

‘The Elite Performance’

Towards a new building culture defined by the exploration and manufacturing of renewable materials



*Geological relations.
By author.*

Thesis Summary Report

Proposal by

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Studio 2c, Fall of 2022.

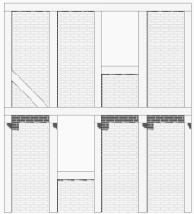
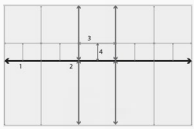
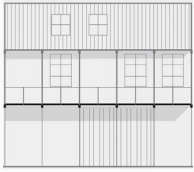
Supervised by

Dan Ljungar

The Elite Performance - Towards a new building culture defined by the exploration and manufacturing of renewable materials

This thesis seeks to explore and communicate different means of construction within the Danish building culture in the attempt to address the current biological and ecological crisis by seeing the push towards a sustainable building culture, not as a hindrance – but rather as an opportunity to improve the way we build.

Speculating new ways of manufacturing, construction, and design.



*Timberframe principles.
By author.*

Monopolized industry

Historically, Denmark has been good at solving social problems by innovating its industries.¹ Through means of legislation, funding, and taxation – new societal problems are often solved by politically altering the private sectors, thus cultivating solutions for the given problem. Most recently, the government passed a new CO₂ emissions tax, with a minimum of 750^{*} dkk pr. tonnage CO₂ emitted by any corporation.² A push which will inevitably disrupt the material industry, as well as the building culture.

A current building culture which is heavily directed by the ‘governmental building institute’ (SBI), which in recent decades has pushed for a technocratic system of standardization and certification in an attempt to heighten the general quality of the built. Making buildings is there for an expensive endeavor, in which both building contracts and material productions require substantial energy and funds. We therefore find ourselves in a material context, which is produced by a few big conglomerates. Each supplying elements to the conservative building system.

A building system which was once thought of as “unconventional,”³ but today has replaced the rich masonry and timber frame systems of the past. A change that happened not at once, but over time with the help of repeated government subsidiaries.⁴ These large cooperations have centralized and refined the manufacturing, transportation, and standardization in a way that prior scattered companies couldn’t. The innovation of our current building system was meant as a solution to the social housing crisis of the mid-19th century. A remarkable success of joint efforts to relieve the tension of the housing shortage at that time.

1. *Dansk byplanlægning 1938-1992, Arne Gaardmand, p 53.*

2. *Regeringen indgår bred aftale om en ambitiøs grøn skattereform, Finansministeriet.*

3. *Betonhåndbogen, Betons historie 1.2.*

4. *Ibid,*

Materials dictates building culture

Today however, we are (in my opinion) seeing a stagnated building sector, which is facing both political, financial, and ecological crisis all at once. And both the realization that building industries have a huge impact on the global environment as well as changing demographics and energy-prices⁵ has recently tipped the scales even further. Currently, we are seeing a material shortage and rapid price-inflation, which is linked to the fact that all materials that we rely on for building today are highly energy consumptive.⁶ It’s become apparent that there is a lack of resilience in the industry - perhaps because of the monopolized, ‘high-entry’ nature of the sector.

This rigid system of governance and powerful corporations are a hindrance towards a sustainable transition. Towards the implementation of materials that are low consumption and/or reusable. It is in many ways materials that dictate the built architecture - and by liberating new building materials, we also expand the building culture. Allowing us to have a reflected discussion about material and formal appropriation in regard to both the supply chain and the context in any given building project.

New material thinking also intrinsically prompts a need for diversifying the material logic within the different scales of construction. We have now grown accustomed to a building system, which is flexible and appli-

cable in all scales and situations, from small house to giant skyscraper – just by calculating and altering the composition and rebar density. But when switching to a diverse sustainable material system, we need to re-appropriate, which materials are suitable for the given task (e.g., span-width). Leaving a more varied building culture with different ‘structural expressions’ across all building scales.

The question thus arrives at how we intend to build future building within a radically different system of both structure, tactility, and ornamentation? Building systems, which prompt reflections on material interpretations and generate new aesthetics through the transition from composite to compostable construction.

In this regard is it also interesting to reflect upon the authority of the material suppliers and stores and how they govern the material market. As it turns out, our country is home to an abundance of local resources, of which only a few are used. But, there are many less processed resources that could be used in a sustainable building culture. Wouldn’t we benefit from promoting local initiatives?

5. *Energipriser eksploderer i dag – din regning er mangedoblet, Poul Dengsoe.*

6. *Materialepyramiden, Det Kgl. Akademi.*

*left Resource mapping
1:500.000, By author.*

*right Mapping of indi-
vidual resources, By
author.*

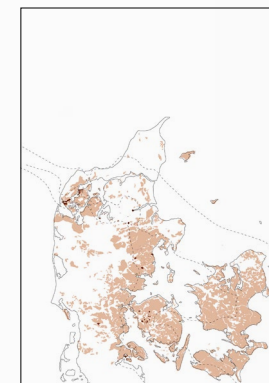


Local resources

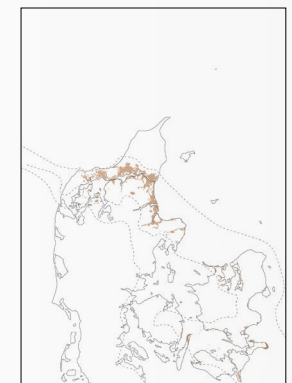
When surveying regional situations, it becomes apparent that different ecosystems and landscapes create a variety of renewable resources. The geological situation constitutes areas of granite, clay and chalk, wetlands, costal cavities of still waters for mussels and seaweed, as well as larger forests and field areas.



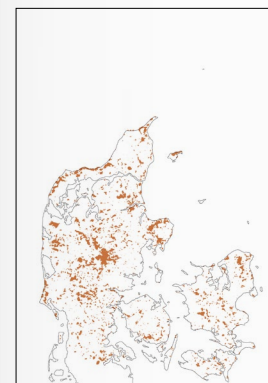
Mussels



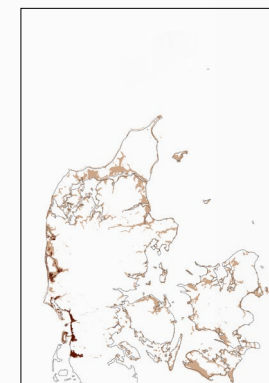
Clay



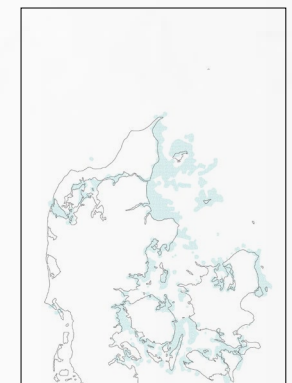
Chalk



Wood



Reeds



Seaweed

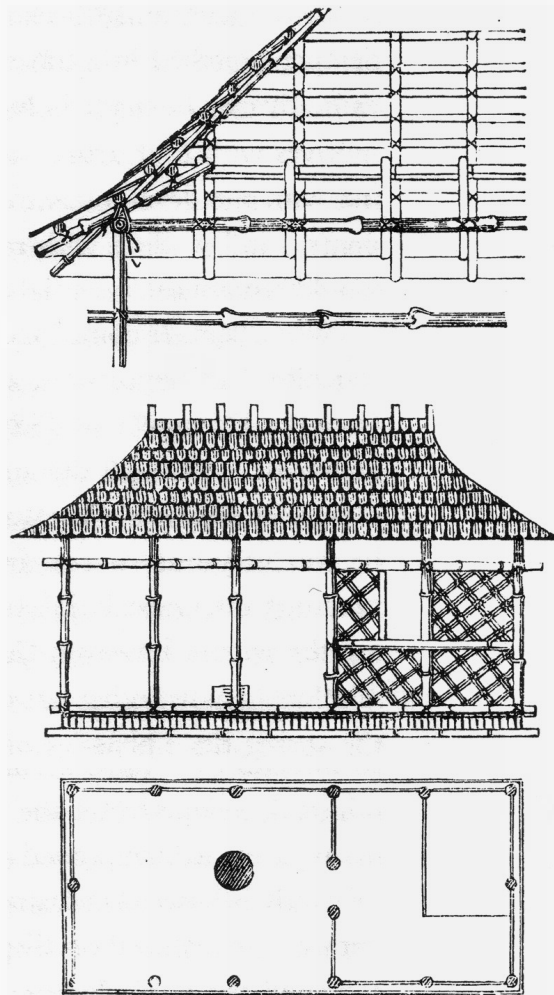


Fig. 03

	TECTONIC		STEREOTOMY	
<i>Element</i>	Enclosure	Frame	Hearth	Mound
<i>Technique</i>	Weaving	Carpentry	Ceramics	Masonry
<i>Material</i>	Textile	Wood	Clay	Stone

Investigating materials resources

The German architect Gottfried Semper (b. 1803) classified raw materials into four categories according to their individual properties:

- Flexible, tough, and highly resistant to tearing.
- Rod-shaped, elastic, and strong in tension.
- Soft and moldable, which, after working are able to be hardened and stay in shape.
- Unyielding, dense, and strong in compression; use in construction being by manageable pieces in regular courses.

The individual natures of the materials described under these four categories gave rise to four crafts in the working of them. These crafts, while respecting the qualities of the particular material with which they are concerned, transform into useful form. In his work, he stumbled upon the Caribbean hut in the 1852 world exhibition, which fulfilled all elements. Elements, which were made up of 'vegetarian materials resources'.⁷

Fig. 04

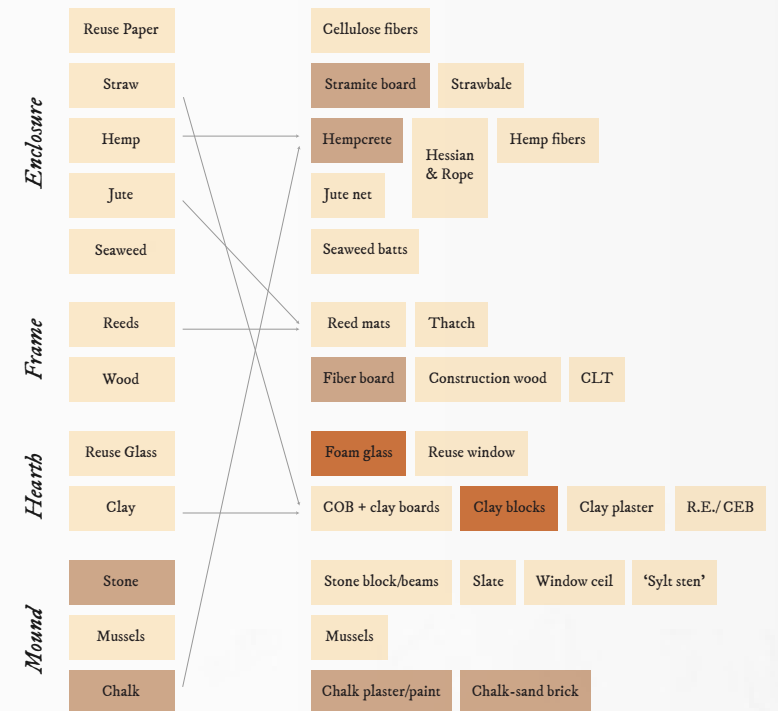


03. *The Caribbean hut.*
Gottfried Semper.

04. *Vegetarian materials.*
Andrea Bocco Guarneri.

From resources to materials

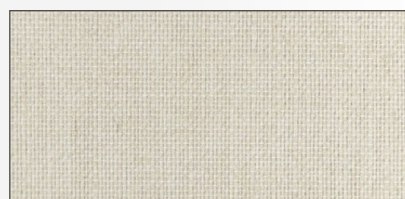
When mapping the possibilities of building materials, it is important to reflect upon which require exhaustive processes, and which don't. Treatments such as heating and high-pressure mechanical treatments are relatively more harmful to the local environment. Especially water and chemical treatments.⁸



Mapping of treatments during production. By author.



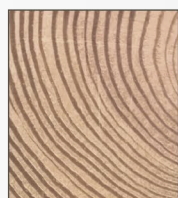
• *Jute* •



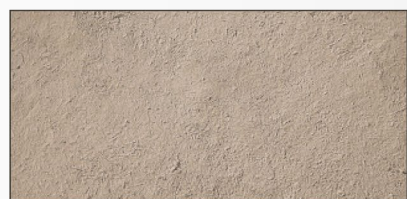
• *Hemp* •



• *Wood* •



• *Seaweed* •



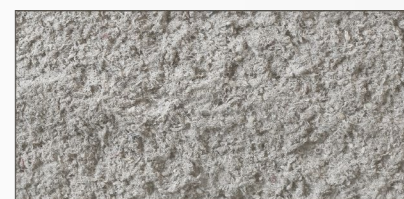
• *Clay* •



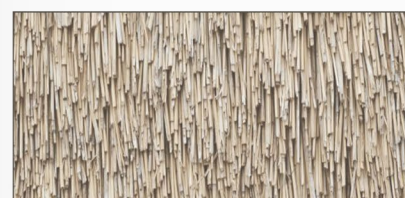
• *Mussel Shells* •



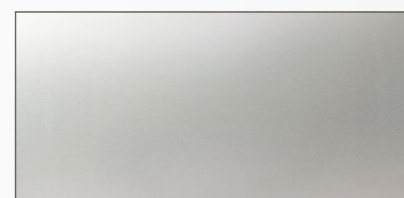
• *Straw* •



• *Reuse paper* •



• *Reeds* •



• *Reuse glass* •

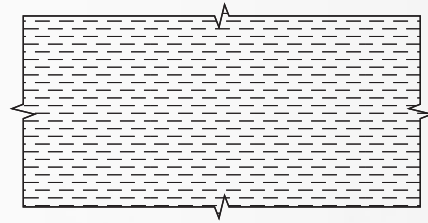


• *Chalk* •

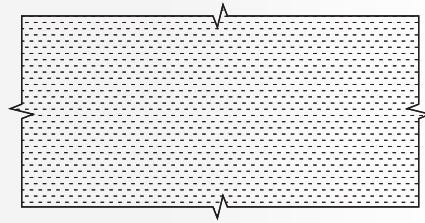


• *Stone* •

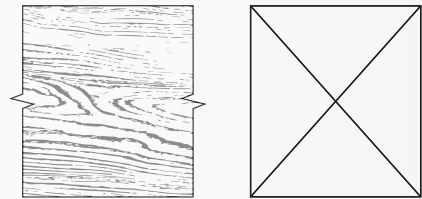
*Photographs of resources.
By author.*



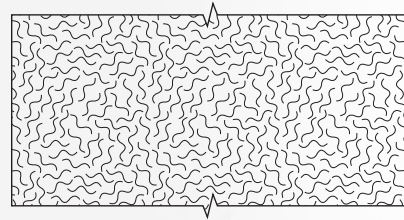
• *Jute in Elevation* •



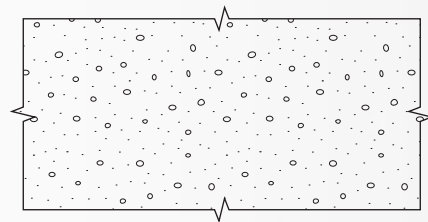
• *Hemp in Elevation* •



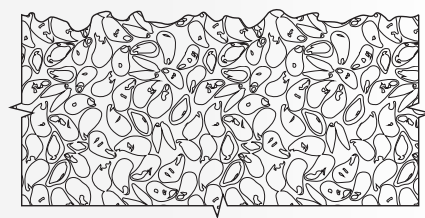
• *Wood in Section/Elevation* •



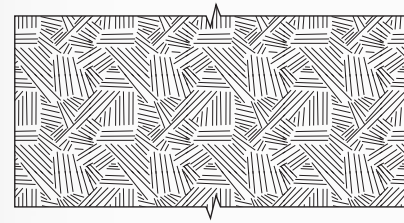
• *Seaweed in Section* •



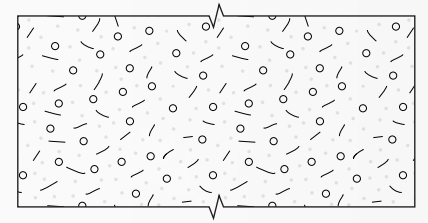
• *Clay in Elevation* •



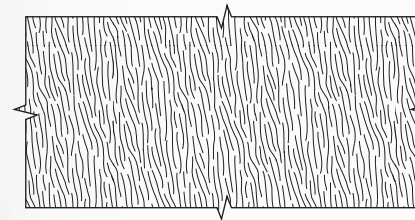
• *Mussel Shells in Section* •



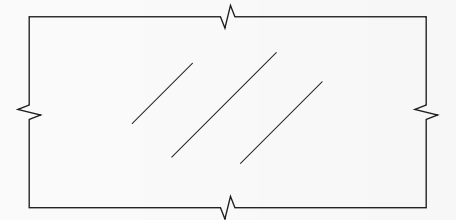
• *Straw in Section* •



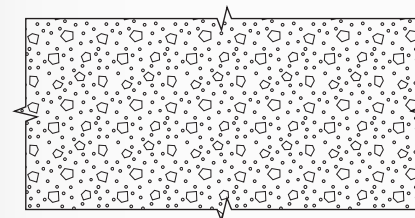
• *Reuse paper in Section* •



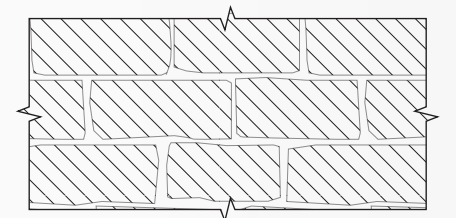
• *Reeds in Elevation* •



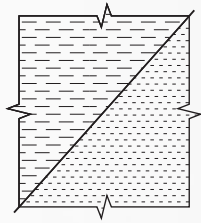
• *Reuse glass in Section/Elevation* •



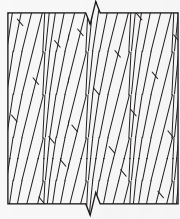
• *Chalk in Elevation* •



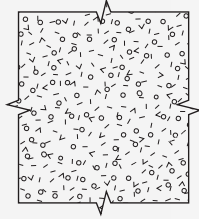
• *Stone in Section/Elevation* •



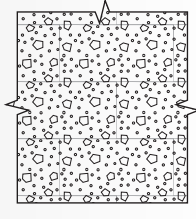
• Hessian •



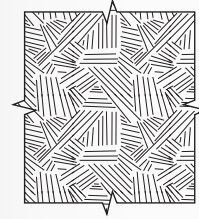
• Rope •



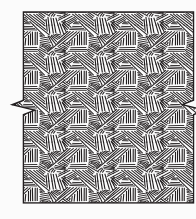
• Hemp fibers •



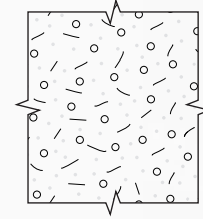
• Hempcrete •



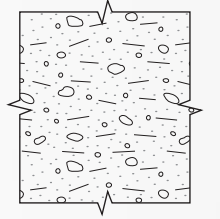
• Strawbale •



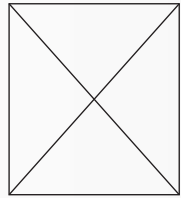
• Stramite board •



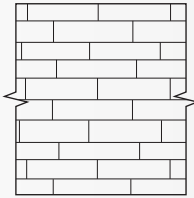
• Cellulose fibers •



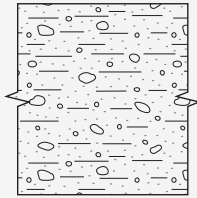
• Wood fibers •



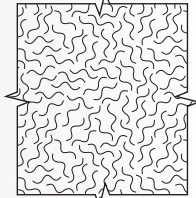
• Timber •



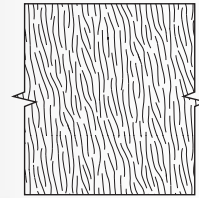
• CLT •



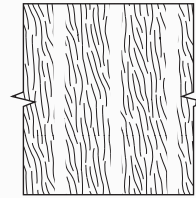
• Chip board •



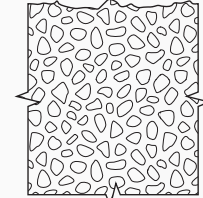
• Seaweed batts •



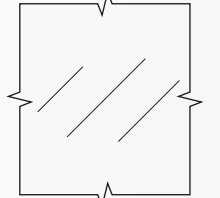
• Thatch •



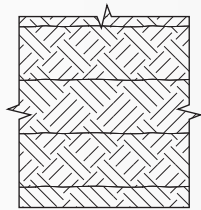
• Reed mats •



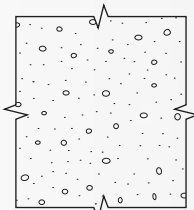
• Foam glass •



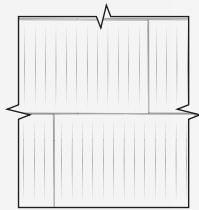
• Reuse window •



• Rammed Earth •



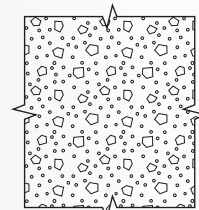
• Clay plaster •



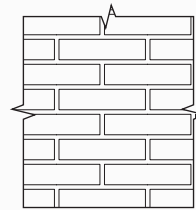
• Clay block •



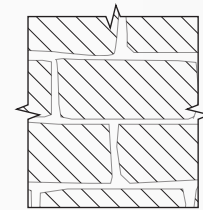
• Mussels •



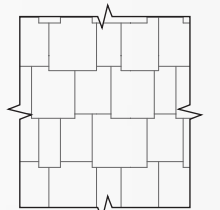
• Chalk Plaster •



• Chalk sandstone •



• Stone •



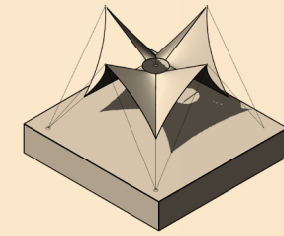
• Slate •

Architectons'

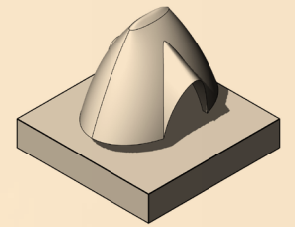
Ar•chi•tec•tone | noun

'tone'/node/sound/voice
the architectural voice'
of a material; it want's
to be something/some-
body.

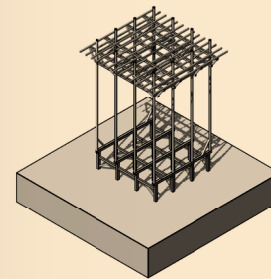
'Highest Form' - The
Elite Performance'



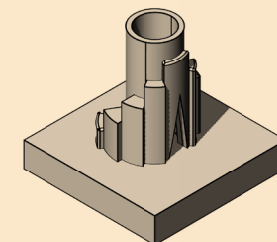
Textile
Weaving



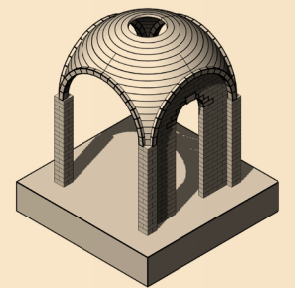
Thatch
Weaving



Wood
Carpentry



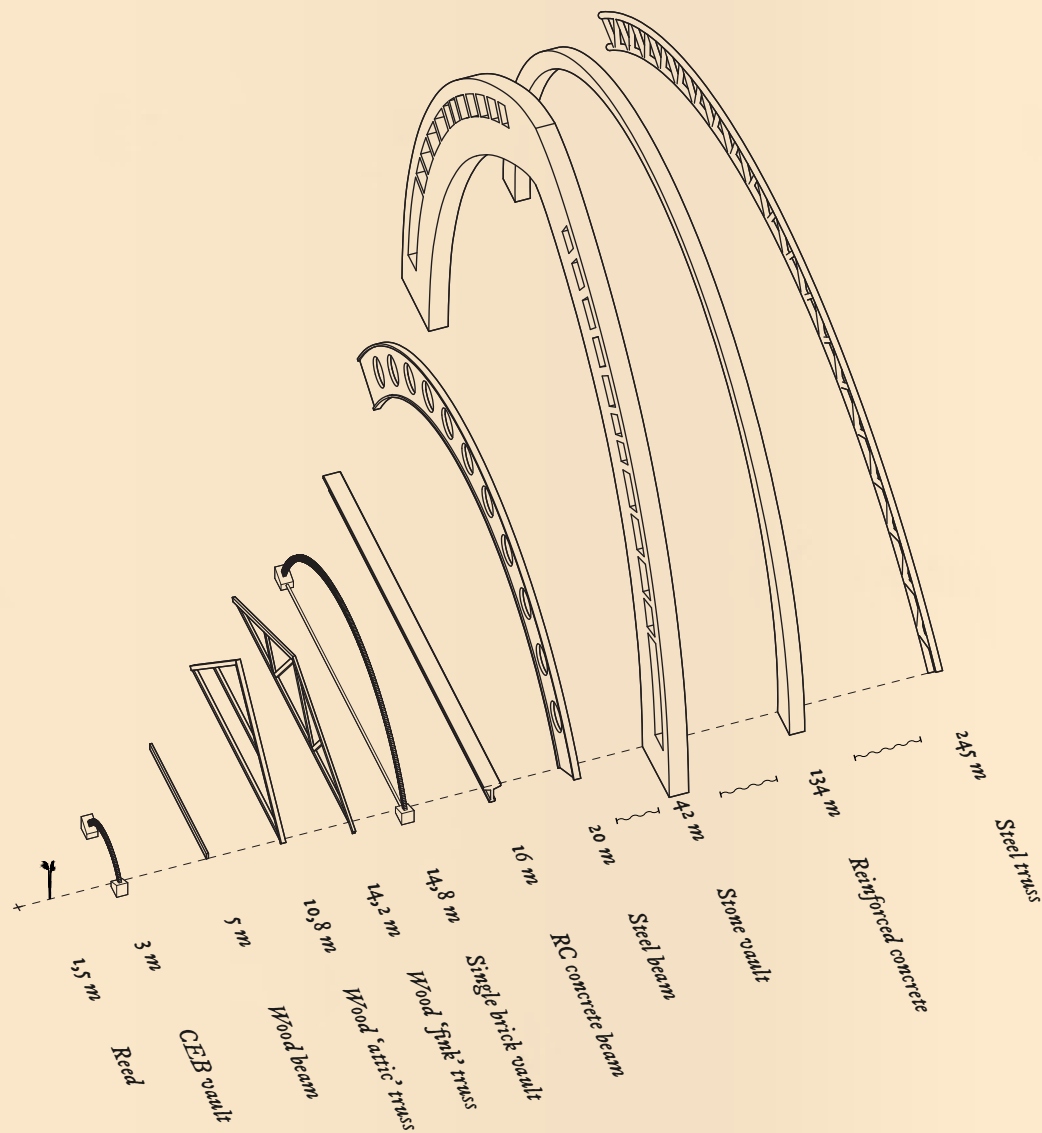
Clay
Ceramics



Stone
Masonry

*Architectons diagram.
By author.*

*Material spanwidths.
By author.*

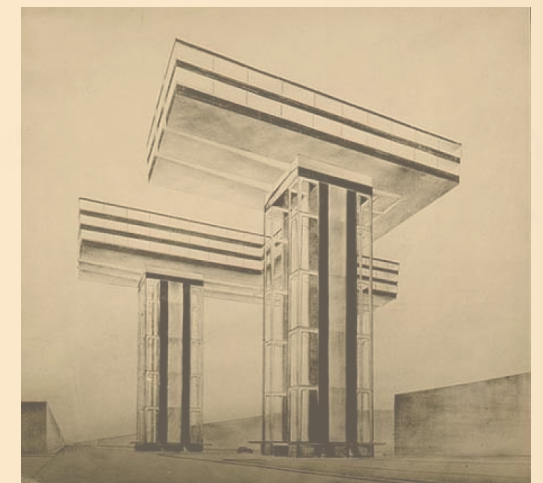


Appropriate material

All materials have bound sizes and scales in which they can manifest. 'There is a limit to the height of a tree, the length of a straw, the weight of a brick, and the span of an arch.' As architects, we follow the intrinsic properties of the materials that we choose to work with. The materials thus have an appropriate scale in which it operates and instinctively, we know of the materials proportions. We can use these assumptions to artistically create an awe by shattering the expectations of the materials scale and surprise the observer.

Typically, however architectural expression benefits from these prior assumptions to create material feelings of ease and balance in the observer. By having the architecture mimic the laws of nature and of our own intuition. Therefore, some constructions are appropriate for a given scale and best convey a message of harmony by subjecting the choice of materials to the size of the construction.

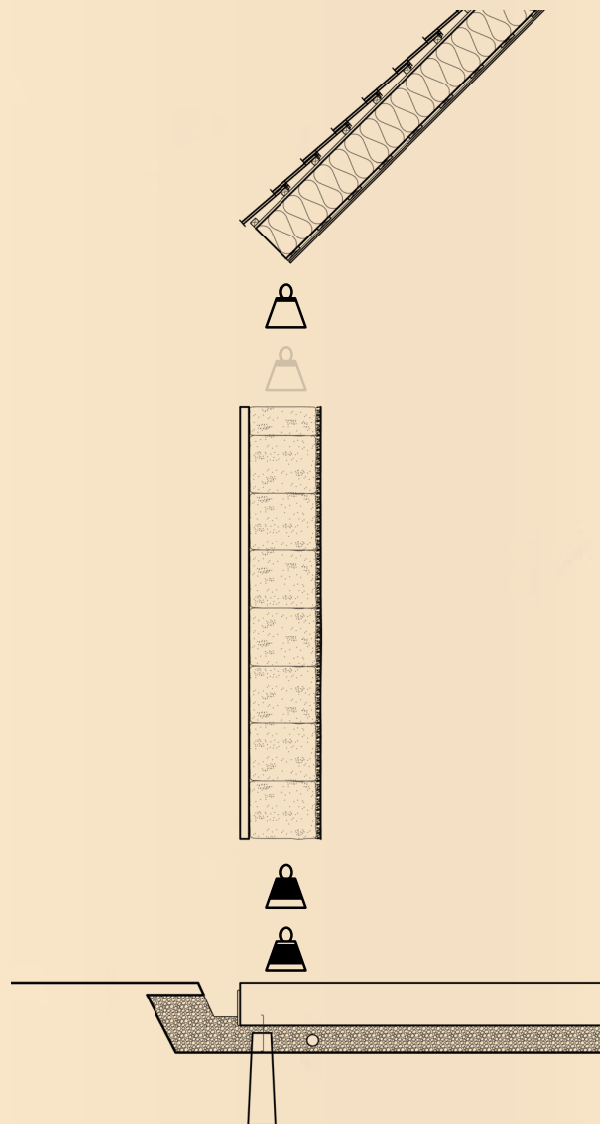
Fig. 13



13. *El Lissitzky.
Horizontal Skyscrapers.*

left *Thinking structural.*
By author.

right *Construction catalogues.* By author.

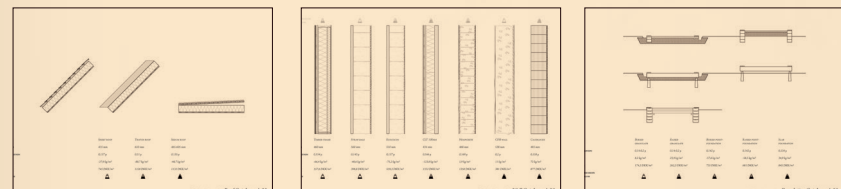


Thinking structure

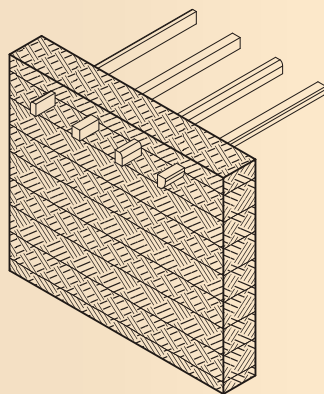
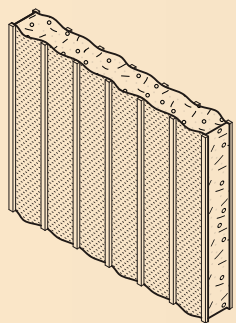
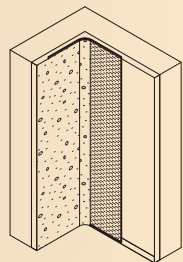
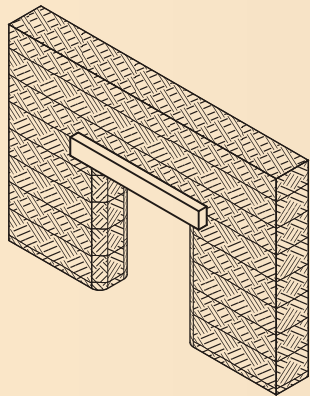
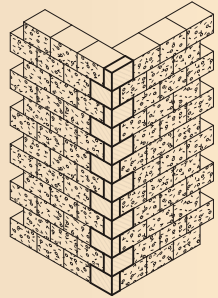
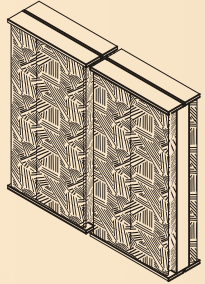
When undertaking an architectural assignment, the structure of the project should be thought of as a series of vertical loads that work to stabilize the whole - while seeking to the ground. In this reasoning, we sometimes face that: as span widths increase so does the point of transference and with it, the structural requirements of the underlying element.

By examining different structural system through a series of catalogues I discovered a correlation between the structural properties, the price, and the environmental impact of different systems. Which future states the notion that some constructions are 'appropriate' for a given scale and some are not. This is the reason you don't see many playhouses constructed in reinforced concrete or iron rivets.

See 'construction catalogue' in appendix, p. 66-71.

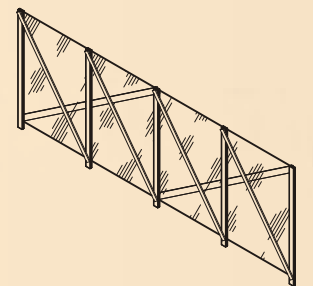
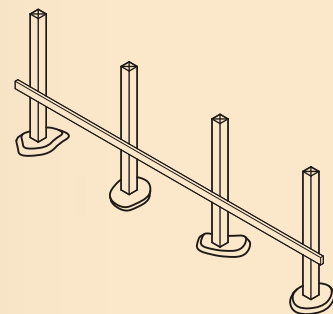


*Diagram of material synergies.
By author.*



Material synergies

Because there are limiting structural properties to materials, some materials are having difficulties manifesting in a building on their own. So, in order to have the material perform a higher function than on its own, we need to start investigating material synergies. Synergies in which the logics of materials 'elite performance' start to unify and support each other. Through the joining of materials.

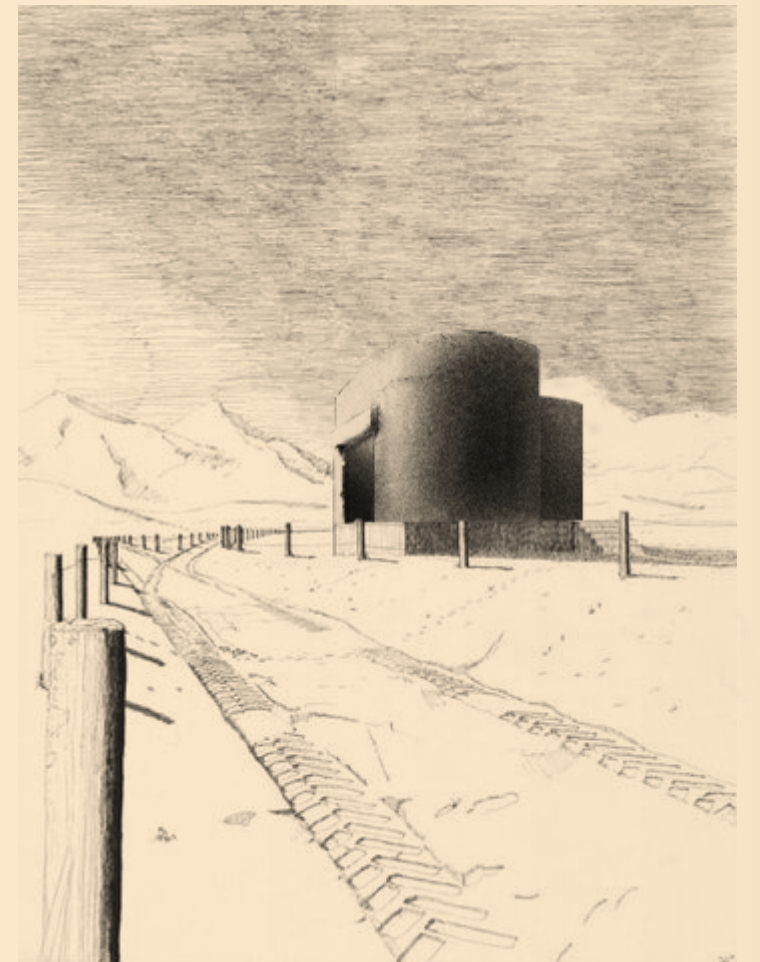
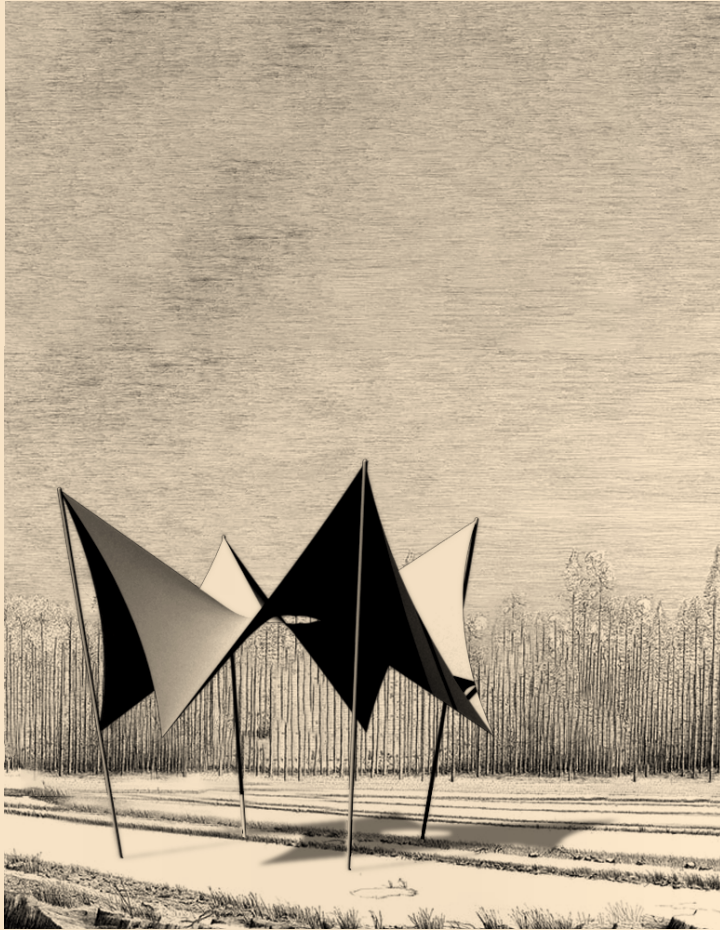


*top left Weaving architecton.
By author.*

*b. left Masonry architecton.
By author.*

*top right Carpentry architecton.
By author.*

*b. right Ceramics architecton.
By author.*



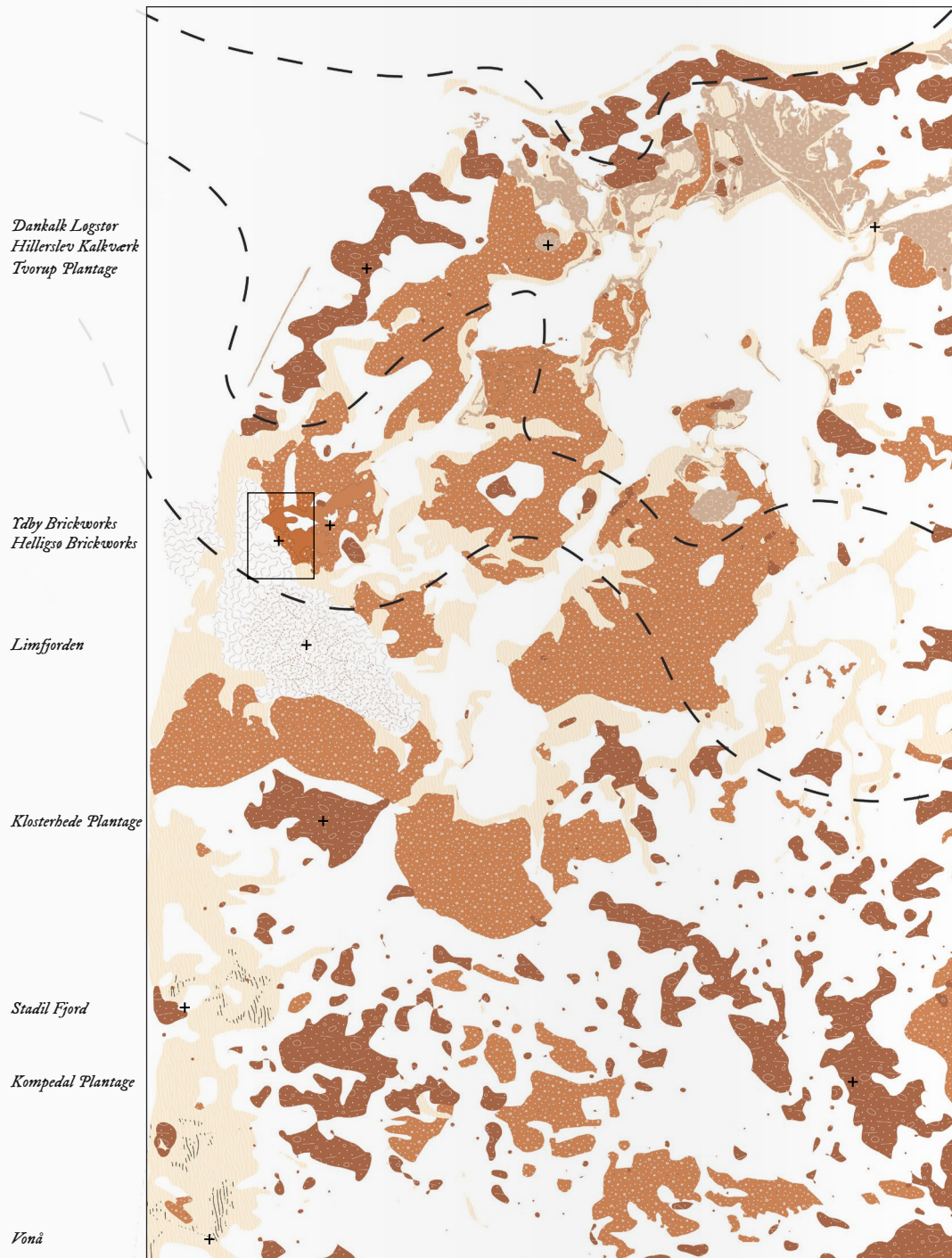
Thatch architecton.
By author.

30

Presence

31





Material convergence in Thy

In the cartography exercise of mapping resources, I discovered a convergence of natural resources in the north-western part of Denmark. Thy is a place, which consists of multiple geological and ecological factors, which all attribute to a varied landscape alternating from harsh sea to protected cove. Here, you can find multiple industries of primary resource productions such as farming, excavation/quarrying, and livestock.

Industries creating timber, chalk, straw, and mussels are already in the area.

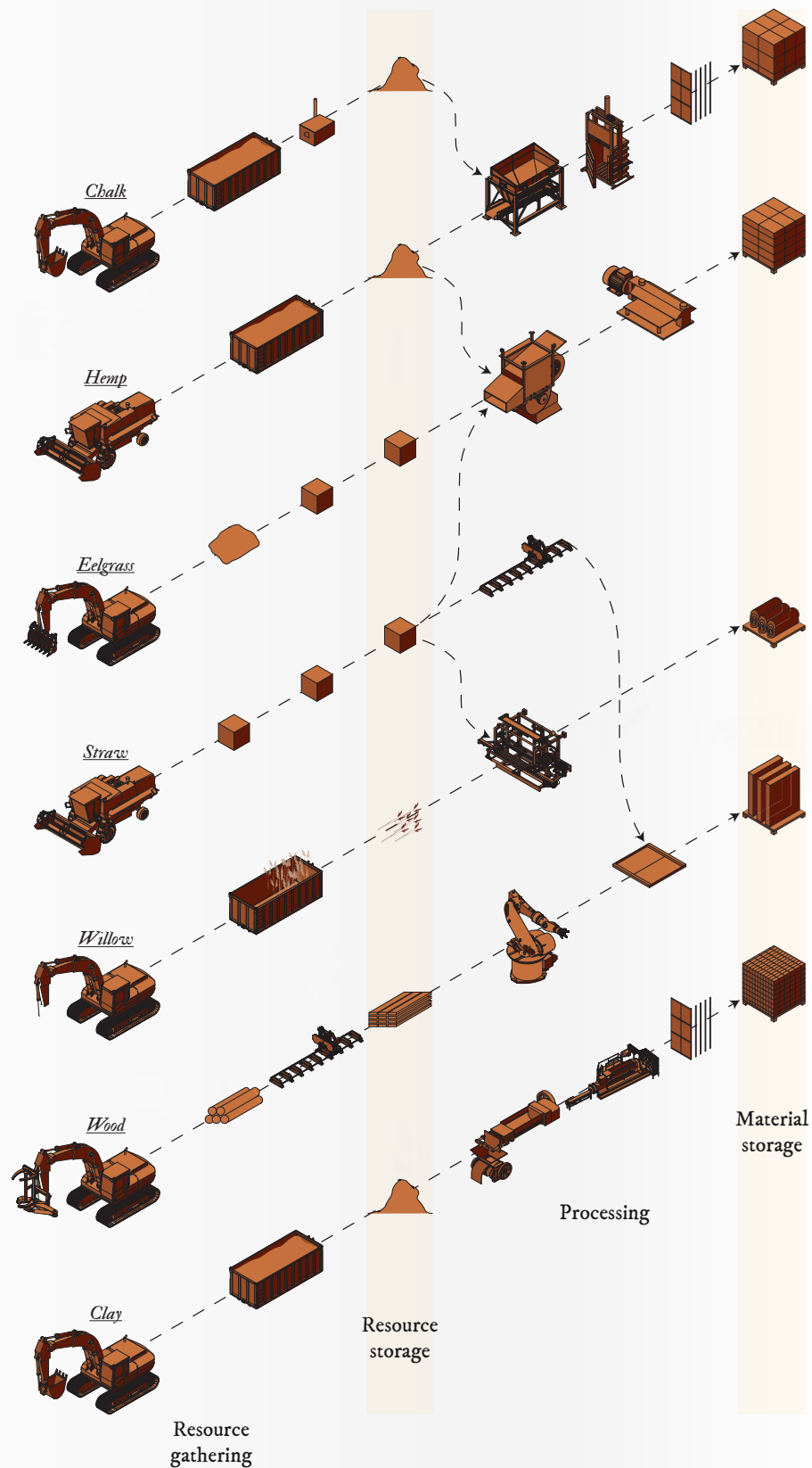


Fig. 24

left Resource mapping closeup. By author.

right Closeup placement. By author.

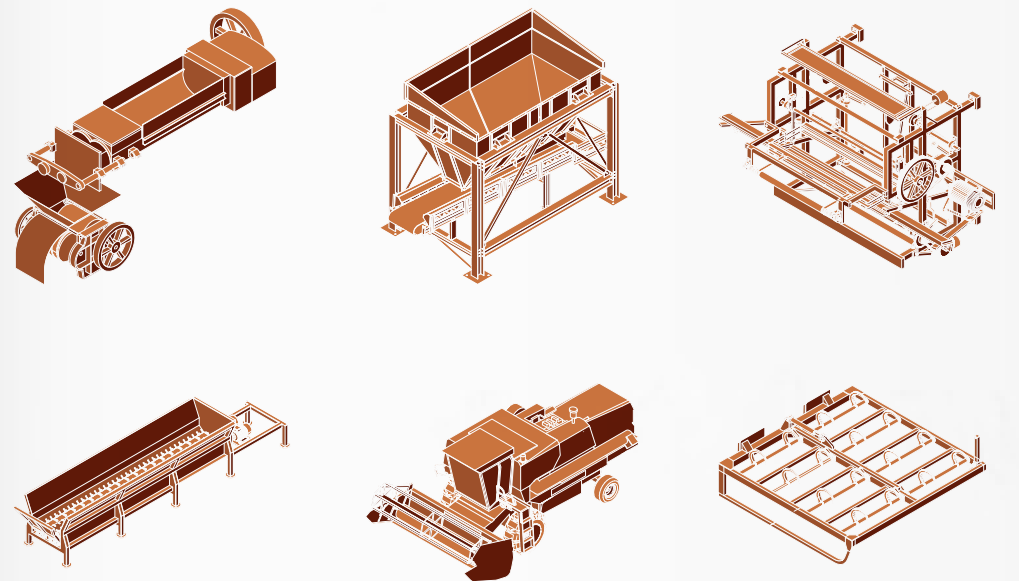
24. Thy nationalpark logo.



Material production process

Investigating the production process steps of sustainable materials is a useful way of discovering programmatic potentials. Manufacturing concludes a series of transformative processes in which resources are treated through compressing, mixing, weaving, shredding, drying, cutting, and moving. Here, different treatments require certain spatial configurations in order to work properly and be safe for the workers. Requirements such as heat, shelter, controlled humidity, etc. all make inquiries towards the building and can inform the built architecture.

See all 'fabrication elements' in appendix, p. 72-81.



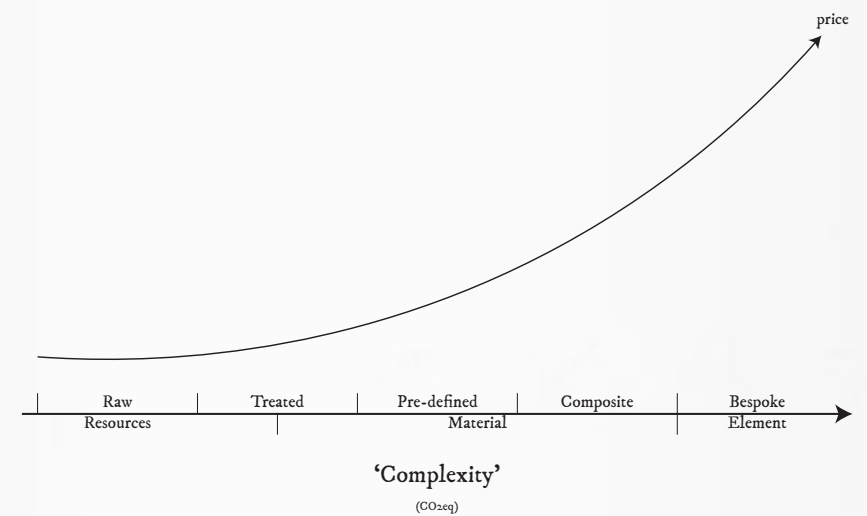
*left Production mapping.
By author.*

*right Production elements.
By author.*

Material complexity

The treatment of raw resources has a gradual increase in complexity parallel to its demanded properties. But as requirements go up so do both price and environmental impact. The demands change for a multitude of reasons such as expanded properties, durability, and controlled appearance.

We see raw resources initially being treated - then shaped into pre-defined standards or being mixed with other resources to create composites that have even more properties. Finally, we have bespoke elements with which our building culture is flooded today.



Surroundings Helligsø brickworks

The brickworks is situated at the foot of the sloping moraines landscape where a small valley meets the fjord. To the south, wetlands mitigate the landscape from hill to fjord. A public road converges with the valley, penetrates the site, and follows the shoreline on a built-up road.

The rural town of Helligsø is surrounded by commercial farmland and grazing areas for livestock. It mostly consists of detached farmhouses and industrial structures located on the higher plateau. Historically, the lower wetlands have been periodically flooded but in recent years it occurs more often. The shoreline consists of larger pebbles and during fall it is draped with a layer of seaweed from the fjord. In front of the brickworks 5 wave breakers are constructed perpendicular to the coast. They were built in 1990 after a storm surge eroded the road in the south.

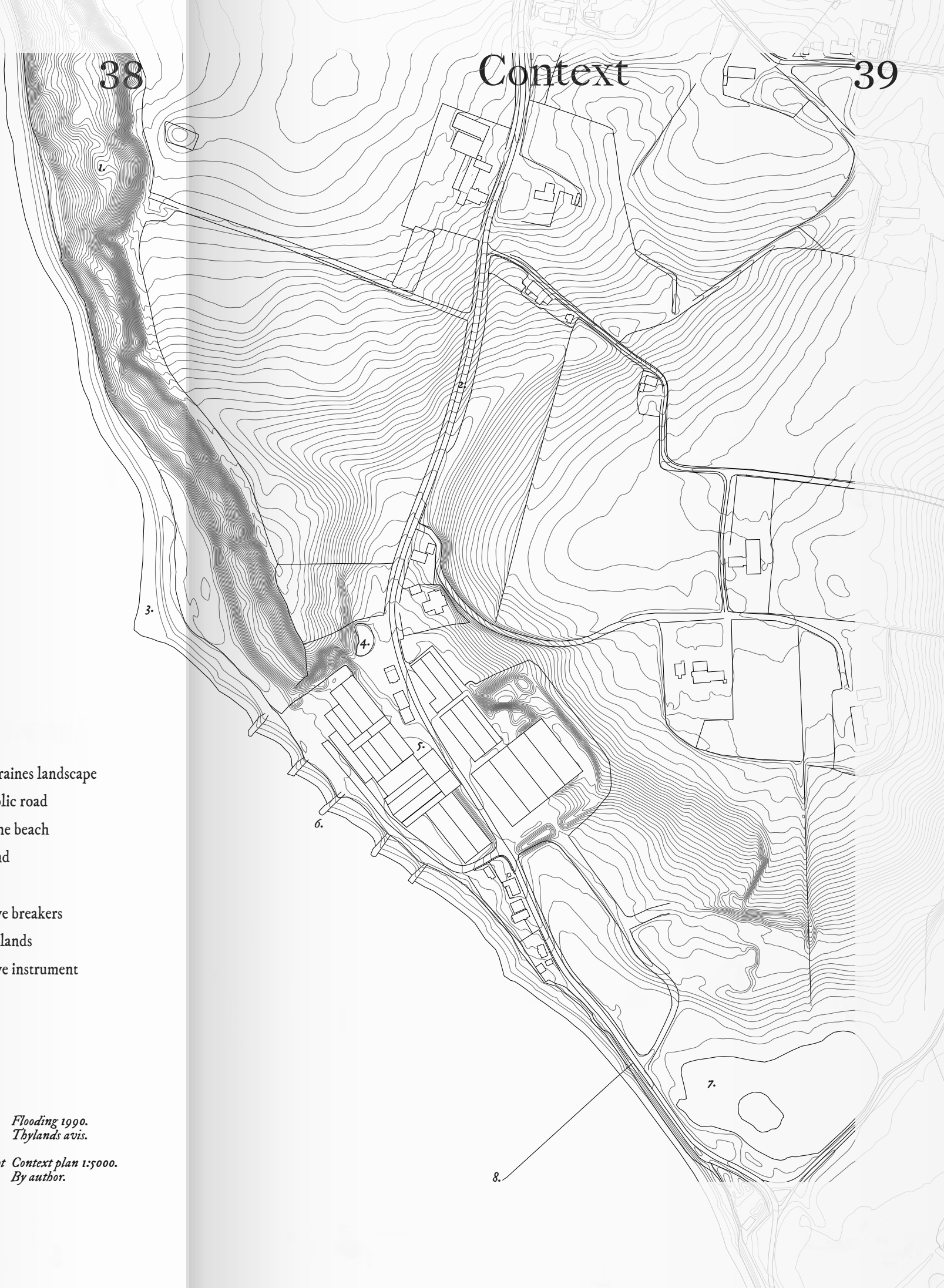
Fig. 28.



1. moraines landscape
2. public road
3. stone beach
4. pond
5. site
6. wave breakers
7. wetlands
8. wave instrument

28. *Flooding 1990.*
Thylands avis.

right *Context plan 1:5000.*
By author.

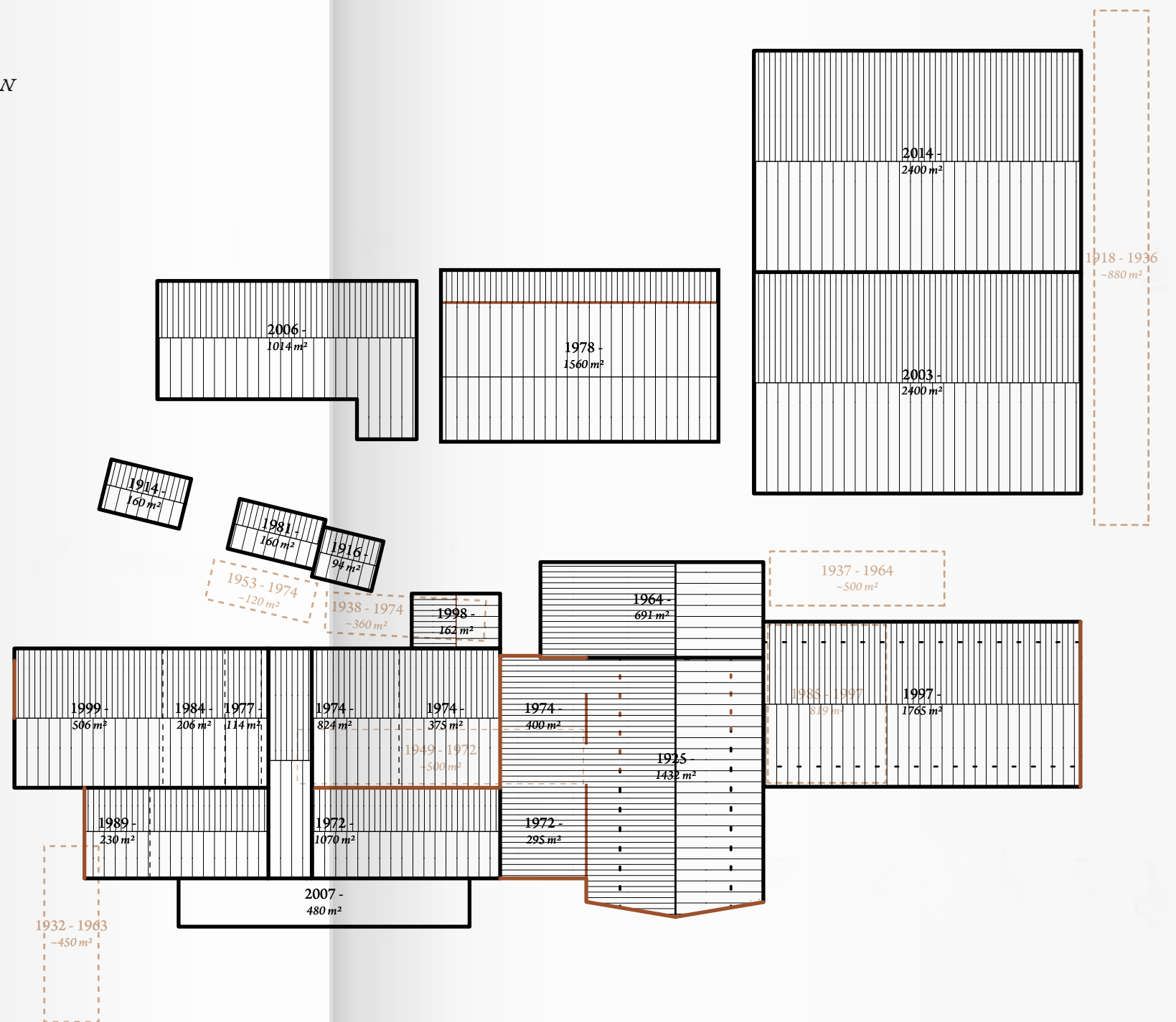


History of the complex

The brickworks has existed since 1874 and was originally founded by local farmers. It has since seen many developments and modifications. In 1925, a 'ring oven' was built, and it was later superseded by a 'tunnel oven' in 1973. The main structure still stands but other buildings have since been removed - most during a fire in 1963. Previously, the clay was sourced directly from the moraine hill to the north - but today, it is hauled from a quarry in Ydby 1.3 km away.

The city of Ydby had its own brickworks but it has been put out of use (2009). For Helligsø brickwork the same has happened periodically in recent years.⁹

Fig. 30.



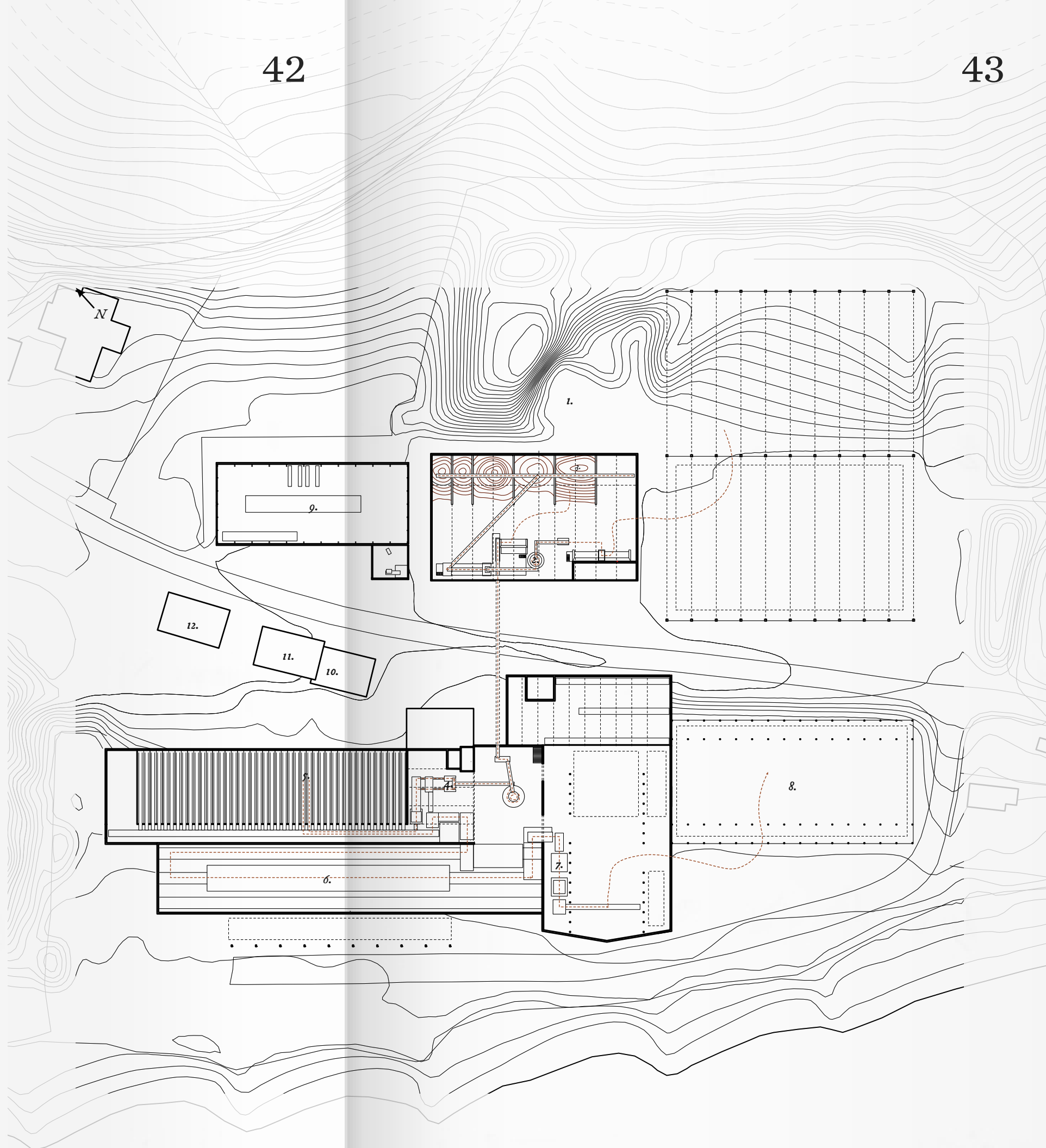
30. Aerial photograph 1951. Sylvest Jensen Lufifoto.

right Development & condition diagram 1:1000. By author.

Production process

The current production setup consists of initial sorting, milling, and storage of the clay on the northern side of the road. It is then transported underground to the southern side where it is extruded, dried, burned, and packaged.

- 1. raw clay
- 2. clay mill
- 3. storage
- 4. extruder
- 5. drying
- 6. furnace
- 7. packaging
- 8. storage
- 9. special production
- 10. office
- 11. kitchen
- 12. common room



*Production flow diagram
1:1000. By author.*

Phantom

The project seeks to transform an industry building through new production. It opens up – invites in new ideas and people to change their perception of what commercial building culture can be. Replacing long and energy intensive processes with shorter, varied ones.

It becomes a seed for expanding a regenerative material thinking, where biogenic materials are not just a mere substitute for the current building materials, but instead replacing them AND their intrinsic thinking with ideas, focusing on individual material performances. This should be demonstrated in the scales of the transformation of the building.

Schemata

Like in a cityscape, the historic presence of the brick, the steel, and the concrete shouldn't necessarily be torn down to make way for the new. Instead, they shall become actors partaking in the new biogenic material synergies. Bearing patina, history, and structural properties.

New additions to the site shall be designed with the intention to support the new production workflows. But most importantly, the additions shall bring the visitors closer to the manufacturing experience by curating the composition, views, and haptics of the factory, while connecting it with the spatial requirements of the different production stages.

The goal of the building is to educate craftsmen, constructors, and the general public in the different renewable constructions and workflows. In a sense, the building becomes an exhibition of what it produces.

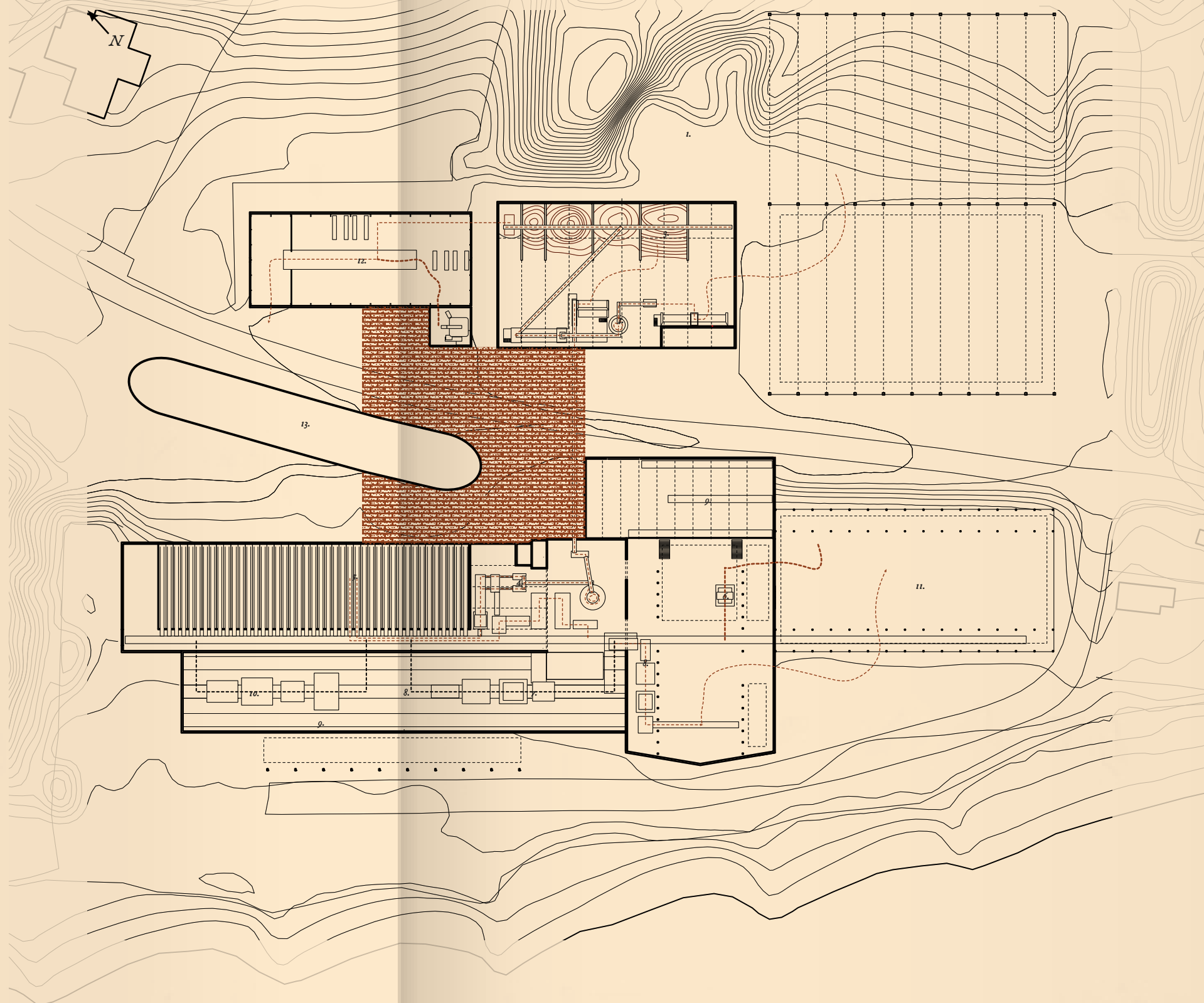
Spatial Estimate

2335 sqm.	Clay process	Factory
1015 sqm.	Wood process	
1650 sqm.	Hemp process	
1430 sqm.	Weaving process	
1300 sqm.	Compression process	
695 sqm.	Halls and walkways	
6650 sqm.	Sheltered storage	
<u>14075 sqm.</u>	Total	
30 sqm.	Arrival	Visitor center
70 sqm.	Exhibition	
35 sqm.	Kitchen	
85 sqm.	Canteen	
75 sqm.	Conference room	
50 sqm.	Bathrooms	Service facilities
25 sqm.	Walkways	
110 sqm.	Courtyard	
120 sqm.	Office	Administration
85 sqm.	Depot	
20 sqm.	Sales room	
50 sqm.	Research and development	
<u>755 sqm.</u>	Total	

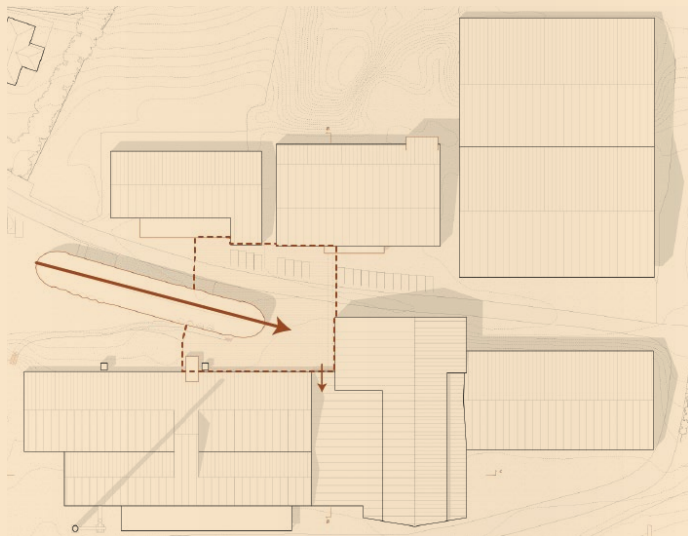
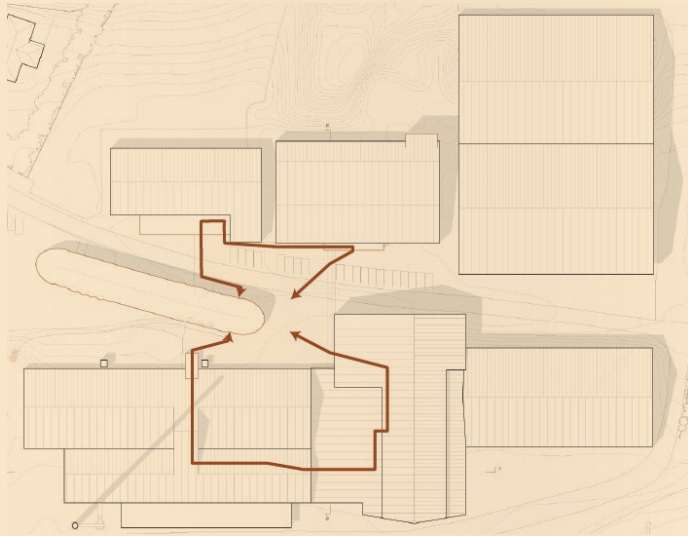
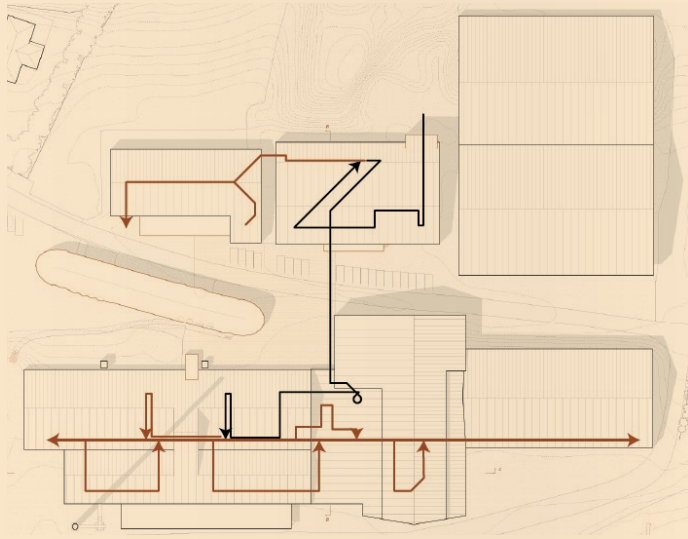
New production and zoning

The repurposing of the facility maintains the parallel positioning of the straddle roof buildings, while strengthening the bend axis of the service and office buildings. Some of these are repurposed to accommodate the visitors. A central square is highlighted and attached to the southern volumes. A public flow is established to curate the visitors through the production process.

- 1. raw clay
- 2. clay mill
- 3. storage
- 4. extruder
- 5. drying
- 6. weaving
- 7. sheeting
- 8. shredding
- 9. mixing
- 10. compressing
- 11. storage
- 12. assembly
- 13. new axis



*New production and flow
1:1000. By author.*



New production

The production is rearranged to allow more Types of production to happen in the southern production hall. The former 'tunnel oven' is removed, while keeping the linear production flow.

New loop

A public loop is introduced through and over the production line to provide access for visitors. At the northern halls, the visitors can look from the outside in. In the south, they can have an immersive tour through the production facilities.

Strengthened axis

The bend axis of the former administration building is highlighted by the transformed building volume. Uniting the volumes under one roof structure, pointing towards a central square. In here, the new service, exhibition, and administration functions are placed. The square stretches between the buildings, tying the volumes together and providing a look above the roofs onto the sea.

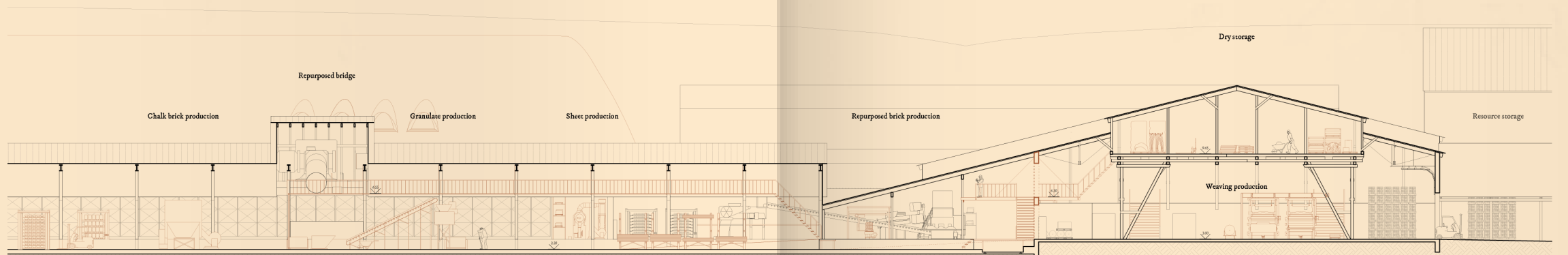
Curated production and visit

The former heat vent of the 'tunnel oven' is being repurposed to allow the visitors a path through the building, connecting to a suspended bridge above the new production. From here, the visitors can access the central platform of the factory and onto another bridge with access to both the repurposed dry loft and a pathway to the square.

B

*Cutout of section CC.
By author.*

B





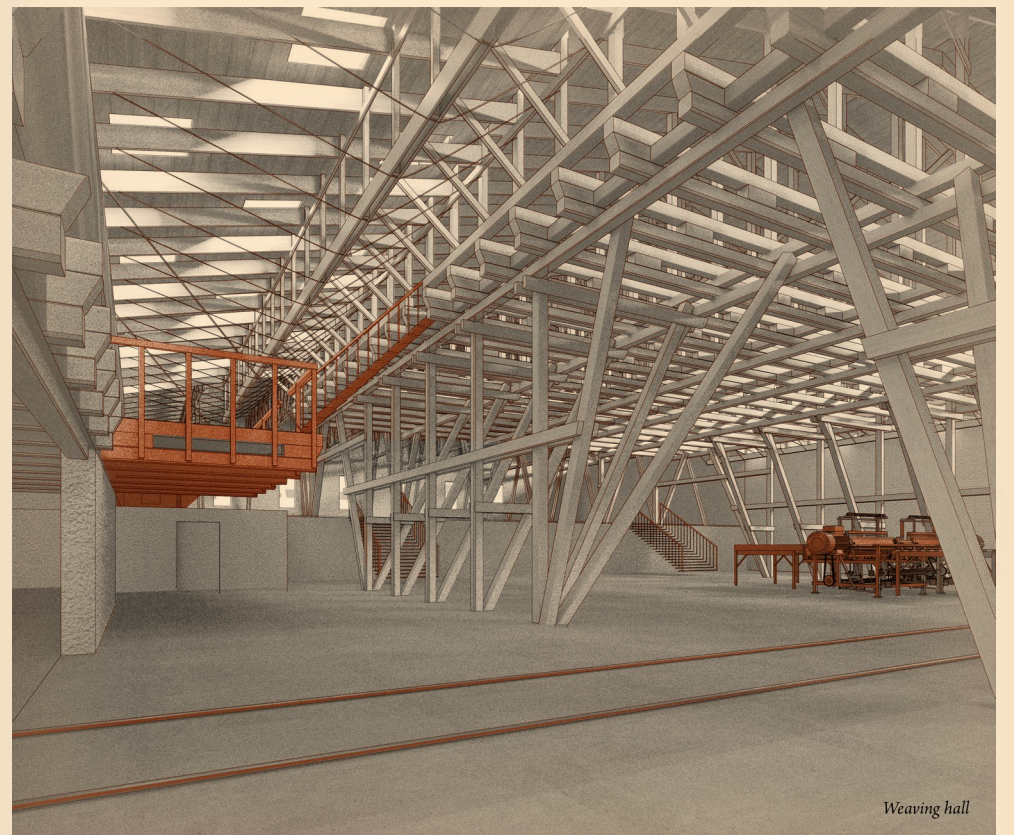
Production hall

left *Production hall.*
By author.

right *Weaving hall.*
By author.

Production halls

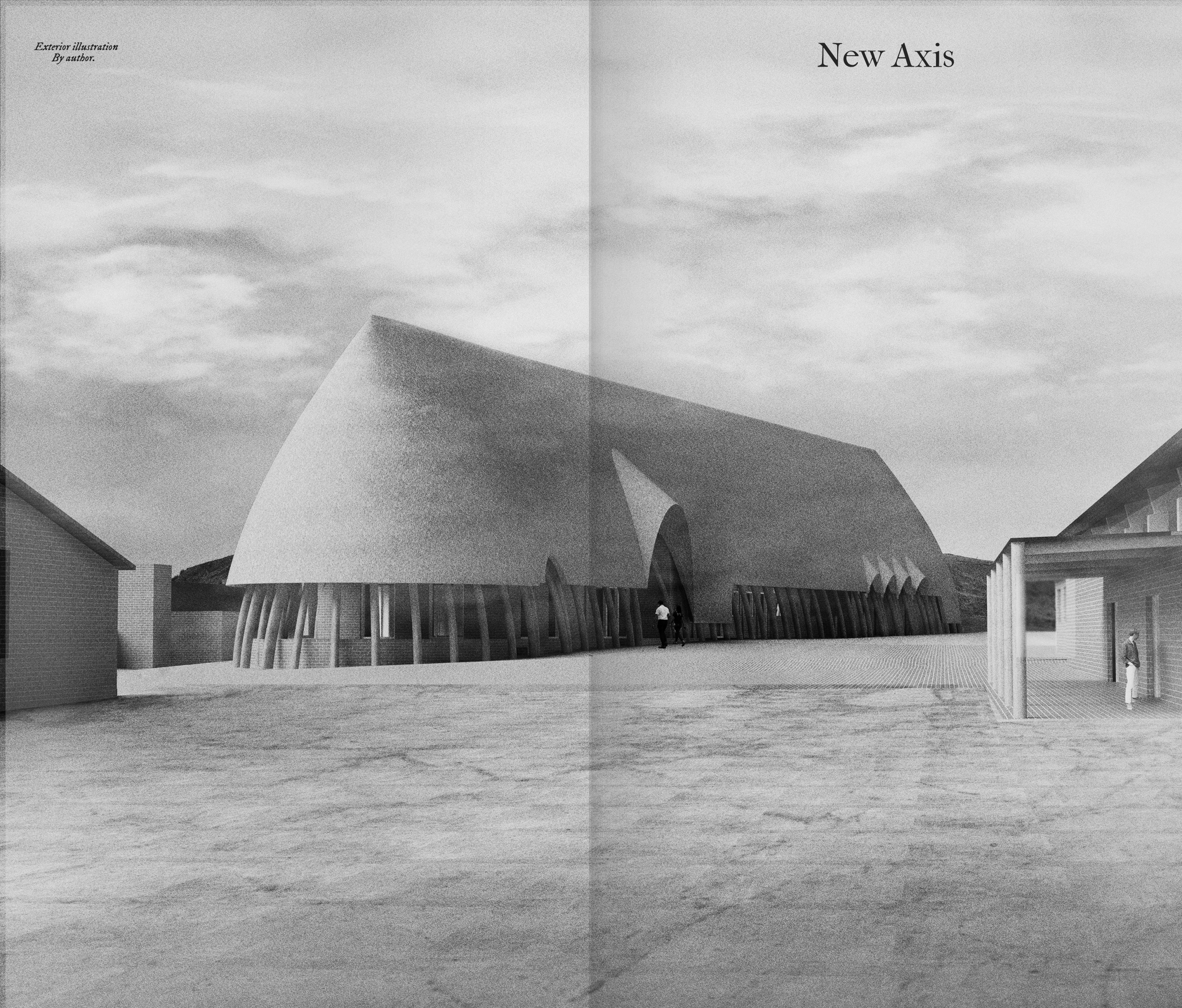
Removing the extensive burning and management of the clay bricks frees up space for multiple productions to happen. Processes such as weaving, sheeting, shredding, mixing, and compressing.



Weaving hall

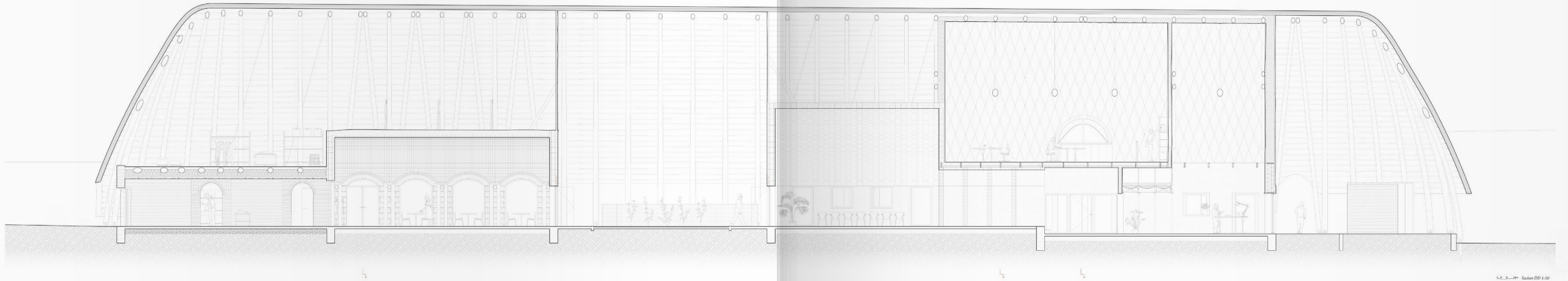
*Exterior illustration
By author.*

New Axis



top *Section D'D.*
By author.

b. *Plan drawing.*
By author.



depot bathroom

bathroom entrance

canteen

courtyard

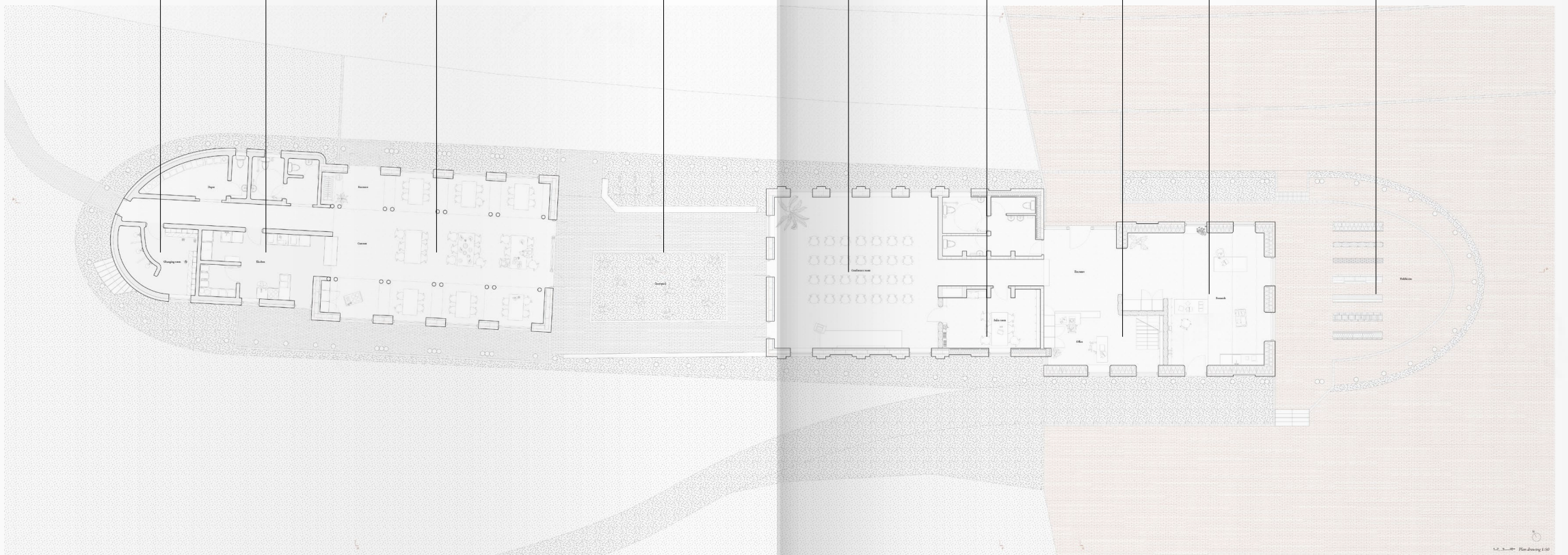
conference room

research

exhibition

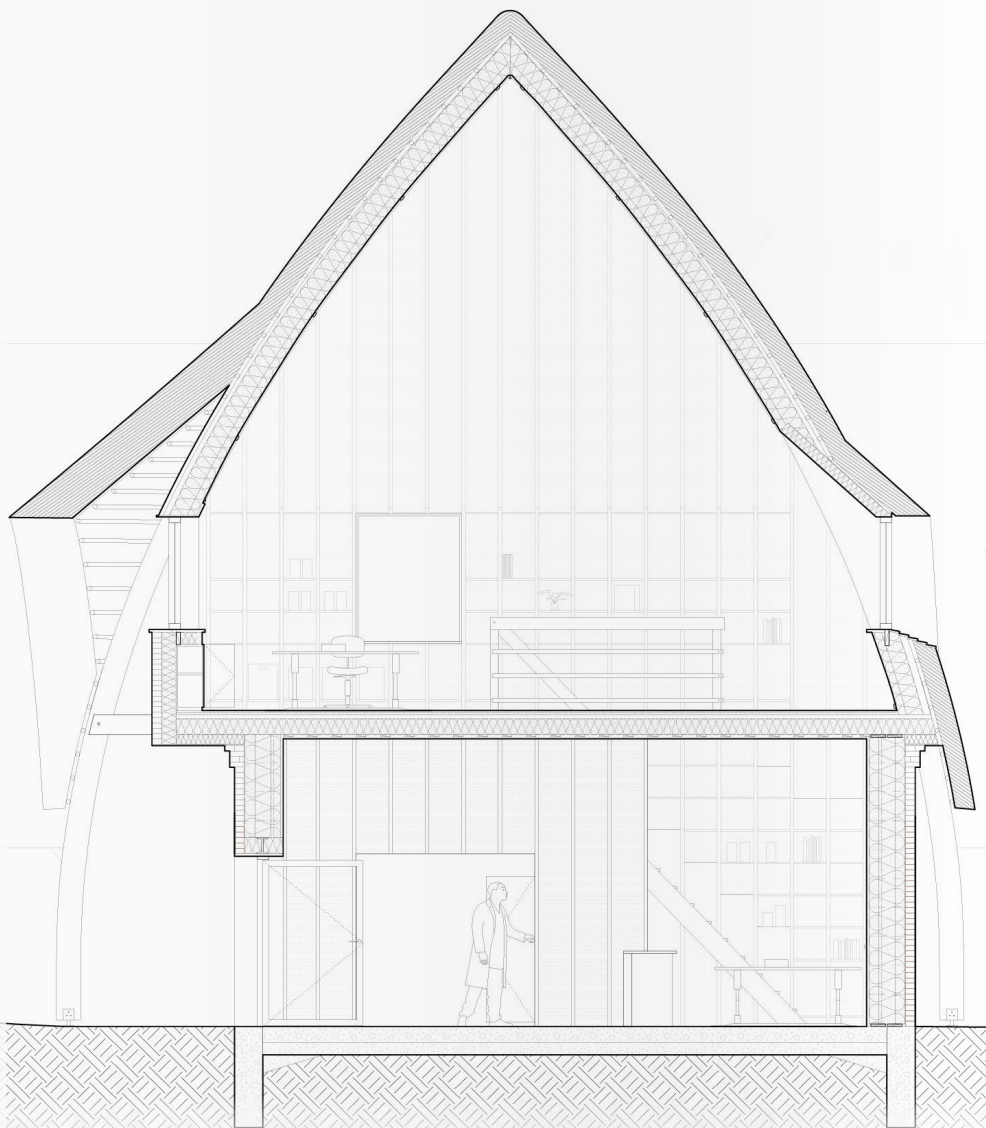
changing room kitchen

sales room office



left *Cutout, section GG.
By author.*

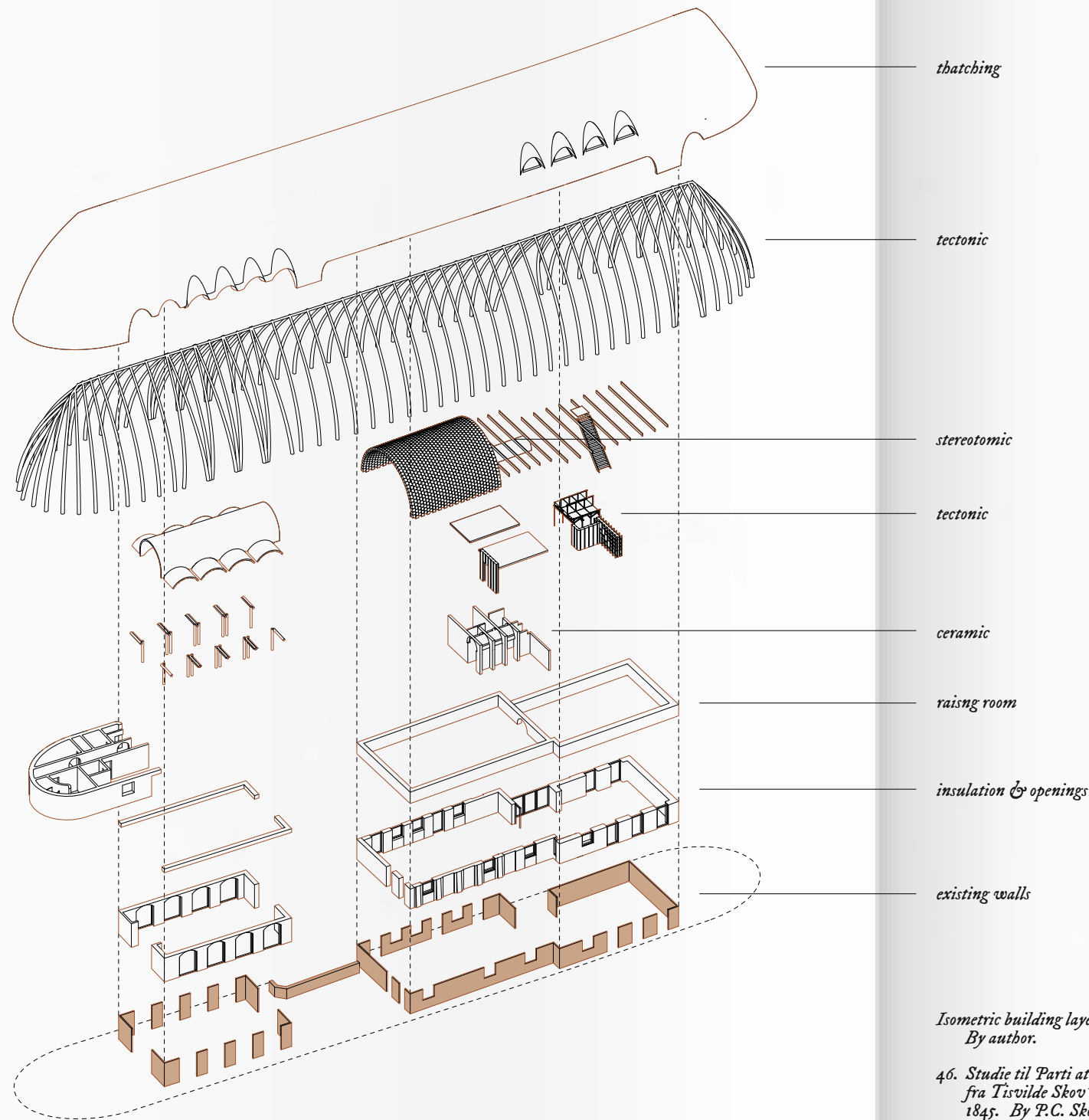
right *Interior render.
By author.*



Transforming the axis

The former administration and service buildings are transformed to accommodate the new and expanded program. The jagged compositions of the volumes is emphasized as the old bricks and the facade openings are kept. The roof and interior, however, are transformed with extra insulation and new aesthetics. Focusing on the 'elite performance' of the materials to curate the rooms specifically to their requirements. Sometimes a large room is required, sometimes a compressed sensation, and sometimes the new aesthetic sparks completely new layers in the building - as the cantilevered roof makes new outdoor sheltered spaces.





thatching

tectonic

stereotomic

tectonic

ceramic

raising room

insulation & openings

existing walls

*Isometric building layers.
By author.*

*46. Studie til Parti at udkanten
fra Tisvilde Skov. 1843-
1845. By P.C. Skovgaard.*

'Elite performance'

The materiality of the rooms seeks to broaden the varied experiences of moving through spaces and functions. From a sheltered exhibition area where the thatch and wooden pillars create a thick vertical canopy. Through the research and administration where a mix of light tectonic spatial dividers and furniture, compliment rounded facade openings of clay plaster.

Moving towards the conference room, the rammed earth walls thicken and compress the space before revealing a large, vaulted ceiling of hemp blocks. The tactile surface of the hemp blocks cushions the sound and makes for great conversations and knowledge sharing.

Opposite the courtyard, another vaulted ceiling structure creates a different atmosphere. Here, the pillars and vaults subdivide the room in smaller niches while the hardened surface reflects sound to create a casual soundscape. Moving further through to the additional building, we are meet by a synergy between free standing rammed earth and a suspended seaweed-paneled ceiling. This is made possible by vertical wood trunks - that also facilitate an attic space above.



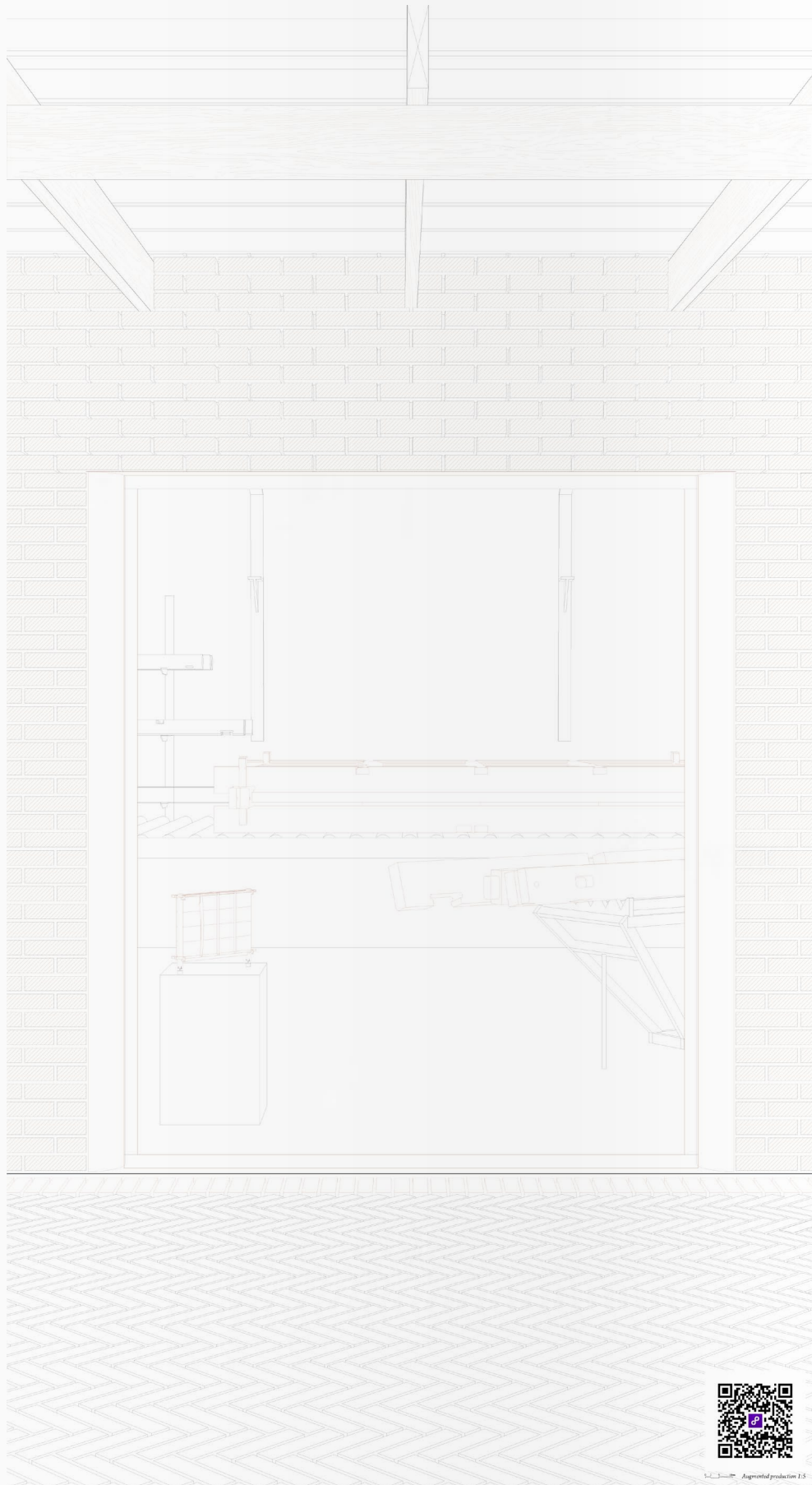
Fig. 46



*Research Render.
By author.*

Developing a new building culture

If we are to implement new ways of constructing sustainable buildings, we also require a place for developing new materials. A place to learn and understand the intrinsic properties of the resources. Testing and developing new products on par with the conventional materials of today. Understanding what the resources can and cannot do. Defining the limits of its scale. Only then can the sustainable building material be certified and used in the commercial erection of buildings. This knowledge can be researched in the buildings laboratory and shared just outside in the exhibition.

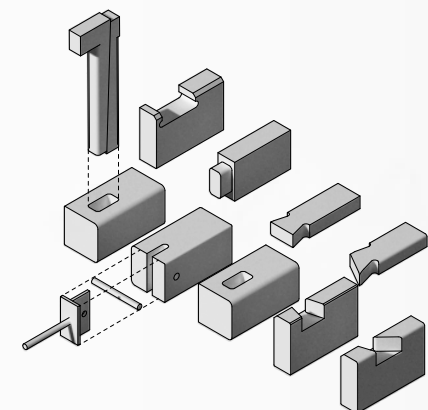


Manufacturing a new building culture

On the topic of new productions, I also think it is worth exploring the relationship between the digital and the analog, as there resides a permanent split between the complex digitized facilities of mass production and the manual labor of the crafts.

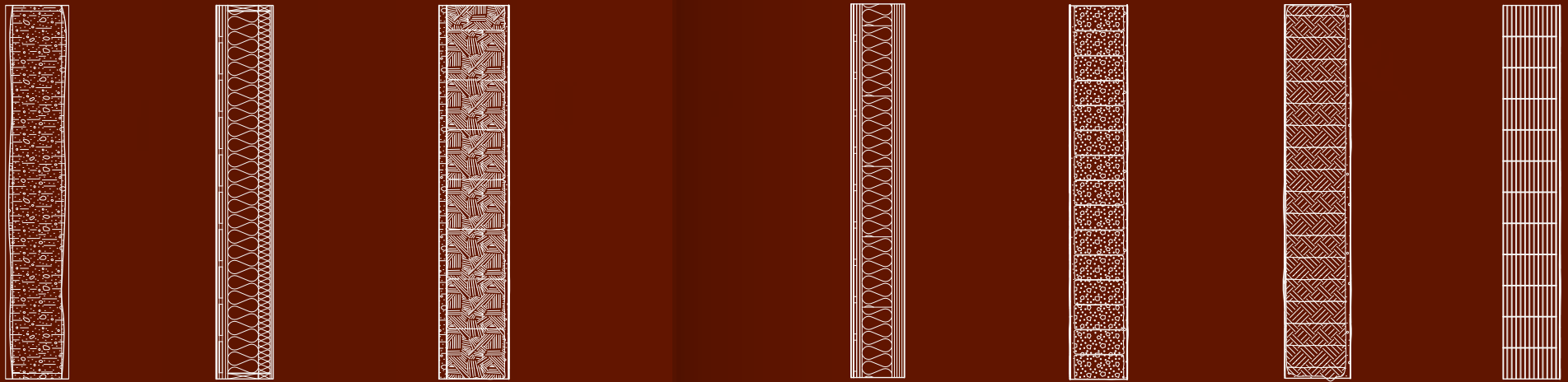
This duality in technique can potentially meet in the manufacturing system of less processed biogenic materials. Materials in which a margin of impression is to be expected. Here, the computational power to grasp complex geometries and datasets can be married with the human hand-to-eye motoric and empiric knowledge of crafting with the body.

Perhaps this is one way of supporting both the traditional craftsmanship of the past, while exploring the sustainable materials of the future. To make use of the intrinsic qualities of varied renewable materials and their 'elite performance' to develop the aesthetics of a new architectural period.



*Augmented reality visualization.
By author.*

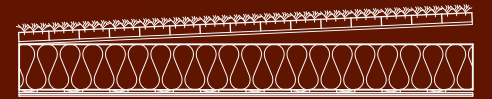
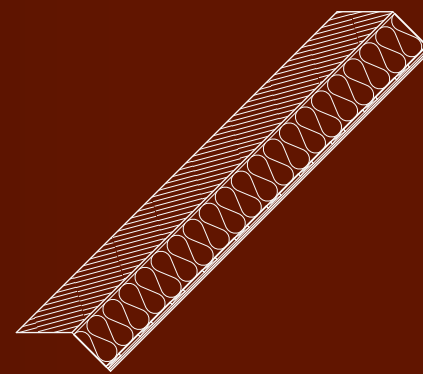
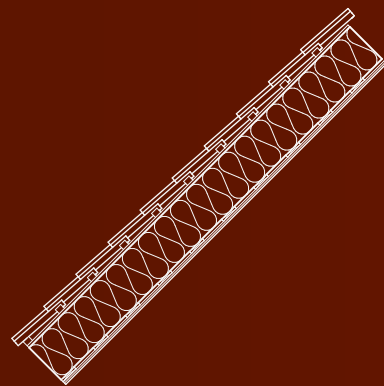
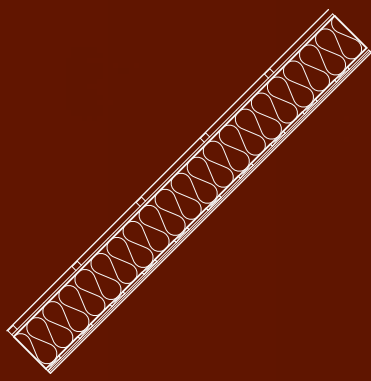
*Fabrication joints.
By author.*



Type	Hessian wall	Timber frame	Straw bale	CLT 100mm	Hempcrete	Rammed earth	Calyblocks
Width	460 mm	460 mm	560 mm	434 mm	468 mm	538 mm	485 mm
Insulation	0,154 μ	0,154 μ	0,143 μ	0,166 μ	0,169 μ	0,2 μ	0,158 μ
GWP	-66,4 kg/m ²	-66,4 kg/m ²	-48,6 kg/m ²	-123,8 kg/m ²	1,9 kg/m ²	11 kg/m ²	72 kg/m ²
Price	557,6 DKK/m ²	557,6 DKK/m ²	398,8 DKK/m ²	1332 DKK/m ²	1350 DKK/m ²	381 DKK/m ²	877 DKK/m ²
Weight							



1:50



Type Sheet roof

Width 435 mm

Insulation 0,137 μ

GWP -27,9 kg/m²

Price 745 DKK/m²

Weight 

Slate roof

Width 475 mm

Insulation 0,137 μ

GWP -25,2 kg/m²

Price 876 DKK/m²

Weight 

Thatch roof

Width 610 mm

Insulation 0,11 μ

GWP -88,7 kg/m²

Price 1228 DKK/m²

Weight 

Sedum roof

Width 465-605 mm

Insulation 0,135 μ

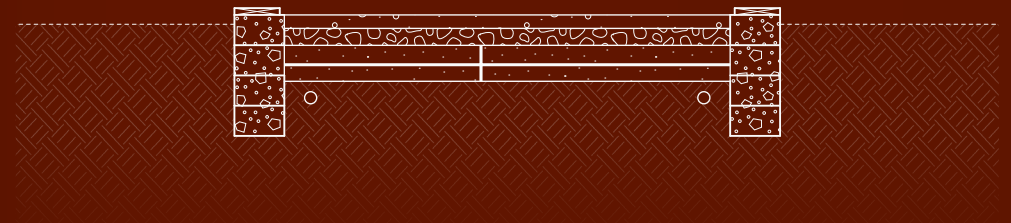
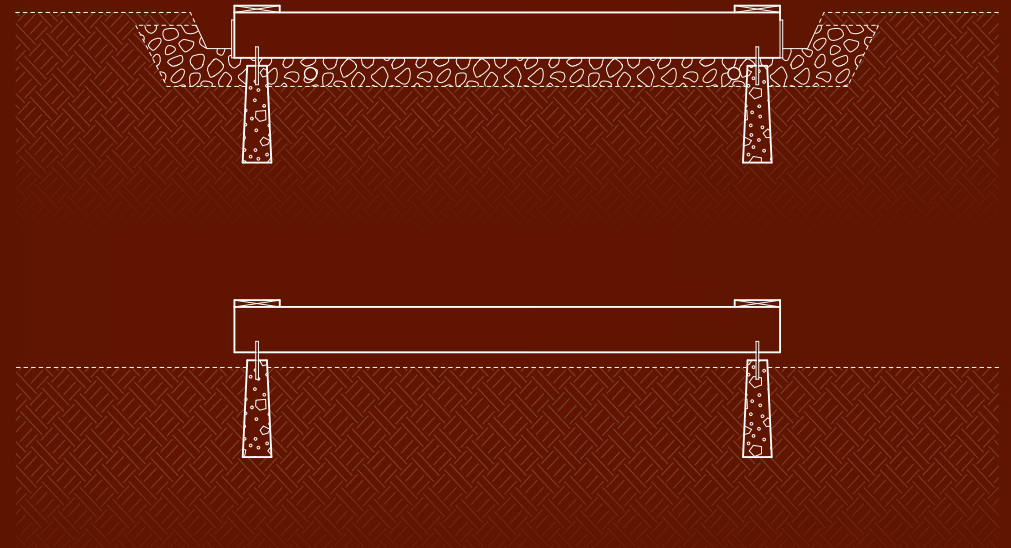
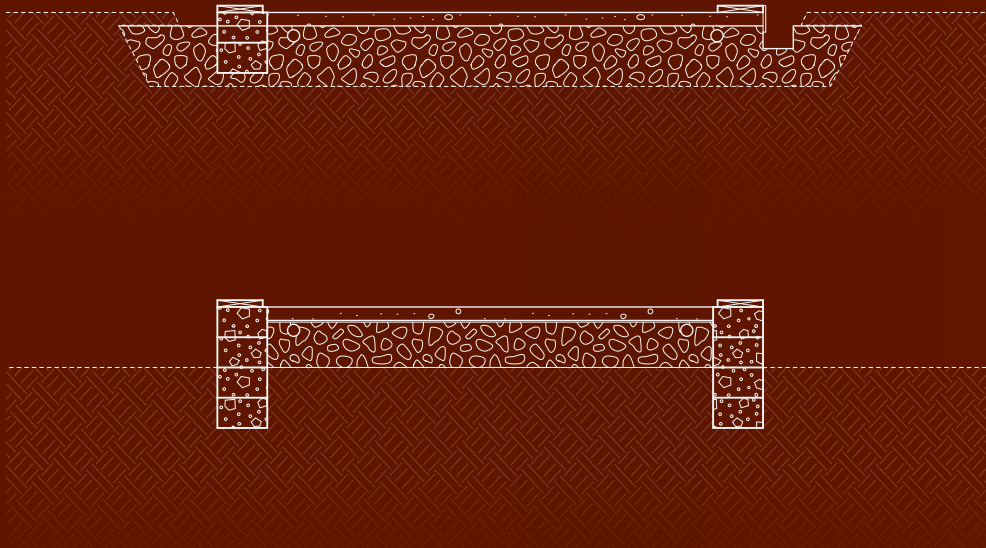
GWP -48,7 kg/m²

Price 1132 DKK/m²

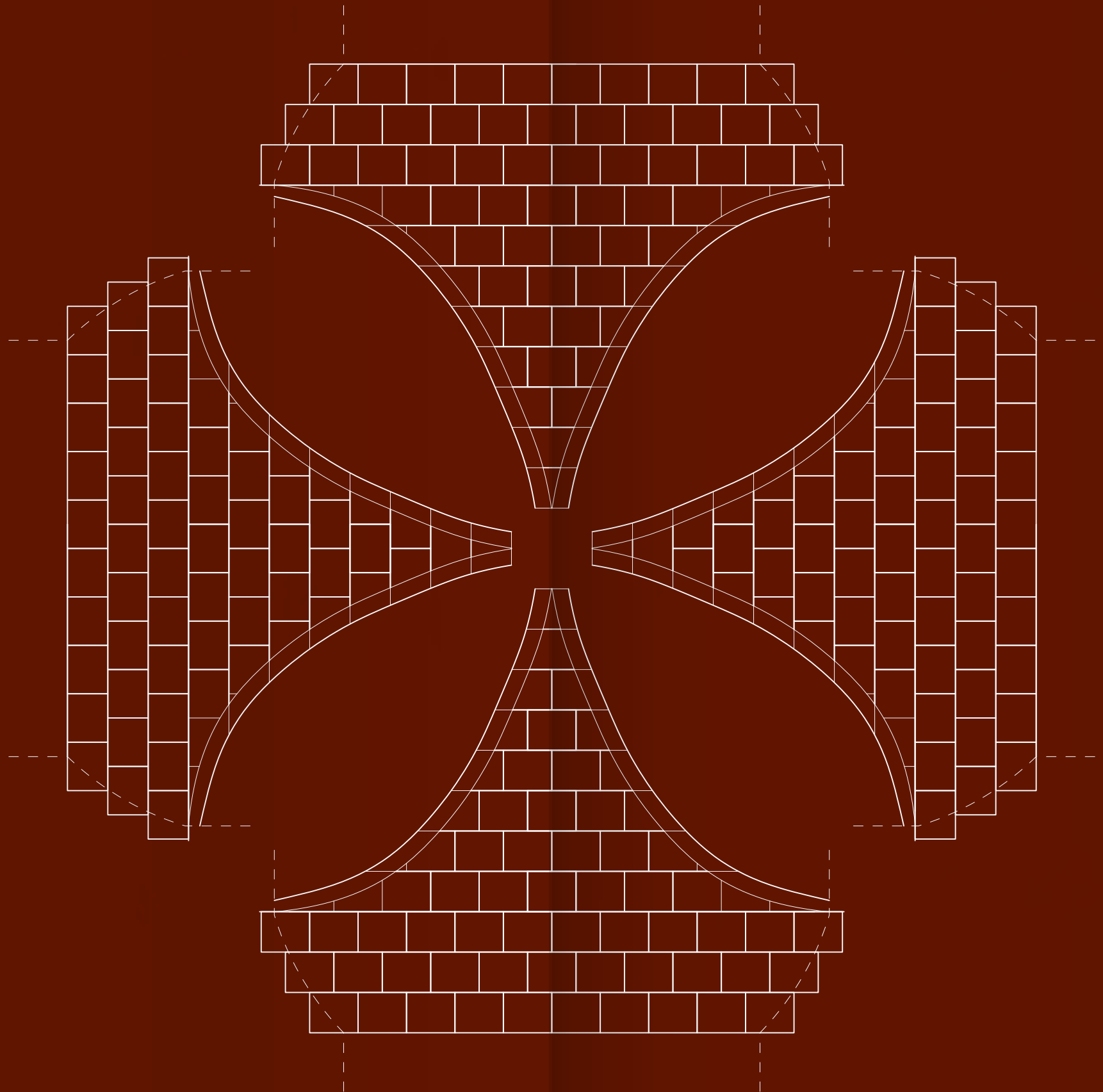
Weight 



1:50



Type	Buried granulate foundation	Raised granulate foundation	Buried point foundation	Raised point foundation	Slab foundation
<i>Insulation</i>	0,14-0,2 μ	0,14-0,2 μ	0,142 μ	0,142 μ	0,134 μ
<i>GWP</i>	8,2 kg/m ²	23,9 kg/m ²	-57,6 kg/m ²	-58,5 kg/m ²	34,9 kg/m ²
<i>Price</i>	174,3 DKK/m ²	262,3 DKK/m ²	735 DKK/m ²	681 DKK/m ²	845 DKK/m ²
<i>Compression strength</i>					



All images by the author unless listed below

- 03 Semper, Gottfried
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- 04 Vegetarian architecture : case studies on building and nature.
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- 13 El Lissitzky's proposed horizontal skyscraper, sketch.
Wolkenbugel: 1923-1925
- 24 Thy national park logo.
Designmanualen for Danmarks Nationalparker 2019.
Thy: Super Schwarz, 2019
- 28 'oversvømmelse'.
Thy: Thylands avis, 1990
- 30 Aerial photograph.
By: Sylvester Jensen Luftfoto, 1951.
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