

### Introduction

The diploma focuses on the design of a new observation tower in northern Iceland at the junction of two lithospheric plates. At the same time, the possibilities of urban solutions for the immediate surroundings are explored. This paper is devoted to the study and use of non-standard modern building systems. The work uses bioplastics and 3D printing.

### Geography

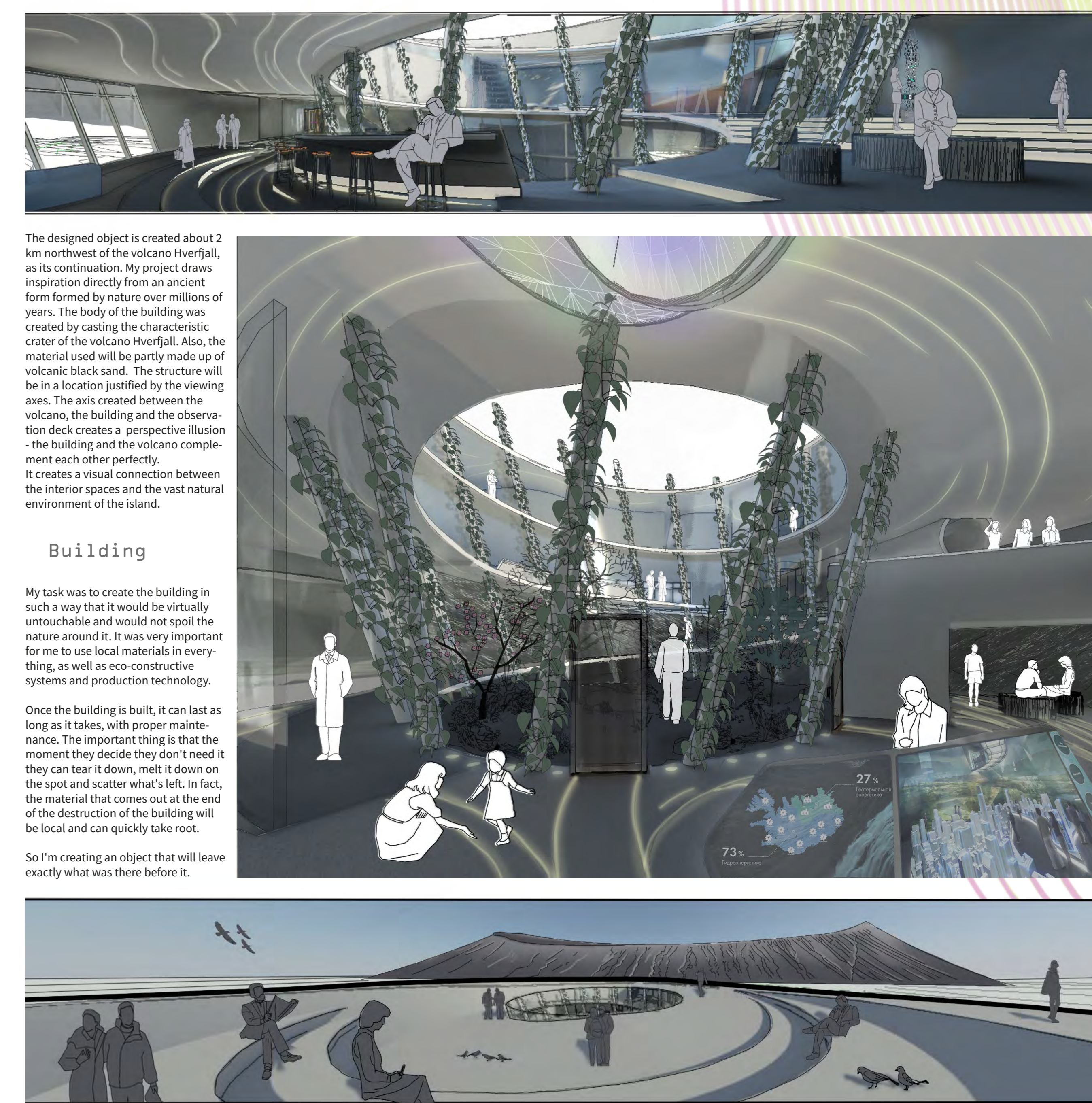
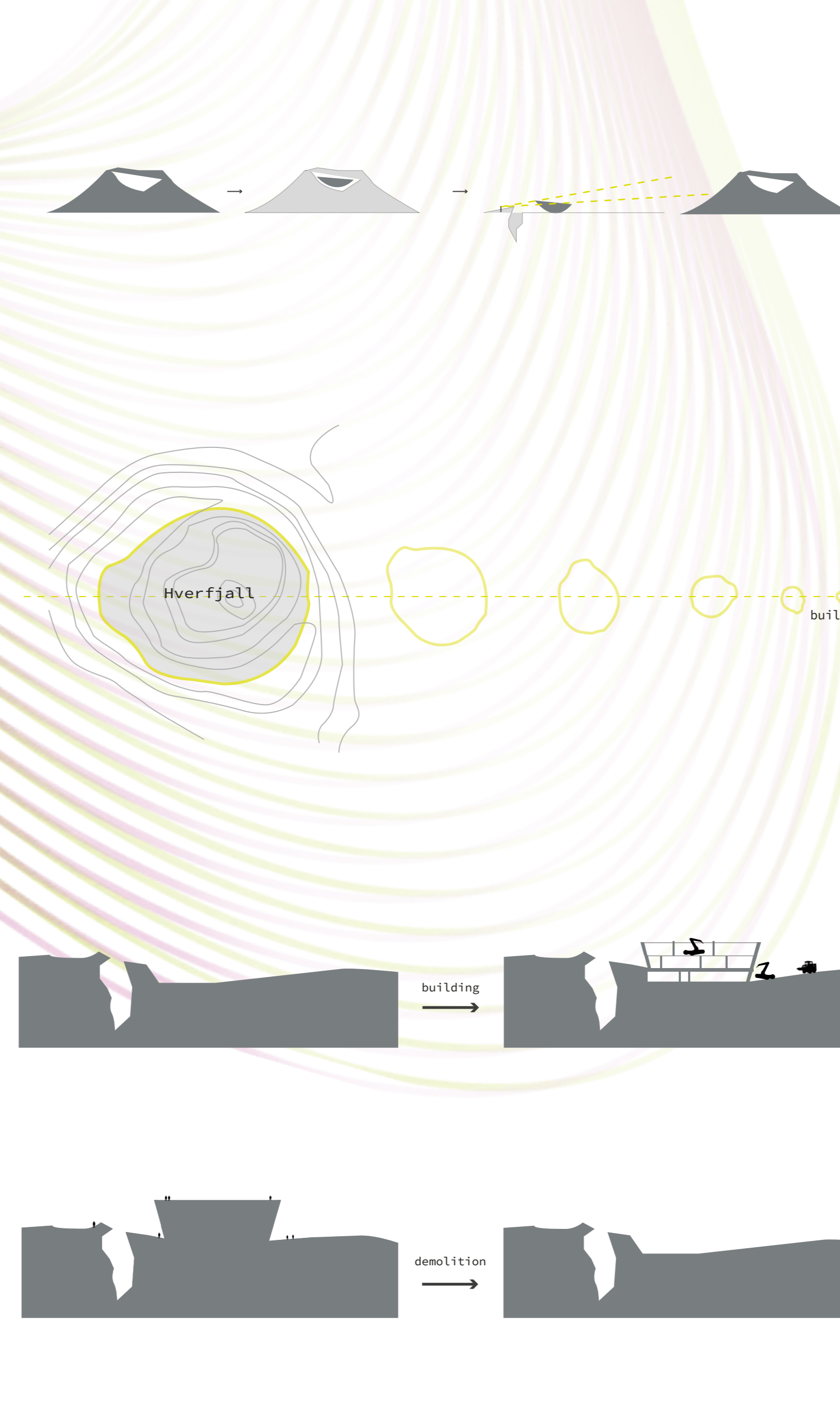
Iceland is a small Nordic island country situated between the North Atlantic and the Arctic Ocean. With a population of less than 333,000, it is the most sparsely populated country in Europe, with the majority of that population living in the capital Reykjavik and the surrounding areas.

Iceland's geography is both varied and extraordinary. The island is volcanically and geologically active, and the entire country is 103,000 km<sup>2</sup> in size, 62.7% of which are tundra. Iceland's coastline is punctuated with many fjords, a third of which of the country's settlements are situated. The interior of Iceland is cold and uninhabitable, consisting of a combination of sand and lava fields, mountains and glaciers, with many glacial rivers flowing to the sea through the lowlands on the exterior of the island.

Gríftagjá is a collection of three small caves located near Lake Mývatn in northern Iceland, and features one of the country's most famous and beautiful geothermal hot springs inside. The caves are all in close proximity, with two of them just 50 meters apart, and are located on Vogar farmland. Sitting on the tectonic divide between Europe and America. That's where the building is located.

### Welcome to the designing of CaveTower

Modern methods of tourism business require renovations in terms of architecture, construction of a more comfortable environment for people, developed infrastructures. The architecture of the health and wellness area should be more focused on the needs of holidaymakers, so for the city of Gríftagjá there was a need to build public buildings with the view area and infrastructural facilities of various purposes as close to one to one.



### Building

My task was to create the building in such a way that it would be virtually unchangeable and would not spoil the nature around it. It was very important for me to use local materials in everything, as well as eco-constructive systems and production technology.

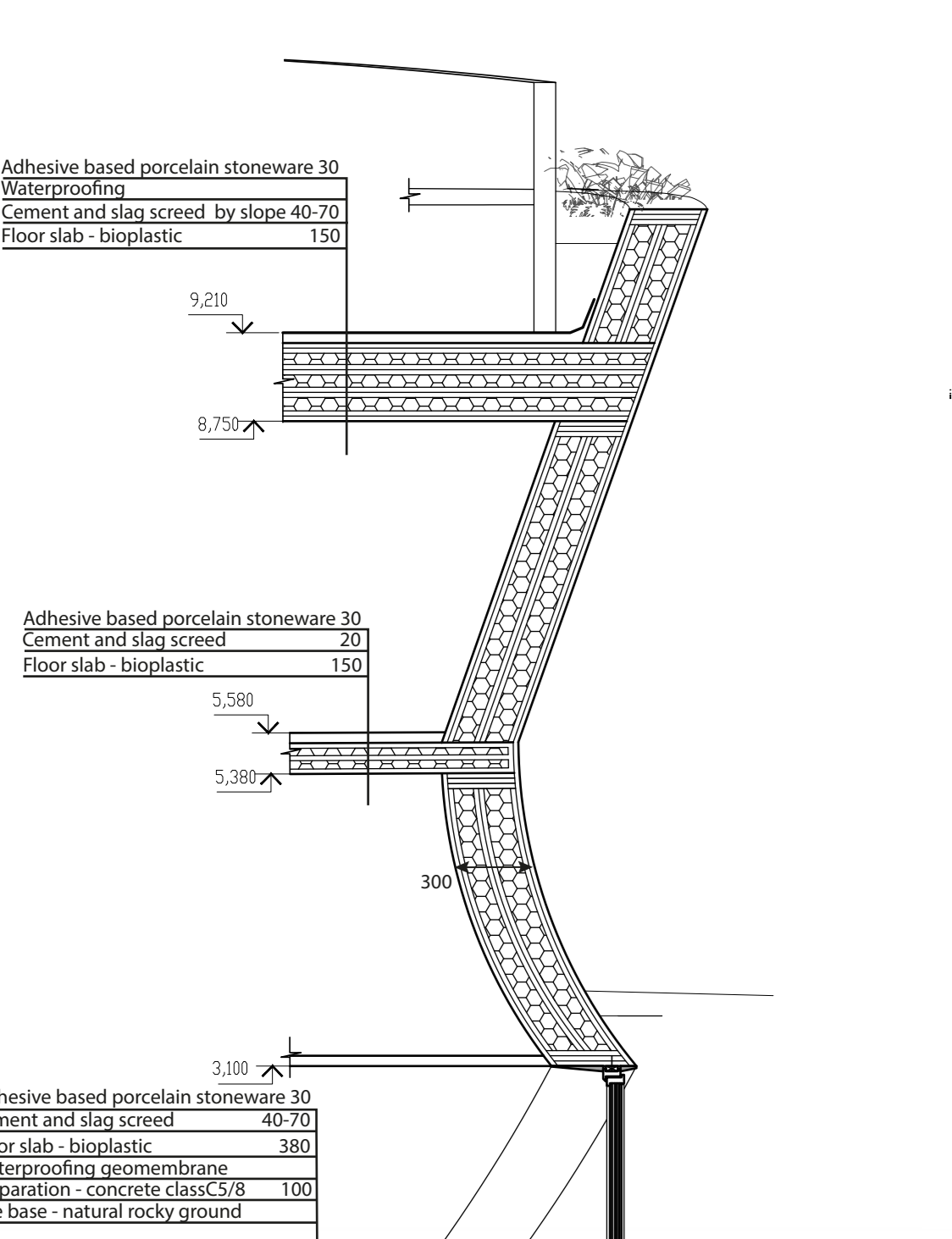
Once the building is built, it can last as long as it takes, with proper maintenance. The important thing is that the moment they decide they don't need it they can tear it down, melt it down on the spot and scatter what's left. In fact, the material that comes out at the end of the destruction of the building will be local and can quickly take root.

So I'm creating an object that will leave exactly what was there before it.

# Iceland Cave-tower

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Architecture is a problem-solving discipline. Considering pollution as one of the major problems in the world, as an architect, one has to be aware of the pollution and waste each project generates and think of ways to apply sustainability or natural alternatives to the processes.



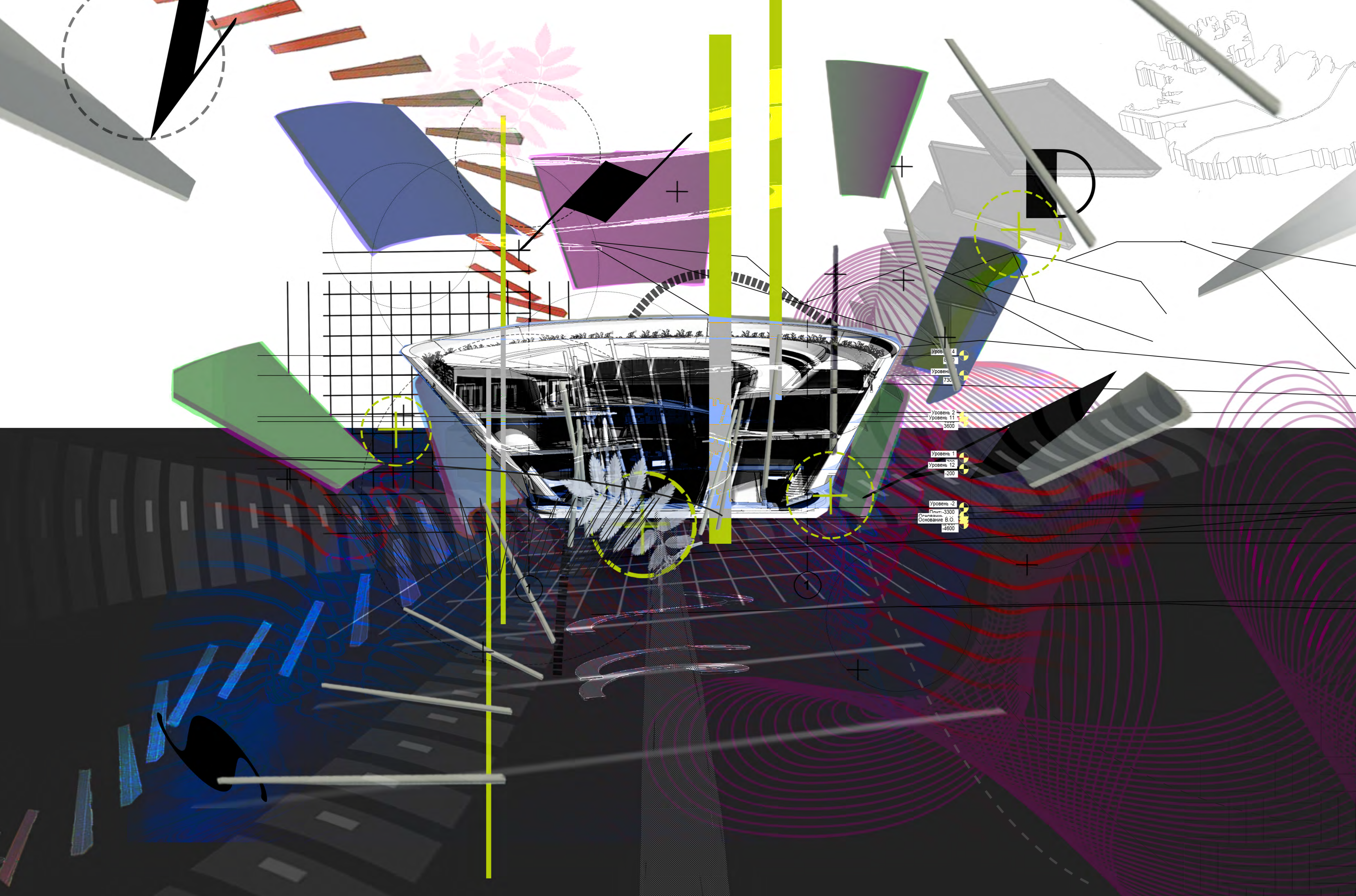
### Construction

The 3D printing system is started via a computer, and the printer prints in layers according to a given contour (depending on the building form chosen by the customer) loaded into the system computer. First, the floor of the building - the so-called future floor - is arranged on the substrate. It is formed by 3D printing horizontally one layer after another, which provides a sort of monolithic slab. Then, on the laid slab, the printer prints the walls of the building layer by layer (taking into account the openings for windows and doors). Upon reaching the set height, the layers begin to shift slightly, thereby rounding the walls of the building to the top (shifting the layers relative to each other) so that eventually in place of the roof appears a kind of reverse dome. One of the features of the technology we offer is the rejection of thermal insulation. The necessary thermal insulation properties of the building are provided by the composition of the material, as well as the design of the wall itself.

- Black volcanic sand
- Gelatin (ribs, shells of crustaceans, certain algae)
- Glycerol
- Water

The atrium space is located in the center of the building, 10 meters in diameter. It is a place of tranquility and communion with nature in our information overloaded world. The corner of tranquility also has a light function, thanks to the glass walls. From below, the grounds are heated and girtrotized thanks to the underground water supply.

- The plants used were native to the area:
- Moss (lat. Bryophyta)
  - Leymus (lat. Leymus)
  - Heather (lat. Calluna)
  - Rowena (lat. Sórbus)
  - Dwarf willow (lat. Sálix)
  - Armeria (lat. Armeria)



### Green roof

With a small section of green roof around the perimeter of the entire building, I organize the space for rainwater suction and treatment.

Also the installation of a green roof reduces the need to manage any stormwater that accumulates, as well as the stress put on local sewer systems.

Since your roof is covered by plants, the amount of it exposed to the elements is limited, enabling the roof membrane to last much longer than if unprotected.

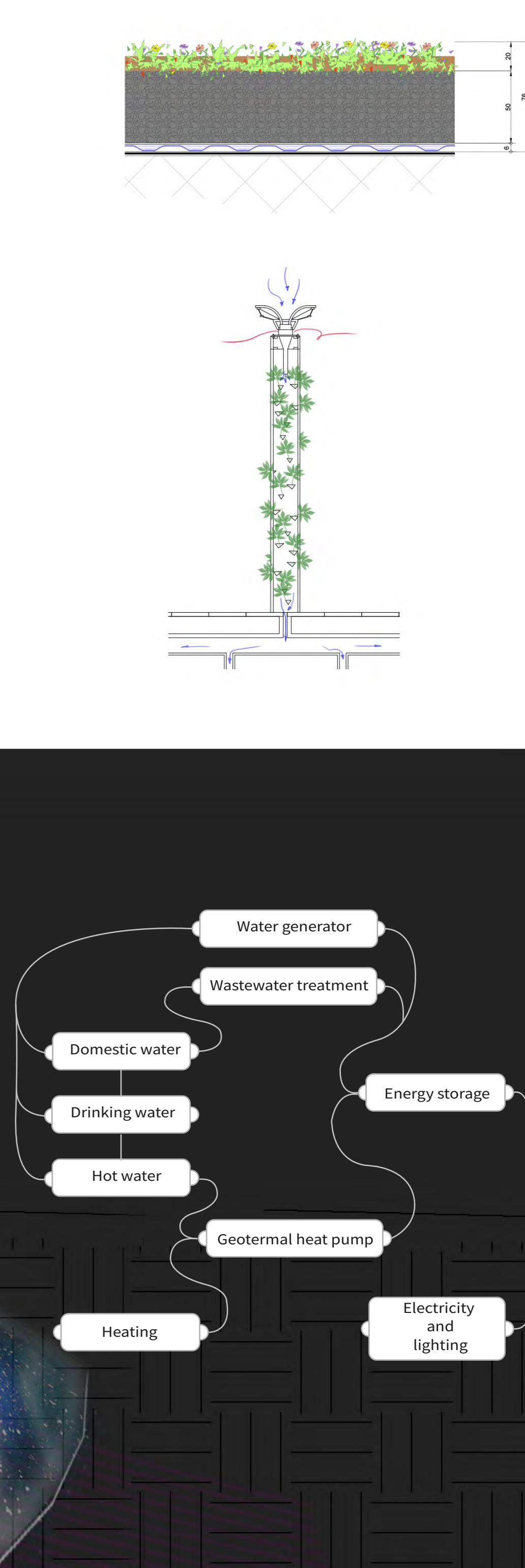
- SOIL DEPT 50mm
- SEMPERGREEN SEDUM - MIX MAT 20mm
- F FILTER LAYER DRAINPLATE 6mm
- PROTECTION SHEET MEMBRANE ARCHITECTURAL SUBSTRUCTURE

### Aeroponic tower system

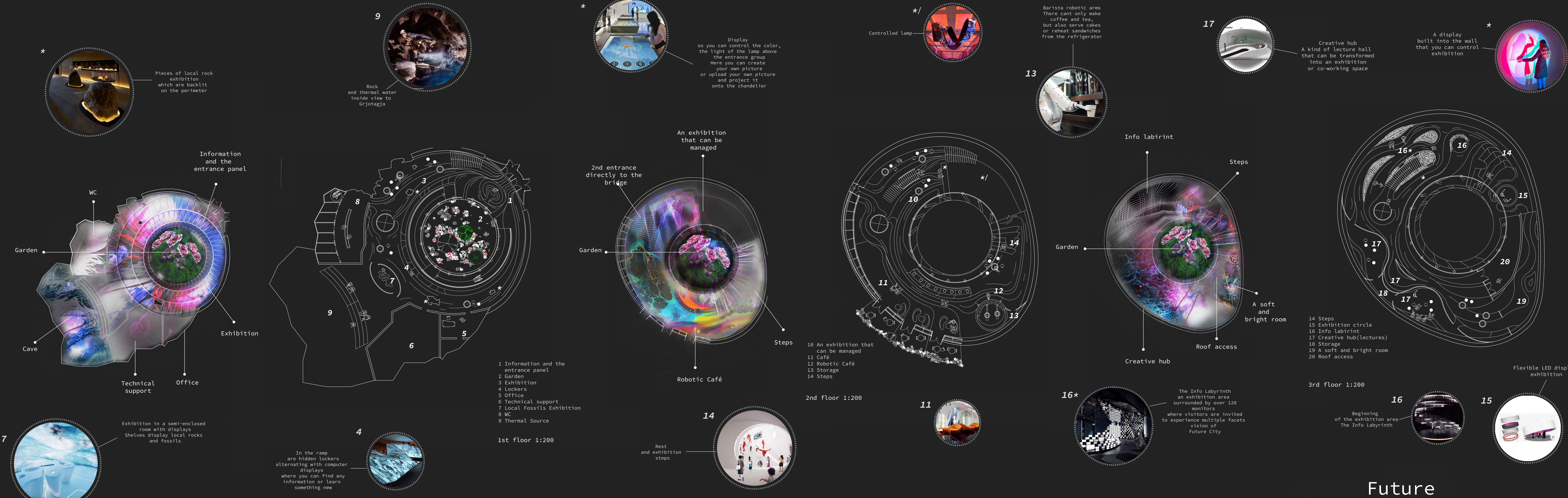
An aeroponic tower collects rainwater in its funnel, the roof. The water enters the filter where nutrients from the nutrient extraction system are added. The flow of water is controlled by a drip nozzle that distributes the water to the suspended roots inside the aeroponic tower, spraying the nutrient-rich water. The water then flows back into the ground so it is not wasted.

### Self-sufficient building energy system

Water, heat and electricity are supplied to the building through the treatment and further use of thermal water.







**Design concept**

Information

Inspiration

Digitalization

Nature

Eco-friendliness

Future

