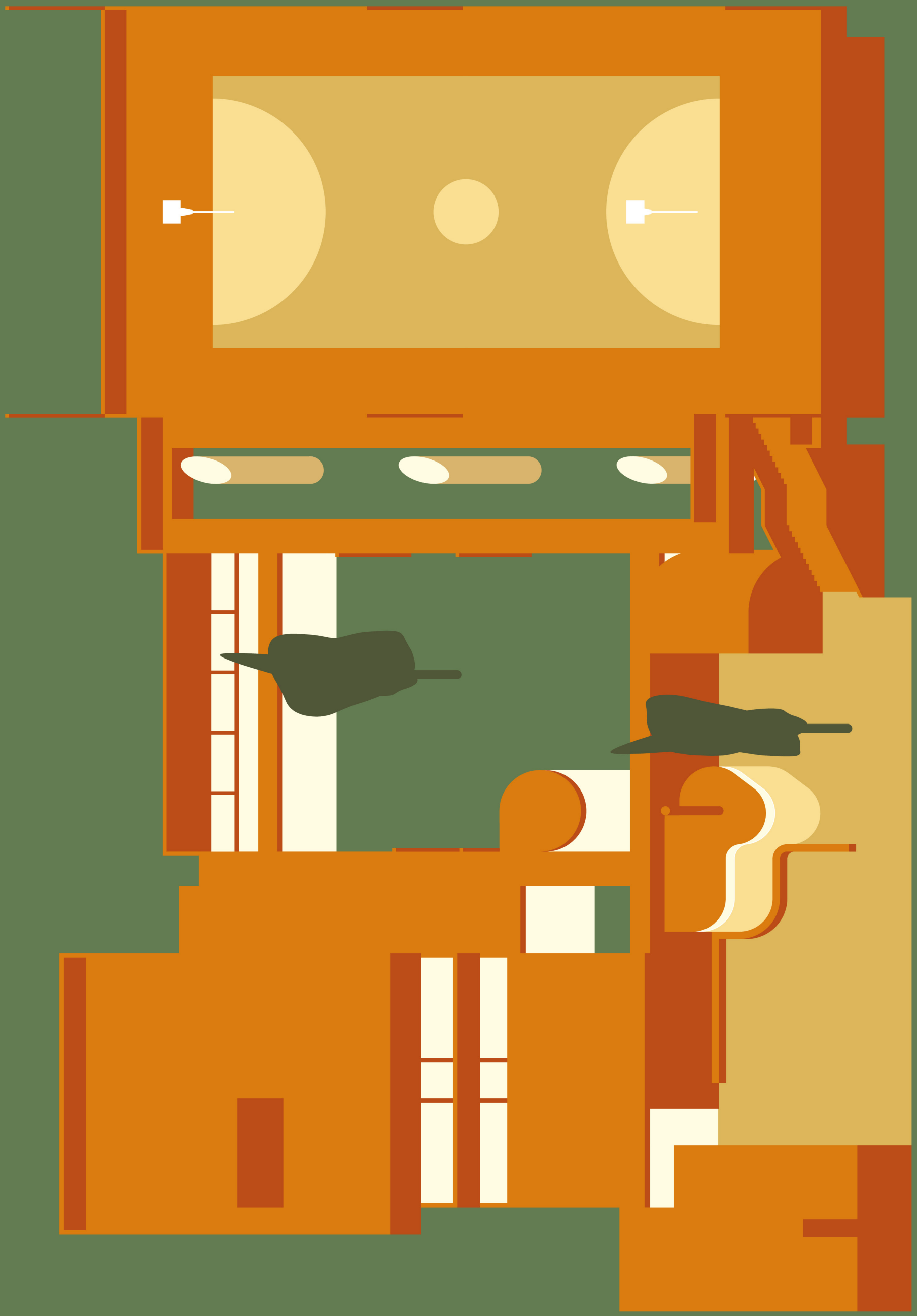


Proton Therapy

Proton therapy is an advanced form of radiation therapy used to treat cancer.

Radiation therapy threats cancer by irradiating cancer cells, and thereby destroying their DNA and disabling them from reproducing. Cancerous cells are particularly vulnerable to attacks on DNA because of their high rate of division and their reduced abilities to repair DNA damage.

Conventional radiation therapy utilizes photons or x-rays which gives the highest dose of energy at the skin and then falls slowly irradiating both the tumor and the healthy tissue before and after. The irradiation of healthy tissue cause both short term problems, and can lead to cancer in the healthy irradiated tissue.

Proton therapy utilises an effect called the bragg peak, The energy delivered to the tissue in front of the tumour is relatively low, peaks in the area of the tumor, and drops to near zero after- thereby minimizing the irradiation delivered to healthy tissue, giving less side effects, and lessens the risk of cancer in irradiated tissue.

Because of the minimized side effects the treatment is especially suited for children expected to live for a long time after the treatment, and adults with certain brain tumors with critical organs nearby.

In 2016 there were 77 proton centers in the world. The closest to Oslo is Skandionkliniken in Uppsala Sweden. In 2015 norway sent about 50 patients abroad for proton therapy. It has been estimated that about 10% of patients receiving radiation therapy in norway can benefit from proton therapy, meaning 1500 patients a year. Stortinget has decided to build two proton theraphy centres in Norway by 2022, one in Bergen and one in Oslo.

The equipment utilized for proton therapy is magnitudes bigger than the equipment used for conventional radiotherapy. A cyclotron, wich is a direct offshoot of the manhattan project accellerates hydrogen ions (protons) to two thirds the speed of light. The protons are then lead down the beamline where their energy is modulated. A nozzle mounted on a rotating gantry delivers the proton beam to the patient. Because of the radiation danger, everything is shielded by up to two meters thick concrete walls.

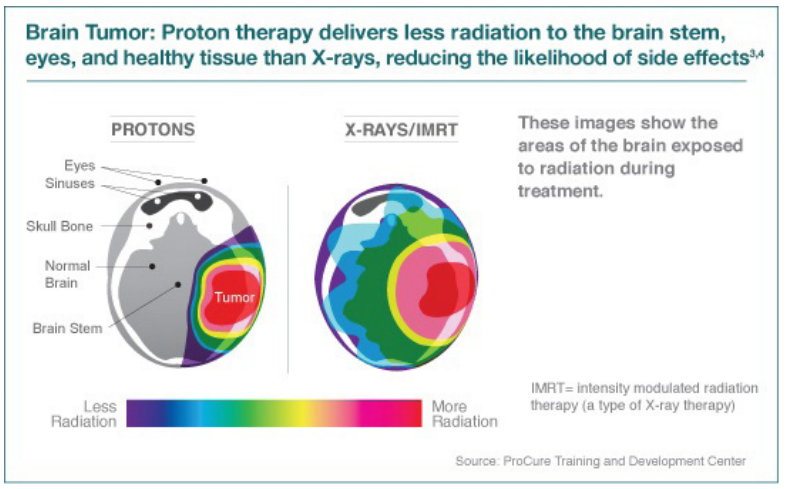


Diagram showing the distribution of energy from proton vs conventional radiotherapy in an human brain.

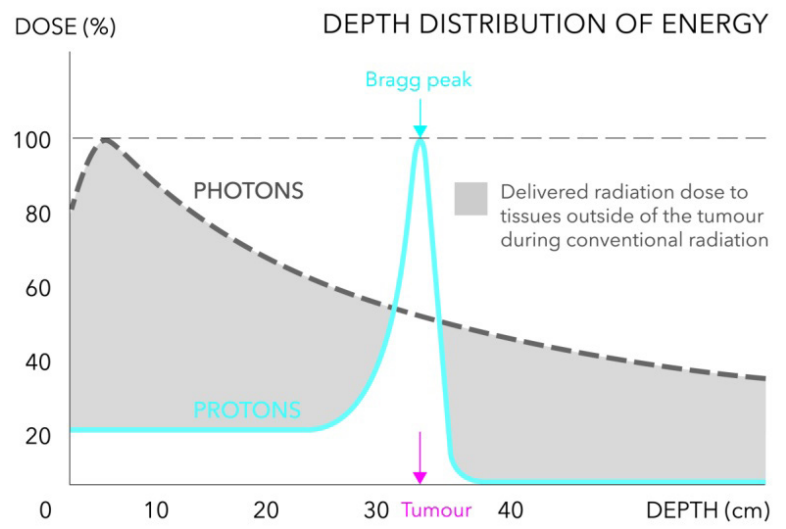
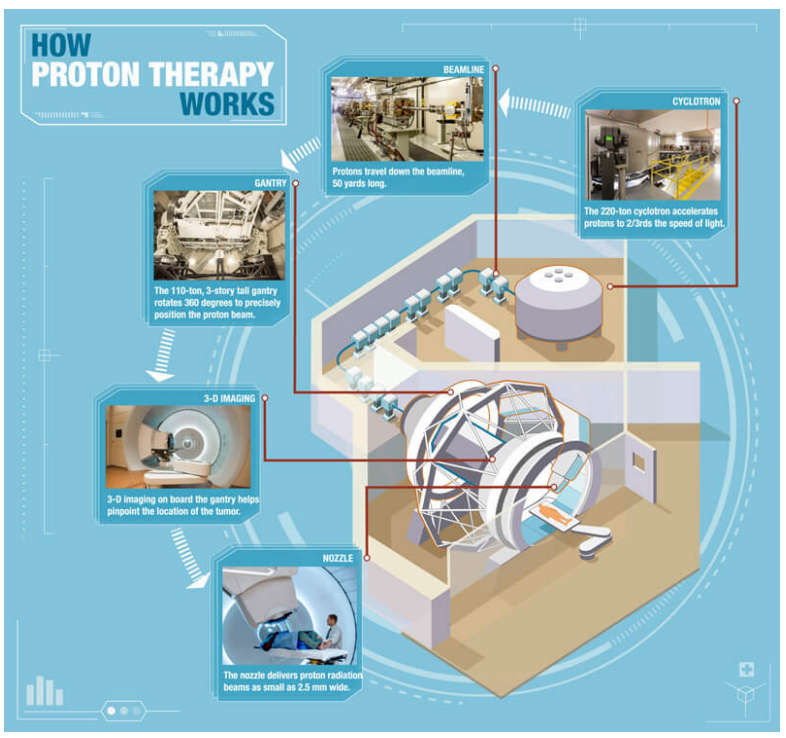
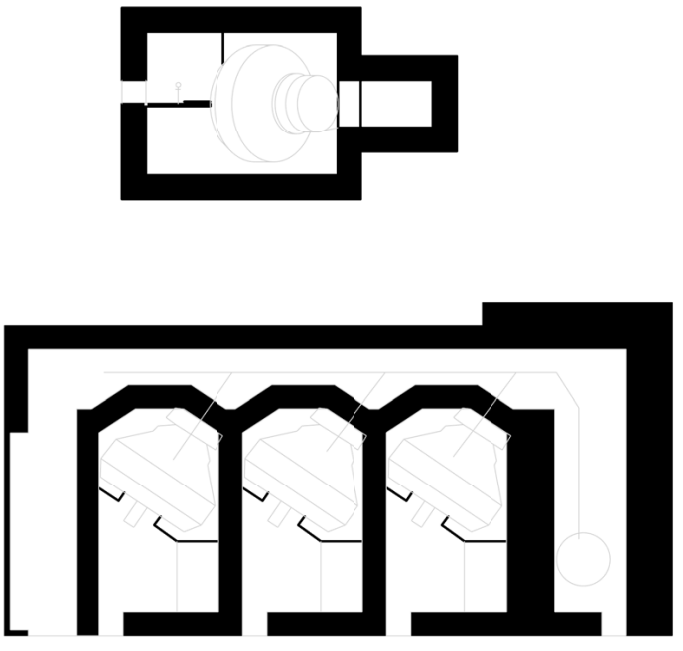


Diagram showing the bragg peak making it possible to control the distribution of energy with protons.





Site:

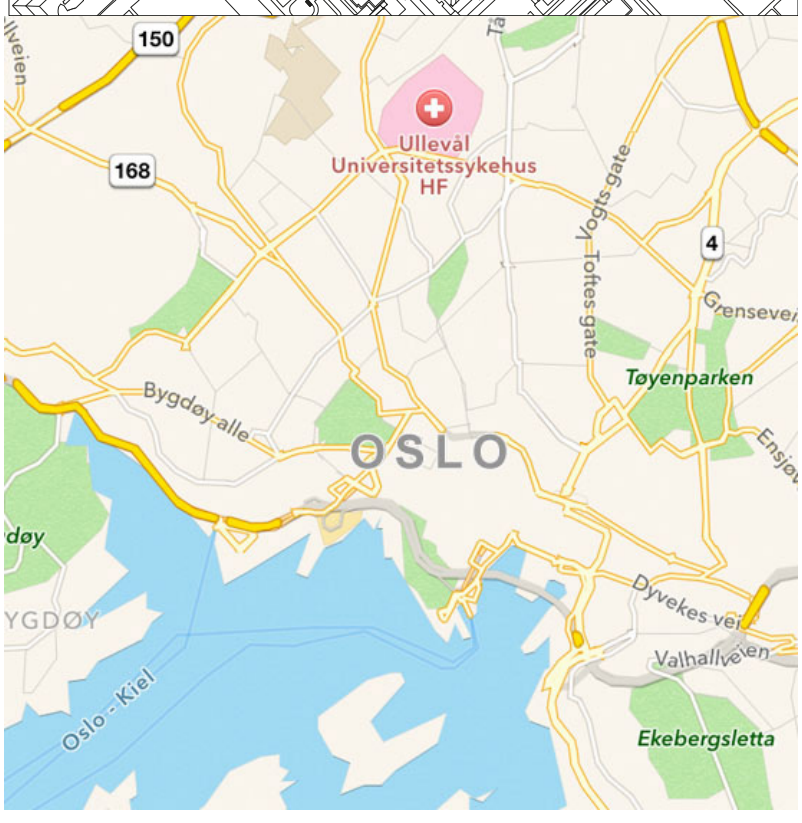
Ullevål hospital is the most central hospital campus in Oslo. The campus is highly urban with the bulk of buildings stemming from 1917 to the cancer centre from 2008.

The site was chosen due to the proximity to the existing cancer centre at Ullevål, the prominence at the hospital campus, and the provisional, disused state of the buildings on the site today.

The proximity to the cancer centre allows for a direct connection between the two, enabling sharing of functions and easy transportation of bedridden patients, who would be staying at the bedpost in the cancer centre.

The site is in direct sight, and short walking distance of the patient hotel, where patients from out of town would be staying for two weeks to a month.

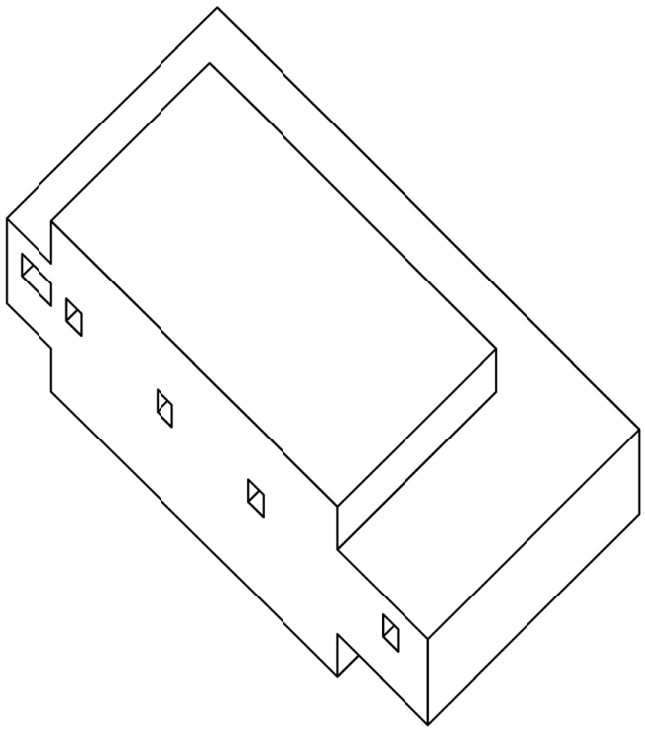
the prominence at the hospital campus, in the intersection of the main road and the road from the patient hotel allows for the adding of public programmes, such as a cafeteria and a ballpark.

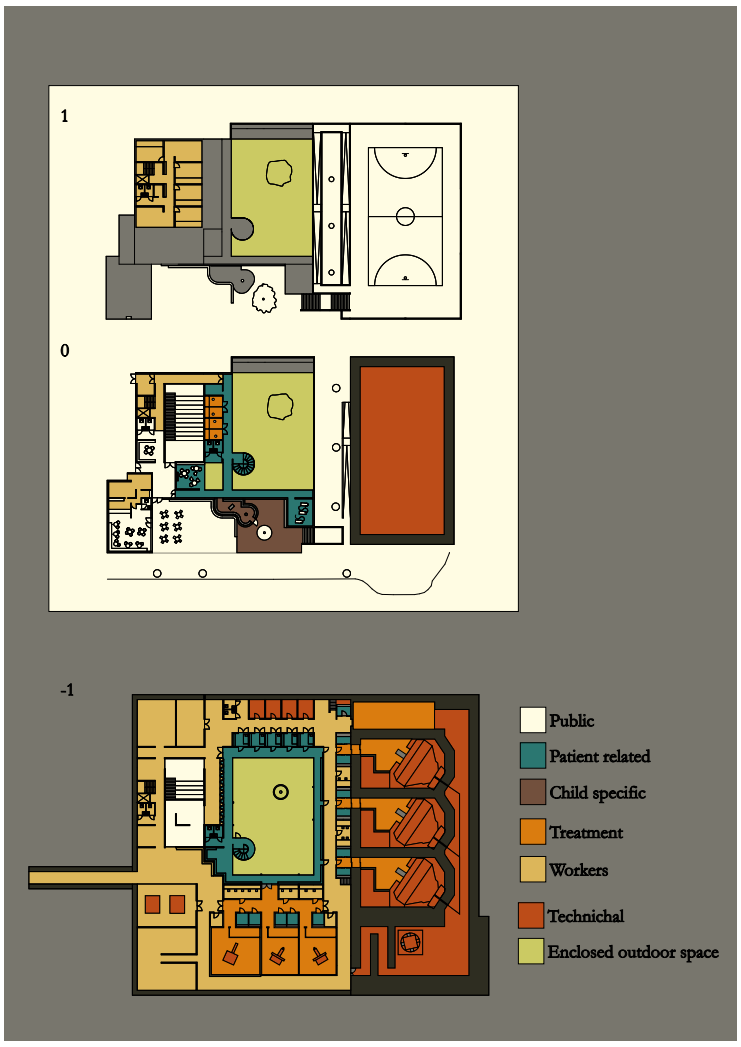


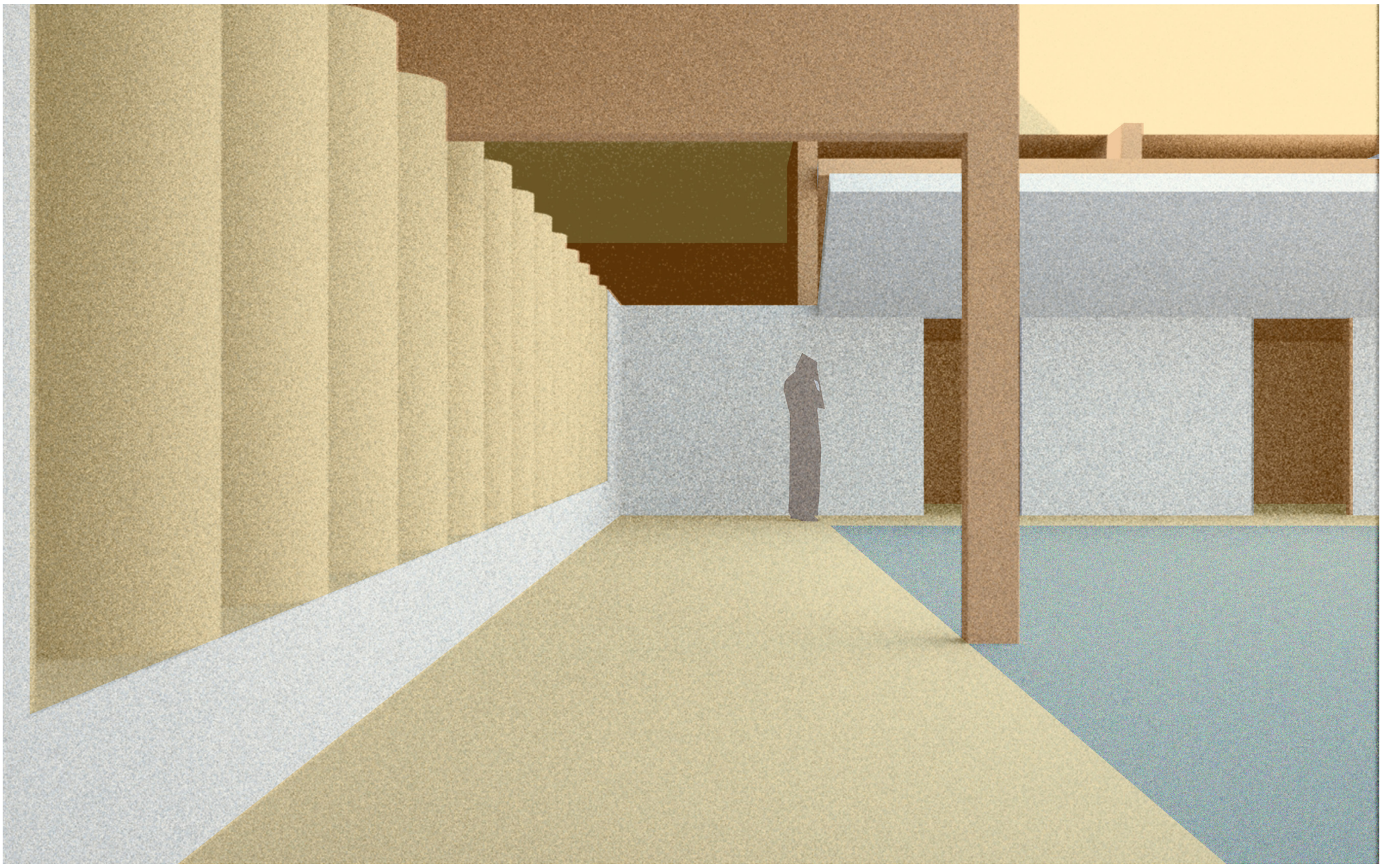
The treatment facilities are wrapped in a big concrete box with protrusions to make room for the gantrys.
To a) make room for the facility on the site, and b) to reduce the impact of the big concrete box i decided to partly bury the facilities, letting only the top four meters be above ground. this results in the entrances to the treatment facilities being four meters underground.
To let light down into the treatment facilities i established a sunken courtyard wich i organized the project around. The underground organisation is concentric around the courtyard, with a patient walkway in the first layer, providing a secluded and calm place with varying situations.
The second layer is a logistic corridor, where all the logistics happens out of sight for the patients. Light shines through from above the patients corridors. The rooms for narcosis and waking up is protruding into the courtyard between the patient and logistic corridor. The patients wake up in the same place they fall a sleep, and there is a view to the trees.
The third layer is control rooms and changing rooms, these have low walls and are open topped to let light in, as well as some light wells placed directly above.

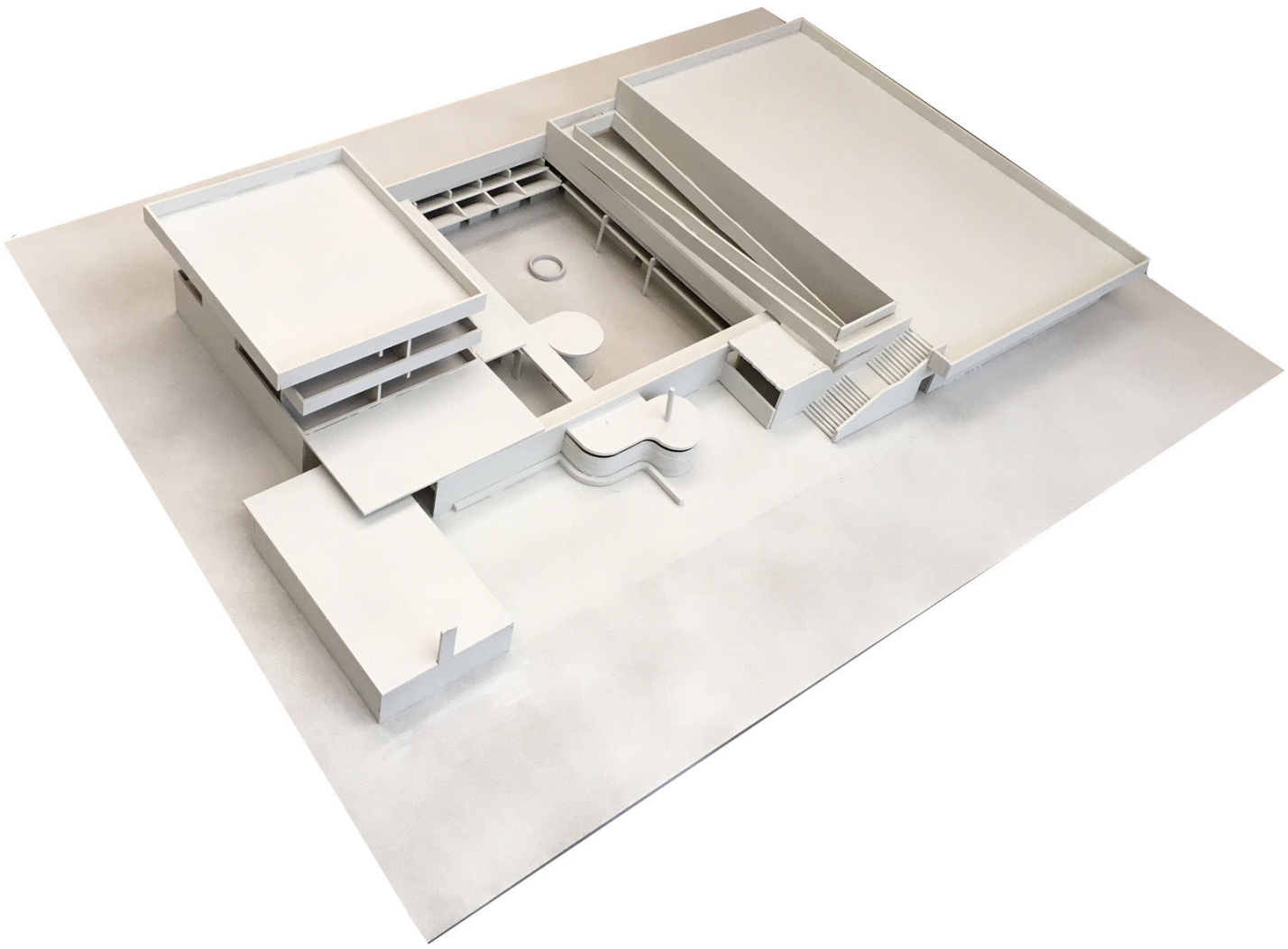
The above ground facilities are fragmented, giving them a human scale, and the part of the treatment facilities protruding above ground are turned into a ballpark, defusing it. In front of the centre there is a public plaza and a cafeteria.

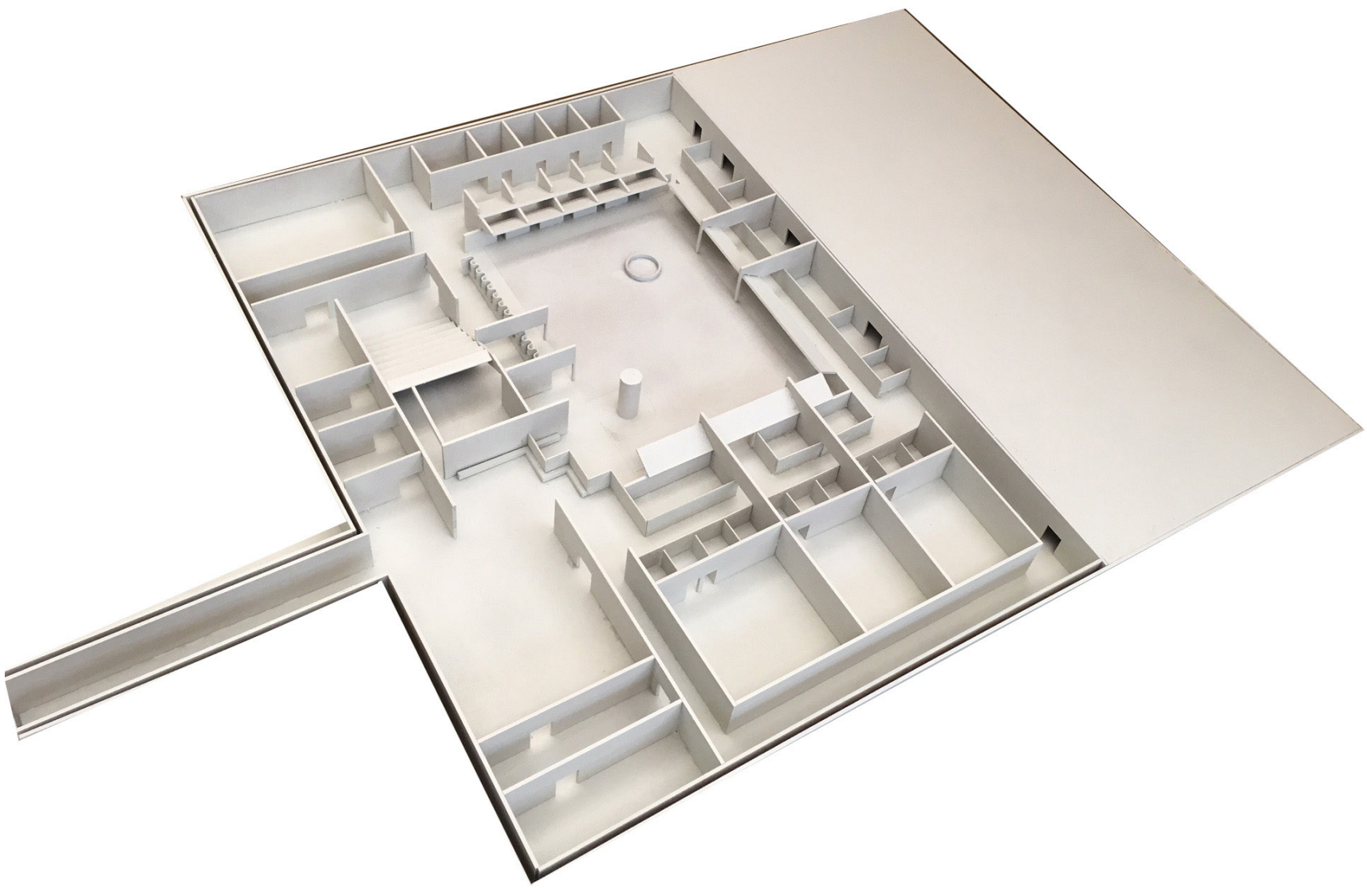
The patients and their families are offered varied degrees of privacy while waiting. They can choose to be amongst others in the public cafeteria or the public plaza, a playroom for children to play in with an enclosed character.

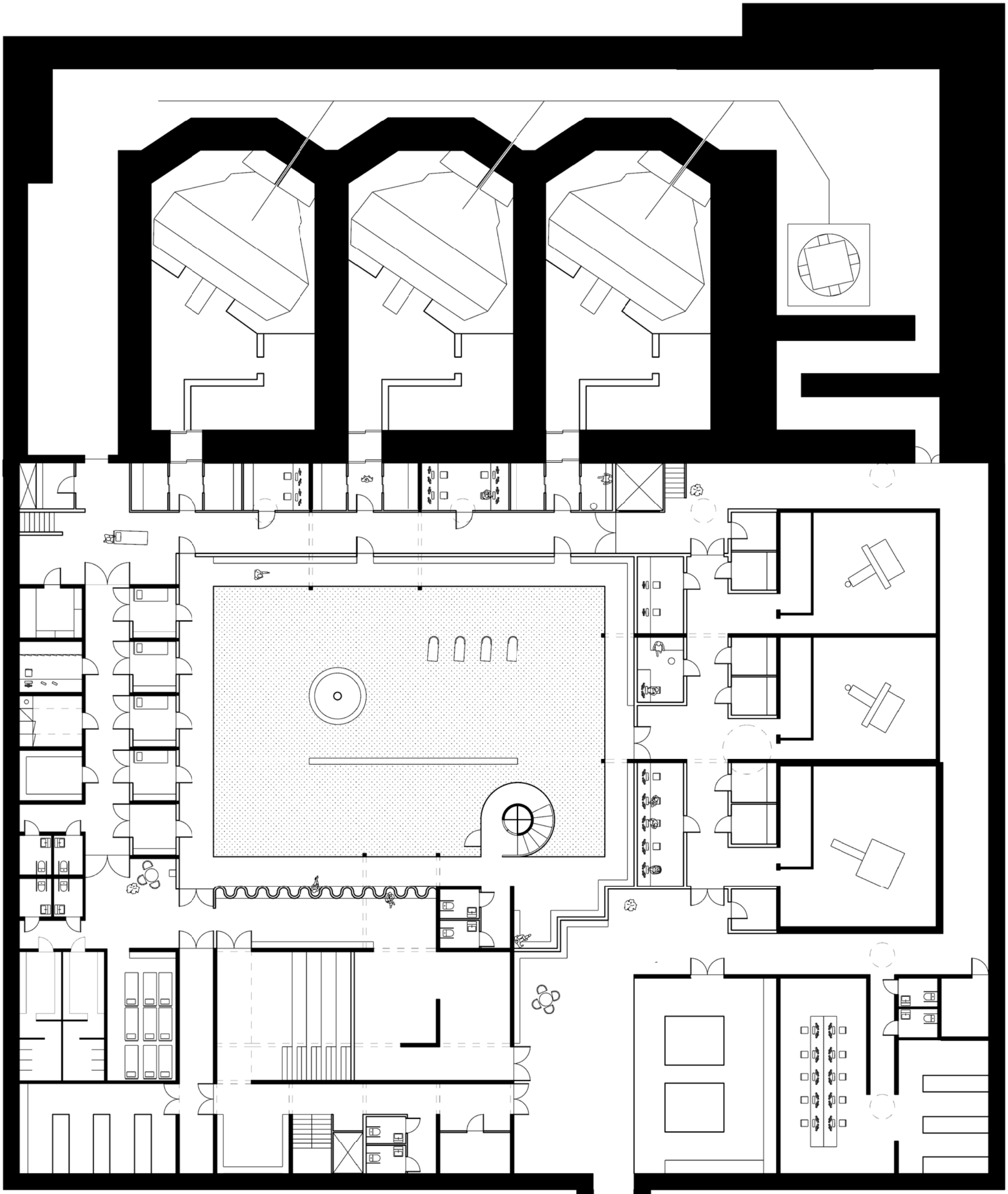


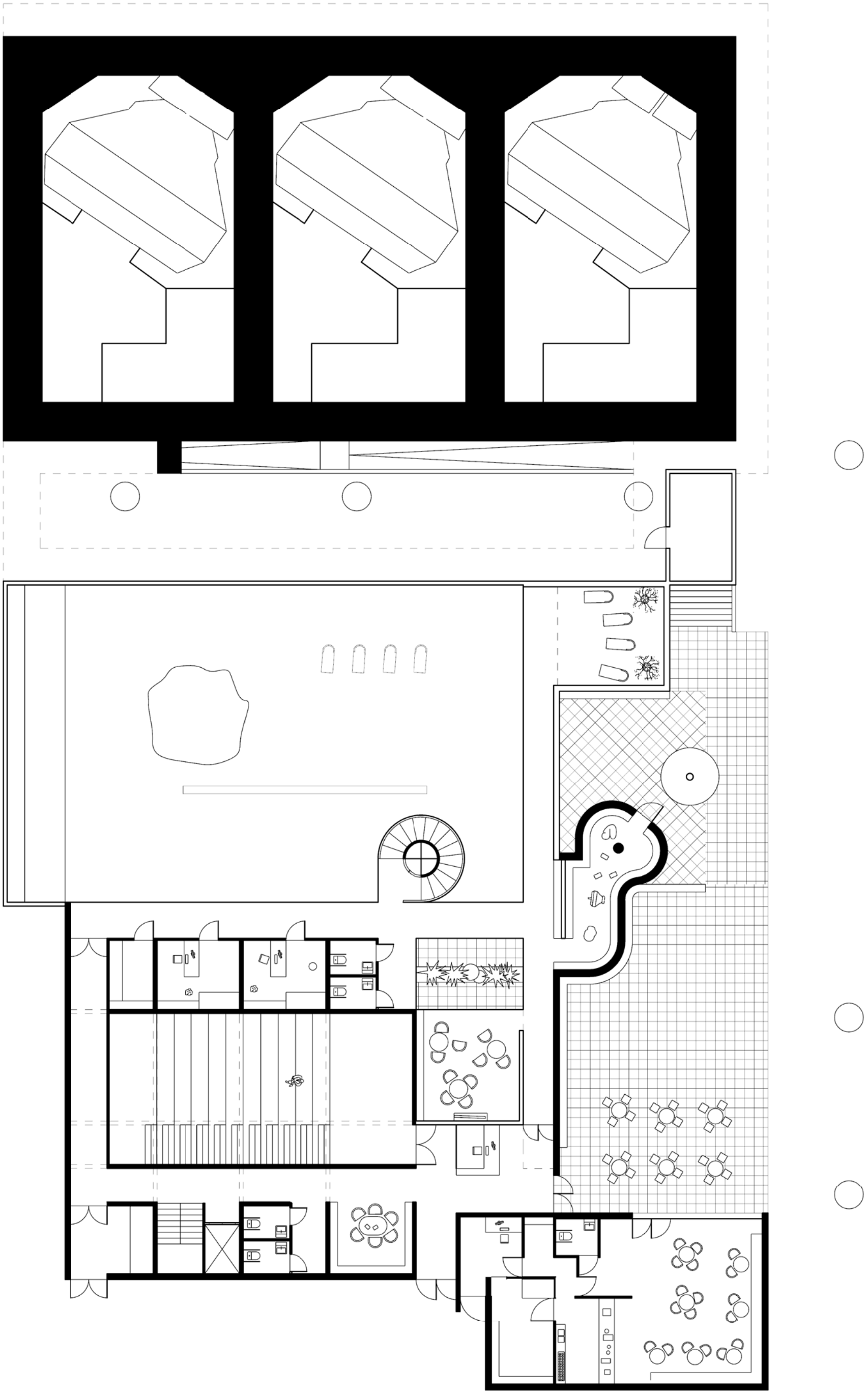


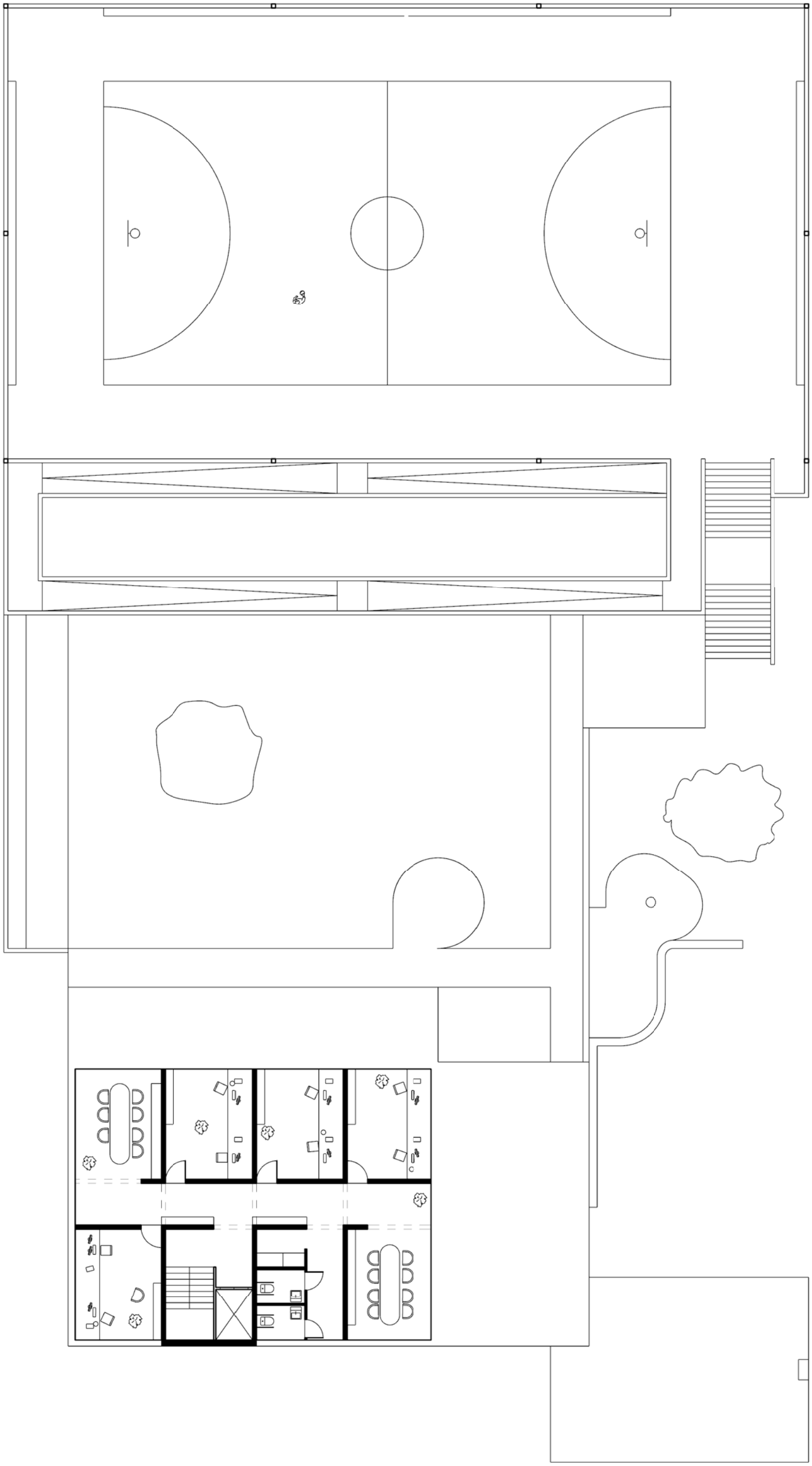


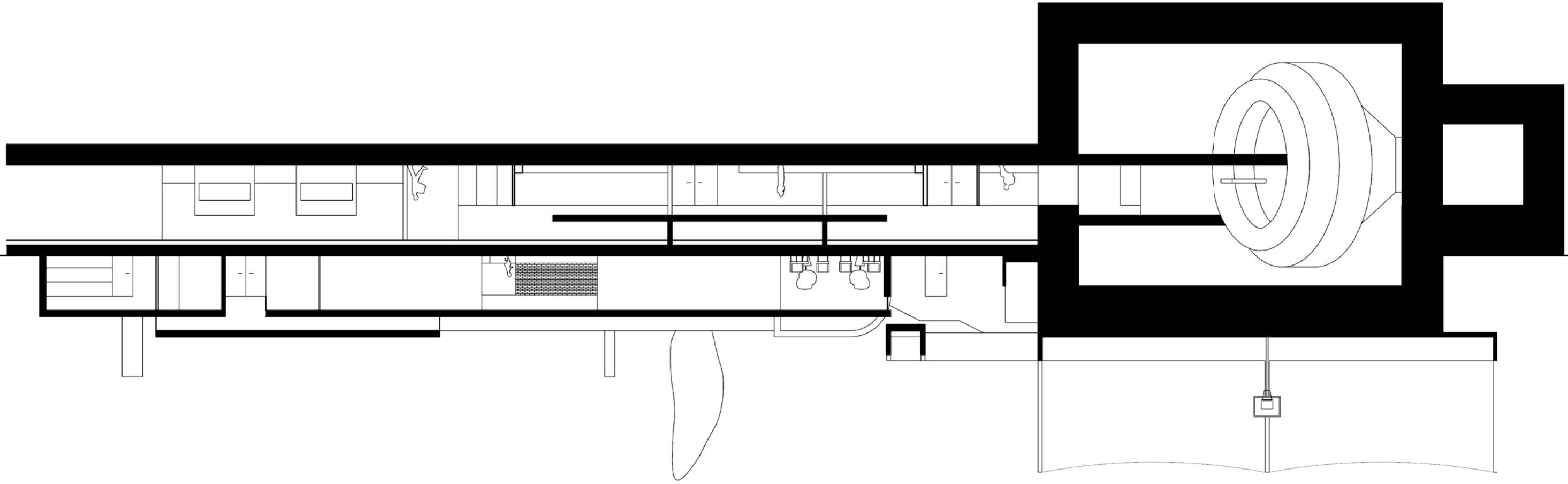


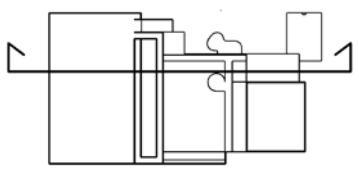


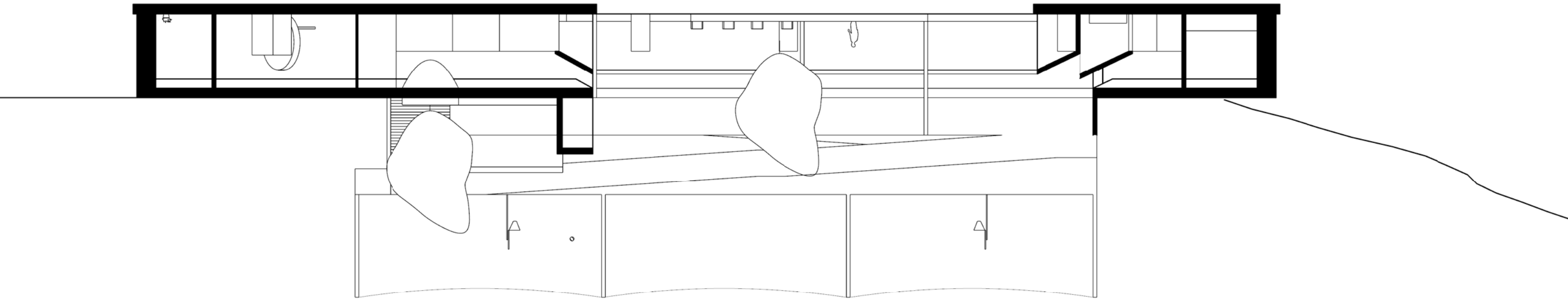


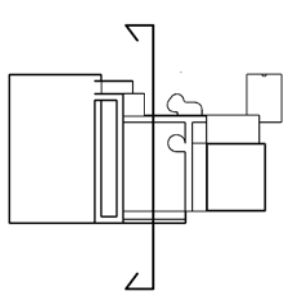


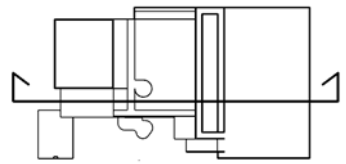


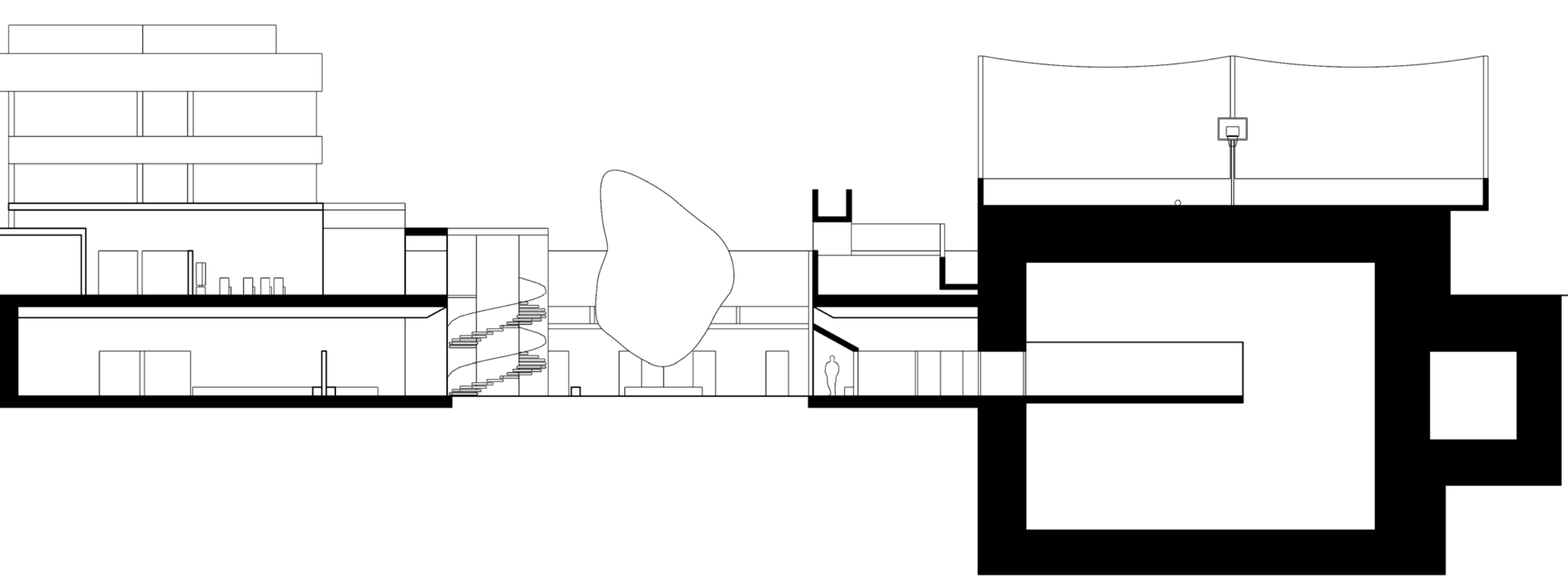


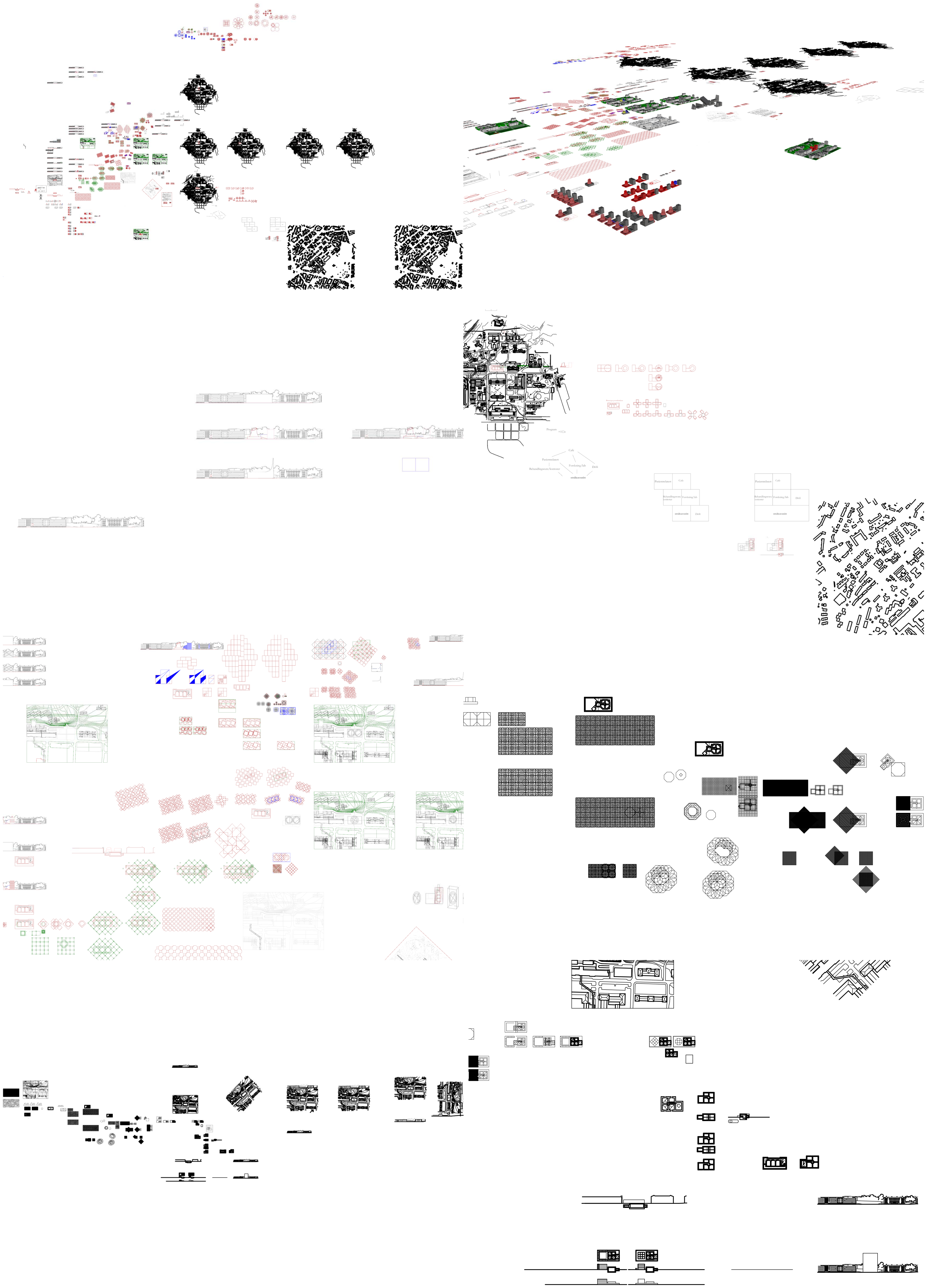


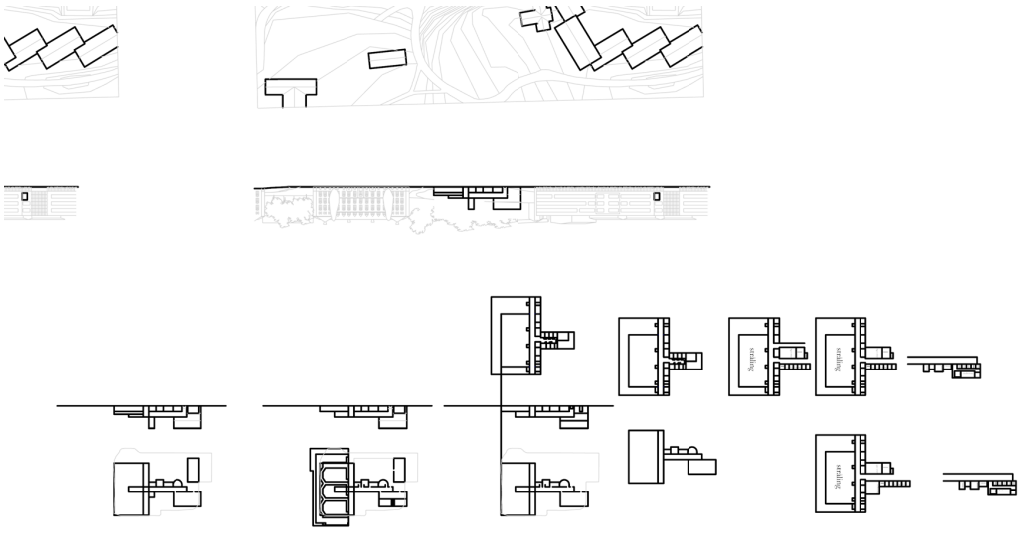








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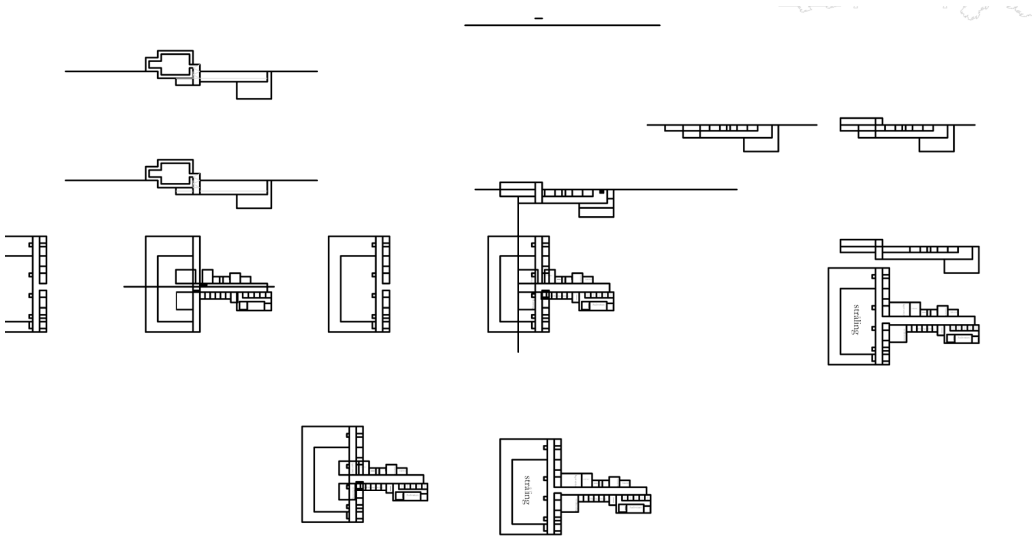
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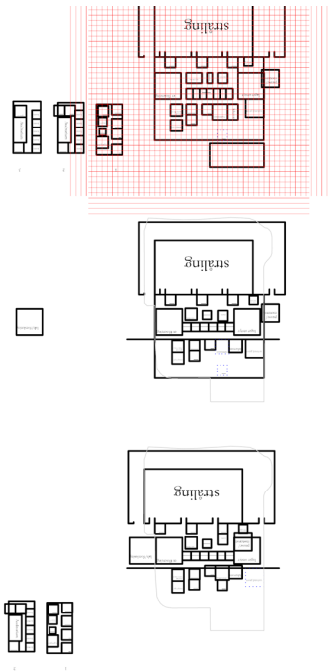
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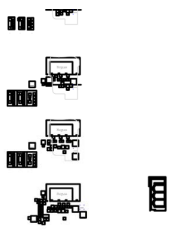

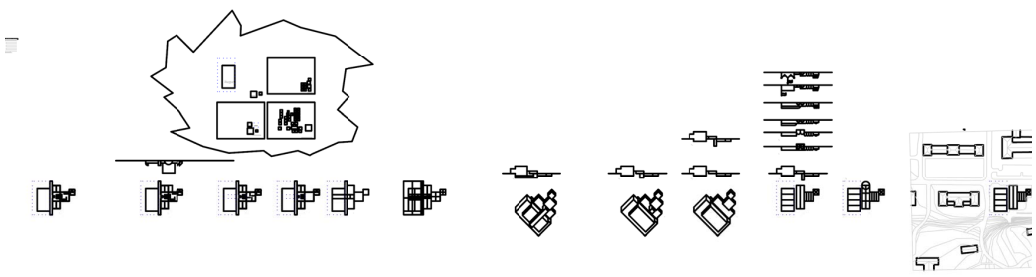

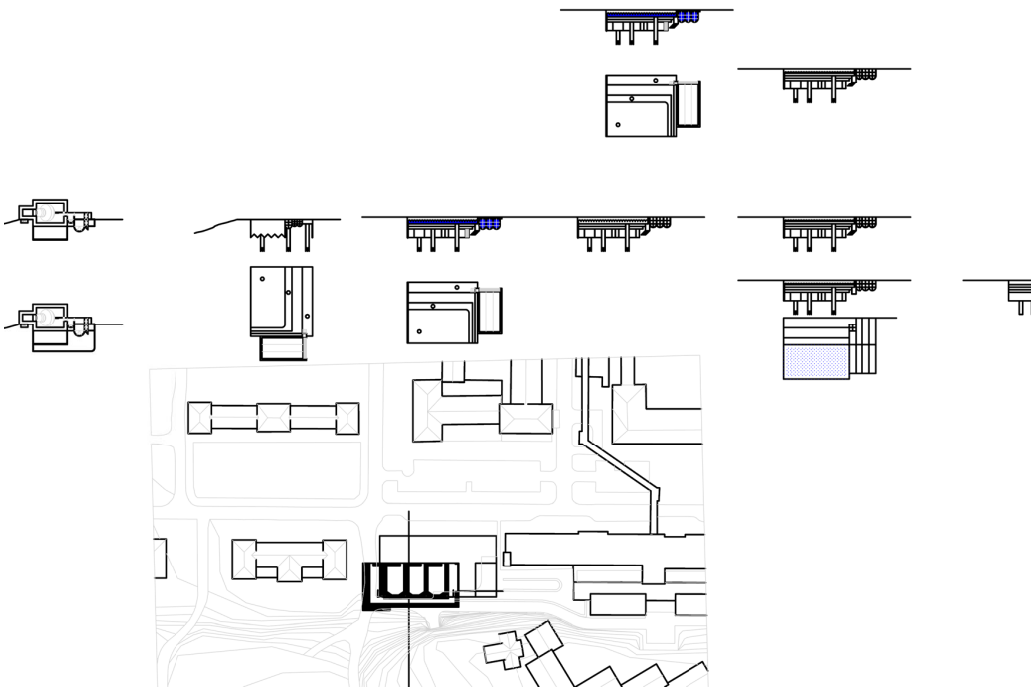

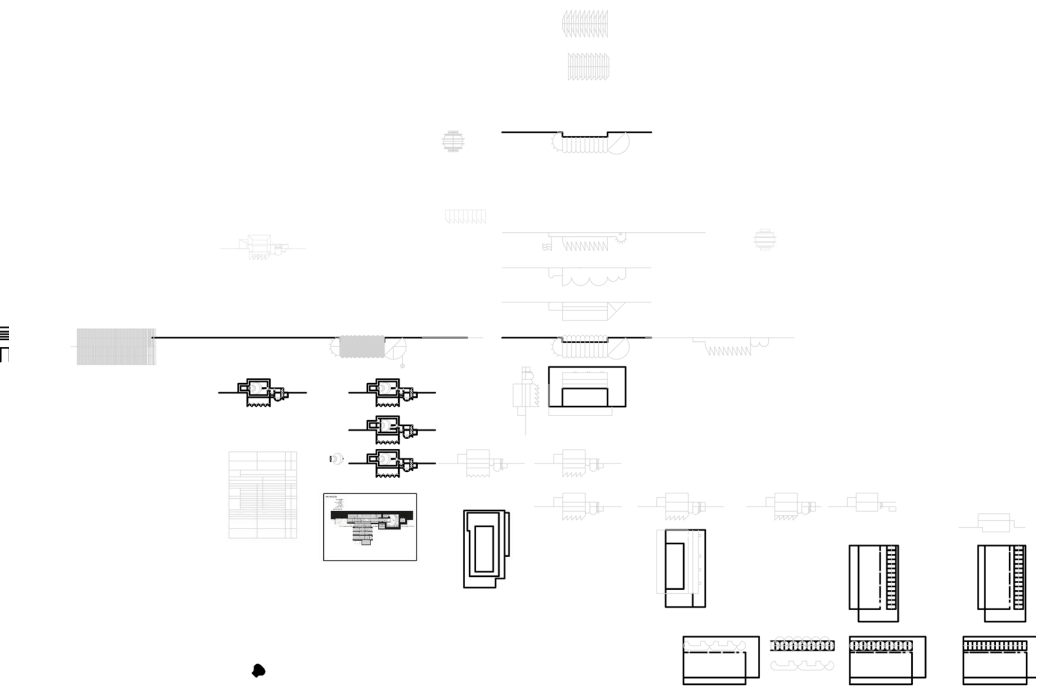

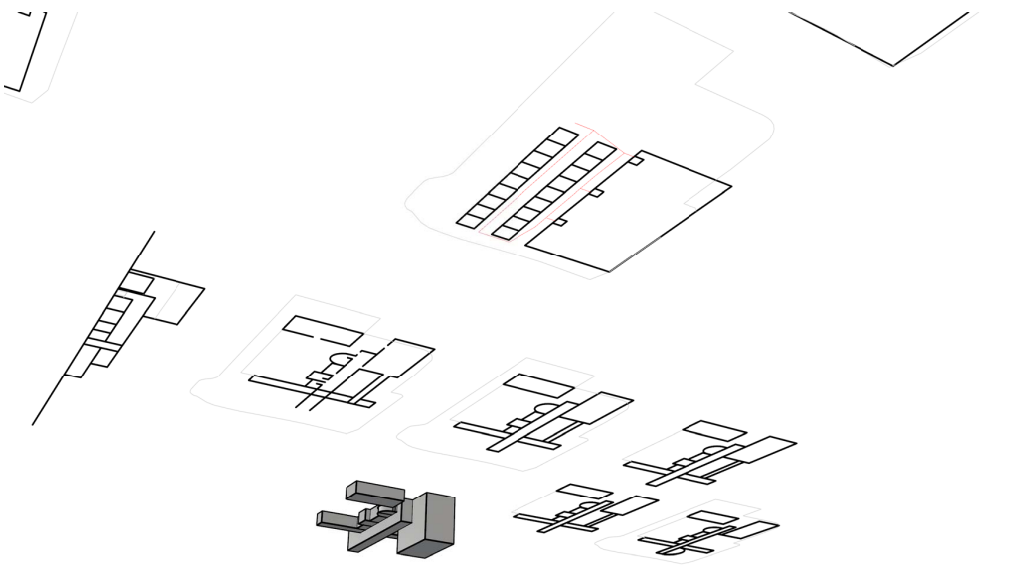

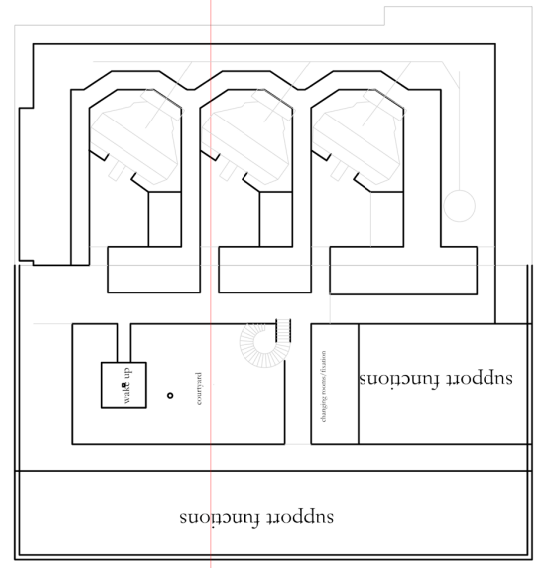
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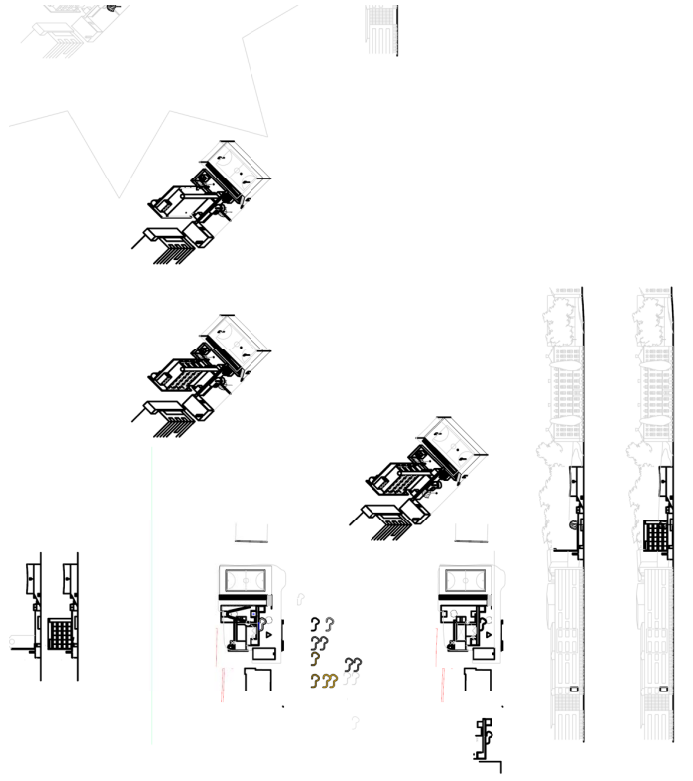
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cafeteria
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outdoor sports
offices etc
patient related
Atrium
patient circulation
fixed programme
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