood can form. The basketball courts and tennis courts are regulation sizes which are 98' x 50' are 120' x 60'respectively. The pool size is 80' x 160' in to accomodate the public realm and match regular public sizes.

PUBLIC LOUNGES

Because the livign units have become privitized and supply less room for public gatherings and activity, there will be open spaces for the occupants that allow for larger gatherings of people. These spaces include larger living rooms with couches and televisions, outdoor barbecue areas, and game rooms complete with billiards and other table games. Some of rooms can be reserved for special events while other will remain open for use by any of the buildings occupants. Again, the hope is that these types of spaces will not only counteract the reduction of space of the living units, but also encourage a greater sense of community for the residents.

FITNESS CENTER

On site fitness centers have become an important element in many modern housing facilities. In consideration of the intended demographic of younger occupants, the inclusion of a fitness center is necessary to work with the current standards. The facility houses a full cardio zone, free weights, machines, and enclosed rooms for exercise classes. One of these centers will be open to public as another response to public need, and to once again make the site a meeting point in the urban context. both gyms will have adjacent locker rooms to serve the gyms. The public locker rooms will also be able to serve the athletic program.

FACILITIES MANAGEMENT OFFICES

Offices for the building will be split into two catagories: building management, and landscape management. There will be 2 private offices and 5 open office desks for the building management offices which organize the support system for the housing units and interior public areas. The landscape management offices will be in charge of operating the composting process, root cellars, greenhouses, and crops. There will be more landscape offices as a response to the more intense needs of site management as opposed to building management, therefore there are 4 private offices and 8 open office desks as well as a lounge area.

GREENHOUSES

The greenhouses are gutter-connected with operable windows for temperature control in the summer. The greenhouses will span between and below the housing units and act as one unit that is subdivided where necessary. Various climate zones will be created and enclosed in response to the climatic needs of the produce source. The majority of dividers will be glass so as not to create visual boundaries. Greenhouses will be publicly accessible during daylight hours and also serve as gardens for the public. Once again, the intent of the public zone is to create an aesthetically pleasing gathering space for the surrounding neighborhood that also provides a utilitarian service. The athletic facilities embedded in the greenhouse zones will have their own demarcated areas in order to prevent damage to the greenhouses and allow for climate control.

CODE SUMMARY

BALTIMORE CITY CODE - ARTICLE 32: ZONING

TITLE 9 - SUBTITLE 2 - R-5 TRADITIONAL RESIDENTIAL DISTRICT

BUILDING CODE- NFPA 101 - LIFE & SAFETY

CHAPTER 4 - GENERAL
CHAPTER 7 - MEANS OF EGRESS
CHAPTER 32 - NEW RESIDENTIAL BOARD AND CARE OCCUPANCIES

RELEVANT ZONING SECTIONS

6-204 - R-5: Rowhouse and Multi-Family Residential Zoning District

9-201 - R-5: Transitional Residential District.

(a): *Neighborhoods:* The R-5 Transitional Residential Zoning District is intended for those areas that facilitate a transition from primarily single-family neighborhoods to neighborhoods that contain a wider mix of housing types

(b): *Housing Types:* The R-5 District is meant to accommodate single-family unites in both detached and semi detached dwellings, rowhouse developments, and limited low-rise multi-family garden apartment developments of moderate density.

12-1001 - Applicability:

(a): *In general:* A Rowhouse Mixed-Use Overlay District may be applied to rowhouse dwellings in the R-5, R-6, R-7, R-8, R-9, R-10, and OR Districts. This Overlay District allows the rowhouse dwelling to be used for 1 of the non-residential uses listed in § 12-1003 {"Use regulations"} of this subtitle.

(b): *Initial conversion requires BMZA approval:* A rowhouse dwelling's initial conversion from a residential use to a non-residential use listed in § 12-1003 {"Use regulations"} of this subtitle requires conditional-use approval by the Board of Municipal and Zoning Appeals.

12-202 - General requirements

(a) Common ownership or unified control.

(1) The site of the planned unit development must be under common ownership or unified control.

(2) If there are 2 or more owners, the application for approval of a planned unit development or for approval of an amendment to an approved planned unit development must be jointly filed by all owners.

(b) Minimum areas. Planned unit developments must meet the following minimum areas:

(1) at least 5 acres in the R-1A, R-1B, R-1C, R-1D, R-1E, R-1, R-2, R-3, R-4, R-5, OIC, and BSC Districts;...

(c) Exceptions. Exceptions to the regulations contained in this Code, including use, bulk, yard, parking, and sign regulations, may be granted through the planned unit development process, as may be desirable to achieve the objectives of the proposed planned unit development, as long as the exceptions are fully consistent with and authorized by this title.

16-602. Required off-street parking

(1) in the R-5 and R-6 Districts, no more than 1 parking space need be provided for every 2 units...

RELEVANT BUILDING CODES

4.5.3.1- NUMBER OF MEANS OF EGRESS- Two means of egress, as a minimum, shall be provided in every building or structure, section, and area where size occupancy, and arrangement endanger occupants attempting to use a single means of egress that is blocked by fire or smoke. The two means of egress shall be arranged to minimize the possibility that both might be rendered impassable by the same emergency condition.

4.6.3 - STORIES IN HEIGHT - Unless otherwise specified in another provision of this Code, the stories in height of a building shall be determined as follows:

(1): the stories in height shall be counted starting with the level of exit discharge and ending with the highest occupiable story containing the occupancy considered.

(2): Stories below the level of exit discharge shall not be counted as stories.

(3): Interstitial spaces used solely for building or process systems directly related to the level above or below shall not be considered a separate story.

(4): A mezzanine shall not be counted as a story for the purpose of determining the allowable stories in height.

(5): For purposes of application of the requirements for occupancies other than assembly, health care, detention and correctional, and ambulatory health care, where a maximum one-story above grade parking structure, enclosed, open, or a combination thereof, of Type I or Type II (222) construction or open Type IV construction, with grade entrance, is provided under a building, the number of stories shall be permitted to be measured from the floor above such a parking area.

4.6.15 - GRADE PLANE - The grade plane shall be established by calculating the average of the finished ground level adjoining the building at all exterior walls. Where the finished ground level slopes down from the exterior walls, the grade plane shall be established by the lowest points within the area between the building and the lot line or, where the lot line is more than 6 ft (1.8m) from the building, between the building and a point 6 ft (1.8m) form the building.

7.1.3.1 - EXIT ACCESS CORRIDORS - Corridors used as exit access and serving an area having an occupant load exceeding 30 shall be separated from other parts of the building by walls having not less than a 1-hour fire resistance rating in accordance with Section 8.3, unless otherwise permitted by one of the following.

(1): This requirement shall not apply to existing buildings, provided that the occupancy classification does not change.

(2): This requirement shall not apply where otherwise provided in Chapters 11 through 43

7.3.1.2 -OCCUPANT LOAD FACTOR - The occupant load in any building portion thereof shall be not less than the number of persons determined by dividing the floor area assigned to that use by the occupant load factor for that use as specified in Table 7.3.1.2, Figure 7.3.1.2(a), and Figure 7.3.1.2(b). Where both gross and net area figures are given for the same occupancy, calculations shall be made by applying the gross area figure gross area of the portion of the building devoted to the use for which the gross area figure is specified and by applying the net area figure to the net area of the portion of the building devoted to the use for which the net area figure is specified.

7.5.1.3.2 - EGRESS ACCESS - Where two exits, exit accesses, or exit discharges are required, they shall be located at a distance from one another not less than one-half the length of the maximum overall diagonal dimension of the building or area to be served, measured in a straight line between the nearest edge of the exits, exit accesses, or exit discharges, unless otherwise provided in 7.5.1.3.3 through 7.5.1.3.5.

32.3.2.2.9 - ALTERNATING TREAD DEVICES - Alternating tread devices complying with 7.2.11 shall be permitted.

32.3.2.3.3 - WIDTH OF MEANS OF EGRESS - The width of corridors shall be sufficient for the occupant load served but shall be not less than 60in.

32.3.2.4.1 - NUMBER OF MEANS OF EGRESS - Means of egress shall comply with the following except as otherwise permitted by 32.3.2.4.2:

(1): the number of means of egress shall be in accordance with Section 7.4.

(2): Not less than two separate exits shall be provided on every story.

(3): Not less than two separate exits shall be accessible from every part of every story.

32.3.2.5.2 - COMMON PATHS OF TRAVEL - Common paths of travel shall not exceed 75 ft (23m).

32.3.2.5.4 - DEAD END CORRIDORS - Dead - end corridors shall not exceed 30ft (9.1m).

32.3.2.5.5 - ROOM EGRESS - Any room, or any suite of rooms, exceeding 2,000 ft^2 (185m^2) shall be provided with not less than two exit access doors located remotely from each other.

32.3.2.6 - TRAVEL DISTANCE TO EXITS - Travel distance from any point in a room to the nearest exit, measured in accordance with Section 7.6, shall not exceed 250 ft (76m).

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