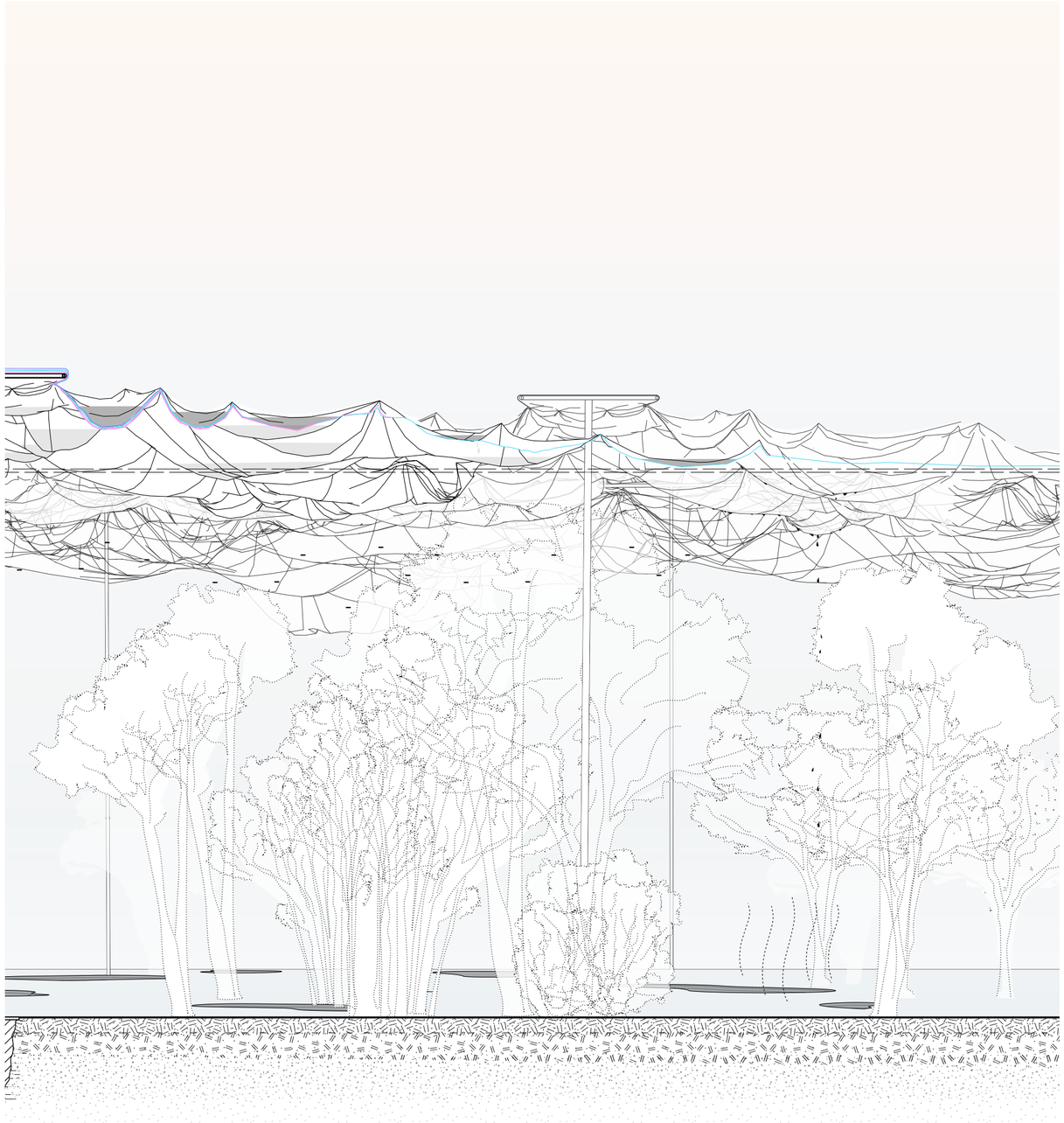
Sophie Hartmann: Floating Ponds

FLOATING PONDS

Rethinking the application of synthetic materials in architecture, this project aims to re-appropriate the special characteristics of high-density Polyethylene foil (PEHD) to create an evaporative roof floating above human and vegetation.
Due to climate change we are facing temperature increases in large cities up to 7 degrees. This will challenge not only our everyday lives but puts vegetation under extreme pressure. To keep high biodiversity in cities and greenspaces flourishing, plants as well as human should benefit from the cooling effects of the implemented structure.

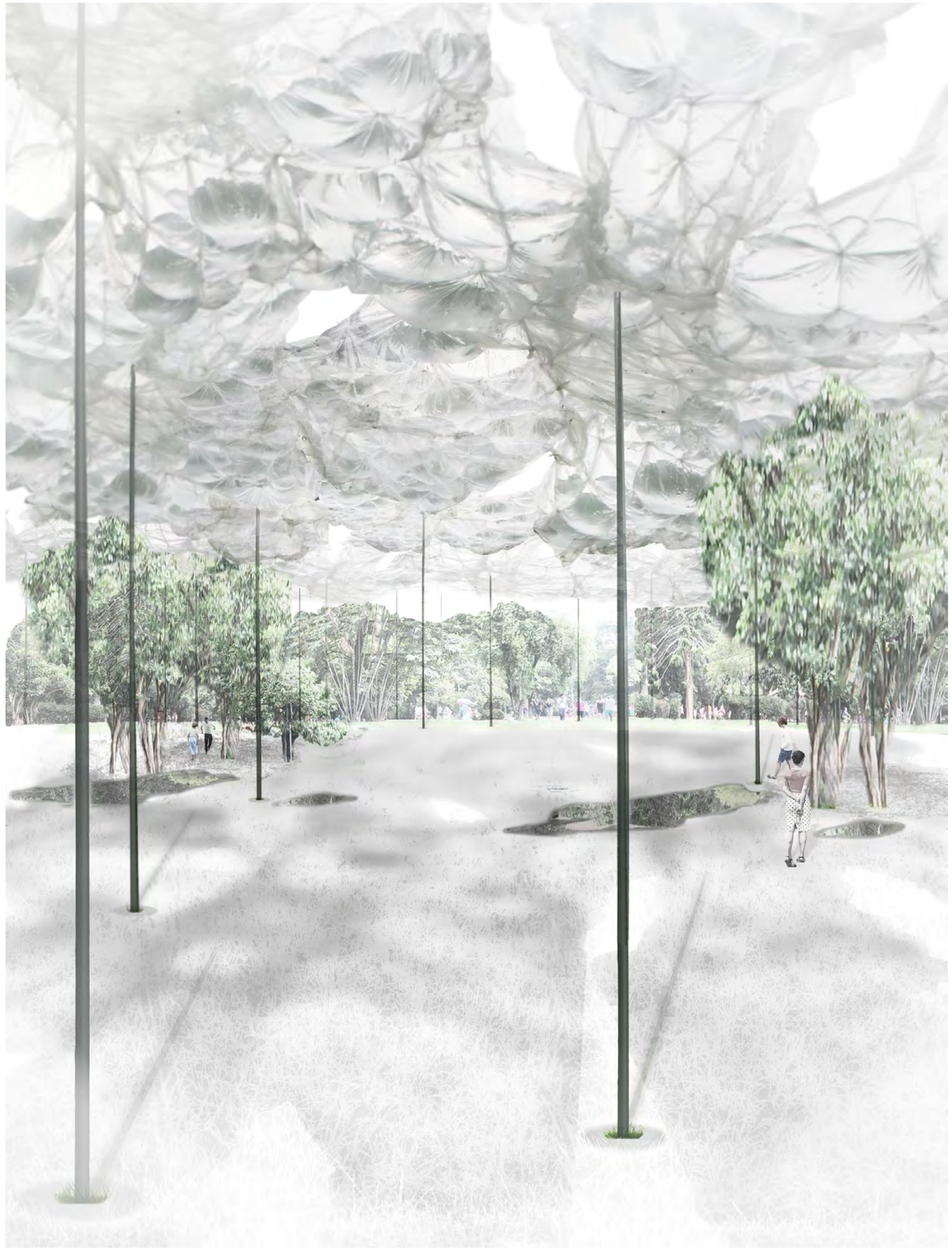
With the help of PEHD foil this architecture wants to take advantage of the natural circular system of water and temperature and perform as a membrane woven between sky and ground. By intervening in the cycle of rain, evaporation and due the foil behaves as a vapor and water barrier that slows down and redirects the processes.
The semitransparent material is extremely light and flexible. To increase its strength floating water ponds tension and stabilize the foil while being the source of evaporation.
The seasonal erected roof extends over Park Ibirapuera in Sao Paulo cooling down the cities liveliest green space.
Cooling effects can be achieved due to the special properties of PEHD foil.
With a thickness of only 0,009mm it is thinner than a hair. This thinness is possible because of the very high density of PE and the production process where plastic gets inflated to create super thin surfaces. Produced as a continuous sheet it can take equally distributed force like wind pressure but breaks very fast when punctual load is applied.
Its high flexibility and fragility ask for a technique where the man-made material is used as a flat surface of extreme thinness, and as a thread like element that is endless and able to use the strength of a string. This duality of elements is unique in the scope of building materials.
The oil-based foil is commonly utilized for short time purposes although its lifetime is about 200 years. This mismatch of application, demand and persistence leads to a huge amount of trashed plastic. However, by taking advantage of its thinness, it is possible to cover 40.000m^2 with a material input of a 1m^2 cube with a height of only 36cm. Furthermore, extending the time of use by more than 100, the application is operating in a sustainable and material efficient way.

The materials relation of being used when something needs to be renewed gives it a connotation of “the state before something”. The materials appearance is based on temporality and what it covers. The qualities of translucency and its fabric like behavior with wrinkles and pleats define the materials visible gestures. The surface can transform from a milky to a glowing and reflective foil depending on the light situation.

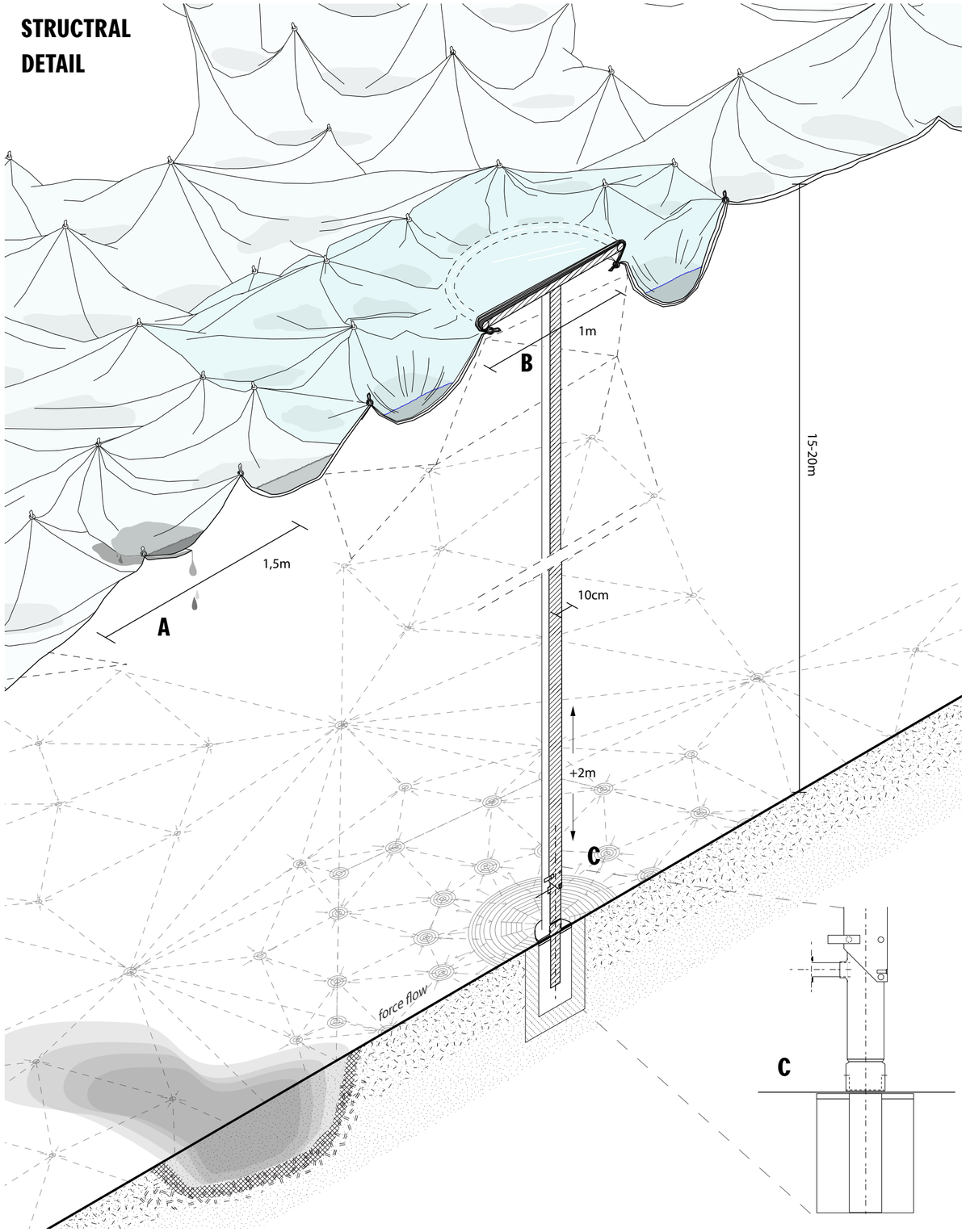


Evaporative Roof, Section 1:50

SUMMER, FLOATING PONDS



STRUCTRAL DETAIL



A Overflow System
B Structural Ring
C Hydraulic Pillar

Hierachy of Elements
1.Ring (B)
takes compression load and translates them into tension
2.Knots (F)
strengthen foil through deformation, shrinking
3.Triangulation (E)
translates load from one knot to the next
5. Sheet (D)
distributes water load
6. Boundary Ring (A)
tensions roof equally
Model 1:15

A

B

C

D

E

F

30°C

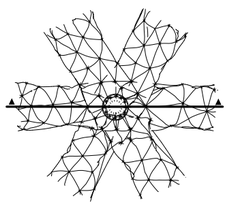
1-2m

max 500L

26°C

12-18m

15-20m



10cm

10m

20m

Evaporative Roof, Section 1:50