ADAPTIVE LIVING IN THE CITY

Arnold Lee

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Master of Architecture in Architecture

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ABSTRACT

Although living in the city can provide many benefits, it also provides many issues as well. Housing costs are constantly increasing, both physical and mental spaces are sacrificed, and our innate connection to nature is severed. These produce profoundly damaging effects on the human psyche and cause people to migrate from the urban to the suburban and rural areas. The solution is to design more efficient urban buildings that can actively adapt to its inhabitants’ programmatic needs and utilizes wood, specifically cross-laminated timber, as its main material to reconnect with nature.
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GENERAL AUDIENCE ABSTRACT

Although living in the city can be beneficial, it has its downsides as well. Compared to other environments, the city allows people to live in closer proximity to other people and resources; however, the downsides include higher housing costs, smaller living spaces, little to no privacy, and the absence of nature from the urban life. As a result, people lead unhappy and unhealthy lifestyles and are moving to the suburbs and rural areas.

The solution is to design buildings that can actively adapt to our needs and can make more efficient use of what little space we have. By utilizing movable partition walls, spaces can be easily transformed into multiple, increasing and decreasing both physical space and privacy at will. In addition, using wood as the main material allows nature to be reintegrated with people’s lives, and using cross-laminated timber in particular introduces the idea of city buildings, both low-rise and high-rise, being constructed from wood, transforming the city from a concrete steel jungle to a thriving forest.
ACKNOWLEDGEMENTS

Thank you,

To my family. Without their love and support I would not have been able to complete my master thesis.

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To my brother, Andrew. For always being there for me and giving me support when I needed it most.

To my girlfriend, Isabel. Your love and support has given me the strength I needed to accomplish one of the best achievements of my life.
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My thesis intent aligned with the Association of Collegiate Schools of Architecture (ACSA) Timber in the City competition that was held for the 2015-2016 academic year. Thus, I decided to enter the competition and was provided with the programmatic and space requirements and information needed to both complete my thesis and my submission. The following is a direct quote from ACSA that summarizes the competition:
“The purpose of the Competition is to engage students to imagine the repurposing of our existing cities with sustainable buildings from renewable resources, offering expedient affordable construction, innovating with new and old wooden materials, and designing healthy living and working environments.

THE CHALLENGE

The competition challenges participants to design a mid-rise, mixed-use complex with affordable housing units, a NYC outpost of the The Andy Warhol Museum and a new and expanded home for the historic Essex Street Market.

The project site is in Manhattan’s lower east side in the former Seward Park Urban Redevelopment Area. In 1967, New York City leveled 20 acres on the southern side of Delancey Street and removed more than 1,800 low-income largely Puerto Rican families, with a promise that they would eventually return to new low-income apartments. Competing forces within the neighborhood and the development community long debated whether the area should be used to develop affordable or market rate housing, for commercial or cultural uses, or all of the above. This debate was waged in the community halls of local public school auditoriums and other city meeting places, in newspaper columns, coop board meetings, and at private strategy sessions in individual homes, and eventually a resolution was reached, leading to the currently planned Essex Crossing development.

The Essex Crossing development as currently planned, however, could be criticized for following a larger bulk zoning than ideal, as well as for not requiring the highest degree of innovative and environmentally proactive construction and energy use standards, this competition elicits responses to correct this critical lack, on at least part of the overall development area.

Entrants will be asked to design places for inhabitation, repose, recreation, and local small scale commercial exchange, as well as the creation of social and cultural exchanges, all while embracing new possibilities of wood. Entrants will be challenged to propose construction systems in scenarios that draw optimally on the performance characteristics of not one but a variety of wood technologies.”
MATERIAL

cross-laminated timber

ADVANTAGES
- energy efficient building system
- cost effective
- structural axial load-bearing stability
- quick installation
- environmentally friendly
- improved thermal performance
- design flexibility

FACTS
- developed in Europe early 1990s
- 3-7 layers of dimensional lumber laminated in 90° angles and adhered in hydraulic/vacuum press
- panel size ~ 18’ x 98’ x 20”

solid wood
ADAPTIVE HOUSING

microapartment
living + bed + bath + kitchen

FUNCTION
1  recreation
2  work
3  sleep
4  eat

STATIC
+ range
+ refrigerator
+ shower
+ sink
+ toilet

DYNAMIC
+ bed
+ chairs
+ storage
+ tables

ARNOLD LEE   |   THESIS 2016

250 square feet
PRELIMINARY RENDER

COMMERCIAL

HOUSING

HORIZONTAL

VERTICAL

421' - 4 13/16"
252' - 9 5/8"
70'-80'958,769 SF

2688 UNITS
30' x 10' x 8'

EAST | 1:64
NORTH | 1:64
WEST | 1:64
SOUTH | 1:64

INHABITANTS
+ FAMILIES
+ COUPLES
+ INDIVIDUALS
+ TOURISTS

PROGRAM
1 RESIDENTIAL
2 WARHOL MUSEUM
3 ESSEX MARKET

PRELIMINARY RENDER
MODULAR
PREFAB
CLT
PUBLIC
PRIVATE
PERMANENT
TEMPORARY
HYPER_DENSITY
MICRO_APARTMENT
MIXED_USE
HABITAT
ADAPTIVE
FLEXIBLE

RESIDENTIAL
ESSEX MARKET
WARHOL MUSEUM

MUSEUM
ROOFTOP
STREET MARKET
Located in New York City on the corner of Essex and Delancey street, the proposed mixed-use building consists of three main programs: the Warhol Museum, Essex Street Market, and Residential.

The Warhol Museum is oriented orthogonally with the site; however, the central Warhol room is shifted and aligned with true north. This allows visitors to not only experience Andy Warhol’s works of art, but also to provide an understanding of Warhol; although he seemed to have a passive superficial personality, in reality he had both depth and complexity.

The Essex Street Market is located on the ground floor above the Warhol Museum. Flexible stalls are located near the street to attract pedestrians towards the interior of the market where the permanent stalls reside. While interior eating areas exists inside the market for rainy days, an outdoor field exists to the west of the building, providing valuable open space in the city for everyone to enjoy.

The Residential units exist on the second up to the seventh floor. There are four different types of prefabricated units: micro unit, one bedroom, two bedroom, and three bedroom units. Rather than the units being grouped by their apartment type, the units are evenly composed with one another, creating a mosaic that is reminiscent of Warhol’s style of creating a grid of silkscreened portraits. With the exception of the micro unit, every apartment has an adaptive wall that rotates and translates in one direction that can transform a single physical space into several programmatic spaces. This allows the space to adapt to its occupant’s needs on demand. On the roof are south-facing solar panels that can produce 220% of the energy consumed by the building in a year, as well as a rainwater harvesting system that can provide 22.6% of the building’s water consumption, or 100% of the rooftop garden’s water needs.

The main structure is a CLT post and beam system that mimics a forest, providing shelter from the harsh conditions of the city. The exposed structure can be seen both inside and outside the building, providing mental comfort and warmth that other artificial materials cannot replicate. The structure as a whole is a metaphor for a tree, with the concrete columns representing the trunk, the CLT posts and beams as the branches, and the rooftop gardens as the leaves.

The end result is a densely wooden oasis that exists deep within the midst of the urban jungle.
| CONSTRUCTION PROCESS |

1 | CONNECT POST AND BEAM

2 | INSERT PREFAB UNITS

3 | CONNECTIONS AND REPEAT
| CONNECTIONS |

BEAM TO COLUMN CONNECTION

COLUMN TO CONCRETE SLAB CONNECTION
<table>
<thead>
<tr>
<th>MICRO APARTMENT</th>
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<tbody>
<tr>
<td>150 units</td>
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<tr>
<td>325 square feet</td>
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<table>
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<tr>
<th>1 BEDROOM</th>
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<td>80 units</td>
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<tr>
<td>615 square feet</td>
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<th>2 BEDROOM</th>
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<tbody>
<tr>
<td>60 units</td>
</tr>
<tr>
<td>940 square feet</td>
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<table>
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<th>3 BEDROOM</th>
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<tbody>
<tr>
<td>20 units</td>
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<tr>
<td>1230 square feet</td>
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ROOF PLAN

1. SOLAR PANELS
2. GARDEN
3. MECHANICAL
WARHOL MUSEUM
OPEN GALLERY
PUBLIC FIELD
REFERENCES


