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Closer into Growth

Future Skyscrapers

Individual Academic Work
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This is a collaboration of architecture with bio-structure and a manifesto for an exploratory revolution in structure and space.

The exploration of new structures faithful to material properties will always create wonderful spatial experiences. Nowadays, a group of scholars have turned to cross-border research in the field of biology and architecture. They hope to optimize structures and create new spatial patterns through inspirations from nature.

Inspired by Monica Ponce de Leon, I studied tree growth in the project to explore the possibility of future skyscrapers and hoped to solve two major problems: the excessive waste of materials in construction and the tedious space mode dominated by core tubes. Through form-finding of tree branches and evaluations of topology optimization, a spatial prototype for high-rise buildings came into being.

This project attempts on the possibility of a future modern city comprised of high-rises organically grown into a forest system, by free connections between each other that provide most adaptable space for generations of people.



Research on Skyscraper Structures

Though the research on 4 interior structures and 5 exterior structures, this project discovers the development of materials on high-rise structure from stone to steel to reinforced concrete.

Rigid Frame



The Home Insurance Building
10 stories / 42 meters



Shear Wall Hinged



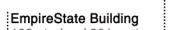
Lake Shore Drive Apartments
26 stories / 82 meters



Interaction System



Empire State Building
102 stories / 381 meters



Outrigger System



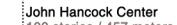
101 Tower
101 stories / 508 meters



Tube System



John Hancock Center
100 stories / 457 meters



Diagrid System



Shukhov Tower
160 meters



Space Truss System



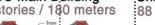
Bank of China
70 stories / 368.5 meters



Super Frame



HSBC Main Building
46 stories / 180 meters



Exo - Skeleton



Shanghai Jinmao Tower
88 stories / 420 meters



One World Trade Center
94 stories / 541.3 meters



Hotel De Las Artes
43 stories / 174 meters

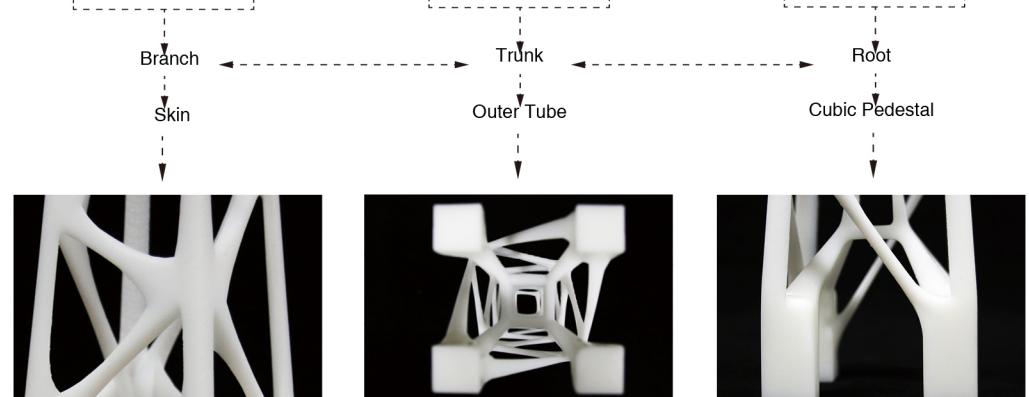
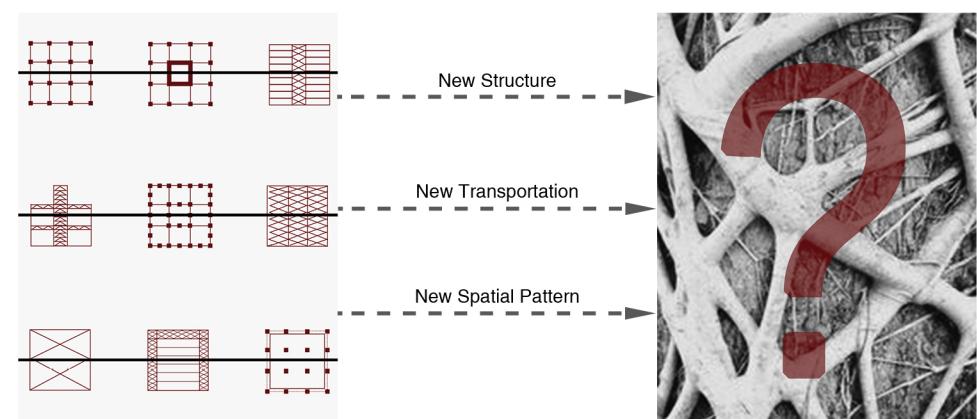


BBVA Bancomer
50 stories / 235 meters

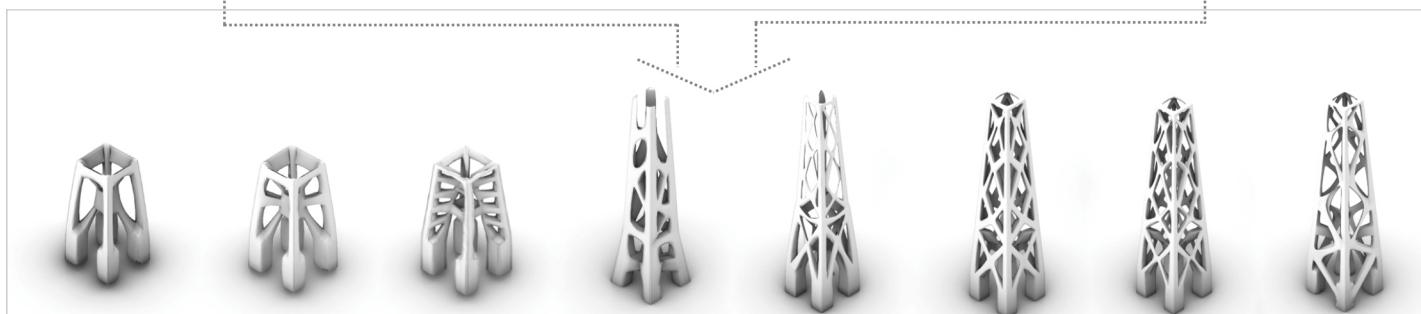
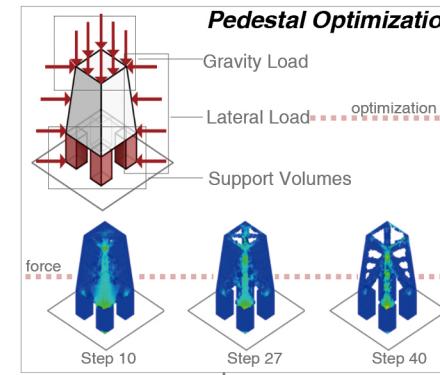
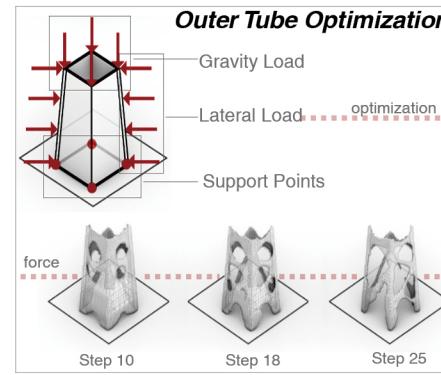
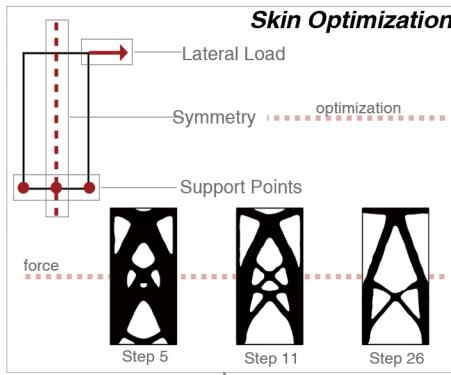
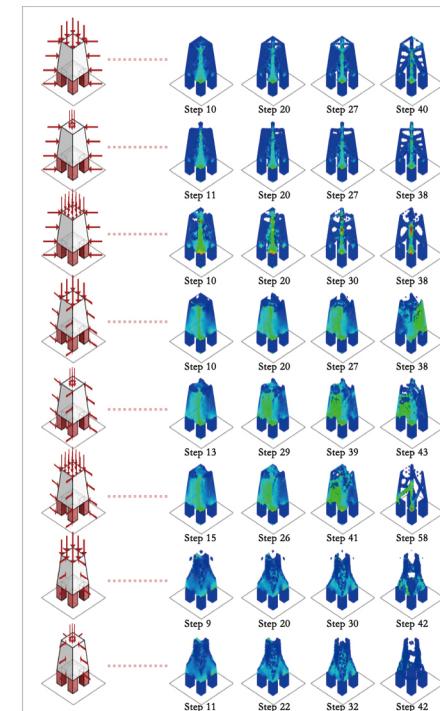
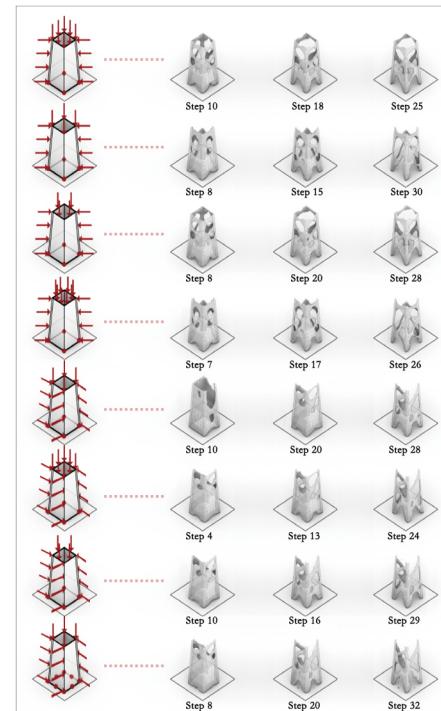
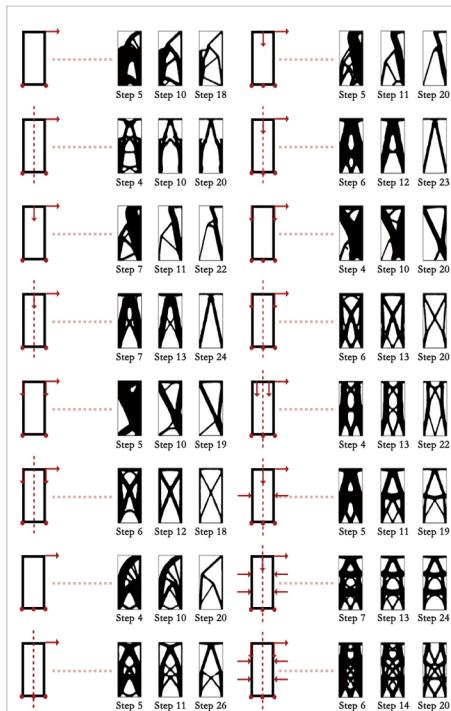


Inspiration from Bio-Structure

Through the study of tree growth, three features are extracted: the branch, the trunk and the root, respectively transformed into a possible high-rise structure.

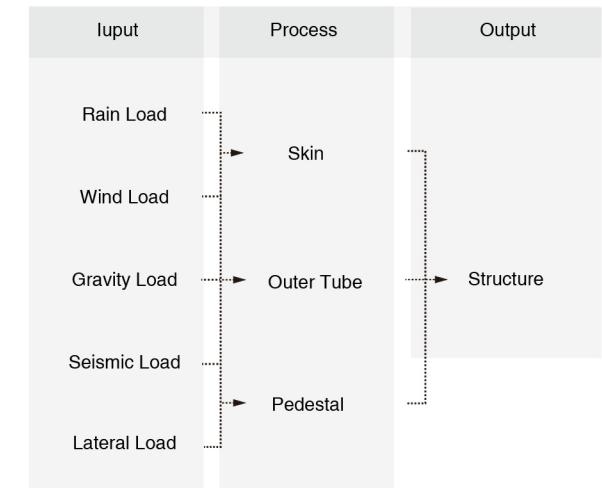


Prototype Structure Design



Through form-finding of tree branches and the evaluations on topology optimization, a spatial prototype for high-rise buildings has been discovered.

The traditional concrete core tubes are re-assembled to four corners to make the structure stable. Optimized branches could connect the outer skins and inner transits to strengthen the whole structures as a whole.



277.4m

235.8m

222.2m

131.6m

49.6m

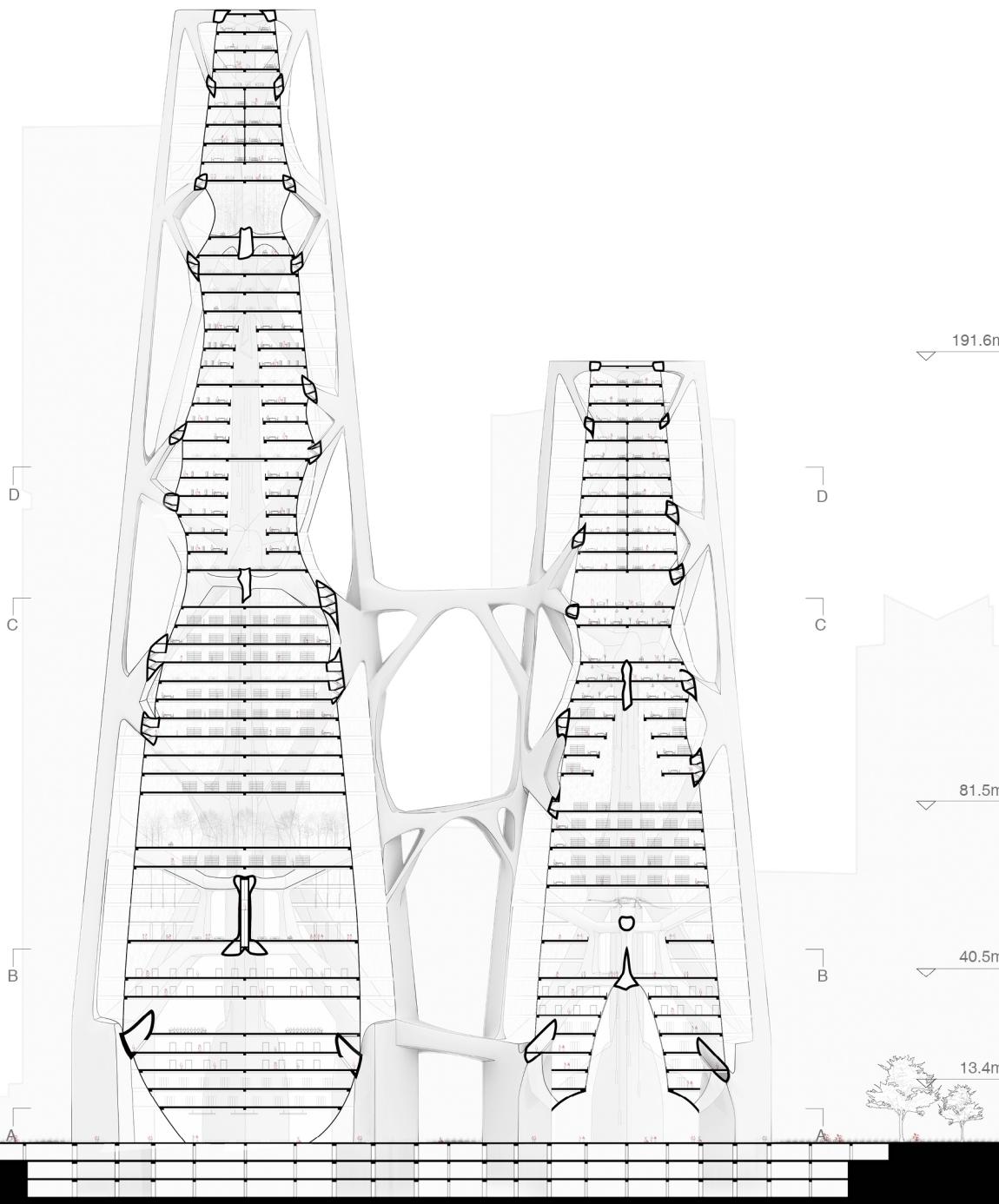
26.9m

191.6m

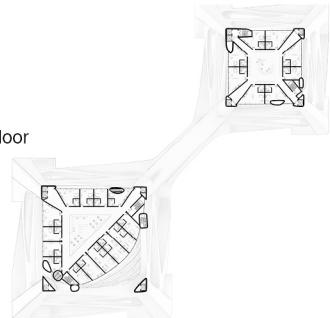
81.5m

40.5m

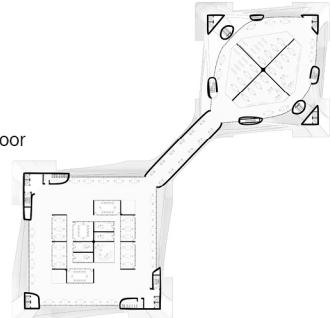
13.4m



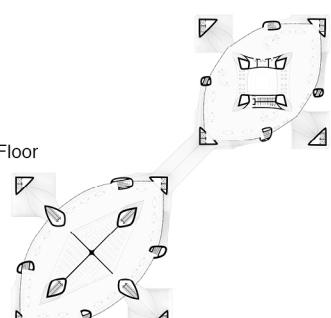
D — Typical Floor



C — Flyover Floor



B — Transfer Floor



A — Ground Floor





Sky Hall

This co-working space supplies a flexible spatial pattern and people can go up through escalators integrated in the concrete structure.



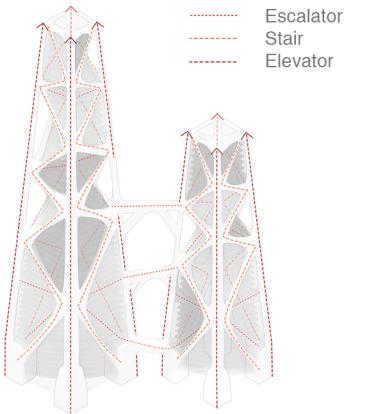
Transfer Platform

This Public Library offers customers relexiable spaces to communicate with this city. Transport System and Equipment System are hidden in the mega-structure.

Transport System Design

The new transportation system is integrated into this structure: vertical elevators are placed in the four reinforced concrete corners, escalators in the inner branches and escape stairs in the outer branches. Such transportation design renders the inner spaces more liberated and flexible.

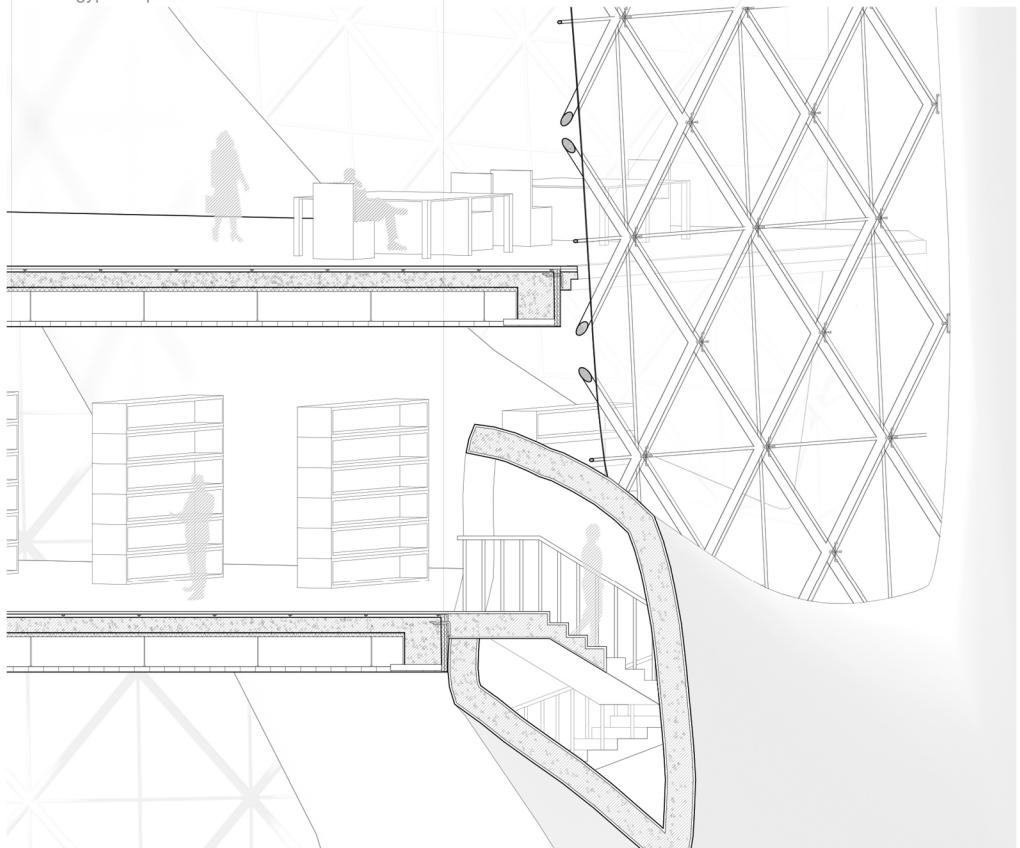
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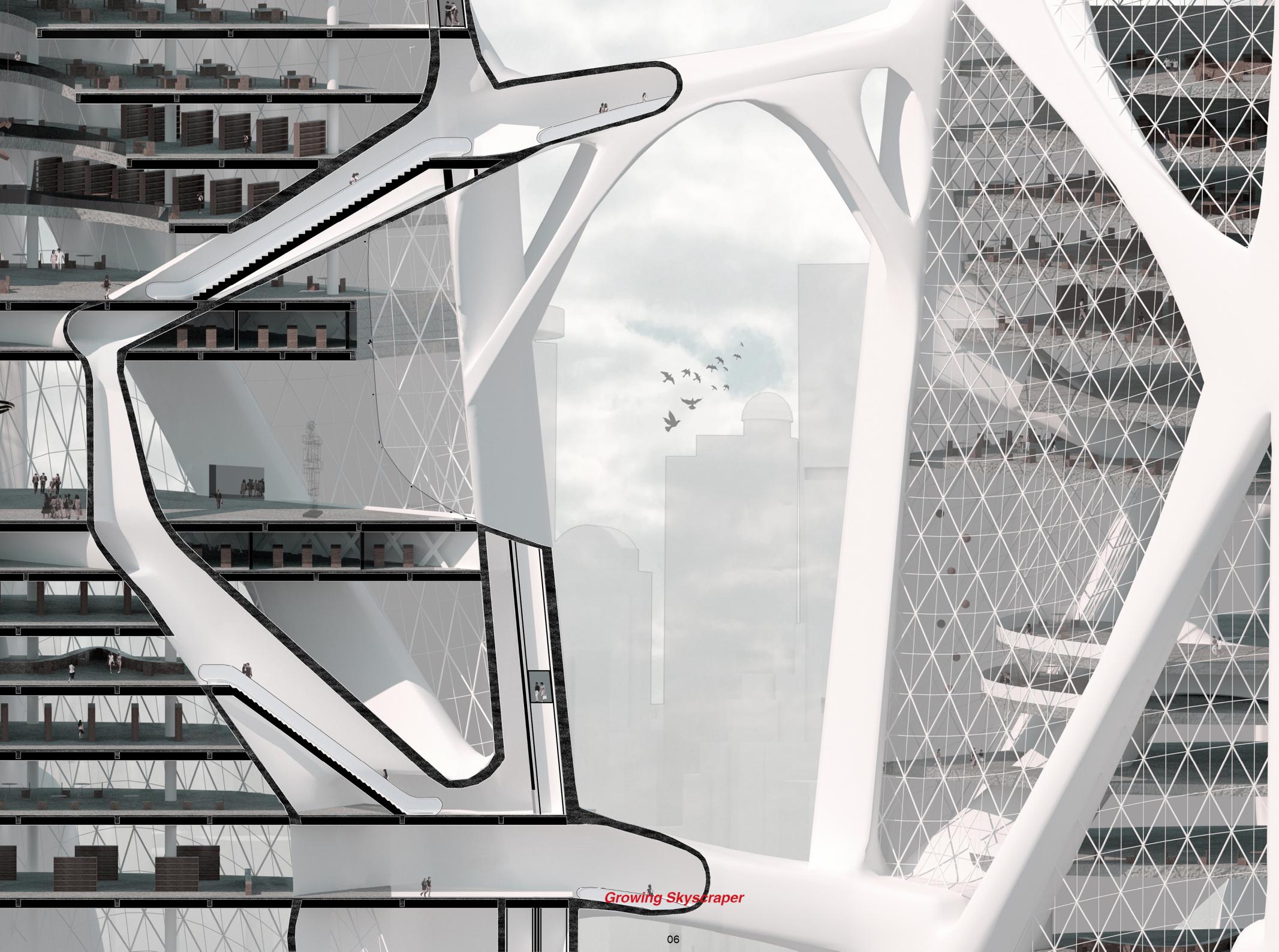


40 mm alternating granite paving
2-ply bitumen sealing layer
30 mm thermal insulation
200 mm reinforced concrete floor slab
50 mm spray foam acoustic insulation
Ceiling suspension system
10 mm gypsum plasterboard

PUR insulation strip
200/180/20 mm steel angle
Non-shrink grout

8 mm Laminated safety glass
Rotule fittings
Point-supported glass system





Growing Skyscraper