

DIPLOMARBEIT

“Space Warp Collective”
a coworking space in Vienna

ausgeführt zum Zwecke der Erlangung des akademischen Grades einer Diplom-Ingenieurin
unter der Leitung

von O.Univ.Prof. DI. William Alsop

E253-4

Abteilung für Hochbau und Entwerfen

eingereicht an der Technischen Universität Wien

Fakultät für Architektur und Raumplanung

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Wien, am 07.04.2016

abstract

The world we are nowadays living in is constantly moving faster and therefore we have to face major changes in the way we are shaping the structures of our everyday life. In this context we also have to rethink our perception of what is an important and determining element of our daily routine – the workplace.

The typical office is no longer adjusted to a productive functioning, it doesn't support us in managing the challenges we have to deal with in our jobs and thus belongs to a system, that is more and more being dissolved. Especially freelancers, who don't have a permanent office space, are in need of a new model, that provides the right environment to get their work done, escape isolation and benefit from interaction.

Coworking spaces are trying to offer an overall solution for this topic by establishing a new mindset of how the workingmode should be designed and combining individual needs with the advantages of a community. One can observe their development all over the world in the last few years.

Up to now a lot of coworking spaces are still located in former offices, unused places or even abandoned buildings.

In the course of my thesis I want to advance this promising trend and concept by designing a new coworking building in the heart of Vienna and creating a spot where people are happy to work, but also to meet and share their ideas with others.

Die Welt, in der wir heutzutage leben, bewegt sich konstant schneller und ermutigt uns, signifikante Veränderungen in der Gestaltung unserer täglichen Strukturen zuzulassen. In diesem Kontext kommt es auch zu einem Umdenken in unserer Wahrnehmung, wie sich ein wichtiges und bestimmendes Element unseres Alltags darstellt - der Arbeitsplatz.

Das typische Büro passt sich nicht mehr dem heutigen Arbeitsrhythmus an, es unterstützt uns nicht bei der Bewältigung neuer Herausforderungen, denen wir uns in unserem Job stellen müssen. Es gehört demnach zu einem System, welches im Begriff ist, sich aufzulösen. Besonders Selbständige, die keinen fixen Arbeitsplatz haben, benötigen ein Modell, welches die richtige Umgebung schafft, um ihnen die Erledigung ihrer Aufgaben zu ermöglichen, Isolation zu vermeiden und von Interaktion zu profitieren.

Coworking Spaces versuchen, hier eine ganzheitliche Lösung anzubieten, indem sie ein neues Denkmodell zu Design und Kombination individueller Bedürfnisse mit den Vorteilen einer Gemeinschaft, etablieren. Man kann ihre Entwicklung in den letzten Jahre global nachverfolgen. Bis jetzt sind Coworking Spaces meist immer noch in früheren Büros untergebracht, ungenutzten Flächen oder sogar verlassenen Gebäuden.

Im Zuge meiner Diplomarbeit möchte ich mit diesem vielversprechenden Trend einen Schritt weitergehen und einen Coworking Space in einem Neubau im Herzen Wiens entwerfen. Ein Ort soll entstehen, an welchem Menschen gerne arbeiten, aber auch zusammenkommen und ihre Ideen mit anderen teilen.

content

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site plan

sections

elevations

roof

ETFE

dewatering

statics

detail

stairs and elevators

circuit

facade

the table

lightning

greening

visuals

SPC WRP COLLECTV
NNΛ



it all started with a personal experience ...



As an architecture student, one is always facing the same topics throughout the whole education - working on projects, teamwork, laptop hours, model building, night shifts...And the same question always popped up - where should I/we go to work? I personally mostly chose the university as the main place to get my projects done, but - as we see in the picture to the left - it was always very crowded, because there was just always too little space for too many students. Some worked at cafés, some at home, some could afford to rent ateliers in groups of people, but the overall solution never really came up. I decided to take this subject and, finally, react to it at the end of my studies in my thesis.

The perception of how a workspace has to be, changed a lot throughout history. In 1904 Frank Lloyd Wright designed the Larkin Administration building, which was one of the first to be dedicated to one specific organisation. It housed over 1800 workplaces and was the first providing air conditioning or noise absorbing walls and furniture. In the 1930ies companies more and more desired to express their identities. This led to an increasing number of office workspaces in general and also created strongly hierarchic structures within them. The first attempts to design workspaces that ensure a certain equality and opportunity to communicate took place in the 60ies - open offices with separated boxes were designed, but failed to think about the worker's individuality and were therefore criticized for their lack of personality. Nowadays the focus in creating successful workspaces is to achieve a place that fosters productivity, but is also informal and pleasant.¹

1 <http://www.deskmag.com/en/a-brief-history-of-the-workspace-coworking-Chicago-Architecture/3>

I launched a little workspace survey and asked people from different professional fields and office structures the following questions:

1. *How many people work in your office?*
2. *How content are you with the design of the office you work in? 1-10*
3. *How content are you with your personal workspace within this office? 1-10*
4. *Does the design of your workspace have an impact on your inspiration, motivation, efficiency and productivity – if yes, how?*
5. *What is the best thing about your working space?*
6. *What is the worst thing about your working space, what would you like to change?*
7. *Do you prefer an completely quiet or rather noisy working environment?*
8. *Which amount of light does suit you while working? Is there a difference between daylight and artificial light concerning your workflow?*
9. *Do you prefer small or large spaces to work in?*
10. *Do you prefer a completely private workspace or do you like being in the same room with your coworkers?*
11. *Is there a separate workspace for collaborative work, meetings, etc. in your office? Do you have to leave your personal workspace to collaborate with your coworkers? If yes, would you prefer adjusting your personal working space to a collaborative mode over switching to another table or room?*
12. *Do you work in an unconventional working environment? If yes, what is it like? If no, would you like to? Do you have some ideas for the office in general or your personal workspace? Consider working while sitting on the floor, working on a sofa or in a hammock...*

The results showed that the majority of the people I asked consider the design of their workplace to be very important (not all of them work in the creative industry). Also the need for gathering space to communicate and enjoy some leisure time is of big importance. To have enough natural light is a major demand and most of them prefer a space with some ambient noise. Separate meeting rooms didn't seem to be a topic they are really concerned about and almost all of them like to work with other people in the same room. Some could imagine working in an unconventional office environment, but it was hard for them to imagine how it could look like and if it would enable them to get their work done.

Considering all these results and thinking about a possible overall solution, I found that the future of our daily office life could be with the already very popular concept of coworking and its development in the future.

but what exactly is coworking?

Let's start with a brief history...

- 1999 *DeKoven creates the word "coworking" - it explains a method that supports collaborative work and business meetings without a competitive approach*
- 2002 *"Schraubenfabrik", Vienna's first coworking space*
- 2005 *"The Hub", now the biggest network of coworking spaces*
- 2006 *"The Hat Factory", the first full time coworking space (San Francisco)*
- 2012 *93.000 tweeds with #coworking*
- 2013 *More than 100.000 people working in 2.500 coworking spaces around the world*

2

“Coworking is a style of work that involves a shared working environment, often an office, and independent activity ... Coworking is also the social gathering of a group of people who ... share values ...”

wikipedia definition

What lead to this successful history that is likely to be continued in the future?

One reason is the emergence of a new collaborative economy by a major change in collective thinking. This happened on one hand as a consequence of the financial crisis which is responsible for a huge loss of trust in governments, corporations and the financial sector - hence thinking became collaborative acting. On the other hand the internet enabled ways of communication and connection that made it easier to put ideas into results.³ New values pushed the development of alternative living and working forms.

Furthermore especially freelancers, entrepreneurs and project workers are often facing an advanced version of the daily workplace struggles students have to deal with. Although they enjoy more freedom and flexibility in general, there are also problems, which need to be overcome. Self-employed people often suffer from spatial and social isolation when they have to work at home. Thus they also have a lack of information exchange, support and safety in terms of their income. Irregular working hours are a collateral danger that fosters procrastination. A boundary-less mixup of working and private life can endanger both sectors and lead to frustration or even burnout.⁴

A potential solution for most of these matters can be found in coworking spaces.

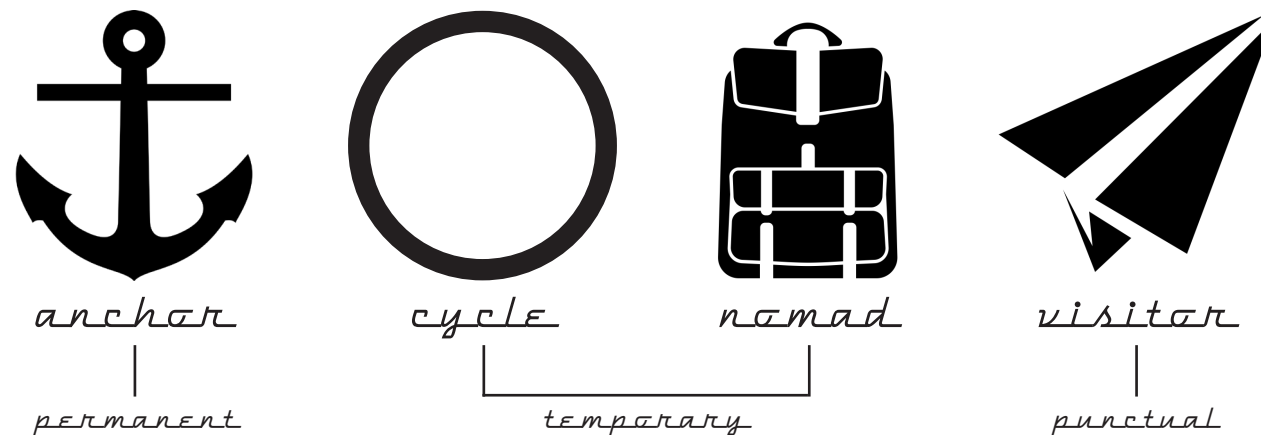
3 <http://www.deskmag.com/en/the-nature-and-potential-of-the-collaborative-economy>

4 Neue Arbeitsräume für neue Arbeitsformen: Coworking Spaces, POHLER NINA, VS Verlag für Sozialwissenschaften, 2012, p. 66

How does a coworking space “work”?

One can distinguish between real estate centric and community based coworking spaces. While one group provides basic coverage of the worker’s needs (space, infrastructure), the other extends their offer to a structure of high participation.⁵

This difference can also be reflected in the balance of flexible- and fulltime coworking memberships. Some coworkers enjoy a high fluctuation of people they share a space with, others prefer constancy in members. A balanced mixture of similarity, complementarity and heterogeneity in people and their professions could provide a space that fits most needs of the coworkers it hosts.⁶



The longer people stay in one coworking space, the higher their loyalty to this specific location rises.⁷

⁵ <http://coworking.com/>

⁶ Neue Arbeitsräume für neue Arbeitsformen: Coworking Spaces, POHLER NINA, VS Verlag für Sozialwissenschaften, 2012; p 68-70

⁷ <http://www.deskmag.com/en/survey-coworking-spaces-144>

professional and social values and benefits

There are several elements one can benefit from when working in a coworking space. By exploring all of them in combination with each other, coworkers can get the most synergy effect out of this office model. Still they can, depending on the individual personalities, be divided into professional and social benefits.

The major advantage of coworking spaces is the freedom in renting of space, since one doesn't have to sign a tenancy contract. Still coworkers can rely on an organized structure, since the places are generally run by managers. Different job profiles and tasks also ask for flexible working hours. These basics ensure the fertile coexistence of stability and independence.⁸

“*Deskmag*”, a magazine dedicated to the topic of coworking, launched a huge coworking survey and found out, that the most important component for coworkers worldwide is the possibility and promotion of interaction (84%).⁹ A widely spread professional network as a result leads to a secure and stable order situation. Both interaction and networking are also benefits the private life will profit from.¹⁰

Interaction is furthermore the first step to sharing of knowledge and finally multidisciplinary collaborating, which most coworkers are looking for when attending a space.

“*Cluster Coworking*” is a model that tries to achieve the maximal professional synergy by creating coworking spaces for particular occupational fields that relate to one another. Their shared knowledge allows casual critique and enables quick collaboration, since a certain specialization is available.¹¹

An atmosphere of informal learning can be created considerably easier within coworking spaces than in traditional offices. People there are often bound to several rules in appearance and behavior.¹²

8 Neue Arbeitsräume für neue Arbeitsformen: Coworking Spaces, POHLER NINA, VS Verlag für Sozialwissenschaften, 2012, p71,72

9 <http://www.deskmag.com/en/what-coworking-space-members-want-survey-211>

10 Neue Arbeitsräume für neue Arbeitsformen: Coworking Spaces, POHLER NINA, VS Verlag für Sozialwissenschaften, 2012, p74

11 <http://www.deskmag.com/en/cluster-coworking-focusing-on-a-theme>

12 Neue Arbeitsräume für neue Arbeitsformen: Coworking Spaces, POHLER NINA, VS Verlag für Sozialwissenschaften, 2012, p74

Social benefits mostly come from the strong community, coworking spaces tend to build.¹³ It is driven by openness and the attempt to establish of a good work/life balance. Having a say as a member in both content and space strengthens the spirit of the community.¹⁴

A socially healthy environment fosters motivation, inspiration and increases creativity. People unleash their productivity and work efficiently, which ultimately leads to getting the work done.

This success leads to an instant raise of selfconfidence and esteem.

Ultimately there is less chance of being bullied in an environment where you can more or less choose your coworkers and colleagues.¹⁵

Coworking spaces help in increasing a significant professional and social sustainability.

The combination of interacting, but still remaining autonomous is the most valuable asset coworking spaces have to offer.

13 <http://www.deskmag.com/en/what-coworking-space-members-want-survey-211>

14 Neue Arbeitsräume für neue Arbeitsformen: Coworking Spaces, POHLER NINA, VS Verlag für Sozialwissenschaften, 2012, S72

15 <http://www.deskmag.com/en/eight-reasons-why-its-worth-joining-a-coworking-space-913>

... dedicated to coworking

international coworking/franchise/fairchise/coworking visa wiki

coworking day/conference/festival/week/jellyweek

global coworking survey

coworking association

coworking magazine deskmag

social networks/coworking wiki/coworking google/coworking blog

Small space vs. large space!?

The average coworking space can host 38 workers at the same time. 1/4 of all spaces offer more than 50 workplaces.¹⁶

Smaller places often have more fulltime memberships unlike big spaces, that tend to encourage “*hot desk-ing*” (- no fixed workplace for each coworker).¹⁷ This can be of disadvantage for the smaller places, because potential new members expect their places to be already occupied anyway. Ergo, the more flexible desks a coworking space has, the more likely it will be successful.¹⁸

Also, bigger coworking spaces usually host more events and thus have a higher attendance rate for each happening.

In general it can be stated that whether a coworking space is small or big, it is likely to always have some space, since the desks are not always occupied (effective use under 50%) and working hours are completely individual.¹⁹

16 <http://www.deskmag.com/en/global-study-coworking-spaces-169>

17 <http://www.deskmag.com/en/global-study-coworking-spaces-169>

18 <http://www.deskmag.com/en/the-development-of-coworking-spaces-213>

19 <http://www.deskmag.com/en/global-study-coworking-spaces-169>

financing strategies

The question of how a coworking space can be financed and survive, maybe even on its own without additional support, needs a close look and thought-out strategy.

Private investors or venture capital could provide a solution, but there are also some possibilities when looking at crowdfunding. Some coworking spaces have already been realized entirely by this finance concept. A significant argument to contribute to the coworking space in terms of funding is the help, coworkers could provide in return when it comes to large scale projects the community wants to carry out.²⁰

Another answer could be with companies. The term “*corporate coworking*” explains the concept of employees of a major corporation sharing their office space with coworkers from outside the company.²¹ Also there is a reverse development as a result of the decentralisation of workspace - more and more people work flexibly, although they are employed at one particular company. They don’t have to be at one certain location to get their work done, people work from anywhere and that obviously improves the whole business efficiency.²² But one development many coworkers are sceptical about, is the creation of many spaces by one particular company, which then rents their desks to mainly punctual visitors. The danger is a potential lack of identity and community.

Public funding, when provided, can be considered to be the safest way to get a new coworking space up and running. Projects such as “*Creative Wallonia*” in Belgium (8 spaces), “*Gangplank*” in Arizona or two new coworking spaces in Israel have already been entirely publicly funded.²³

Arguments that can enable a public partnership is for instance the economic development coworking spaces contribute to. They can thus serve as a connection between the old and new economy.

20 <http://www.deskmag.com/en/coworking-crowdfunding-project-community>

21 <http://www.eremedia.com/ere/corporate-coworking-is-it-calculated-brilliance-or-foolishness/>

22 <http://www.deskmag.com/en/the-benefits-of-flexible-workspaces>

23 <http://www.deskmag.com/en/public-sector-fund-coworking>

Supporting the youth by education and teaching withing the spaces (*“knowledge hubs”*) is a big impact co-working spaces could have on the society as a whole and therefore be entitled to public funding.²⁴

The revitalization of a whole area ist also an important goal and based on the grounds of being part in this process, coworking spaces could entertain a public partnership.²⁵

Public funding can provide better prices for memberships in the future which leads to a higher number of people being able to use coworking spaces. Also there is the advantage private based institutions becoming less competitive.²⁶

In order to persist, there are a lot of actions a coworking space could take. Since most spaces cannot survive from only the rents, it needs to ensure additional measures.

Workshops, courses and events could be organised and charged at a fair price.²⁷ Making outside groups pay to use space and facilities to organise their own events could not only bring money, but offer a verietiy of activities to members and ultimately increase the exchange with other coworking spaces.²⁸

An internal “market place” where members are able to post offerings and needs can also be an important part of making the place work. Coworking spaces make alternative currencies possible and have thereby and influence on collective thinking and acting alltogether.²⁹

A good connection and synergy between different coworking spaces is vital to their surviving and development in the future.³⁰

24 <http://www.deskmag.com/en/public-sector-fund-coworking>

25 <http://www.deskmag.com/en/profitable-coworking-space-business-models-189>

26 <http://www.deskmag.com/en/the-future-of-coworking-882>

27 <http://www.deskmag.com/en/public-sector-fund-coworking>

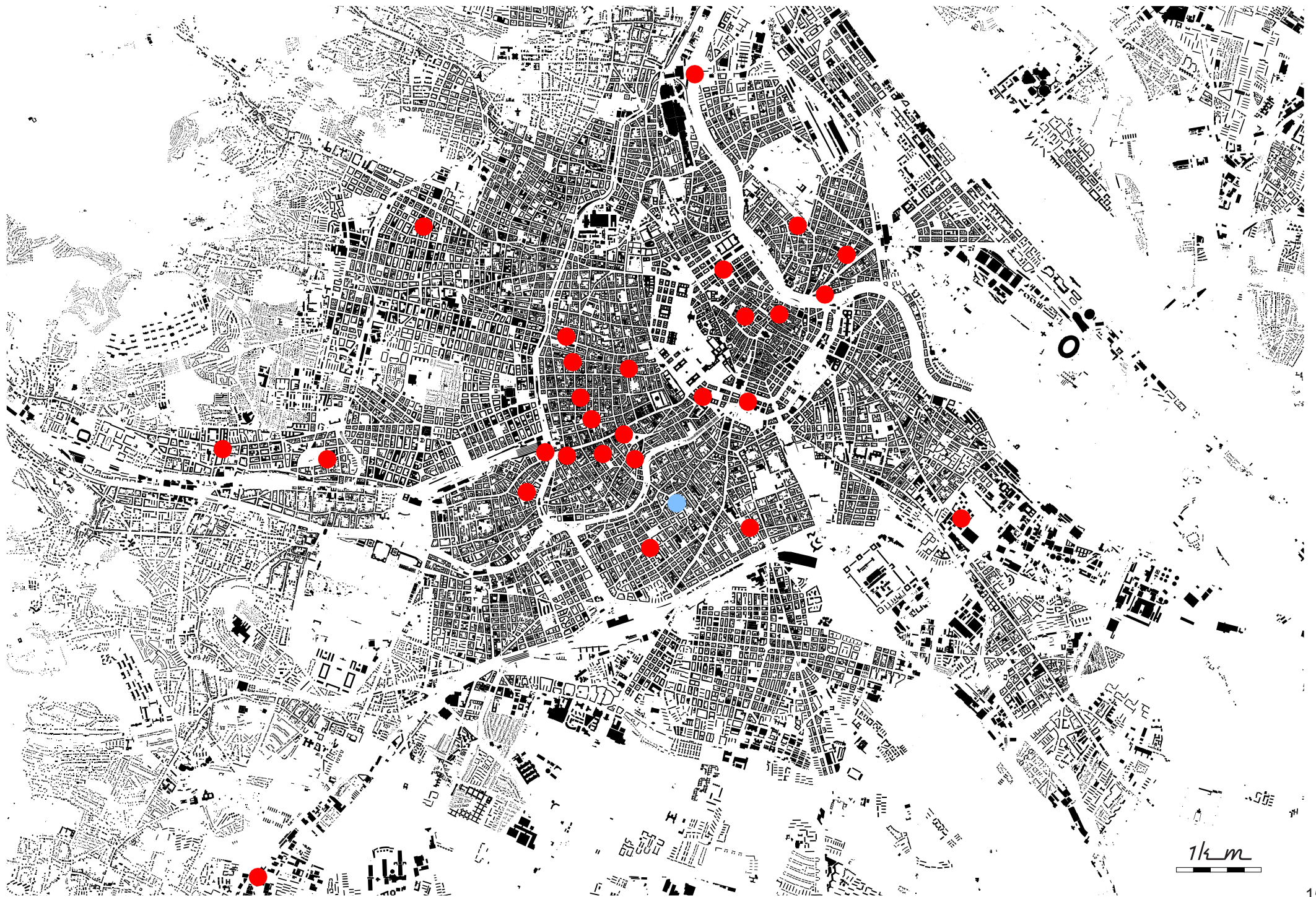
28 <http://www.deskmag.com/en/profitable-coworking-space-business-models-189>

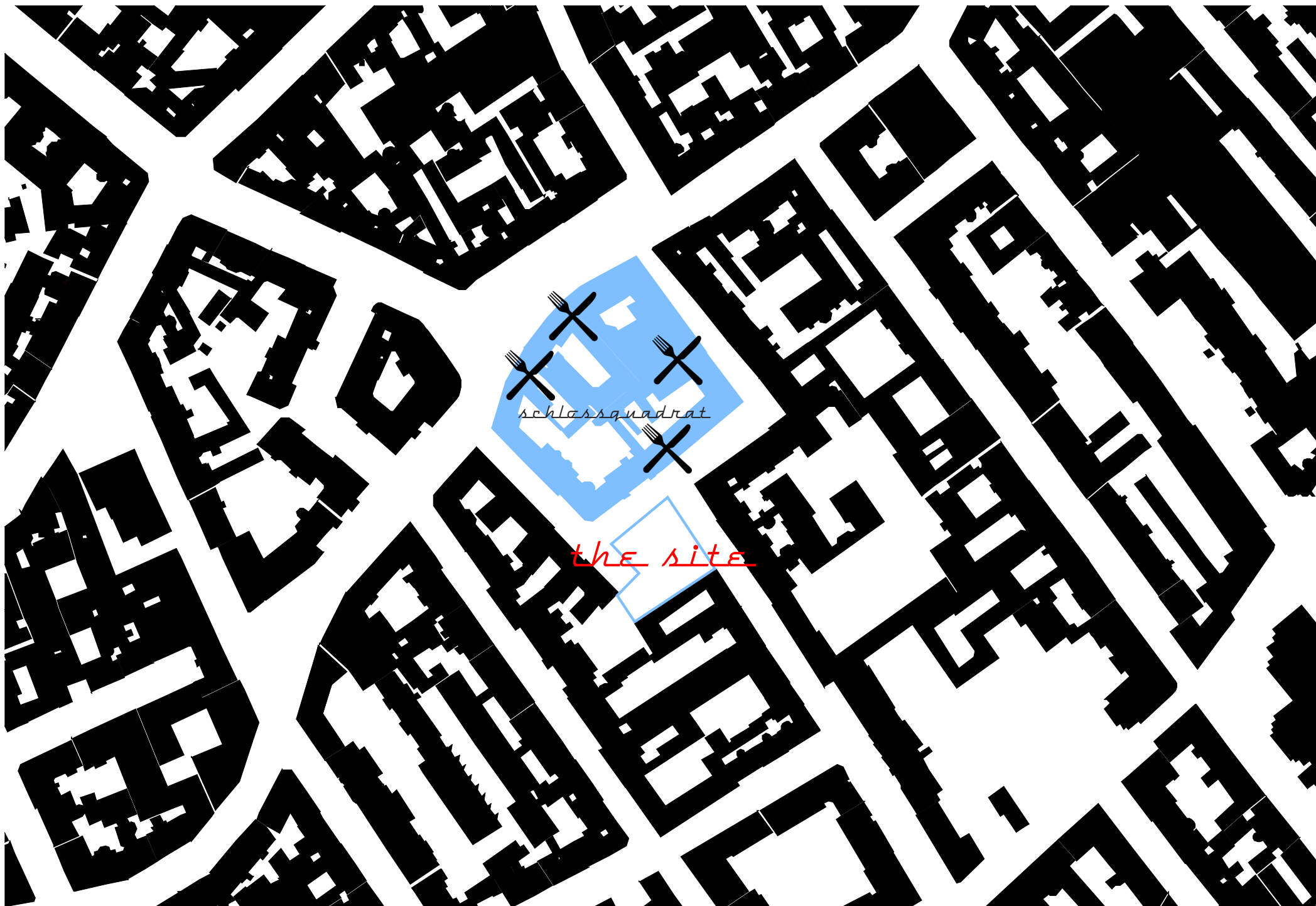
29 <http://www.deskmag.com/en/coworking-spaces-explore-the-use-of-alternative-currencies-866>

30 <http://www.deskmag.com/en/the-future-of-coworking-882>

VIENNA

There are already several coworking spaces in Vienna.
The blue point marks the site of my project.





Based on my knowledge about coworking spaces and the demands they make on their environment, I chose a site in Vienna's 5th district.

A good combination of basic facilities (transport, supermarket, etc.) in the surrounding area with an interesting and challenging neighbourhood is an important element of finding the right spot for a successful coworking space. The site I chose is located in a very quiet part of the district that managed to be both, a housing area and creative melting pot at the same time. A movie production, architecture offices, music composers and an advertisement agency contribute to the spirit of the whole neighborhood.

The "*Schlossquadrat*", a block of houses in the center of the area, can be seen as the main meeting point of people, who live and work there. A group of four restaurants is placed within the block and all of them are connected through pathways from their individual courtyards. Passing by, one would maybe not expect such a vivid bubble almost hiding inside a pretty ordinary block. I consider this also being a major advantage for the success of a coworking space located in this neighborhood.

The site itself is an abandoned zone, enclosed by a fence and left to its own devices. The whole surface is overgrown and for many years now there hasn't been any serious attempt on changing this situation. Rumors in the neighborhood say that nobody yet bought this ground, because of the many legal restrictions (f.e. in height) one has to face when intending to build something there.

For my fictitious project I did not take this fact into account.

The surrounding buildings are a mixup of smaller houses, having an almost rural character, and bigger blocks in style of typical Viennese "*Gründerzeit*" housing (late 19th, early 20th century).

A special example of these historical buildings is the "*Margaretenhof*", one of the most famous and admired structures in the whole district.

I picked this particular site not only because of the beauty of the whole area (clearly it doesn't belong to a quarter that needs to be revived by a coworking space), but also because I think that a fresh and crisp structure in content and form could be accepted in the mindset of people populating this creative neighborhood. A contrasting design could contribute to the already unique area in this part of the district.

schlossquadrat



margaretenhof

the site

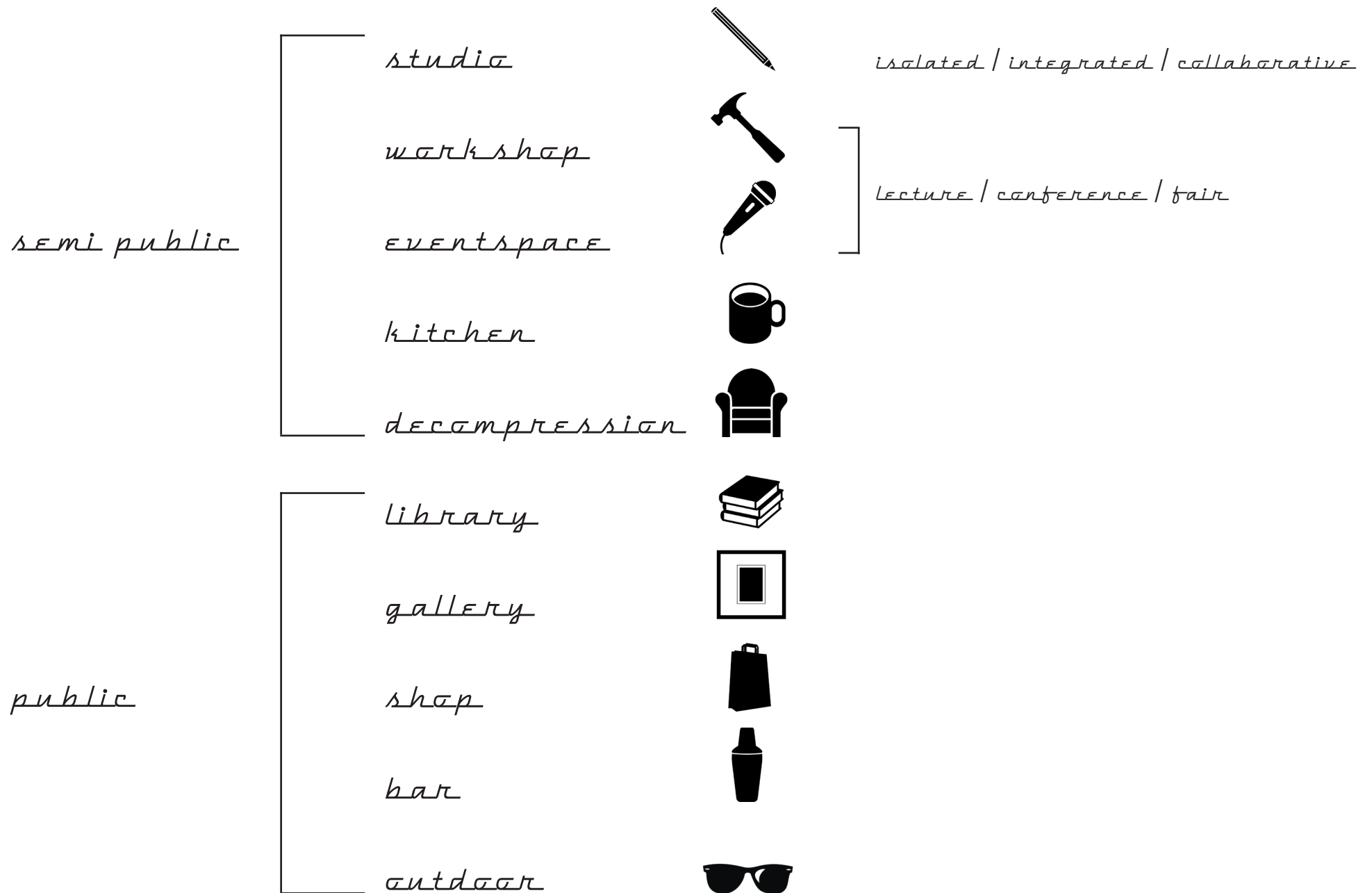






*create a space where
relation leads to inspiration*

space allocation



design topics



crossfunction / hybrid



moving pattern - improve interaction



semi public / public



openness



adaptation / change



small space / big space - various needs

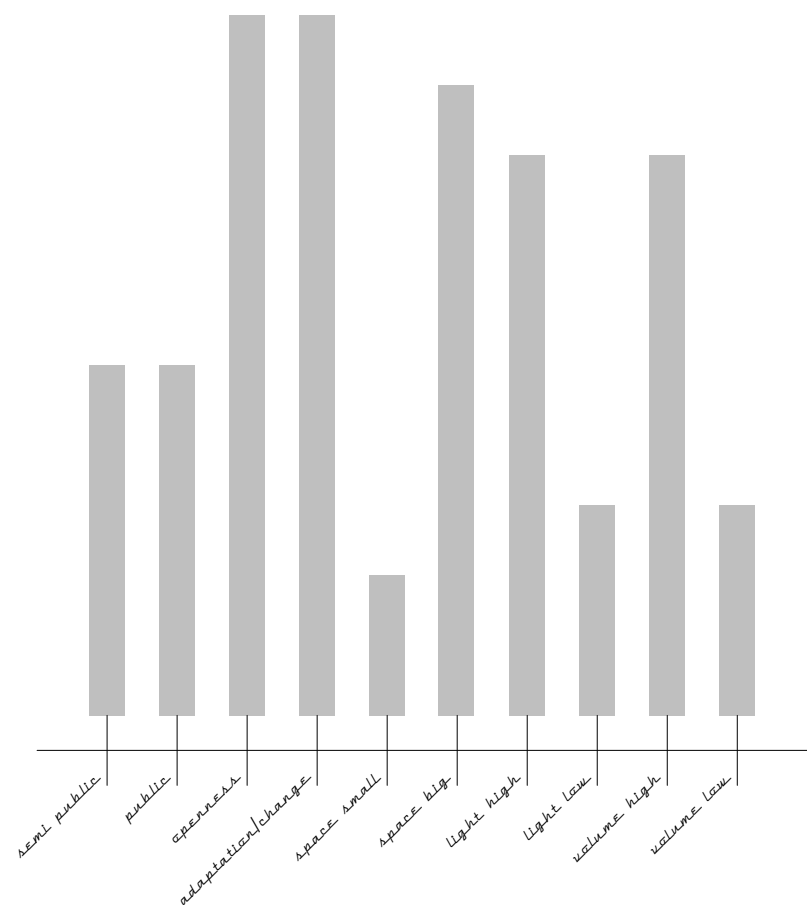
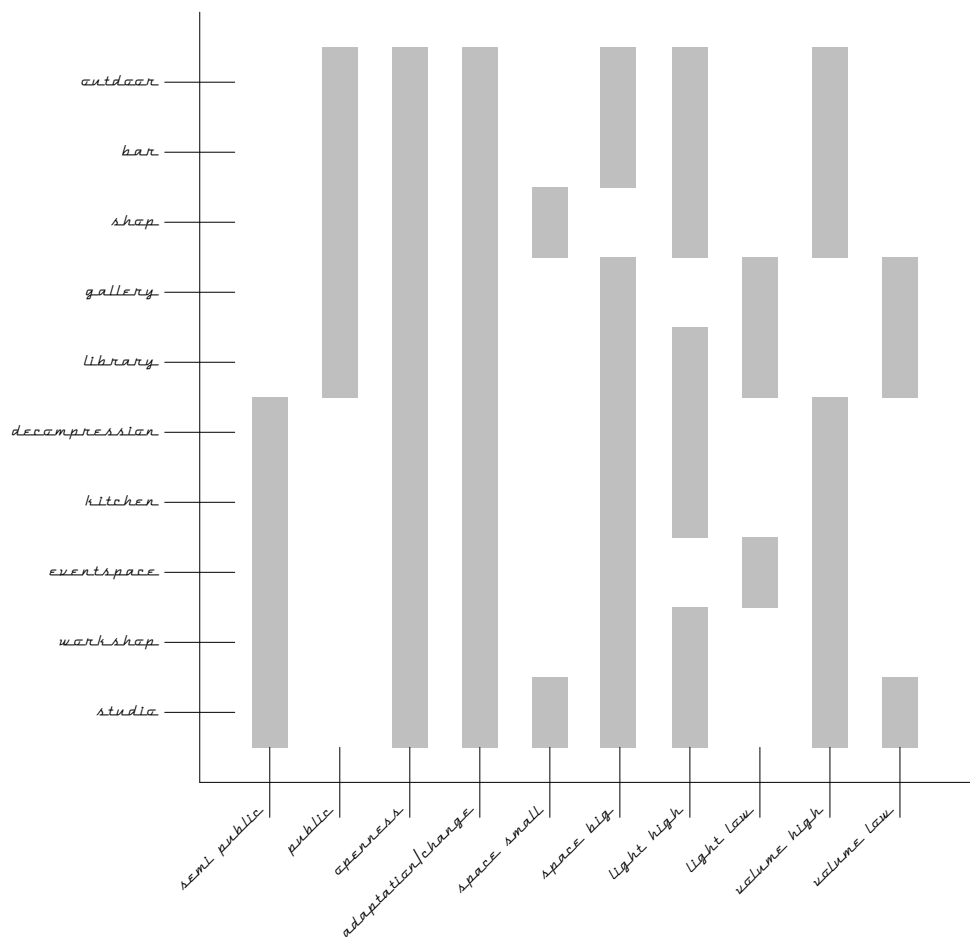


light - various needs

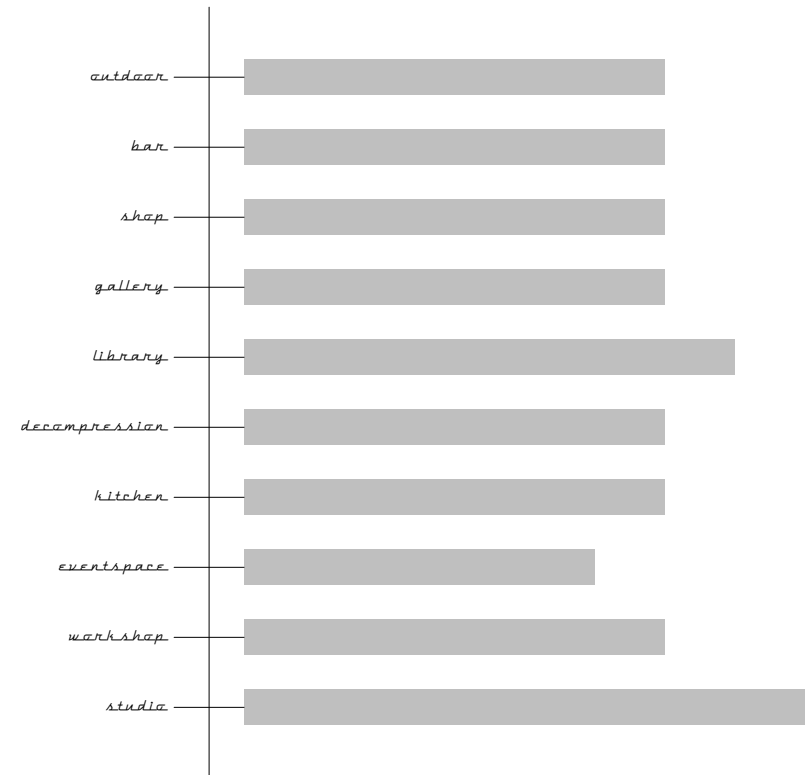
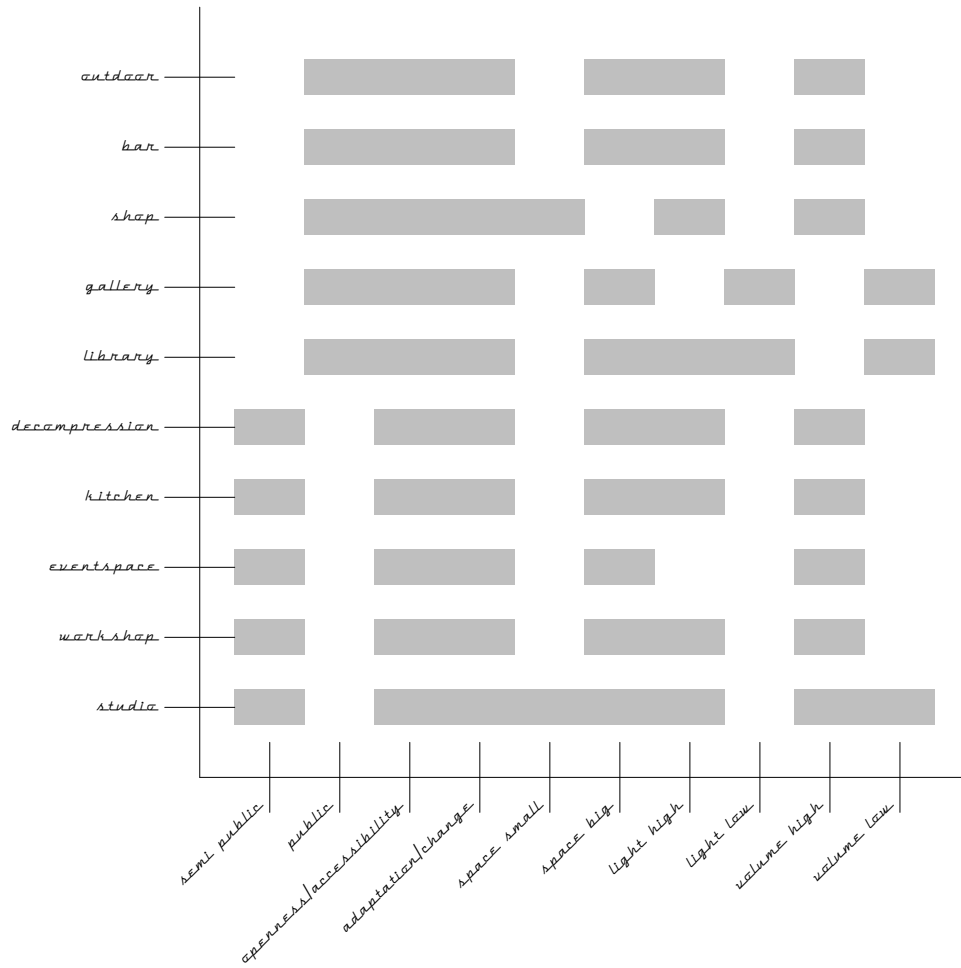


volume - various needs


spatial requirements




most demanding functions




arrangement



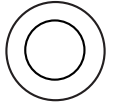
openness



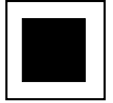
adaptation / change



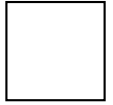
semi public



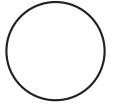
public




space small




space big



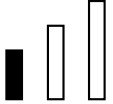
light high



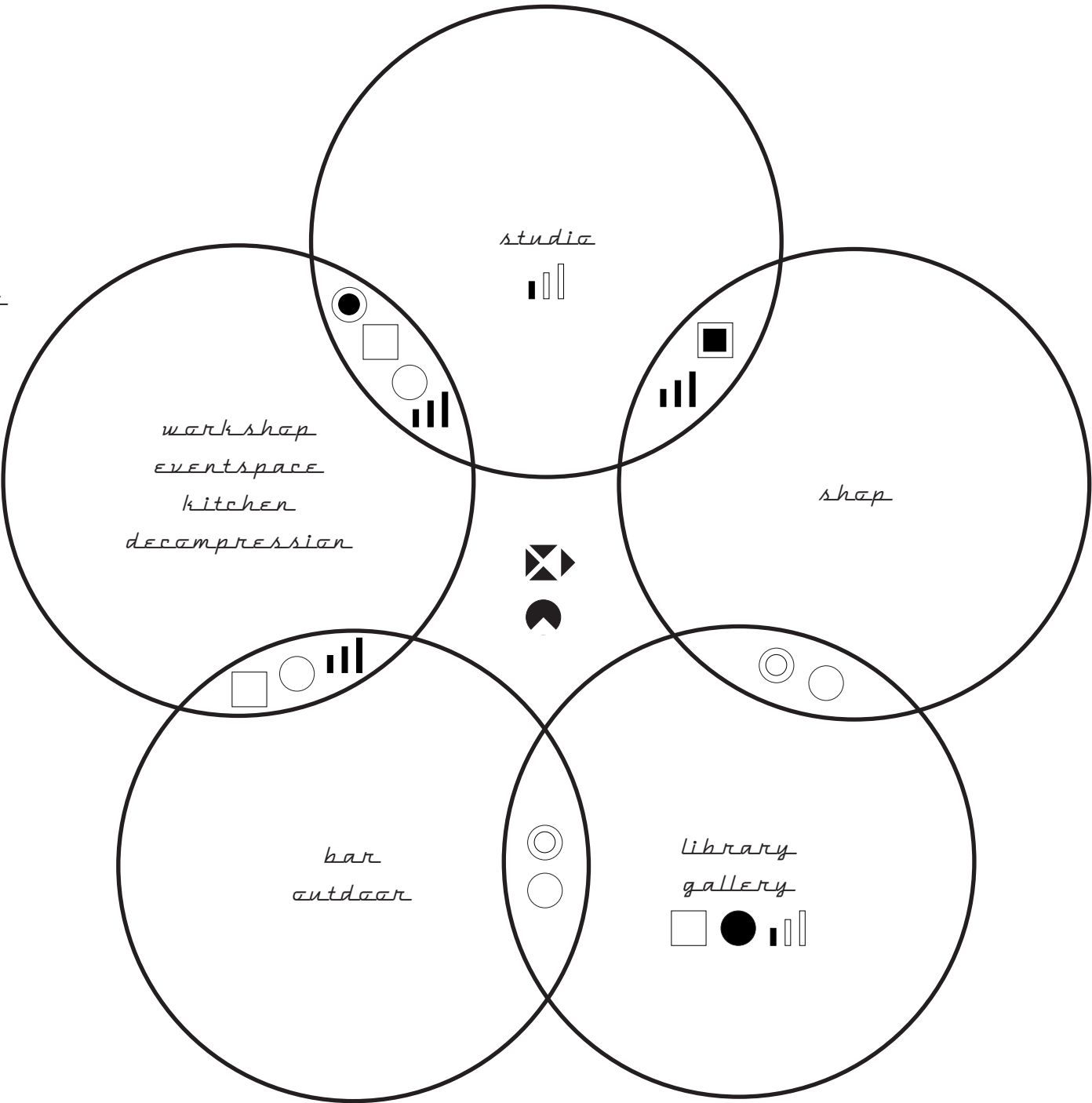
light low



volume high

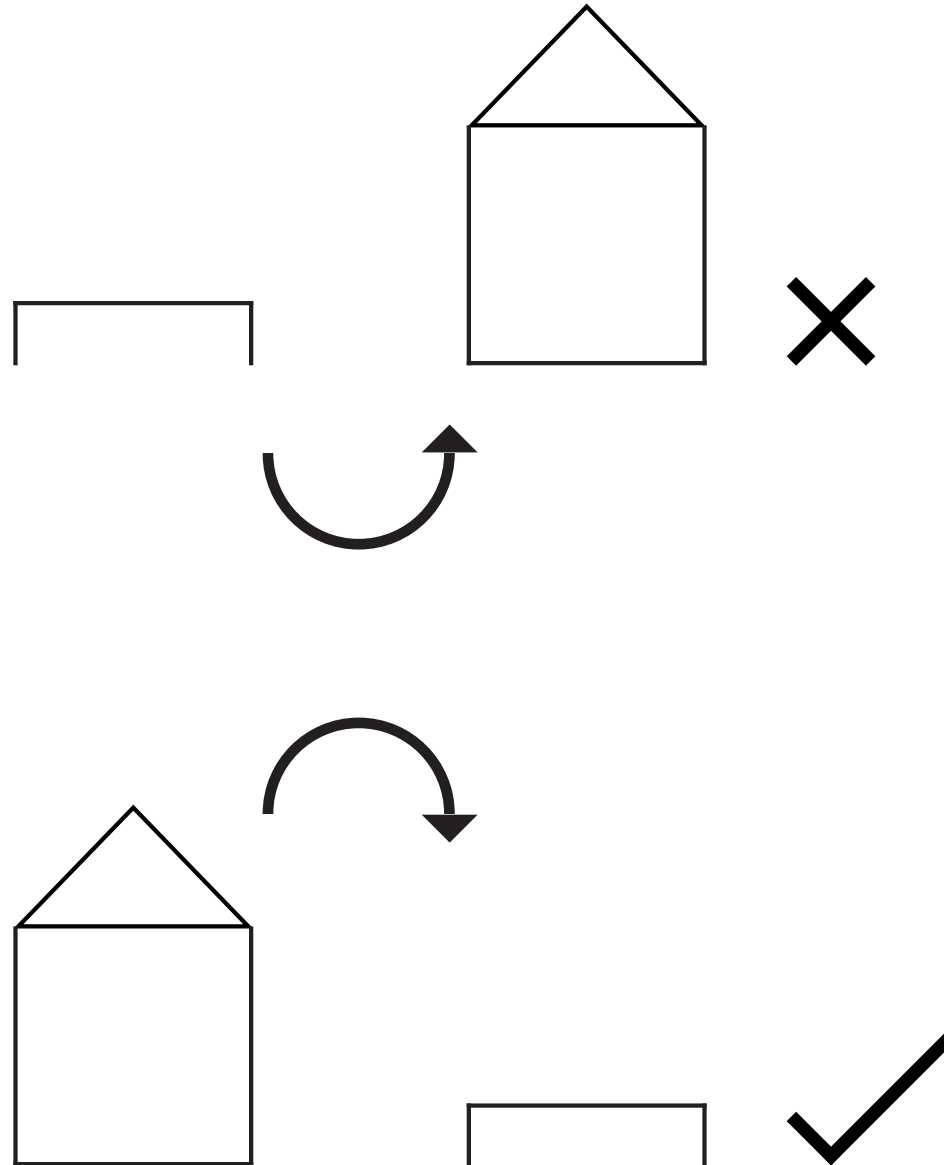


volume low



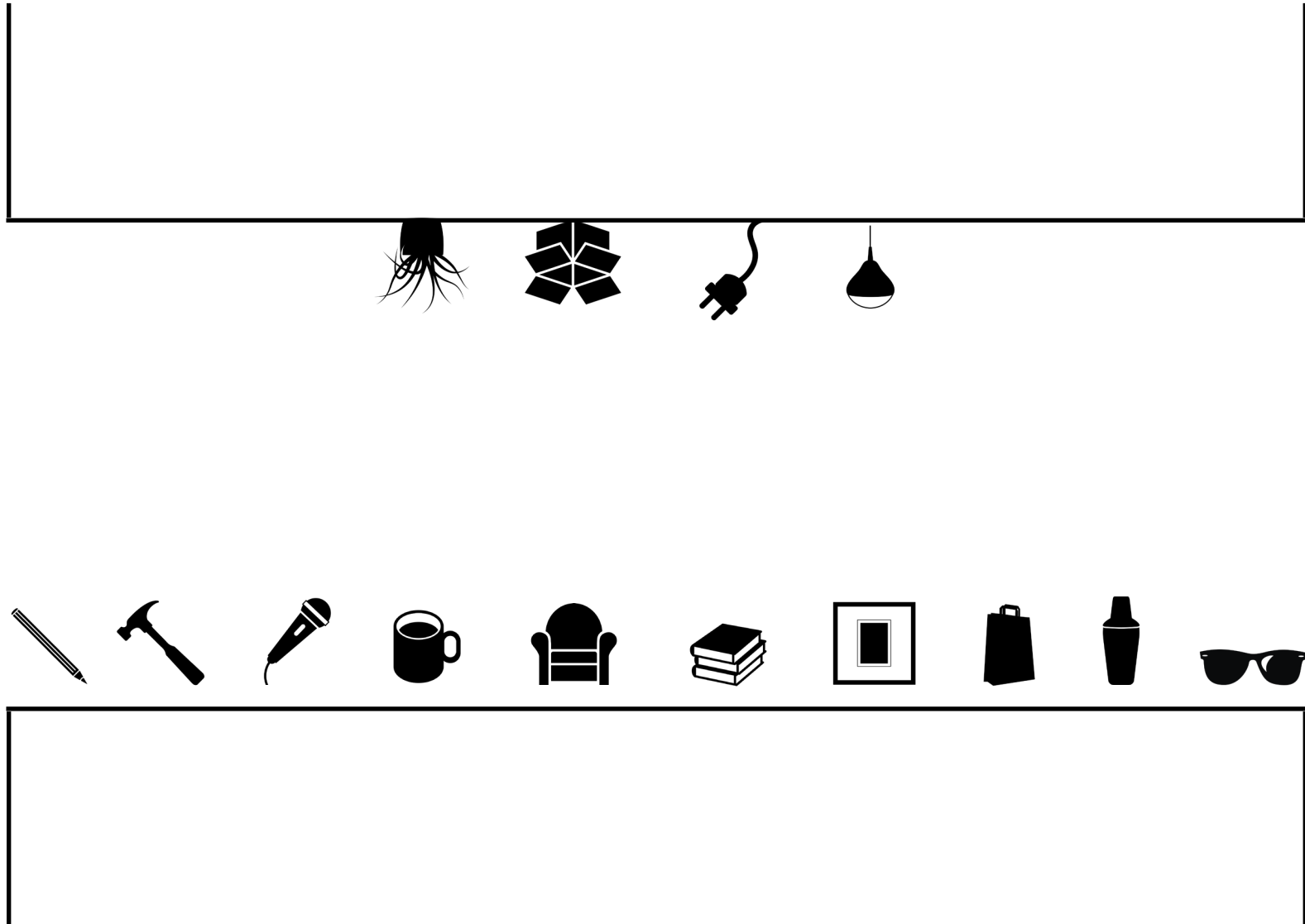
concept

Since I found the table being the most essential part of a workspace, I decided, not to put a table in a building, but to design a building evolving around a table!



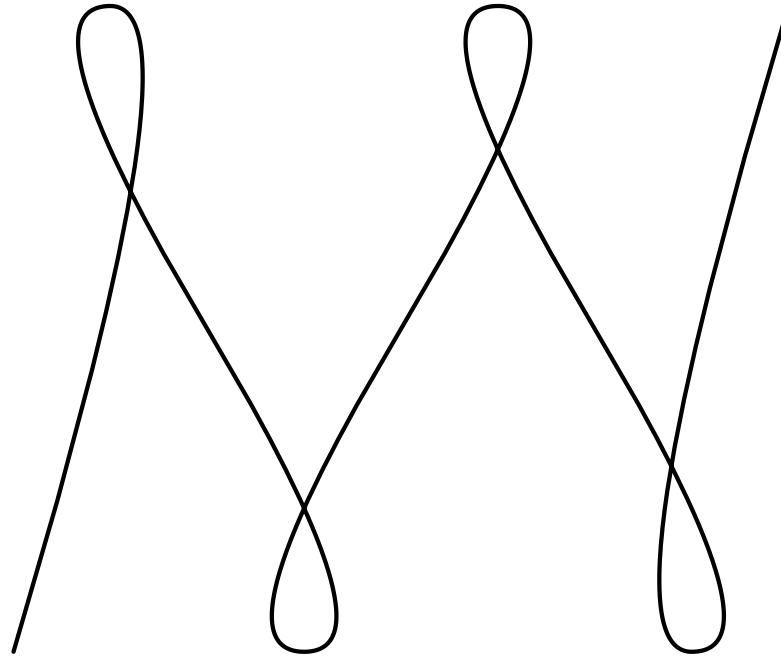
the table's two planes...

...are housing the whole space allocation.



By connecting the two planes and shaping the structure according to different requirements in function and form, I created:

an endless table



- it improves social interaction by slowing down the moving pattern,
- allows to change space without changing space,
- offers neutral space for individual working habits and other applications and
- supports thinking and experiencing outside the box by creating diverse accessibilities of space

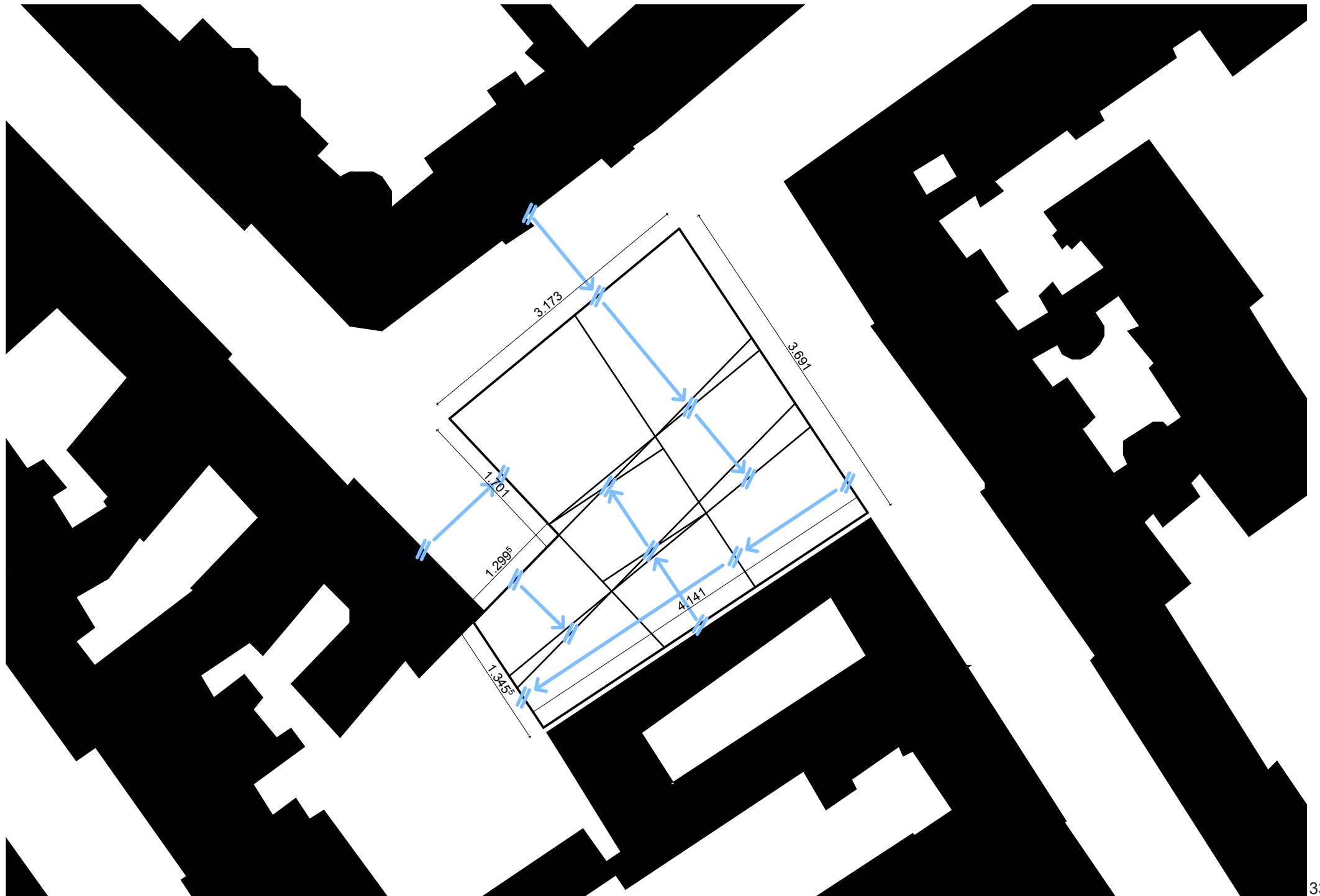
the design

The basic zoning and determination of a building line are a response to the borders of the site and the surrounding area.

The creation of a courtyard relates to the “Schlossquadrat”, but also serves as shortcut and invites people to walk through the structure, who thereby already feel as a part of the community. It furthermore frames a public surface for communication and leisure time.

These lines also regulate the interior, since coworking spaces mostly do well with open office structures. It was important to avoid any spatial hierarchies.

Altogether the building is organised in two separate parts, connected through the basement. This measure differentiates the semi public and public functions within the coworking space.

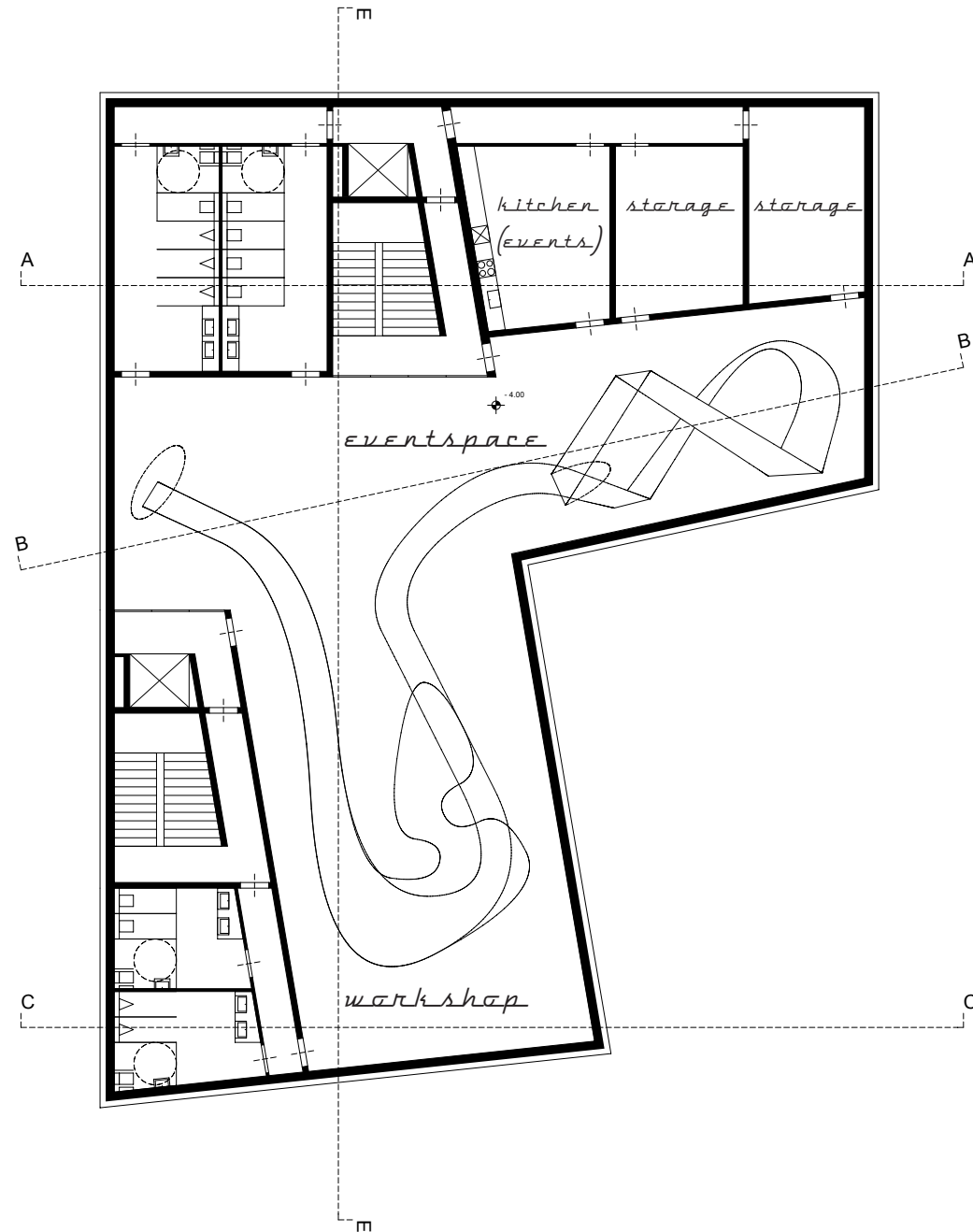


basement 1:250

The “space warp collective” is a crossfunctional building and seeks to thereby foster the benefits of a co-working space.

The workspace in the basement provides space and access to several machines, self-employed people don't own themselves, but also need to get some of their work done.

Also most events would take place on this floor.



ground floor 1:250

A crucial element to achieve a high attendance and boost the popularity of a coworking space is its accessibility.

Most members like a good proportion of open and more private areas. With a focus to collaborative working, the endless table still provides both by offering smaller “*retreat bunks*” that bend to the exterior. The design encourages people to explore the variety of working positions and postures.

Physical walls block collaboration, the divisions of functions appear therefore intuitively.

The coworking concept of interaction can be strengthened by including areas of unusual function mixup. As a result printing and kitchen share one area.

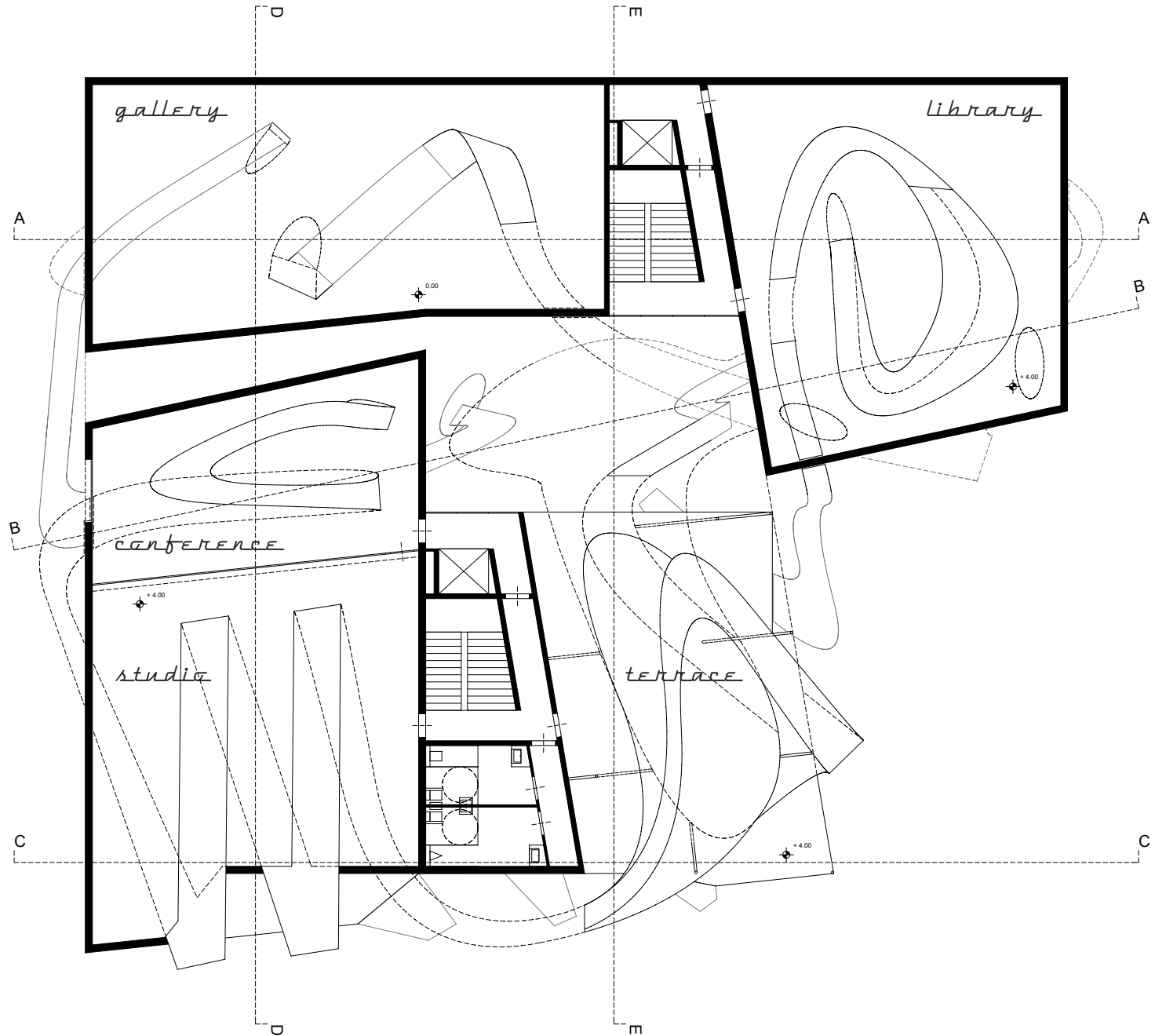


first floor 1:250

Ambient noise doesn't necessarily have to be a disturbing element. A study in the Journal of Consumer research by Ravi Mehta, Rui Zhu and Amar Cheema showed that constant mid level noise is better to maintain concentration, than low- and high level noise.³¹

Two terraces on two different floors are part of the important interactive spaces and leisure facilities.

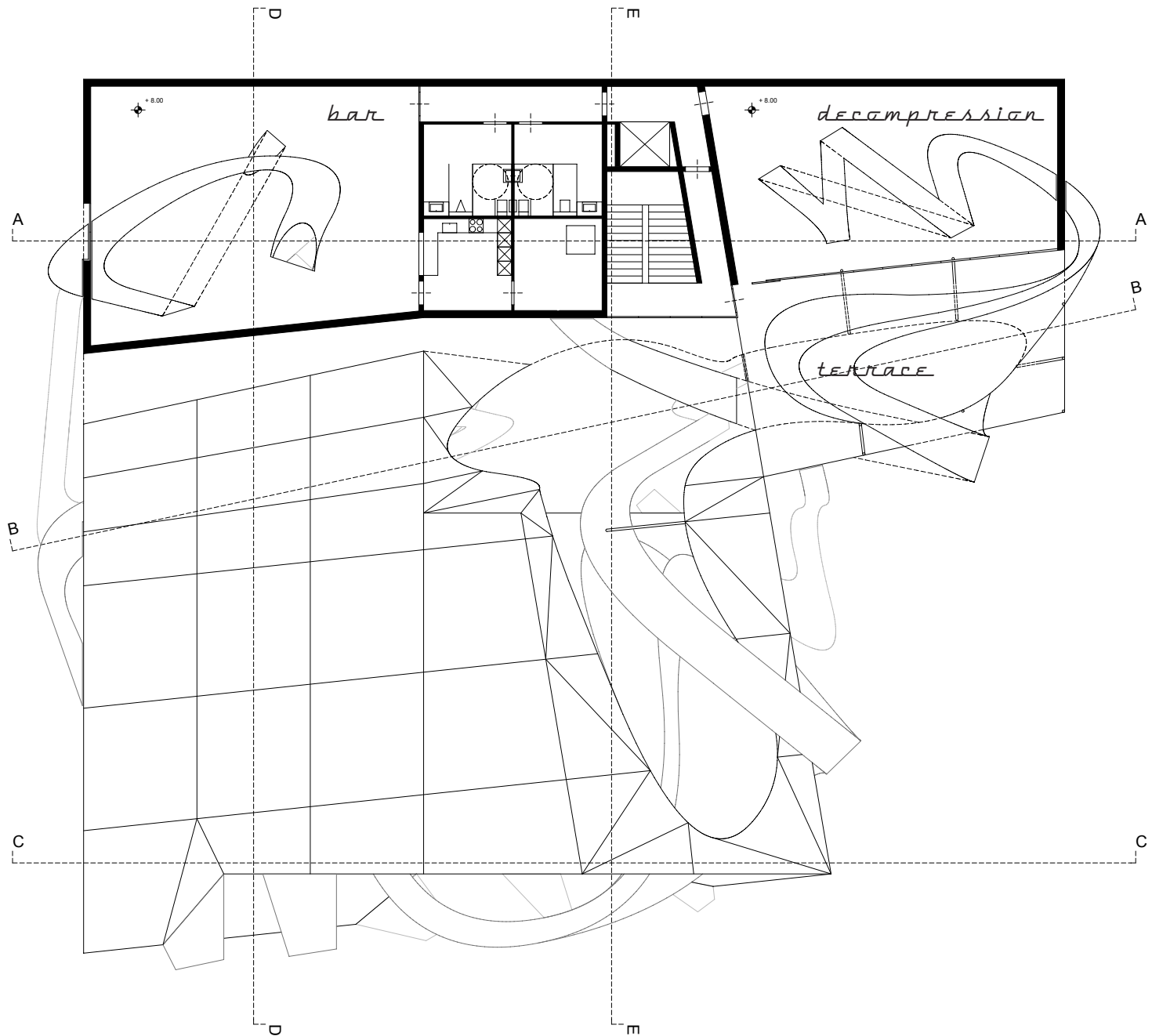
31 <http://www.deskmag.com/en/ambient-noise-boosts-creativity-coworking-spaces-493>



second floor 1:250

Restaurants and bars are important spots for the whole community. Since the “Schlossquadrat” already provides four restaurant, the coworking space is housing a bar.

It is important not to have it within the office area, as it could be a disturbing element.



site plan 1:500

A coworking space should encourage it's members to play with the space, influence and change it. Therefore a coworking space is never "finished".³²

Member activity should be communicated to the exterior. The "space warp collective" with the endless table should also be limitless in it's design and hence allow and encourage their members to paint the surface of the desk according to their vision. It doesn't only support the spirit of the community, but also establishes a strong identification with the place and unique branding.

The road surface around the site is made of cobblestone, which now has an extension into the courtyard of the new building.

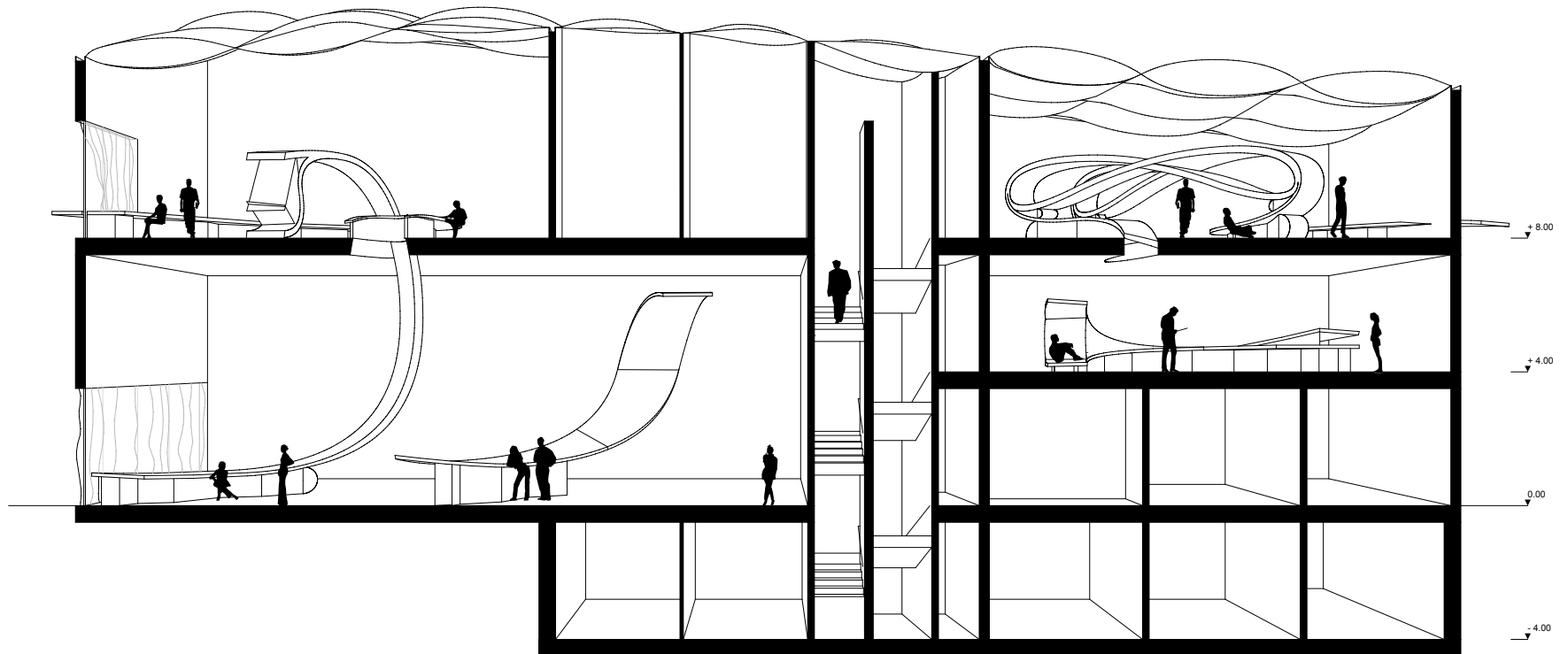
The "space warp collective" can host around 50 people working at the same time.

32 <http://www.deskmag.com/en/designing-a-successful-coworking-space-183>

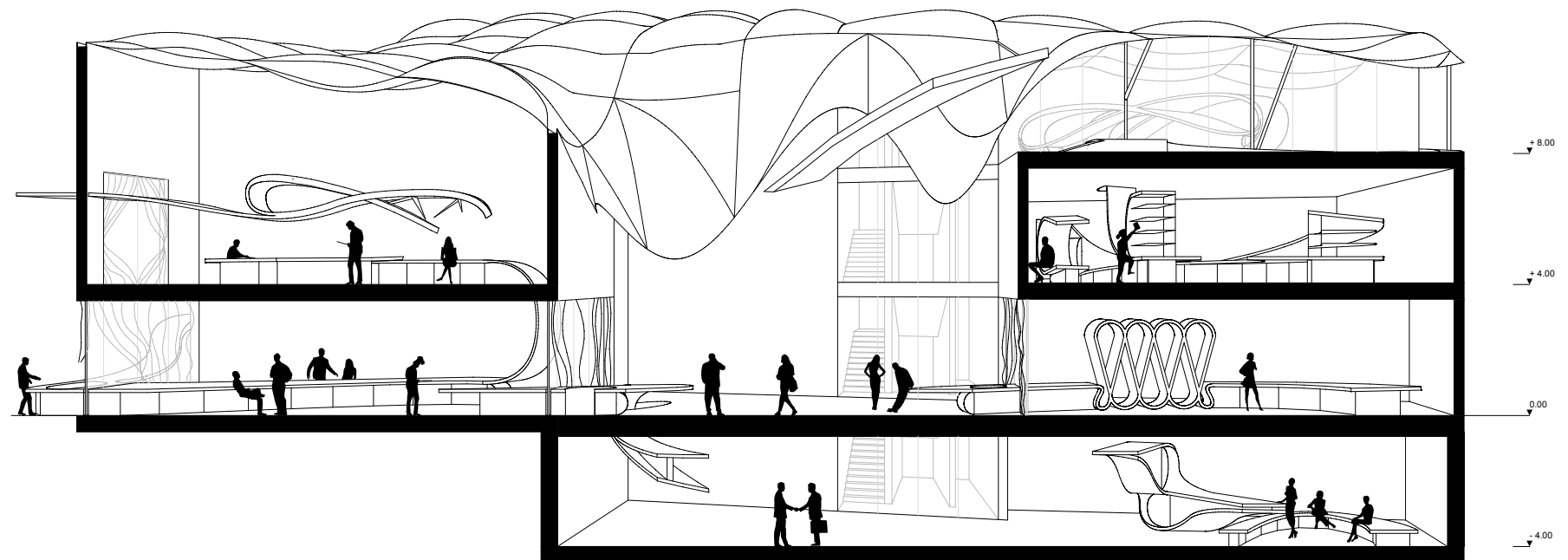


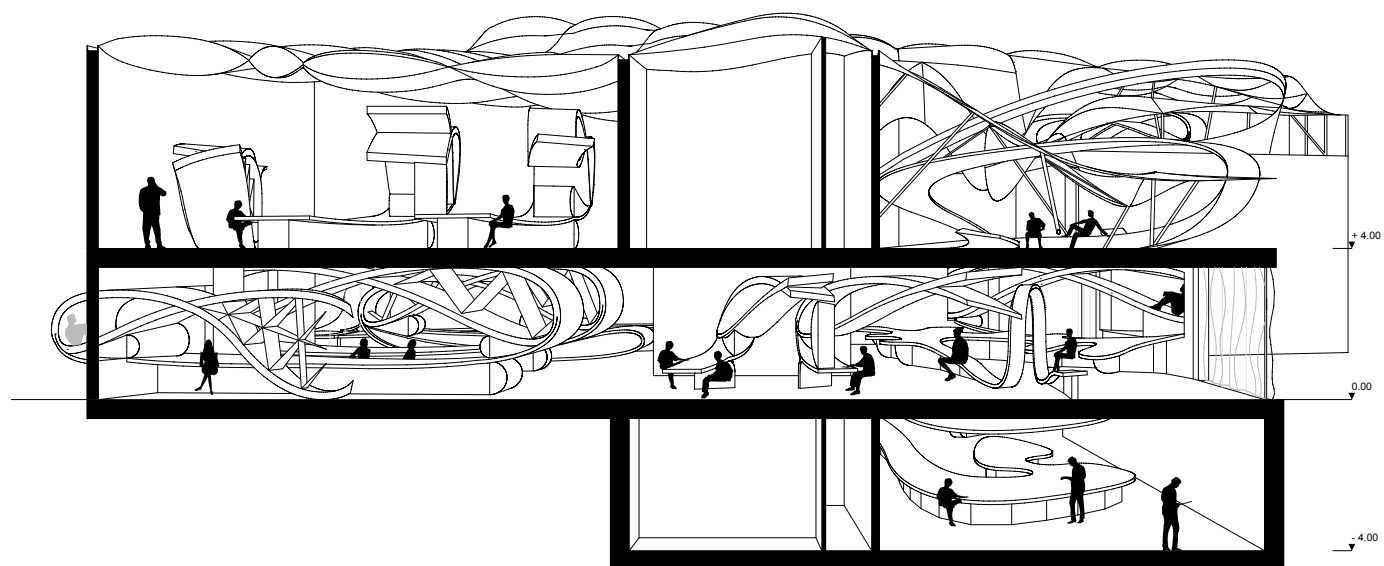
Section 1:200

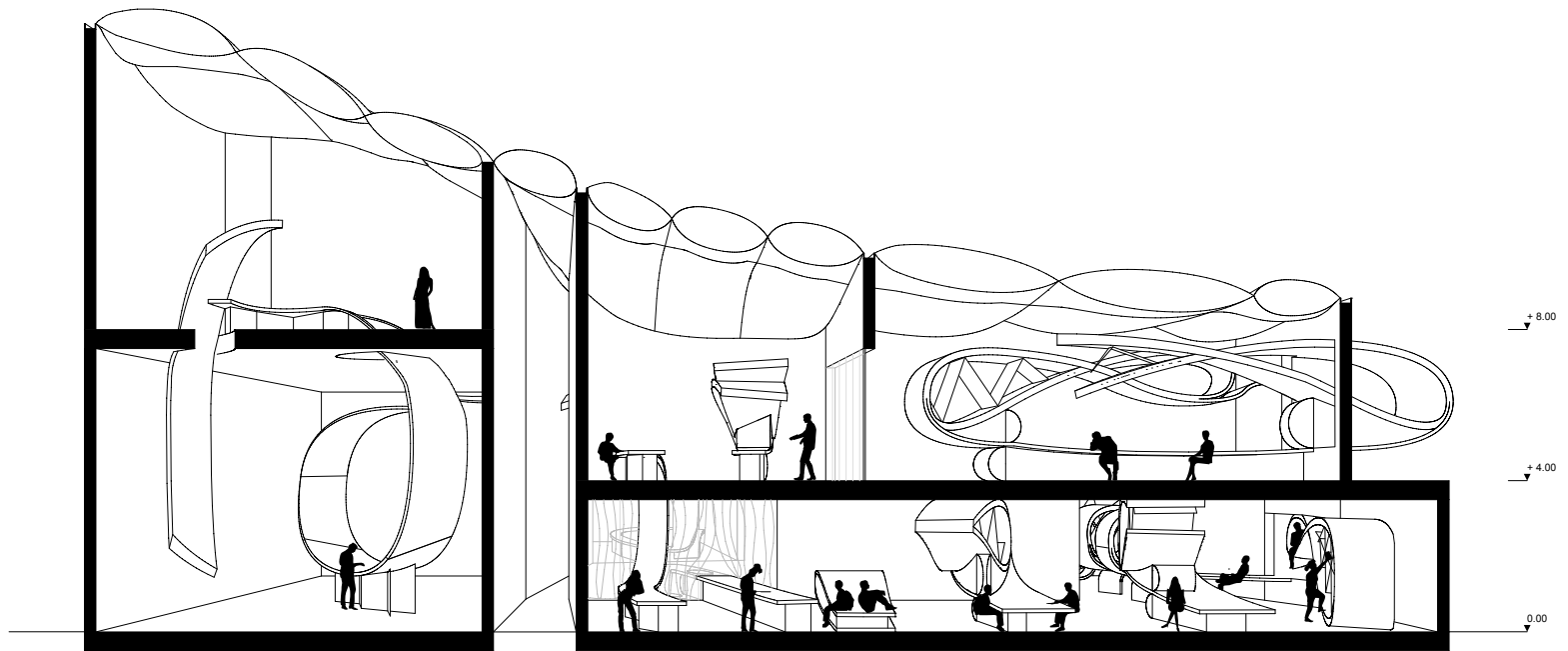
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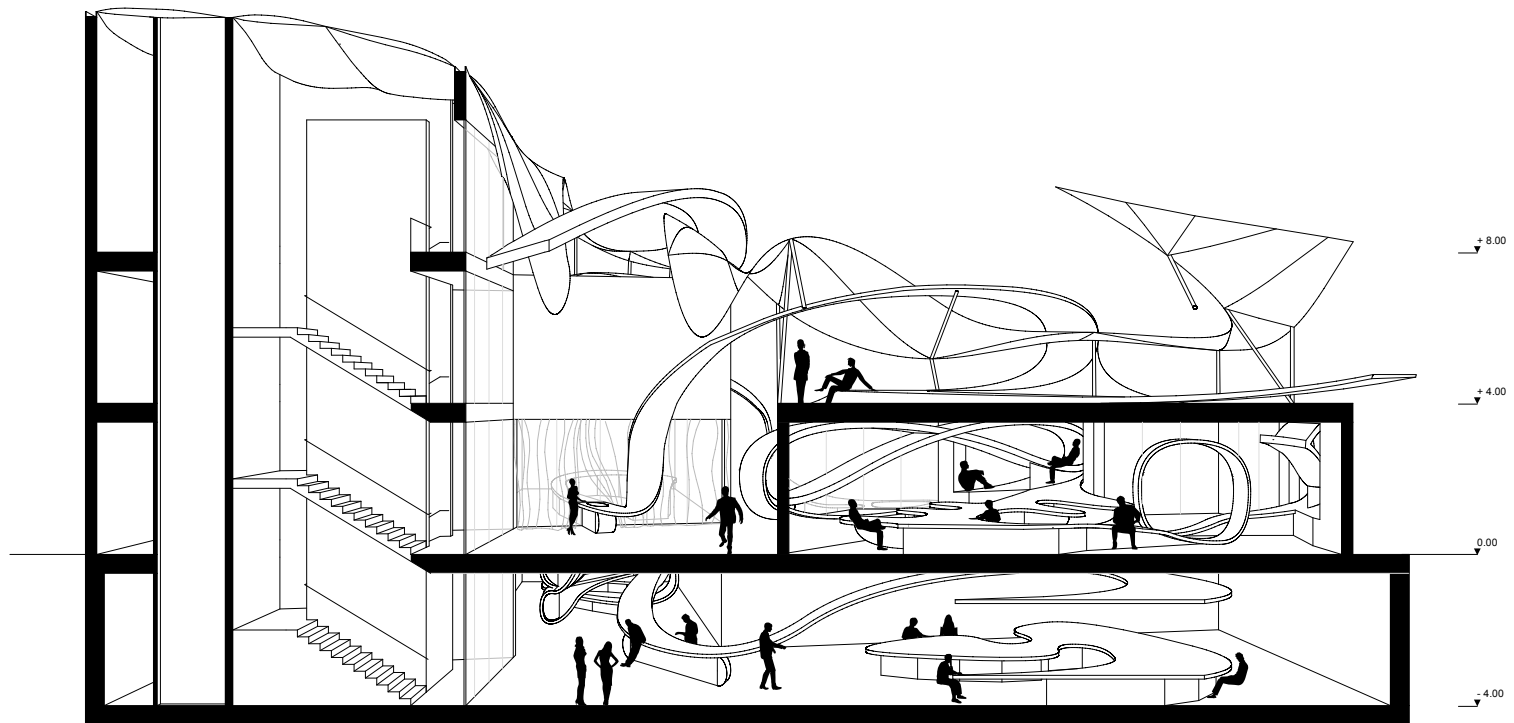


h h

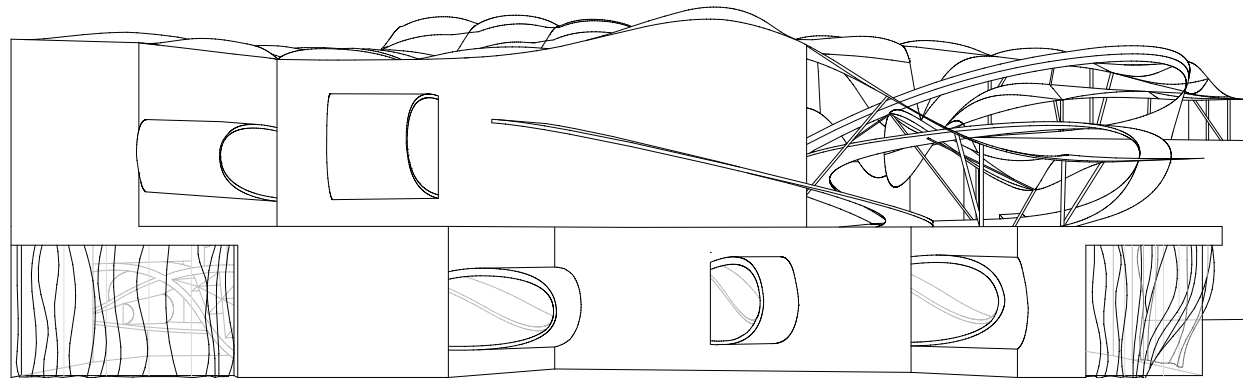




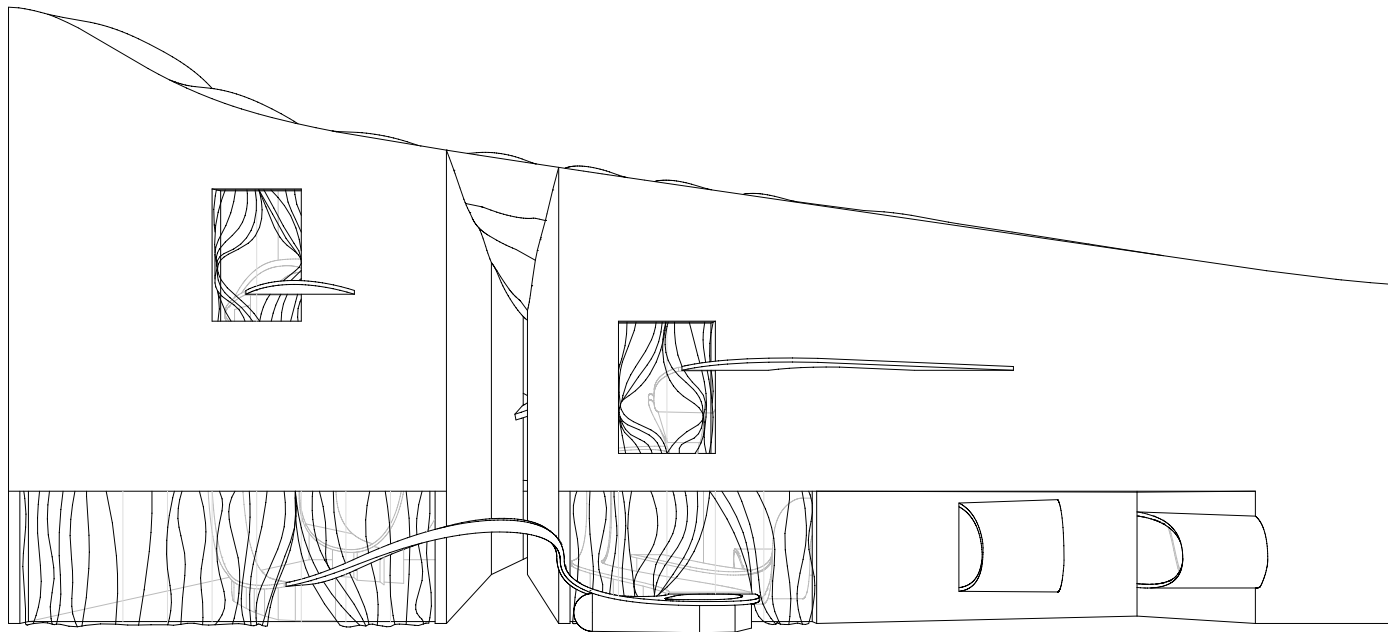




elevations 1:200

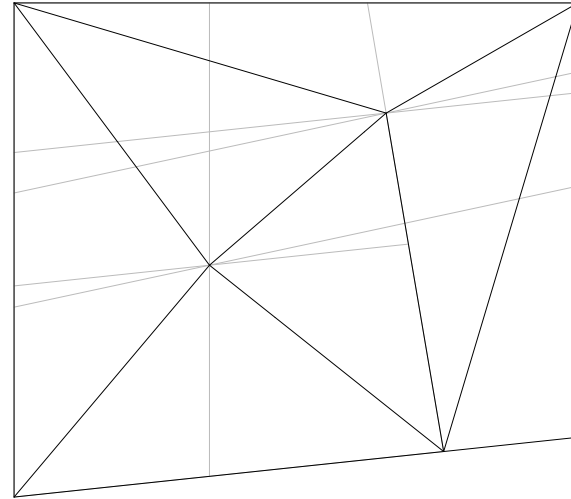
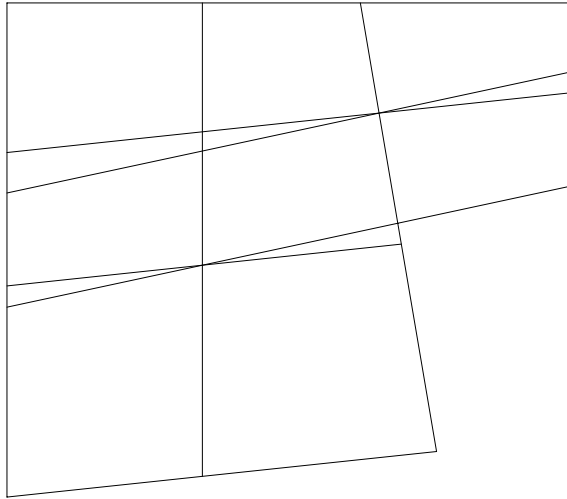


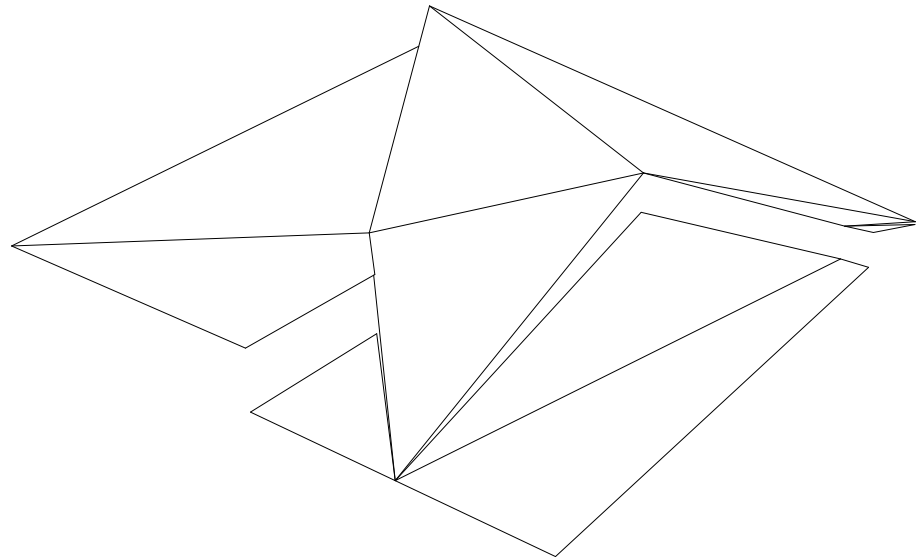
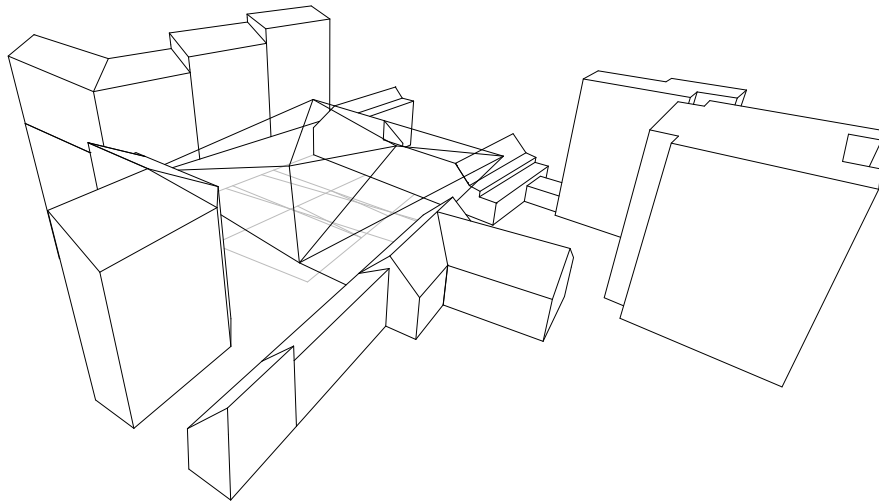
schlossgasse



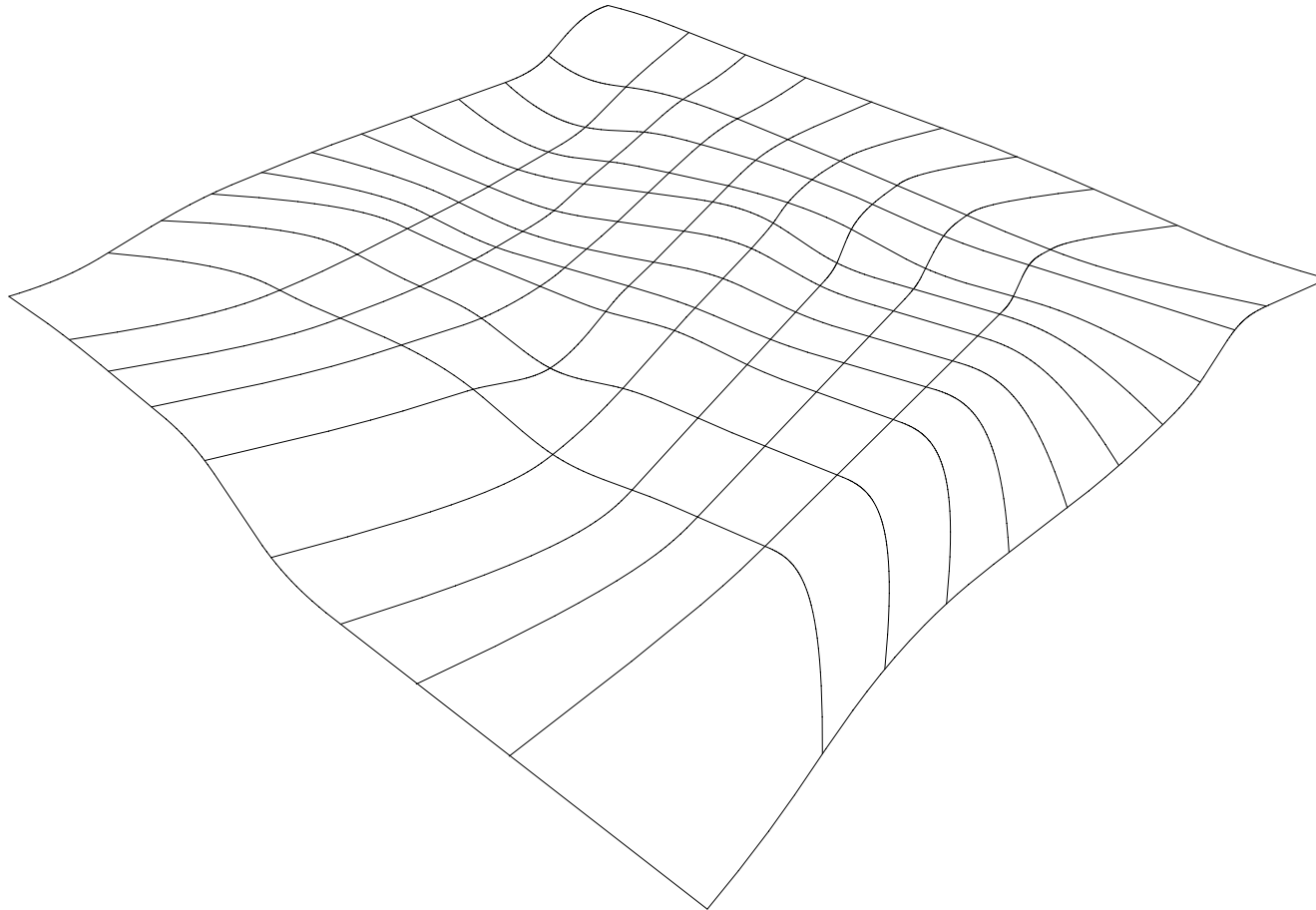
hofgasse

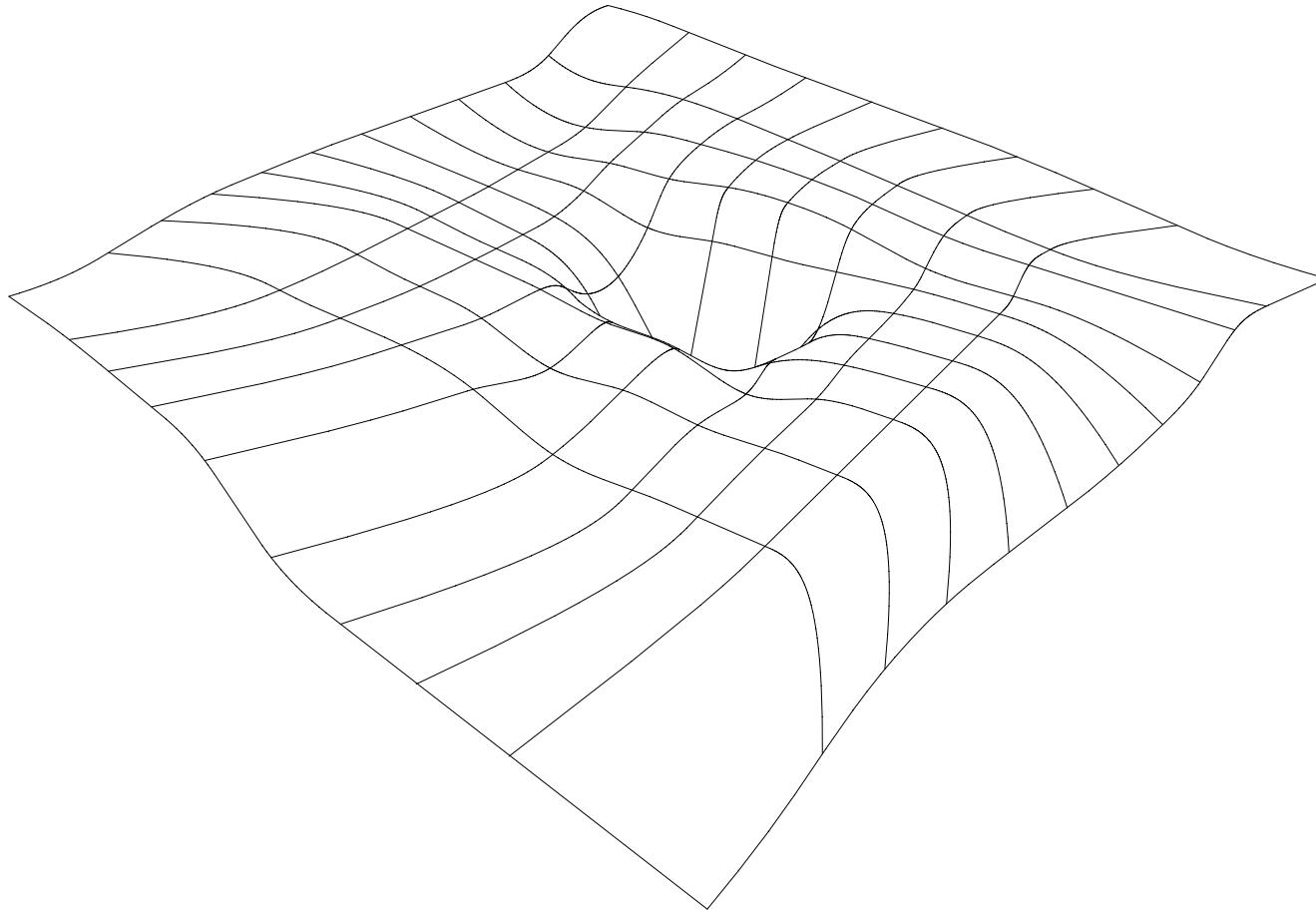
the roof

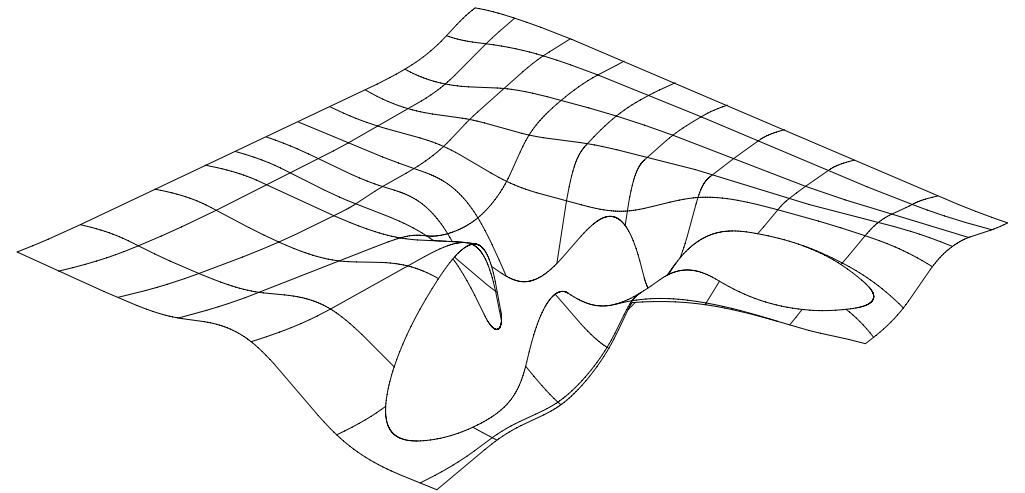
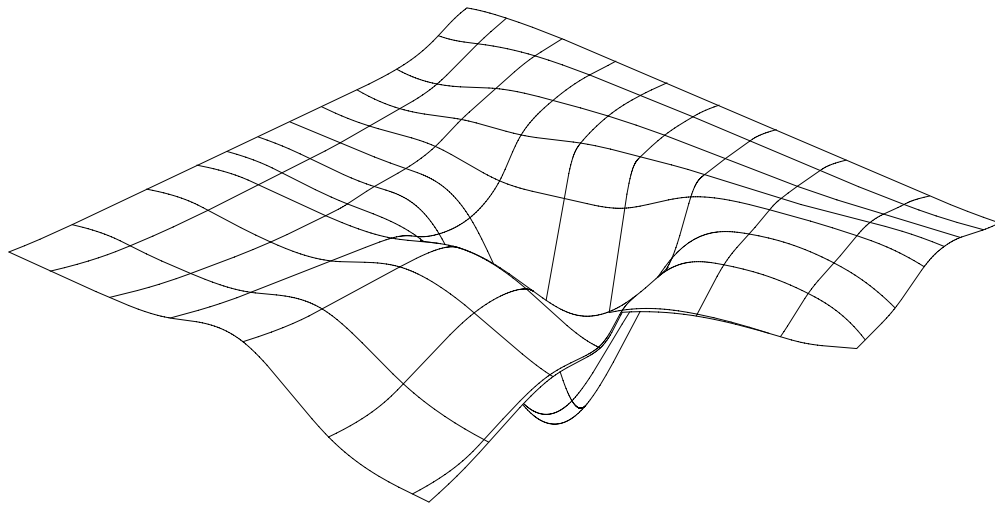


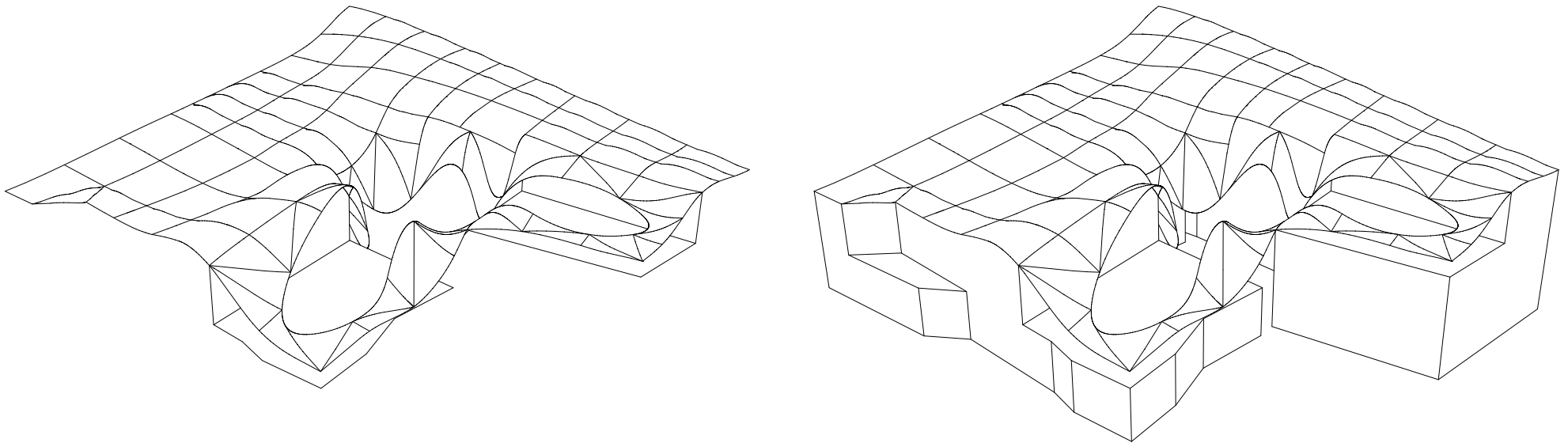


height development according to the surrounding buildings

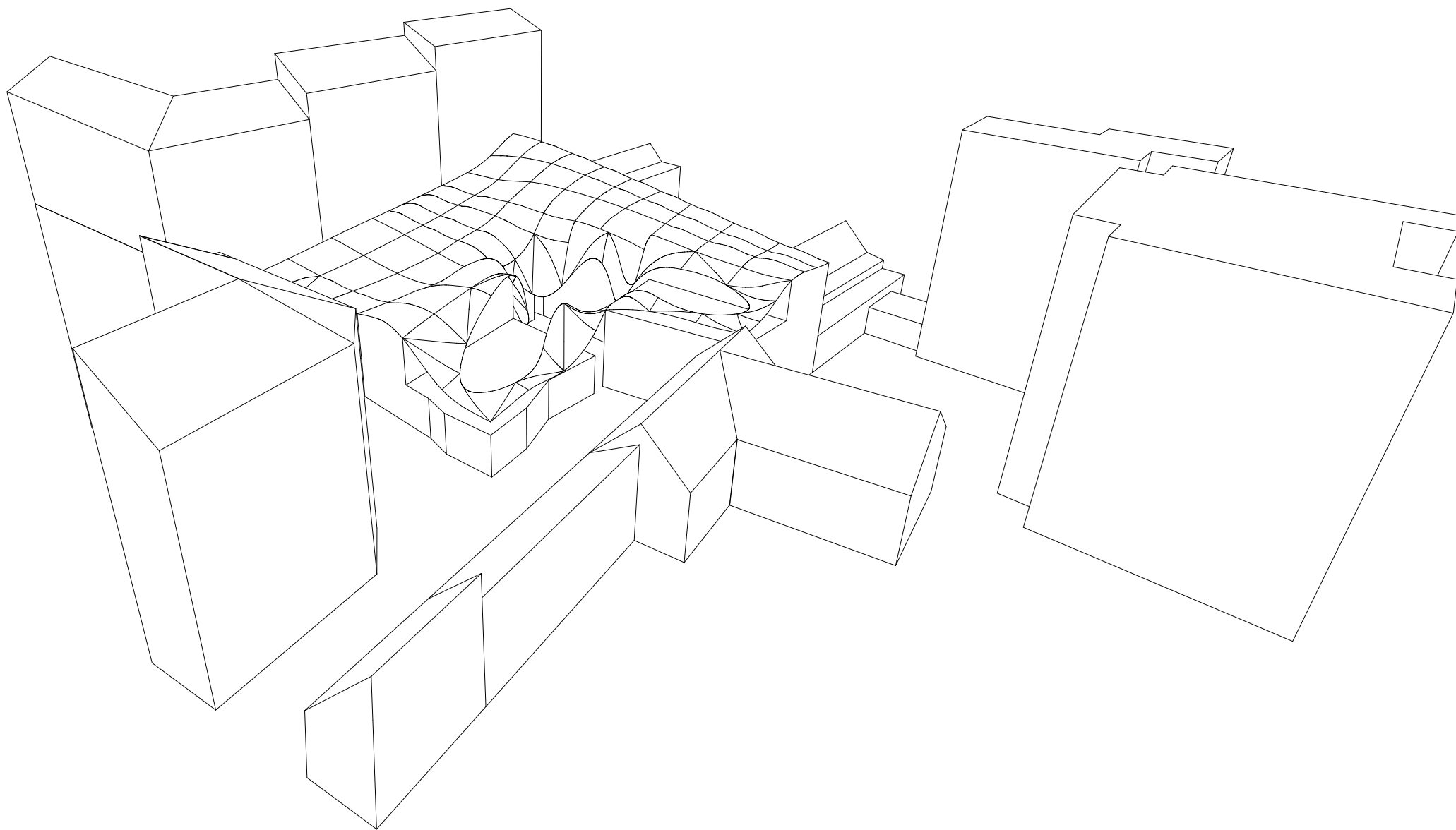








During the development process of the roof and by considering diverse determinations, such as my overall design grid and the heights of the surrounding area, but also the formal aspects of the coworking space itself, I found ETFE being the right material to work with.



etfe (ethylene tetra fluoro ethylene)

ETFE was developed by DuPont, who actually created it as an inert coating material for the aerospace industry. It was then being used as covering material for greenhouses, before it found the way into the field of architecture on the grounds of numerous benefits it is providing.³³

First a raw granulate, ETFE is then being extruded into a thin foil of 0.1-0.3mm thickness.³⁴

It appears either as a one-layered membrane construction, or a multilayer cushion system, supported in an aluminum perimeter extrusion.³⁵ Steel cables of 8-12mm diameter serve as holding support for the ETFE membranes, but can also be used with the cushions to achieve bigger spans without any additional structure.³⁶

The cushions consist of 2 to 5 layers of ETFE foil and are constantly filled with low pressure air by a closely located Air Handling Unit (AHU).³⁷ An internal pressure of 200-300Pa guarantees the structural stability and insulation for each cushion.³⁸

The AHU (1.2x1.2x0.9m) needs a constant power supply by two 240V 13amp electrical connections. It contains a filter and dehumidifier to dry the air before it reaches the two alternately running fans. Only one fan at a time pushes the air through the primary air supply tube and secondary air pipes of every individual cushion. In case of extreme weather conditions, loss of cushion pressure or even failure, the fans start running simultaneously to maintain the functioning of the whole system. If an overall power loss occurs, the cushions start deflating after 3-6 hours without supply of air. A smart monitoring system controls, along with other elements, the internal pressure of the cushions.³⁹

33 <http://www.birdair.com/tensile-architecture/membrane/etfe>

34 <https://www.sattler-global.com/textile-architektur/etfe-folien-1013.jsp>

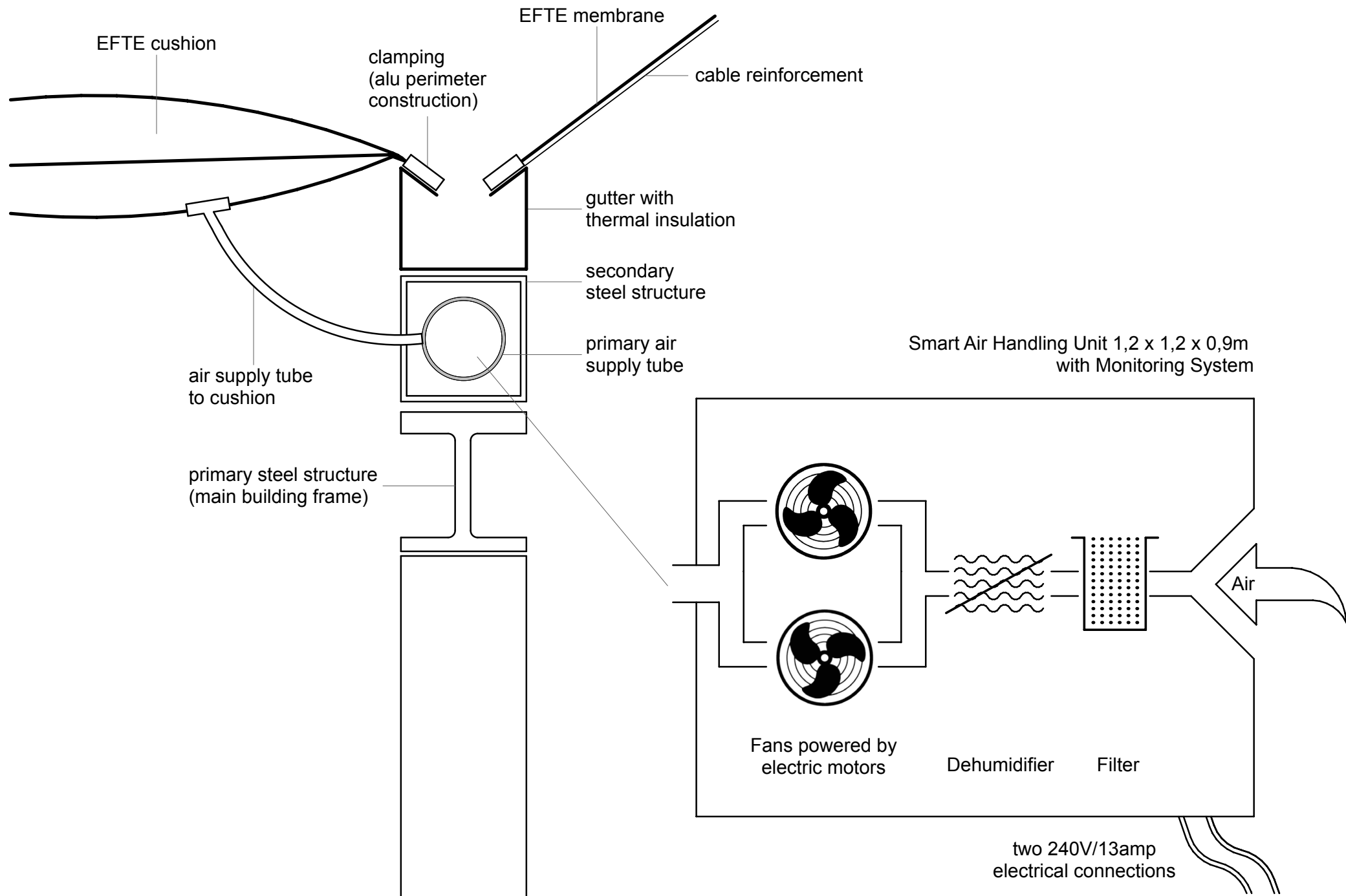
35 <http://www.architen.com/materials/etfe-foil/>

36 <https://www.sattler-global.com/textile-architektur/etfe-folien-1013.jsp>

37 <http://www.architen.com/products/etfe-cushions/>

38 <http://www.architen.com/materials/etfe-foil/>

39 <http://www.architen.com/articles/etfe-foil-a-guide-to-design/>



One AHU consumes 60-100w of power, which is equivalent to one single light bulb.⁴⁰ It can supply up to 1.400m² of roof.⁴¹

ETFE is an extremely lightweight material (2-3kg/m, which is 1% the weight of glass) that is neither affected by UV light, nore atmospheric pollution. It is also shatter resistant and self-cleanes in the rain.⁴²

The foil has an extremely high elasticity (up to 600% at breaking point) and is structurally resistant at the same time.⁴³ Its tear resistance ranges between 21-23N/mm².⁴⁴

An important benefit of ETFE is its behaviour in the event of a fire. It has a very low flammability (fire class EN 13501-1/B-s1,d0⁴⁵) and is regarded self extinguishing. Fire softens the foil and therefore provokes its failure, which allows the material to shrink away from the fire source and provide natural ventilation. It also doesn't cause any toxic fumes or molten drips.⁴⁶

ETFE foil has a UV transmission between 83-88% and a light transmission of up to 95%. It also absorbs a significant proportion of infrared light. The ability of reducing acoustic transmission can be considered as insufficient, since it can rise up to 70%.⁴⁷ In my case this deficit can be mostly neglected, because of the extremely quite surrounding area of the site. The U-value for a 3-layered ETFE system is 1.96W/m²K⁴⁸, the g-value can be lowered to 0.35 to reduce solar emission if needed (g-value of glass - 0.88).⁴⁹

40 <http://www.architen.com/products/etfe-cushions/>

41 <http://www.birdair.com/tensile-architecture/membrane/etfe>

42 <http://www.architen.com/materials/etfe-foil/>

43 <http://www.birdair.com/tensile-architecture/membrane/etfe>

44 <https://www.etfe-film.com/etfe-roof-foil>

45 <https://www.sattler-global.com/textile-architektur/etfe-folien-1013.jsp>

46 <http://www.architen.com/articles/etfe-foil-a-guide-to-design/>

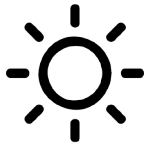
47 <http://www.architen.com/articles/etfe-foil-a-guide-to-design/>

48 <http://www.architen.com/products/etfe-cushions/>

49 <http://www.architen.com/articles/etfe-foil-a-guide-to-design/>



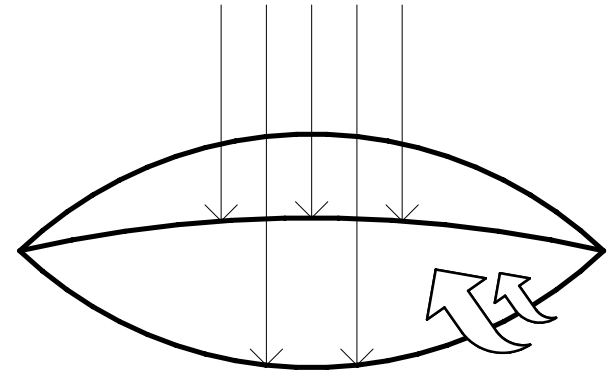
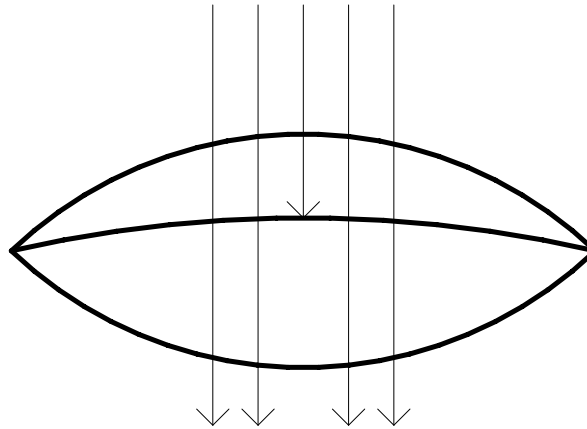
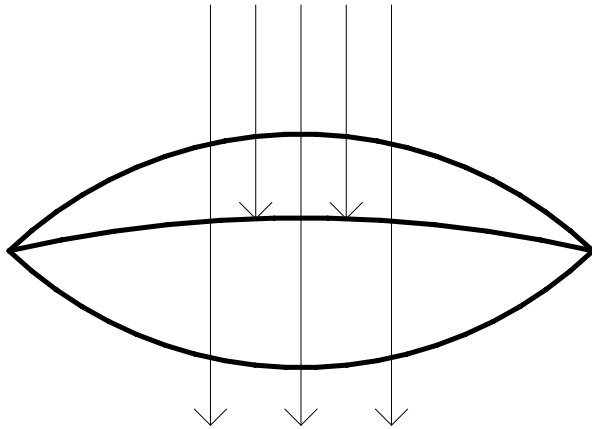
UV - Transmission
83-88%



Light - Transmission
up to 95%



Most Infrared light
absorbed



Filled with 200-300 Pa
low pressure air for insulation



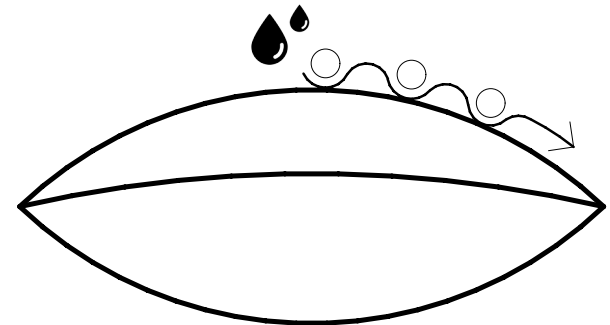
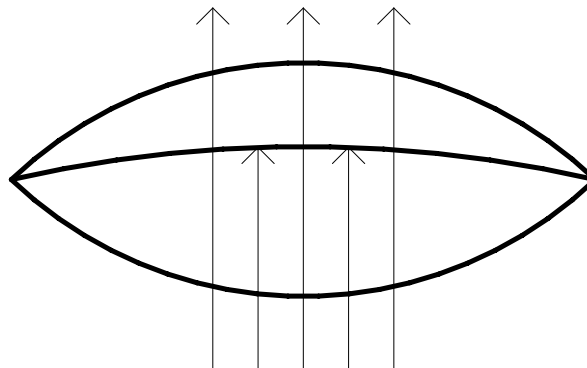
Plants can
grow underneath



Acoustic - Transmission
70%



Selfcleaning by rain



U Value (3 layers):
1,96 W/m²K

g Value (3 layers):
0,35 = solar transmission

A rain suppression mesh can be installed as an additional cushion-layer to avoid disturbance by rain noise, although it must be noted, that this measure instantly reduces the transmission of light to 50%.⁵⁰

To control the amount of sunlight coming through the roof, a system of intelligent printing can be applied to the cushions. The top- and middle layer of each cushion (minimum 3 layers required) are being printed with an offset pattern, usually geometric (silver ink) - it then depends on whether additional air is supplied to the cushion to separate the chambers maximally and therefore let more sunlight in (max. 37% transmission), or sucked out to bring the layers close together and achieve a maximum printed coverage (19% transmission). This process is automated by installing light sensors on the roof and connecting them to the smart AHU. The translucency of the material is not affected by this application.⁵¹

Further methods of reducing incoming sunlight are surface treatments or the usage of tinted ETFE foil.⁵²

To ensure the building's sufficient ventilation, hinged ETFE panels are incorporated in the roof structure. Their automatical opening in case of overheating or even fire is also provided by sensors that communicate with the smart AHU.⁵³

Minor damages of the ETFE hull can be repaired by using adhesive patches of the same material. If a bigger damage happens to the structure, single cushions can be easily replaced. They also need to be cleaned externally every 2-3 years and every 5-10 years on the inside.⁵⁴ The whole ETFE system altogether needs only minimal maintenance inspections and is expected to last around 35 years and more.⁵⁵

50 <http://www.architen.com/2012/09/etfe-guide-controlling-solar-gain/>

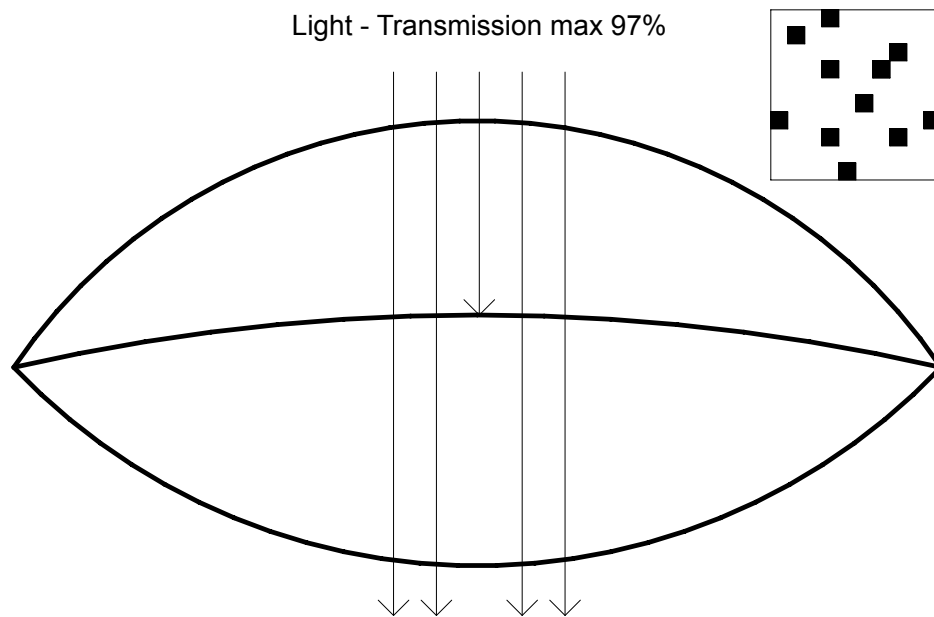
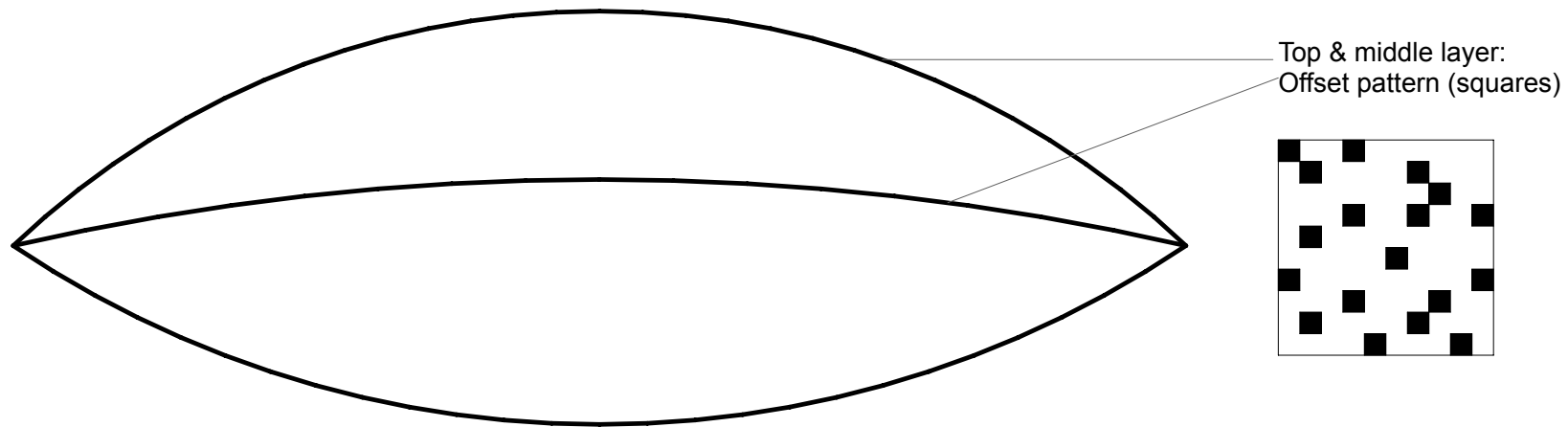
51 <http://www.architen.com/products/intelligent-printing/>

52 <http://www.architen.com/articles/etfe-foil-a-guide-to-design/>

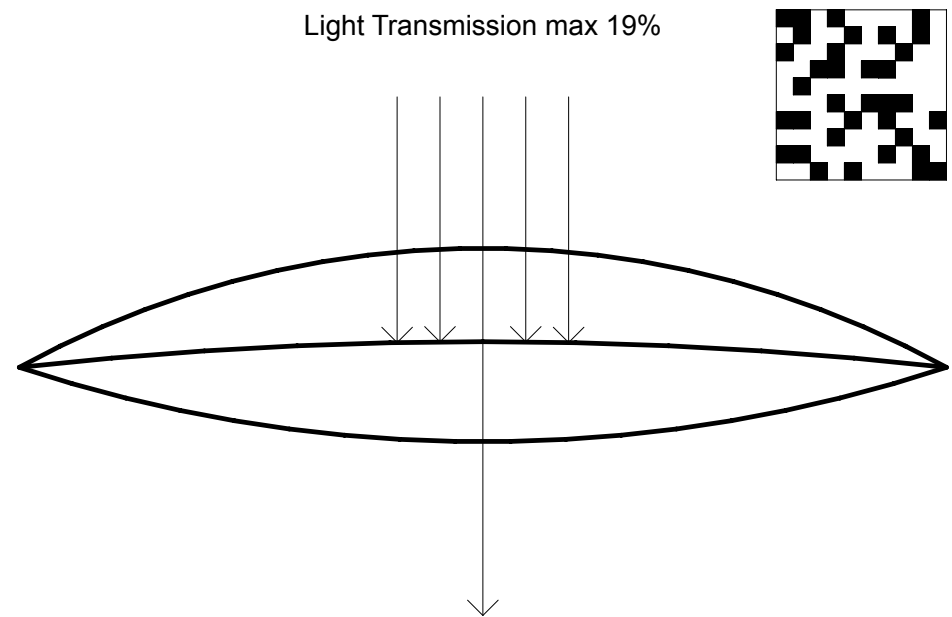
53 <http://www.architen.com/products/architen-ventilation/>

54 <http://www.architen.com/articles/etfe-foil-a-guide-to-design/>

55 <http://www.architen.com/materials/etfe-foil/>



High air pressure: Maximum natural light transmission



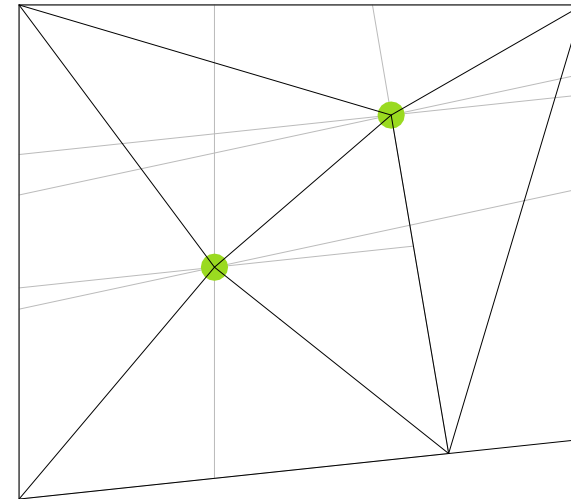
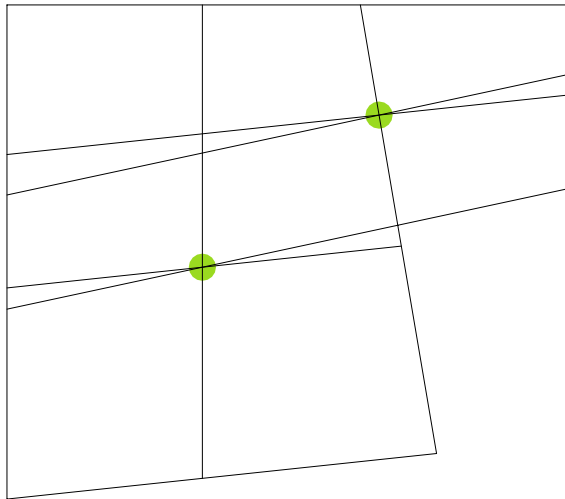
Low air pressure: Maximum printed coverage

The production and manufacturing process of ETFE is considered to be very environment friendly. Combined with an easy transportation to the site and the huge benefits of a good thermal insulation and providing of natural light, the whole energy consumption of the building can be reduced which is noticeable when looking at the carbon footprint. ETFE is a recycling material and can be transformed into tubing components, wires or castings.⁵⁶ Finally it also reduces the overall building costs, because no big foundations are needed in order to support this lightweight structure.⁵⁷

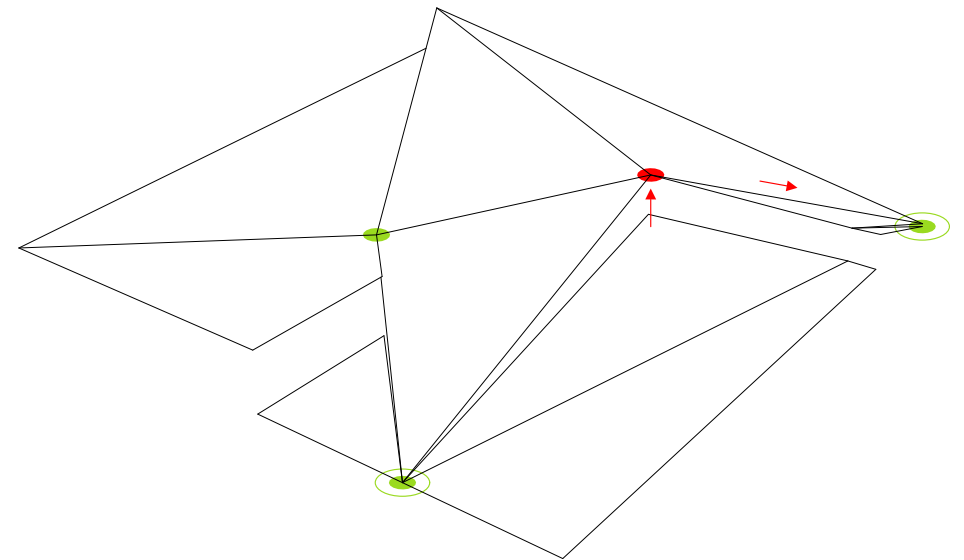
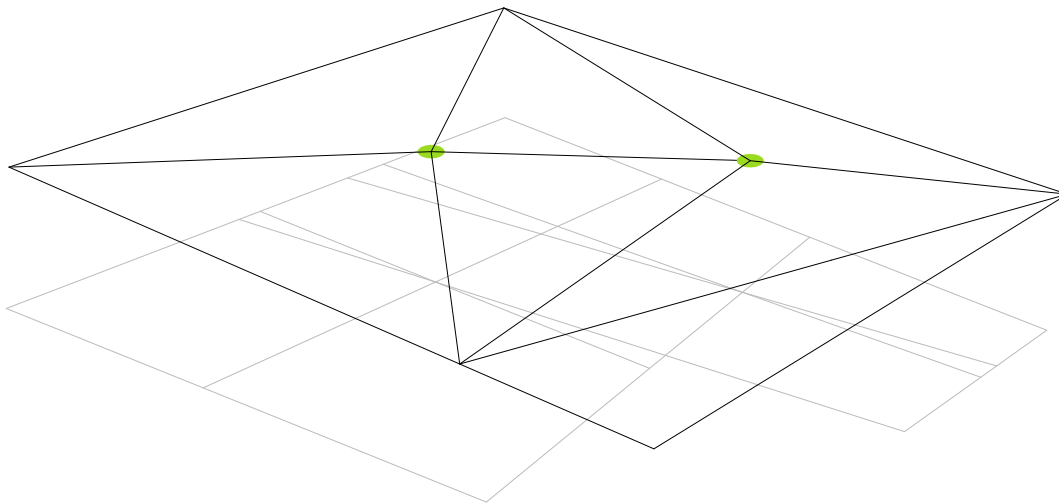
56 <http://www.birdair.com/tensile-architecture/membrane/etfe>

57 <http://www.architen.com/materials/etfe-foil/>

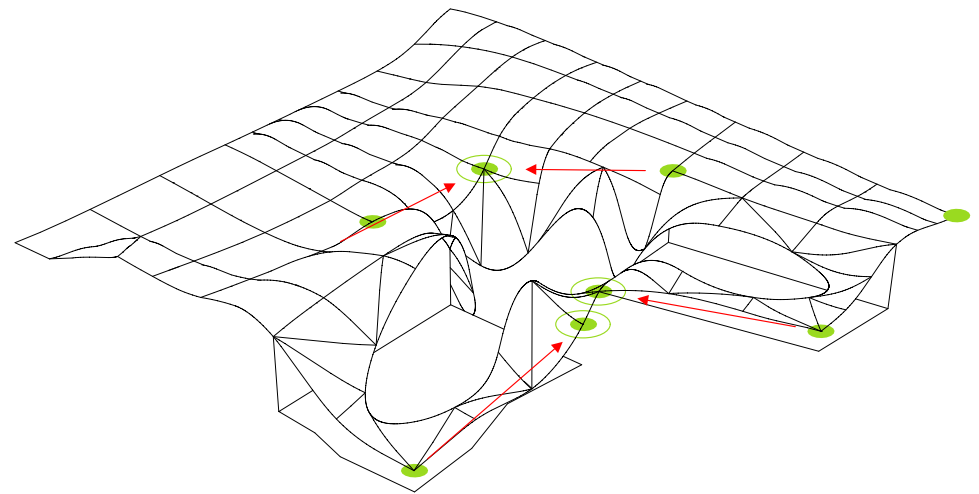
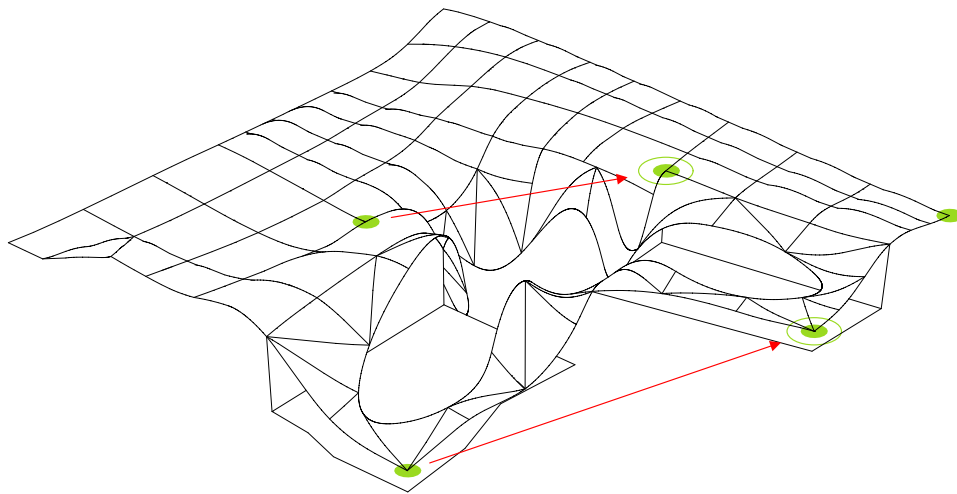
dewatering



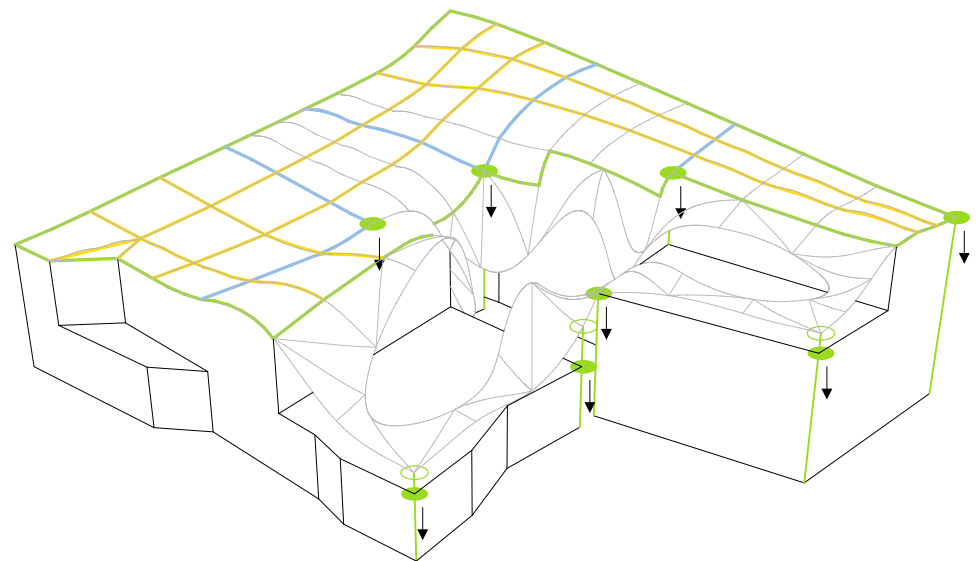
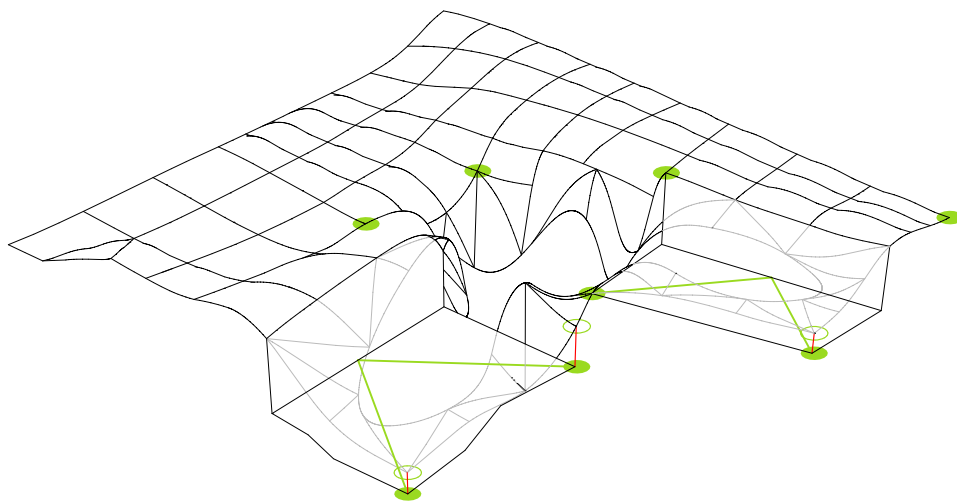
two downpipes at the cores



development of height shifts one lowest point and creates another

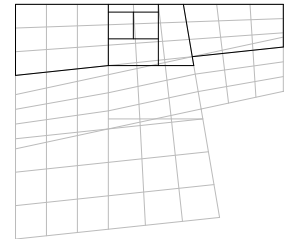
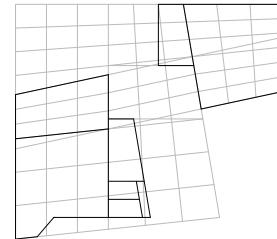
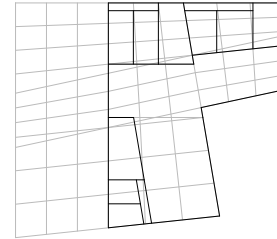
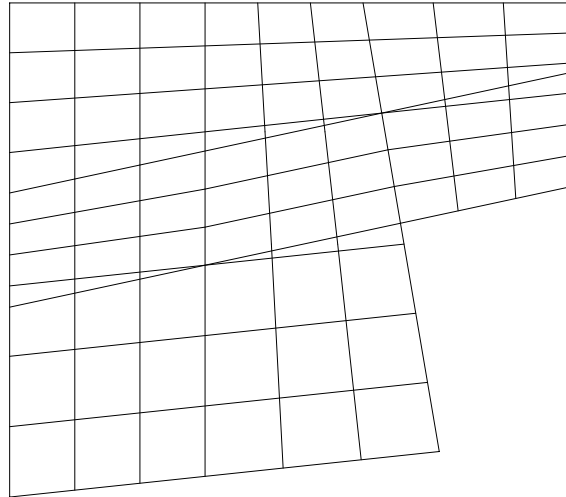
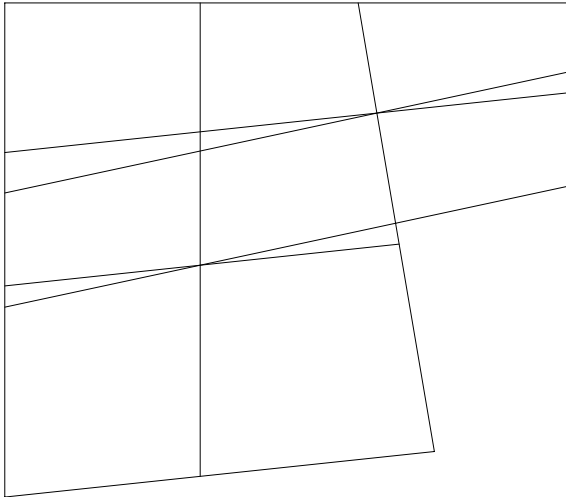


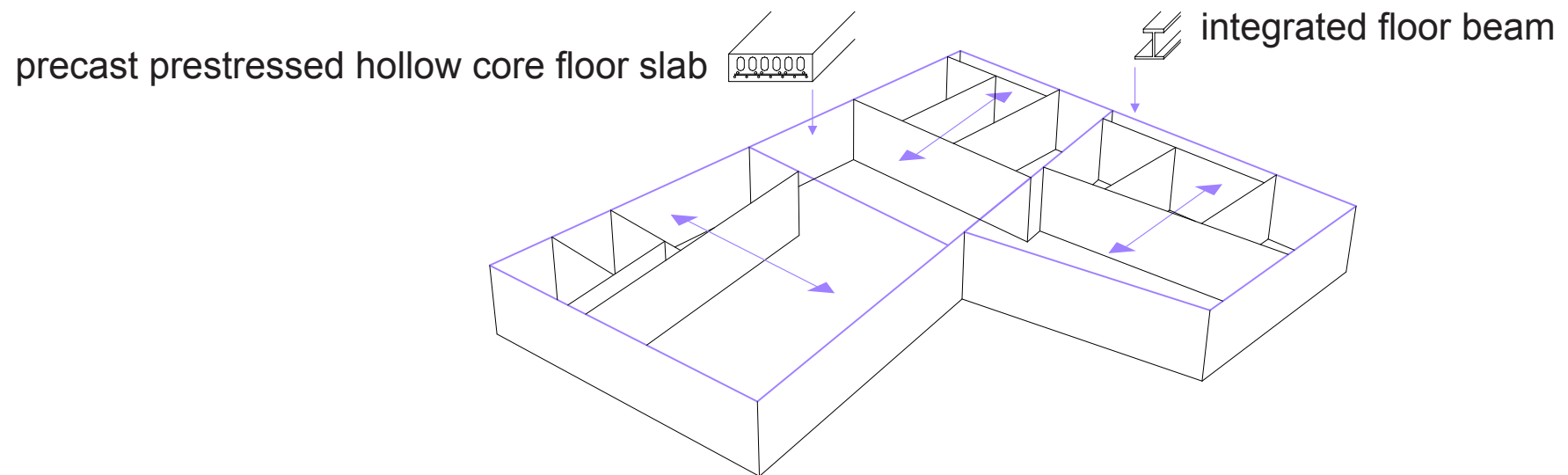
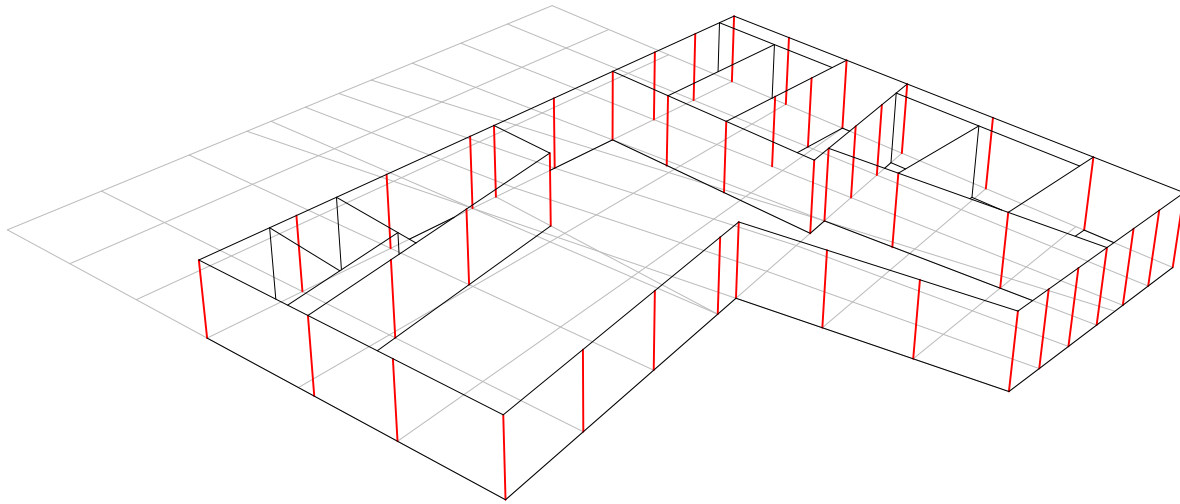
systematically added downpipes



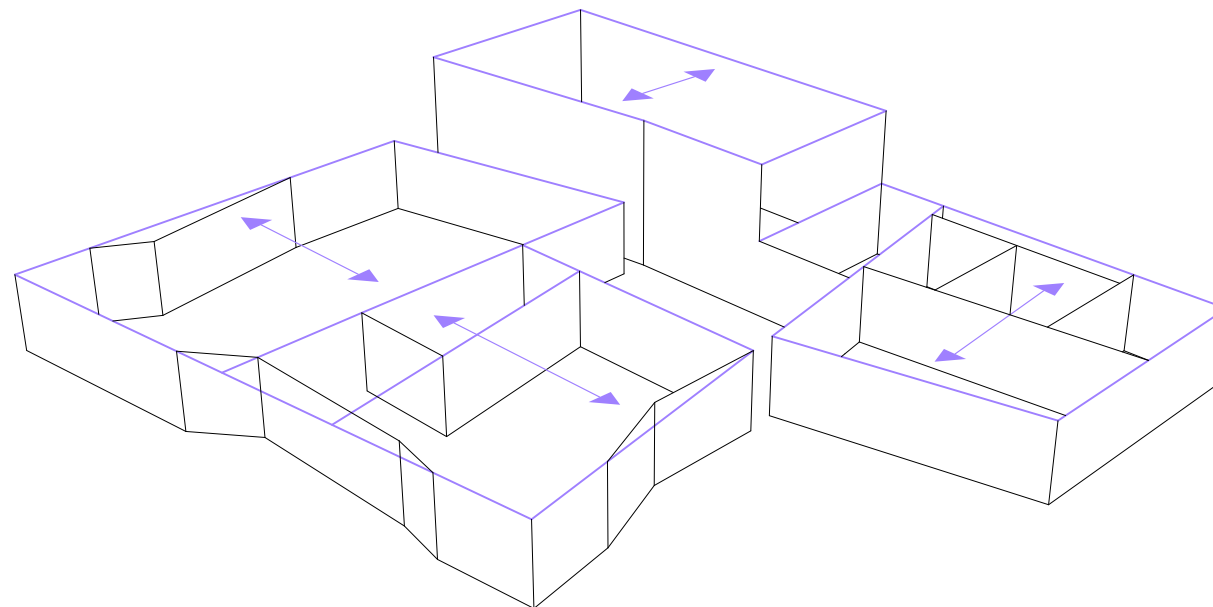
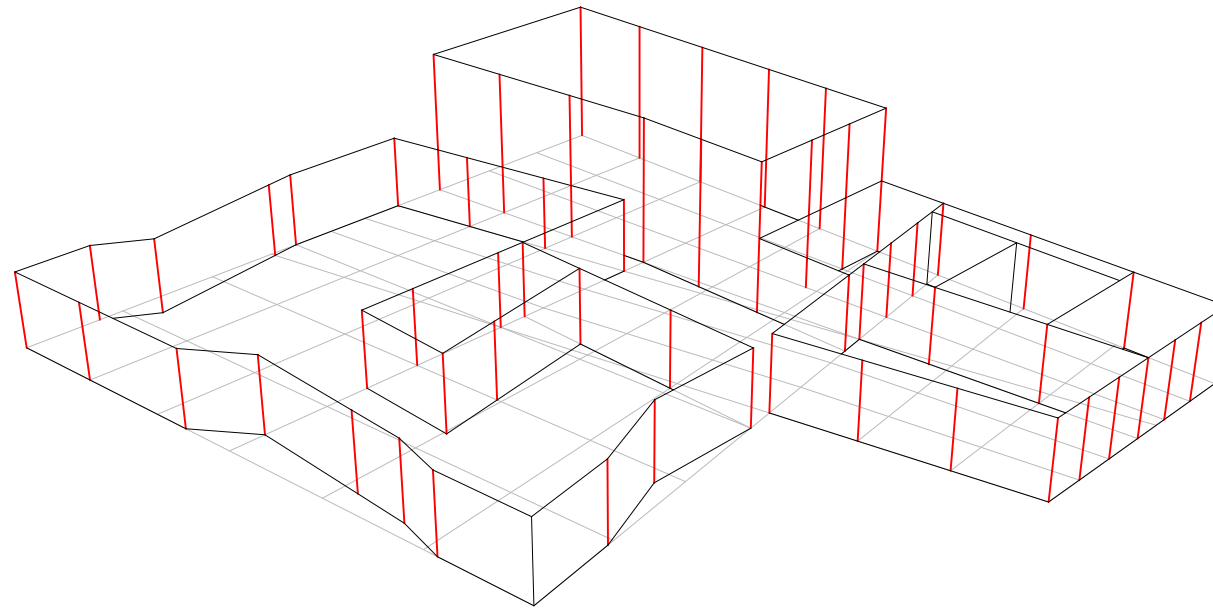
terrace dewatering / 8 downpipes / 1 surrounding gutter / 5 primary gutters / 6 secondary gutters

statics

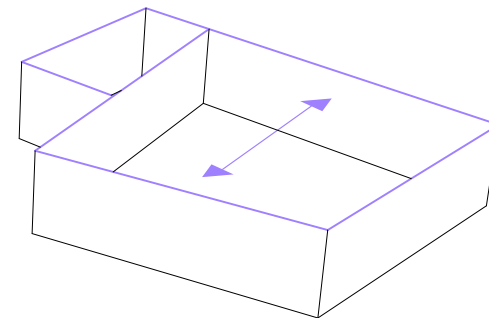
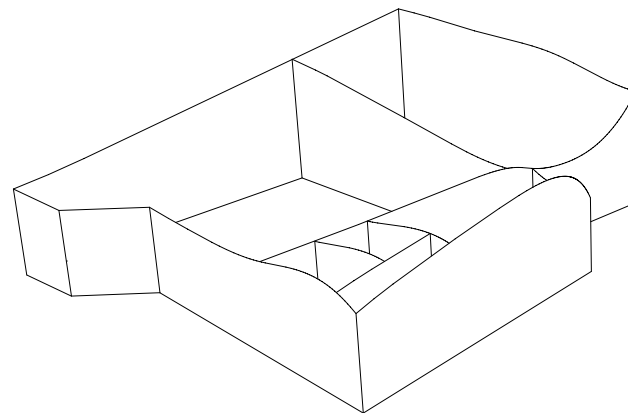
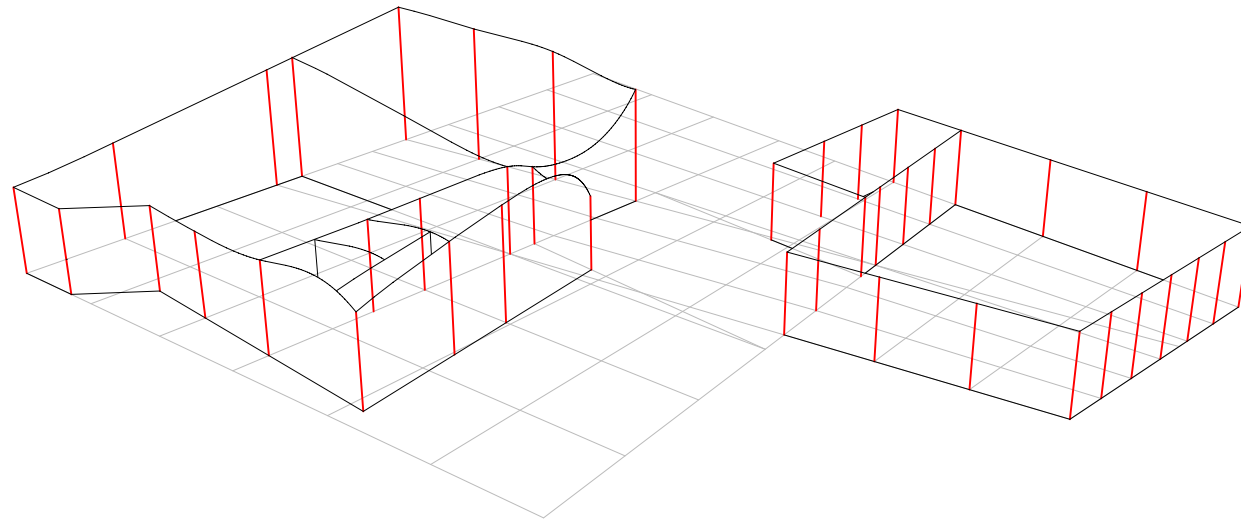




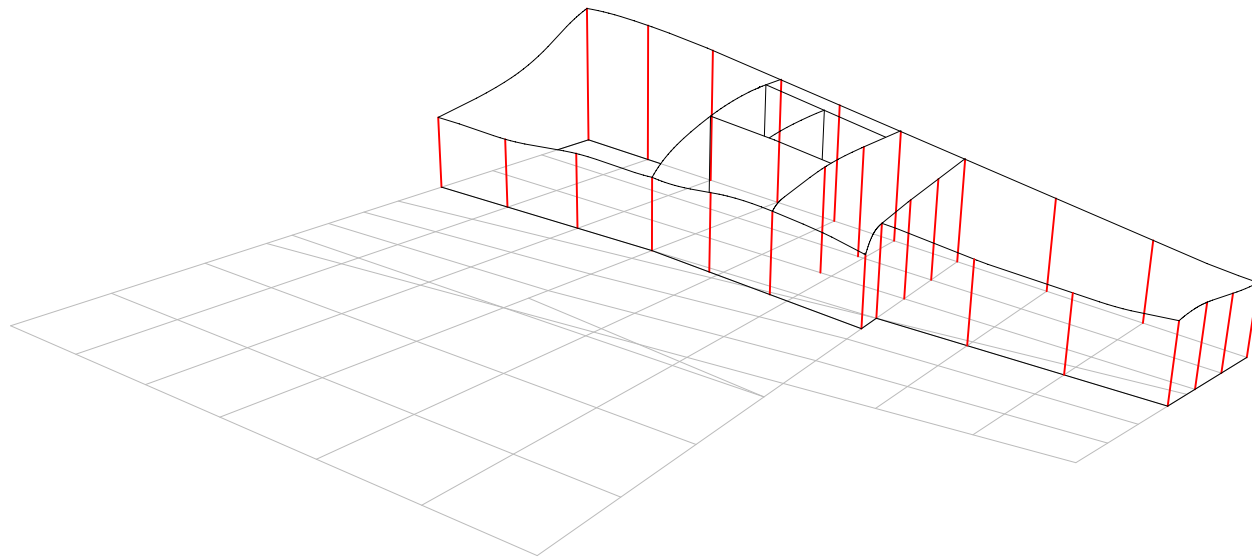
basement

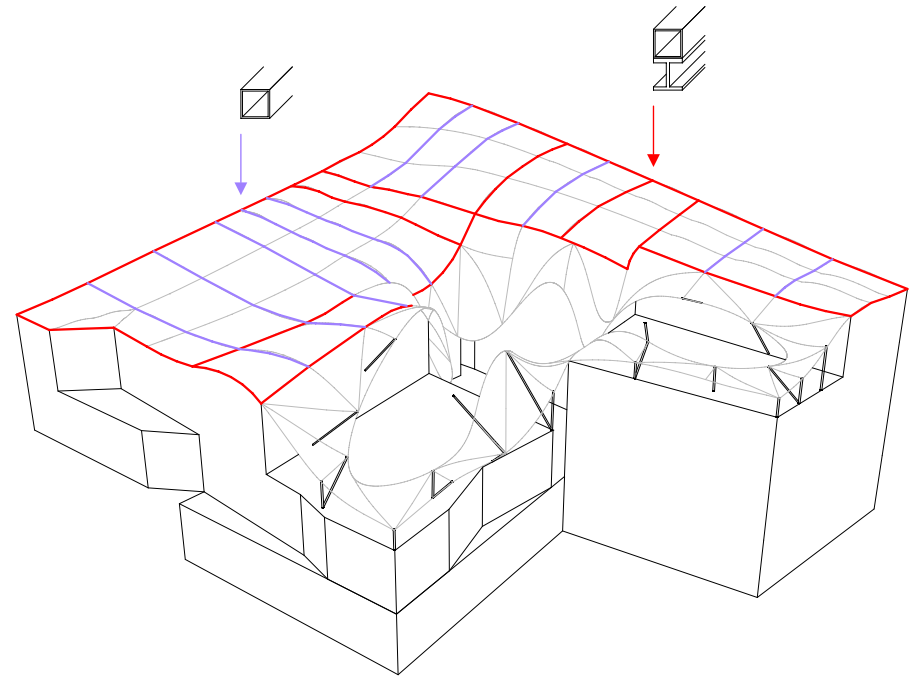
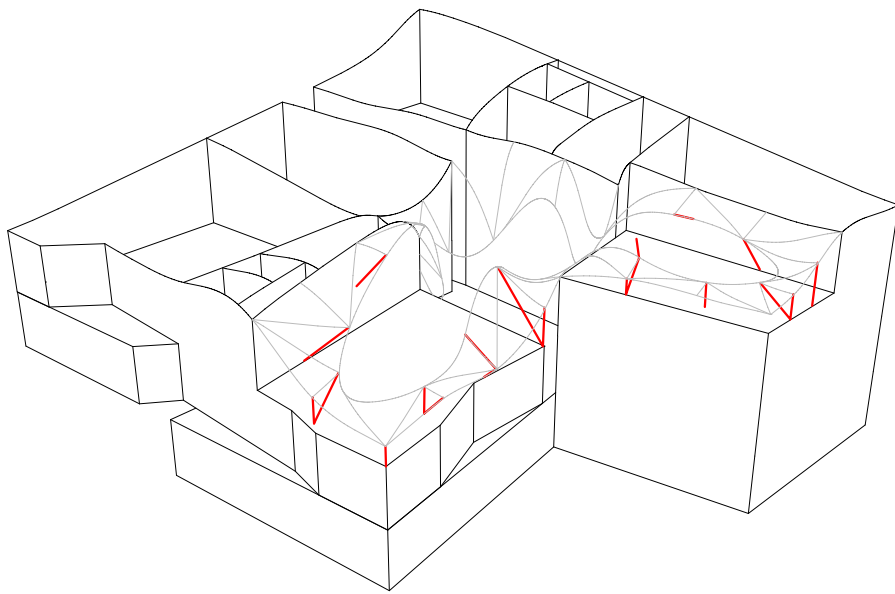


ground floor

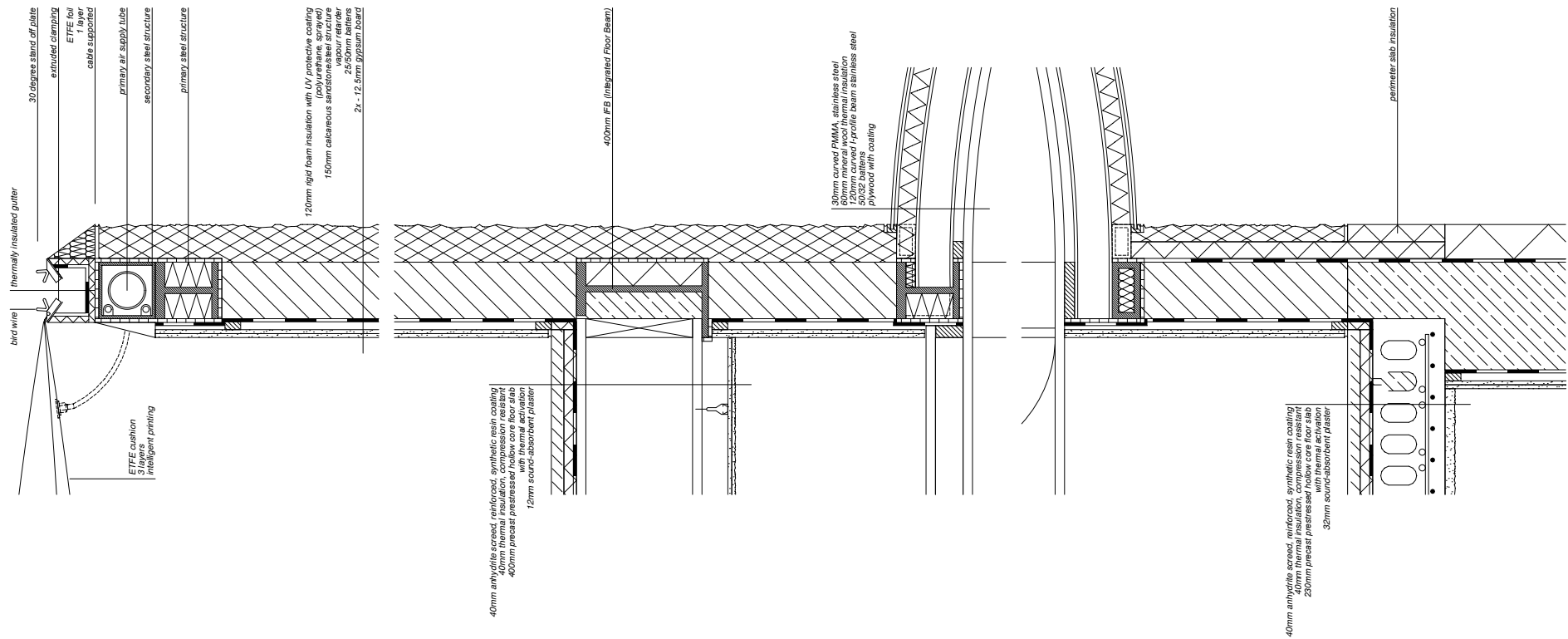


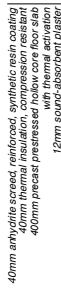
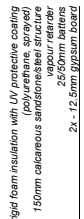
1st floor



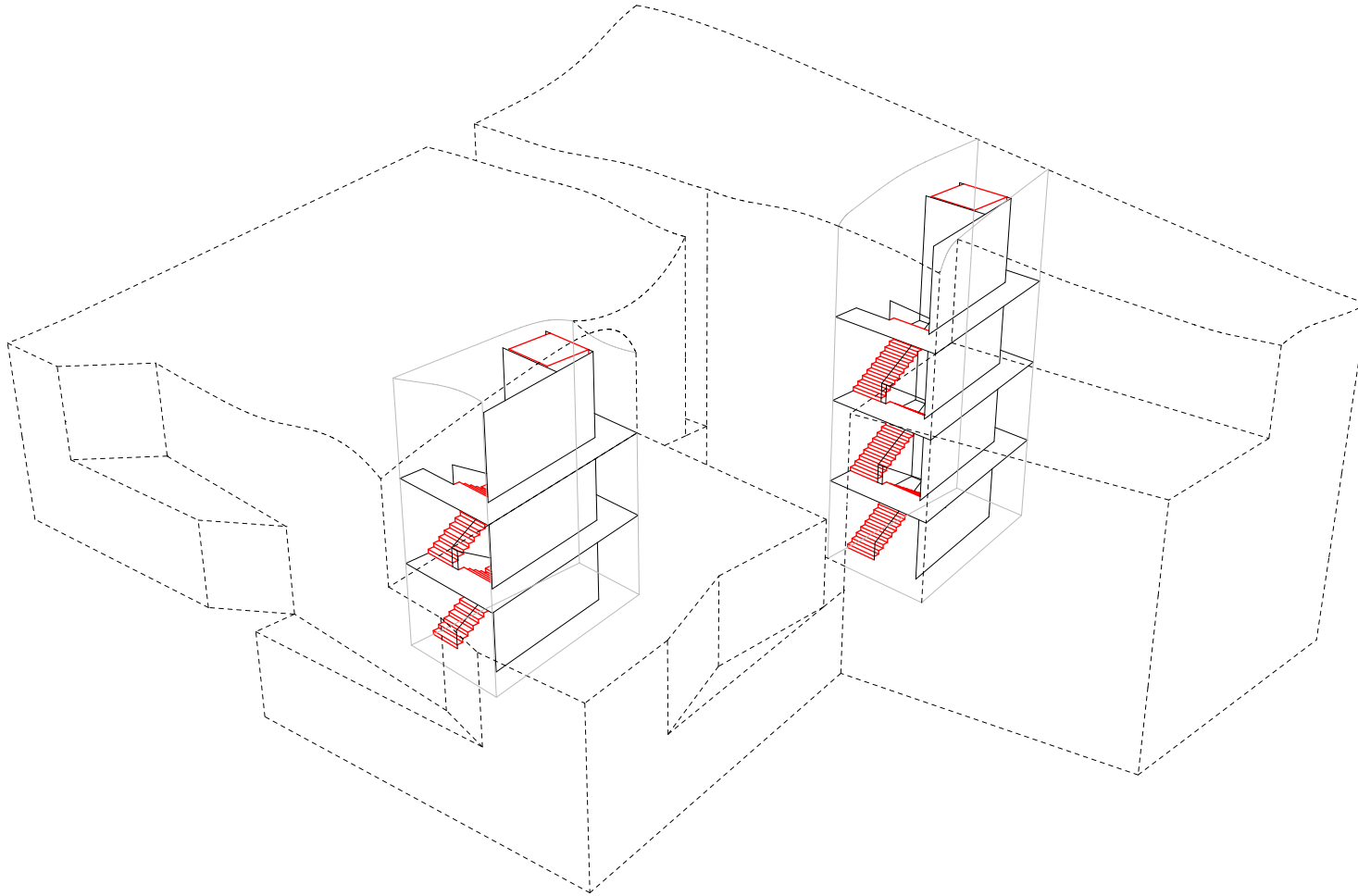


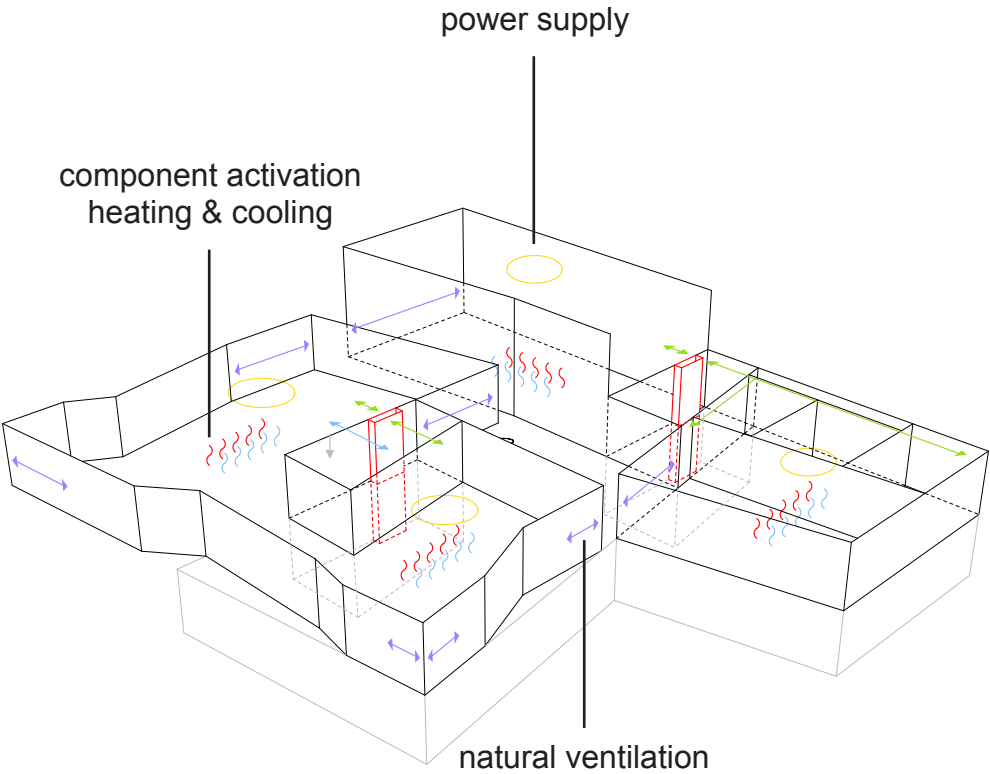
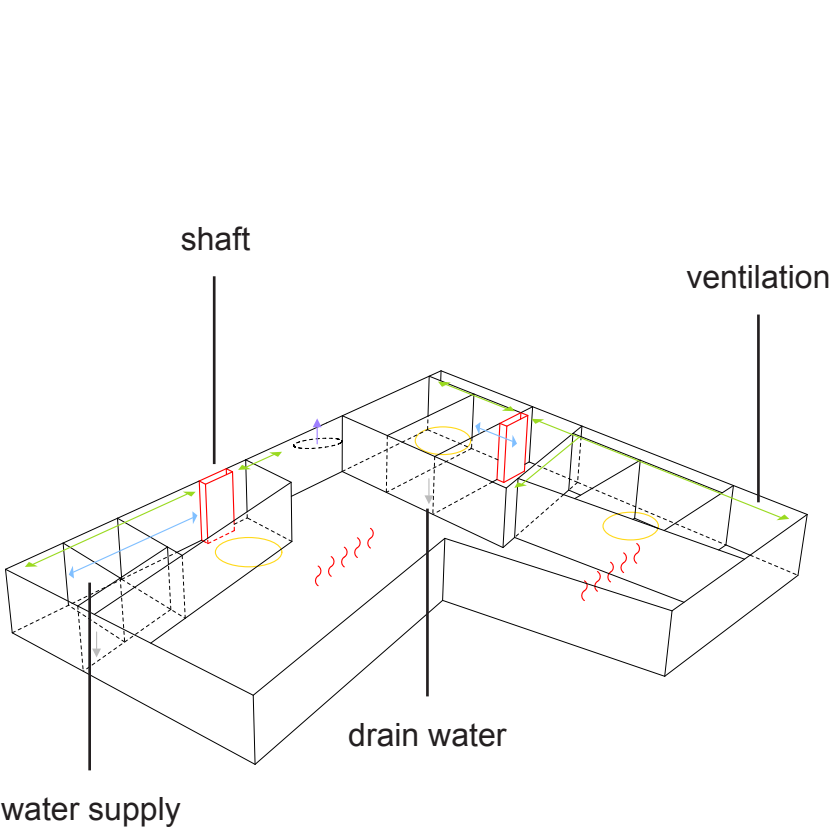
details 1:20

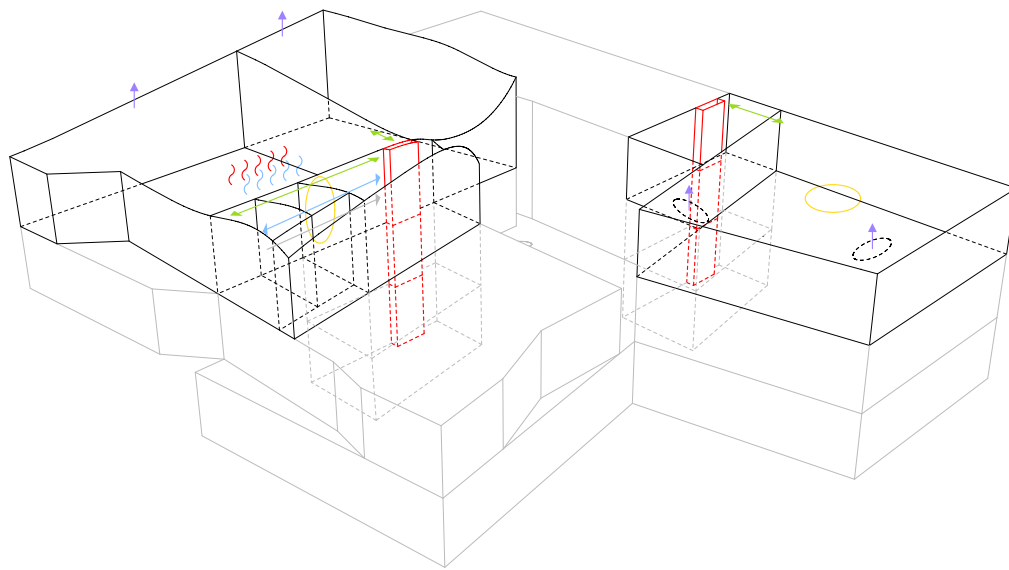




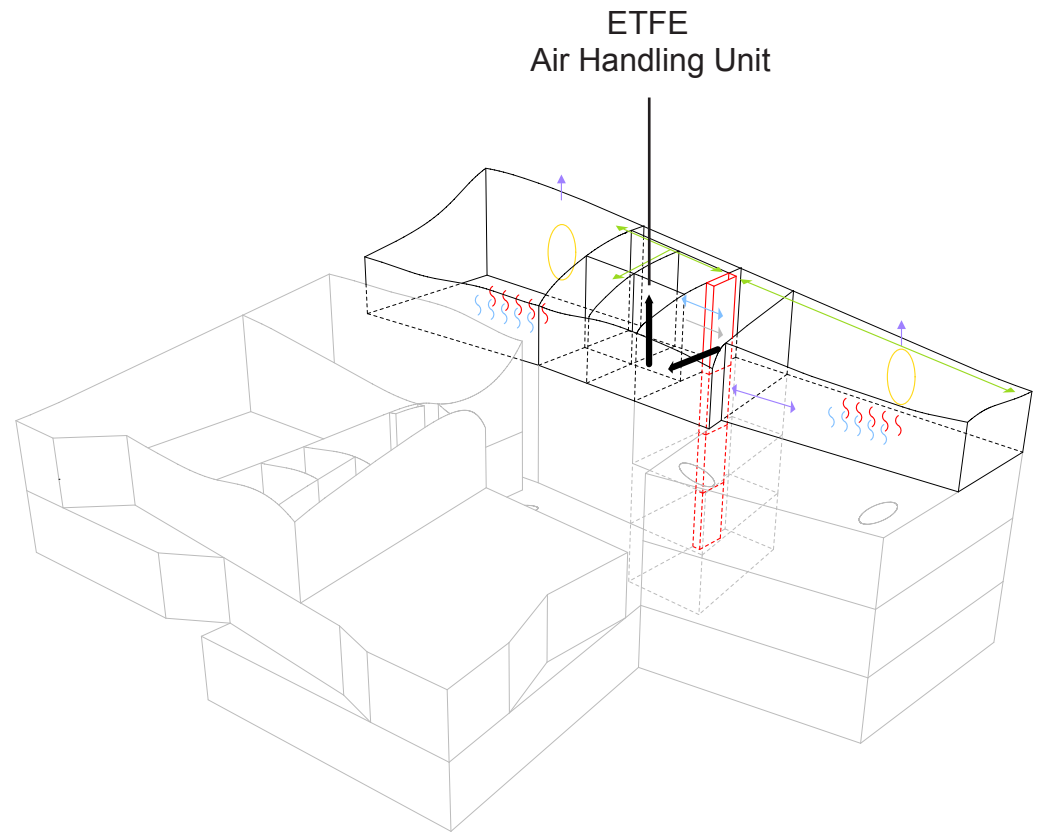
stairs and elevators







1st and 2nd floor



facade



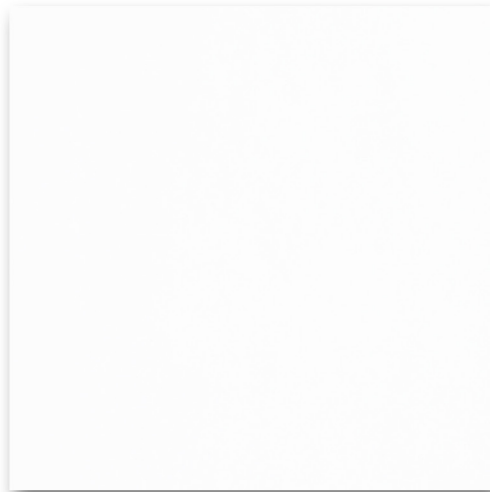
polyurethane, sprayed



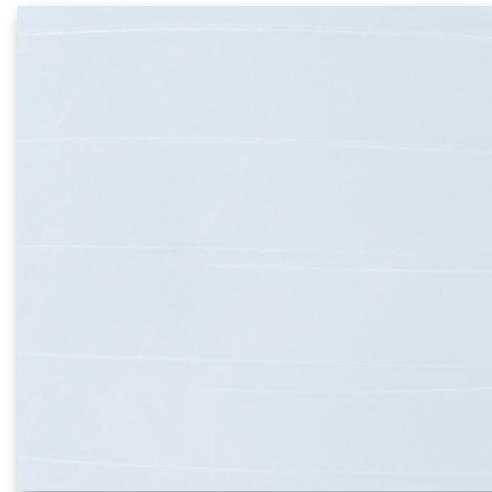
curtains on the exterior, acryl



glazing



curved PMMA



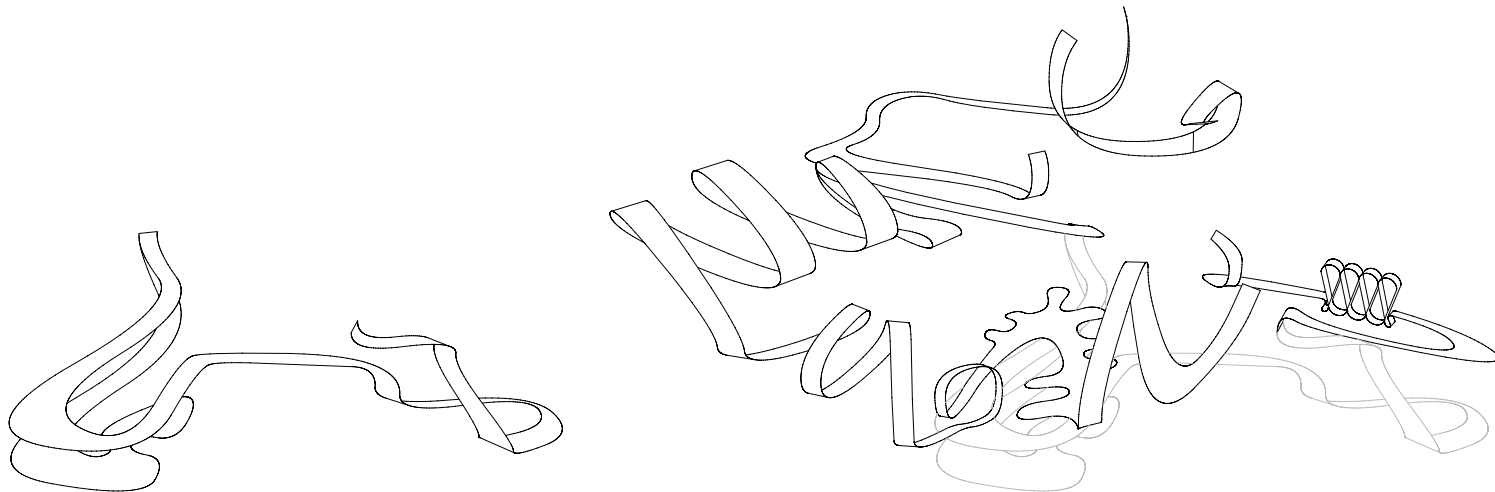
ETFE cushion

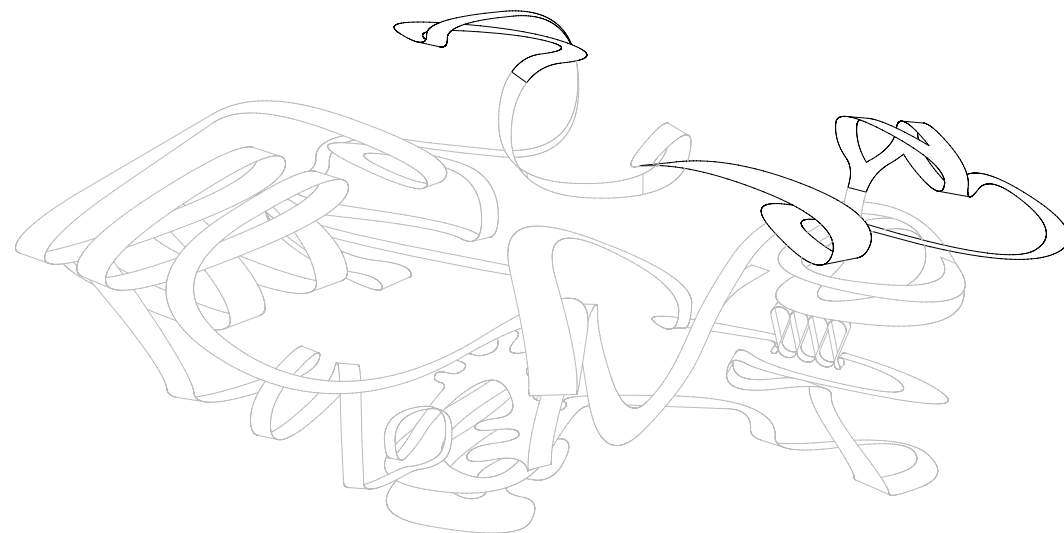
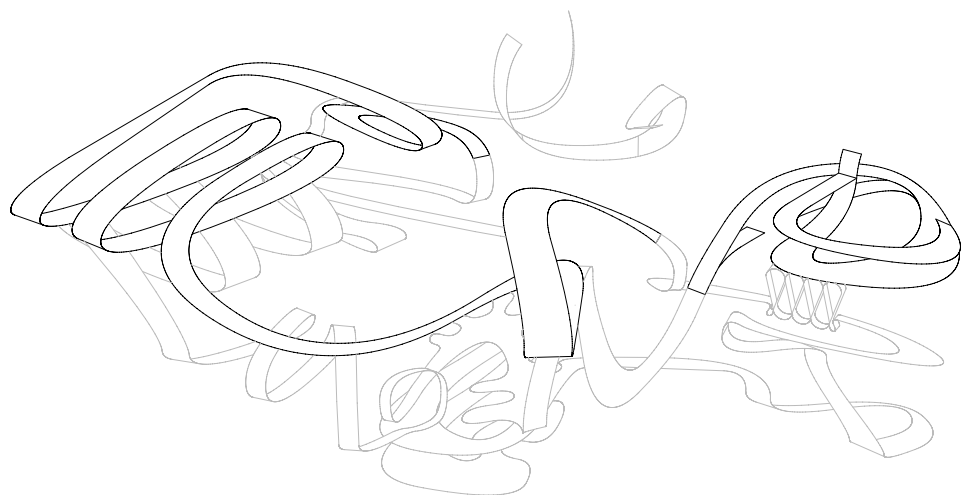
table

The endless desk is made of plywood elements, connected with steel plates. It is assembled on site and then covered with plastic coating, poured on site to achieve a seamless surface.

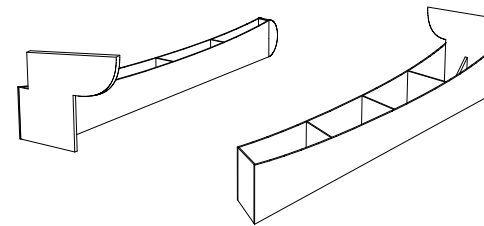
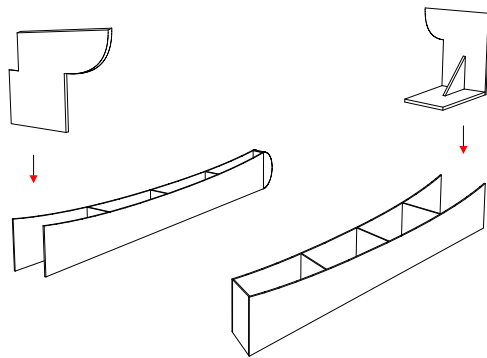
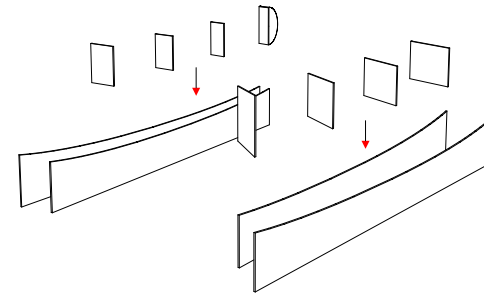
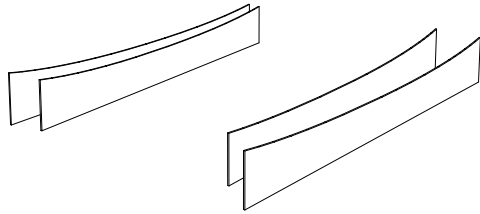
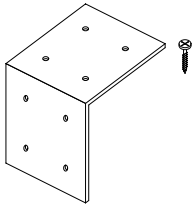
The kitchen has a metal surface instead of plastic, because of the high demands (heat, water, etc.) this tablepart has to meet.

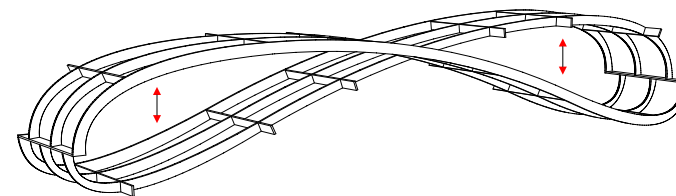
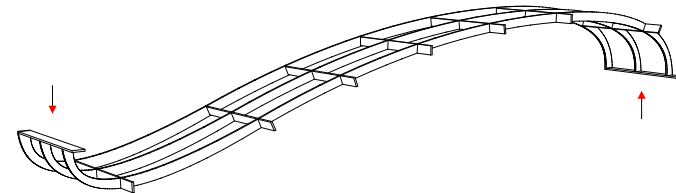
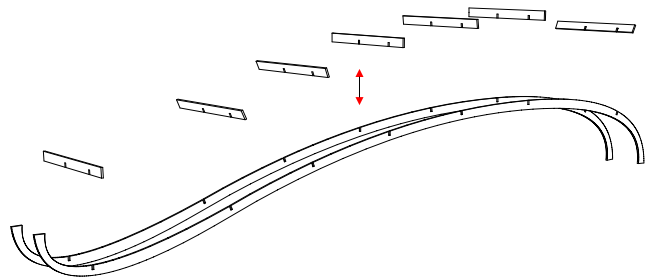
A unique color design is provided by the coworkers themselves and adapts and changes corresponding to new ideas.

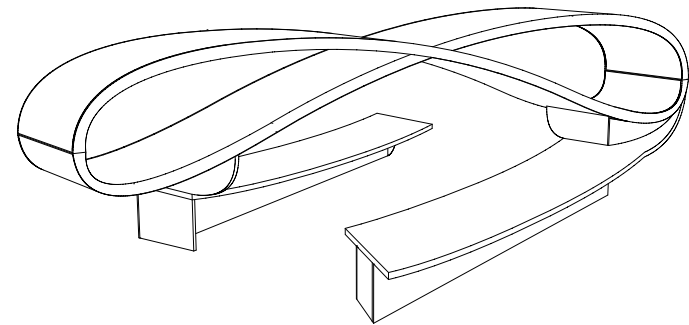
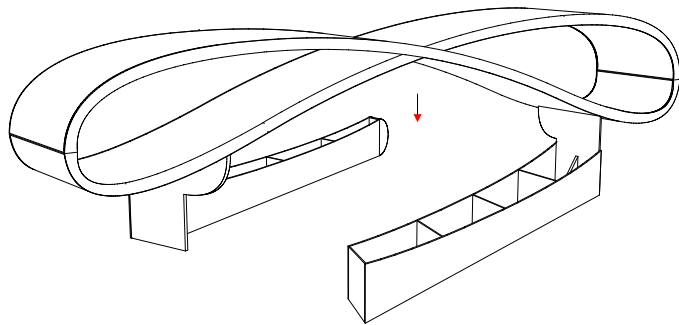
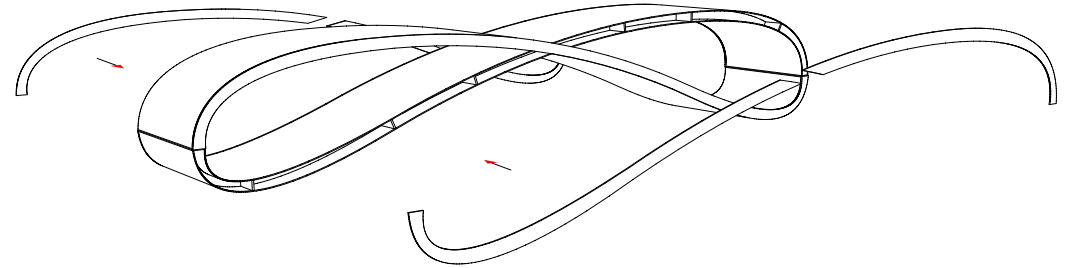
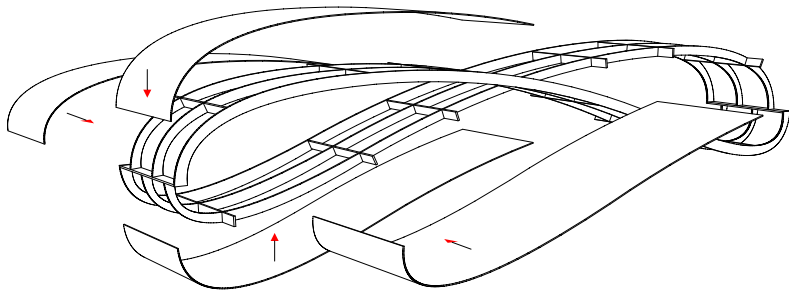


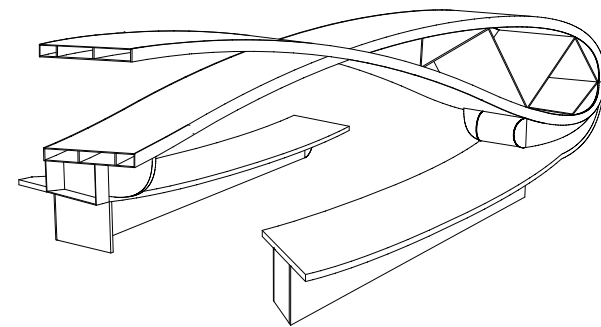
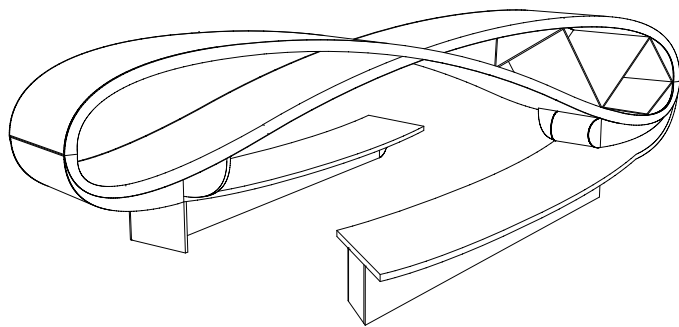
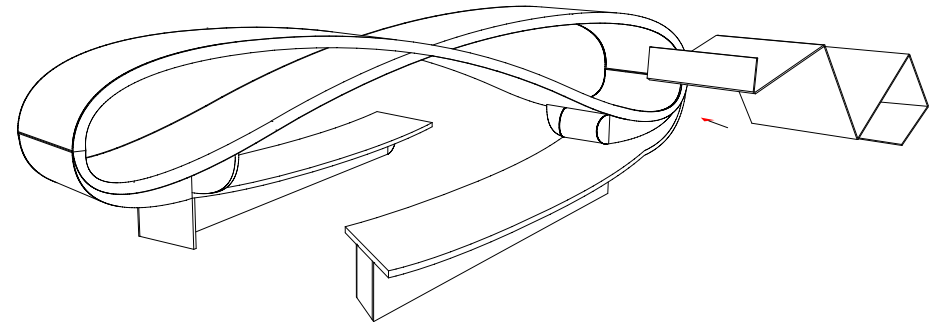
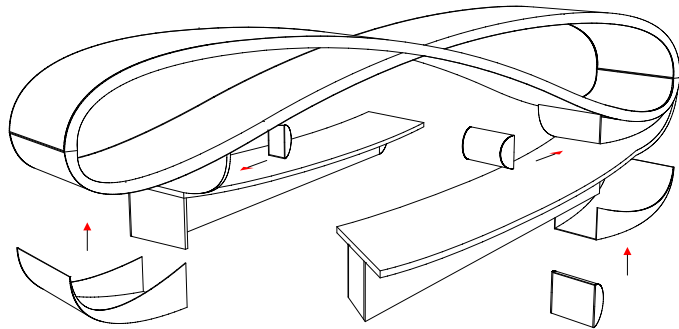


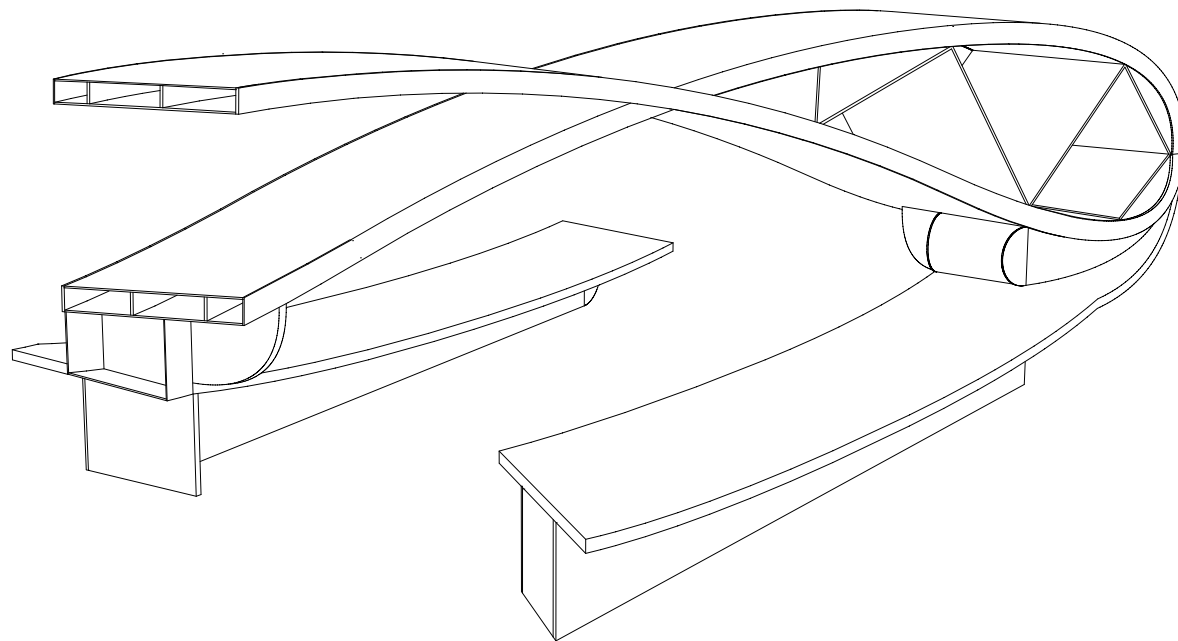
structure and assembling

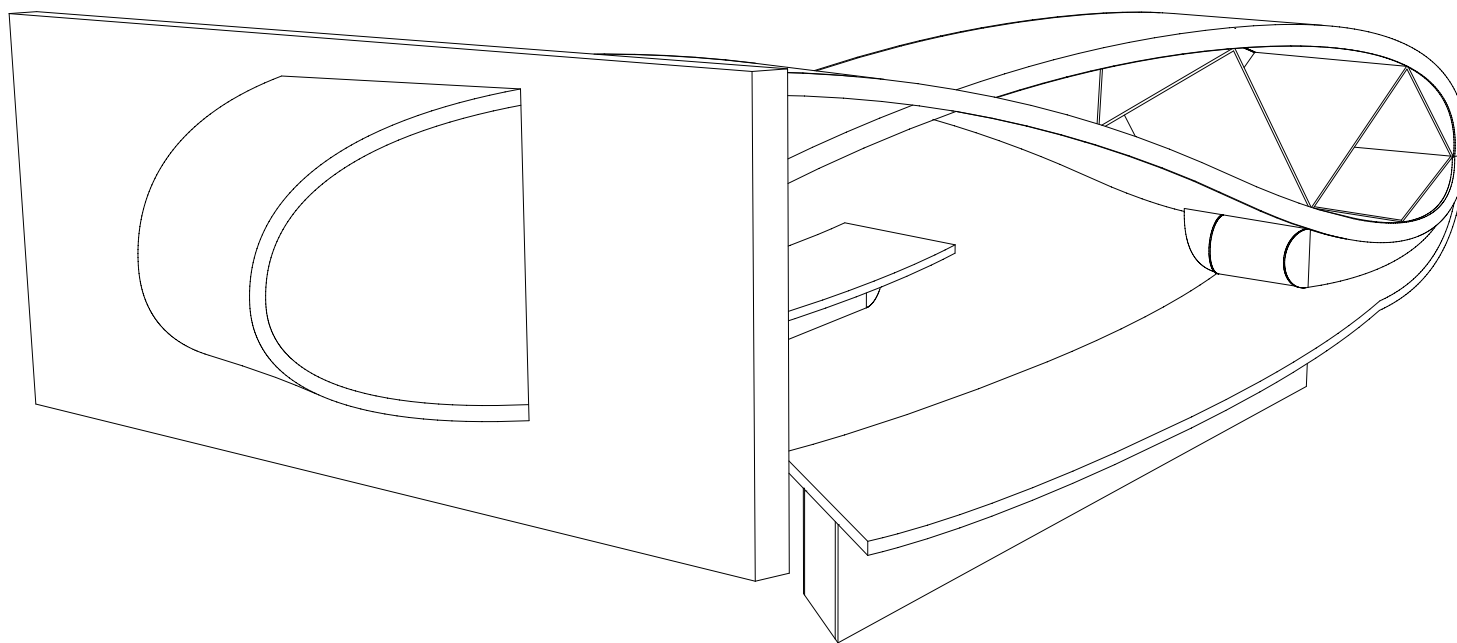


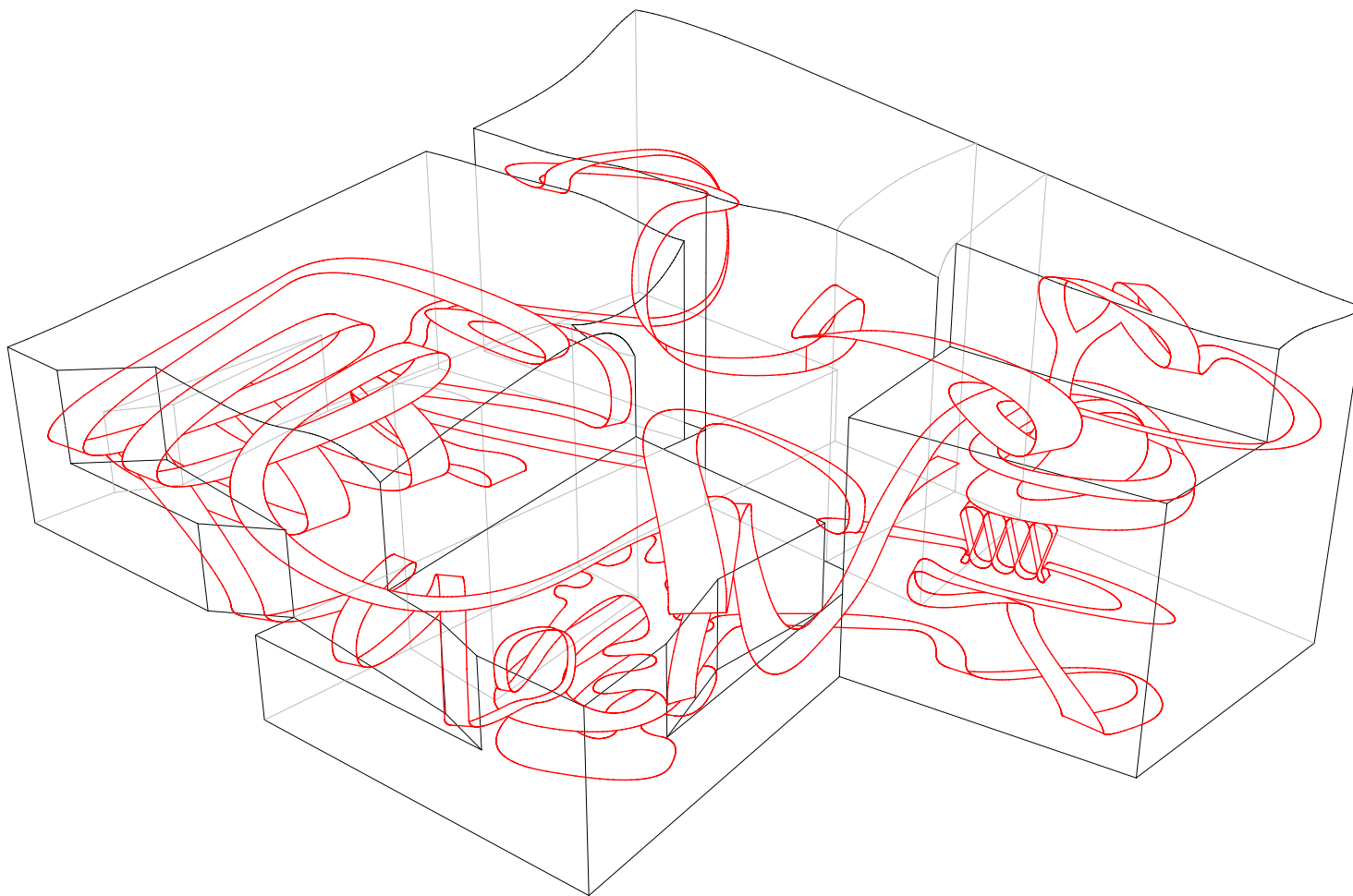




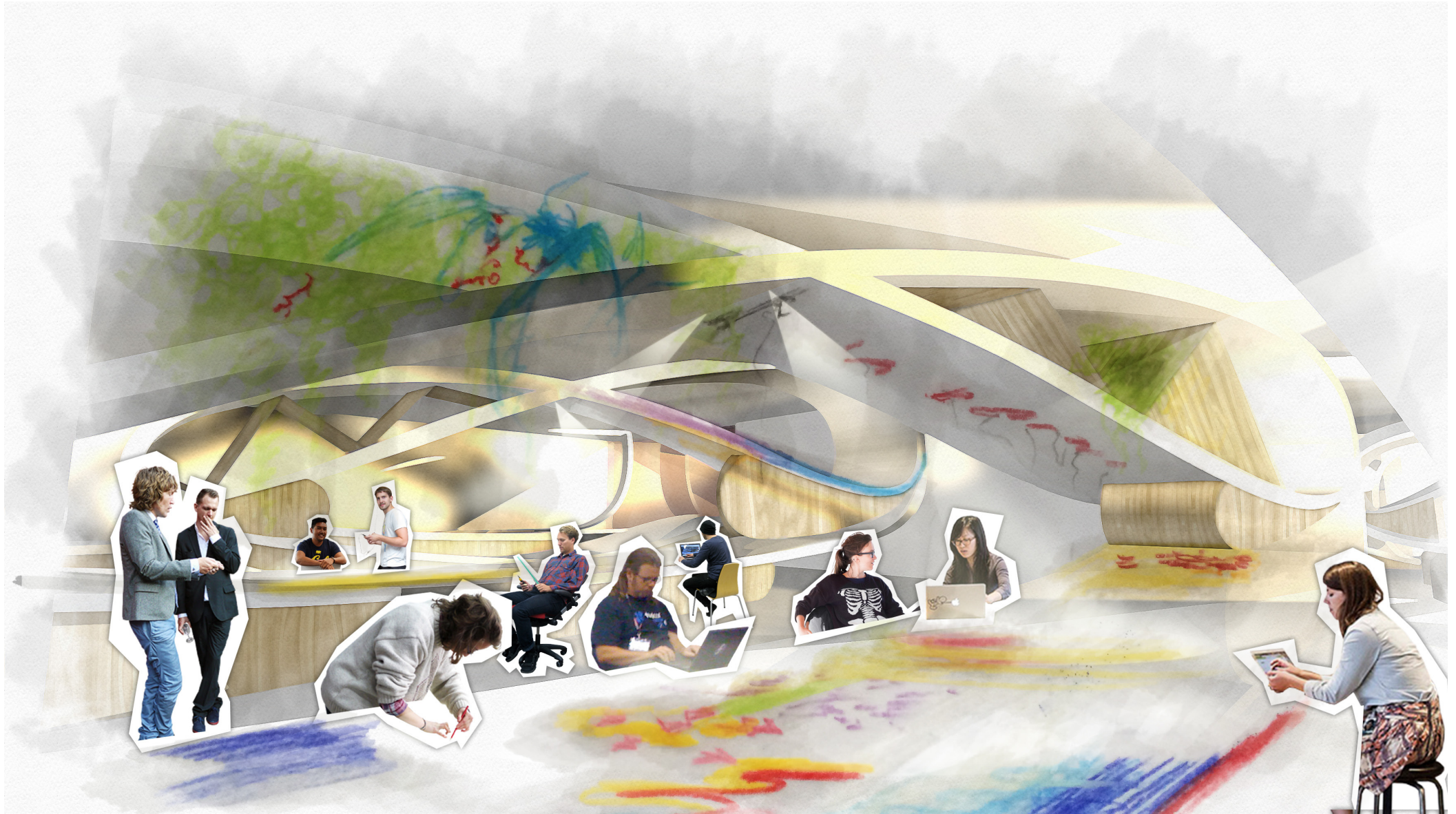






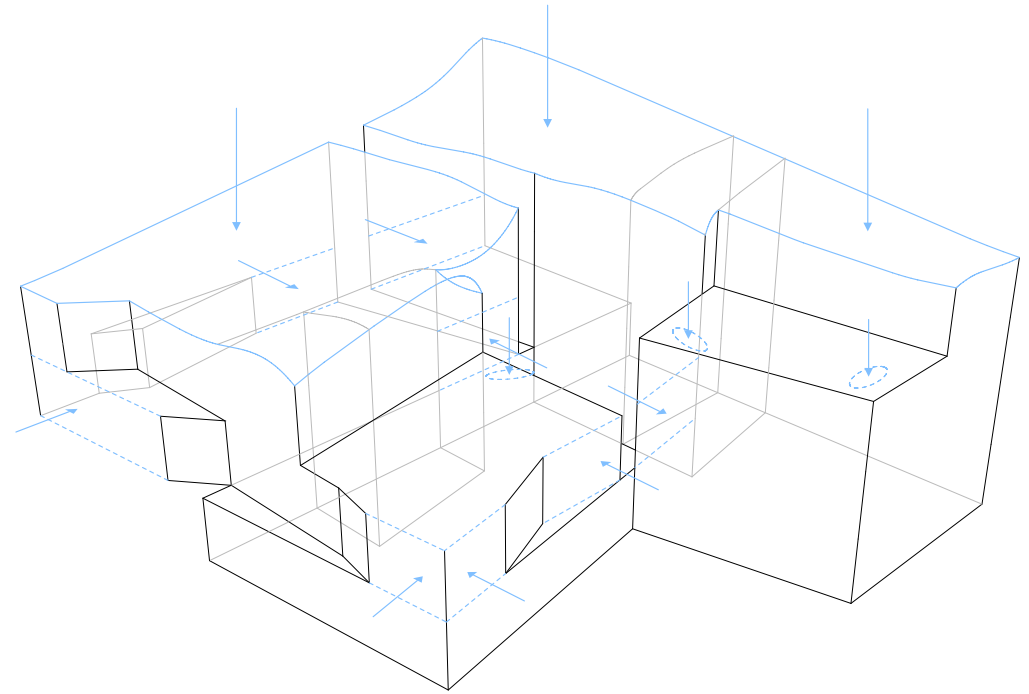
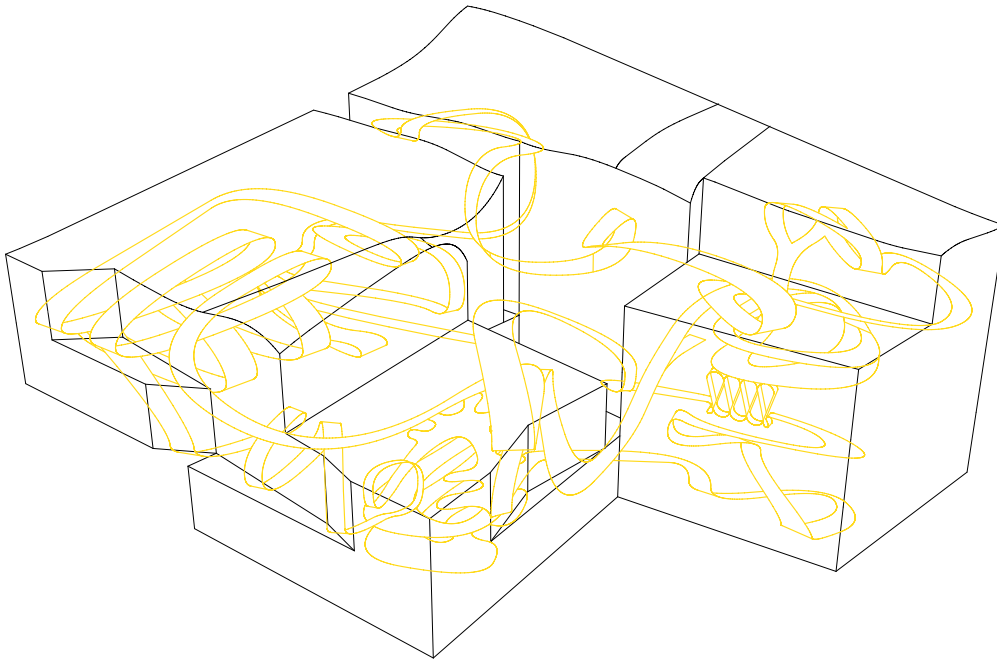


studio
ground floor

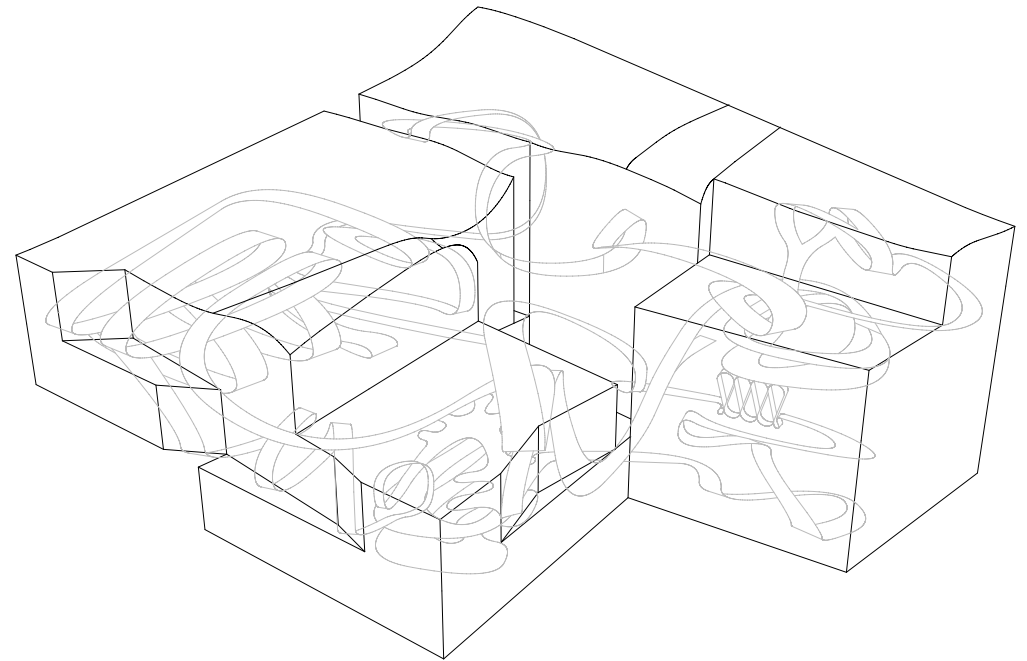


The lightning concept of my building consists of three main components:

1. artificial light from lamps within the table. They provide a balanced mixture of direct spots (f.e. at the workplaces) and ambient lightning throughout the whole building. A special addition is the glowing tablepart in the basement that ensures enough light for the workshop, but creates also a special atm sphere for different events.



2. Natural light coming through the glazing, sometimes softened by the translucent curtains of the facade.
3. Direct natural, but hushed lightning through the ETFE roof. Intelligent printing reacts to the changing positions and intensitiy of the sun to influence the amount of light passing through the cushions.



The area of my site belongs to a very urban structure and is hence not very green. In fact the only vegetated plane is the small “jungle” covering my site. I decided to leave a trace of it’s existence by greening a light rim around the new building. Furthermore the table itself, as it houses the whole programme, also serves as surface for different kinds of planting, both on the interior and exterior.

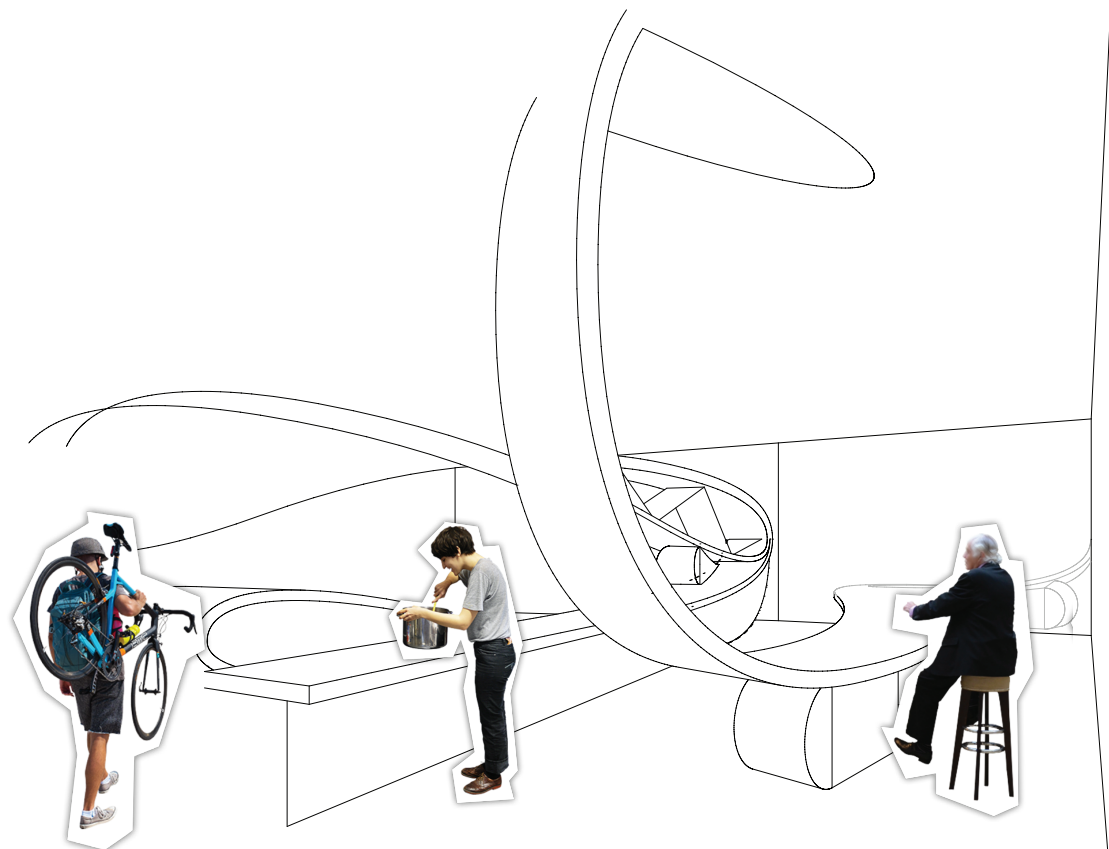
workshop & eventspace

basement



kitchen

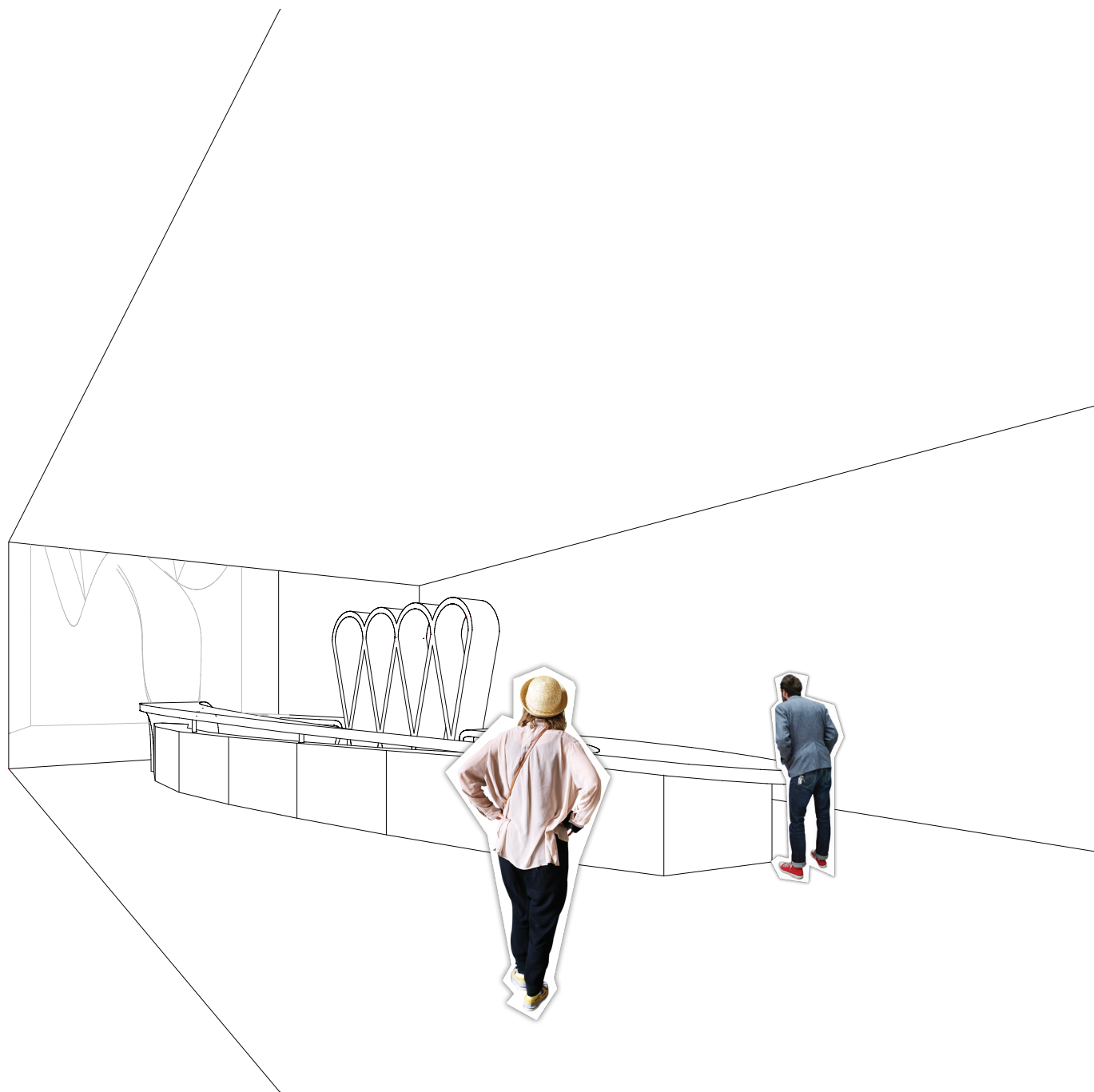
ground floor



studio
ground floor



shop
ground floor

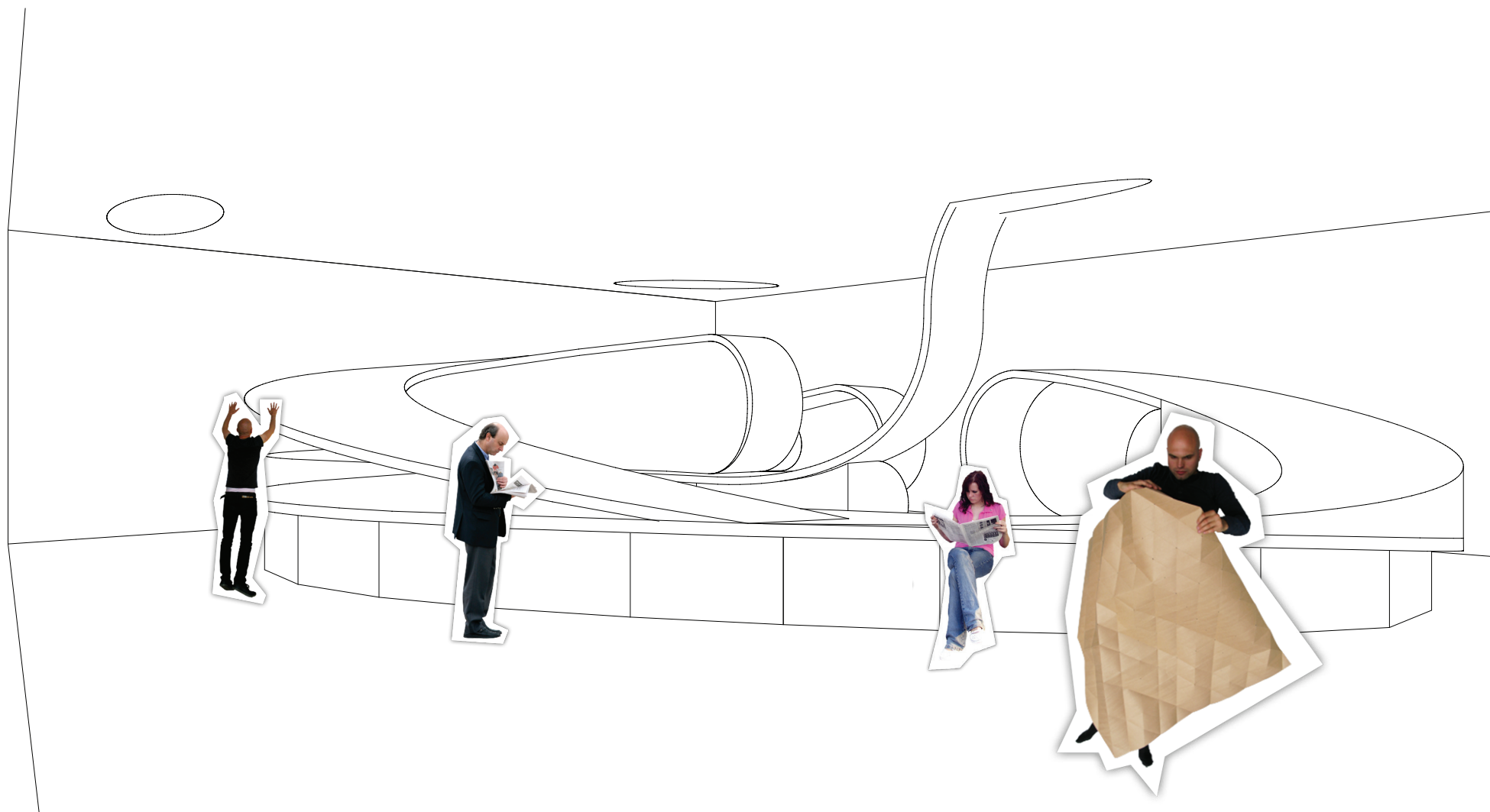


gallery
ground floor



library

first floor



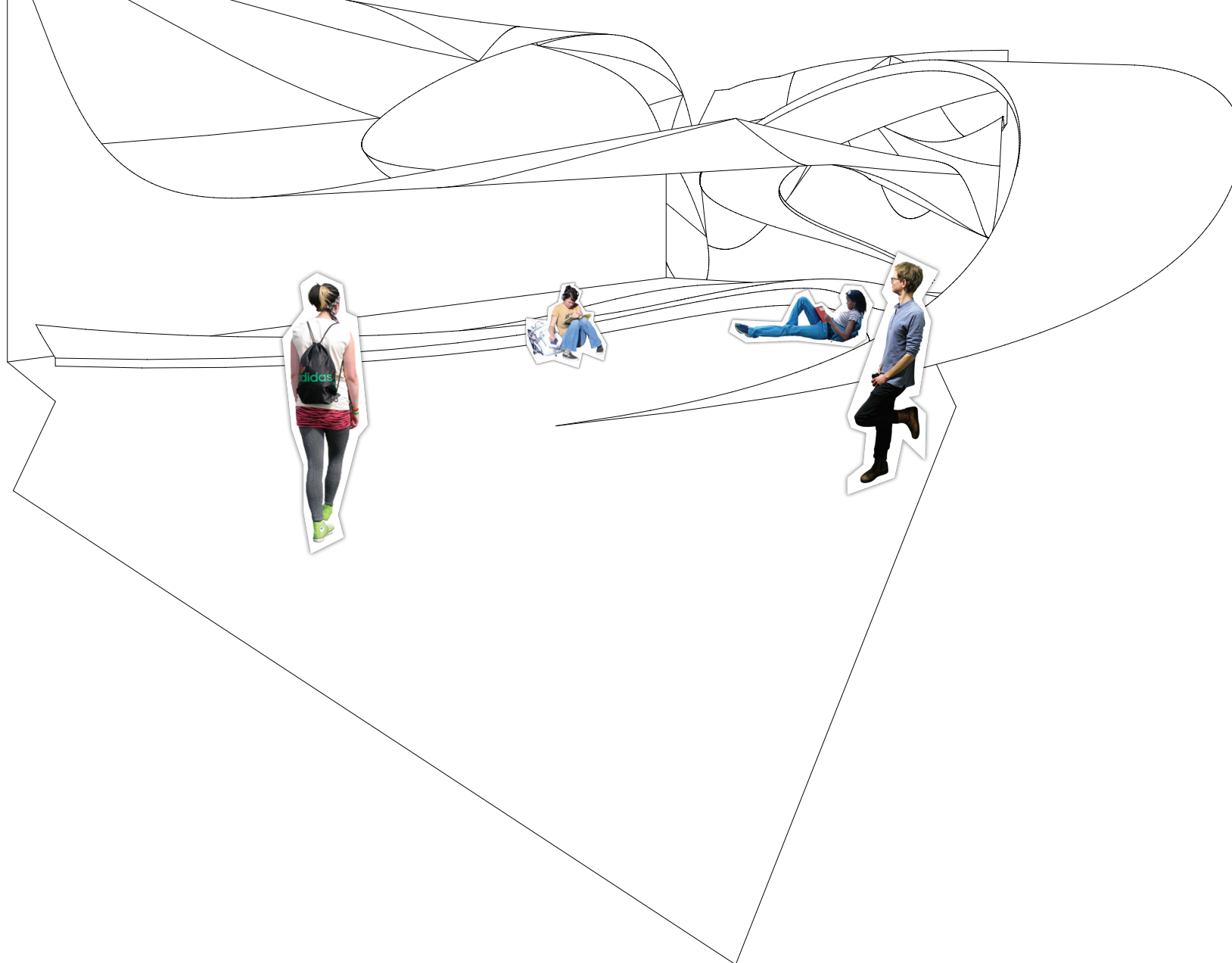
studio

first floor



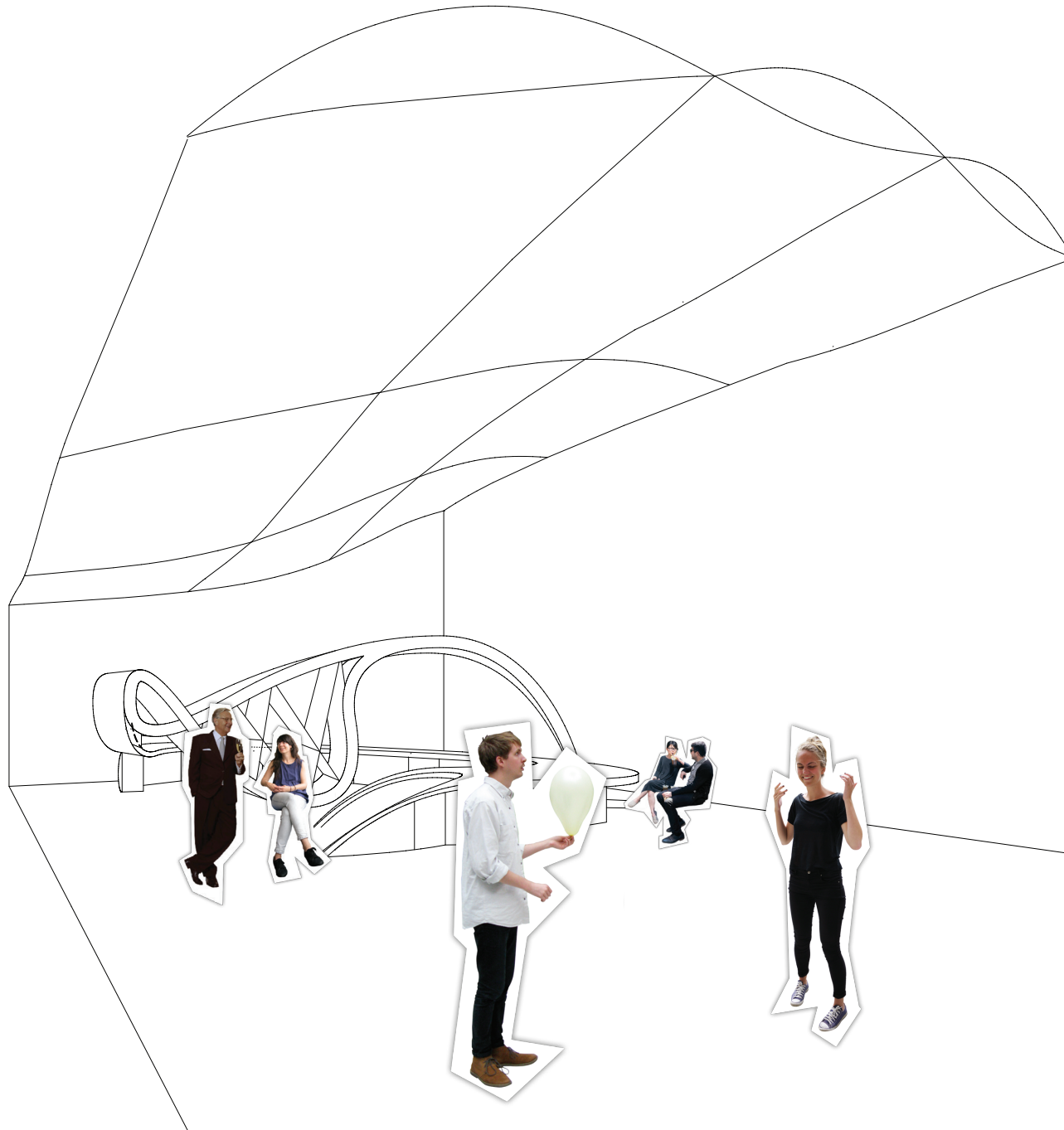
terrace

first floor



bar

second floor



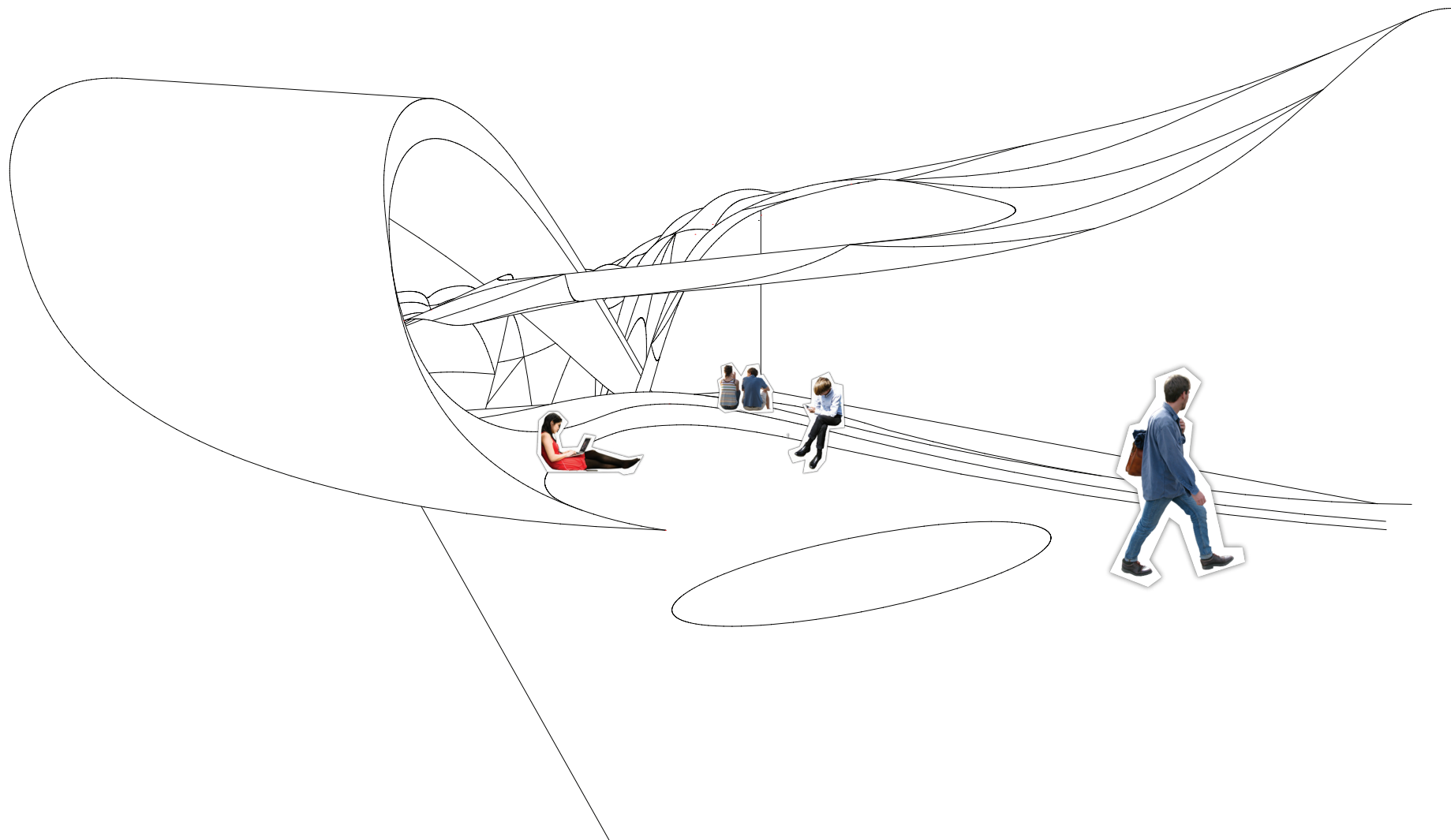
decompression

second floor



terrace

second floor



exterior

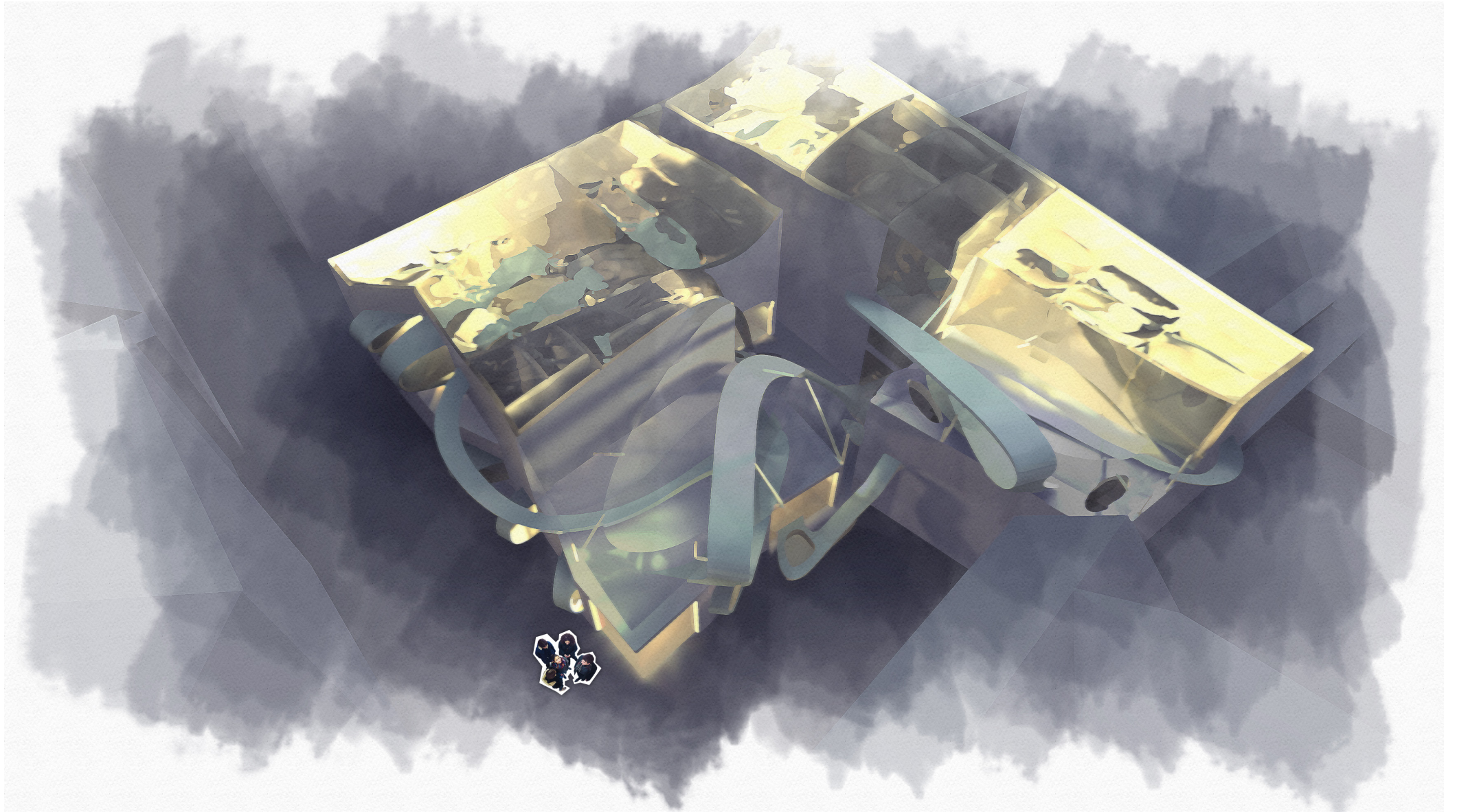


courtyard



exterior

night



list of references

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thank you

to

my family, friends, colleagues, employers and teachers

who broadened my horizon

