



THE LIVING CROWN

- Avery Hall Roof Addition

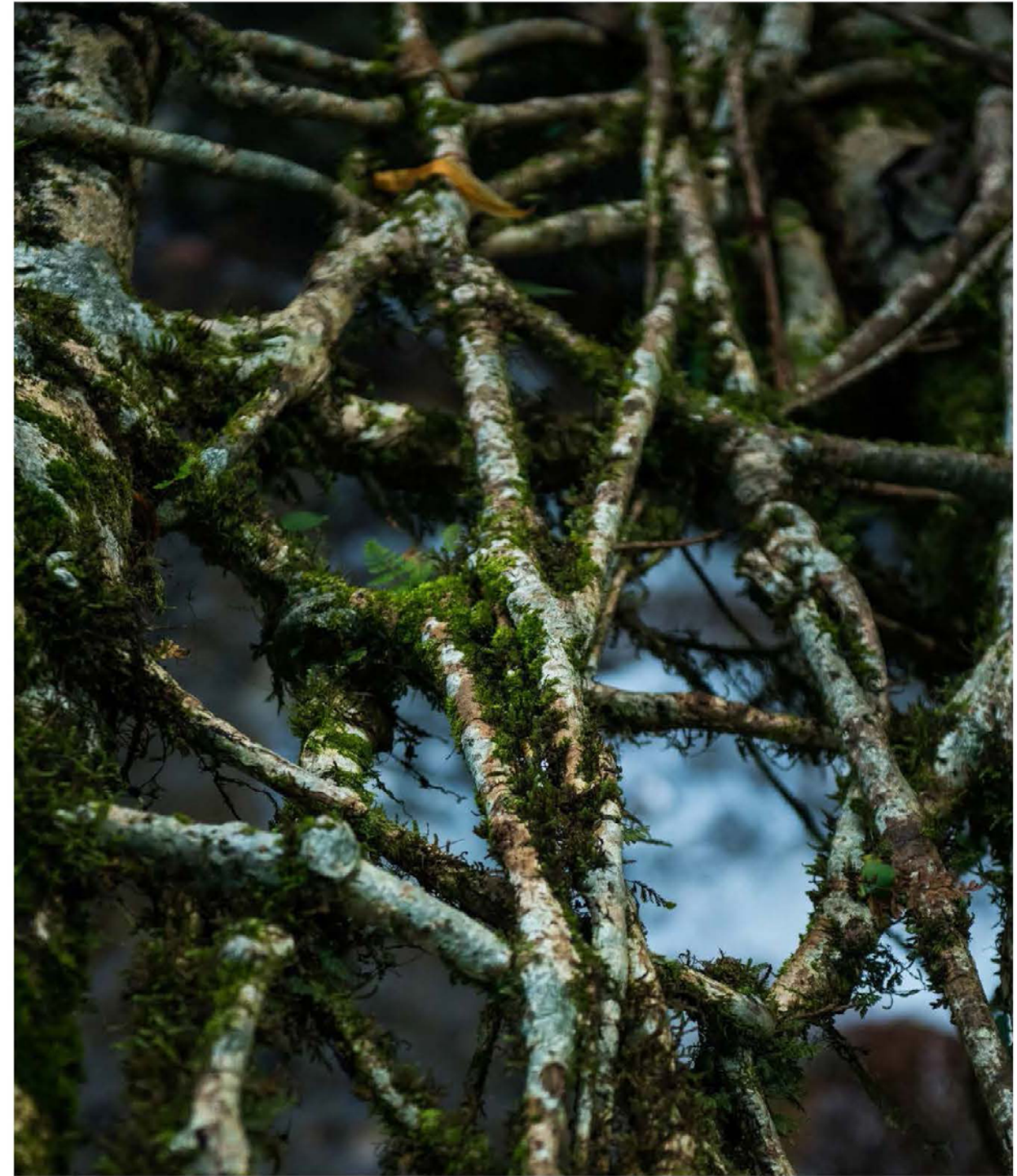
HAO ZHONG

A **living root bridge** is a type of simple suspension bridge formed of living plant roots by tree shaping.





- Ficus roots are pulled and tied to the trunk of a tree on the other end of a river. This is how roots are guided to eventually grow into a bridge.

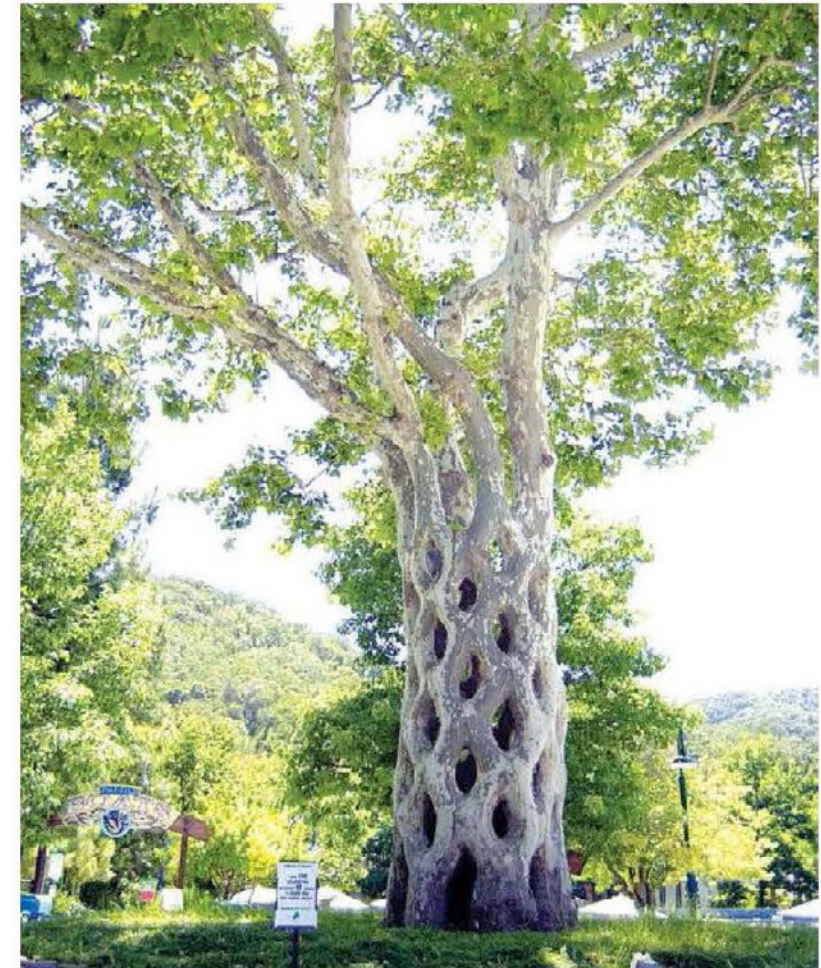


- A mat of Ficus elastica roots have merged together after years of growth, giving strength to the bridge.



A new trees grow over top of the old one and naturally merging to create a stronger tree. Eventually the original tree is redundant

Arbosculpture is a rich and centuries-old art form where trees are slowly bent and grafted into beautiful and functional shapes such as weaves, bridges, chairs, hammocks, even full houses.



Baubotanik

Baubotanik is a term that describes a building method in which architectural structures are created through the interaction of technical joints and plant growth. The term entails the practice of designing and building living structures using living plants. In this regard, living and non-living elements are intertwined in such a way that they grow together into plant-technical composite structures

*Ferdinand Ludwig,
Hannes Schwertfeger
and Oliver Storz*

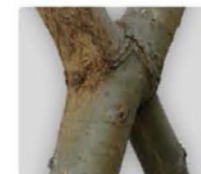


LIVING SYSTEMS

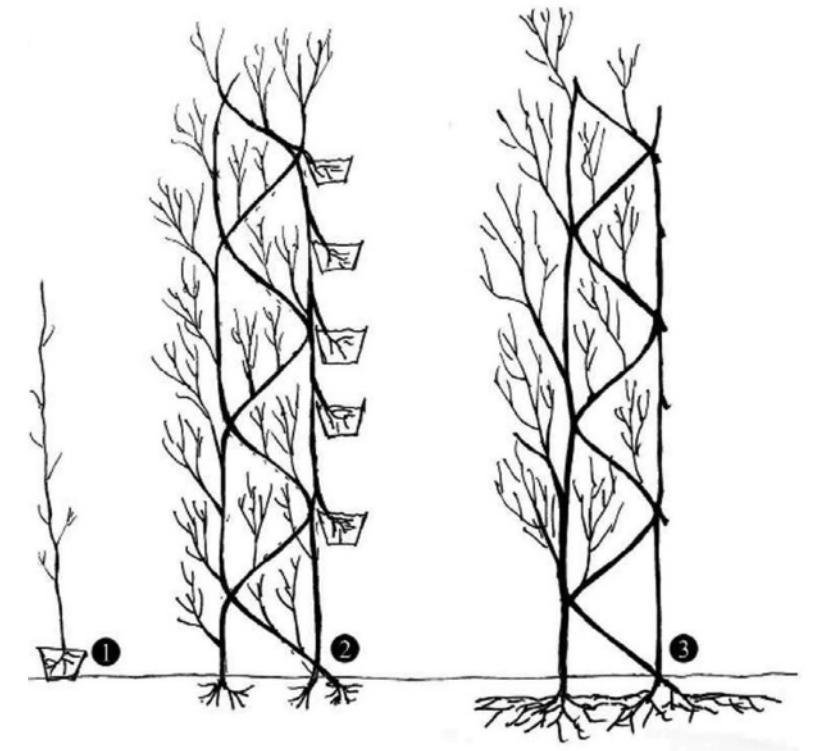
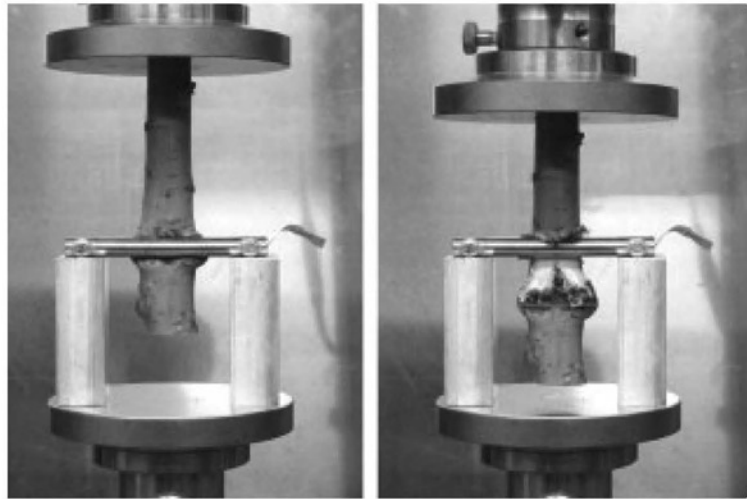
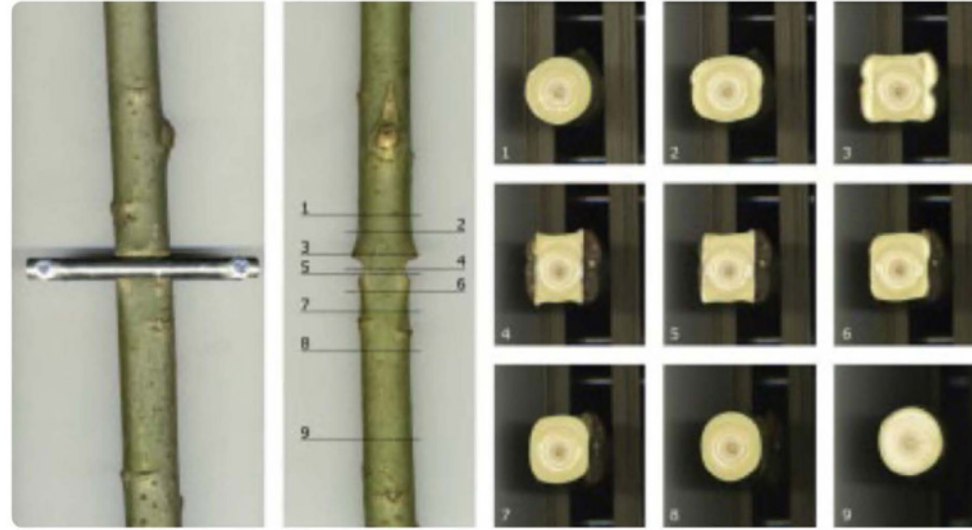
DESIGNING GROWTH
IN BAUBOTANIK



Baubotanik – the construction method that uses living plants for load-bearing in architectural structures – provides a surprising ability to anticipate the latent convergence of non-living and living systems in architecture. Through interdisciplinary research by architects, engineers and biologists it aims to synthesise architectural qualities, constructive requirements and biological properties in living structures. In this article, **Ferdinand Ludwig, Hannes Schwertfeger and Oliver Storz of the Baubotanik research group** at the Institute for Architectural Theory and Design (IGMA) at the University of Stuttgart explain how living and non-living building elements can be designed to develop into vegetal-technical compound structures.



Tree Grafting



The footbridge was realized as an experimental building in 2005. Its simple vegetable-technical structure shows demonstrates the conceptual as well as the constructive approach of the Baubotanik.



after completion



1st growing season



2nd growing season

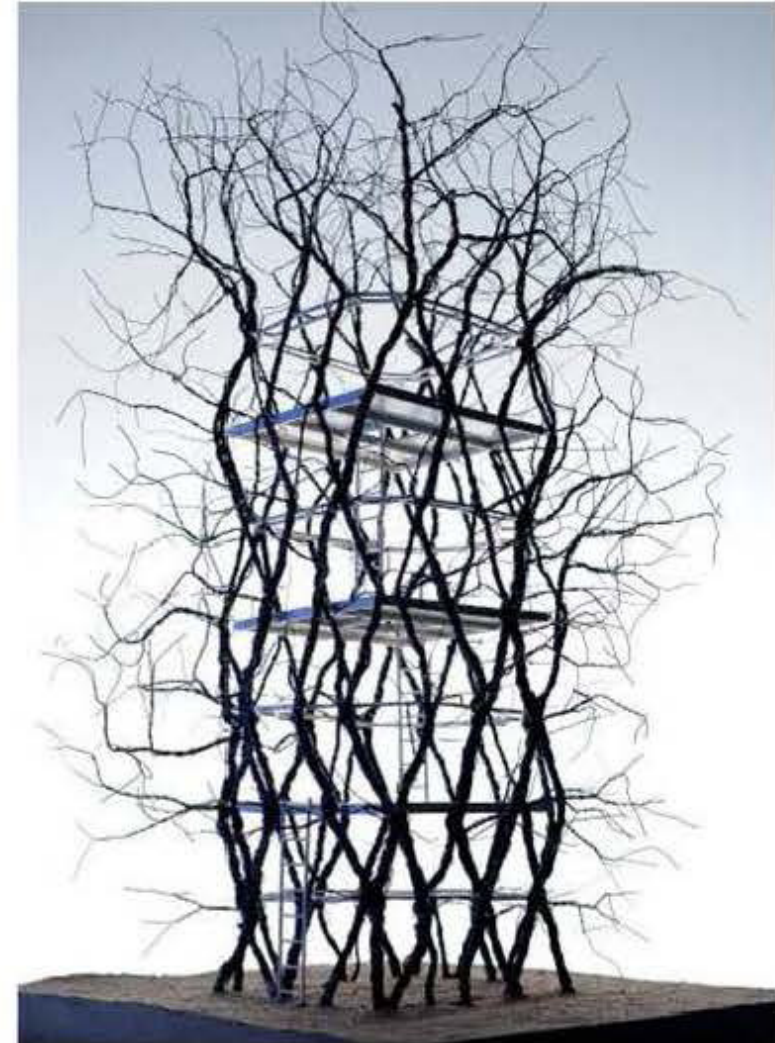


3rd growing season



4th growing season

The Baubotanik Tower is a test and demonstration building completed in 2009. It exemplifies new possibilities of engineering with living plants and visualizes the architectural and ecological potential of Baubotanik.

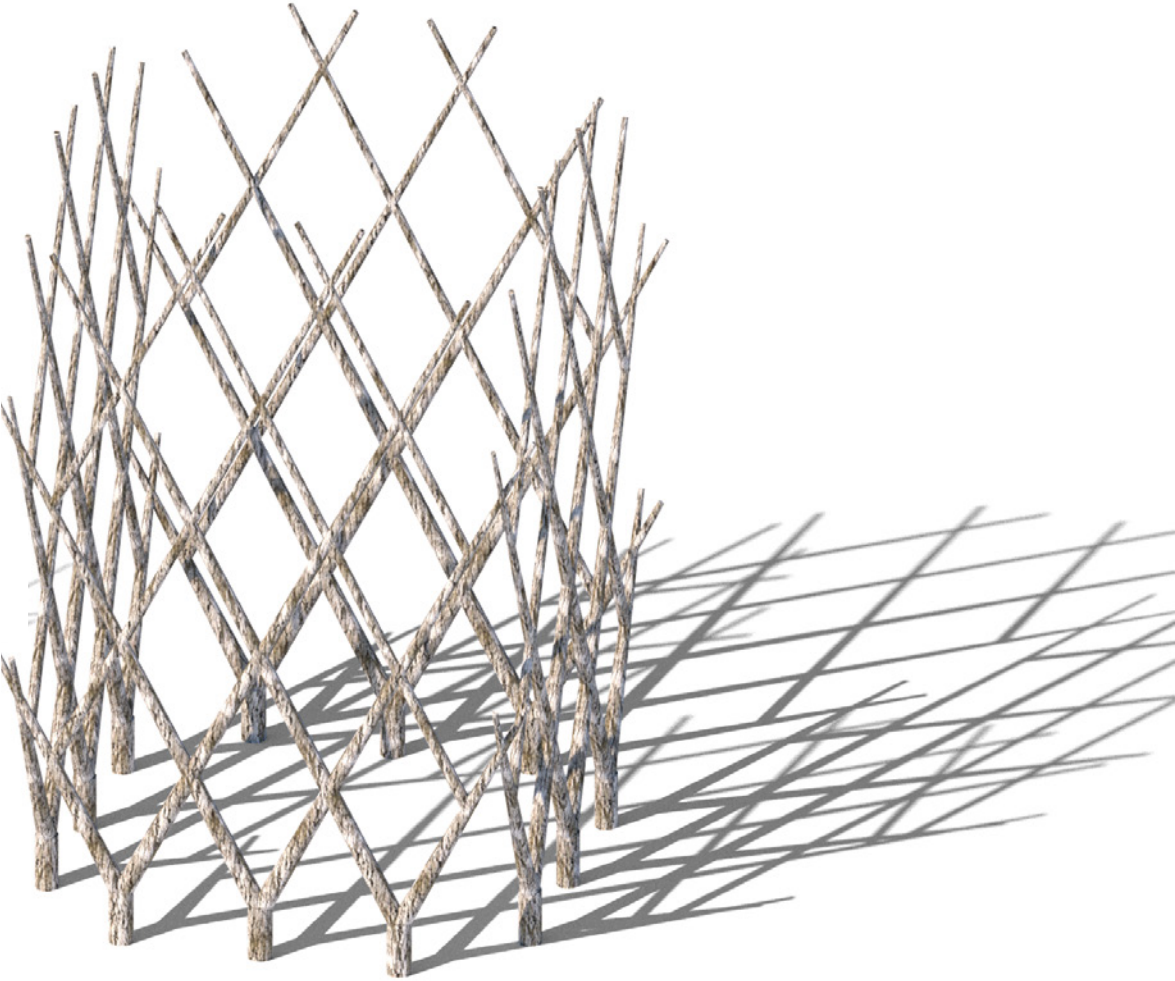
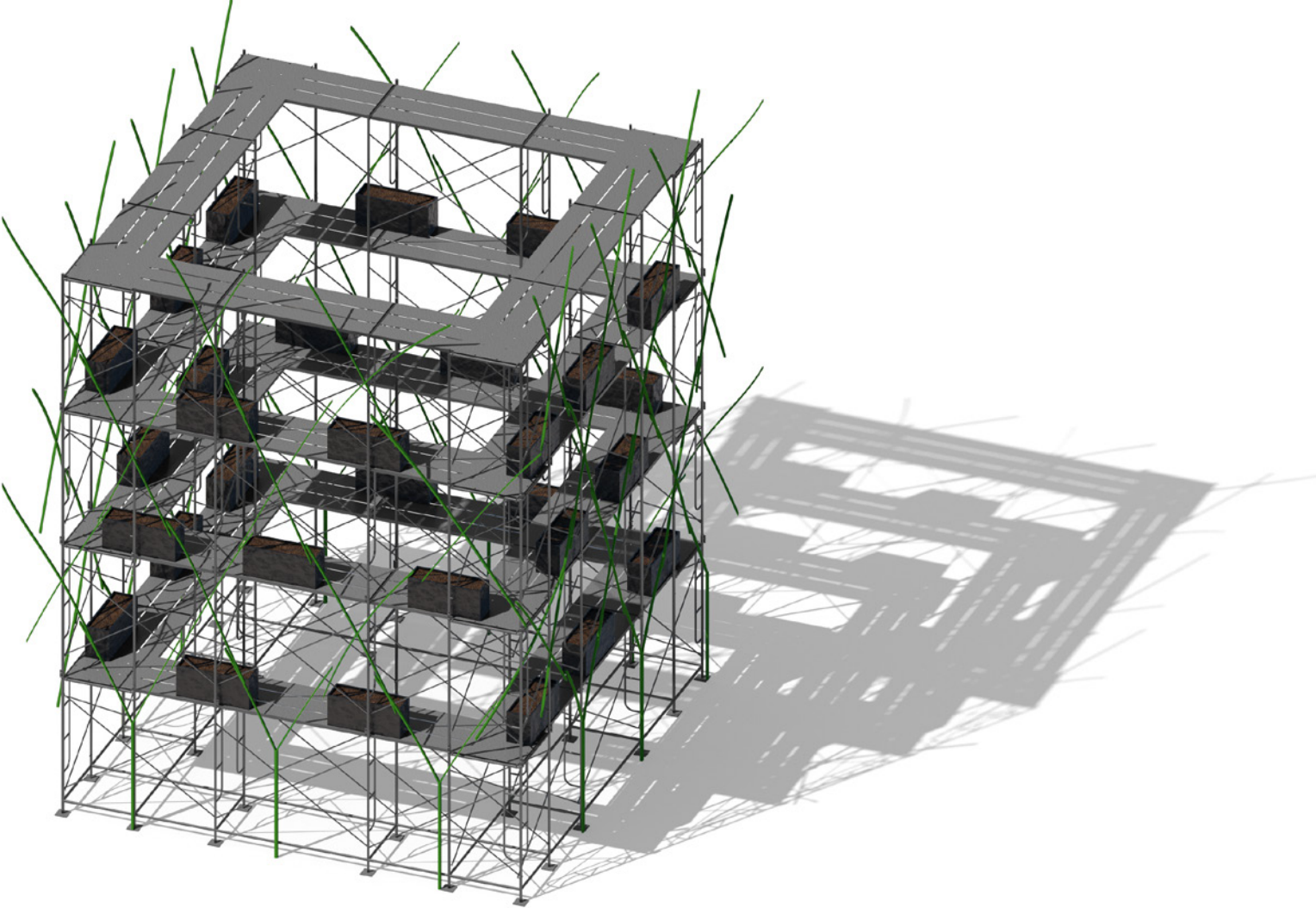


The Plane-Tree-Cube Nagold is the biggest baubotanical building so far and the first one that is designed specifically for an urban context. It is a contribution for the regional horticultural show 2012 in Nagold and will be part of a number of town houses afterwards.

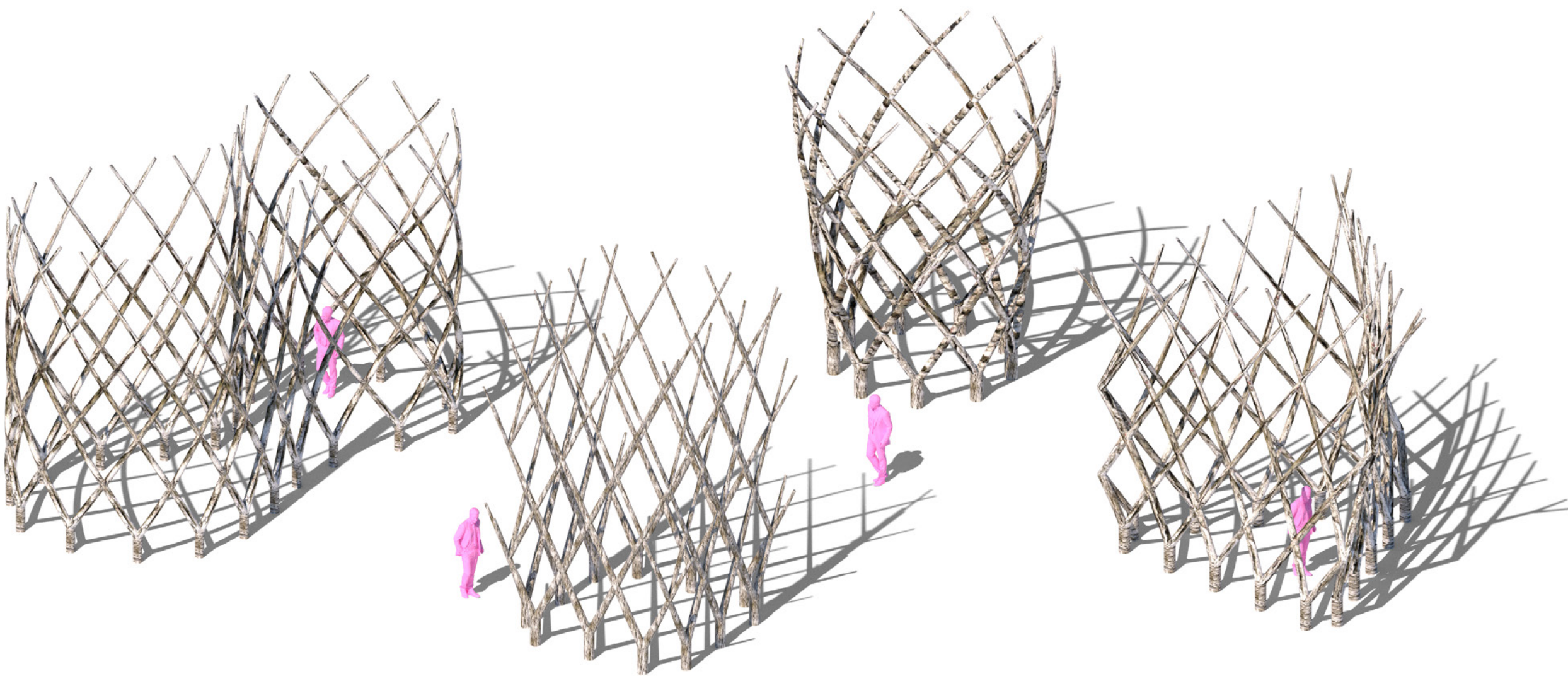




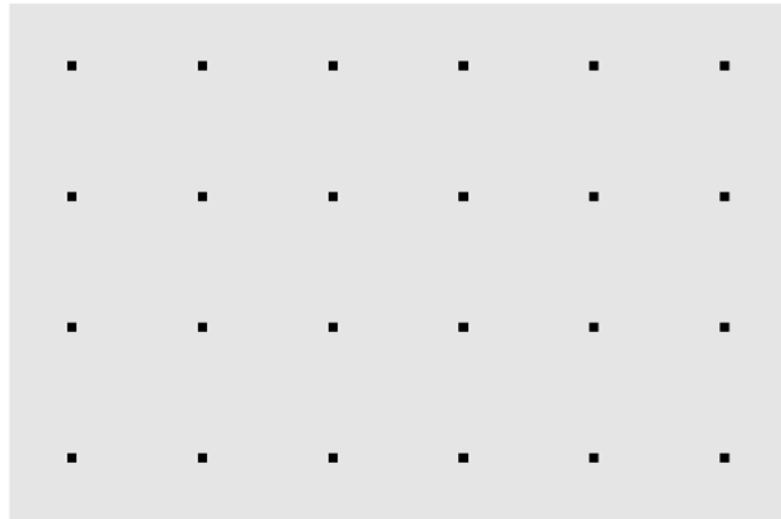
Scaffolding Structure



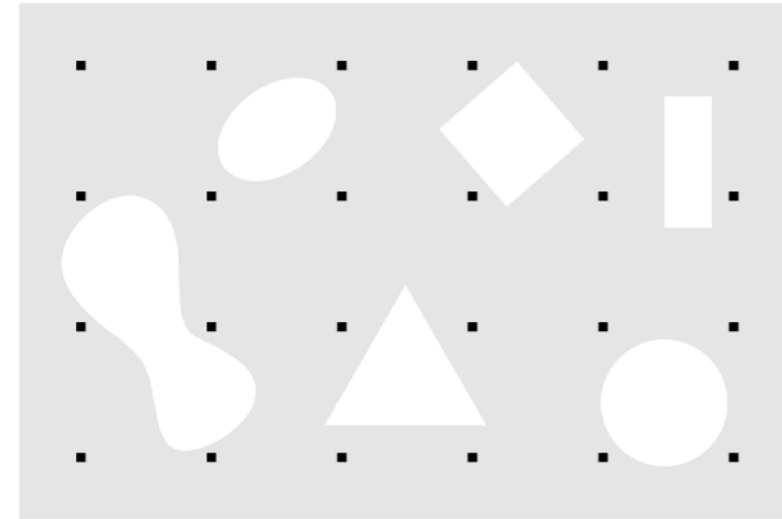
Living Tree as Load-Bearing Member



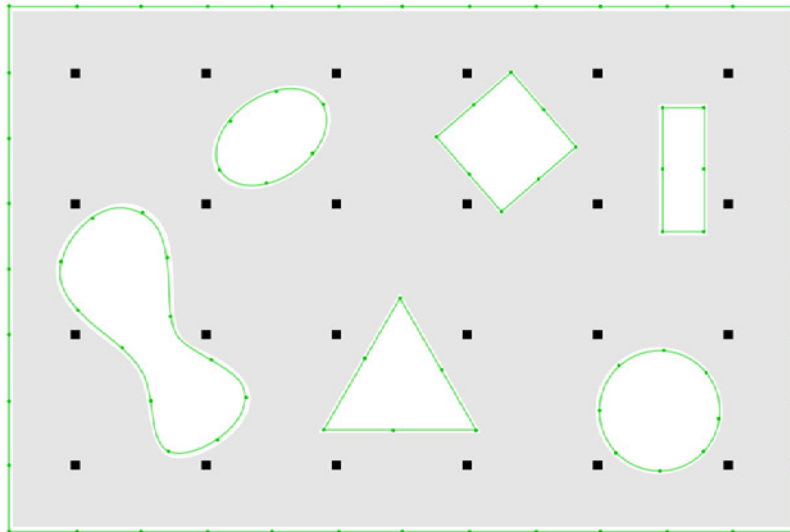
Early Idea



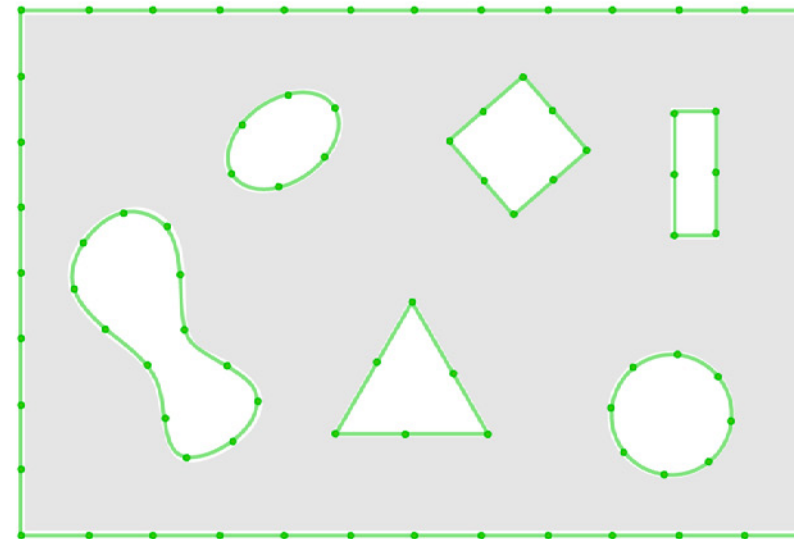
column grid



void



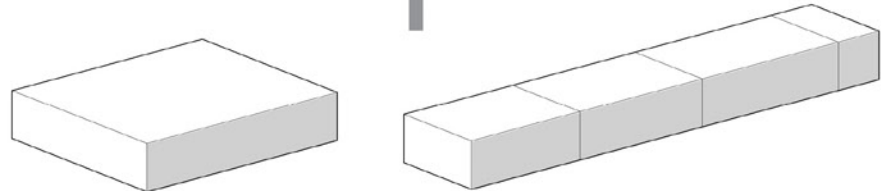
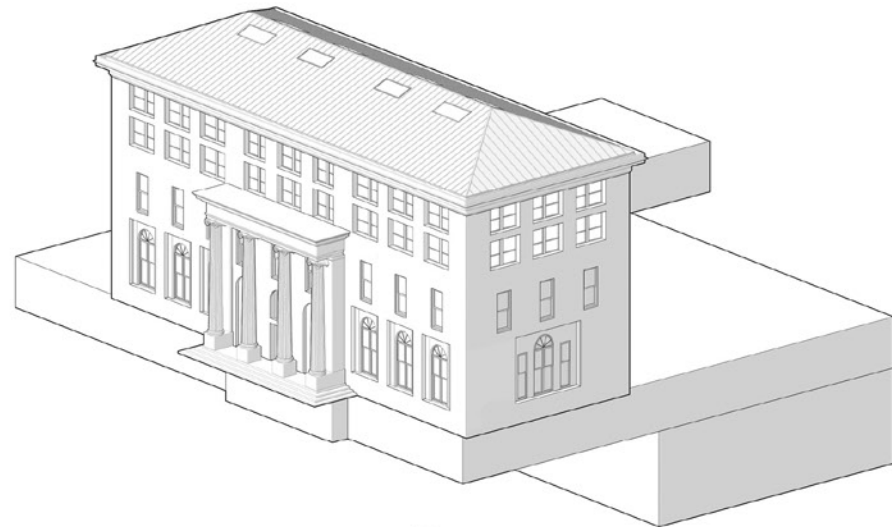
tree cores (merging)



column removed

Current Program Arrangement

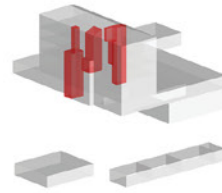
AVERY



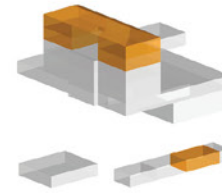
SCHERMERHORN

FAYERWEATHER

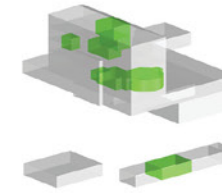
Vertical Circulation



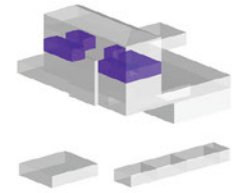
Studios
13,300 sq.ft



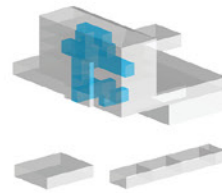
Classrooms
5,500 sq.ft



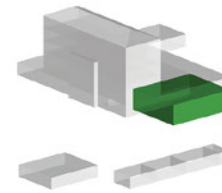
Offices
2,275 sq.ft



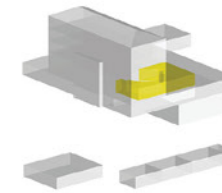
Hallway
5,480 sq.ft



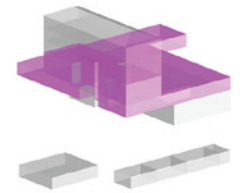
Auditorium
4,000 sq.ft



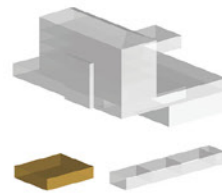
Cafe & Exhibition
2,250 sq.ft



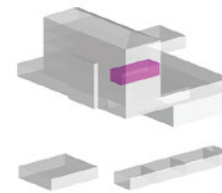
Library
40,650 sq.ft



The Shop
4,150 sq.ft



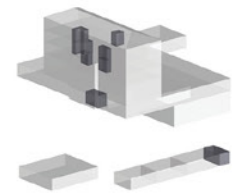
OPS
680 sq.ft



Lab
1,200 sq.ft



Restroom
1,720 sq.ft



Concept Diagram



current condition



remove roof



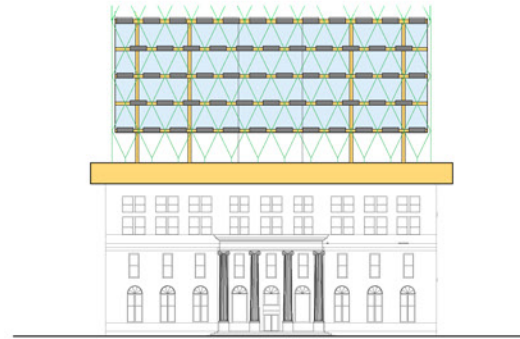
add soil tub



new volume



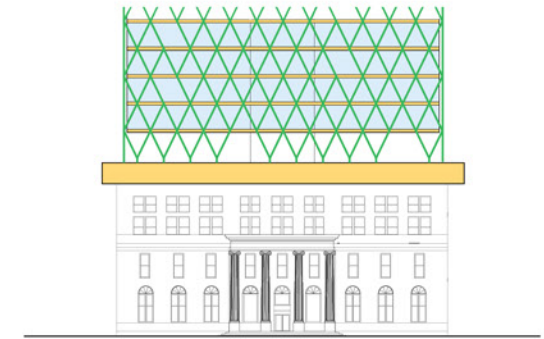
timmer structure



tree placement
(year 1)



tree merging
(year 5)



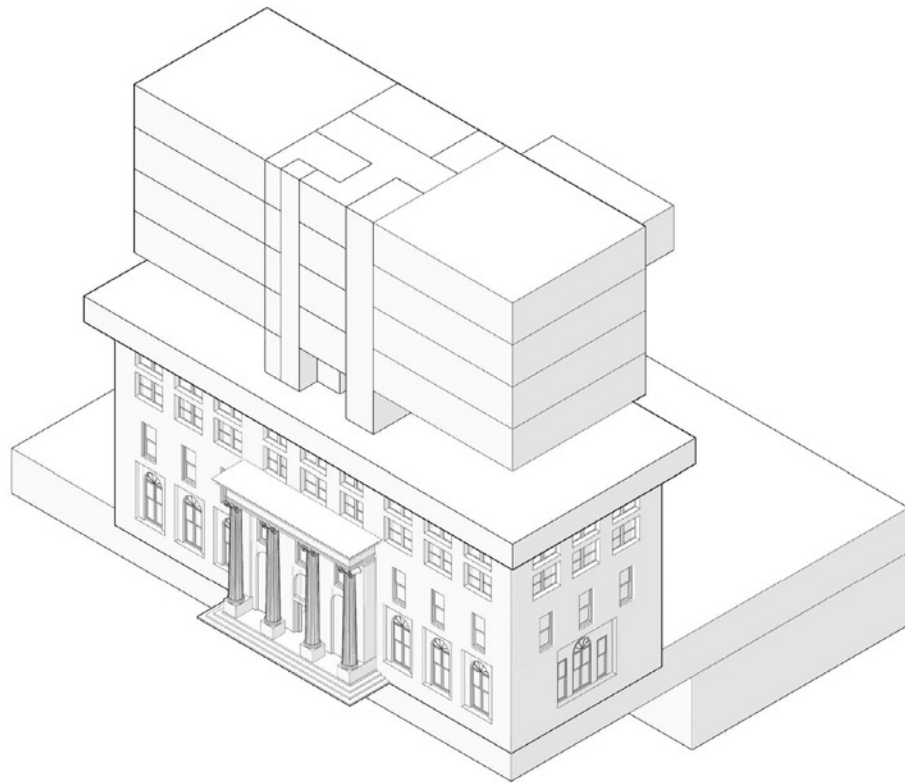
tree maturation
(year 15)

Proposed Program Arrangement

ROOF ADDITION

+

AVERY



Vertical Circulation



Studios
31,520 sq.ft



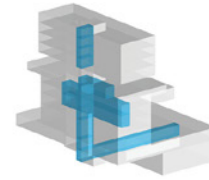
Classrooms
8,880 sq.ft



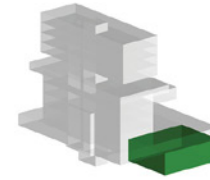
Offices
5,300 sq.ft



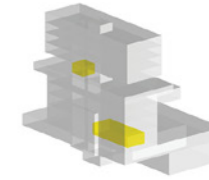
Hallway
7,380 sq.ft



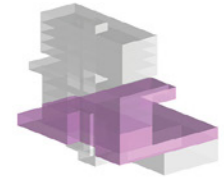
Auditorium
4,000 sq.ft



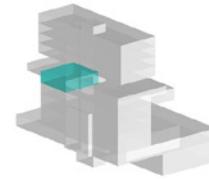
Cafe
2,320 sq.ft



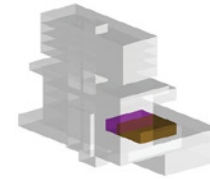
Library
40,650 sq.ft



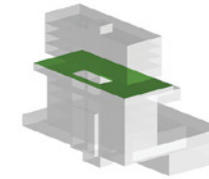
Lab
2,600 sq.ft



The Shop & OPS
2,700 + 1,280 sq.ft



Garden
12,820 sq.ft



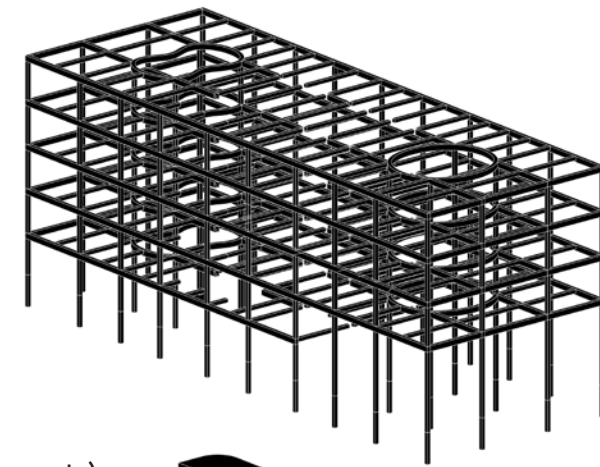
Restroom
3,690 sq.ft





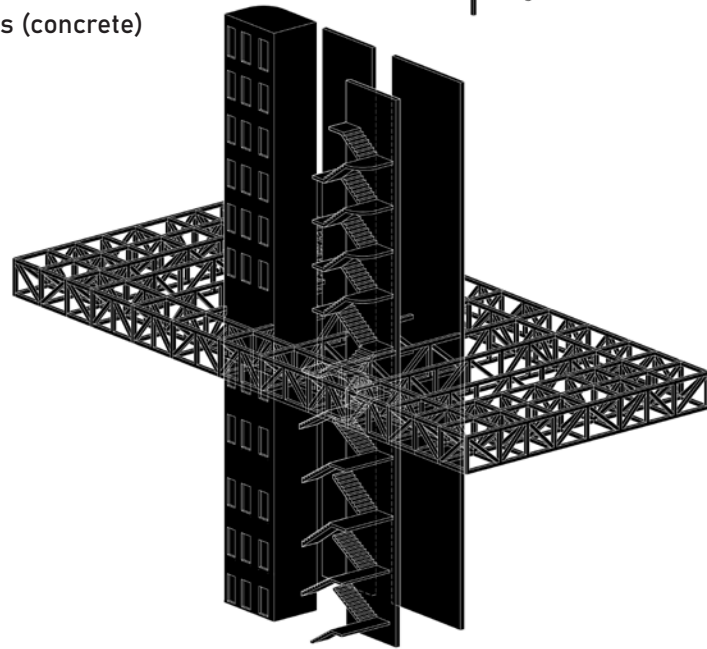


glulam structure

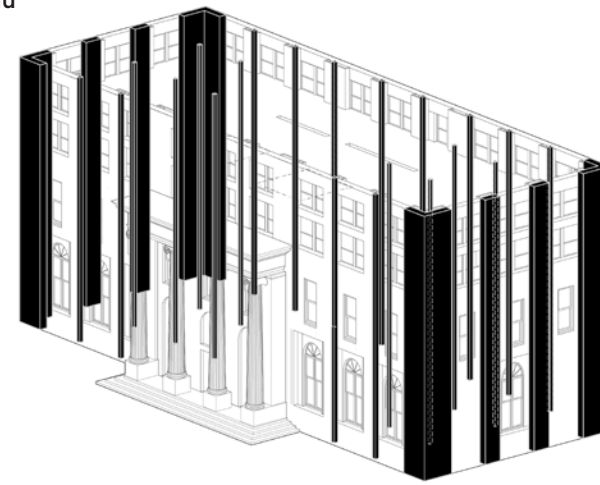


core & shear walls (concrete)

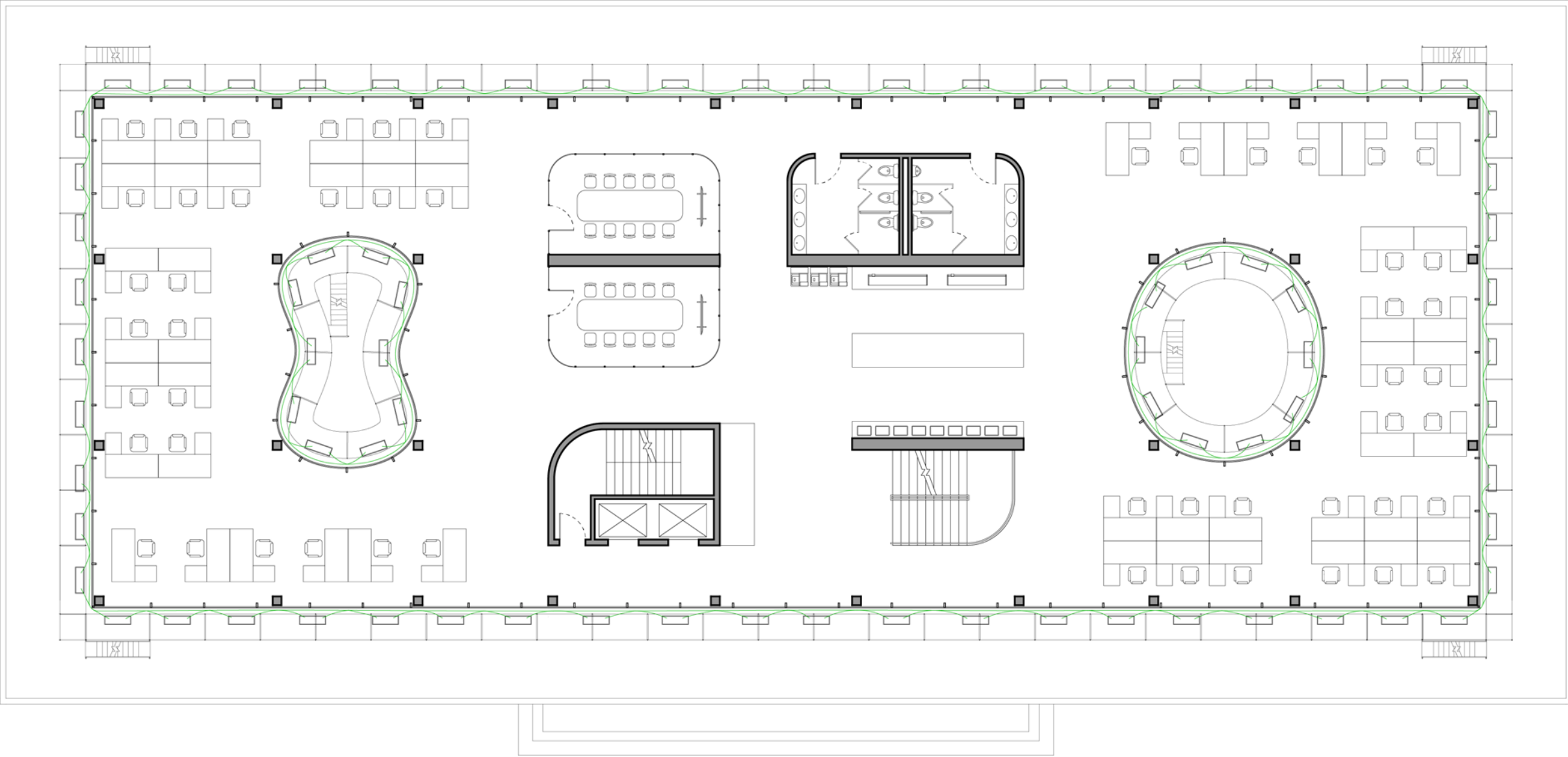
+
timber trusses



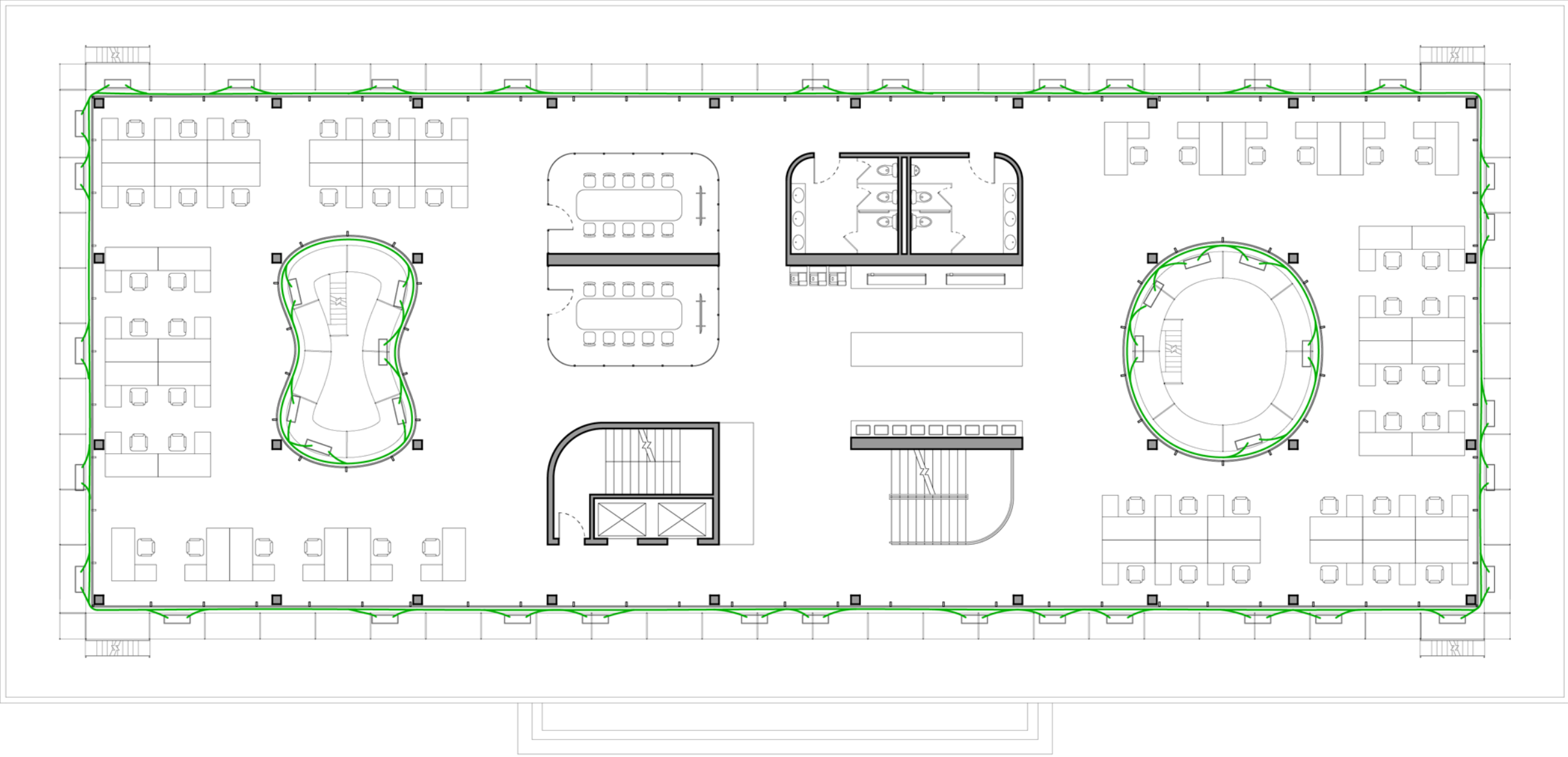
existing structural grid
(reinforced)



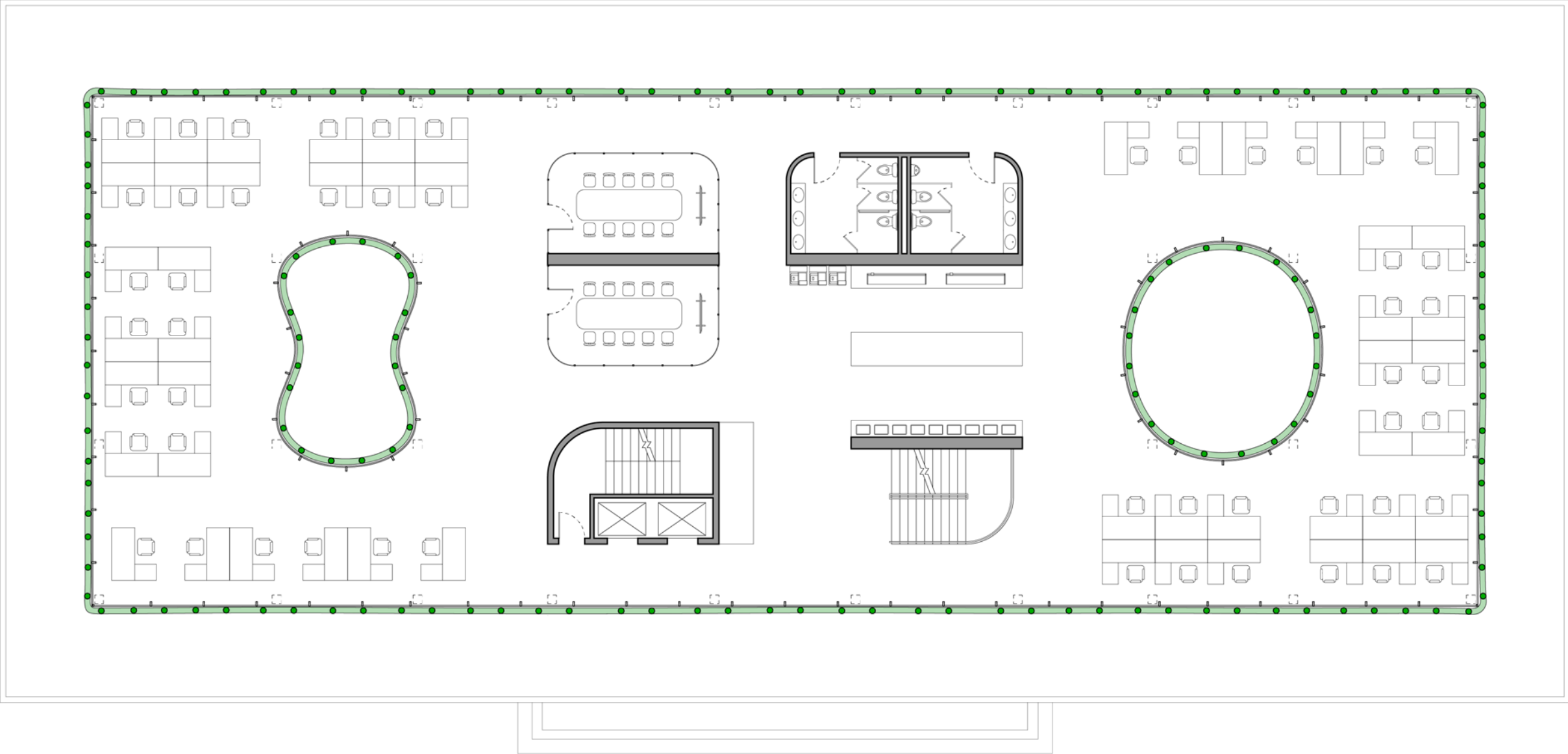
Typical Floor Plan (Year 1)



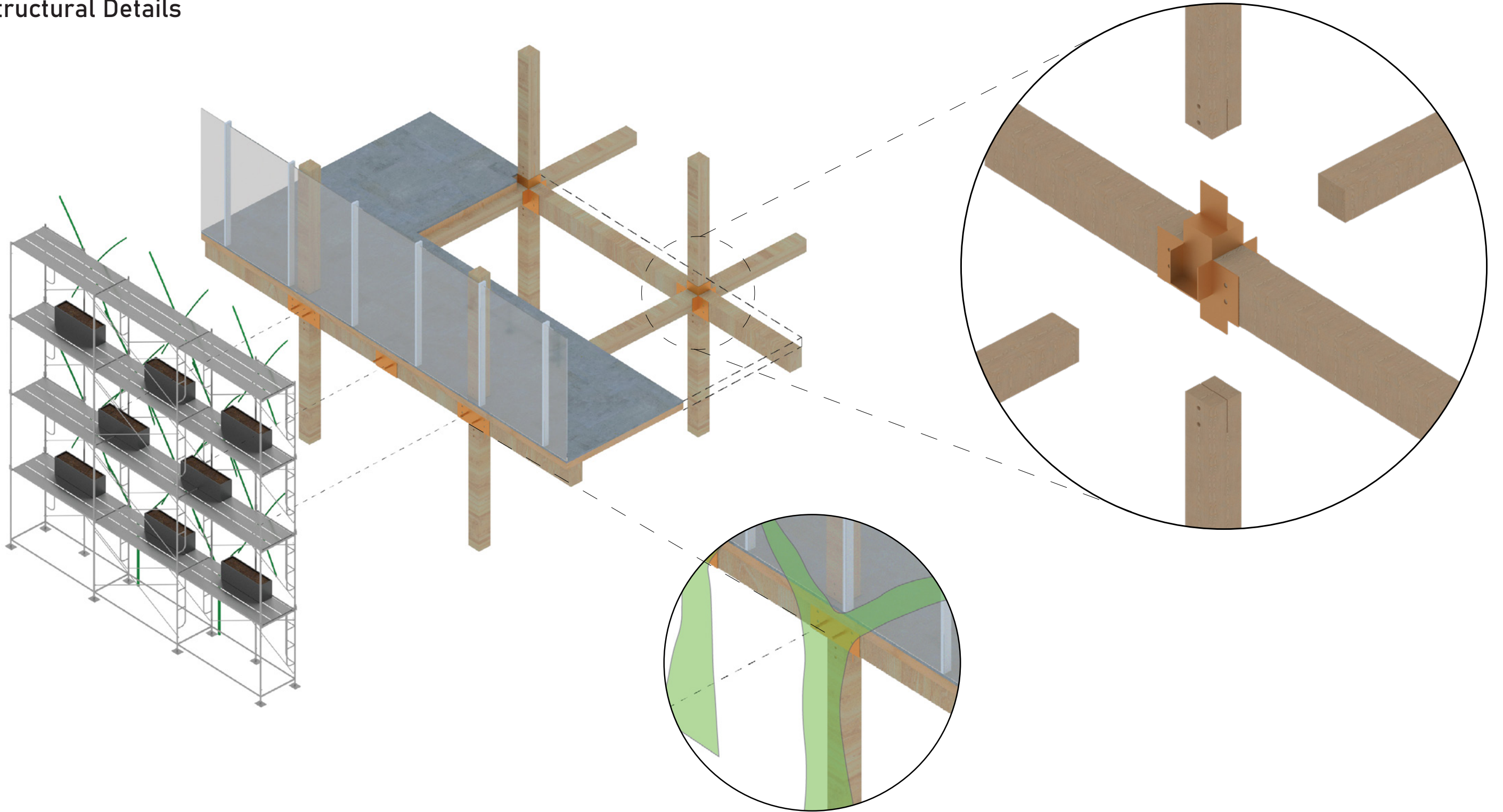
Typical Floor Plan (Year 5)



Typical Floor Plan (Year 15)

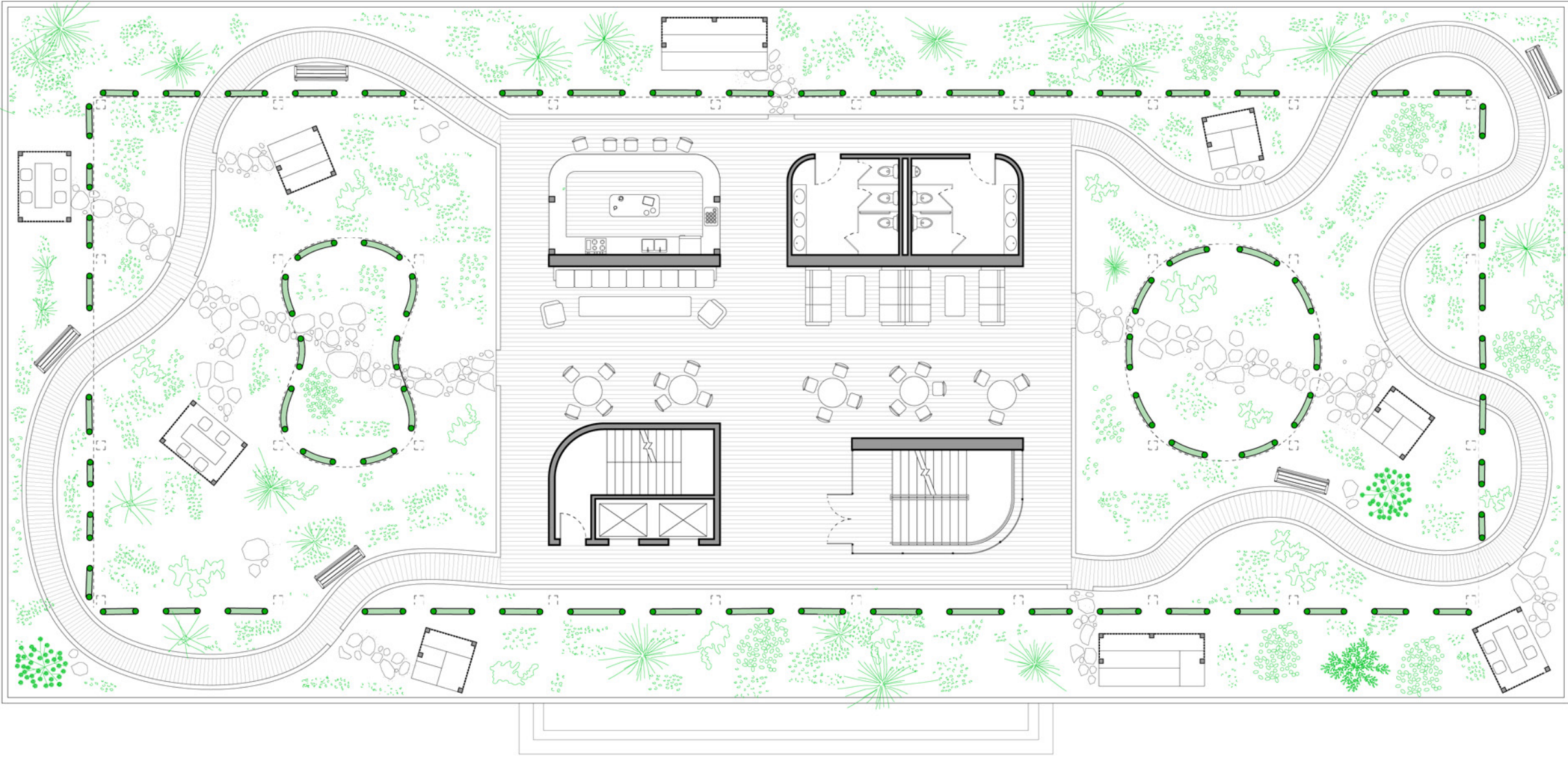


Structural Details





Garden Plan (Year 15)



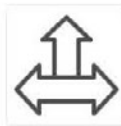
River Birch

As its name suggests, the river birch naturally grows along riverbanks. But as a landscape tree, it can be planted almost anywhere in the U.S. The species is valued for its relatively rapid growth, tolerance of wetness and some drought, unique curling bark, spreading limbs, and relative resistance to birch borer. The river birch grows to a height of 40–70' and a spread of 40–60' at maturity. Roots of River Birch spread into a 4- to the 8-inch thick mat-like structure primarily near the soil surface in order to absorb the rainwater from the soil.



Hardiness Zones

The river birch can be expected to grow in Hardiness Zones 4–9. [View Map](#)



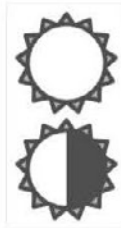
Mature Size

The river birch grows to a height of 40–70' and a spread of 40–60' at maturity.



Growth Rate

This tree grows at a medium to fast rate, with height increases of anywhere from 13" to more than 24" per year.



Sun Preference

Full sun and partial shade are best for this tree, meaning it prefers a minimum of four hours of direct, unfiltered sunlight each day.



Soil Preference

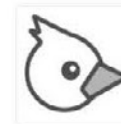
The river birch grows well in acidic, loamy, moist, sandy, well-drained, wet and clay soils. It will tolerate moderate flooding as well as some drought.



Attributes

This tree:

- Features glossy green leaves that are 2–3" long and somewhat triangular. Margins are double-toothed and leaves are arranged alternately.
- Produces brown and green catkins in April and May.
- Yields a large number of tiny nutlets after female catkins mature, typically in May and June.
- Develops a cinnamon-colored bark that curls and peels (once mature).
- Can grow as either a single- or multi-stemmed tree.
- Is the most borer-resistant birch.
- Works well for holding stream banks and keeping erosion in check.
- Grows in an oval shape.
- Should not be planted in very alkaline soil.

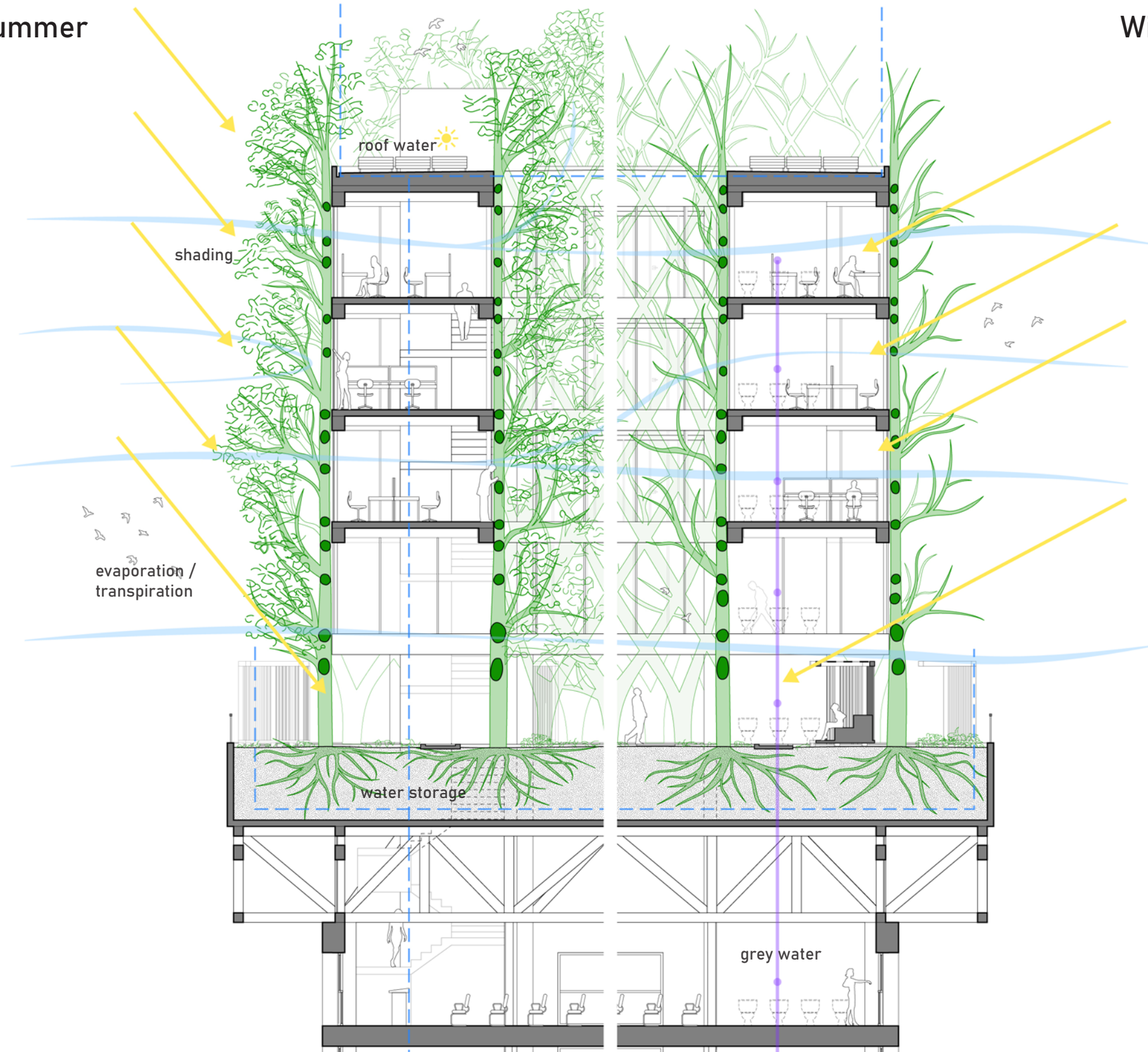


Wildlife Value

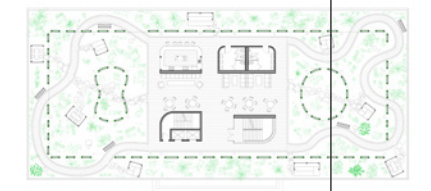
The catkins of the River Birch are used by redpolls and pine siskins. The foliage is eaten by deer and other browsers. The small but plentiful seeds are appreciated by a wide range of songbirds.

Summer

Winter



cross ventilation /
air filtration



Year 15

At Completion

