THE ADAPTIVE BLUEPRINT

OF CHRISTIANIA

ACADEMIC REPORT

MSc04 ARC Group 11, May 2024

A special thank you to the people of Christiania, for their comittment to their values, for their fight for their ethos and for inspiring a diverse and colorful world.

A special thank you to

Mette Prag
Carlo (Carl Oskar Strange)
Joker

for your time and openness towards the project. We wish you good luck with the development of the freetown.

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TITLE SHEET

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Appendix: 17 pages
Design presentation: 25 pages
Assembly guide: 32 pages
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ABSTRACT

This master's thesis embarks on an architectural exploration within the unique context of Christiania, Copenhagen, aiming to fulfill the historical agreement between the Copenhagen Municipality and Christiania to construct 15,000 square metres of social housing by 2030. The study focuses on integrating new structures into the community, emphasising personalisation, adaptation, and the preservation of Christiania's cultural heritage and lifestyle.

The project is divided into three main components: an academic report, a design presentation, and an assembly guide for new residents. The report covers the theoretical and analytical dimensions of the design process, while the presentation includes the final architectural drawings and visualisations. The assembly guide provides a step-by-step method for residents to personalise and adapt their living spaces within the new development.

Ethnographic analysis, sunlight studies, and assessments of outdoor comfort are among the critical aspects informing the design process, aiming to achieve a holistic solution that balances aesthetic, functional, and technical considerations. The design methodology incorporates Integrated Design Process (IDP) principles, as well as Participatory Architecture (PA) and Study-to-design methods. Additionally, AI tools have been utilised both in the design process and as editorial aids.

The final design respects Christiania's history and values, promoting sustainable architecture and fostering a sense of belonging among residents. This thesis contributes to the ongoing development of Christiania by offering a blueprint for social housing that is both expandable and adaptable. The proposed building serves as a model for adaptive architecture, featuring a modular system that can be configured in various ways to meet diverse needs, while the designed urban space creates a ambience that invites to integration between the new and old residents.

READING GUIDE

This master thesis is organised into three distinct reports: an academic report, a design presentation folder, and an adaptive guide.

The academic report serves as the theoretical and analytical component. It introduces the reader to the methodologies employed, the programme, and the design brief. The report documents the design process and finishes with a conclusion and reflections on both the process and the design proposal. Additionally, it includes all references utilised to inform the creative process, and an appendix contains significant calculations.

The design presentation folder focuses on explaining the design proposal to all interested parties. This folder unfolds the project through visual material and contains presentation materials such as floor plans, elevations, and visualisations.

The adaptive guide is an additional part of the design presentation. This serves as a handbook for the users of the building, providing instructions on how to adapt their dwellings with assembly guides and construction details.

Moreover, several terms used in the report require clarification within the context of this project:

Co-building: In this project, this term refers to the collaborative process between the architect and the user, spanning from the initial sketching phase to the completion of the building.

Adaptation: This term describes the process of modifying physical spaces to meet new demands or desires.

Old Christianites / New Christianites: With new residents moving into the area, it was necessary to create a terminology to distinguish between different user groups. 'Old Christianites' refers to individuals already integrated into the community, while 'New Christianites' denotes newcomers. However, it is crucial to note that this terminology is not recommended for use once integration begins.

Reuse / Recycle: Regarding materials, 'reused materials' refers to items that have been repurposed without undergoing chemical transformation, unlike recycling. For instance, a wooden facade can be reused as furniture, whereas steel frames can be recycled into new building materials.

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1 PROLOGUE

In this first section, the Prologue, the reader will receive an introduction to the project, which will lead to an initial problem statement forming the foundation of this master's thesis. Furthermore, various methodologies will be explained, starting with the Integrated Design Process and followed by other methods used throughout the project. An explanation of the different methods and how they are used will conclude this section.

INTRODUCTION AND MOTIVATION

Identity in architecture is a broad term, encompassing different cultures, periods, art, ideals, and more. It's a complex concept discussed in the architectural community, yet easily recognisable when a house has character versus when it doesn't. The term varies in meaning based on individual perspectives and philosophies. In architecture, identity reflects the characteristics of the community where it originates, tied to geography, traditions, and local knowledge, enabling the distinction of architectural elements (Torabi and Berahman, 2013). Thus, identity is inevitable in communities that connect their built environment with the buildings.

Why, then, do multi-story housings often lack identity? Many new buildings in Denmark lack the detail and craftsmanship of older ones, such as intricately detailed lintels and finely made cornices. The identity of these buildings is their lack of character, as contemporary masons rarely showcase their craft. It requires dedicated architects to insist on detailed designs. Since the 1960s, especially in social housing, many projects lack detail, using prefabricated elements for economic reasons, which compromises architectural quality and character. Similar issues exist in smaller detached housing, where lightweight concrete blocks are used structurally with brick as exterior cladding.

Christiania in Copenhagen is a prominent example of identity and expression. Established in 1971, it is home to diverse people rooted in an anarchist approach to life, reflected in its unique architecture. Despite not complying with building regulations, various shapes and solutions have been created, expressing residents' needs. However, in 2022, Christiania agreed to build 15.000 square metres of social housing as part of a municipal strategy to address Copenhagen's housing crisis. This agreement raises questions about the future identity of Christiania, as integrating social housing could alter its dynamics. Social housing typically requires a new organisational structure, which must fit within Christiania's existing political framework to ensure its survival.

A design space must exist where Christiania's character intersects with the efficiency of prefabrication, necessitating collaboration between occupants, the built environment, and architects. This thesis proposes new structures for Christiania, aiming to maintain a coherent society where every citizen can express themselves, particularly in their dwellings.

INITIAL PROBLEM STATEMENT

How can one build social housing into the existing structures of Chritsiania?

IDP.

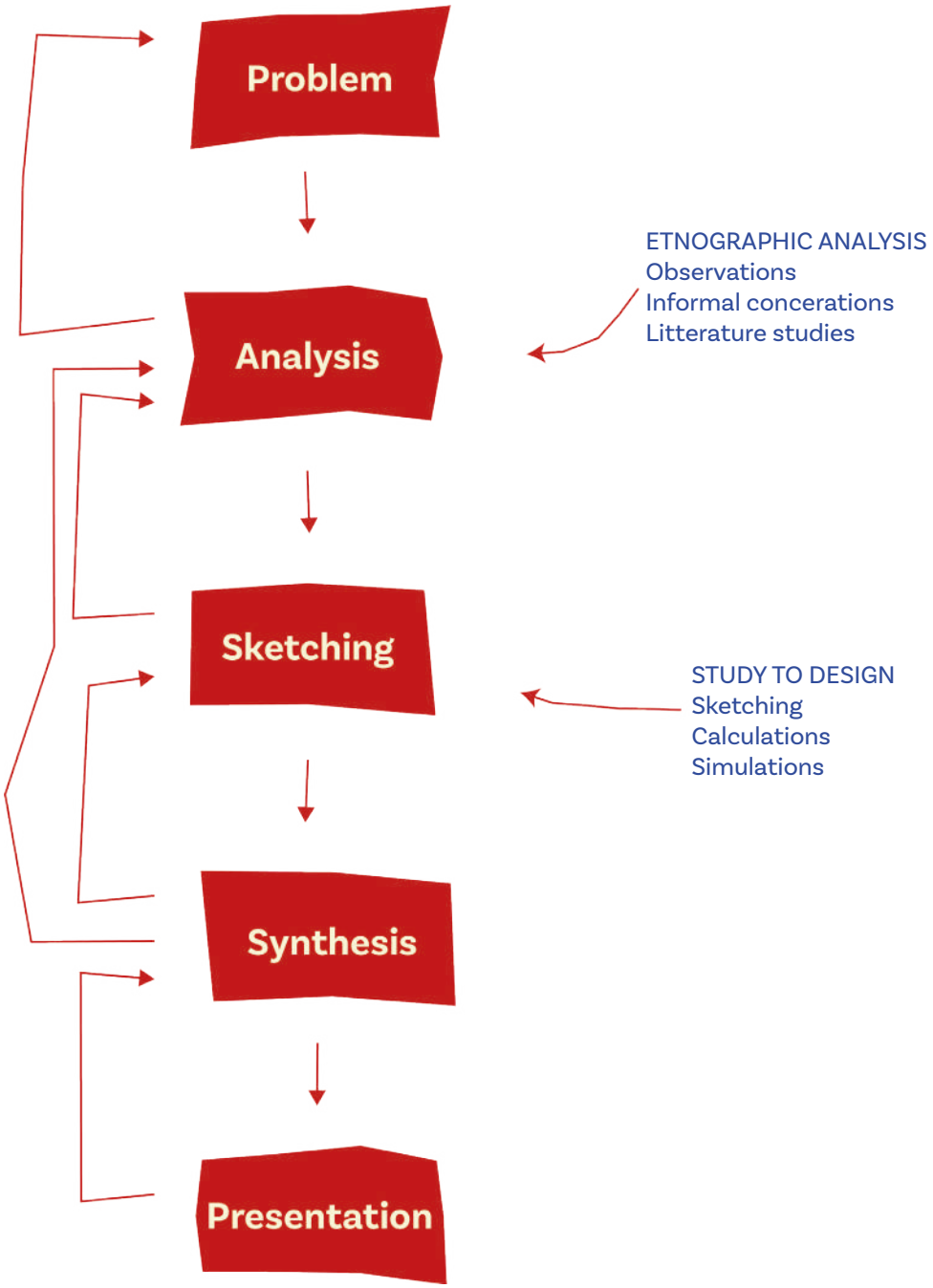
METHODOLOGY

The Integrated Design Process

The project will adopt the Integrated Design Process (IDP) as its methodology, emphasising the intersection between architecture and engineering. This approach revolves around an iterative process, where the design evolves through multiple cycles, not limited to the act of designing alone. The process also involves continuous analysis and synthesis of the design, taking into consideration perspectives from users, engineers, and developers (Hansen, HTR & Knudstrup, 2005).

The foundation of the IDP will be consistently applied throughout the project, involving ongoing analysis, design refinement, synthesis, and a concrete definition of the problem at hand. The underlying philosophy acknowledges that the authors are in a continual process of gaining insights into the project. This awareness of evolving understanding will be reflected in the project's development, ensuring that the design remains dynamic and responsive to the evolving perspectives and insights gained throughout the project.

Throughout the process, other methods will be implemented alongside IDP. Participatory Architecture (PA) inspires the process to be more user-oriented design as well as analysing the participation of the design. Ethnographic studies and observations help to analyse and understand the everyday life of Christianites in order to help further their needs and identity. Study-to-design pushes the architect in the sketching phase to explore other options and as well as to synthesis the design. These methodologies fall into different phases within the IDP, as to their use within the process, and as such are mostly delegated to singular phases of this structure.



Illu. 01. The IDP-process

PA.

METHOD

Participatory Architecture

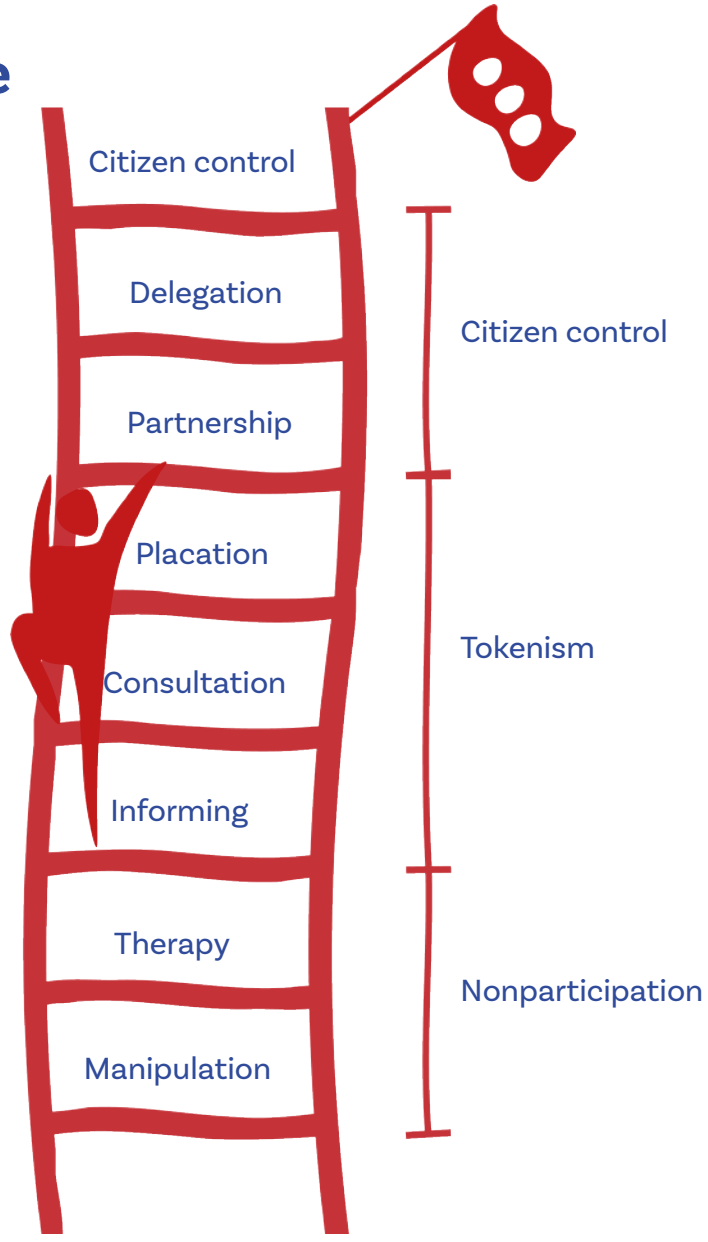
Participatory Architecture (PA) embodies the democratisation of architectural design processes, offering an alternative way of designing (Sanoff, 2010). The central tenet of PA revolves around returning power to the users, transforming the once-static notion of spaces into dynamic, ever-evolving environments. (Luck, 2018)

While PA shares commonalities with movements like DIY, informal urbanism, and architecture without architects, it distinguishes itself by prioritising the community over individual agency. Consequently, PA serves as a valuable tool for fostering strong relationships within communities, acting as a catalyst for co-designing processes. (Luck, 2018)

One method for assessing Citizen Participation is through the lens of Arnstein's Ladder of Citizen Participation, an eight-step continuum that spans from manipulation to Citizen control, based on the level of user involvement. (Arnstein, 1969) At the lowest end, non-participation means users have little to no say. Moving up, tokenism offers symbolic influence but lacks real engagement. Further up the ladder, Citizen control increases, signaling active involvement where users can even act as architects, shaping the project centrally. (Arnstein, 1969)

Given the exhaustive nature of PA, involving active workshops and engagement with numerous stakeholders, and the contemporary time at Christiania, it will not be feasible for this project to involve Christiania in initiating a PA process. Christiania, being a community deeply rooted in consensus as a fundamental value, has already embarked on its own Participatory Design (PD) process, emphasising the importance of reaching a collective agreement.

Therefore, this thesis will focus on creating a design that allows user modification, either during or after construction and the concept of freedom of expression will guide this approach. Due to time constraints and limited access to users, the focus will be on developing a concept that facilitates user involvement and that ensures that the design reflects Christiania's community values and preferences. This imposes a significant task on the architect to gather comprehensive data and phenomenological experiences from the field. For an explanation on the ethnographic methods employed, see section ETNO at page 15.



Illu. 02. Christiania in the ladder of PA

ETNO.

Illu. 03. An explorer

METHOD

Ethnographic analysis

Due to the informal organisational structure of Christiania, qualitative data are hard to collect and an ethnographic approach has been conducted to gain insights into the identity, culture, and everyday life of Christiania. This ethnographic method collects and analyses quantitative data on the social behaviour of humans. The studies have their offset in observations and interviews, along with archival research, as an attempt to understand the surrounding area (University of Virginia, 2021). This approach is common within the architectural field, aiding architects in understanding the symbiosis between built environments and human existence.

In this project, informal conversations with residents of Christiania, along with the analysis of documentaries and phenomenological data from observations, will create the foundation for developing an understanding of everyday life and the people living in the community. However, it's crucial to acknowledge the complexity of distilling a comprehensive narrative from empirical experiences in Christiania, given its tradition of honouring every individual's voice. As one resident aptly puts it, "Over nine hundred people are living here, which means there are over nine hundred answers and opinions." (Joker, 2024)

Moreover, amidst the ongoing transformation of Christiania, residents contend with a multitude of effects on their livelihoods and emotional well-being. The inundation of media attention and tourist inquiries has resulted in widespread fatigue among the populace, impeding efforts to recruit participants for the project. Consequently, reliance on observation rather than interviews becomes necessary, despite initial intentions.

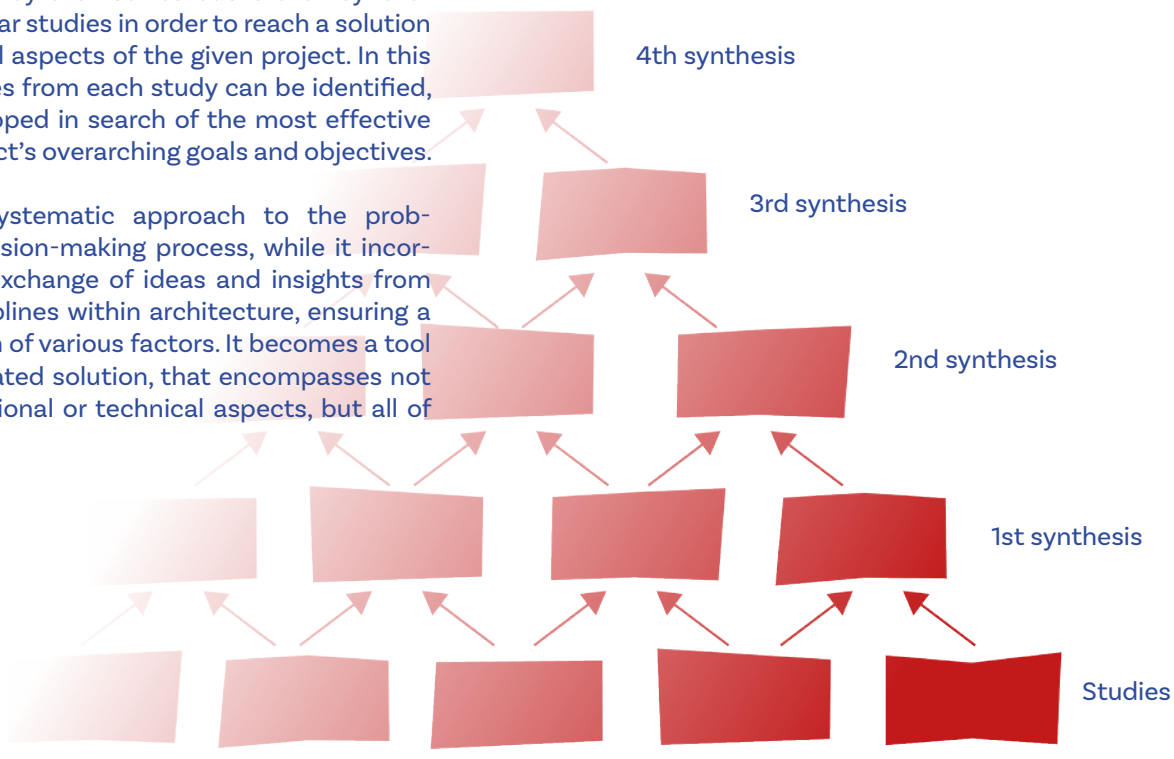
S-D.

METHOD

Study to design

In pursuit of a thorough understanding and effective resolution to the challenges inherent in the project, an approach that synthesises various critical aspects has been implemented. This is to recognise the multifaceted nature of the endeavour undertaken and to prioritise the synthesis of diverse perspectives. Specifically, this focuses on the generation of multiple alternatives, with specific focus on one aspect – sunlight, outdoor comfort, etc. – to find the best-suited candidate in that category. These studies can not be implemented by themselves but is then synthesised with other similar studies in order to reach a solution that encompasses all aspects of the given project. In this way, the best qualities from each study can be identified, extracted and developed in search of the most effective solution for the project's overarching goals and objectives.

This facilitates a systematic approach to the problem-solving and decision-making process, while it incorporates a dynamic exchange of ideas and insights from many different disciplines within architecture, ensuring a holistic consideration of various factors. It becomes a tool to develop an integrated solution, that encompasses not only aesthetic, functional or technical aspects, but all of them as a whole.



Illu. 04. Study to desig, diagram

AI.

METHOD

AI as an editor and helping hand

In a constantly evolving world driven by technological advancements, the integration of technology becomes indispensable. With the emergence of AI, designers and students alike are compelled to adapt and evolve alongside it. In the project, AI, particularly in the form of Language model AI such as ChatGPT, is predominantly utilised during the presentation phase, serving as both an assistant and editor. Specifically, the group employs AI to refine and augment the self-generated materials, whether it involves clarifying text or imbuing it with emotional depth. This collaboration with AI streamlines the editing process, ensuring coherence and precision across the report.

Furthermore, AI contributes to the initial stages of design by expediting the generation of ideas. These lists encompass various aspects, from compiling sustainable practices for housing construction to brainstorming strategies for enhancing community engagement. AI serves as a swift and efficient tool for generating a plethora of ideas, which are subsequently scrutinised and evaluated by the team.

Moreover, AI has successfully created details as parts of an illustration. In this context, the program Photoshop has been particularly helpful in generating the missing visualisations.

The following report has been edited or supported by AI. Nevertheless, the group has consistently approached the AI-generated results with a critical perspective.

Illu. 05. AI as an personal assistant

2 PROGRAM

This next chapter describes the program which ultimately ends in the design brief for the thesis. Here, the project delves deeper into the physical and theoretical framework surrounding the project. This is done in three parts, that describes, analyses and concludes on different themes and aspects that relate to the project. Specifically, this encompasses the Freetown of Christiania, the theme of communal architecture and the specific site within Christiania, which will be further explained and analysed.

2.1 CHRISTIANIA

PROGRAM

In this section, readers will be introduced to the Christiania itself. It delves into the existing structures within the Freetown, both in terms of physical structures such as buildings, but also the configuration of power structures, rental systems, and the history that shaped life within this anarchistic community.

Illu. 06. The area of Christiania, Copenhagen. 1:10 000

THE HISTORY OF CHRISTIANIA

For much of its history, Christiania has been marked by conflict, stemming from its origins as a refuge for rebellious youth in the 1960s. The occupation of abandoned military barracks in Christianshavn by squatters sought liberation, attracting around 150 individuals to this newly seized territory.

Anarchy prevailed during Christiania's early years as more people settled into the vacant homes scattered throughout the area, while authorities hesitated to intervene. Uncertainty loomed over the sustainability of this dream, but aspirations for the area continued to expand, culminating in Christiania's establishment on September 26, 1971. As residents began improving existing structures, the necessity for communal rules became apparent. However, initial attempts at organising community meetings often devolved into chaos due to conflicting voices.

The threat of eviction persisted during the initial years, with successive governments holding varying stances on the enclave's fate. Despite protests advocating for Christiania's preservation, the government devised a 10-point plan mandating the demolition of illegal structures, citizen registration, and payment of a "utilisation rent" for utilities. Christiania became a testing ground for alternative housing models and collective autonomy, albeit brief respite as municipal authorities pursued alternative plans.

From 1974 to 1979, Christianites faced imminent eviction amidst conservative government agendas (Lauritsen, 2002). Legal battles ensued as residents contested plans to demolish newly erected buildings, garnering public support through civic initiatives. Although legal victories were elusive, public sentiment against demolition forced the government to allow Christiania to persist under existing conditions.

Illegal drug activity, particularly the hashish trade, has long been intertwined with Christiania's narrative, despite efforts to combat hard drug use by illegalising hard drugs from the start (Lauritsen, 2002). The influx of drug dealers and conflicts with biker gangs like Bullshit heightened tensions, culminating in violence and murder. The bikers get arrested and since then biker gangs have been banned from Christiania, but the sale of hash is still rampant. So much so, that they erected "the wall", to combat the aggressive environment by the main entrance, where they walled off all access and moved the sale of hash to what is known as "Pusher Street".

Efforts to legalise Christiania have been ongoing, with both sides struggling to reconcile differing visions for the future. Contentious issues such as the regulation of hashish trade and taxation exemptions have impeded progress. In 2002, the government issued an ultimatum demanding an end to the hashish trade, illegal construction, and fencing. Subsequent revisions in 2004 aimed to normalise Christiania while preserving its alternative lifestyle, leading to continued resistance from its residents. (Lauritsen, 2002)

In 2011, a pivotal agreement between Christiania and the Agency for Culture and Palaces paved the way for the enclave's autonomy (Bladt, 2015). Through a foundation, residents secured ownership of land and buildings within central Christiania, enabling them to manage and maintain the area independently without municipal interference. This landmark agreement, facilitated by loans and public investment, marked a significant step towards securing Christiania's future.

1971

Illu. 07. When the fences surrounding Christiania were forced down in 1971

from 1987

Illu. 08. Riot Police patrolling

2011

Illu. 09. Christiania offers the possibility of becoming more independent

1960's
The youth rebellion rages on

May 1972
The first agreement is made, making the citizens of Christiania pay for electricity and water

Early summer 1973
Christiania is appointed as a social experiment with new ways of living, collective right of use and autonomy

June 1979
The minister of defense declares, that Christiania can continue existing on more exact conditions, as long as the area is not needed for the army

1979 - 2002
The severity of drug dealing in Christiania rises, because biker gangs move into the area. Later, after a body is found, they are forced out, but the narcotics still linger. Several initiatives are put into place by the citizen of Christiania, like the Junkblockade, and "The Wall", as they did not want hardcore drugs. To establish a more specific collaboration with the government the "Christiania law" is passed, and the Christiania secretariat is made. Still, the government later puts forth an ultimatum, that makes Christiania put a stop to all drug dealing, fencing and illegal building.

2004
A new law to promote normalisation and legalisation of Christiania is passed, which means renovations of protected buildings and the demolition of illegal buildings

2011
A deal is made with the the agency for culture and palaces, that made it possible for Christiania to buy the area for themselves

2012
The Christiania foundation buys the downtown area and becomes the official owner

THE CONTEMPORARY CHRISTIANIA

Ten years after the initial agreement to purchase part of Christiania, negotiations were reopened, resulting in the Supplemental Agreement on August 30, 2022. Under this agreement, Christianites committed to implementing a comprehensive development plan for the area, including the construction of 15,000 m2 of social housing, extensive renovations to existing buildings, and collaboration on crime prevention measures. This agreement also paved the way for the Christiania Foundation to acquire the remaining ramparts of Christiania, furthering their autonomy. (Social- og boligstyrelsen, 2022)

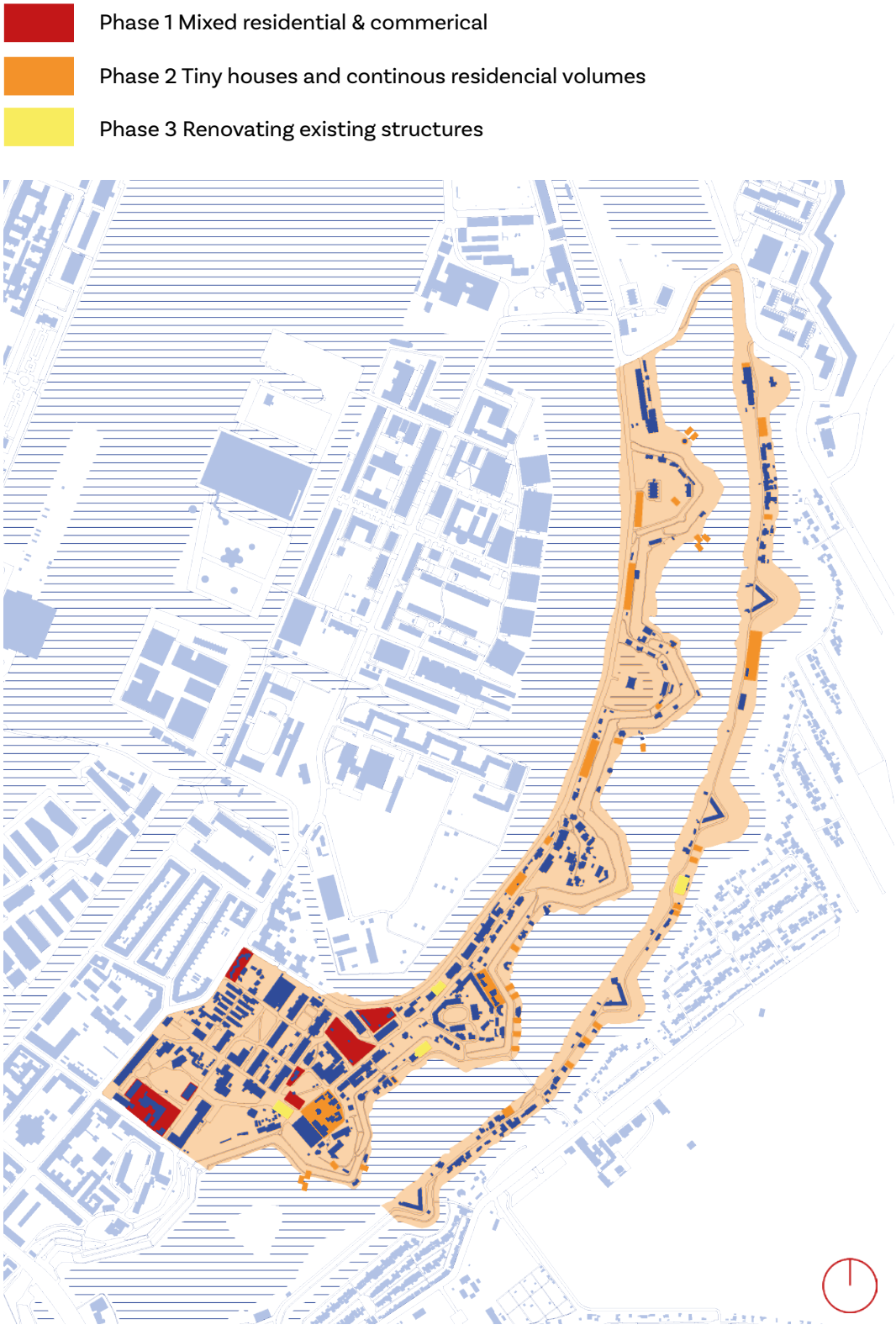
The initial agreement faced criticism from Christianites, who felt it favoured government interests and was enforced under the threat of eviction and demolition of Christiania's buildings, which technically remain on government-owned land. (Joker , 2024)

However, as promised in the supplemental agreement, in the last couple of years the Christianites have put a big effort into renovating and making many of their illegal dwellings, legal and heightening the quality of indoor comfort. (Prag, 2024) Furthermore, in conjunction with the supplemental agreement, a preliminary plan for phased implementation of new social housing has been developed, allocating different building plots for various projects, including tiny houses, contiguous volumes, and mixed residential-commercial buildings, see illustration 11.

Moreover, as of the 1st of April 2024, Christiania is in the process of a significant transformation, particularly in the Downtown area, centred around Pusher Street. A Participatory Architecture (PA) process involving residents, architectural firms, artists, and other stakeholders has been initiated to guide this transformation. The plan envisions a revitalised Pusher Street with a large dome, studios, workshops, residences, and seating areas, guided by themes of creating vibrancy, establishing destination appeal, and enhancing physical settings. (Vandkunsten et al., 2024)

The renovation of Pusher Street is outlined in four key steps, starting in April 2024: regaining control, site activation, sustaining momentum, and converting temporary structures into permanent ones. This comprehensive approach reflects Christiania's commitment to positive change, community involvement, and the long-term enhancement of Pusher Street. (Vandkunsten et al., 2024)

Illu. 10. Pusher street



Illu. 11. Devolopment plan for Christiania, 1:10 000

Illu. 12. Former Pusher Street, photo taken 8th of April 2024

TODAYS CHANGES AND TRANSFORMATION OF CHRISTIANIA

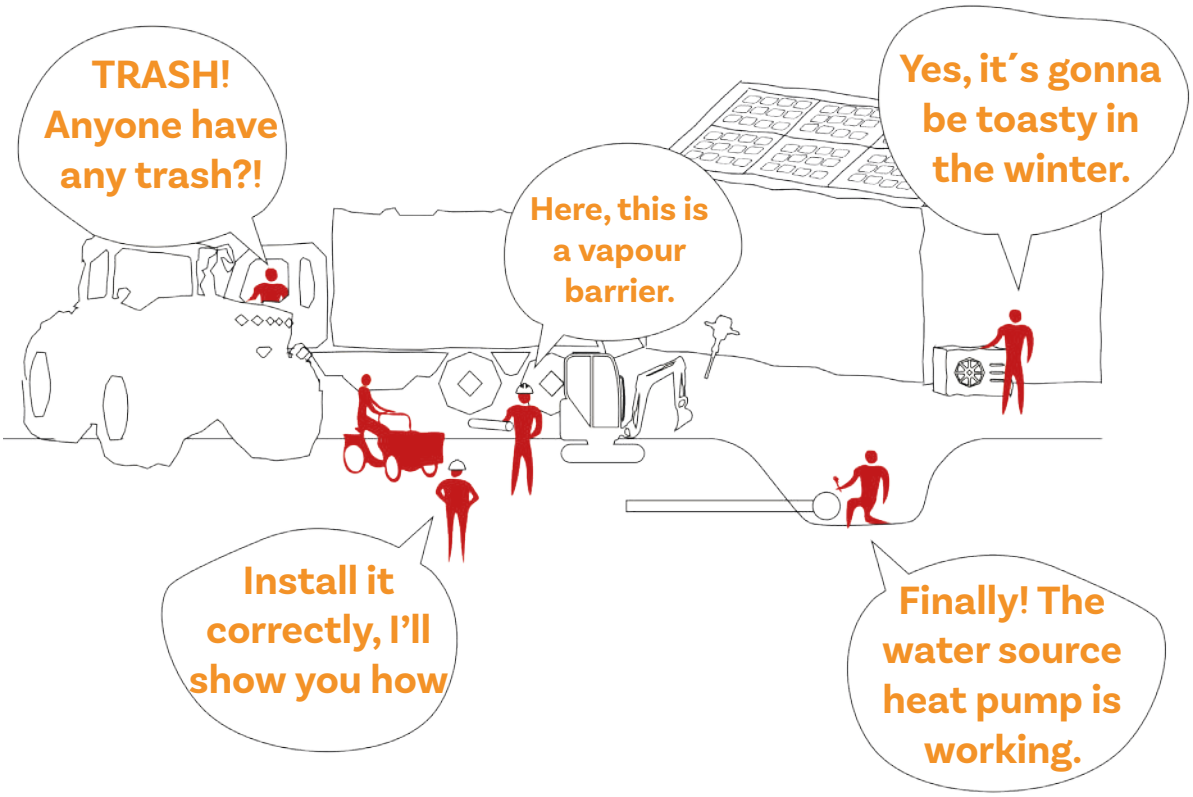
In these years Christiania is transforming. This is evident with the removal of Pusher Street and alterations to the downtown area, as well as in conversation with the existing Christianites. Christiania is always evolving and transforming, and within a few years, the demographic shifts will become apparent due to two key factors.

Firstly, an ageing demographic within Christiania faces the challenge of shouldering the responsibilities of their homes, compelling many to relocate (Andersen, 2016). These individuals, deeply woven into Christiania, have contributed significantly to its establishment and resilience over time. Due to their age, and the societal structure of Christiania, these residents have to move by necessity. “Sadly I had to relocate my neighbour to the local retirement home, even if he didn´t want to.” (Prag, 2024). There exists a need for new, low-maintenance homes for the elderly of Christiania.

Secondly, the supplemental agreement forecasts an influx of newcomers to Christiania. Today, it is estimated that approximately 900 people live in Christiania (Prag, 2024). Although specifics regarding the expected population increase remain vague in the supplement agreement, it could potentially result in a roughly 30% growth. The integration of these “new” Christianites will be crucial to preserving and upholding the community’s traditions and values. However, conversations with current residents reveal a generally positive outlook on new arrivals, viewing them as catalysts for Christiania’s growth and development. This emphasises their idea of avoiding any division into “A” and “B” Christianites. (Strange, 2024)

With the new building volumes being built, there is a need for buildings adapted to elderly people. In these cases, there would need to be a focus on dwellings that would already be able to accommodate these residents. Moreover, the new buildings should possess communal qualities to secure the integration of the more experienced Christianites and the less experienced in the community. There must not erupt a schism between the old and new residents in order for Christiania to survive as a society. Both user groups should be mandated to undergo the application procedure established within the Christiania framework to secure residency as they exhibit disparate requirements and levels of familiarity with the community’s norms and practices.

Through architectural interventions, the design can facilitate the integration of these user groups. Emphasis should be placed on engendering spaces conducive to both formal and informal interactions. Moreover, the design ought to offer residences characterised by low maintenance demands, coupled with flexibility in spatial configurations to accommodate evolving needs over time.



Illu. 13. The independent Christiania

THE INDEPENDENT FREETOWN

CHRISTIANIA

When Christiania initially claimed the old military bases, they established a self-contained community, detached from the outside world. Over time, they have progressed, securing access to necessities such as heat and water in their own houses. The independence is thriving as technology to produce energy gets more affordable. As of today, Christiania generates its own energy, employing independent heat pumps, and promoting the installation of solar panels, and utilising water energy for district heating, all locally sourced. (Prag, 2024)

Independence extends beyond energy, constituting a cornerstone of Christiania's history. They have, throughout time, developed their own garbage service, recycling center, garbage sorting, construction office, and secretariat, effectively managing internal affairs. An architect oversees the development, while skilled craftsmen handle renovations and infrastructure, with materials sourced from local recycling centers. The tradition of co-building is strong and evidenced by communal work weekends dedicated to enhancing Christiania. They also have a local health center with a focus on natural products. Furthermore, they have their weekly newspaper. (Prag, 2024)

Christiania has over the years evolved into a well-organised state within Denmark, with its own form of ministries, here it is called work groups, each focusing on specific areas such as transportation or green spaces. In terms of rent, they have developed their own economic structure. Residents contribute 35 kr per square meter as a right-of-use fee, not owning or renting the place but paying to live there. The fee they pay covers the communal expenses but the house they live in is owned by Christiania, however, the building structure is the resident's responsibility. "It is fun that I can go and buy some nails and a wooden plank, for my own money. But the second I nail it to the building, it is not in my possession anymore." (Joker, 2024.) This creates some of the lowest rents in Copenhagen, along with residences offering the possibility of adaptation and a lot of flexibility for its users.

After careful observation, it is clear that Christiania's independence stands as an external core value, which should be integral to its vision for the future. Additionally, cooperation is expressed as an internal core value within the community and is as important to incorporate into the design.

HOUSING AT CHRISTIANIA

Generally, in Denmark, there exist four common residential types, private rental, owner-occupied dwelling, cooperative housing, and social housing. All possess different admission restrictions, valid laws and rules, and most importantly prices. (Københavns kommune, 2022) The parameters for different housing types are illustrated in illustration 14, comparing the influence of Income, Network, Time/Patience and Financing.

The private rental is owned by a landlord, who owns the property. This can be either individual people or professional landlords, and they determine who can rent. Both parties enter a lease agreement upon moving in, that establishes the rights and obligations of the landlord and tenant which usually include maintenance of the interior. In this section, the most imporant factor is the the economic, as well as some degree of networking.

Owner-occupied dwellings are for those who have the financial means to buy their own. These properties are owned by the people occupying them, which means they have full right of disposal for the entire property. As for the private rental, here the economic factor is imperative.

The primary responsibilities of a cooperative housing association are to buy, own, and manage a property in which the members of the association live. In this type of cooperative housing, all residents own a share of the assets and have the right to live in one of the units on this property. To get in touch with this system, one has to have some patience along with a strong network.

Lastly, social housing is a type of rental, where the properties are owned by a nonprofit organisation, and managed by the residents as well. This means no profit is made from the property and the rent only covers the utilities and maintenance. These units are based on waiting lists, which are open to everyone and patience is the key. (Københavns kommune, 2022)

The situation in Christiania is a little bit different when one wants to live here. All houses are organised within one of the 15 communities, that manage their own area of Christiana. Whenever there is a vacant dwelling, they post it in their local newspaper and on their website, and whoever wants to apply can. It is then up to the community in the area, to decide who gets to move in. It can both be outsiders and insiders, but the decision lies on the people already living in the area. (Prag, 2024) This also means that they consider the match between the dwelling and the applicant. There are not as many laws and governing rules and one's network can be more important than in other kinds of housing because you would have an advantage if you know any Christianites. Otherwise, the fastest way to move in is by becoming romantically involved with one of the existing residents. (Strange, 2024)

Another very specific thing to Christiania is the fact that rent is not in itself a thing. The residents of the different dwellings pay something they call "Right of use". It is a small fee based on the size of the dwelling and is a very small fee per square meter. This covers only the rights to use the actual physical space as the occupant does not own anything, but they still commit to maintenance, renovation, or other necessary changes to the dwelling. (Prag, 2024)

Through analysis of the various residential types, it becomes evident that networking plays a crucial role in securing an apartment in Christiana. In order to seamlessly integrate new buildings into the community, it can be inferred that the residential type should align with existing structures in Christiana. However, to fully comply with the Supplement Agreement, the residential buildings should draw inspiration from the constraints and regulations of social housing.

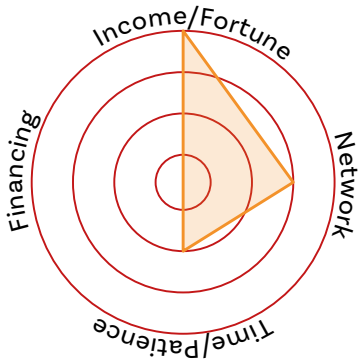
Income/Fortune, the ability to take a high loan or pay a higher rent

Network, the potential of your relationship/network to find a dwelling

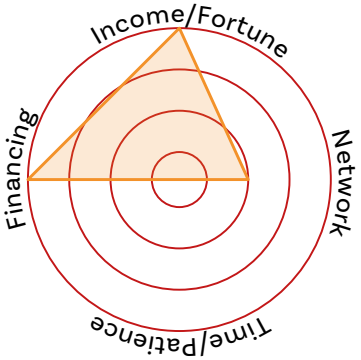
Time/Patience, how long time one needs to wait for availabe dwelling

Financing, governmental rules concerning bank loans

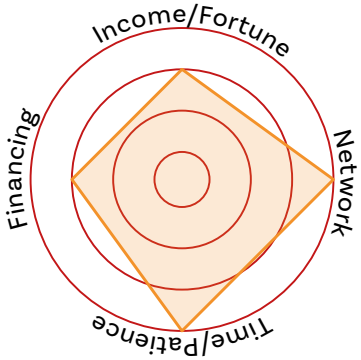
PRIVATE RENTAL



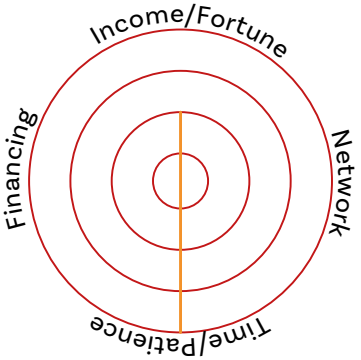
OWNER-OCCUPIED DWELLING



COOPERATIVE HOUSING

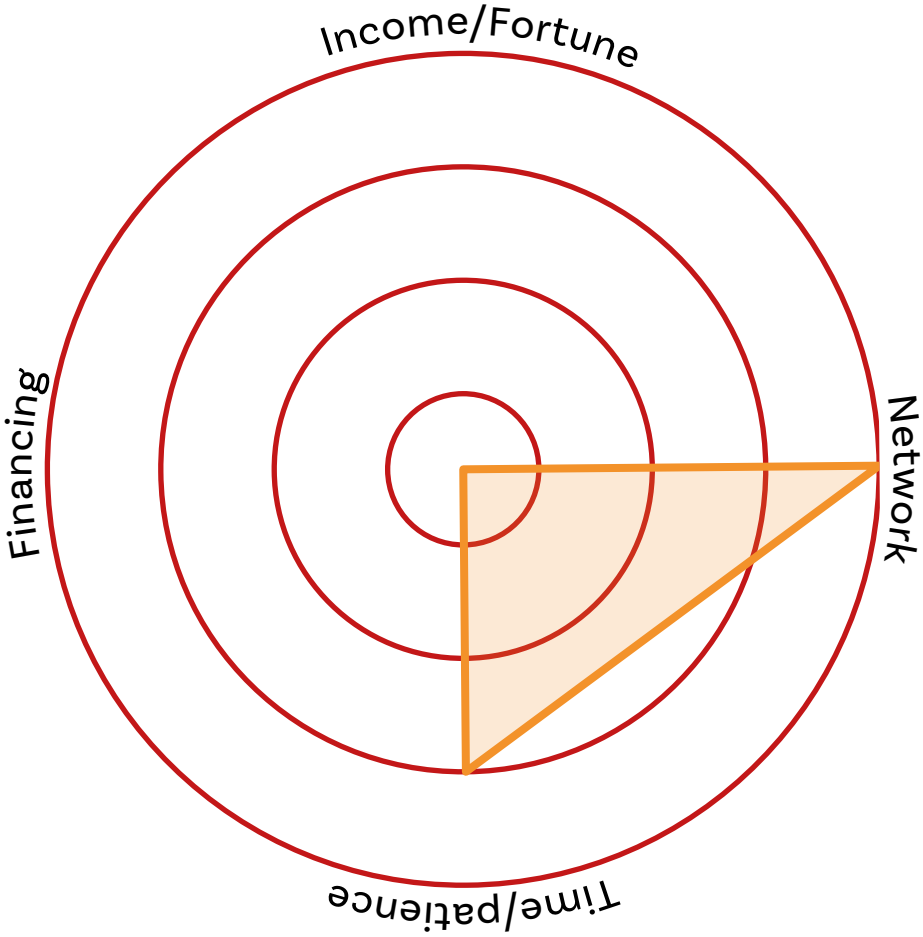


SOCIAL HOUSING



Illu. 14. Diagrams of dwelling types

CHRISTIANIA



Illu. 15. Diagram of the dwelling type at Christiania

SOCIAL HOUSING
IN DENMARK

As a result of the supplementary agreement, a mix of social housing and commercial buildings are to be constructed in the Christiania area. It is crucial to adhere to the requirements of Christiania and integrate it into the new buildings. However, it is equally important to understand the regulations surrounding social housing to meet the municipality of Copenhagen's requirements.

In Denmark, social housing typically refers to rental dwellings constructed by established housing organisations with financial support from the municipality. This imposes certain constraints on construction in terms of economic scope, as it is subject to a government-imposed maximum total construction cost to keep rents low overall (Thøger, 2023). Originally a philanthropic effort to provide affordable housing for the less fortunate, this remains its purpose today (Vestergaard, 2024). Additionally, rent is kept at a minimum as no one may profit from it; it is solely used to cover expenses, aligning with the concept of Right of Use as practised in Christiania. Moreover, this bears similarities to how Christiania plans to handle housing strategies by establishing its own housing organisation. (Prag, 2024) Low rents and the allocation of rent to cover communal utilities in the area are evidence that illustrates how closely the principles of social housing align with housing in Christiania.

Traditionally, social housing in Denmark is categorised into family housing, student housing, and senior housing, each with specific requirements regarding apartment sizes, and other spatial considerations. Furthermore, the new building masses must meet current regulations to ensure safe and high-quality dwellings that comply with fire regulations, accessibility standards, and building codes. However, this represents a development and transformation for the architecture in Christiania, which has a stronger tradition of anarchistic and free-form architectural styles, see Chapter 2.2.

When examining social housing in Denmark and the current residential system in Christiania, it is evident that there are both similarities and differences. As discussed in the previous chapter, the application process and Right of Use should be incorporated into the new building strategies. However, it is essential to respect the regulations associated with social housing projects and building codes in Denmark to ensure the provision of high-quality dwellings.

	Senior housing	Family housing
Criteria for admission	Must have some sort of functional impairment, but be able to take care of themselves	None
Physical space	Wheelchair accesibility Needs to be able to call for aid at all times	≤ 115 m^2 A private toilet, bath and kitchen

THE USERS

The individual already integrated into Christiania
This individual, often an elderly member of the community, finds it necessary to seek housing accommodations with reduced maintenance demands and responsibilities due to physical impairments such as mobility issues. They have been integral to the Christiania community since its inception, devoting their life to its development. Possessing profound insights into its cultural norms and traditions, they maintain a profound affinity for the locale and they need to be able to express themselves.

The newcomer embracing the Christiania spirit
These individuals migrating to the locale either need to, or already be, aligned with Christiania's principles, including the liberation of expression and sustainability. Predominantly comprised of younger couples with no or one child, they aspire to integrate into a community that resonates with their ethos. Energetic and receptive to communal responsibilities, they may lack familiarity with collective living arrangements. Given the centrality of their residences as bastions and fortresses, long-term envisionment within their dwelling spaces assumes paramount importance to them.

A DIVIDED CHRISTIANIA

In Christiania, there's a notable divide between the resident-centric village of Christiania and the tourist-focused downtown. Within the area, these two become almost opposites, with one being a more urban experience, and the other becoming almost suburban. In some ways, it also represents the generational divide among the residents of Christiania. There exists a need to explore further into the relationship between these two aspects of Christiania.

the Destination

The downtown area, driven by tourism and formerly characterised by illegal drug trade, contrasts sharply with the life experienced in the Village Christiania. Tourism is a big economic advantage and with around 500,000 visitors yearly, Christiania is one of the biggest tourist attractions in Copenhagen (Visit Denmark, N.d.). However, the overwhelming tourism has negatively impacted the local atmosphere, with residents like Emmerik Warburg expressing discontent: "The sheer amount of tourism and not wanting to learn but instead only needing to have a different background for your selfie kills the surroundings." (Calderon, 2019).

This divide is not just among the people but can also be experienced in architecture. The downtown area is dominated by the old military brick volumes, often four floors or above. Often, shops or other urban functions are placed on the ground floor, and there exists limited space for private or semi-private everyday life to take place between the building volumes and the street. It is denser in its structures and facilitates a different way of living than its counterpart.

the Village

In contrast to Christiania - the tourist destination – exists the village. An aspect of the community, with a strong emphasis on families and children, considers children as one of the top priorities (Joker, 2024). Residents of Christiania prioritise children, offering day-care, and after-school activities like horseback riding, skating, soccer, and music lessons within the community. Parents deliberately choose nearby public schools to keep kids connected to the national education system. "This choice is viewed as a crucial decision for the children's future, considering the challenges of reintegration into the mainstream system later on" (Joker, 2024) The village values individuals from diverse backgrounds. Christiania's unique political system emphasises second chances and individual importance over strict laws, fostering tight-knit relationships among residents. (Strange, 2024).

Not only the atmosphere between people is changing in the different areas, but also the architecture. This area is dominated by tiny houses, often in wooden structures and wooden facades. Innovative designs are common, evident in the varied building shapes that reflect numerous renovations or expansions. This lends the architecture a distinct personal identity and highlights its adaptability.

Illu. 16. An old military building

Illu. 17. One of the tiny houses

Illu. 18. Collage of architectonic identity at Christiania

THE ARCHITECTURAL IDENTITY OF CHRISTIANIA

When walking through Christiania one distinct characteristic of the area is that of identity. It is a place for expression of one's individuality with a setting that is accepting of all differences and people. Here you would find people of many different upbringings and social classes, with the wish to express themselves and to take part in a community of like-minded people. Many of the structures bear vibrant graffiti, while some have even gained additional floors on their rooftops.

As mentioned, Christiania's origins as a military area are evident in the imposing brick volumes that dominate the urban landscape in the downtown area. The narrow space between buildings and streets offers little room for semi-private or semi-public expression, leading to the frequent use of shared gardens, embodying the informal essence crucial to Christiania's architectural character. One place where this identity is especially strong is in the disparate buildings situated in Christiania. This is most prevalent in detached housing, but all buildings in the area possess qualities that make them distinct from one another, whether this may be in their layout, form, colour, or other distinguishing features. This amount of identity comes out due to the choices of the individuals and this is whether they want a new facade or a new addition to the house and is very distinct when put in relation to the general way of building in Denmark. These newer structures often consist of tiny houses clad in wood, exemplifying their freedom of expression through innovative design. These homes reflect daily life, with adjoining plots often showcasing bicycles, children's toys, and crafts, each narrating the stories of their inhabitants.

Examining the materials used in construction and urban areas reveals a strong commitment to circularity within the community. Residents display ingenuity and creativity, repurposing items others might discard as waste. Additionally, the community maintains its own reuse-centric hardware store, stocked with reclaimed materials such as windows, doors, and tiles, available for projects throughout Christiania. In this way personalisation through customisation becomes the reason for the distinct identity of Christiania, that every resident is allowed to modify and adapt, appropriating the space and making it their own. Each decision made in the process, from the layout of the rooms to the colour of the facade, reflects the inhabitant's unique identity and individualism. It can also contribute to the overall atmosphere of the space, with strategic placement of windows creating intangible lighting schemes and the use of natural materials like river stones can connect the building even more to its surroundings.

The buildings become a part of the landscape of Christiania in the same way that the people themselves do, and are an integral part of the expression of the place.

AESTHETICS
AND THE PREDICTED URBAN PERCEPTION

When entering the gates of Christiania, vibrant colours, and unpredictable structures, stimulate the eye and brain, and creativity and personality enrich the architecture. It is easy to read the different structures and understand from which era they were built. In this case, the aesthetics of the facades play a crucial role in the conversation between the outside and the residences. This kind of creativity in terms of aesthetics has been evolving in different ways, and by analysing that, one can inform the new architecture and further develop the architecture of Christiana.

Spolia is translated from Latin into spoil, and it means that something is stripped from something. In ancient Rome, the origin of the strategies of spolia was founded in reusing elements such as old flour millstones, into new building elements in walls. This practice is often connected to ancient and medieval architecture, however, the practice is used in all ages and has a trend in today's society with a focus on environmental sustainability and scarce resources (Kinney, 2006). Common for the classic spolia aesthetic is that one keeps the original structure, but puts it in a new context, off the original purpose of creation. This distinguishes itself from the preconceived ideas of aesthetics and encourages it to step outside the norms. It inspires creativity and freedom and emphasises the possibility for the individual to express themselves. When connecting it with the term of reuse, or repurposing elements, it also lines up with the sustainable and affordable values, connected to Christiania.

As for history, the post-modern era was an era filled with criticism of dull and fake architecture. The architecture of the Modernistic movement removed a lot of the ornamental aesthetics in the buildings, which was missed by the public and as a response, the architectural studio FAT (Fashion Architecture Taste) challenged the simplified and clean architecture with bold and colourful architecture. (Heathcote, 2015) Much of their work could be seen as almost ironic and humoristic when they challenge tradition with unconventional architecture. In a time of digitalisation and engineering efficiency, one could argue that this type of architecture stimulates creativity and could inspire architects all around the world to rethink design solutions. However, much of the post-modern architecture meets a lot of criticism for creating scenes instead of keeping to quality architecture. It has also been criticised for building with disrespect for its surroundings as the individual has had a focused perspective of their own needs and demands. (Lund, 2021b)

In constrast to the unconventional approaches of post-modernism, contemporary Nordic aesthetics are more simplified in their expression. When investigating newer architecture that falls within this Nordic description, the site and context highly influence the design. Inspired by Nordic architects such as Jørn Utzon and Alvar Aalto, this type of architecture is more about the setting, and the buildings become an element to highlight the existing context, be it nature or otherwise. Simplicity and local materials are key roles, along with tectonic qualities. (Lund, 2021a) However, this type of architecture has a polished aesthetic, that stands in opposition to the character of Christiania. The facades are usually more unified and mono-material, while no space for adaptation or personalisation exist for the user. The facades often symbolise community and unity, rather than individualism and identity.

In conclusion, the facade is an important building element and is as important for the residence as the urban perception. The ideals of the postmodern era could inspire architects to celebrate diversity and reinvent facade materials. In the context of Christiania, the aesthetics allow the residents to be innovative in their choice of materials. In combination with their aim to take care of the resources, both the user, the urban expression, and the environment, could benefit by implementing aesthetics that embody re-use and re-implementation.

Illu. 19. An example of spolia architecture

Illu. 20. House for Essex, by FAT Architecture and Grayson Perry

Illu. 21. The Lyserøde Børnehus, a pre-school at Christiania

A CONCLUSION OF CHRISTIANIA

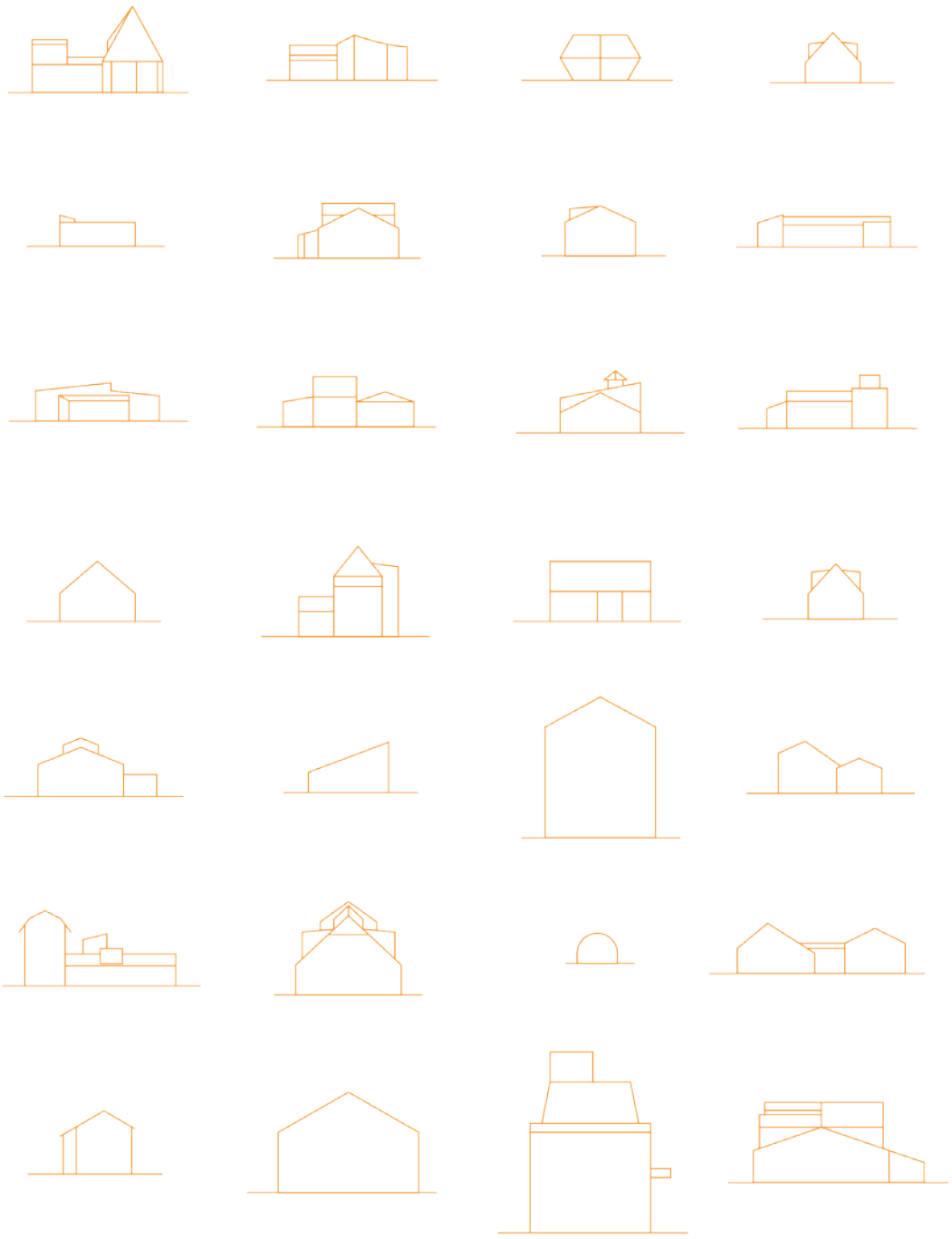
Through the preceding analysis and exploration of Christiania and some of the aspects within it, it becomes evident that it is a community rooted in values, with a rich history of defending its autonomy. Inclusivity, self-governance, freedom of expression, and environmental sustainability are among its core principles, integral to both the community's identity and its future development.

In envisioning the integration of new residents and buildings, it is crucial to uphold these values, ensuring they remain central throughout the process. By bridging the new and old residences, Christiania can evolve into a community where the elderly have a place while also bearing significant responsibility for integrating newcomers into the societal structure of Christiania while adhering to the existing traditions.

The existing architecture of Christiania, characterised by vibrant street art and innovative, sometimes almost parasitic, architecture, underlines the importance of preserving the freedom of expression in the design of new structures. Allowing new residents the opportunity to contribute to the aesthetic expression within these buildings fosters a sense of belonging and encourages creativity and adaptation.

Moreover, incorporating principles of environmental sustainability into the project not only benefits the global ecosystem but also enhances the community's ethos of humility and stewardship. Rather than imposing a standardised concrete design, new buildings should reflect and respect the community's values and surrounding context.

When designing for Christiania, a people-centric approach is essential, aligning with its values. Ideally, the design process would prioritise extensive participation, with community members involved at every stage. However, given the ongoing transformation of Christiania, as noted in this report, this report will respectfully limit itself from community engagement and observe the ongoing work and transformation.

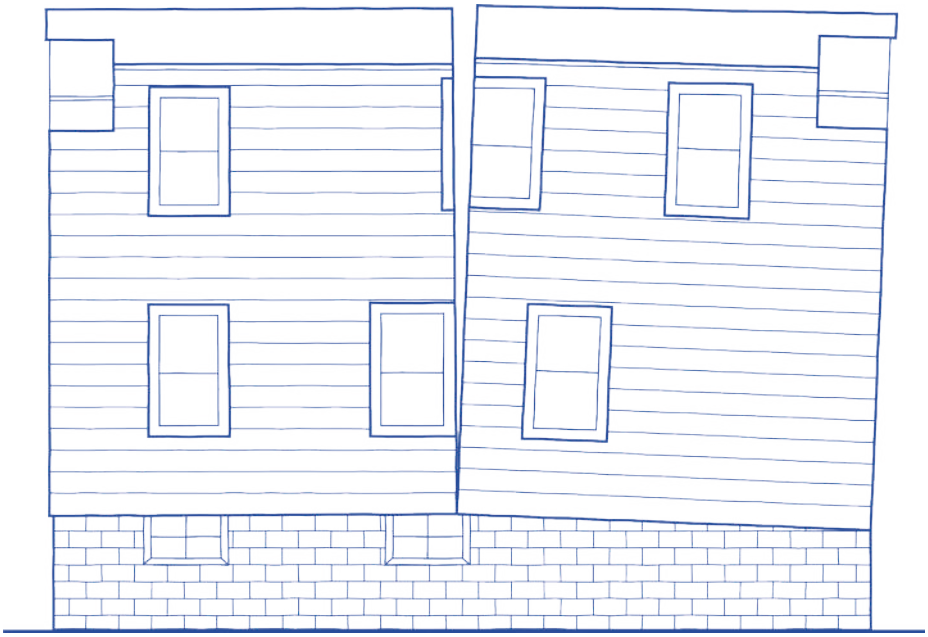


Illu. 22. The outlines of various buildings in Christiania reveal an architecture rich in identity

2.2 PROGRAM

USER-CENTRIC ARCHITECTURE

In this section, the reader will be introduced to some of the theoretical background of anarchist architecture. Here the relationship between vernacular- and anarchistic architecture is explored in order to understand how communities like these evolve to fulfill the needs of growing communities. Furthermore, systems to afford adaptation within dwellings will be explored, as a step to accommodate the specific requests of the resident. Lastly, this section will incorporate a case study, that has its offset in social housing and adaptability, to gain the understanding of how this can be done and incorporated into a successful project.



Illu. 23. Gordon Matta-Clark's "Splitting"

ANARCHIST ARCHITECTURE

The pairing of architecture and anarchism might not seem to go hand in hand. The controlled pencil strokes of the educated and learned architect meet the rough and rebellious youth politicians. In some cases, they can be opposites, with detailed police stations housing those incarcerated for violent demonstrations in favor of less bureaucracy. Even though these concepts are disparate, there may be some learning to be gained from an exploration of the interdependence between the two.

Anarchism has deep roots in politics and especially in taking action. It is the absence of government and is founded on self-organisation. Pure anarchists believe that government itself is unnecessary and that life is not about disorder but rather a new type of order. Many of the tenets of anarchism are based on a bottom-up approach with terms such as autonomy, mutual aid and direct democracy being at the core of what anarchists believe is the right order (Dobraszczyk, 2022). Some believe that an anarchist way of life also entails the mentality of the self-builder, either as an individual or as part of a solidary collaboration (Coates, 2015). This also becomes apparent when looking at traditional communal architecture – vernacular architecture – a type of architecture reflecting the geographic, culture and traditions at site.

This seems to be the way architecture and anarchism collide, with the role of the architect being dissolved and reassembled as a part of a communal collaboration. This may lead to radical changes in the traditions and will stand in direct opposition to the mass housing market, but these changes may be necessary for the occupant to be re-engaged in architecture itself (Coates, 2015). Self-building and personalisation may be methods of putting agency into the hands of whoever is going to reside in the dwelling.

While investigating historical architects, and their take on anarchist architecture, Gordon Matta-Clark seemed to have relevance in accordance with the identity of Christiania. His way of appropriating abandoned buildings and processing them in a sculptural way expressed a political statement in opposition to the sociopolitical structure of the time. He developed the idea of Anarchitecture, where he would rather cut and split existing buildings, as works such as Splitting are examples of, than create new ones. An elucidation of Matta-Clark's idea of architecture was his approach to the architecture and his opinions on education and with his work, he symbolised an architecture where you go your own way, as he also did the work himself. (De Monchaux, 2016) This further reinforces the anarchist ideal of self-built architecture, while also re-contextualising the preconceived ideas of the relationship between people and architecture.

Many of these anarchist aspects also apply to Christiania, with their history being steeped in opposing opinions to the government, especially on societal structures. Today this is seen both in their way of organising their community, but also in the way their dwellings are created. It seems to be a bottom-up approach that has made the built environment evolve almost naturally, whenever the community needed it.

Illu. 24. An Italian hill town, a true example of vernacular architecture

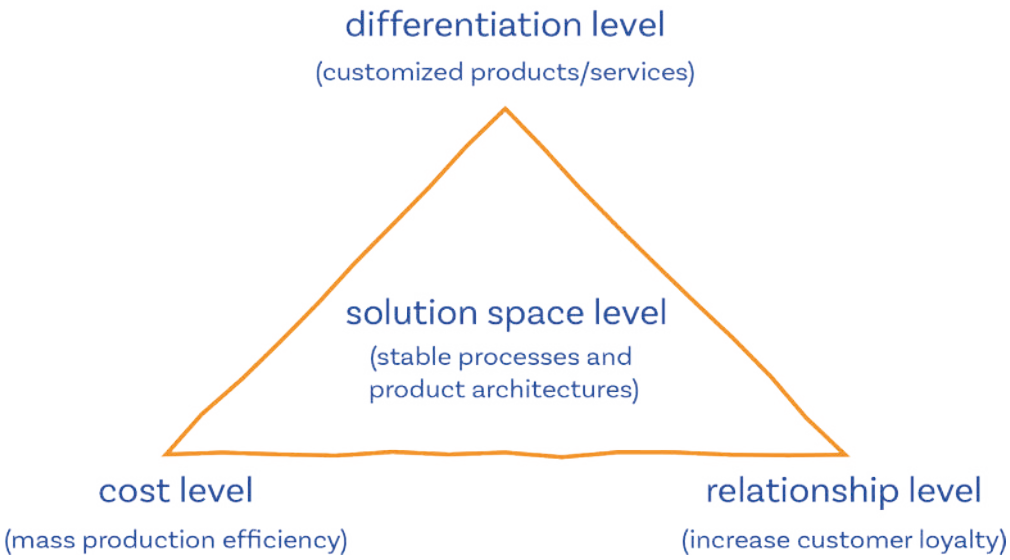
VERNACULAR ARCHITECURE

In general, one understands vernacular architecture as architecture without the intrusion of specialists - a reflection of the site and place in terms of building traditions. As a term, it covers a great deal of buildings, as those not formal enough to be considered an architectural monument (Rudofsky, 1965). Within this appellation, one finds buildings such as the underground villages of Loyang, northern China, and hill towns of Italy. Structures that spontaneously form, given the parameters of their environment. This extends to not just the physical environment, as some of the most prevalent characteristics of this type of architecture, is its relation to context and tradition (Hnin, 2022).

The meaning of context within this type of architecture is that the built environment possesses features that are responsive to the environment and climate, but also those responsive to the social and communal use of the buildings. The granaries of the Spanish province of Galicia serve as a monument to the almost religious respect the peasants of the area, have for bread. Context also comes into play, when choosing materials for a building as the only ones available in traditional vernacular architecture, would be local ones. Everything from adobe bricks to wood could be classified as local, according to the environment where it is found. (Rudofsky, 1965)

Tradition is closely related to techniques used in building, either in the building types or in the way of constructing the specific building. Some cultures see it as humiliating to move into spaces inhabited by strangers, and therefore they build movable architecture, such as the thatch roofs of the Rendille nomads. Other cultures rely on rammed earth as a way of constructing their buildings. Tradition seems to influence the built environment more in these examples, where other materials or techniques could have been used, but those known and commonly used were preferred. (Rudofsky, 1965)

With its roots in the context, Christiania can be interpreted as a contemporary case of vernacular architecture within an otherwise architect-dominated context. Wood skeleton construction is the preferred method of construction, demanding almost no special training or education to erect. The materials can also be seen as vernacular, in the sense that it is easily available in Denmark, and reused windows play a prominent role in the built environment of Christiania, a material commonly available with the renovation of the former army buildings.



Illu. 25. Mass Customization in four levels by Piller

MASS CUSTOMIZATION

A shift happened in the evolution of production means, from personalised and tailored craftsmanship to industrial mass production when the technology for it became available during the industrial revolution. With this came also more affordable products, but some would argue that with it came also the cost of sameness and one-size-fits-all (Mcteer, Jr., 1998).

The creation of prefabricated structures, either concrete or CLT elements, changed the way we build today. It almost seems paradoxical to implement systems meant for creating standard solutions into an architectural space, where every solution is unique. Generally, these types of systems focus on quality and cost but are often stigmatised with regard to the quality of their architecture. It can sometimes become devoid of personality, which stands in direct opposition to the ways of Christiania. If one were to use these in such a place as Christiania, they would need to allow for modification and personalisation, to fit into the existing structures and the built environment. As this is social housing, there is a need to keep costs low, which prefabrication could help with, but then it necessitates a processing of the singular element. One solution to this could be the implementation of mass customization.

This term essentially revolves around creating more value for the customer, by adapting the product to their specific needs and creating the sense of a tailored product, while it can be made using the same means of production. Usually, mass customization relies on the notion of a standard platform, unto which adaptations are made. Transferred to architecture, the platform would probably consist of the carcass, and this interpretation does not limit the choices regarding surfaces and materials. One could argue that the carcass plays an important role in the accommodation of the diverse life within the multi-story building, which necessitates a solution space in which the platform itself is mutable and variable (Jørgensen, 2007). This represents a greater challenge for Mass Customization, as it demands a deeper understanding of the organisational needs and requires a more complex approach to this term regarding architecture.

In general, Mass Customization works on four different levels; Differentiation level, cost level, relationship level & solution space. (Piller, 2005)

The first is regarding the added value a customer gains from a product or service, that corresponds to their specific needs. Here, the manufacturer seeks to find differentiation that creates greater value in this differentiation, and as such is focused more specifically on the user.
Cost level is related to the level of differentiation, as the cost of this variability may not exceed a level, where the target demographic shifts and becomes another. The value that is gained reflects the customer's willingness to pay more for the better fit.
The relationship level is connected to the process of acquiring the necessary information needed, to be able to customise the product to the individual customer. In this process, a relationship is built that fosters loyalty between customer and manufacturer.
The last, solution space, is less focused on the customer, and more on the manufacturer. Specifically, the internal and production-related solution space. It is an expression that revolves around the degree of freedom built into the production system, and the variation of assemblies that is possible with the given production means.

One needs to consider all implications of this type of production, in order to successfully implement it in architecture. The complex and interlinked relationship between the platform and its variability and the different levels on which Mass Customization are the central themes to be explored when looking to work with and make use of this type of production.

CO-BUILDING

TOGETHER

Another step towards understanding how the identity of Christiania becomes so distinct and disparate is to look at the building process itself and try to understand how this anarchistic approach has created the community one would see today in Christiania. This is with the structures created by the Christianites themselves, as these would possess the most characteristics defined by this method of construction.

Identity may not just be an outward and visual expression but may become a part of the building process itself. In Christiania, in cohesion with their communal society structure, the use of co-building is widespread. It refers to the collaborative process in which different stakeholders work together to create or develop something, which in this case would be a dwelling. In this way shared decision-making and active participation are encouraged between all involved parties. Co-building exists in different terms with this being one, that encompasses the action of the resident, or other stakeholders, to physically be a part of the building process. Participating in this way can give the resident a deeper sense of ownership, while also empowering them to shape the physical space to their individual needs (Mazzuco, 2018).

Another aspect of this participatory approach is that of co-design, where, instead of architects imposing their decisions on communities, it is a collaborative process, where all different stakeholders are invited to participate in the design specifically. It may still be a developer who oversees and manages the actual building of the structures, but it is wholly envisioned and designed by the community in which it is placed, with the aid of specialists. This is exemplified also in companies who work with standard housing, to create a customised dwelling that fits the singular customer. This does in some cases skew towards more control from the specialist, especially in specially designed dwellings (Bisp and Sonne Glatz, 2022). It would still be able to give the customer a sense of; “This is mine, I made it”, and in this way create a deeper relationship between the occupant and the dwelling.

Generally involving the user in some kind of co-creation, when it concerns their physical space, be it in designing or building, is a way for the occupant to create lasting relationships with the space that they inhabit. This serves as a selling point for many, when looking at possible dwellings, whether or not they are leaving a mark on it.

Illu. 26. An evolution of adaptation in the social housing project Quinta Monroy, Chile

QUINTA MONROY

A GOOD EXAMPLE OF INTEGRATION OF THE USER

An architectural project that relies on some of the anarchist ideals in terms of self-building, is the residential project of Quinta Monroy project in Chile, made by Elemental Architects, an office led by Alejandro Aravena. Here the architect designed a structure, with space for - and even with encouragement of - user personalisation. The design offers a structure with built-in voids for the residents to fill out according to their needs and demands. In doing this, the architects ensure the establishment of a common foundation based on standard solutions, but with space for diversity, which in turn will result in an area with a distinct identity. Furthermore, this has not only resulted in an architecture that allows for personalisation but also a way of offering low-price social housing in one of the poorest areas of Santiago de Chile (Louisiana Museum of Modern Art, N.d).

The idea came from the tight budget that the government of Chile provided the project, for an expensive area of land but dedicated to the poor. By minimising the needs of a residence to only 35 square metres, the dwellings offered a design with only the most important functions, also the most complicated to create by themselves, such as bathrooms and kitchens. (Danish Architecture Center – DAC, N.d) At the same time, there was space for expansion and the user could, at any time, add more bedrooms to the dwelling, which could expand up to a maximum of 71 square metres. Furthermore, to secure the low-price concept of the project, all structural elements are made in reinforced concrete. (Engineering For Change, N.d)

When analysing the traditional design tactics of Christiania, similarities are to be found with the design tactics of Elemental and Quinta Monroy in Chile. When experiencing Christiania, there is a significant amount of evidence of users performing an additive tactic of adding extra building elements into existing structures to personalise and adapt the dwellings.

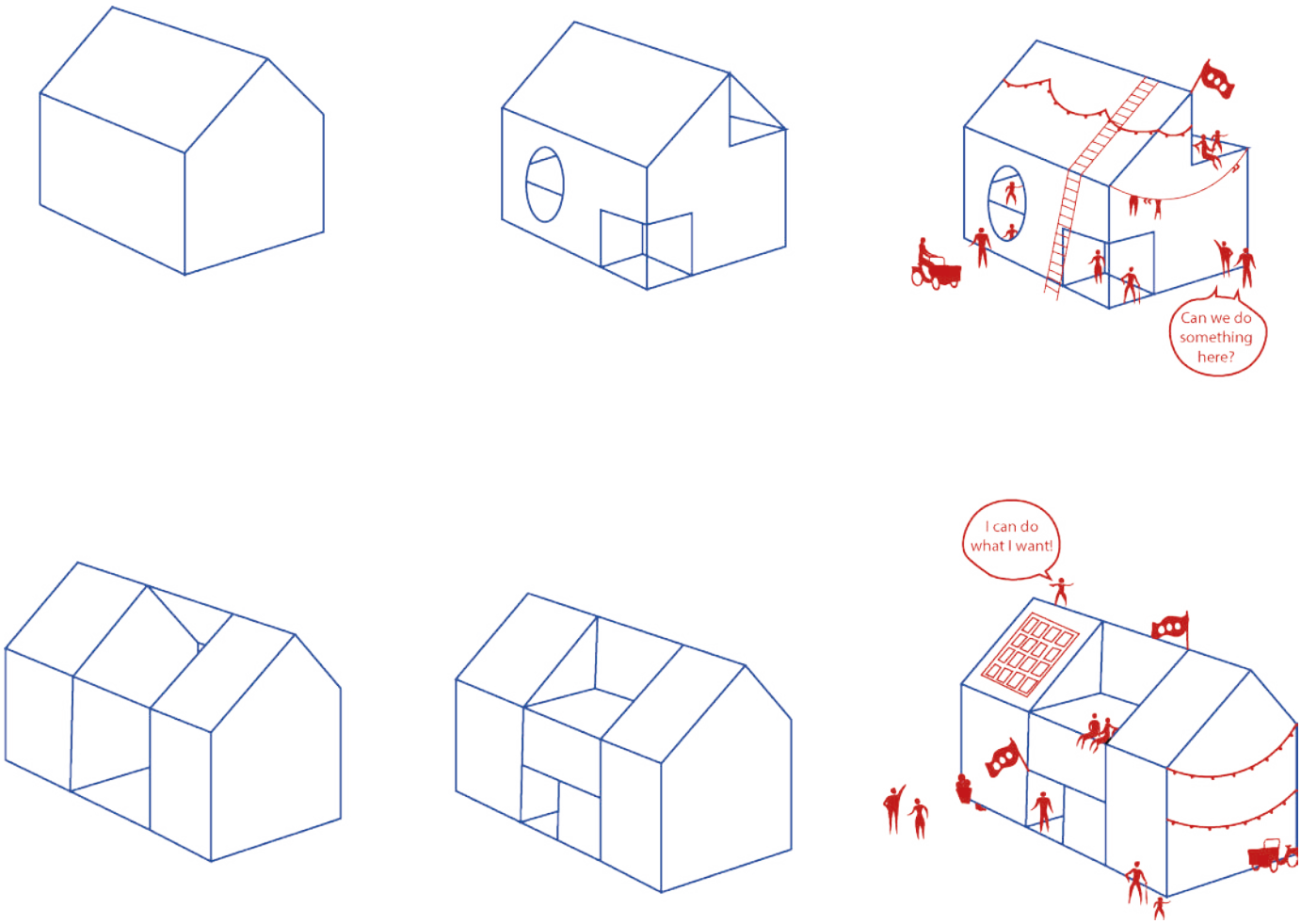
CONCLUCION OF THE

USER-CENTRIC ARCHITECTURE

Through the theoretical background of various approaches to creating user-centered architecture, it has become evident that incorporating voids in building design is one of the most crucial ways to engage users in the adaptation of the space. Rather than having users create their own canvas, as Gordon Matta-Clark suggested, allowing them to fill in these pre-existing voids enables them to engage more deeply with the design. This approach, reflected in both the building and master plan, aligns with vernacular architecture principles, where users fill in the necessary blanks with available materials, fostering a sense of ownership and identity that mirrors Christiania.

This underscores the importance of a design that empowers users to actively participate in the creation process, resulting in buildings that are tailored to their individual needs and desires. In the context of social housing and economic considerations, a degree of prefabrication is necessary to streamline part of the process. By using prefabricated structural elements that can then be customised by the user, a balance between efficiency and personalisation is achieved.

Ultimately, a hybrid model that combines prefabrication with customisation options can create living spaces that are both economically viable and rich in identity and personality. This approach aligns with the traditions of Christiania and can serve as a model for future social housing projects, placing user influence and community needs at the forefront.



Illu. 27. Diagram showign different strategies of how to appropiate spaces

2.3 PROGRAM

THE SITE

In this section, readers will be introduced to the site and its surroundings. The following analyses employs phenomenological methods such as observations and informal conversations with individuals in the vicinity. Additionally, the chapter endeavours to delineate the predominant elements—such as vegetation, topography, surrounding buildings, and functions—that are poised to influence the design process in various capacities.

The site selected was a possible building spot from the Christiania community and the plan involved two mid-rise buildings, with approximately four to five floors, housing both residential and commercial functions. (Social- og boligstyrelsen, 2022) However, the designated square metres were not connected to the specific site, but the project assumed the overall plan to suggest that the site should contain 1000 square metres of new structures.

Illu. 28. The location of the site, 1:7000

Illu. 29. A collage of existing structures

EXISTING STRUCTURES

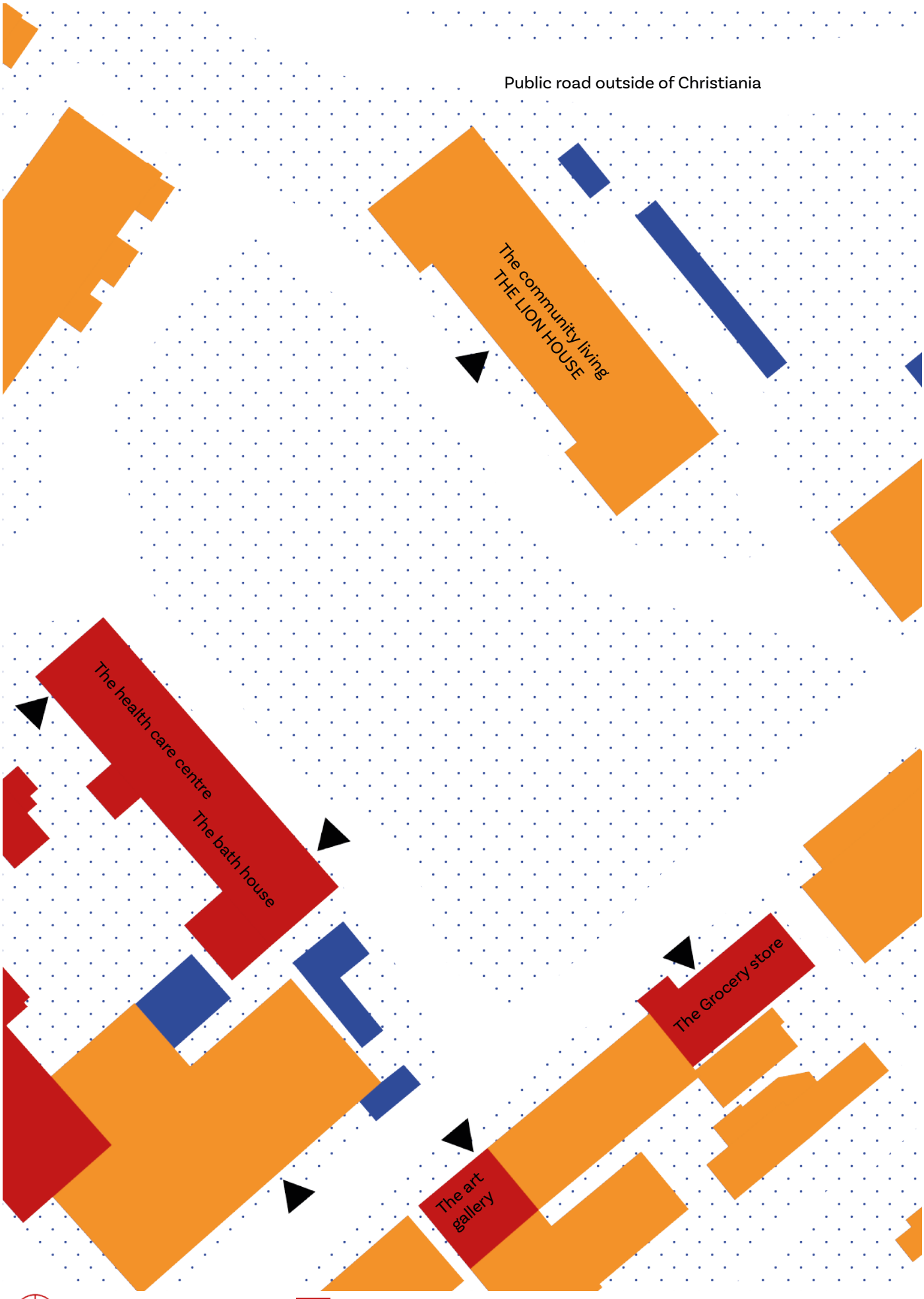
The site is situated in a way that requires careful consideration and demands respect. In the far north, Christiania is demarcated by a fence delineating entry into the community and the rules that govern it. Towards the northeast stands the prominent residential building known as the "Lion House". This community asserts its presence on the site, claiming a portion connected to the house as their own, with a small garden adorned with raised gardening beds and toys for the local children.

On the southwest side, a public building houses the health care center and public showering facilities. While this structure lacks a direct relationship with the site, it extends the length of the street, providing essential infrastructure.

Moreover, the southern corner of the site serves a dual purpose for waste disposal and recycling, with a hidden garden offering a secluded space for informal gatherings.

To the southwest, a popular playground serves as a focal point within Christiania's village area, accompanied by seating areas that connect to the grocery store, facilitating informal gatherings among residents. Observing this side of the site makes it evident that the grocery store is a vital community hub, where numerous informal conversations unfold on the street.

Upon analysing the existing structures, it becomes apparent that the community house, the "Lion House", and the grocery store have the most significant influence on the site's atmosphere. Along with the bathhouse, these built structures frame the site and impose constraints on the design, dictating how closely other structures can be built and shaping the life that unfolds between them.



Illu. 30. Funktiondiagram, 1:500

THE FLOW AT THE SITE

The site itself lacks streets or pathways, thus the analysis will focus on observing the flow occurring around it.

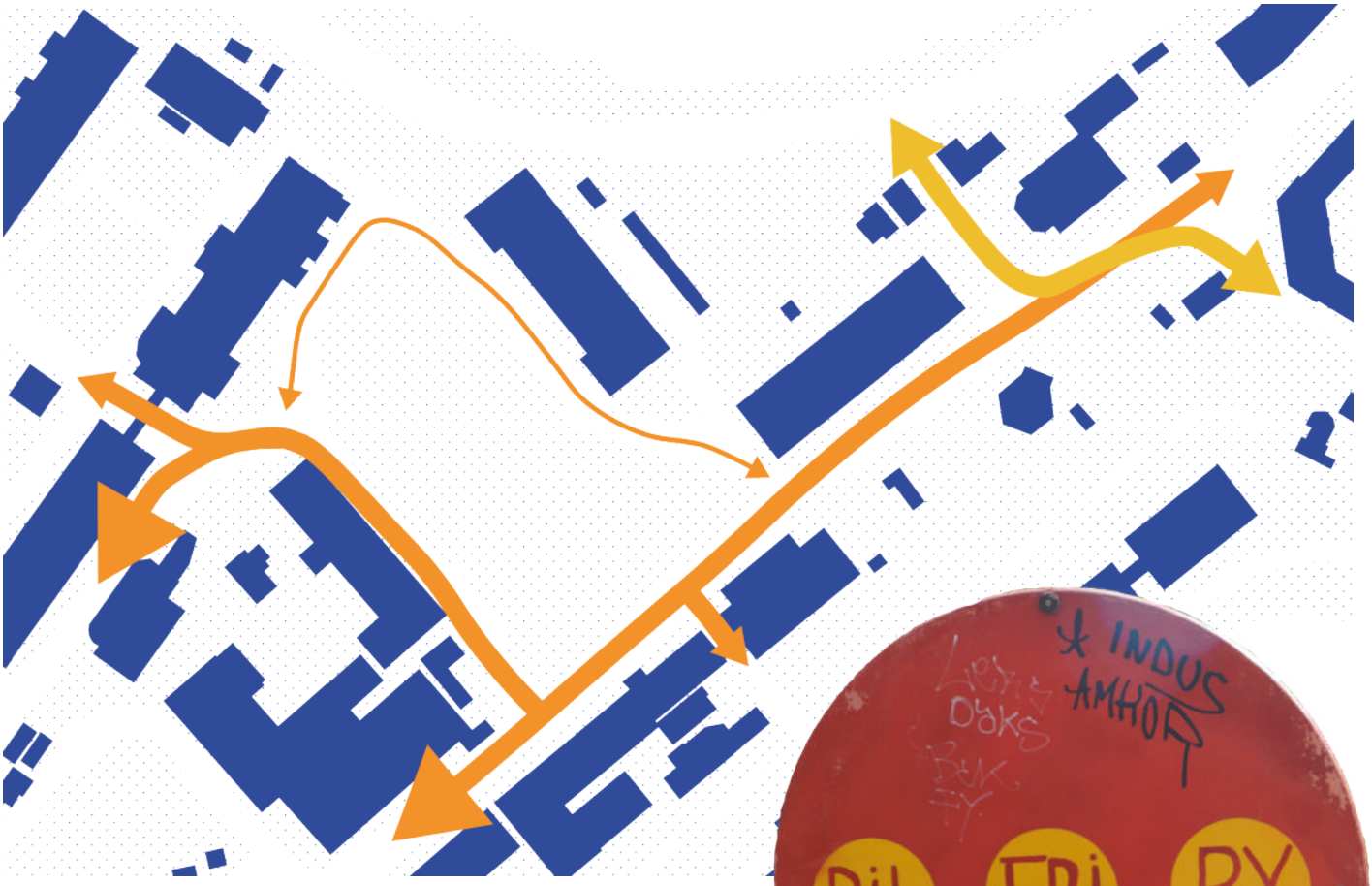
Christiania, a car-free area with limited motorised vehicle access primarily for essential services such as garbage trucks, prioritises bicycles as a crucial mode of transportation. In addition to conventional bikes, the iconic Christiania bike, commonly used for transporting children and materials within the area, is prevalent. “Cars are allowed, but everyone knows that the car is adjusting for the people, and not the other way around.” (Joker, 2024)

Situated centrally, the site experiences a significant daily flow of people passing by. The presence of a wide street and a local grocery store designates this street as a main thoroughfare, dividing individuals into different paths and providing a transit zone.

The municipality of Copenhagen’s emphasis on transitioning from hard to soft traffic, notably bicycles, has led to the establishment of various cycling routes, including the green bike path. Part of this route traverses through Christiania, aligning with the city’s strategy to connect the people with the green and blue structure of the city. (Teknik- og Miljøforvaltningen, 2022). The proximity of this transit route to the site enhances its role as a transit area.

Primary flows, indicated by thicker arrows on the map, see illustration 31, occur along designated routes, although some secondary transit occurs on the more secluded side of the site, primarily utilised by residents rather than serving as a transit zone.

Through meticulous observation and analysis of the area’s flow patterns, the southern part of the site emerges as a transit hub. However, the absence of cars mitigates speed, transforming the transit area into an informal social nucleus, and enhancing the overall atmosphere of the site’s southern region.

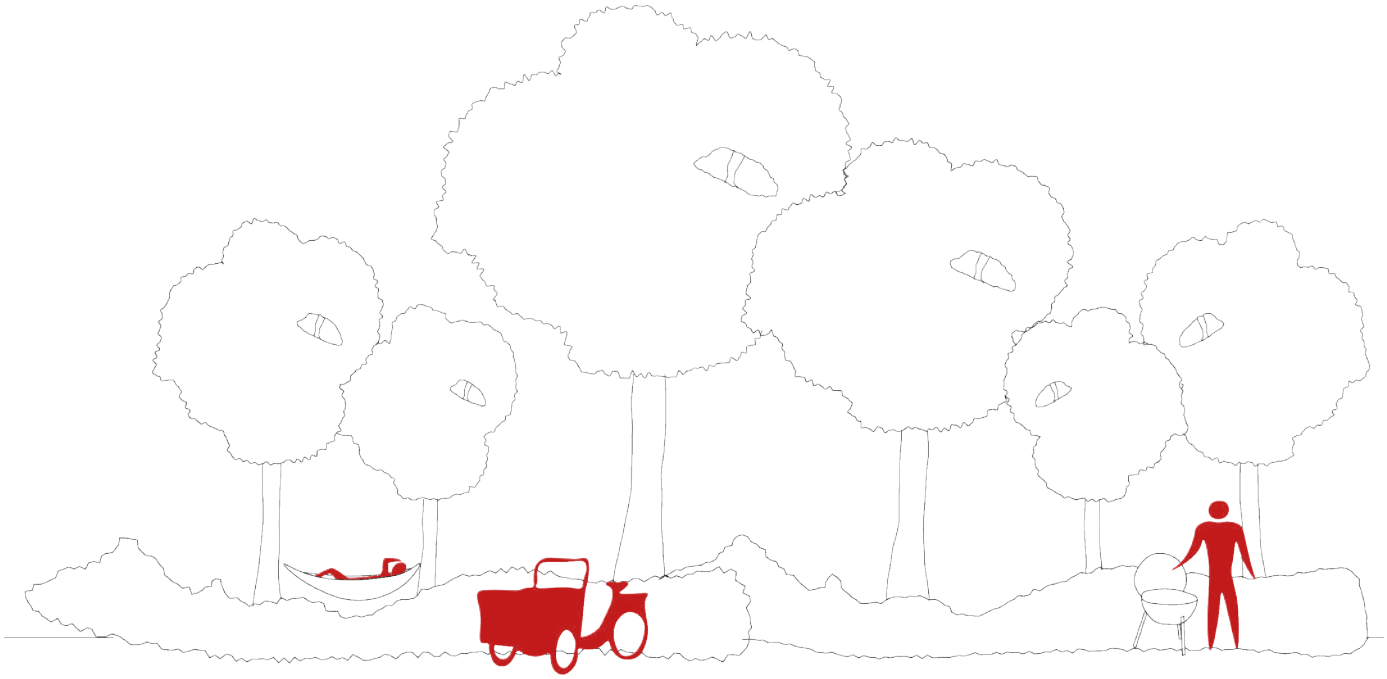


COPENHAGEN BIKE LINE

INTERNAL CIRCULATION WITHIN CHRISTIANIA

Illu. 31. Flow analysis at the site. 1.1000

Illu. 32. A car free zone, photo from site



Illu. 33. A summernight in the private community garden of the "Lion House"

A PHENOMENOLOGIC EXPERIENCE OF THE

PRIVATE GARDEN

In the early summer, as the sun begins to set, its golden light illuminates the tops of the trees, casting a warm glow over the lush greenery. The verdant foliage creates an intimate and comforting atmosphere, with towering trees acting as guardians from the outside world. This green oasis, nestled amidst the hustle and bustle of Copenhagen and adjacent to a lively grocery store, feels like a sanctuary, evoking a sense of safety akin to home.

In the distance, beyond the barrier of topography and vegetation, the faint sounds of children giggling can be heard playing near the grocery store. Otherwise, the wind conducts an orchestra of rustling leaves and creaking branches from the century-old trees. The air is humid, with the grass still moist from the day's heat, yet as the sun dips lower, a slight chill accompanies the breeze against the cheek.

Amidst the garden cluttered with toys and gardening tools, a hammock hangs between two trees, its vibrant fabric reminiscent of a Moroccan spice market. A young woman swings gently back and forth, engrossed in her book, unaware of the friendly neighbour emerging from the community house and entering the garden through the small gate. Roses begin to bloom around the arch, adorning the entrance with their sweet fragrance, welcoming all who pass by. As the neighbour fires up the grill, the scent of charcoal slowly replaces the lingering aroma of roses, signaling the start of an evening gathering.

Illu. 34. The green structures of the site, 1:500

THE GREEN STRUCTURE

OF THE SITE

Upon first approaching the site, one of the most striking elements is the vegetation. It dominates the area, characterised by several century-old deciduous trees towering up to 25 meters in height, accompanied by younger specimens. Interwoven with patches of grass and bushes, they create a lush oasis with a firmly established presence. To the southeast, a vacant green space hints at unclaimed territory, while the northern section is designated as a private garden by the “Lion House” community. This area features fenced grassy plots housing toys, farming areas, a greenhouse, and garden furniture.

The site’s spaciousness is greatly shaped by its vegetation, which also plays a pivotal role in harmonising the new building structures. Therefore, preserving as much vegetation as possible is crucial, as it will mitigate the imposing nature of the new buildings on the site. Furthermore, prioritising the preservation of the old trees is imperative not only for their environmental sustainability but also because it aligns with the community’s values in Christiania.

Illu. 35. The topography made by the bunkers, 1:500

THE TOPOGRAPHY

OF THE SITE

The site's distinctive topography, shaped by disused military bunkers, divides it into two parts, and along with the trees, aligned with the topography, creates a natural barrier to the road to the southeast. The placement of these bunkers creates a terrain variation in the area, with the highest point reaching up to 1.5 meters.

Although the topography is defined by the bunkers, they are not a prominent element in the urban landscape. Only three openings are visible, but they are sealed, indicating disuse.

While the bunkers themselves lack architectural significance, their topographical influence offers potential for spatial division within the site. Removing the bunkers would not only pose an economic disadvantage for the project but also affect the vegetation, as the roots of the trees have intertwined with the bunker structures over many years.

Illu. 36. Shadow diagram, the intensity of the hatch, determines the amount of shadow, 1:500

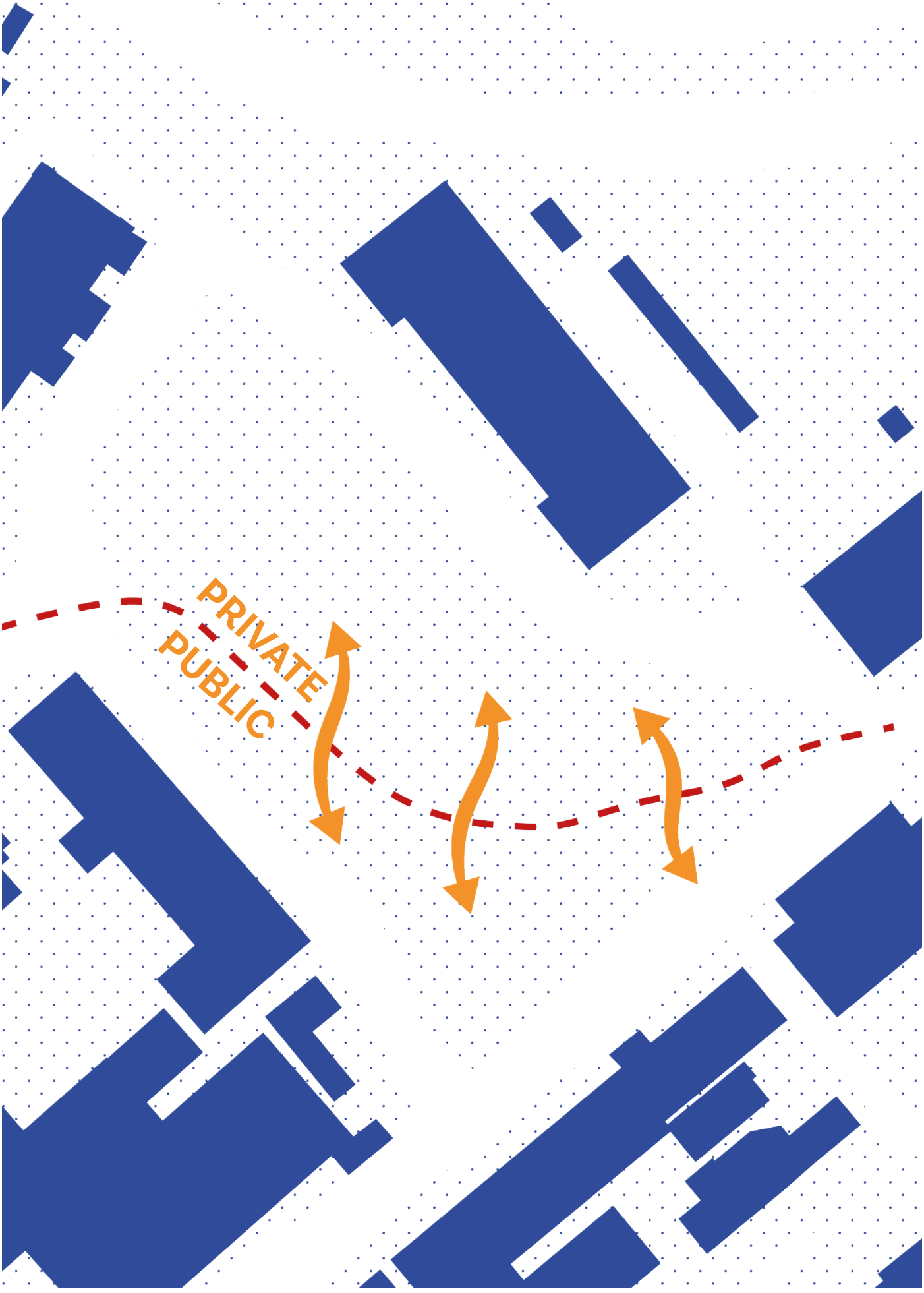
THE SHADOW STUDY

OF THE SITE

The site has been analysed to determine its solar potential. This year-long analysis provides an estimate of the site's radiation potential. The sun primarily shines from the south, where low buildings do not cast shadows on the site. This area is ideal for developing an urban space where the residents of Christiania can enjoy sunlight throughout the day.

The southeastern part of the site is characterised by the great amount of sunlight hitting this part, with opportunities for longer stays, while the rest of the site is fairly shadowed by both trees and adjacent buildings.

All vegetation on the site is deciduous, which means that during the winter, a great deal of sun hits the site. Additionally, in the summer they provide much needed shadow.



Illu. 37. The division of the site into public and private, 1:500

THE DIVISON OF THE PUBLIC & PRIVATE

Today, the site exists as a green urban area. Connected to the community house, the "Lion house", there is a garden and a line of cycle parking, which gives the building an identity as a home. The building itself appears anonymous and offers little to no expression of the individuals living in it.

The residential building towards the northwest shows its backside towards the site and has no relation to it. The road ends, enhancing the private atmosphere in the northern space of the site.

Towards the showering house and the health care center, there is limited relation. Due to the functions inside, most of the windows are covered, and even though there is a physical close connection to the building, there is no relation between the people inside and outside. The road is often used, which gives the area a more public than private ambience.

In the southwest, the local grocery store is situated, and everyday life takes place here. This place is occupied by residents throughout the whole day. This street is also the primary street in the area, resulting in a strong public experience of the site. The playground integrates the public experience into the site.

The topography and vegetation enhance the atmosphere offered by the functions surrounding the site, and it can be concluded that the existing site has a strong public and private side.

Illu. 38. The garden of the "Lion house"

Illu. 39. The residental building in the north-west

Illu. 40. The street outside the health care centre and the showering house

A PHENOMENOLOGIC EXPERIENCE OF THE

VIBRANT HUB

As the first rays of sunlight peek over the rooftops, a gentle warmth spreads across your face, accompanied by the cheerful symphony of birdsong dancing through the air. The site before you lies tranquil and empty, save for a scattering of beer bottles that whisper tales of revelry from the hours past. As the morning dew evapourates beneath the sun's tender caress, the site begins its transformation into a bustling hub of social activity.

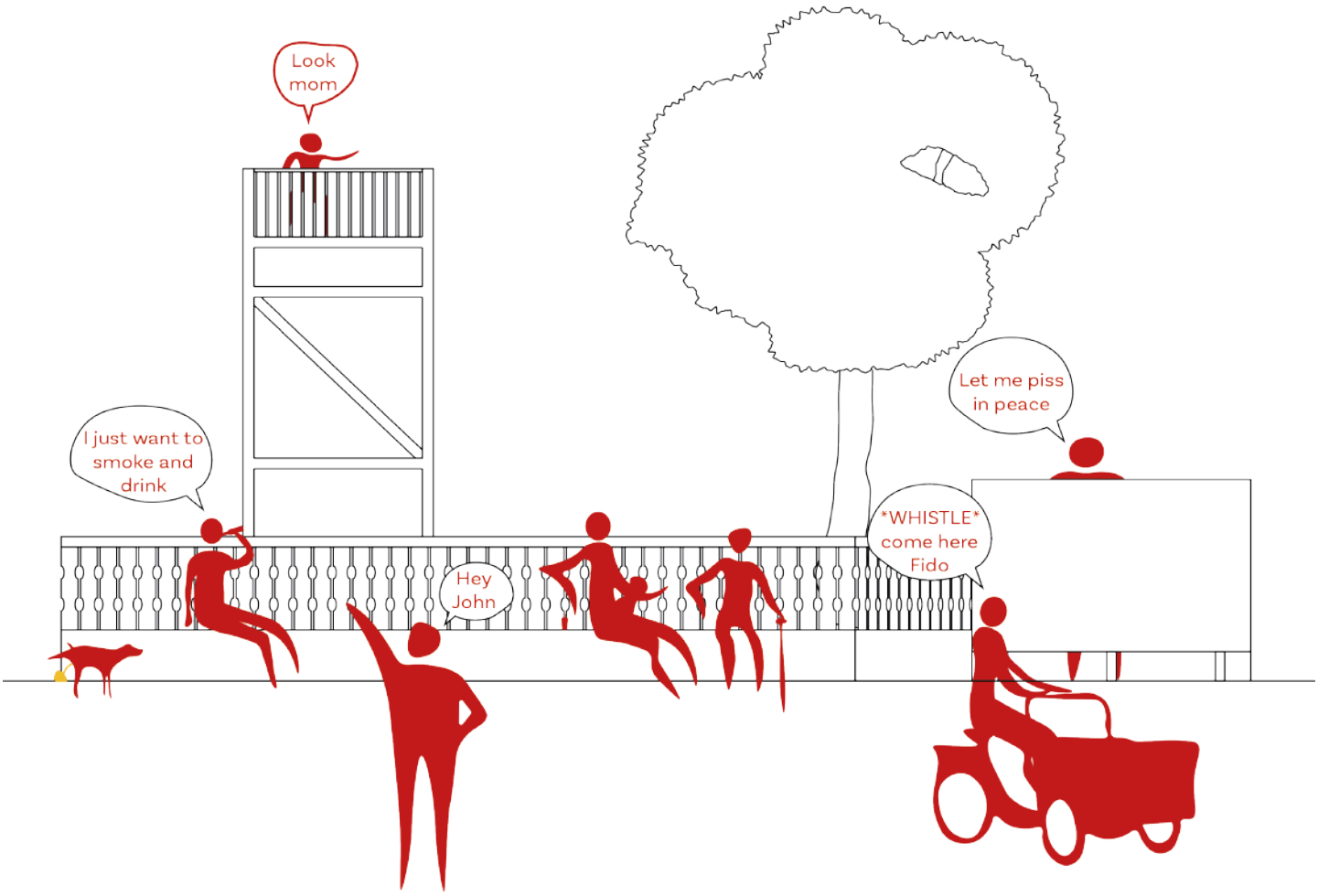
Mothers and children gradually emerge, their laughter and chatter blending harmoniously with the rustle of leaves. Eager youngsters run, past two men having their first beer of the day, towards the playground, their eyes alight with anticipation as they embark on the day's inaugural cable car ride. Meanwhile, mothers congregate, exchanging greetings over steaming cups of coffee, their conversations weaving effortlessly between the mundane and the momentous, from neighbourhood gossip to dinner plans.

As the morning progresses into midday, the sun climbs higher in the sky, casting its warm glow upon the scene below. Mothers and children drift away, venturing forth into the wider world beyond Christiania's borders. In their wake, the site undergoes a subtle metamorphosis, evolving into a rendezvous point for passersby seeking respite from the day's hustle and bustle.

Strangers become acquaintances as conversations ebb and flow like the tide, punctuated by greetings exchanged between familiar faces. The nearby grocery store assumes new significance, its aisles now serving as a pit stop for refreshments on the go – a quick soda, a small icecream or perhaps a chilled beer to ward off the midday heat.

As the sun begins its descent, casting long shadows across the landscape, the site undergoes yet another transformation. The air becomes infused with the heady aroma of beer and fragrant cannabis, drawing more and more people together, predominantly men. Conversations grow louder, laughter more raucous, as bottles clink in merry camaraderie.

Eventually, nature calls and the procession to the outdoor urinal begins, a testament to the communal spirit that thrives within this vibrant enclave. As dusk settles in, painting the sky in hues of amber and indigo, the site continues to pulse with life, a testament to the enduring spirit of camaraderie and connection that defines this unique corner of the world.



Illu. 41. The vibrant life in front of the grocery store

A CONCLUSION OF THE SITE

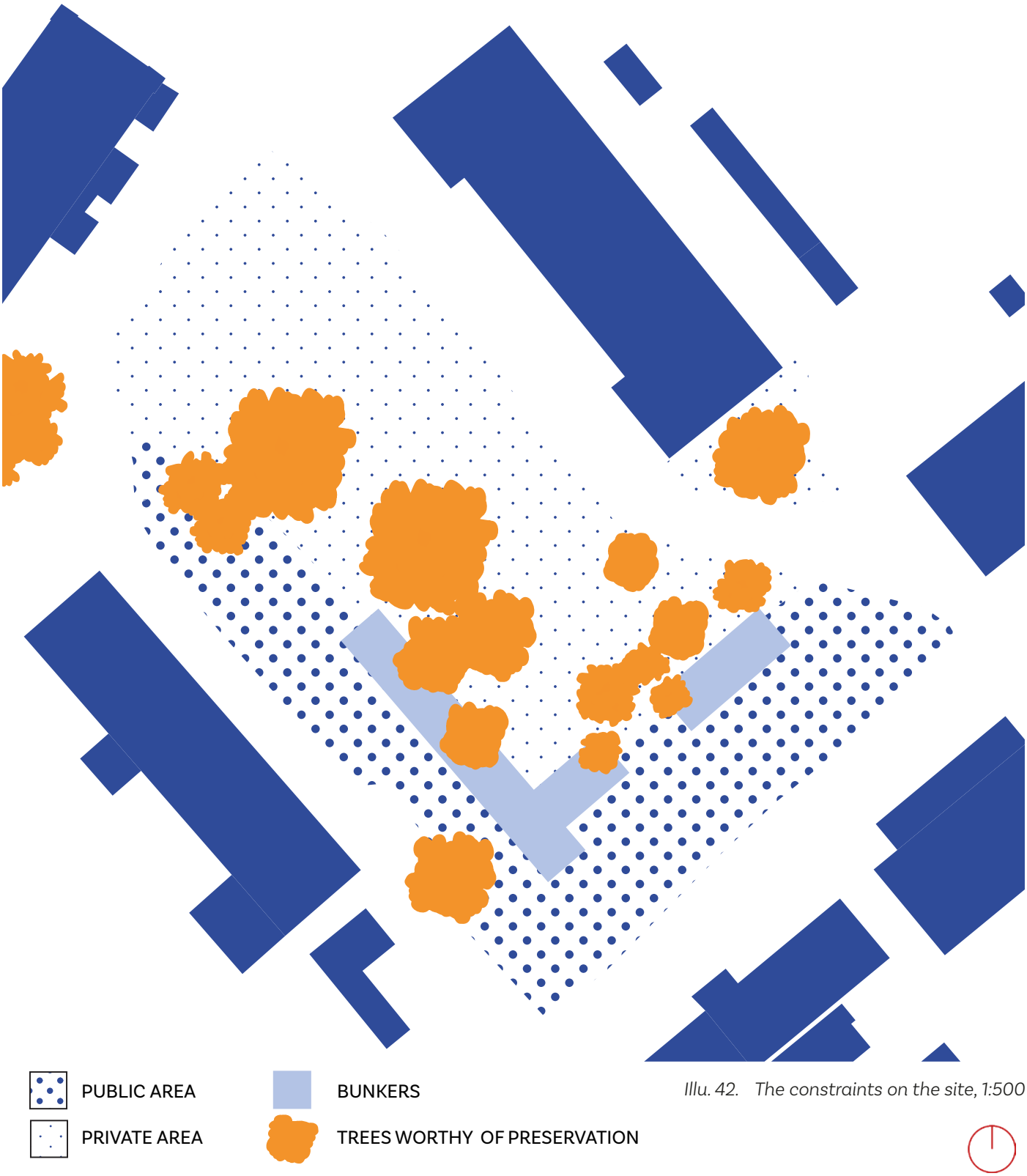
After analysing the site, it can be concluded that the site holds a central and integral role within Christiania, functioning not only as a communal meeting point but also providing essential amenities such as a grocery store, bathing facilities, and a healthcare center. Additionally, it serves as a crucial transit route for residents. Due to its pivotal role, the site presents an optimal opportunity for a visual transformation of Christiania.

Currently, the site is utilised as a playground and a small park, demonstrating its flexibility and adaptability. The atmosphere is very much created by the vegetation and the big trees create a comforting low-scale spacious feeling. The surroundings feature a mix of building styles, including old military structures and self-built constructions. The scale varies from one to four stories high, with many buildings serving a dual purpose, combining both residential and commercial functions.

Given its multifaceted nature and its significance as a central hub, the site offers a canvas for a thoughtful and impactful transformation that can enhance both the aesthetic appeal and functionality of Christiania. The diverse mix of building styles and uses adds to the unique character of the area, making it an ideal location for a visually compelling and comprehensive redevelopment.

However, some constraints must be taken into consideration when designing the site. This includes preserving the trees of value, leveraging the topography created by the bunkers, and respecting the surrounding functions and the life that thrives in the streets.

Furthermore, the site possesses a strong division between private and public, which needs to be respected and balanced in the design.



Illu. 42. The constraints on the site, 1:500

2.4 DESIGN BRIEF

In the following section, the reader will find a synthesis of the analysis conducted. This will raise the thesis question and form a problem statement. Furthermore, the vision, strategies, and concept will be described in both text and illustrations. This will then collectively form the design criteria for the project.

SYNTHESIS

When walking through Christiania one distinct characteristic of the area is that of identity. It is a place for expression of one's individuality with a setting that is accepting of all differences and people. Here you would find people of many different upbringings and social classes, with the wish to express themselves and to take part in a community of like-minded people. One place where this identity is especially strong is in the disparate buildings situated in Christiania. This is most prevalent in detached housing, but all buildings in the area possess qualities that make them distinct from one another, whether this may be in their layout, form, colour, or other distinguishing features. This amount of identity comes out due to the choices of the individuals in the building process, and at the time of renewal, on how they want to personify their residence. This is whether they want a new facade or a new addition to the house and is very distinct when put in relation to the general way of building in Denmark. In this way personification becomes the reason for the distinct identity of Christiania, that every resident is allowed to modify, expand, and change their dwelling, appropriating the space and making it their own. Each decision made in the process, from the layout of the rooms to the colour of the facade, reflects not only practical considerations but also the inhabitant's unique identity and individualism. It can also contribute to the overall atmosphere of the space, with strategic placement of windows creating intangible lighting schemes and the use of natural materials, like river stones can, connect the building even more to its surroundings.

When designing a place like this, one cannot forget the roots and history of the place. The anarchist society is alive and thriving, though it often sees threats from outside sources. One of the most important things to its survival is the community surrounding it, and in Christiania everyone contributes in their own way, which helps to develop the society they have created, as well as the built environment. Their tradition of co-building is a part of their anarchist approach to communal living and is part of their bottom-up approach to building. This need not be cast away when building new structures for social housing but rather should become a part of it. This along with the ability to adapt and customise dwellings, may be integral to life in Christiania. This will have a deep impact on the new residents and their ability to assimilate into the community.

This specific site possesses an inherent connection to both the village- and downtown Christiania. It becomes a crucible for the two, and opinions, people, and ideals meet here. It is a place for the exchange of ideas, but also for the mundanity of life to unfold. It has a prominent role in the life of the Christianites and is an important transit route from north to south and vice versa. It is currently a more or less blank space, that is only utilised by the surrounding buildings for temporary uses. Developing a site for both new and old Christianites is desirable as a way to interlink the two as a single community, rather than two groups. It does however possess some constraints in the existing vegetation, old military bunkers located in the terrain, and its proximity to other buildings.

PROBLEM STATEMENT

How do you build social housing, that allows residents personalisation through customisation and adapt their own disparate housing, while building a strong sustainable community within a site with the diverse identity of Christiania?

Illu. 43. The vision of the project, celebrating the ability to appropriate space

VISION

This thesis aims to give some control back to the Christianites and provide them with the tools to develop their way of life, the way they want to, while still developing the area and fulfilling the demands of the municipality. Specifically, it focuses on:

A big fear is that of c**reating A and B Christianites**, as the large inflow of new residents could create a schism between the new and the old. Using architectural tools, such as programming buildings, and urban spaces, this project aims to promote a united Christiania, where everyone is respected and has an equal say. By making room for the elderly generation of Christiania, the integration between new residents and the first residents of Christiania will be enhanced. By integrating people with a strong cultural connection to the community, together with people with new energy, the architecture could offer a platform for learning and development of the community.
Furthermore, one of the overarching aspects of Christiania is its identity, as all structures have their own expression that is created by the use of colour, shape, and material. For the integration to be seamless and fulfilled, the new structures need to inherit some of the qualities that establish the identity of Christiania, something that the thesis aims to ensure. A system needs to be devised, where adaptability and customisation help to create a built environment that is interlinked with the existing structures.

The notion of having more governmental rule in Christiania challenges the history and the existing political structure. This is bound to have some ramifications for life in Christiania. To alleviate this concern somewhat, this project aims to work with the built environment in a way that furthers the **development of Christiania** so that it respects the history and the wishes of the existing residents.
In the architecture of Christiania, there is clear evidence of reusing and recycling. Enhancing this side of Christiania could keep Christiania developing as an even stronger role model within sustainable architecture in terms of materials. The use of reused materials will not only benefit the environment but also give the building a certain expression. Furthermore, the implementation of appropriative spaces will help to enhance the identity of Christiania even more and may inspire other social housing projects to do the same. Through the creation of these adaptive spaces, Christiania heightens itself as an innovative and creative space for expression and user-oriented architecture.

In this way the project contributes to creating a built environment that all Christianites can agree to on some level, one that positions itself within the existing structures, to blend in and develop upon the notion of building in Christiania, and one that promotes this society in a different way than what is portrayed in the media, while also highlighting the valuable parts of this area.

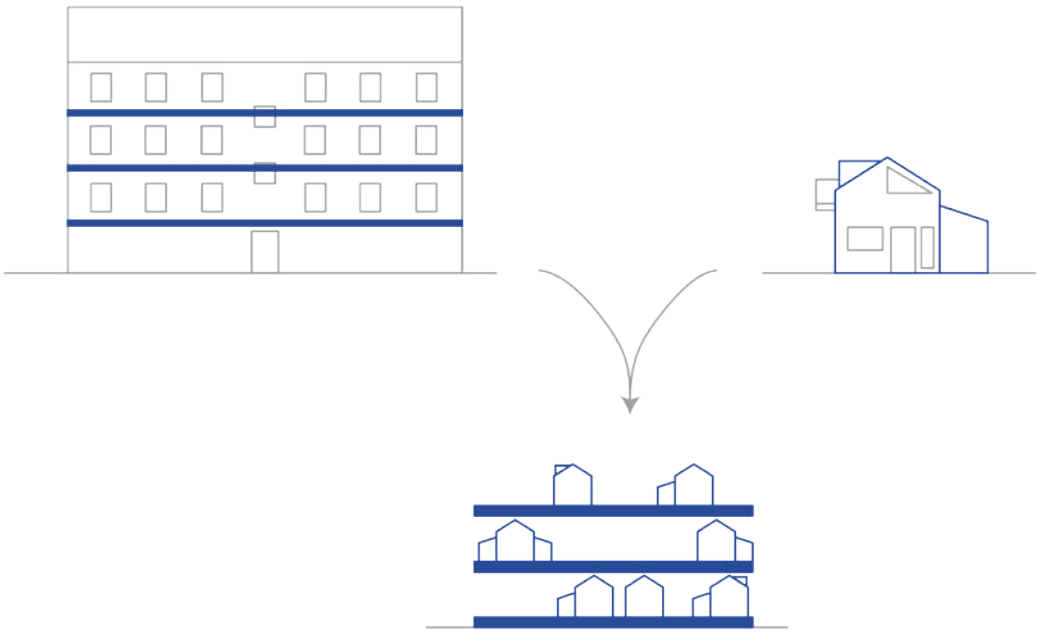
Illu. 44. Diagram - The strategy, tactics and the goal

STRATEGIES

The following strategy harkens back to PA as a method and helps to organise the project while directing it in a direction that helps to develop a fully formed project. The overall goal is to create coherence for the new residents in Christiania to both the other residents and the place. This is an essential part of creating growth within Christiania, as there should be equal power for everyone, and if there were A- and B-Christianites the latecomers would not have as much say. This coherence is achieved by giving all residents the freedom of expression through equal opportunity for adaptability meaning that the strategy for attaining coherence is through personalisation. The freedom to customise one's own dwelling to the needs and specifications of the individual creates a greater sense of belonging and responsibility for both one's own space and the surrounding place. Different tactics are needed to achieve this, herein lies a flexible space plan, communal functions, and reused materials.

By the implementation of a flexible space plan, the user gets the potential for growth, while creating relations to the existing Christiania, as they also have the same opportunities. The communal functions serve to connect the new and old residents even more, as they have informal and formal meetings. Reused materials serve to create an aesthetic expression of the user within the dwelling and convey their identity.

These initiatives help to create the growth that Christiania wants to alleviate the risks of the society becoming less and less independent, but rather staying as a bastion of anarchism and self-government.

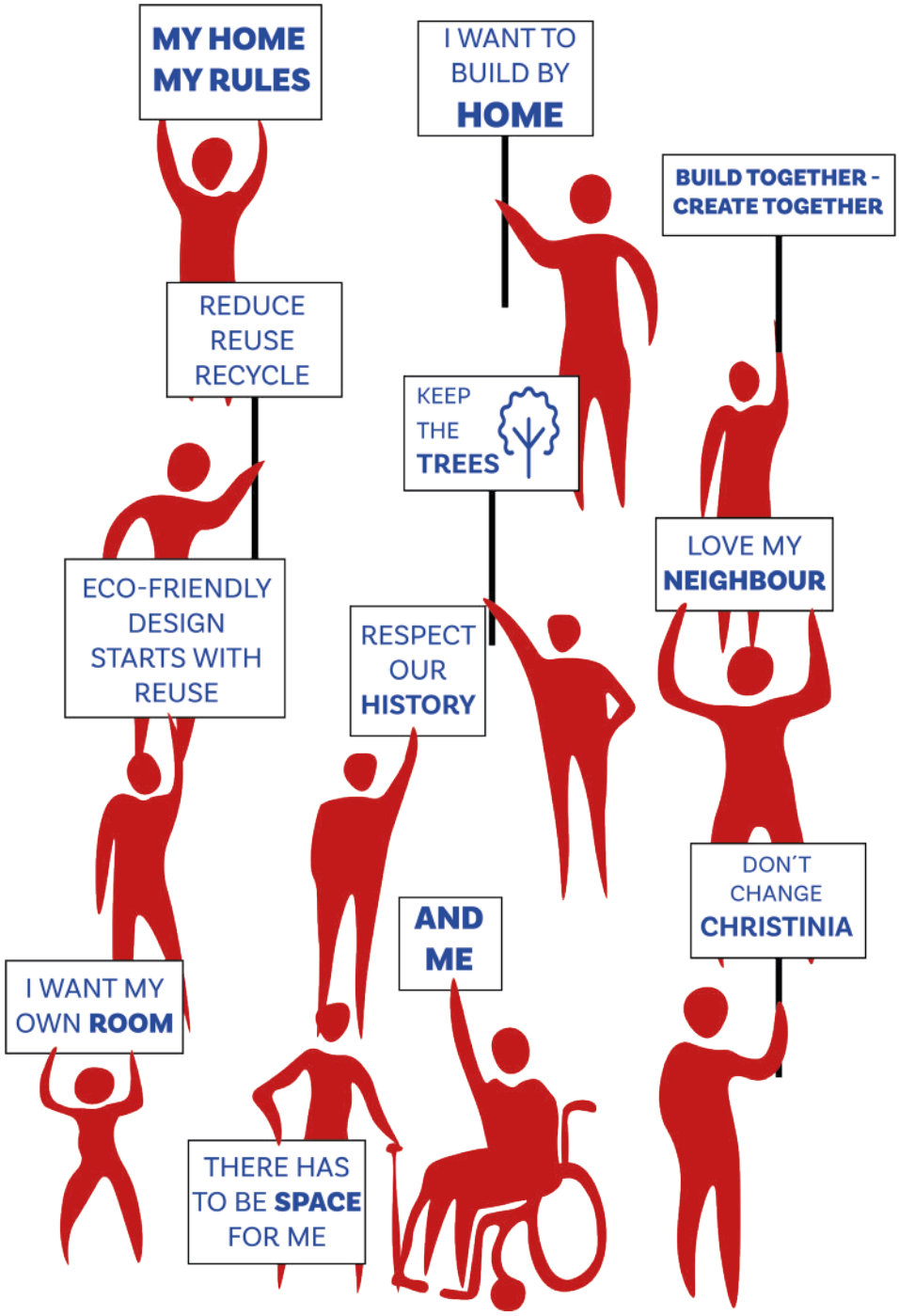


Illu. 45. Concept drawing - Taking the efficency of a high-rise building, and combining it with the expressional freedom of a detached house

CONCEPT

To afford the freedom of expression, one needs to have the basic needs of the design set. The core needs to be able to support the diverse wishes and requirements of the occupant, while still providing enough agency to not limit the desired expression. A platform needs to be established that can ensure, that the performed adaptations still possess a certain level of quality in all regards. The task of the specialist within this project is to design the core functions needed for the building and the urban space to operate, the services, the structure, and the shield, while the occupant resides over the freedom of the space plan and skins. In this way, the platform transcends its physical denotation and describes also the way the resident inhabits it. This platform will create a sense of belonging and a deeper connection between the physical space and the occupant. In doing so the facades will possess a certain identity as the freedom of expression unfolds in the different materials and spatial perception of the building, while the urban space is allowed to sprawl with different temporary structures which are built by whoever appropriates the space at the time.

It takes some of the qualities of ordinary multi-story housing while incorporating the identity and characteristics of Christiania. Combined it becomes a platform for life in Christiania to develop and unfold.



Illu. 46. People demonstrating for their demands

DESIGN GOALS

The **design** should encourage the use of **reusable materials**

The design should offer a range of **homes** available to be inhabited by a **diverse user group**

The design needs to afford **adaptability** and ***customisation*** of the dwelling

The design should enhance and further **develop** the village of Christiania

The design should focus on affording **community living**

The design should address the **qualities** of the **vegetation** and **topography** of the site

The design should offer the users a **collective building process**

Illu. 47. Diagram showing the Intergrated Design Process

3 DESIGN PROCESS

Within the upcoming chapter, the design process will be presented. It chronicles how the design has been developed from the early ideas and conceptual shapes, into the final building and urban landscape, tracing its evolution from inception to realisation. It will go into both grander concepts like circulation systems and programming as well as the smaller details such as LCA calculations and service routes.

Processes such as this will always be non-linear. Even with the implementation of the aforementioned IDP model, there will be periods of work that move between phases in this model in ways that are hard to understand afterwards. This is to be expected, as the dynamic nature of design often leads to fluidity and unpredictability in the progression of projects. Navigating this process and moving further in the development is based on the earlier design brief, even though this also evolves throughout the project.

In embracing the complexity of this narrative, the following chapter renounces a strictly chronological presentation in favour of thematic exploration. Each section becomes a description of a distinct facet of the process, allowing the description to traverse the project space with fluidity. As these themes are presented, there will be occasional leaps in chronology, and the actual chronology has been mapped, see illustration 47, to try and convey the process in its entirety as a way to communicate what choices were made when.

The themes that are going to be presented in the following design process chapters are the initiating design phase, **a sense of belonging**, and **modern village Christiania**. The first is an examination of the first lines drawn in the project, the first abstract ideas. The second is a deep dive into the thoughts and ideas for how to afford customisation in the building. Lastly, there will be an exploration into the themes and initiatives taken in order to develop upon the existing Christiania in a way that respects its history and its roots.

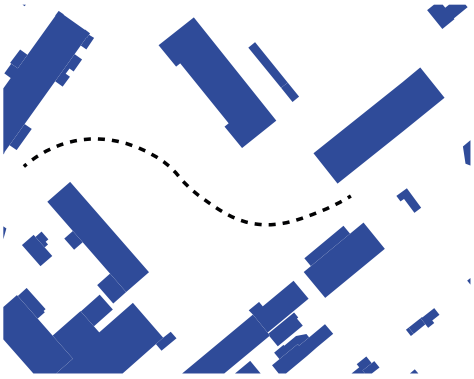
3.1 THE INITIAL DESIGN

By exploring the site, the concept, and the building process, this section describes various studies that have informed the design process and inspired further design development. Studies such as zone divisions, typologies in a foam model, and flow analysis tested the site and laid out the initial framework. Early visions and investigations into the building process connected the design with its users and the unique context of Christiania. Additionally, examinations on how to add mass to an existing structure, as well as considerations of materials and structural systems, influenced the early shape of the building.

ZONE STUDY

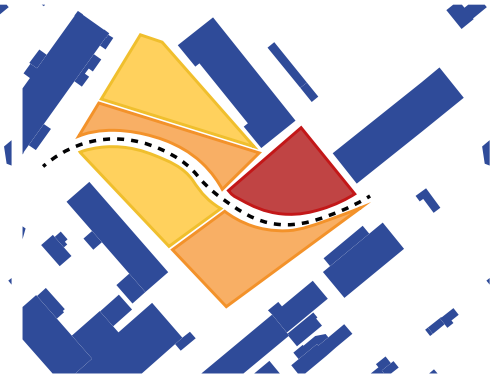
In the initial phase of the design process, the site was evaluated and identified distinct public and private areas. The existing structures, vegetation, and topography, created by the bunkers, enhanced the division of the site. The functions of the existing structures should be respected and reflected in the site. The division line, made by the topography and vegetation, creates zones in themselves and should be utilised as a quality of the site. To maintain harmony at the site, the following zones are set.

The strong division of the site suggested that the southern part should remain designated as a public area. This gave the idea of implementing a public building, a building to enrich the village ambience of Christiania, rather than merely serving tourism purposes. For instance, an administrative office or a building consultation center could be considered, which would relocate them from their current location at the edge of Christiania and offer them a more centralised location within the community, a wish they have stated themselves.



Illu. 48. The division line

Illu. 49. The first iteration



Illu. 50. The second iteration

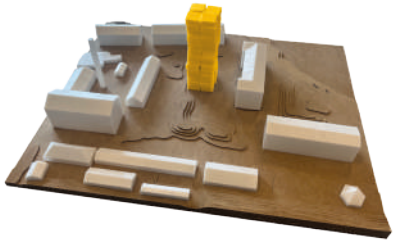
Illu. 51. The final zoning of the site

MASSING STUDY

To understand the scale and density of the site a foam study was conducted, and different building typologies were tested. In the proposed building plan, the building office of Christiana has suggested two mid-rise structures, capped at four floors, as depicted in Illustration 52.
The general model studies showed the buildings could be a tool to create a more private park while integrating into the existing structures, though the constraints of the site made this arrangement difficult. Furthermore, the grocery store would be experienced as out of place standing opposite this building mass. It could be concluded that mid- to high-rise buildings would not be experienced as alien to the site, apart from in front of the grocery store.

Illu. 52. Proposed building plan

Illu. 53. Low-dense typology

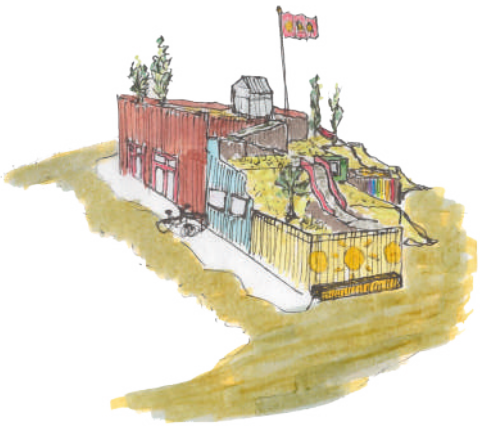


Illu. 54. High-rise typology

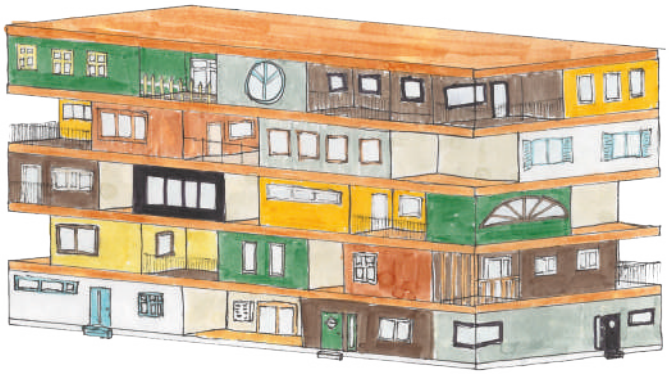
Illu. 55. Mid-rise buildings showing the initial placement

Furthermore, by redistributing square metres across two building plots, it became feasible to create a contrast in height, with taller structures in the northern section and lower ones in the southern, more public area. This differential in height would signify varying levels of privacy, with the lower profile of the public building fostering a sense of ownership and community engagement among the Christianites.

In the northwest area, diverse architectural styles and functions had influenced the design, resulting in a more formalised aesthetic. Conversely, the northeast plot offers an opportunity for a more playful and innovative expression, given the presence of imposing surrounding structures. This came to life through various vision drawings, that would translate this relation between the two sites into abstract shapes and structures.



Illu. 56. Vision drawing of an appropriative urban building



Illu. 57. Vision drawing of a rigid building

Illu. 58. Vision drawing of a vernacular building

FLOW STUDY

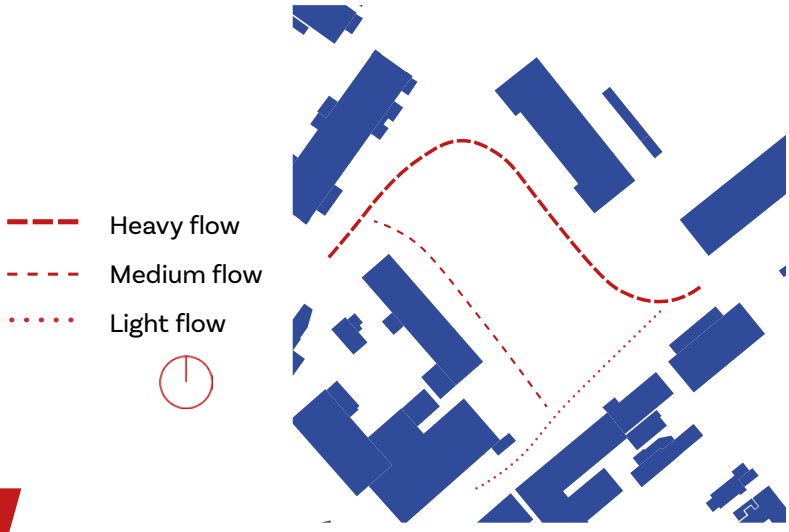
In the process of understanding the site, a flow study was conducted to gain deeper insights into the movements on and around the site.

In the initial iteration, the heavy flow was redirected to follow paths northward on the site. However, this led to a disconnect with the grocery store and reduced opportunities for informal interactions, while also compromising privacy in the area.

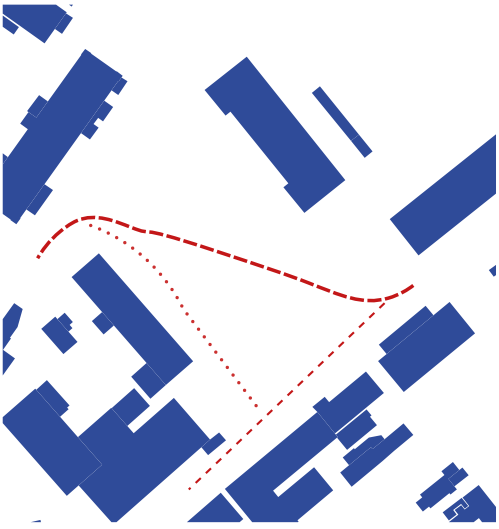
In the second iteration, a more intuitive diagonal flow was introduced to connect two entrances. However, channelling the heaviest flow throughout the site minimised informal gatherings near the grocery store, potentially speeding up pedestrian traffic and transforming the site into a transit zone. Yet, achieving this required significant alterations to both vegetation and topography, resulting in a bigger-than-intended intervention.

For the third iteration, inspiration was drawn from existing flows, strengthening them to enhance privacy in the more secluded areas of the site. Additionally, two potential meeting spots were strategically reinforced, to strengthen the existing urban qualities and potentially raise the amount of informal meetings between residents in Christiania.

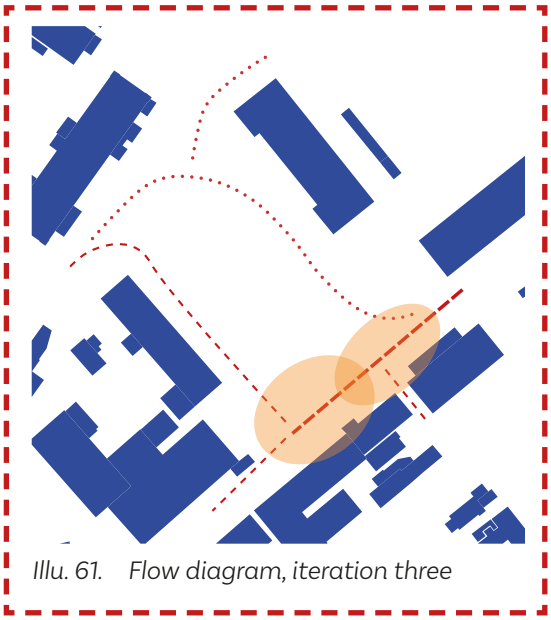
Given that the current flow dynamics at the site are functional, the focus should be on further refining existing flows rather than radically reorganising them, as such a change could adversely impact the design.



Illu. 59. Flow diagram, iteration one

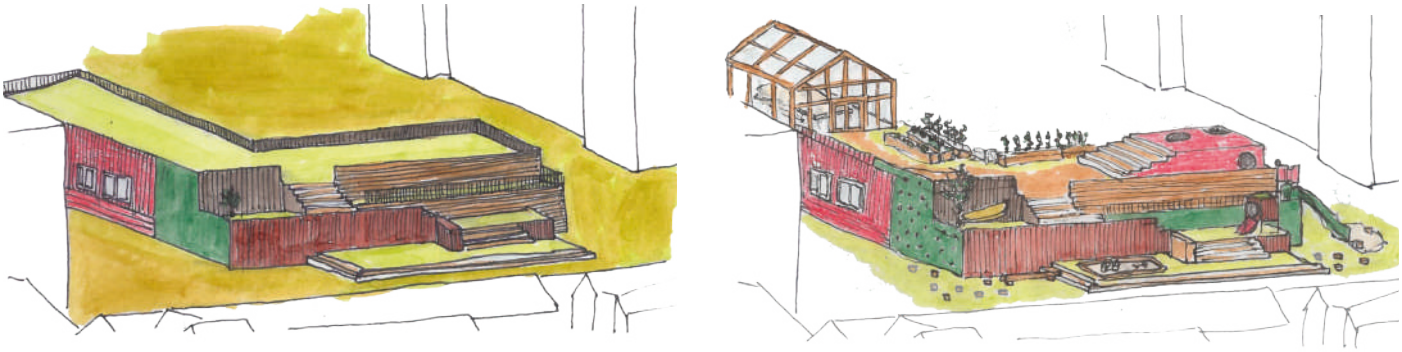


Illu. 60. Flow diagram, iteration two



Illu. 61. Flow diagram, iteration three

Illu. 62. An evolution of the residental building, with the timeframe of newly erected and five years later



Illu. 63. An evolution of the urban building, with the timeframe of newly erected and five years later

A VISION

As part of the vision to seamlessly integrate new residents while emphasising the village-like essence of Christiania, the concept of allowing individuals to personalise their own spaces emerged. This approach aims to facilitate swift and robust integration into both the site and the community, resulting in inherently unpredictable architecture. Consequently, it was of paramount importance to place focus on creating room for evolution, growth, and adaptable spaces. Two building examples were thus conceptualised, informed by a deeper understanding of the site, while showing the vision for the buildings and their future additions and adaptations.

However, a central concern arose regarding how to extensions within a Danish context, utilising materials that encapsulate the narrative of Christiania while also employing a structural system conducive to modular approaches.

PA

PARTICIPATORY ARCHITECTURE AS A PROCESS

To ensure a sense of belonging, the project needed to allow users to influence and shape their own residential spaces. By breaking down a building structure into distinct parts, an investigation began into which aspects of the design and construction process users could have input. This exploration aimed to strike a balance between the user, who possesses specialised knowledge of their own needs, and the architect/engineer, who was educated in building design.

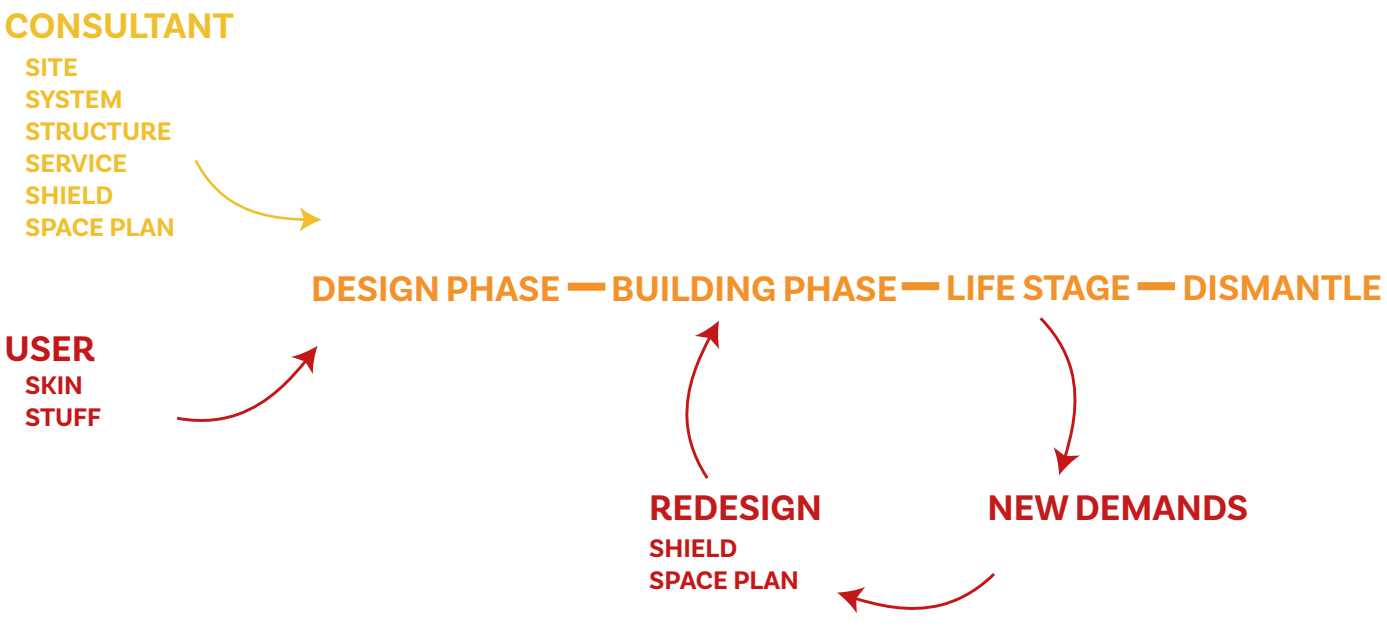
Inspired by the work of the architect Frank Duffy, and as elaborated by Stephen Brand, the building was conceptualised as comprising eight distinct layers, ranging from site-specific considerations to the personal belongings of the users (Brand, 1997).

The eight layers are categorised as follows:

SITE - Functional zoning and building placement
SYSTEM - Circulation in the building
STRUCTURES - Construction elements
SERVICE - Electrical, sewer, water, and air systems
SHIELD - Insulation, vapour barrier, and wind protection
SPACE PLAN - Layouts and floor plans
SKIN - Exterior and interior surface materials
STUFF - Personal belongings

Once all building components were assigned to different layers, the responsibility to design and build them, was to be delegated to either the user or architect/engineer. The importance and required knowledge were taken into consideration, as the layers like the SHIELD was very important and would require specialty knowledge to take responsibility for. However, these discussions only encapsulated the design up until construction. For the thesis, it was imperative to envision the building's ongoing utilisation. Thus, a timeline was devised, see illustration 64, to illustrate user integration over time, considering the dynamic nature of occupants moving in and out. It clarified which layers of the design/pyramid would be delegated to which specialist. The timeline also revealed that the different areas of responsibility need not strictly adhere to the pyramid's sequence but can be integrated at various phases.

By delineating the responsibilities of building between users and professionals, users developed a greater commitment and sense of ownership toward the building. This argument cemented the choice of ensuring user involvement in the design process and showed that it is paramount to the project. However, this diagram elucidates what designers should prioritise when developing such concepts.



Illu. 64. Building life cycle

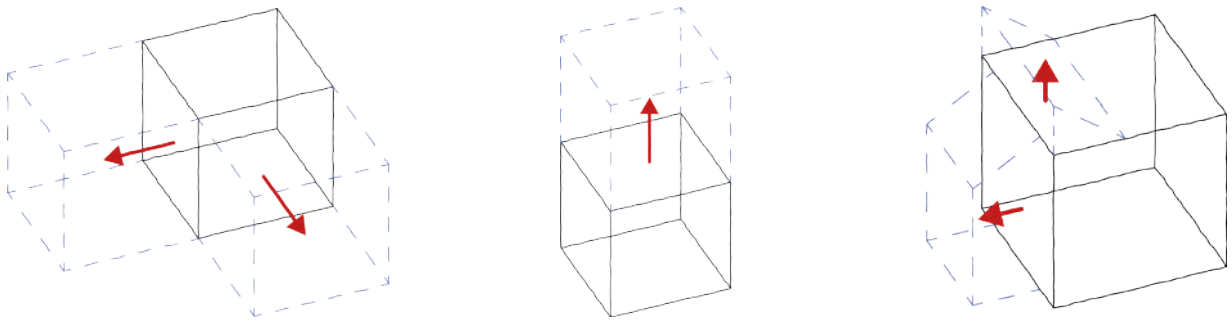
SHAPING

To be able to adapt one's dwelling, studies of how to add building mass were conducted. The study concentrated on the diverse range of extensions to existing building structures. It would delineate various extension options along with their respective advantages and disadvantages, without drawing any conclusive remarks, but instead highlight the potential they could add to the project.

Expanding **horizontally** would offer the option to add new rooms to an existing building, providing occupants with substantial flexibility to tailor spaces to their needs, whether for larger or smaller rooms. Nonetheless, this type of extension would pose challenges, especially when considering expansion on the ground floor.

Another option would involve expanding **vertically** within the existing structure. This option can also be implemented on the ground floor, but it could be limited by the building height, or adjoining dwellings, which would restrict the user's flexibility. This kind of expansion would also create a bigger physical division between existing and new rooms.

Another alternative would be to enable users to create smaller **add-ons** to the existing building. Measures of this nature could be dormers or bays, that would shape the spatiality of the room and accentuate its identity. However, this approach would be limited by the available space and facades, while the potential uses it would add to the building would be few. These small add-ons would however be feasible on every level of the structure.



Illu. 65. Expansions in different directions

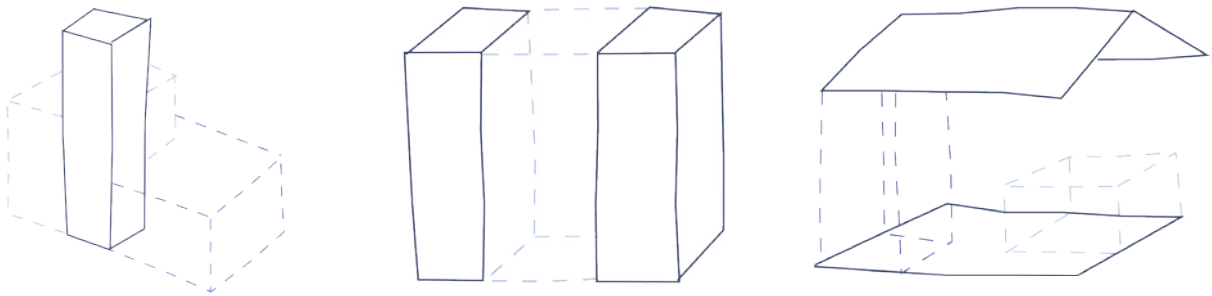
When these studies were to be implemented on a building scale, it could either give shape to the building or have its possibilities defined by the building. How this could impact the outer shell of the project needed to be explored further. Various solutions were explored to understand how a building could evolve around this concept.

One approach involved developing **a core or center** around which expansion occurs in different directions. This would not limit the expansion in any way, to allow the highest level of adaptability. Implementing this method of expansion would create a chaotic expression, with many different facades, colours, and textures blended into an amalgamation of many different identities.

Another tactic was to construct **different cores** and then allow extensions to occur between them, merging them into a unified unit. The expansions could occur both horizontally and vertically, with limitations to the horizontal expansion. With this, horizontal barriers would create limits for growth, but simultaneously create a more defined building mass, that would be easier to control from a technical standpoint.

Additionally, a principle where the **foundation and roofing** are set was examined, leaving the rest to be explored by the user. The implementation of vertical and horizontal expansions was feasible, while the vertical would be limited. This seemed to be another version of the former variation, but the roof would act as the delimiter for both directions of expansion, as one would otherwise build outside of the building space.

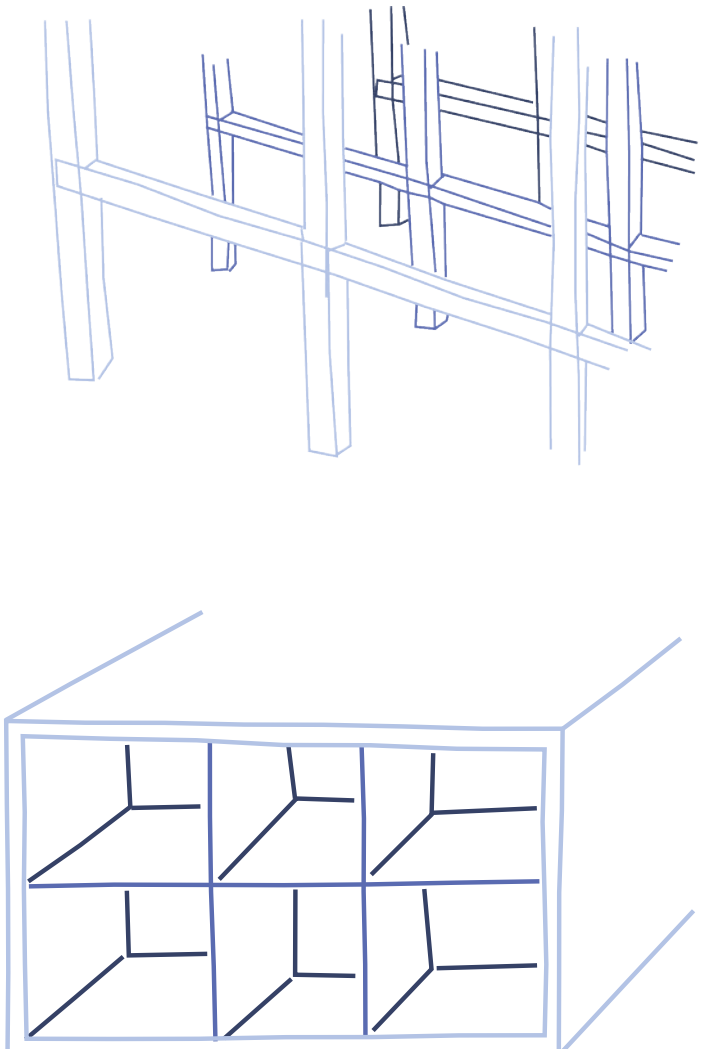
These studies informed the rest of the design process in what type of expansions to implement and where, according to its potential use in the project.



Illu. 66. Different design of buildings offering adaptability for its user

AN INSPIRING STRUCTURE

In this part of the process, it was crucial to understand the structural system. When looking at the Quinta Monroy project, it was clear that the structure consisted of materials such as concrete, however, it was imperative to the project to convey the narrative of Christiana's people through architecture and materials. Furthermore, as this project was only concerned with a part of the overall development plan, a focus was put on modularity, as this building was supposed to be able to be placed on multiple sites. Hence, the decision to use wood as the load-bearing material was made. Some sketches were drawn as a post and beam system, while others relied more on the idea of plates and slabs to create the spaces for the Christianites to inhabit. To understand both systems in context, further research was conducted in order to determine which one would suit the project best. Specifically, three different aspects became apparent as arguments for choosing one over the other, these being practicality, occupant freedom, and lastly stability.



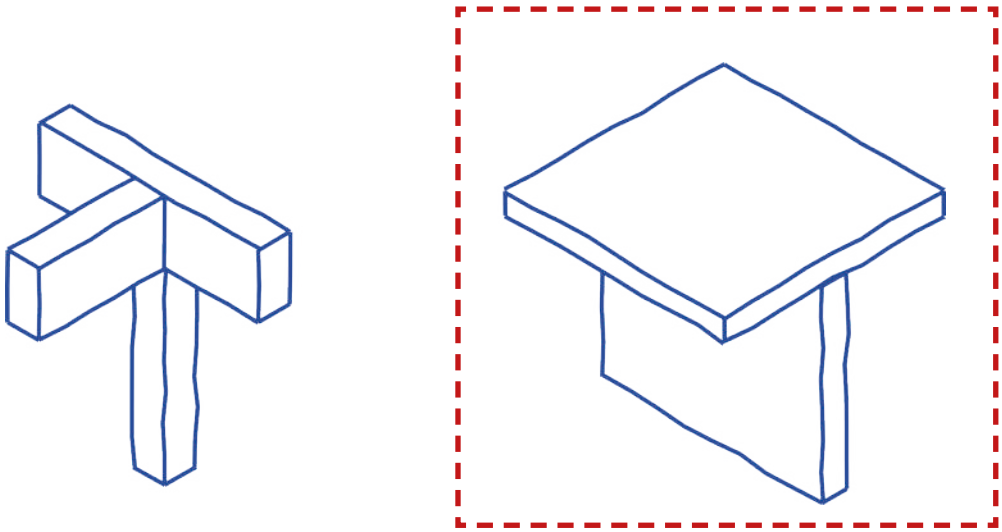
Illu. 67. Different principles of wooden structures

The placement of the different services, that would provide heat, ventilation, water, and power is relevant to discuss when looking at the structural system, and the practicality of placing these services. Due to the height of a potential beam, it could become impractical for the services to be located at the ceiling. Ventilation would become an issue, having canals at 120 mm in diameter, running underneath the beams. There would need to be compensation in terms of the ceiling height, resulting in more material use. The practical solution in this case seemed to be the plates and slabs, as there would be no disparate ceiling height, and the services could be constructed in a drop ceiling.

There was a wish to allow the residents to have as much freedom as possible, in terms of creating space made for appropriation, that would suit whoever lived there. These different structures invite different methods of appropriating the space created by them, where post and beam constructions pose the most liberty in the appropriation of the actual spaces. The use of plates and slabs would however remove the restrictive considerations of the actual construction, as they would not need to think about or investigate the structure, to determine whether an addition could be made. The flat surfaces would be a blank canvas for the unfolding of the resident's life. The floor plan is more flexible for the individual apartment, and not dependent on the placement of neither posts nor beams. As the project relied on the individual to be able to create their own living space, there was a need for a more defined space to appropriate.

Lastly is the point of stability. With the length and slimness of the building, and the idea of cores, there needed to be some element of stability along the length of the building. These elements could be some kind of braces, either in the shape of steel cables or some kind of wooden truss. The solution could also, in terms of plates and slabs, be actual plates running along the length of the facade, which is a reasonable solution to the challenge that required no further development of the structural system.

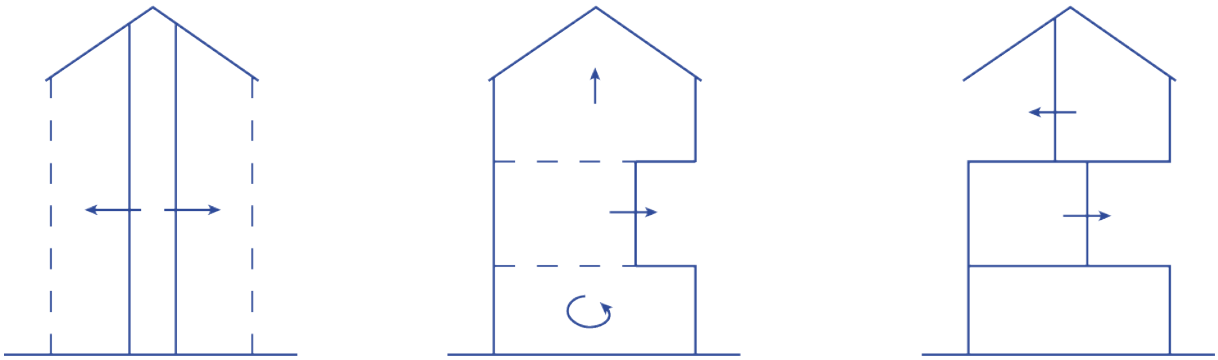
Due to the importance placed on freedom of expression within this project, and the ease of use, the plate and slab structure were chosen to be developed further to best suit the project.



Illu. 68. Structural principles

3.2
A SENSE OF BELONGING

In this section, there will be a thorough explanation of the design process with regard to creating a sense of belonging within the newcomers to Christiania. It will detail how the project was designed to afford customisation, especially with the intent to bridge the gap between new and old Chrisitianites, by creating opportunities to exercise their freedom of expression. It will detail how the floorplans were made, how the daylight quality has been ensured and many other aspects.



Illu. 69. Diagram showing the differnet arrangement of the space plan

SPACE PLAN

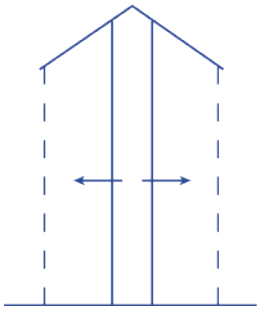
The floor plans in this project were one of the most important aspects as the adaptability of the dwelling relied on these. When making the plans, a great focus was put on the voids in the plan, as these would be filled in by the occupant. There was a need for a kind of space, as mentioned in the conceptual section, that would not be filled from the start as these would be appropriated by either building mass or outdoor spaces like winter gardens or balconies.

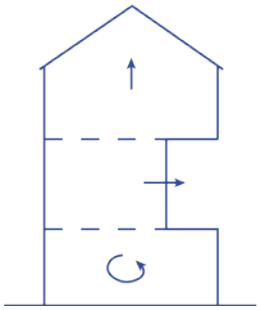
The initial ideas sprang from the notion of the core, or rather two cores. One for the circulatory system, and one for services. Here the occupants would create the plan themselves, to build upon the idea of co-building or co-design. They would place the outer walls, and the platform and the core would be the only thing that was in place from the beginning. The core would also possess a shaft for services like heating, sewage, and electricity to free up space for other functions. To this core would also be connected a kitchen to run water the easiest, and this would also be placed by the occupant. This way, the residents would get to fully design their residence, while the architect would ensure that the basics would be secured, along with the structure. It was envisioned that this would create the spontaneous and characteristic aesthetic of Christiania, but there was a concern regarding the ability to extend the apartments. When one resident would adapt and extend, another would lose some of their ability to, as it would create obstacles regarding the building envelope, while the structure would also depend on the residents' ability to design the actual structure, something that is not desirable.

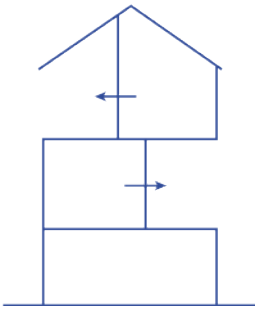
The ideas shifted to overcome this hurdle, by retaking some of the freedom from the occupant and designing more of the apartments from the start. To eliminate thermal bridges, the ground floor had to be fully covered, which, along with more examination of the user, inspired a shift in approach from equalised floorplans to different plans for different user groups. As the seniors would be those with the least resources to extend and adapt, they would get an apartment already fully built which had the possibility of rearranging the internal spaces. These would be smaller, and more plentiful, as to accommodate singles mostly. Young families with children would be directed towards the upper floors, as these were bigger, but allowed them to extend upwards with dormers or a whole other floor. Lastly, couples or single people would be relegated to the middle floor, where there would be the possibility of extending outwards, toward an external gallery. In this way, the different apartments had disparate opportunities suited to their user.

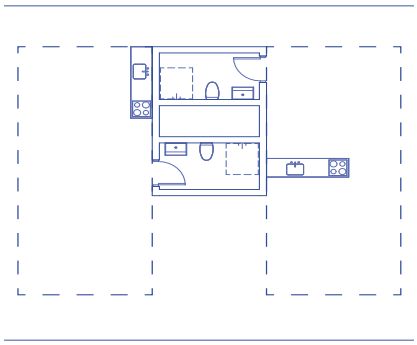
This still presented challenges regarding the building envelope as the occupants would adapt and extend. If one would build an addition to their space, there would be no way to secure the vapour barrier, without having to educate the Christianites on its importance. One resident adapting would always have encroached on others' space. This aspect of extending was so important to the project, that there would need to be a compromise, with other aspects that ultimately led to shifting in the placement of the apartments and therefore the facades as well.

This shifting in the apartments would ensure that whenever an addition was added, it would only affect one resident's space, not any other. There would still be ample opportunity for extension, but the building envelope was taken care of, making this arrangement the best way to position the apartments. Within them, there was a kitchen, a living room, a bedroom, and a bathroom, creating a simple platform from which to expand and appropriate the space taken up by a balcony. This was able to be appropriated in different ways, leading to many different configurations of the apartment, with or without a balcony, more rooms, a bigger living room, and many more. Due to a shift in the circulatory system, the lower floor had to be rearranged and ended up with apartments of different sizes which resulted in five apartments, with the ends being a bit bigger. These were able to accommodate older couples as well, which helped the diversity of the building and was able to allow more of the existing seniors to move here. The upper floors became more uniform, but the amount of freedom in adaptation made it possible for singles, couples, and small families to inhabit the dwellings.

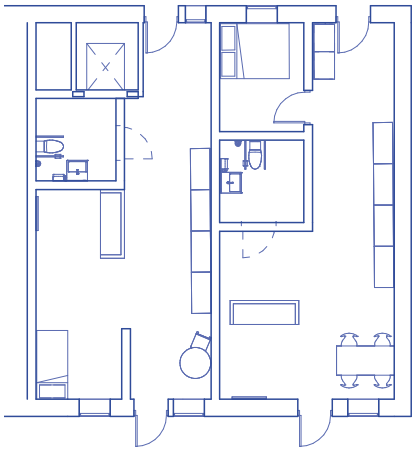








GROUND FLOOR



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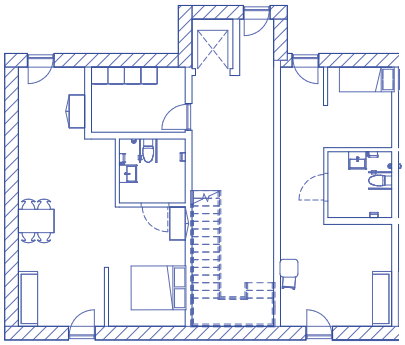
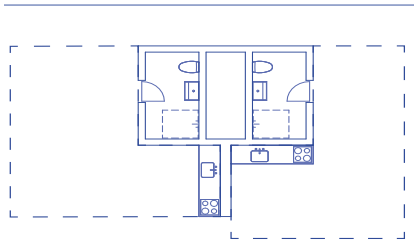
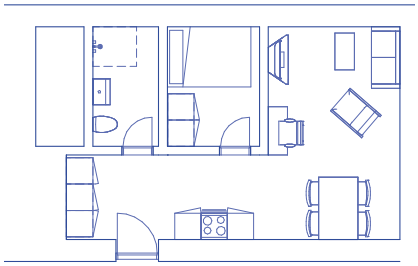




FIRST FLOOR



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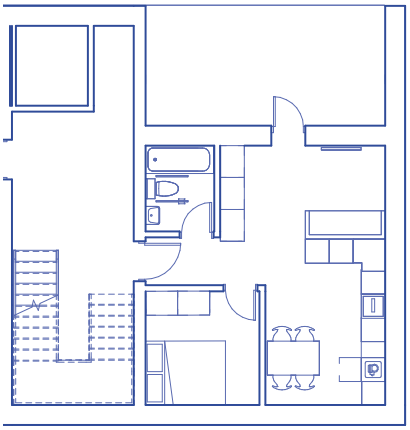
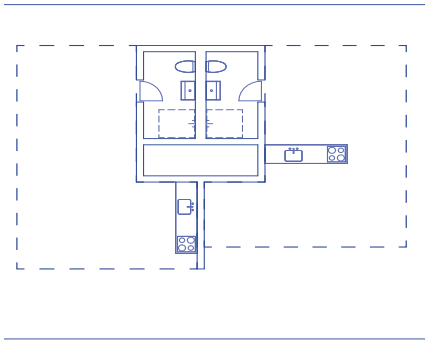
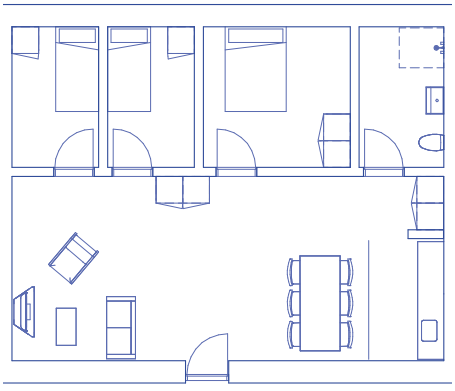




SECOND FLOOR



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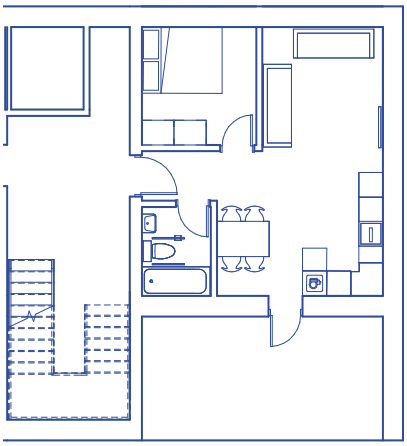


Illu. 70. Diagram of spaceplan evolutions

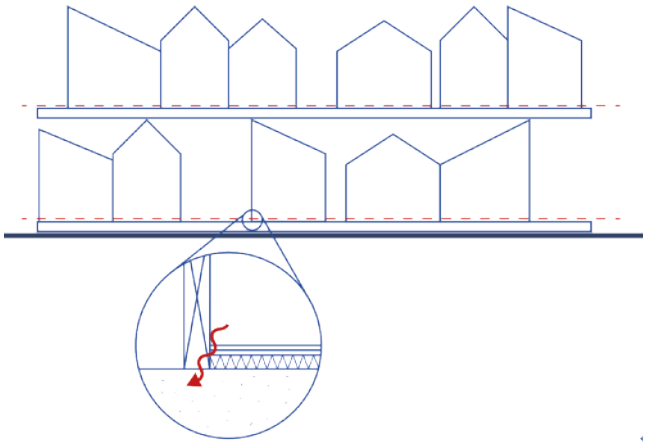
SHIELD

As the possibility to expand and adapt was one of the core concepts of the project, one aspect was of utmost importance namely the building envelope – here called the shield. The primary focus was on ensuring an impermeable vapour barrier and avoiding any thermal bridges throughout the building's lifetime. The project is founded on the underlying basis, that a double vapour barrier could create problems with moisture being trapped in the construction and lead to rot. The project would rely on the inhabitants to secure the vapour barrier in the future project, which meant that the process of cutting and re-securing the tightness of this barrier would solely rely on the abilities of the occupant unless they hire a contractor to do so. It was decided Christianites would be able to carry out this process, with arguments and evidence behind it being the fact that they had succeeded in improving all but six buildings to regulatory standards (Joker, 2024), and the existence of the building consultation office. Although there was a belief in the Christianites, there was a wish to make the process the easiest, and even possible. Furthermore, this should not be a compromise and create thermal bridges.

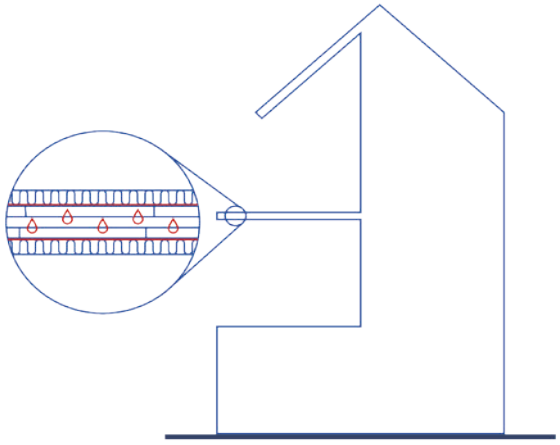
The first thoughts surrounding this topic were in conjunction with the studies on extensions and additions, as this would be the situation where problems could arise. With the idea of platforms being the core shape concept, the challenges would arise in correlation with the platforms becoming thermal bridges that would transfer a lot of heat out of the building, especially with the concrete slab for the ground floor. There was a possibility to incorporate thermal breaks between what would become the interior and exterior slab, but this was a bigger intervention than intended for the residents to perform, and there was no guarantee for efficiency. To combat this it was decided that the ground floor should be fully built from the start, which meant that the ground floor slab would be covered, and there would be a greater degree of control in terms of thermal bridges.

After a shift in the shape and programming of the building, the platforms were still found to be a challenge, this time in the CLT elements on the upper floors. These would have to be continuous to retain their strength which meant they would penetrate the exterior walls and become another thermal bridge. What could be done to remedy this, was to insulate and seal the whole of the platform, but putting a vapour barrier on both sides of the load-bearing structure could trap moisture, leading to rot.

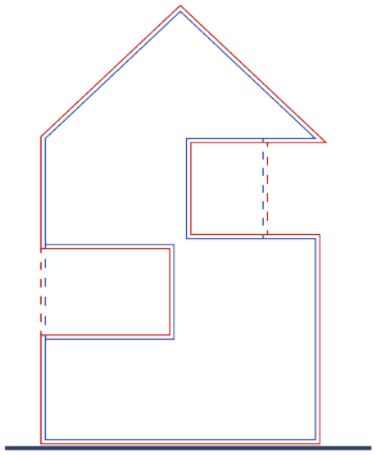
This, along with other factors led the project to shift the placement of the apartments, to always ensure that there would be no thermal bridges, even when there would be additions to the existing apartments. There existed how-



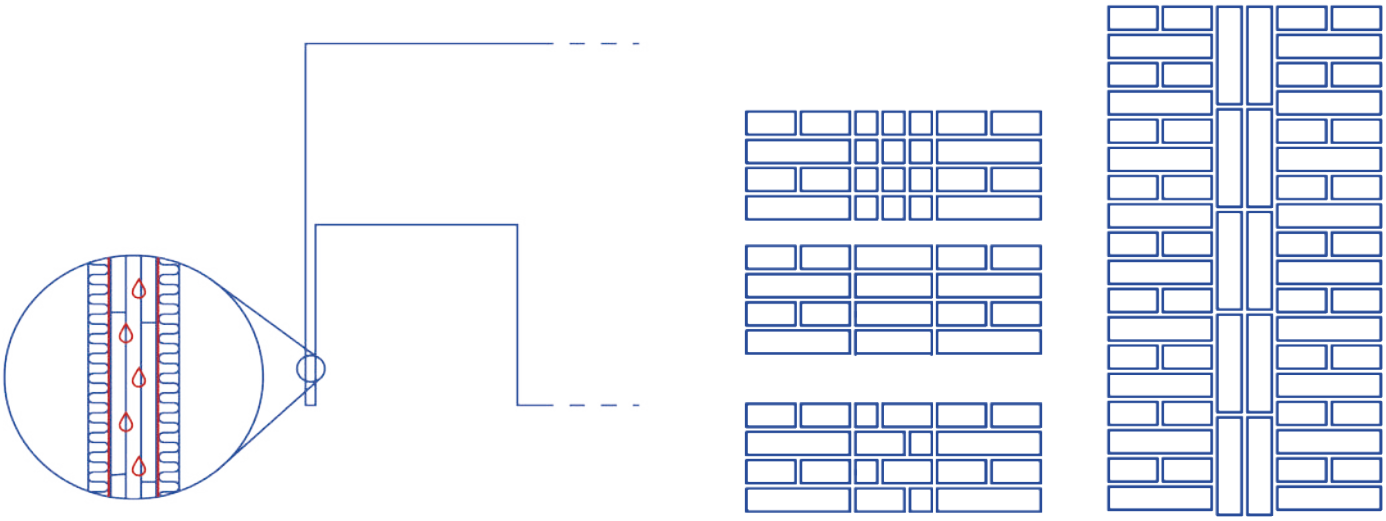
Illu. 71. Considerations regarding thermal bridges in the early concept drawing



Illu. 72. Double vapour barrier are a risk for trapping moisture , leading to rot



Illu. 73. Shifting directions of the apartments, solves the vapour barrier problem



Illu. 74. Plan drawing of the gable, with different solutions of nudging the resident

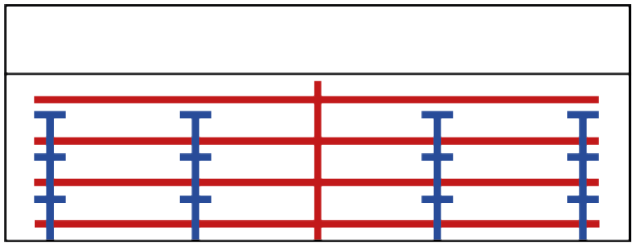
ever still a challenge with the vapour barrier in the gable, as there would need to be some kind of support for the upper apartments at the end of the building. If this was a full CLT wall, there would be a double vapour barrier, and if it was a column, it would be a thermal bridge. Different solutions were investigated, which led to the choice of building a full wall, but in brick instead. Due to the inorganic nature of brick, a vapour barrier was not necessary for this type of construction, which made it possible to make an unbroken vapour barrier throughout the building envelope.

Constructing a brick wall made it more difficult for the resident to extend their dwellings, as the process of removing brick demands more resources, but it was deemed necessary for the project. It did however also pose a challenge regarding the thermal bridging when it would become part of the interior. To nudge the occupant to intervene, a study was made into how the bricks could be laid to make it easier for the resident to find the right place to "cut". A standing stone, recessed to about the width of a closer brick, was chosen as it would clearly indicate the intended place for the occupant to remove stones and fill the hole with insulation.

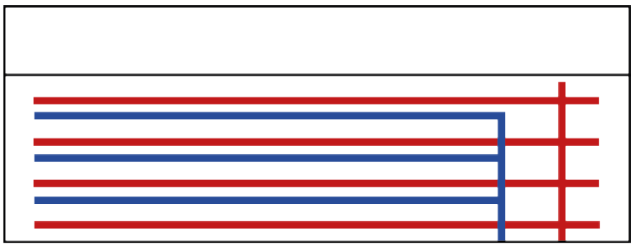
These initiatives ensured that the building would possess no thermal bridges, nor a broken vapour barrier, which would secure the performance of the building.

	Bedroom/ Living room	Kitchen	Bathroom
Minimum ventilation, including infiltration [l/s, m_2]	0,42	0,42	0,42
Additional extract air flow [l/s] (1 main room)	-	20	10
Additional extract air flow [l/s] (2 main room)	-	25	10
Additional extract air flow [l/s] (3 main room)	-	30	15
Additional extract air flow [l/s] (4 main room)	-	35	15

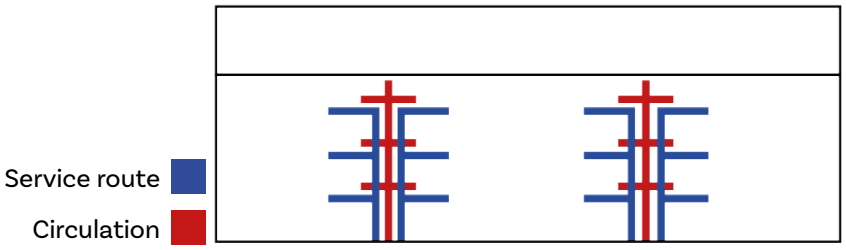
Illu. 75. Table of design ventilation air flow rates



Illu. 76. Diagram of inital service route



Illu. 77. Diagram of amended service route



Illu. 78. Diagram of final service route

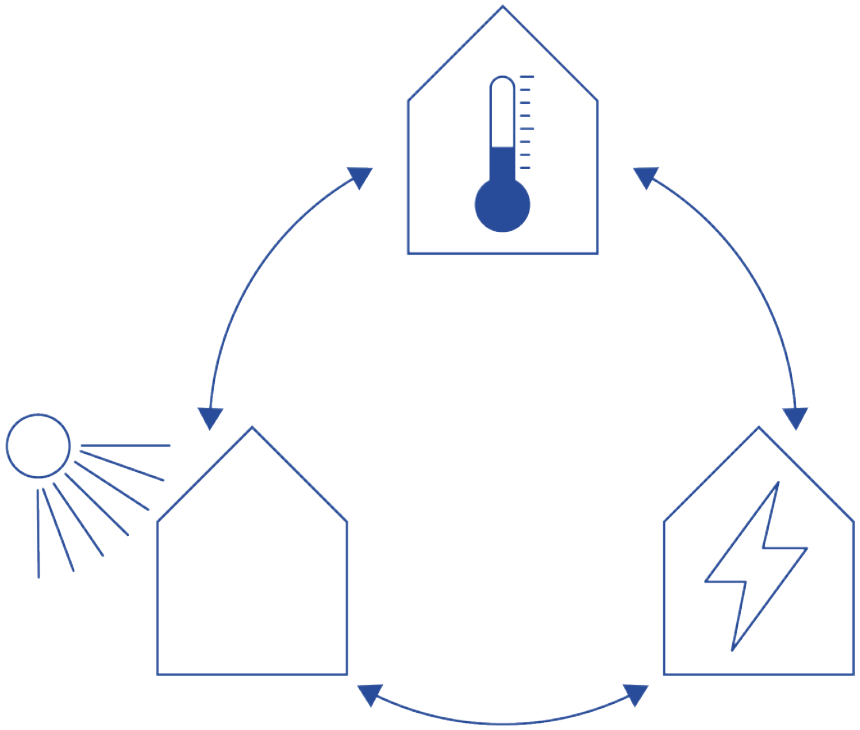
SERVICES

One of the aspects that needed to be ensured when working with expandability, was the services running throughout the building, this being ventilation, heating, domestic hot water, sewage, and electricity. In order to create an integrated design, that would be able to support expansions and adaptability, this needed to be designed in such a way that it would not obstruct the freedom of expression or the ongoing process of expansion. This meant that the systems, especially ventilation should be dimensioned to be able to handle all scenarios, which made us examine the design values for ventilation (Danish Standards Association, 2019).

At first, the ideas related to this theme surrounded the idea of service cores, where all service routes came up through the building in one shaft that would service two apartments on each floor. This was separate from the circulation system to give the most freedom to the occupant, as they would not have to think about ensuring pathways and the necessities would be constructed from the start. It did however demand that the kitchen and bathroom were just next to each other, with little room for adjustment in the space plan. This informed the further studies into the positioning of the service system, in order to optimise the possibility for expansion.

As the project developed, the circulation system was being reworked and repositioned, which caused a shift in the way circulation was being handled. With the service cores connected to a circulation core at one end of the building, there would be more room for adaptation. The rooms were not as restricted. This came with other challenges, as the ducts for the ventilation system would take up a lot of space in the first few apartments it would have to travel through, as the ducts here would be larger, and they would help propagate a certain aesthetic within the apartments that was not desirable. This could be solved with a dropped ceiling, where the ducts could run above, which would also solve some of the problems with the sewage, whenever the pipes were far away from the service shaft.

When the project shifted to having multiple cores, there was a need for a new system for the services. The most forthcoming solution was to have service shafts running up by the circulation cores, as this would be the easiest, but it required some shifting in the space plan. The ventilation unit would be placed in the attic of the core, to provide the possibility for service on the machine, while a shaft would be placed by the elevator for ventilation to run in. The shafts for heating, water, and sewage would be placed in direct connection with the core, in such a way that they would not obstruct the shifting of the building.



Illu. 79. Different technical aspects affect each other in holistic approach

TECHNICAL APPROACH

Concurrently with considerations about potential extensions to the dwelling, there was a need to ensure compliance with regulations, particularly regarding energy performance and daylight. As there would be a great deal of co-building with the occupant, a set of rules would need to be made, maybe even physically expressed, to guarantee ongoing regulatory adherence. These would be conveyed to every resident whenever an addition was to be made, in order to ensure performance and comfortability of the building.

These rules would need to govern many different aspects in terms of both u-values, glass area in the facades, etc. and these would present a restrictive process to the resident, where their choices would need to coincide with the more optimised solutions. To not restrict the freedom of expression, there was a wish to create a range of values for the different aspects, that ensured the performance, while expanding the variety of options for the resident. These ranges should also be able to support the extensions and additions made to the building so that there would be no compromise in comfort or performance. The aspects that would need to be ensured were the daylight, the indoor thermal climate, and the energy performance of the building.

Many different initiatives were able to affect these aspects, but to limit the scope of these examinations the project adhered to a stricter methodology. By the use of generative design, specific values were chosen and varied upon, to establish the ranges that would become the rules for the residents. Here, the size, properties, and placement of the window and the building component u-values were chosen as the varying values, as these were deemed as the most important, those with the biggest impact on the design, see Appendix 5.1. They were input into the appropriate applications and simulated upon to be able to create the ranges.

These values could not be analysed singularly, as they would present consequences for all design aspects. The values used regarding the daylight needed to be evaluated against the indoor thermal climate and energy calculations, and vice versa. In this way, the project strived to become an integrated process. This also caused the necessity of more studies, also regarding functional and aesthetic aspects, to understand these consequences fully, and make the most informed decisions regarding the ranges, and thereby the rules, we impose on the Christianites.

PERFORMANCE

As explained earlier, the technical aspects of the project were examined through the use of generative design, specifically through the use of a monte carlo model, and such is the case with the energy performance as well. There was a focus on reducing the required energy as much as possible, to align with the values and wishes of Christiania. The solution space found with these simulations would need to support many different types of buildings depending on the amount of additions that could be built.

The energy calculations were based on the Danish energy frame model, where the threshold is 30,0 kWh/m2 per year + 1000 kWh per year divided by the heated floor area. Furthermore, a focus was put on removing all energy for overheating in the model, to then make sure it would not exceed the regulations in terms of the maximum of 100 hours above 27 degrees and 25 hours above 28 degrees operative temperature. (Bygningsreglementet 2018)

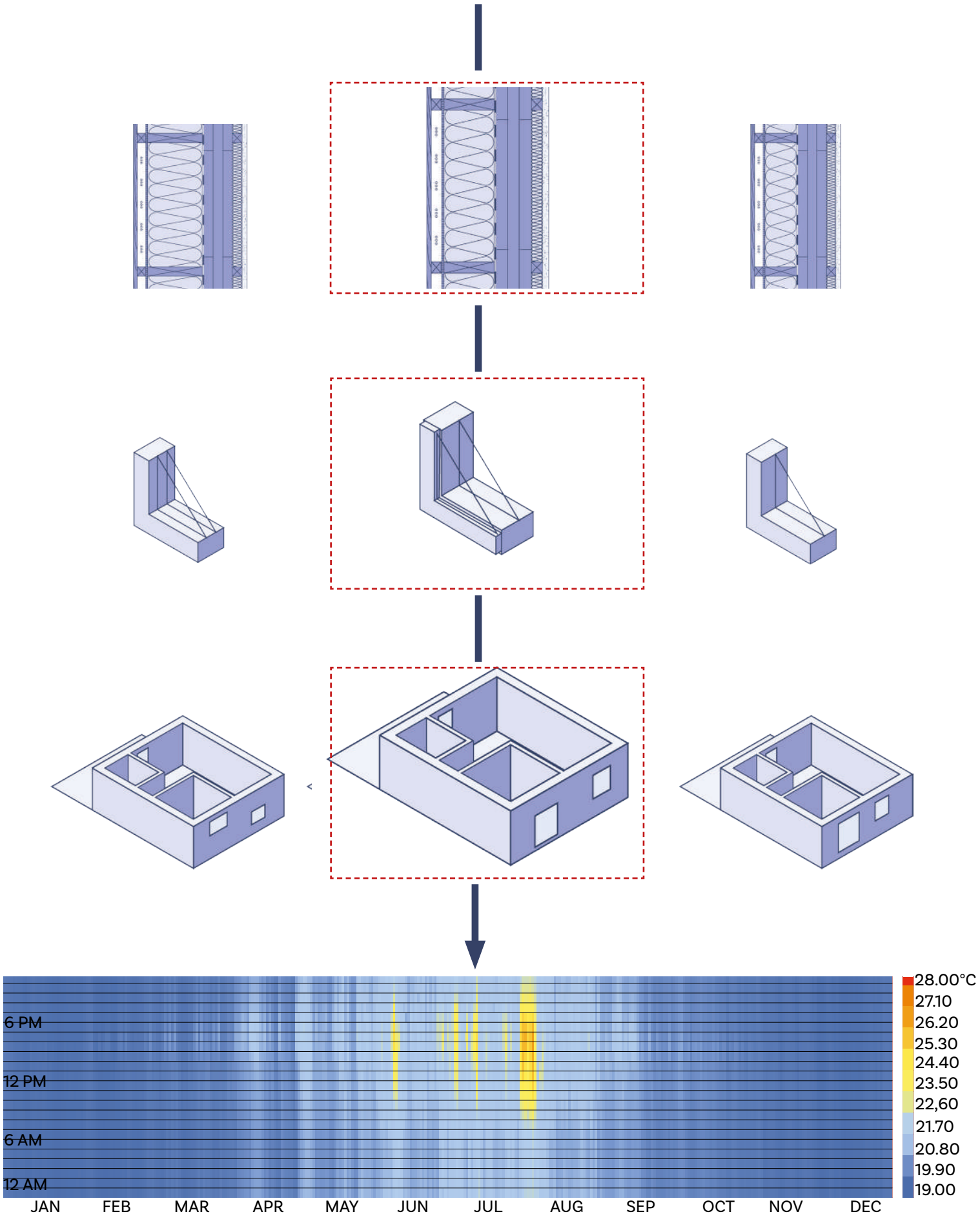
The actual values that were varied were the u-value of the different building components, the window types, and the sizing of the windows. The first was based on calculations done to establish a variety of u-values of the building examined by looking at the amount of insulation and varying it to find the size that balances the efficiency in a reduction of the energy demand and the perceived climate impact of the added material. The window type was investigated by establishing setpoints for the u-value and g-value of different types of window designs, with a focus on reused windows. Lastly, the sizes of the windows were varied to find the balance between the solar gains and the heat loss. The sizes were viewed as a function of the window-floor ratio, to correlate it with the room in which it sits. This workflow is shown on illustration 80, which is a singular simulation, out of the hundreds made, and the resulting operative temperature.

This did have a direct relation to daylight and could affect the amount and spread of light within the apartments. This led to the undertaking of ongoing simulations to make sure that the variations done within these calculations would not compromise the quality of the daylight.

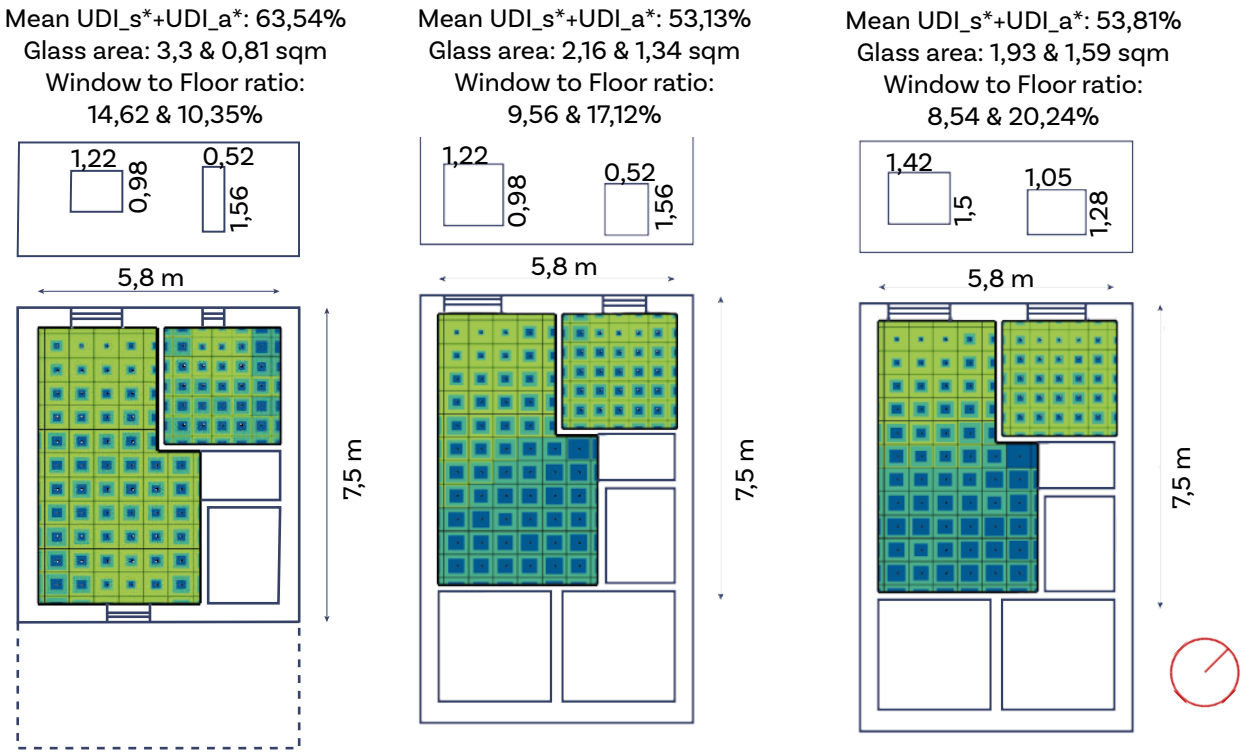
To further lower the energy demand, the use of hybrid ventilation was implemented. This made sure to balance the use of mechanical and natural ventilation when conditions would favor one over the other. The project relied on cross ventilation to most effectively utilise the natural ventilation and to ensure this was possible the project relied on the rule of thumb that the maximum room depth is equal to 5 times the room height (Butcher and Chartered Institution Of Building Services Engineers, 2011).

This workflow ensured that whenever iterations were made, its performance was taken into account in terms of both energy and thermal comfort. By integrating these considerations, the design process became more comprehensive, addressing not only the immediate architectural needs but also the long-term sustainability and occupant well-being. This holistic approach ensured that the building operated efficiently, minimised environmental impact, and provided a comfortable and healthy environment for its users. The resulting rules are described in the assembly, as it is information that pertains to the experience of the resident.

Due to the window properties, the SGHC being low, it became clear, that almost all possible window-to-floor ratios were viable, as the solar gain was almost irrelevant. This did however make it necessary to decrease the u-value of almost all building components for the transmission loss to not be too great in relation to the regulations. The result found to be viable for energy performance and thermal comfort was lower than 24% window-to-floor ratio. The result of these simulations are found in Appendix 5.2 & 5.3.

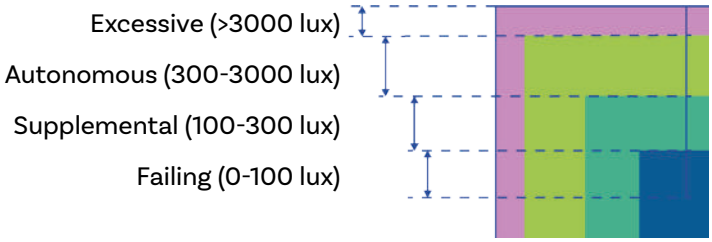


Illu. 80. Abstraction of the workflow regarding building performance and thermal comfort



Illu. 81. Excerpt of the daylight simulations from Climate Studio

*UDI_s : Useful daylight illuminance supplemental
*UDI_a : Useful daylight illuminance autonomous



DAYLIGHT

When approaching daylight in this project, there was a focus on enhancing the general quality of the light within the apartments. The regulations had to be met, the Danish 10 % rule, but there existed a wish to further refine the spread and level of daylight to optimise indoor visual comfort. This led to an exploration into UDI, useful daylight illuminance, and how this method of simulating and analysing daylight would benefit the project.

This metric was understood as a way to convey the percentage of occupied time when different ranges of illuminance are met. This may be both beneficial and detrimental according to the range in which the illuminance lay, in accordance with illustration 81. The width of the band was directly proportional to the percentage of time this value falls within the given range. Values in the supplemental category were considered to be acceptable for bedrooms, while only those in the autonomous category were considered viable for living rooms and the like.

To perform these simulations the placement, size, and properties were varied to explore the solution space in which to position the project. The placement was restricted to 200 mm from all inside edges of the walls, but all placements within the created square would be perceived as viable. Any scenarios with a window-to-floor ratio lower than 10% would be discarded, as this would not comply with regulations. The SGHC (solar heat gain coefficient) value, was kept the same for all simulations, but later varied with the influence of the energy and thermal simulations. Lastly, in order to ensure the ongoing quality of the apartments, multiple rounds of these simulations were made, as the apartments evolved, which could affect the level of daylight in the different rooms. The different additions one could make had an effect on the availability of daylight for the singular window, which meant that rooms had to rely on other openings for daylight. These then had to be large enough to support harsher demands.

Not just the technical were evaluated but also the functional aspects of the windows. Here, the placement of the windows, and the resulting spread was a focus, as the daylight within a room should fit the functions of the inside. This resulted in the creation of rules regarding the minimum sill height of the window, which would ensure a spread within the room applicable to the function within.

Through analysis and interpretation of the resulting simulations, the project could establish rules that govern the window sizing, placement, and properties to enhance and ensure indoor visual comfort. These were different depending on the apartment type, the room, and the direction of the windows. The sizing in this study became the determining factor with a range between 12%-38% window-to-floor ratio being deemed a viable range, as the mean UDI_a+UDI_s was above 60%. Higher than this range, the amount of excessive daylight would begin to diminish the quality of the light. The result of these simulations are found in Appendix 5.4.

WINDOW STUDY

To support the daylight studies and their effect on the implementation of co-building within the project, a study was made into what aspects the resident would be able to control. The study concentrated on testing window composition and window types. The study tested the balance between citizen control and architectural control, without drawing any conclusive remarks.

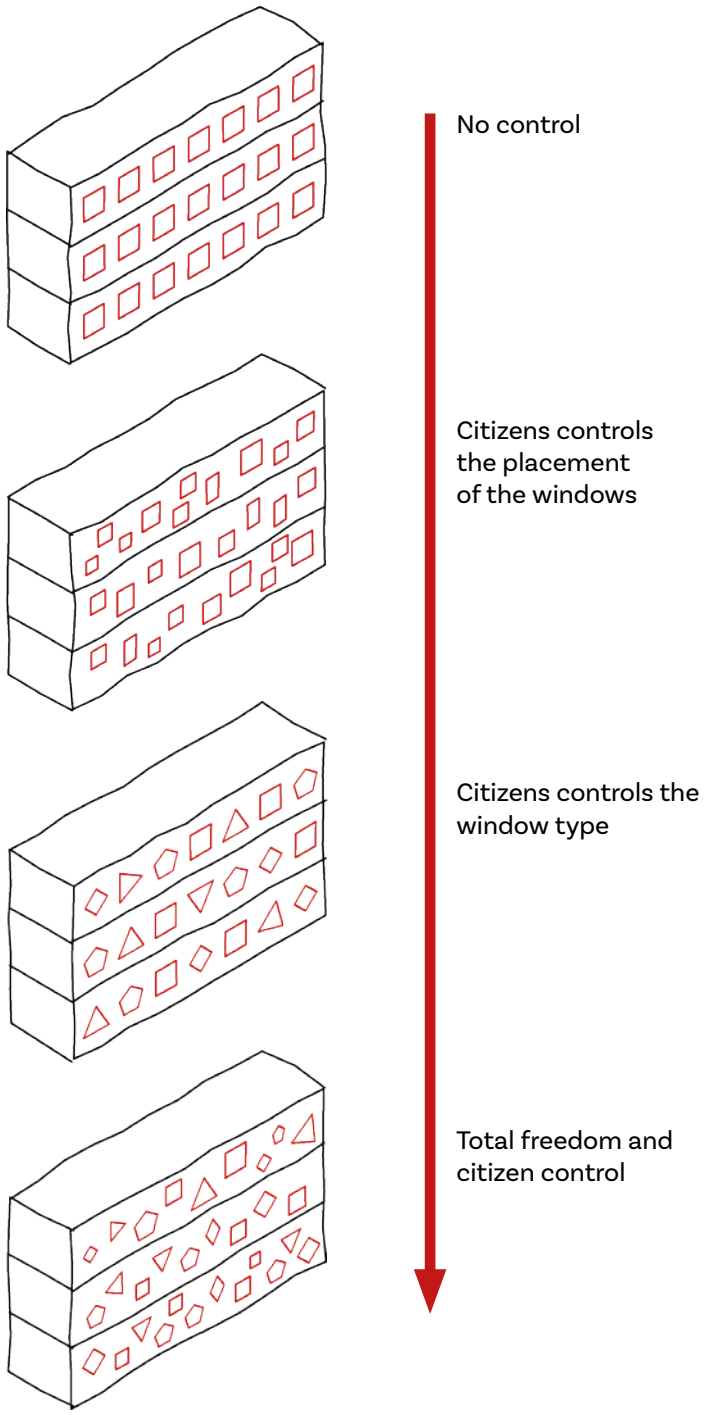
This option offers users **no decision-making power**, as the window type and composition are predetermined. This is typical in social housing projects that prioritise efficiency over citizen participation. The advantage of this approach is that it grants architects full control over the design expression and ensures cost-effectiveness.

This option empowers users to influence the final design by allowing them to have a say in the **placement** of predetermined windows. Architects retain control over specific window types, which users can then place according to their preferences within their floor plan. This grants users the freedom to design their windows to suit their needs, while architects ensure that the windows maintain consistent performance and contribute to a unified facade expression.

Another option involves architects providing users with a **predetermined grid** wherein they can then place their chosen window designs. This grid ensures a cohesive architectural expression while allowing users complete control over the window's aesthetic. However, users are limited to fixed placements within the grid and thus cannot directly align the window designs with their floor plan.

This option grants **complete freedom** to the user, as the architects have no control over the placement or design of windows. Users can freely position windows according to their preferences without any restrictions. This represents total citizen control, embodying the principles of user autonomy and decision-making.

Therefore the last iteration is the chosen one, as to give the user maximum freedom and make it possible to incorporate the flexibility of choosing reused windows. However, this needs to be reflected in the overall technical calculations of the building, with other initiatives being implemented to ensure the performance.



Illu. 82. Diagram showing the level of citizens control in terms of window design

REUSE
MATERIALS

In conjunction with the facade studies, the topic of the materials available for the user came up. As the goal is coherence with the rest of Christiania, the use of re-used materials is very applicable. For the occupant to be most dressed to make sustainable choices in the adapting of their dwelling, an exploration into re-used materials has been conducted. This focuses on the outer and inner skin, while also looking at such things as windows. This is to be able to fit the project building into the existing context and give it some of the defining characteristics that make up the identity of Christiania.

As a prevalent and malleable material, **wood** is one of the most used materials for the newer structures in Christiania. Re-using it can be a bit complex as there is the possibility of it having been compromised with its earlier use, as it may have been exposed to moisture or stresses that have affected its structural integrity.

Its use is seen mostly in facades and roofs, where it is fastened as cladding, to protect the insulation and the structure from the weather. In most of the detached dwellings, it is also used as the primary structural material. When reused it is repurposed and retrofitted as inner walls, such as the "New Nordic wall system" from Vandkunsten. (Nielsen, 2016a)

The expression it is able to make is varied and there are many ways to coat, construct, or otherwise modify it. The way the cladding is created, whether it be planks, shingles or lamellas is also part of the character that each building has. Furthermore, these can be painted to personalise it even more of which there are many examples within Christiania.

The Danish building tradition is marked by **clay bricks**. It is a widely used material throughout the whole nation and is used in everything from sheds to courthouses. There is a specific cutoff for when bricks can be re-used, that being the 1960s when the Danish builders switched to a more durable mortar (Farsund, 2023).

The actual bricks are mostly used as a facade material, while other applications of clay can be used as a roofing material, and it is the dominant material in the pre-occupation buildings within Christiania. When re-used they can be implemented as the same constituent in most cases, depending on the formerly mentioned state. Otherwise, companies like Lendager have had some success in re-using whole sections of brick, with mortar and all (Lendager and Pedersen, 2020a).

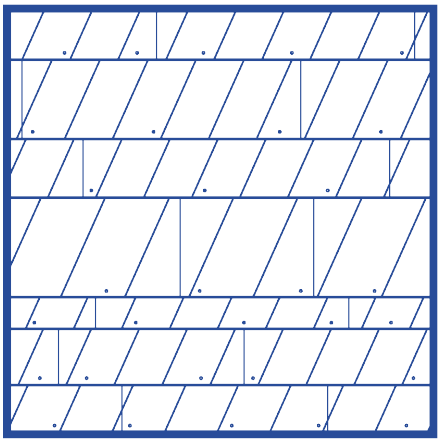
Brick has a very distinct architectural expression, that is commonplace to see for the Danish people. It is traditional and evokes known aesthetics. There exists a space, where the brick becomes more of an artistic expression, with either different colours of brick, the bond it is laid in, or the direction it is laid in; horizontal or vertical.

Within Denmark **metal** has traditionally been reserved for roofs, as a finishing surface and here zink, copper, steel, and aluminium have been the most popular. The classic roofs of Copenhagen are an example of this, with their patinaed surfaces that become verdigris.

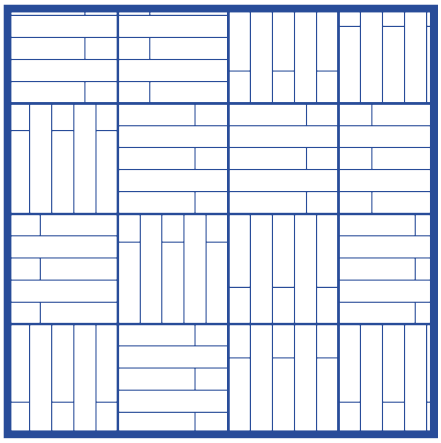
In the later years, metals of different kinds have been seen more as a facade material, with their long lifespan and resilience towards the weather. Especially on sheds and other buildings of the same type, as it is a fairly cheap material to quickly cover against the weather. It is seen in disparate places in Christiania which may be due to its ease of installation, just having to be put directly onto laths. It can be reused completely as it can be melted down and reshaped for new use. This does however use a lot of energy to heat the material, which is why some companies look to re-use existing panels of excess building materials, like Vandkunsten and their "Spiro duct shingles" (Nielsen, 2016b).

Due to the glossiness of the material, metals are disparate from many other materials. Their shine becomes an expression in itself and is a big part of its aesthetic. The different metals also harbour different properties which are most pronounced in their ageing, and their patina, which come to be many different colours. They do however mostly come in rectangular panels, which may limit their freedom of expression.

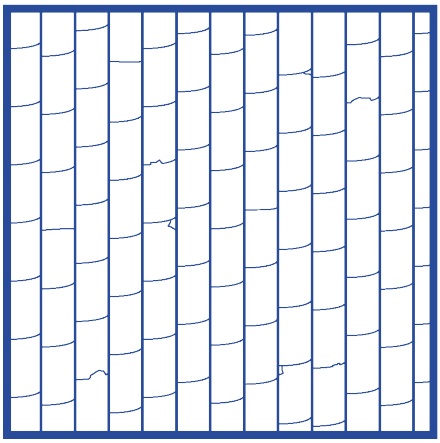
A big part of our facades is glass and by that **windows.** These come in many different varieties and with different levels of insulation and energy optimisation. This may cause problems with re-use as the technology creates more and more energy-efficient windows.



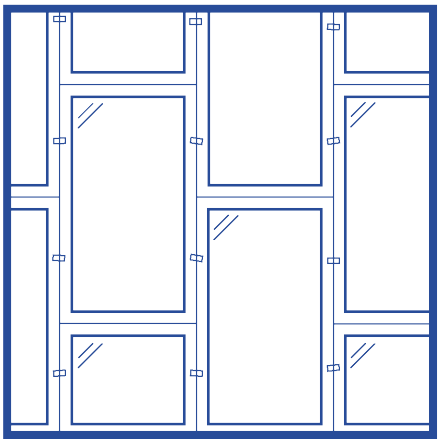
Illu. 83. Reused metal as facade



Illu. 84. Reused wood as a inner wall



Illu. 85. A clay tile facade

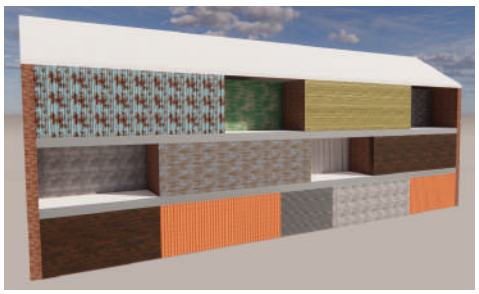


Illu. 86. Reused windows as a facade

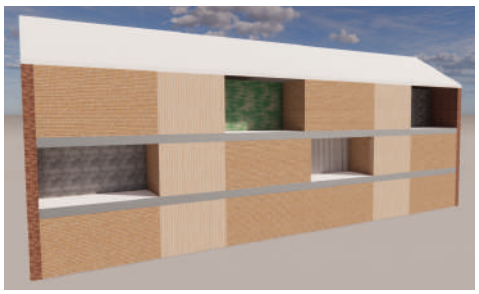
Windows are a central part of buildings, as it is both a big part of the visual comfort as well as the energy performance of a building. It is seen in all buildings from the smallest dwellings to the biggest office buildings, and can become an expression of the building, by being its facade. Usually, it is not advised to directly re-use windows though, as it may have become obsolete during the lifetime of the building. Re-used windows can be applicable in some renovations as there are more slack rules and regulations, or be refurbished or upcycled into a new system, such as those used in the double skin facade in "Upcycle Studios" by Lendager. (Lendager and Pedersen, 2020b)

The slick and reflective facades of glass-skin buildings create a visually dynamic facade and its transparency helps to blur the boundaries between inside and outside. Building with these kinds of expressions is often cited as being modern or even futuristic. This can be combatted by using something like wood as a framing material, which gives it a warmer aesthetic.

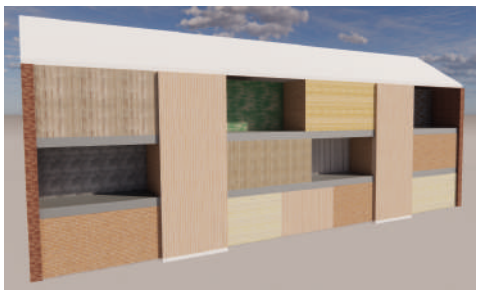
The potential aesthetics that reused materials can generate carry the same playful and stimulating essence found in Christiania. Upon visiting the reuse center within the community, one can readily observe the prevalence of reused windows as a familiar feature in the building elements. However, it's noteworthy that while bricks and wood dominate the facades in Christiania, wood might not be the optimal material for exterior cladding when considering reuse. Through analysis, it's apparent that more diverse facade materials such as reused metal or clay bricks would harmonise with the context and simultaneously infuse a fresh identity into the area.



Illu. 87. Facadestudy, iteration 1



Illu. 88. Facadestudy, iteration 3



Illu. 89. Facadestudy, iteration 7

Illu. 90. Facadestudy, iteration 8

Illu. 91. Facadestudy, iteration 9

Illu. 92. Facadestudy, iteration 10

FACADE STUDY

Simultaneous with the window studies, and their aesthetic deliberation came also the thoughts about the facades. To afford the freedom of expression the facades had to be able to accommodate and display many different types of materials, depths, and identities. By implementing co-building there would be many disparate aesthetics, that would need to coexist. With the changes in the building being an ongoing process, the facade also needed to be a blank canvas for many kinds of aesthetics, and for the residents to express their identity in the exterior. For this to be possible there was a need for a study on the facade and its expression.

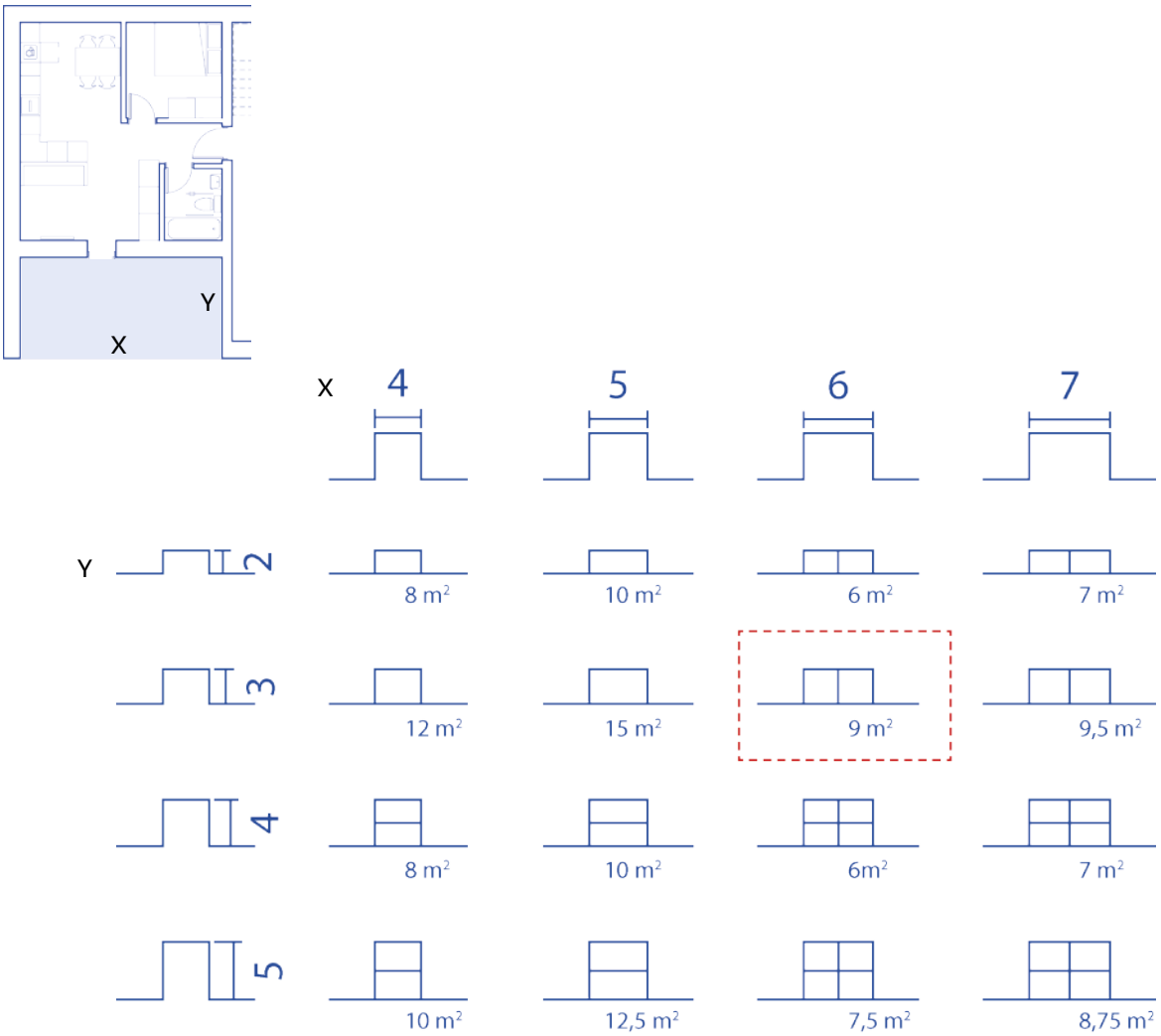
There was a focus on how the materials would interact with each other and the circulatory system, and what kinds of expression this would create, while also taking into regard the structure.

As the occupant were supposed to be able to fit their facade on their dwelling, the amount of materials used for the exterior skin had the potential to be disparate from every other surface. Even facades in the same material could be different regarding their treatment, boards going in different directions for example. By trying different materials in conjunction with each other, as seen illustration 87, the effects could be seen. It became a chaotic collection of different expressions, with no border to distinguish them. Further scenarios were made to achieve a more unified aesthetic, as seen on illustration 88. By choosing the material for some of the exterior walls, the resident would lose some of their co-determination, but to heighten the quality of the architecture this compromise was seen as necessary.

The chosen circulatory system had the potential to make a distinct mark on the facade, especially with it being either external or internal. Some of these examinations stemmed from the question of whether or not the circulatory system should differentiate itself from the dwellings, become an integrated part of the building, or be a statement of its purpose. This could be expressed only in the material used on cores, as seen in illustration 88, but could also be a physical presence on the facade by pushing it outwards from the and creating external, though still attached, cores, as seen in illustration 89.

The possibility lay before the project to express the structural system, which meant an indication of the slabs and plates. There were experiments with columns and beams to further accentuate the structure and to support a possible external gallery. The support for these was examined by looking at rhythm, sizing, and connections to understand their impact on the aesthetic of the facade. These elements would be placed externally, as seen on illustrations 90-92, but it was determined that this would become a dominating aspect in the facade, and overshadow the occupant's expression of themselves.

These examinations were made by creating visualisations with variations upon the aforementioned aspects and evaluating them for aesthetic values. These studies were later combined with the considerations regarding the aspect of the circulatory system and structural system, and this notion of the blank canvas, and therefore, the aesthetic of illustration 89 was chosen to develop further.



Illu. 93. A diagram of investigating the appropiate size for added rooms

BALCONY STUDY

With all these additions being added, one very relevant aspect was the sizes of these balconies, and how much space would be needed to build a utilisable room, be it a bedroom, a living room, or something else. A configuration needed to be found, in which the resident was able to appropriate the space in a meaningful way, and not only have the implied opportunity to expand in different ways. To understand the parameters of this, a study was made into the sizing of this balcony.

This exploratory study was made by varying the width and depth. In this diagram, it is indicated how the additions are envisioned, and the sizes they can inhabit. The size written by each variation is one of the fields available for addition. It became clear how both the depth and the width of the balcony contribute to the freedom of appropriation, by creating different spaces to build into. Depending on its sizing, there may not be room for anything other than a single addition. To best fit the building and its sizing, while giving the most opportunities, the choice fell on a depth of three meters, and a width of approximately six meters, allowing the user to extend with two times nine square metres.

SUN STUDY
ON THE BALCONIES

Along the process, the question of the quality of the balconies came up, surrounding the question of whether or not the balconies oriented towards the northwest would experience any direct sun as the context was close and would obstruct the view to the sun, and because the orientation was not favourable for direct sun. Without it, these spaces would not be comfortable to inhabit, and a clear front and back would be created, as this would lead to varying quality in the apartments which was not desired. So to determine whether this was the case or not, a sun hour analysis was made.

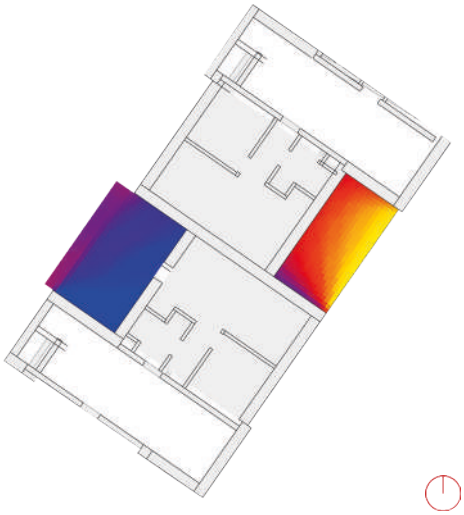
This shows that the existing balconies only received an average of approximately 180 hours of direct sun as seen on illustration 94, about 1/16 of the annual sun hours. This was deemed as not viable, as the balconies would then either not be used, or only be used for storage, which is why more studies were made to understand the possibilities of extending or reshaping these in such a way that they gain more sun.

These studies examined how many more hours of direct sun would be gained by extending the balconies perpendicular to the facade. This did increase the number of hours, but to gain anything noteworthy, it would have to extend 1,5 m out, which would disrupt the existing facade. This solution was deemed non-viable.

Another way to approach this was to give all apartments balconies to the southeast, by adding a smaller balcony on those that did not have any outdoor space towards the south. As to not take up too much space, these could not be deep, about 1,5 m. Even being this shallow they would still disrupt the facade and they would enhance the notion of a front and back, which was not desirable.

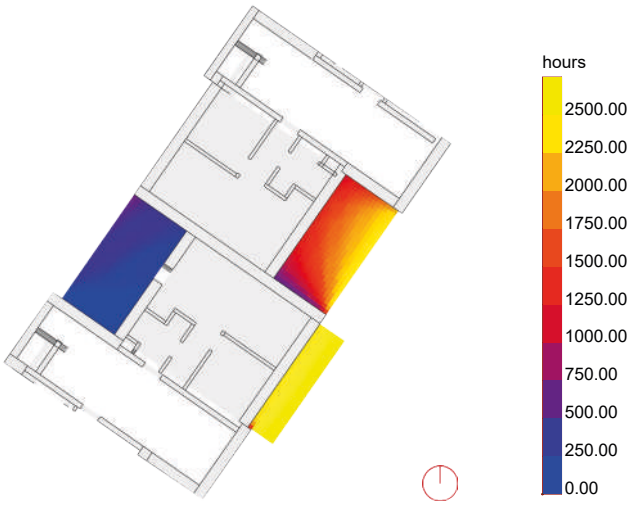
Bigger interventions had to be made in order to remedy this challenge. To try and address these issues a new study had to be made regarding the final placement of the building, see page 108, as the changes to the balconies were deemed unviable given the parameters of the project.

Illu. 94. The original



Illu. 95. Extended towards north

Illu. 96. Extended more towards north



Illu. 97. Extra balcony towards south

3.3 MODERN VILLAGE CHRISTIANIA

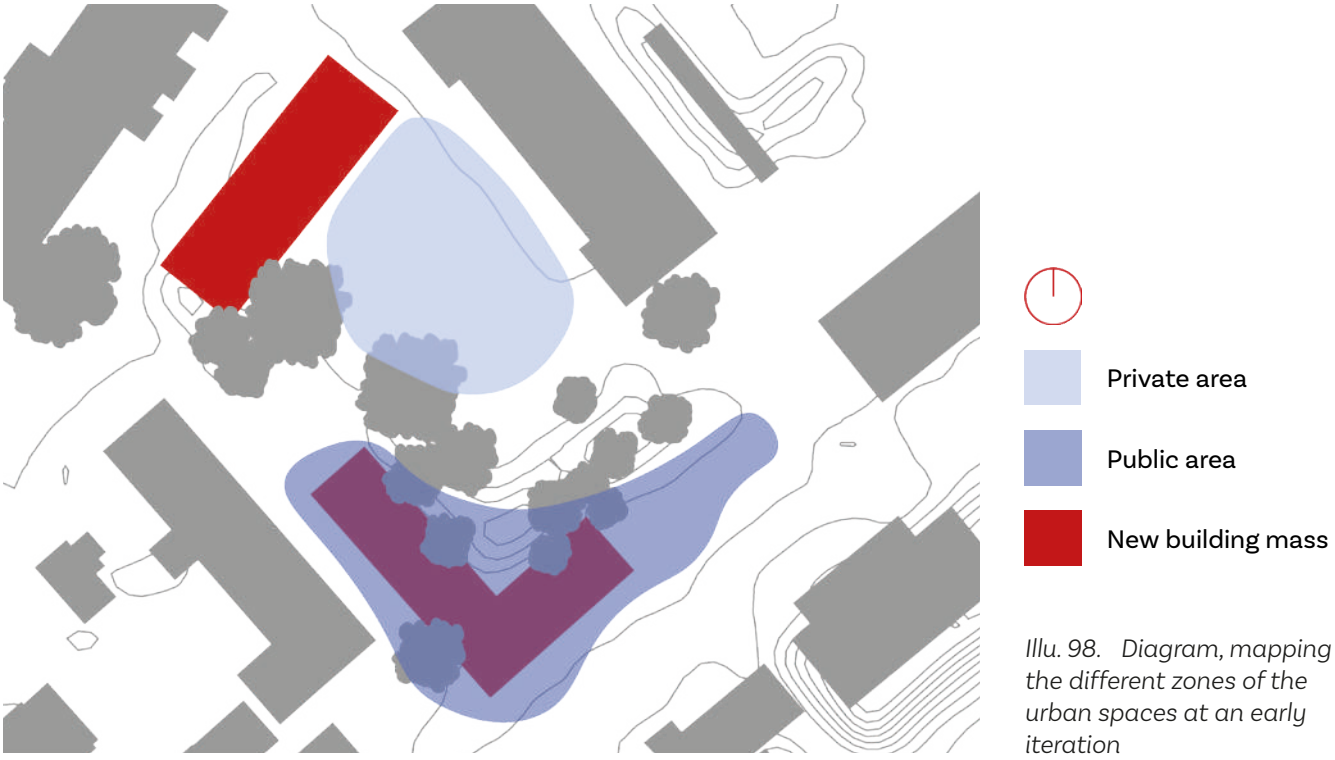
To enhance and accentuate the vibrant village atmosphere of Christiania, various aspects were implemented that hold central importance in this regard, influencing the site's programming, building circulation, material choices, and the incorporation of additional urban and public functions, such as the office building. These elements will be elaborated upon in the following chapter.

PROGRAMMING

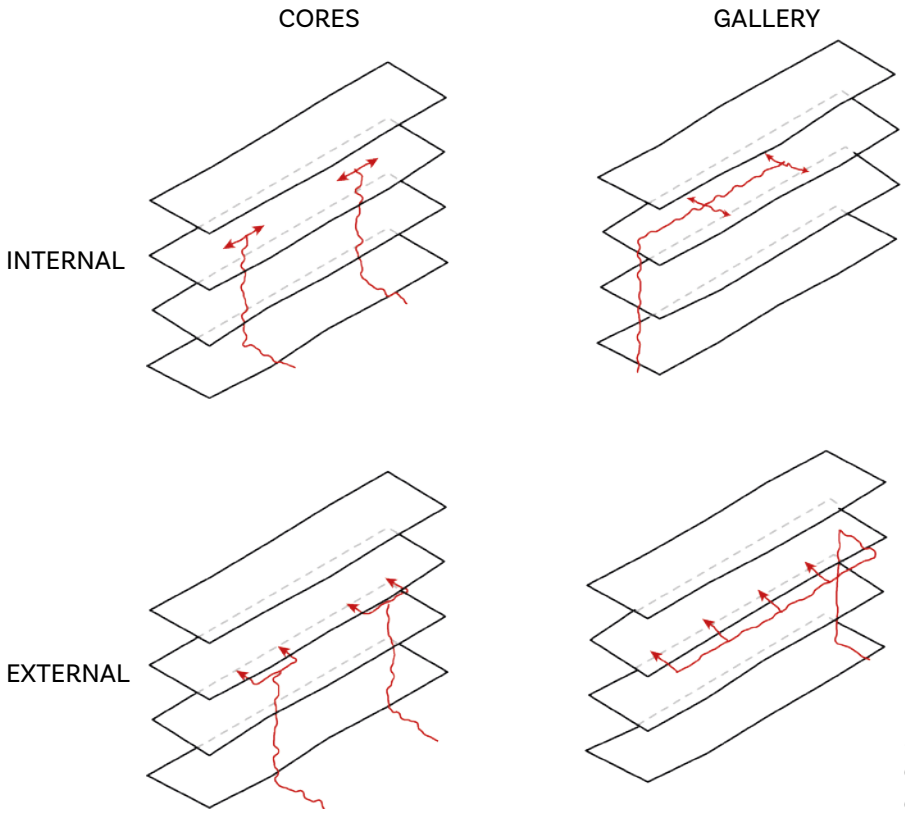
OF THE SITE

As the initial placement of the buildings was set, the further development of the urban spaces was happening simultaneously with the further development of the residential building. As concluded in earlier phases, the southern part of the site should evolve into having a more public atmosphere, while the northern part of the site should concentrate more on privacy and semi-private functions that could enhance communal living in the closest context.

The site in front of the grocery store turned out to be an important space for the project and the enhancement of informal meetings, along with it being a space for longer stays, was imperative to secure in the new design. Therefore, the playground and different seating areas became key functions of this space. The designing of an office building contributed to the public feeling and the intersection between the urban space and the office building was further developed, to secure a strong connection between the two functions, while enhancing the notion of appropriative spaces for the Christianites to claim and make their own.



Illu. 98. Diagram, mapping the different zones of the urban spaces at an early iteration



Illu. 99. Diagrams of external and internal cores and galleries

CIRCULATION
WITHIN A BUILDING

As for the residential building, circularity became an architectural tool for displaying the life of the users, while still respecting the privacy of a home along with securing a qualitative community life for the users. This was explored early in the process, as it affected the floor plans and the additive concept of the building. Multiple different kinds of systems were examined for their viability within the project and its scope. Specifically, these were cores and galleries, both internal and external.

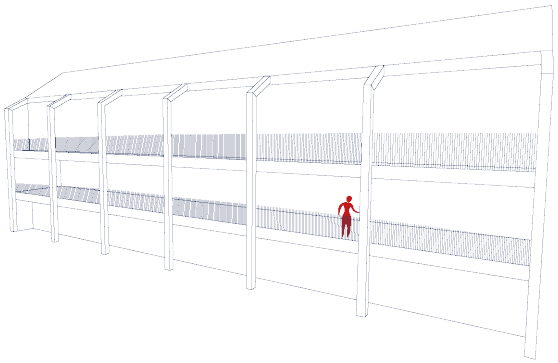
The internal cores would work like traditional multi-story housing, a singular core with apartments on both sides, accessed from within this core. These would be able to help facilitate the structural system as they could be used at structural cores as well, giving the building a stabilising component. Meanwhile, it would facilitate flexible indoor spaces, where the actual living space could be disconnected from the cores. This also affords adaptation without the limitation of circulatory spaces needing a certain space. It does create space for communal functions, but as it is often relatively small spaces, there is not much space for communities within these cores. They are defined only by their purpose; transition between public and private spaces.

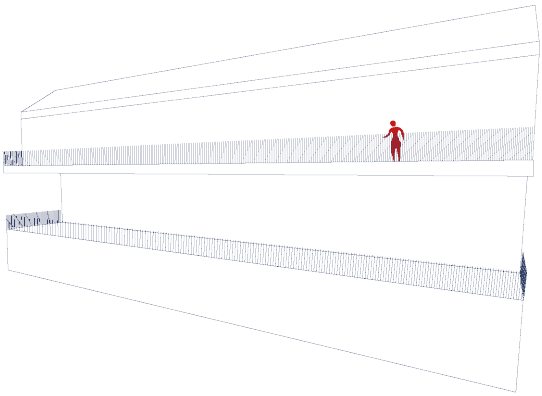
External cores are regularly seen on newer residential buildings, where elevators are especially prominent. By implementing them in the project, the actual floors could be relatively free for the occupants to appropriate and inhabit, while at the same time using the least space to facilitate movement throughout the building. It would limit the utilisable facade space, the space otherwise used for windows to provide daylight for the individual apartments. In this way, it would also create a clearly defined front and backside.

The internal galleries are not a particularly used way of building within the Danish context but have merits to their design. As opposed to an external gallery, these are sheltered and therefore often climate-controlled, in an effort to increase comfort for the occupant. They may also have an impact on the communities within, as they would force more informal meetings between occupants as they would be more congested in smaller areas. It would take up space inside the building and encroach on space used for other important functions, while at the same time dividing the building into two halves and limiting the possible configurations of the building on the site.

The use of external galleries is spread widely in Denmark, especially in relation to the bigger concrete element buildings. Due to its openness, this method of access is often described as having a clearer connection to the urban setting in which it is placed. This does however also result in an accessway that is susceptible to the weather. In addition, when incorporated into the building itself, external galleries can create depth and enhance the aesthetic appeal of the building. If this is not the desired expression, contrarily it could lessen the clear expression of the facades behind them.

One cannot examine these circulatory systems by themselves, as they have a certain impact on the facade and its expression.

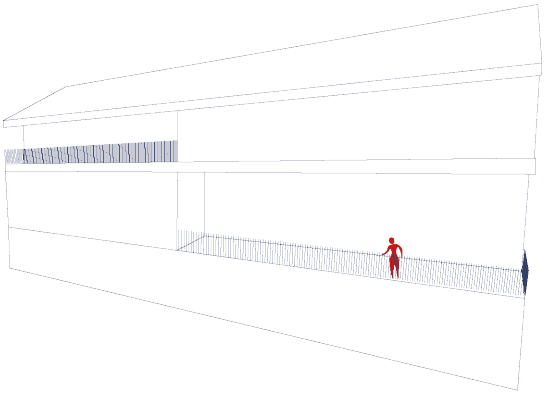




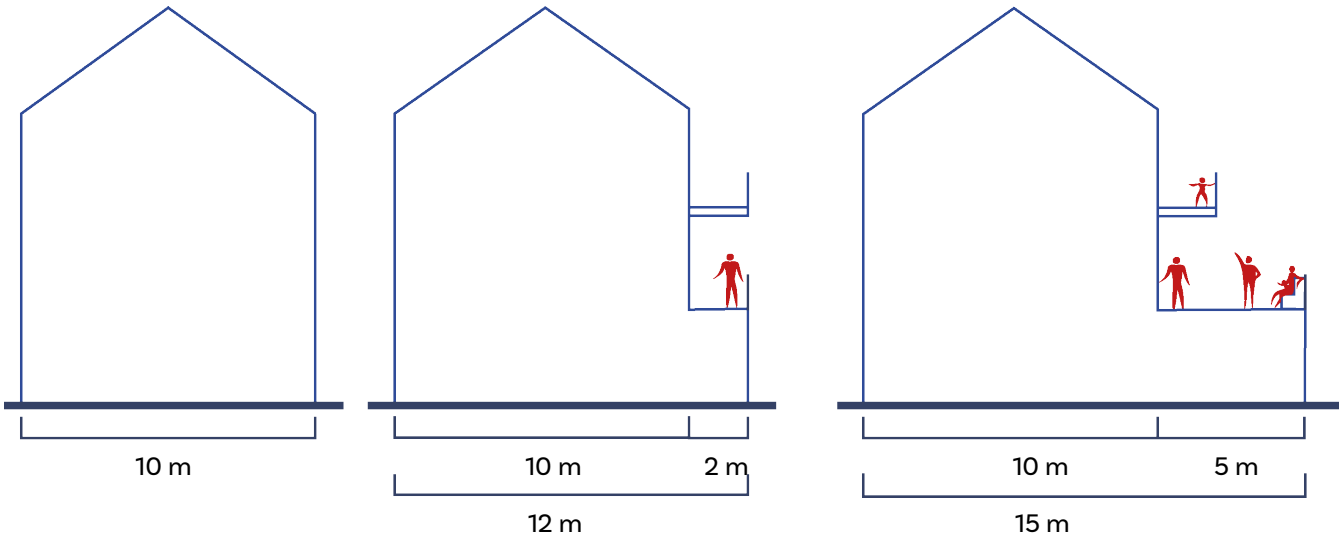
CIRCULATION

TRANSLATED INTO THE BUILDING

Once these aforementioned qualities and weaknesses were identified, the translation into this project began. As the potential for creating a strong community atmosphere increased when using an external gallery, this solution was more suitable for this project. However, the external gallery was intended to ensure a common area and therefore should be connected with two staircases. This could give the gallery the qualities of a suburban street, rather than leaving it as a dead end. Throughout this process, several iterations of the programming of the gallery were tested. These showed that while the gallery brought life to the facade, it also risked drawing too much attention away from the depth, created by the additive concept, as the structure necessary to support it, would take up too much space. Consequently, the gallery was placed on the same side, establishing a front and back side of the building, which would be a private and a public side, thereby enhancing the connection with the semi-private urban life in the private area.



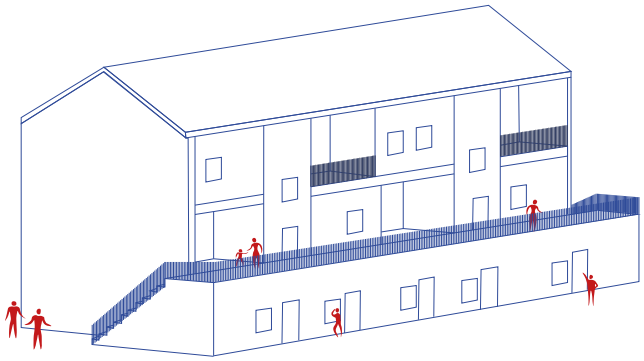
Illu. 100. Different iterations of galleries connected with the building



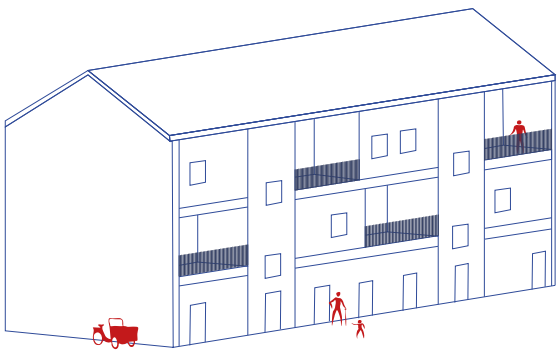
Illu. 101. Section diagram of circulations and depths, 1:250

However, due to accessibility regulations, residential housing above three stories with communal stairs must be serviced by an elevator (Bygningsreglementet 2018). This led to a conflict in ensuring accessibility into the building, resulting in a hybrid solution with a gallery on the first floor and an internal core connecting to the second floor. The elevator could then be situated on the ground floor and accessed from the street. Nevertheless, this solution conflicted with the ground floor apartments, designated as senior apartments, see illustration 101-102, leading to disjoint spaces. To foster a community space rather than just a transit area, the gallery needed to have a depth extending over five meters to enhance a community atmosphere, instead of enhancing a transit zone. The integration of this type of external gallery, conflicted with the ground-floor apartments, as the depth affected the indoor comfort and the quality of light. Furthermore, the depth of the building, was not suitable for the site, as it conflicted with its surroundings.

This led the design to opt for two internal cores instead, as this could achieve a higher quality indoor climate and a more suitable building for the site. Moreover, the idea of community living was further iterated upon, see page 112.



Illu. 102. Diagram showing a hybrid circulation solution



Illu. 103. Diagram showing the solution with two cores

LCA CONSIDERATIONS

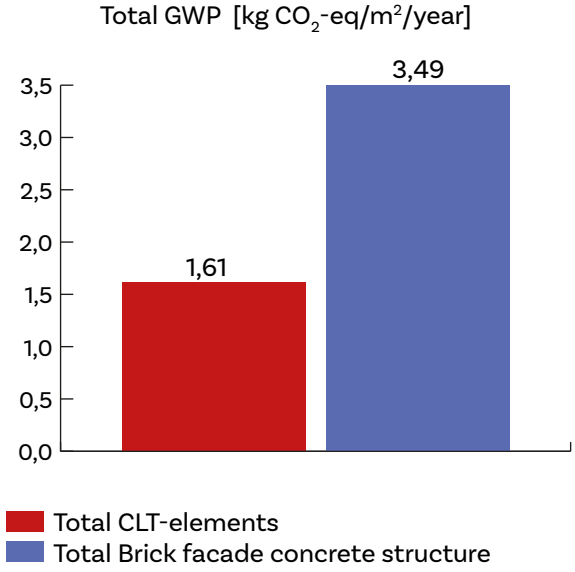
In the initial design process, the focus on material choice was to tell the narrative of Christiania, and therefore, a wooden structure was the preferred choice. However, as described earlier, see page 86, a wooden structure created extensive problems concerning the vapour barrier. Thus, the use of wood as the load-bearing structure needed to be further investigated, considering both its environmental impact and its role in the construction process.

Historically, brick was the most used material for multi-story buildings in Denmark until the 1930s and serves as a prominent example of a reliable structural system. It is a well-known technique and, as evidenced by the Danish townscape, a very durable material. Later, concrete became popular, both in in-situ cast structures and prefabricated elements, from the 1950s to today (Engelmark, 2013). Recently, prefabricated solutions, especially those in wood such as CLT (Cross-Laminated Timber) elements, have gained attention. Experimental wooden residences, such as the “Skademosen” project by Vilhelm Lauritzen Arkitekter, show that wood is becoming a more common building material in Denmark (Andersen et al., 2023). However, CLT is not common in Christiania but could be a viable material to implement since it does not require as heavy machinery, compared to concrete, in the construction phase and offers great efficiency like concrete elements.

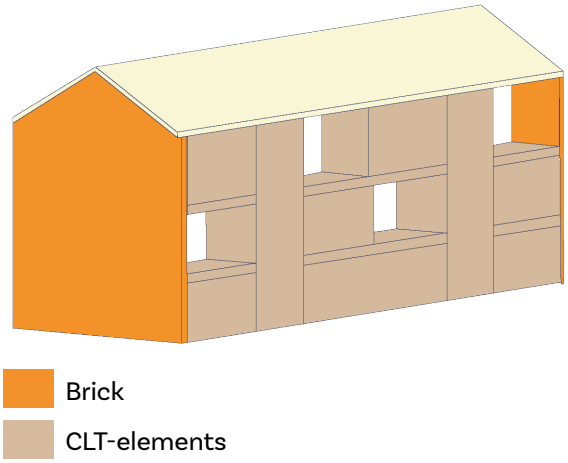
One of the most crucial aspects of choosing materials is the environmental factor, particularly important in Christiania, which prioritises environmental friendliness. With different materials in mind, two combinations were chosen for LCA (Life Cycle Assessment) analysis. One option includes brick gables to mimic surrounding buildings and the general aesthetic of Christiania while solving ease of addition issues, with CLT for all other elements. The other option uses brick-faced concrete elements for all facades, which is presumably one of the most economical systems in Danish social housing projects.

The analysed building components are limited to the load-bearing elements, which include the slabs, dividing walls, facade walls, and gables. The roof and ground floor are the same for both variants, so they are excluded from the comparison. Similarly, the skins and shields are kept as similar as possible to ensure a common U-value, facilitating a fair comparison. To determine the amount of material needed, construction calculations have been conducted, see Appendix 5.5.

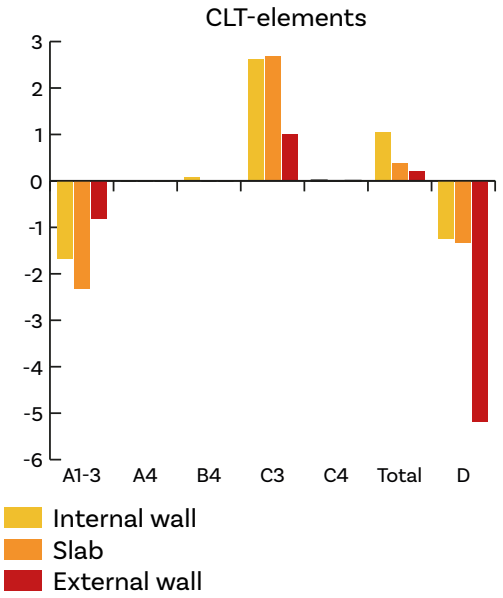
The analysis clearly shows that using CLT elements is the least polluting scenario, with less than half the environmental impact of the other scenario, see illustration 104. This highlights CLT elements as the right material choice, as they offer environmental advantages and align more closely with the building culture of Christiania, even though they pose additional challenges within the concept of Adding mass.



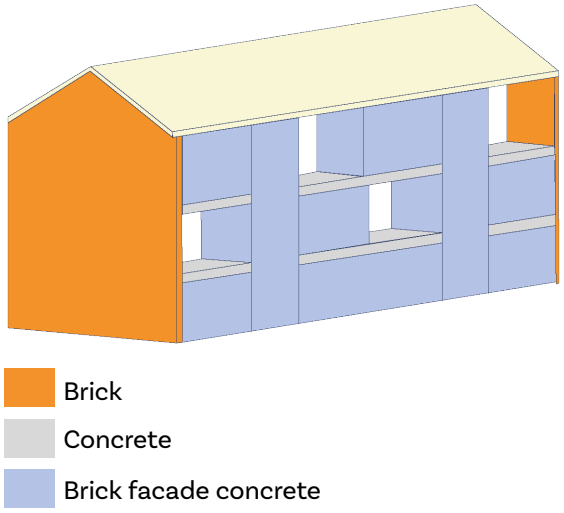
Illu. 104. Results from LCA, excluding phase D



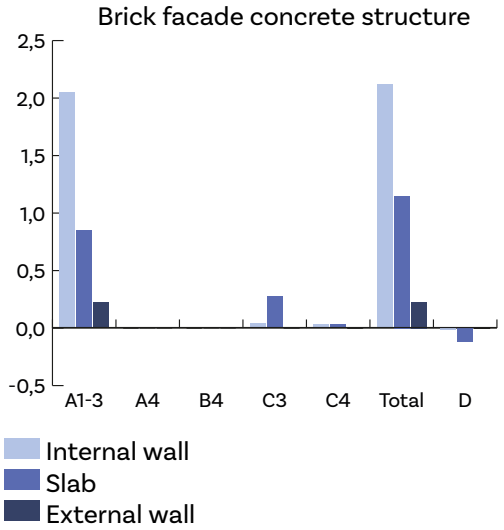
Illu. 105. Diagram showing the calculated materials placement 1



Illu. 106. LCA results of CLT are categorised into different phases of the material's lifespan



Illu. 107. Diagram showing the calculated materials placement 2



Illu. 108. LCA results of Brick facade concrete structure are categorised into differnet phases of the mateiral's lifespan

Explanations of the different phases, based on the regulations from BR18 (Social- og Boligstyrelsen, n.d.). However, phase D is considered here due to the relevance of reused materials for the project.

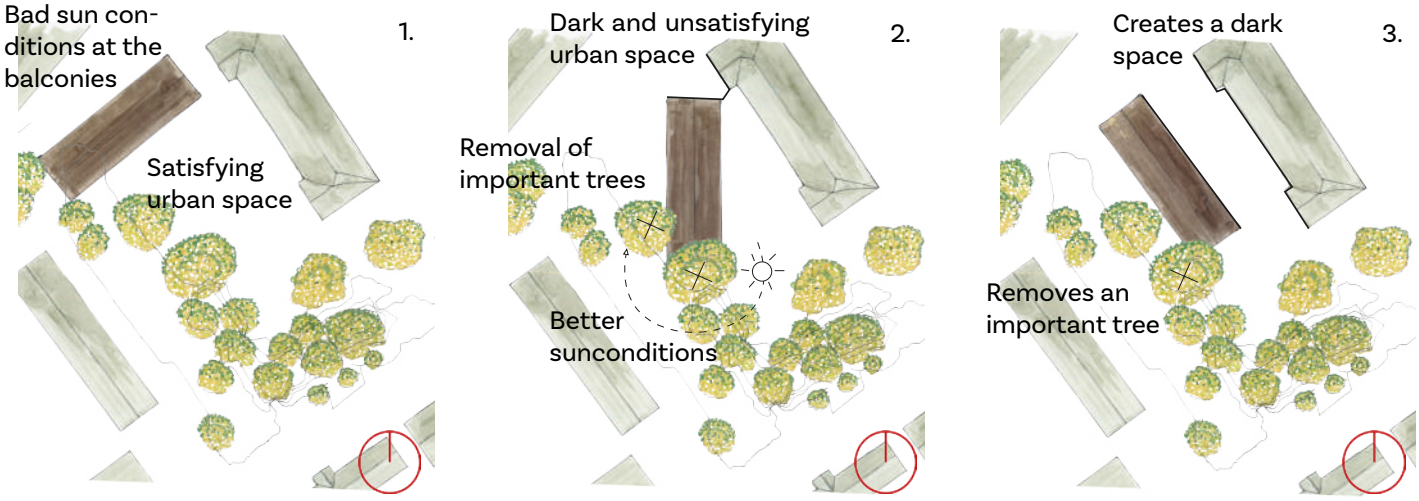
A1-A3 : Product Stage, including Raw material supply, Transport, Manufacturing
A4 : Construction process stage, including Transport
B4 : Use stage, including Replacement
C3 : End of life stage, including Waste processing
C4 : End of life stage, including Disposal
D : Benefits and loads beyond the system, including Reuse, Recycling

THE FINAL PLACEMENT

As previously noted, the initial decision was to position the residential building in the northern portion of the site. However, once the building's precise shape, dimensions, and floor plans were established, it became apparent that the lack of direct sun exposure on the northern balconies necessitated reevaluating its placement, see page 98. Consequently, a new placement study was initiated.

Various locations across the site were explored for the building's placement, with careful consideration given to factors such as sunlight exposure, preservation of existing vegetation, site topography, and respect for surrounding structures. Despite these efforts, the formal constraints and regulations of the site posed challenges to achieving a coherent building placement, ultimately leading to the decision to divide the structure into two separate units. Employing the internal core model facilitated this division, allowing for the floor plan to be divided with minimal adjustments. This was possible due to the thoughts given to modularity at the start of the project and made space for many more arrangements of the volumes.

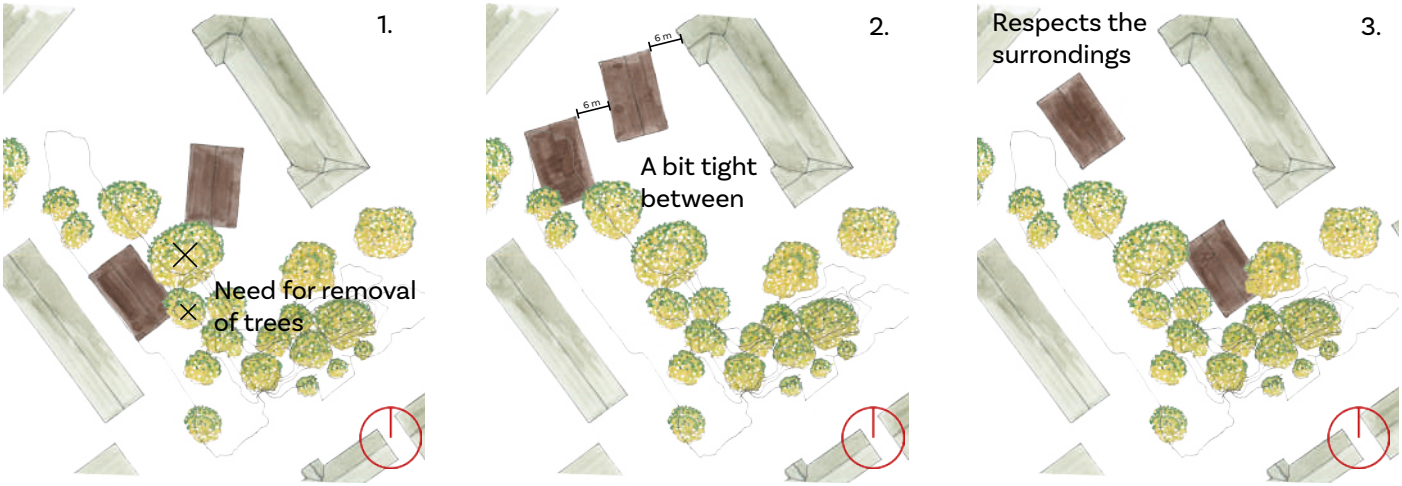
Placement schemes were made to evaluate different aspects of the placement: the sun radiation at the balconies, the quality of the urban space created, the respect for the surrounding buildings, and the preservation of vegetation and topography. The matrixes are based on the different iterations shown in illustration 109, and are scored on a scale of 1-3 where 3 is the highest. Results of solar radiation at the balconies can be found in Appendix 5.6.



Illu. 109. Illustration showing the relocation of the residential building

	Sun-radiation at the balcony	Urban space	Respecting surronding buildings	Preservation of vegetation and topography	Total
Iteration 1	1	2	2	3	8
Iteration 2	3	1	1	1	6
Iteration 3	2	1	2	2	7
	3. Very good	2. Moderate	1. Bad		

By dividing the building, greater flexibility was afforded in arranging the two building bodies. During the process of relocating them on the site, it became evident that an east-west orientation would optimise sunlight exposure and allow for better integration with the surrounding architectural context. Furthermore, careful consideration was given to the creation of urban settings conducive to fostering a semi-private communal atmosphere, as indicated in earlier studies. This urban area was envisioned to serve as a common courtyard for residents of the new buildings, as well as those residing in the “Lion House”. In this area, common functions such as a greenhouse, workshop, or raised beds for cultivation would be suitable. However, the resulting urban should not be fully designed by the architect, but rather the architecture should inspire functions, as the area should be designed and appropriated by the residents.



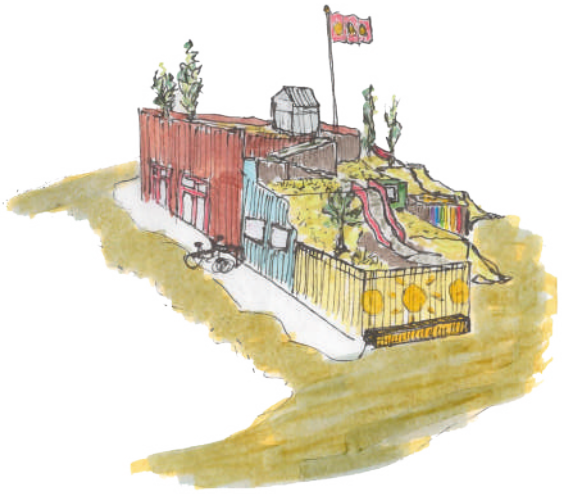
Illu. 110. The placement of the splitted building

	Sun-radiation at the balcony	Urban space	Respecting surronding buildings	Preservation of vegeta-tion and topography	Total
Iteration 1	3	1	2	1	7
Iteration 2	1	2	1	3	7
Iteration 3	2	2	3	3	10
	3. Very good	2. Moderate	1. Bad		

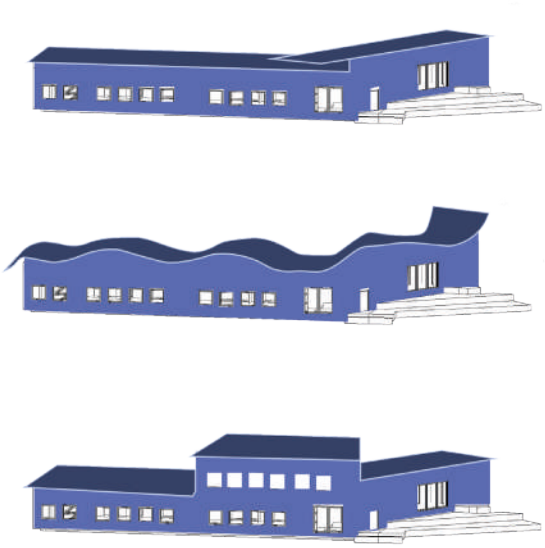
THE PUBLIC
COMMUNITY FUNCTIONS

During the initial design process for an office building, intended to serve as the administrative center for a building consultancy, the idea was to position it as an urban landmark with a rooftop park. This embraced the concept of allowing people to appropriate space within the urban settings while highlighting the communal experience centered around the grocery store. However, subsequent iterations revealed that this way of building upwards was unsuitable for the site. The public-facing functions should be oriented toward the street, and then optimal sunlight for the roof was difficult to ensure, as well as a direct connection to the grocery store.

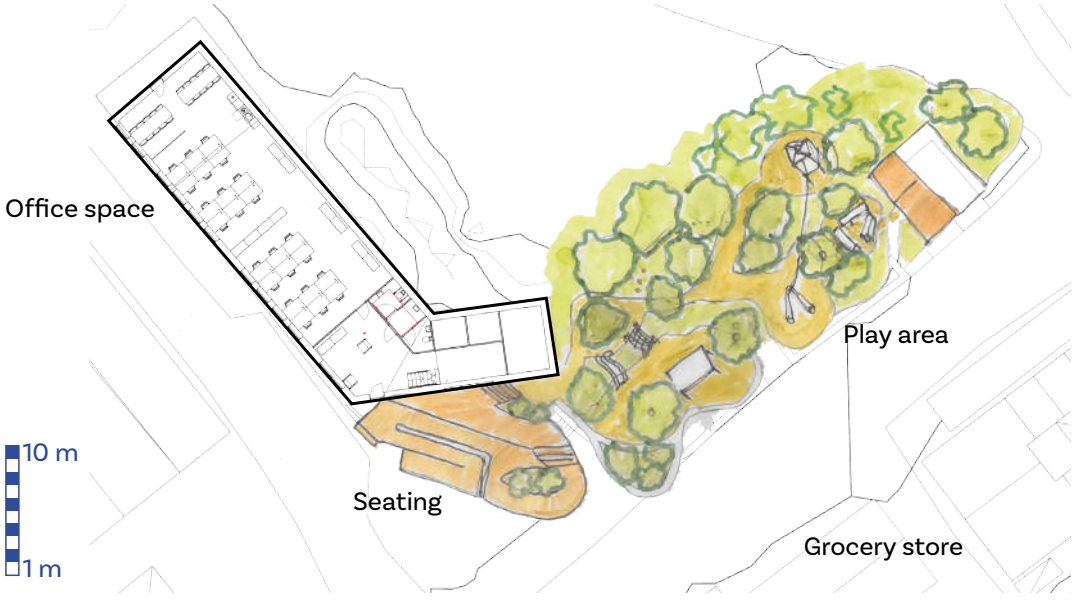
As a result, new design iterations were undertaken, relocating the building adjacent to the communal bathhouse to mimic its architectural idiom. To preserve the existing trees, discussions focused on the foundation, respecting the site's topography and vegetation, and the terrain, imposed limitations on the building's dimensions. A traditional foundation would have significantly impacted the roots of the old trees. Alternatives, like screw foundations, were proposed to reduce this impact and better preserve the vegetation. However, this approach disconnected the building from urban amenities and did not promote the communal atmosphere of the site. Different strategies were tested, including creating a common rooftop area, extending the building to integrate with a seating area connected to the playground, and designing the roof to mimic the site's topography. Despite these efforts, all iterations resulted in a rigid building that felt disconnected from the public space.



Illu. 111. Initial vision of the public space

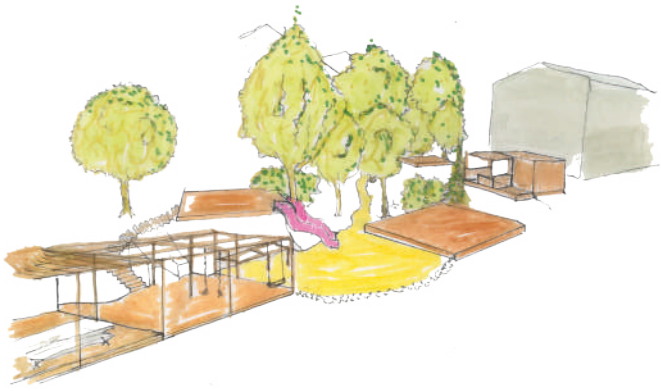


Illu. 112. Different iterations of roof design



Illu. 113. One iteration - a masterplan of the public area of the site

To enhance the building's accessibility and connection to the community, it was relocated closer to the grocery store. The design incorporated a communal kitchen on the top floor and a terrace directly connected to a seating area. This placement framed the informal meetings in front of the grocery store, fostering a direct connection and harmonising the two functions. Consequently, the playground was swapped with the seating area, creating a gradient from formal to informal and then back to formal programmed spaces. This layout defined a path through the site, linking the private residential zones with the public areas. As a further initiative to diffuse the narrative of the environmentally friendly Christiania, the idea of letting the facades become a showroom for new facade materials, was implemented. In this way, the counselor within the building consultation office could show off different methods for creating environmentally friendly facades.



Illu. 114. Vision drawing of the playground

Illu. 115. Final vision drawing of the common house, housing both a community kitchen and a work space

Illu. 116. Iterations of a central placed common houses

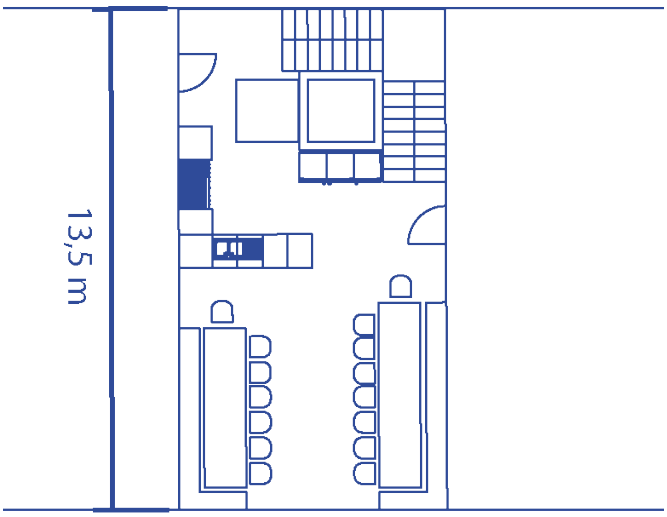
THE FUNCTIONS OF A COMMUNITY

Originally, the design included the idea of creating a community kitchen for the entire neighbourhood of Christiania, which could facilitate various public gatherings. However, incorporating this hybrid function for both the building's residents and the broader community led to discussions about balancing feelings of responsibility and ownership. The programming of this space was crucial to fostering the desired atmosphere.

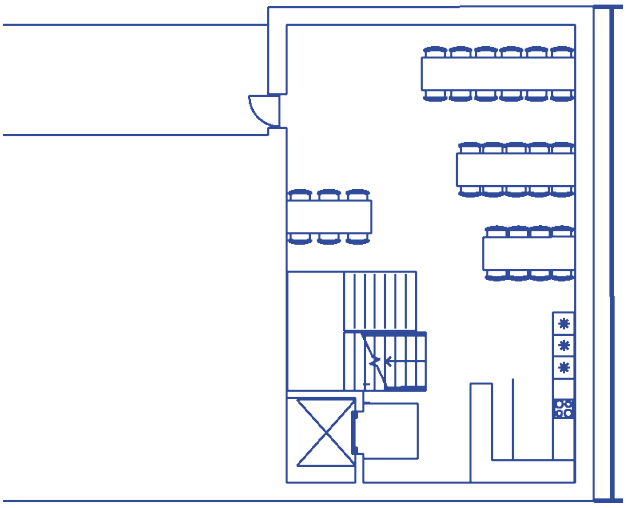
During the floorplan iterations, one goal was to promote communal living by moving some apartment functions to common areas and implementing circulation paths that encouraged social interaction. A common house connecting different slabs was considered essential. This common house could offer a larger kitchen, a dining area for communal meals, and social spaces for play and conversations. However, as the building evolved and the additive concept was prioritised, the level of communal living had to be reduced, and alternative solutions for communal spaces were needed. The common house had to make way for circulation spaces, and thus, a building accommodating both cores, apartments, and a common house would not fit on the site in terms of dimensions.

Therefore, the building program had to enhance community living through other functions as the community kitchen was moved more into the public zones of the site. The cores themselves had the potential to function as a common house, and communal functions like a washing area could be implemented here. However, the core areas were experienced more like transit zones rather than places to stay, as the staircase had to be placed on one facade and the elevator on the other, limiting the room's spatiality and connection with the outdoors.

Thus, the urban areas became more important for fostering integration among residents and highlighting the communal living of Christiania. The architecture aimed to create a semi-private area, not open to all of Christiania but directed towards the residents of the two new buildings and those living in the "Lion House". This space could be arranged as they wished, with features like greenhouses, terraces, wood workshops, or raised beds for cultivation.



Illu. 117. Iterations of a central placed common houses



Illu. 118. Iterations of a common house placed in the end of the building, connected with galleries

Illu. 119. Drawing showing the community cores and a first ideration of an informal common urban garden

4 EPILOUGE

In the final chapter, concluding thoughts and further reflections are presented, rounding off the academic report. The last section contains the reference list, providing sources of collected knowledge and illustrations. Additionally, the appendix offers a deeper understanding of the calculations of energy, construction and sun hours.

CONCLUSION

Identity has been a determining factor for most of this project, intending to create dwellings that fit into an existing context, with as much character and distinguishing features as Christiania. Here there are no standard solutions, no prefabricated concrete elements, and not even an elected government. To erect typical housing developments here, would stand in opposition to the core values of this small community, even though this is the municipality's intention.

This project is a solution to this challenge, by demonstrating the capacity for customisation in building design. It reflects the many characteristics of Christiania, while still possessing its own identity, that heighten the built environment of the site and place. The freedom of expression created by the structure of the building helps to distinguish the different apartments from each other, creating a varied and interesting facade, which is conducive to creating coherence with the rest of Christiania. The architectural language employed blends seamlessly with Christiania's eclectic aesthetic, and the implementation of co-building further enhances this by fostering a sense of pride and ownership among residents. This coherence is further enhanced by the integration of disparate dwelling types, that cater to different user groups while programming the urban space to be an appropriative space made for informal meetings. The new residents can integrate with the existing communities through these meetings, which are facilitated by the platform that is the architecture, as they partake in co-building to gain the sense of belonging that comes with having responsibility for one's dwelling.

With its distinction between private and public, the project creates a certain atmosphere that helps to grow the village of Christiania, both in terms of physical space and in the perception of the layperson. The careful delineation of private and communal areas fosters a sense of security and individual space while promoting social interaction and community cohesion. Private residences offer personal sanctuaries where individuals can express their unique identities, while the communal spaces are designed to facilitate informal meetings, social gatherings, and cooperative activities, reinforcing the community spirit that defines Christiania. Even developing it into a role model for sustainability, both environmental and social, will prove beneficial to the Danish building industry and grow upon society as a whole. The project's commitment to sustainability is evident in its holistic approach, addressing not just the environmental impact but also the social dimensions of living spaces. By incorporating reused materials as a core aspect of the design, the project emphasises the importance of resource conservation and the creative potential of upcycling. This approach not only reduces waste and environmental footprint but also infuses the new constructions with a sense of history and continuity, linking the past with the present.

This is all done to preserve Christiania as the Freetown that it is. By respecting the wishes and requirements of the existing residents, it becomes an extension of the history and identity of Christiania. The project's success is based on its ability to harmonise new and old, fostering a community that is vibrant, inclusive, and sustainable. By setting a precedent for mindful development, it aims to inspire future projects both within and beyond Christiania, showcasing how modern architectural practices can honour and enhance local identities.

REFLECTIONS

In reflecting on the project, both in terms of process and outcome, it became evident that additional development in specific aspects of the project would have benefitted the design. This ranges from aspects like user involvement, to further development on the interface between the building and urban environment. Generally, all these aspects could have benefited from more time, as this is a crucial factor in a constantly evolving architectural design space, especially in as dynamic and vibrant a place as Christiania.

The project would have been enhanced by involving users more directly in the design process, as the whole idea behind the project relies on the needs and specific wishes of the user. The vision of creating a building and master plan based on participatory architecture (PA) principles is fundamentally dependent on user involvement. The approach to PA shifted from a method for understanding and including the user and their wants to a way to analyse and understand these perceived needs. This shift was necessary due to multiple factors, but most importantly the four-month timeframe of the project, which limited the extent of user involvement. A comprehensive PA project would take many more months to complete, as there would be a need to chart the different user's needs, conduct multiple rounds of experiments with the user, and many other initiatives. These would help engage in dialogue with users about their wants and priorities and would have enriched the architectural process with valuable feedback. Furthermore, the timing of the project's endeavours into Christiania and its people was not conducive to performing different experiments, because, as earlier described, Pusher Street would be demolished during the course. This made for a tumultuous period for the Christianites and respecting their privacy and situation came at the cost of less user involvement. Due to these aspects, it could be discussed whether the project is actually implementing PA or just designing for PA.

In the examinations of the building envelope, specifically the vapour barrier and thermal bridges, the project would have benefitted from the involvement of professional craftsmen and constructors. Dialogue with these professionals would have provided insights into the connections and joints between different building components and could have helped solve the technical challenges faced during the project. Detailed connections were developed both for immediate construction and for future expansion, that are expected to be viable, but through guidance, these could have been produced more efficiently. Potentially, it

could also have improved their constructability and ease of disassembly and expansion. By doing this, time would have been freed up, that could have been used to remedy some of the less developed aspects of the project, in order to heighten the quality of the architecture.

Due to Christiania's wishes and values regarding environmental sustainability, there was a vision to create a building with a low carbon footprint. The fact that this should also be expandable presented many inherent challenges, connected to the material use, as designing an adaptable and flexible home requires more materials, resulting in higher CO_2 emissions. This is further exacerbated by the ability to choose your own facade, and if the next occupant wants to do the same. However, the building's potential for long-term use, allowing modifications to suit user preferences, could offset these initial emissions. By performing a comprehensive life cycle assessment (LCA) and comparing it to a traditional building, the project would be able to further discuss and validate whether the extended lifespan justifies the additional emissions.

Creating an expandable home for multiple sites, that possess different inherent configurations may have compromised the specific connection to the site. The shown configuration possesses a clearer cultural and aesthetic link to the place, that of Christiania, than a physical one. This dilemma came with the thoughts on modularity and adaptability in a way that may have benefitted from more development. One aspect that could have helped remedy this could have been greater flexibility in the circulation cores, as the current design features a front- and backside. Additionally, the focus on expandability may have overshadowed the vision of fostering a community within the building, where common areas extend personal living spaces. The residential building lacks this community feeling, resembling more conventional public housing. However, the project includes a larger staircase to connect apartments and a community kitchen in the office building to engage the broader community of Christiania.

These reflections would help to further develop the project if more time was given, and heighten the overall quality of the project, through developing upon some of the challenges the current design faces. However, given the parameters of the problem, the priorities lay elsewhere in the project, which resulted in the given proposal, knowing that design is never finished and time is a limiting factor.

LITTERATURE LIST

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5. APPENDIX

5.1 BEDESIGNER INPUT

Outer wall:
U-value - 0,1;0,15;0,2 W/m2*K

Infiltration:
0,13;0,2;0,3;0,4;0,5

Window to floor area:
12-24%

Window type:

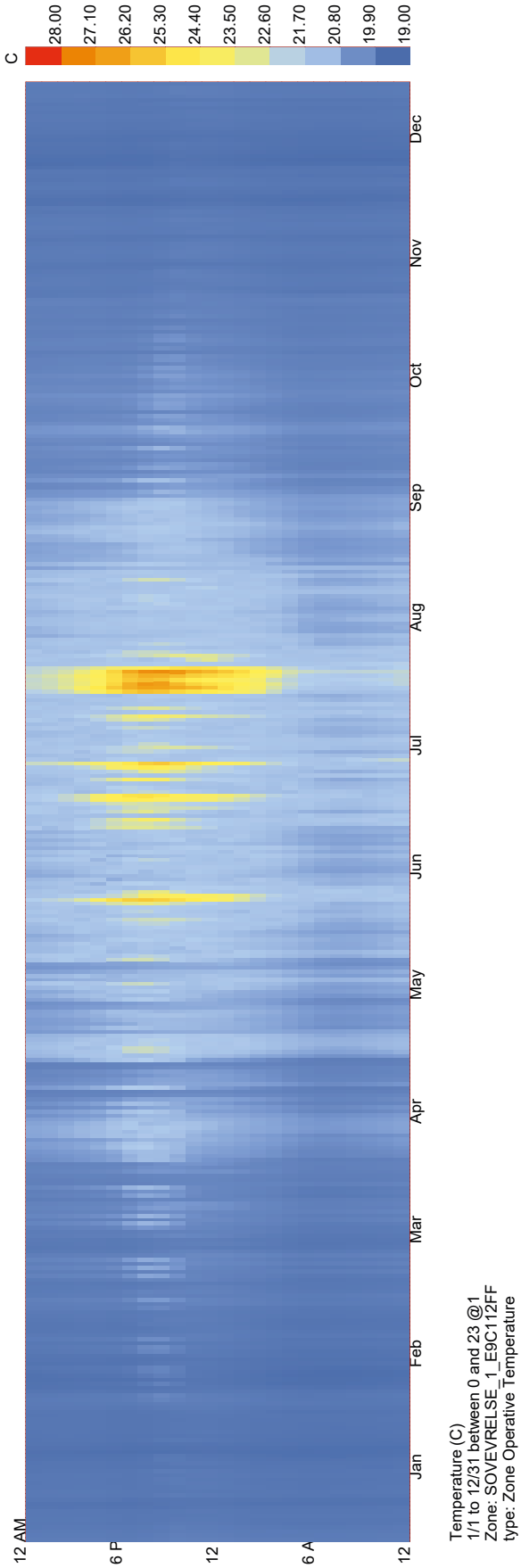
Type	U-værdi [W/m2*K]	G-værdi
1 + 1 window	2,75	0,47
1 + 1 window Energy glass	1,69	0,44
1 + 2 Window Energy glass	0,87	0,33

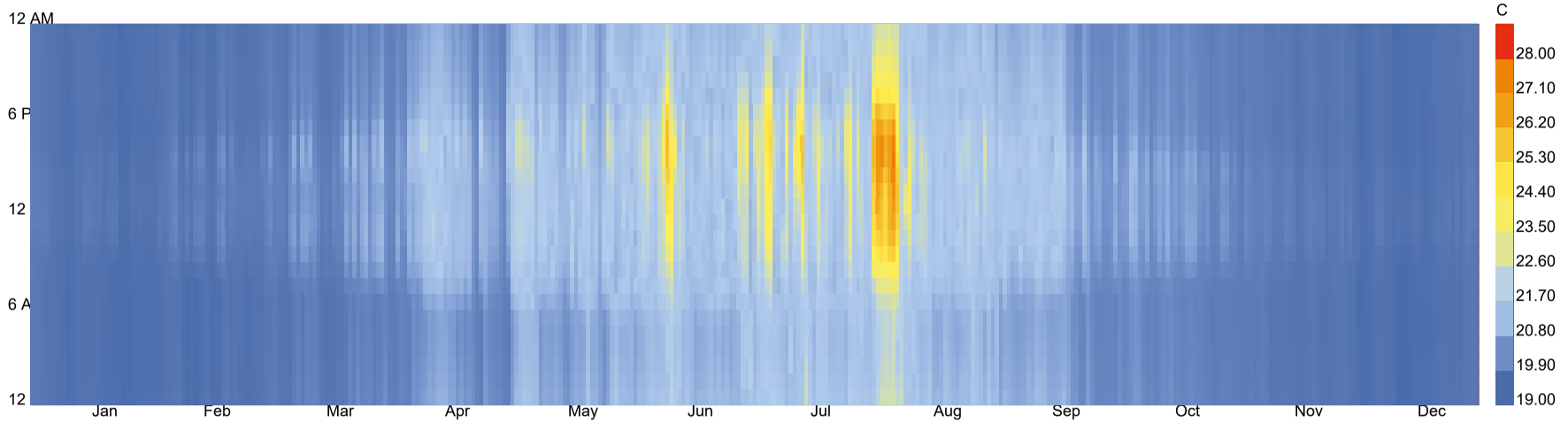
Source:
U-value: https://www.glasfakta.dk/viden/vinduer/doere/energi-og-miljoe/u-vaerdi-i-loesninger-med-forsatsglas-koblede-vinduer/?fbclid=IwZXh0bgNhZW0CMTAAAR2fAivAMx-HmQzmEb1atoyhxeYEmb9VqHzW518MsWsxjSQgLX4r8WQxkzh4_aem_ZmFrZWR1bW15MTZieXRl-cw

G-value: https://www.bygningsbevaring.dk/uploads/files/vintab12slutrapport2.pdf

5.2 INDOOR THERMAL COMFORT

Results from the two critical bedrooms.





Temperature (C)
1/1 to 12/31 between 0 and 23 @1
Zone: SOVEVRELSE_11_2EE69292
type: Zone Operative Temperature

5.3 BE18 RESULTS

Building maximum suqare meters, window maxium sizes.

Transmission loss: 15,0 W/m²

	MWh	Januar	Februar	Marts	April	Maj	Juni	Juli	August	September	Oktober	November	December	I alt
	Varmebehov													
+1	Trans.- og vent.tab	4,68	4,28	5,02	3,02	2,06	1,35	0,54	0,51	1,28	2,48	3,90	4,68	33,80
2	Vent. VF (total)	0,27	0,25	0,31	0,08	0,00	0,00	0,00	0,00	0,00	0,01	0,19	0,27	1,38
3	Vent. VGV nedreg.	0,00	0,00	0,00	0,00	-0,04	-0,12	-0,23	-0,23	-0,13	0,00	0,00	0,00	-0,75
4	Varmetab	4,41	4,03	4,71	2,94	2,10	1,47	0,76	0,74	1,41	2,47	3,71	4,41	33,17
5	Solindfald	0,31	0,68	1,57	2,45	2,97	2,77	3,11	2,68	1,86	1,10	0,41	0,24	20,17
6	Internt tilskud	2,00	1,81	2,00	1,94	2,00	1,94	2,00	2,00	1,94	2,00	1,94	2,00	23,56
7	Fra rør og VB konst.	0,02	0,02	0,03	0,01	0,01	0,01	0,00	0,00	0,01	0,01	0,02	0,02	0,16
8	Samlet tilskud	2,33	2,51	3,60	4,41	4,98	4,72	5,12	4,68	3,81	3,12	2,37	2,26	43,89
9	Rel. tilskud, -	0,53	0,62	0,76	1,50	2,37	3,21	6,70	6,30	2,71	1,26	0,64	0,51	
10	Del af rumopv.	1,00	1,00	1,00	0,07	0,00	0,00	0,00	0,00	0,00	0,38	1,00	1,00	
11	Variabl. varmetilsk.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
12	Tot. tilskud	2,33	2,51	3,60	4,41	4,98	4,72	5,12	4,68	3,81	3,12	2,37	2,26	43,89
13	Rel. tilskud, -	0,53	0,62	0,76	1,50	2,37	3,21	6,70	6,30	2,71	1,26	0,64	0,51	
14	Udnyt. faktor	0,98	0,97	0,93	0,64	0,42	0,31	0,15	0,16	0,37	0,73	0,97	0,99	
15	Varmebehov	2,11	1,60	1,35	0,01	0,00	0,00	0,00	0,00	0,00	0,07	1,42	2,18	8,74
16	Vent. VF (centralvarme)	0,27	0,25	0,31	0,08	0,00	0,00	0,00	0,00	0,00	0,01	0,19	0,27	1,38
17	I alt	2,39	1,85	1,67	0,09	0,00	0,00	0,00	0,00	0,00	0,08	1,61	2,45	10,12

Nøgletal, kWh/m² år

Renoveringsklasse 2

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
74,1	0,0	74,1
Samlet energibehov		23,7

Renoveringsklasse 1

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
55,6	0,0	55,6
Samlet energibehov		23,7

Energiramme BR 2018

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
31,9	0,0	31,9
Samlet energibehov		23,7

Energiramme lavenergi

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
27,0	0,0	27,0
Samlet energibehov		23,7

Bidrag til energibehovet

Varme	19,1
El til bygningsdrift	3,9
Overtemp. i rum	0,0

Netto behov

Rumopvarmning	18,8
Varmt brugsvand	13,1
Køling	0,0

Udvalgte elbehov

Belysning	14,0
Opvarmning af rum	0,0
Opvarmning af vbv	0,0
Varmepumpe	0,0
Ventilatorer	3,9
Pumper	0,0
Køling	0,0
Totalt elforbrug	34,6

Varmetab fra installationer

Rumopvarmning	0,3
Varmt brugsvand	0,0

Ydelse fra særlige kilder

Solvarme	0,0
Varmepumpe	0,0
Solceller	0,0
Vindmøller	0,0

Building minimum suqare meters, window maxium sizes

Transmission loss: 12,3 W/m²

	MWh	Januar	Februar	Marts	April	Maj	Juni	Juli	August	September	Oktober	November	December	I alt
	Varmebehov													
+1	Trans.- og vent.tab	4,43	4,05	4,75	2,86	1,95	1,28	0,51	0,49	1,21	2,34	3,68	4,43	31,96
2	Vent. VF (total)	0,23	0,21	0,26	0,07	0,00	0,00	0,00	0,00	0,00	0,01	0,15	0,23	1,15
3	Vent. VGV nedreg.	0,00	0,00	0,00	0,00	-0,04	-0,10	-0,19	-0,19	-0,11	0,00	0,00	0,00	-0,62
4	Varmetab	4,20	3,84	4,49	2,79	1,98	1,38	0,70	0,68	1,32	2,34	3,53	4,20	31,43
5	Solindfald	0,26	0,57	1,31	2,05	2,48	2,31	2,59	2,23	1,55	0,92	0,34	0,20	16,82
6	Internt tilskud	1,67	1,50	1,67	1,61	1,67	1,61	1,67	1,67	1,61	1,67	1,61	1,67	19,62
7	Fra rør og VB konst.	0,02	0,02	0,03	0,01	0,01	0,01	0,00	0,00	0,01	0,01	0,02	0,02	0,16
8	Samlet tilskud	1,95	2,10	3,00	3,68	4,15	3,93	4,26	3,90	3,17	2,60	1,98	1,89	36,60
9	Rel. tilskud, -	0,46	0,55	0,67	1,32	2,09	2,85	6,12	5,76	2,41	1,11	0,56	0,45	
10	Del af rumopv.	1,00	1,00	1,00	0,33	0,00	0,00	0,00	0,00	0,00	0,57	1,00	1,00	
11	Variabl. varmetilsk.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
12	Tot. tilskud	1,95	2,10	3,00	3,68	4,15	3,93	4,26	3,90	3,17	2,60	1,98	1,89	36,60
13	Rel. tilskud, -	0,46	0,55	0,67	1,32	2,09	2,85	6,12	5,76	2,41	1,11	0,56	0,45	
14	Udnyt. faktor	0,99	0,98	0,95	0,70	0,47	0,35	0,16	0,17	0,41	0,78	0,97	0,99	
15	Varmebehov	2,28	1,79	1,64	0,07	0,00	0,00	0,00	0,00	0,00	0,17	1,61	2,33	9,89
16	Vent. VF (centralvarme)	0,23	0,21	0,26	0,07	0,00	0,00	0,00	0,00	0,00	0,01	0,15	0,23	1,15
17	I alt	2,50	2,00	1,90	0,14	0,00	0,00	0,00	0,00	0,00	0,18	1,76	2,56	11,04

Nøgletal, kWh/m² år

Renoveringsklasse 2

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
74,9	0,0	74,9
Samlet energibehov		28,8

Renoveringsklasse 1

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
56,2	0,0	56,2
Samlet energibehov		28,8

Energiramme BR 2018

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
32,2	0,0	32,2
Samlet energibehov		28,8

Energiramme lavenergi

Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme
27,0	0,0	27,0
Samlet energibehov		28,8

Bidrag til energibehovet

Varme	25,0
El til bygningsdrift	3,9
Overtemp. i rum	0,0

Netto behov

Rumopvarmning	24,7
Varmt brugsvand	13,1
Køling	0,0

Udvalgte elbehov

Belysning	14,0
Opvarmning af rum	0,0
Opvarmning af vbv	0,0
Varmepumpe	0,0
Ventilatorer	3,9
Pumper	0,0
Køling	0,0
Totalt elforbrug	34,6

Varmetab fra installationer

Rumopvarmning	0,4
Varmt brugsvand	0,0

Ydelse fra særlige kilder

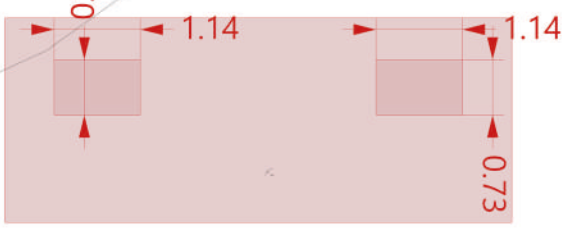
Solvarme	0,0
Varmepumpe	0,0
Solceller	0,0
Vindmøller	0,0

5.4 INDOOR VISUAL COMFORT

Mean UDI_s+UDI_a: 66.6% & 66.21%

Glass area: 0.83 & 0.83 sqm

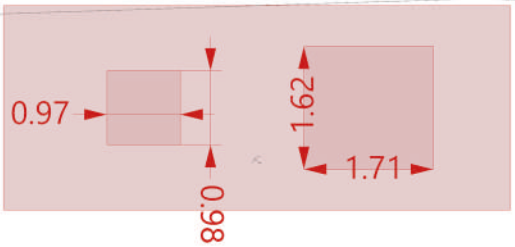
Window to Floor ratio: 12.17 & 12.17 %

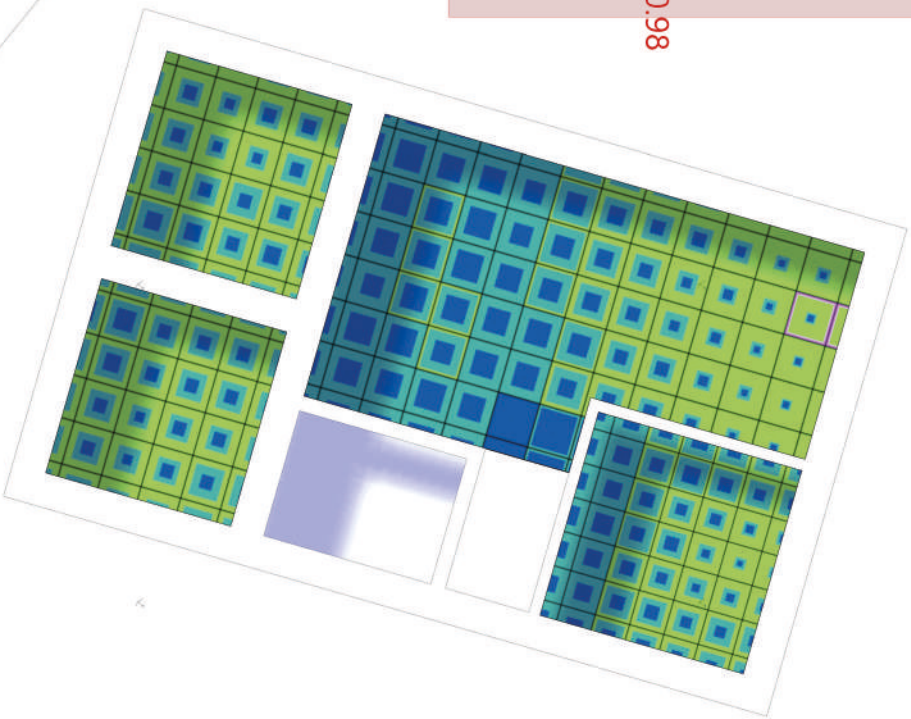


Mean UDI_s+UDI_a: 62.76% & 55%

Glass area: 0.95 & 2.78 sqm

Window to Floor ratio: 12.09 & 12.32 %

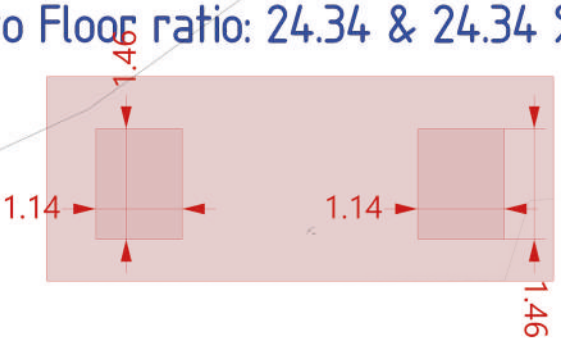




Mean UDI_s+UDI_a: 73.07% & 73.05%

Glass area: 1.66 & 1.66 sqm

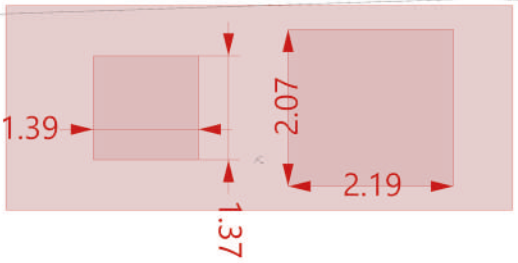
Window to Floor ratio: 24.34 & 24.34 %

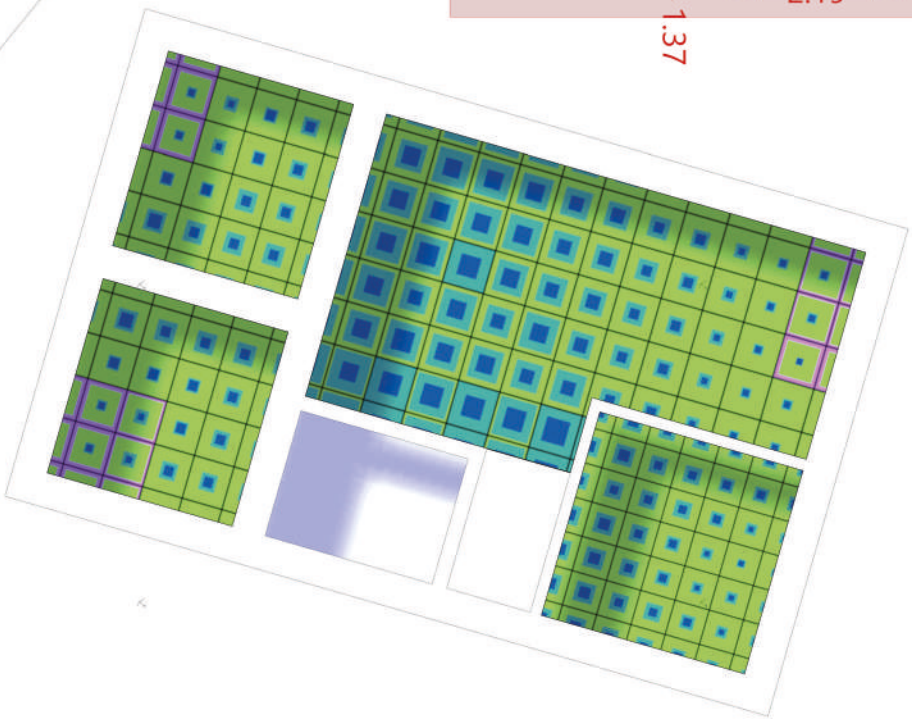


Mean UDI_s+UDI_a: 75.36% & 66.27%

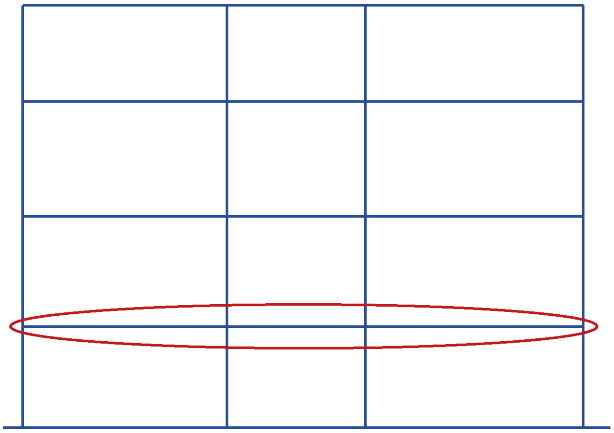
Glass area: 1.9 & 4.54 sqm

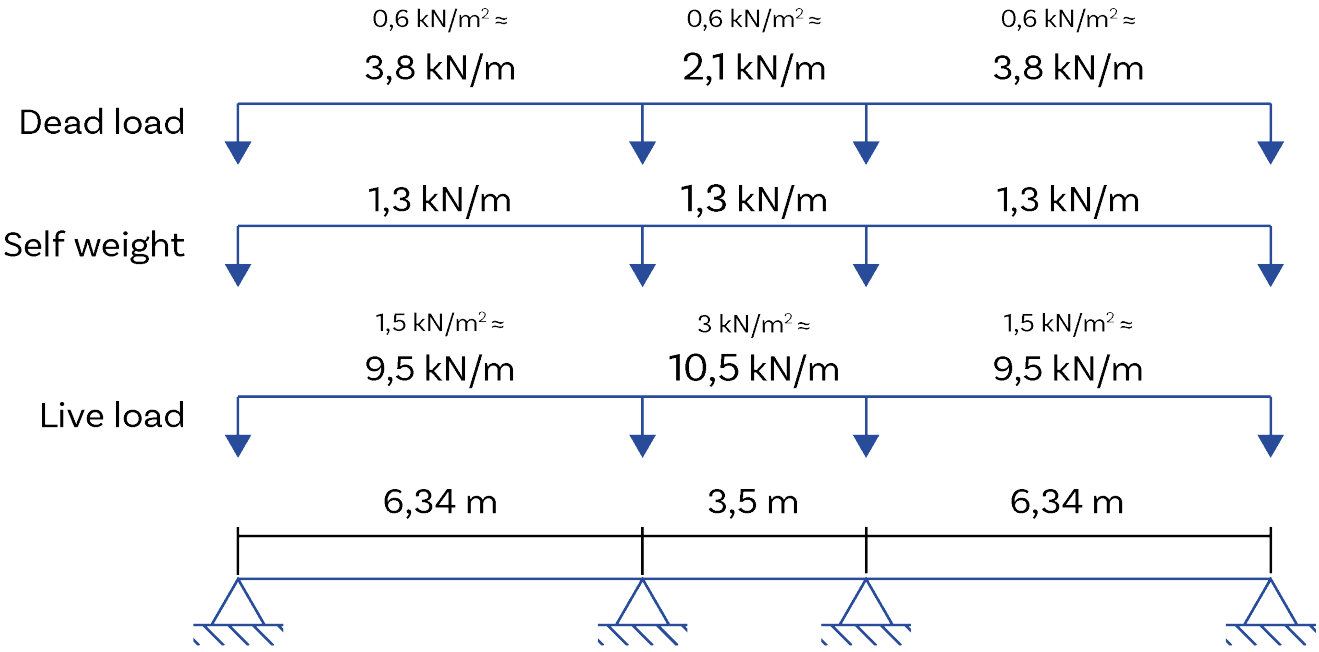
Window to Floor ratio: 24.25 & 20.12 %



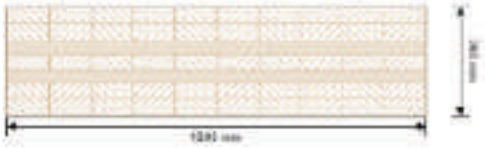


5.5 CONSTUCTION CALCULATIONS FOR LCA





Section: CLT 260 L7s - 2



Layer	Thickness	Orientation	Material
1	40.0 mm	0°	C24 spruce ETA (2022)
2	40.0 mm	0°	C24 spruce ETA (2022)
3	30.0 mm	90°	C24 spruce ETA (2022)
4	40.0 mm	0°	C24 spruce ETA (2022)
5	30.0 mm	90°	C24 spruce ETA (2022)
6	40.0 mm	0°	C24 spruce ETA (2022)
7	40.0 mm	0°	C24 spruce ETA (2022)
t_{CLT}	**260.0 mm**		

Material values

Material	$f_{m,k}$ [N/mm²]	$f_{t,0,k}$ [N/mm²]	$f_{t,90,k}$ [N/mm²]	$f_{c,0,k}$ [N/mm²]	$f_{c,90,k}$ [N/mm²]	$f_{v,k}$ [N/mm²]	$f_{r,k,mm}$ [N/mm²]	$E_{0,mean}$ [N/mm²]	G_{mean} [N/mm²]	$G_{r,mean}$ [N/mm²]
C24 spruce ETA (2022)	24.00	14.00	0.12	21.00	2.50	4.00	1.25	12,000.00	690.00	50.00

ULS Combinations

	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC3
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * LC3 + 1.50/0.00 * LC2

SLS Characteristic Combination

	Combination rule
LCO3	1.00/1.00 * LC1 + 1.00/1.00 * LC3
LCO4	1.00/1.00 * LC1 + 1.00/1.00 * LC3 + 1.00/0.00 * LC2

ULS Flexural design

Field	Dist.	$f_{t,k}$	γ_m	k_{mod}	$k_{sys,r}$	$f_{t,y,d}$	$M_{y,d}$	$\sigma_{t,y,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[-]	[N/mm²]	[kNm]	[N/mm²]		
1	2.85	24.00	1.30	0.80	1.10	16.25	78.60	-7.37	45%	LCO2
2	3.5	24.00	1.30	0.80	1.10	16.25	-70.75	6.63	41%	LCO2
3	3.48	24.00	1.30	0.80	1.10	16.25	78.60	-7.37	45%	LCO2

ULS Shear analysis

Field	Dist.	$f_{v,k}$	γ_m	k_{mod}	$f_{v,d}$	V_d	$\tau_{v,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	6.34	4.00	1.30	0.80	2.46	-78.12	0.42	17%	LCO2
2	3.5	4.00	1.30	0.80	2.46	-49.34	0.26	11%	LCO2
3	0.0	4.00	1.30	0.80	2.46	78.12	0.42	17%	LCO2

ULS Rolling shear

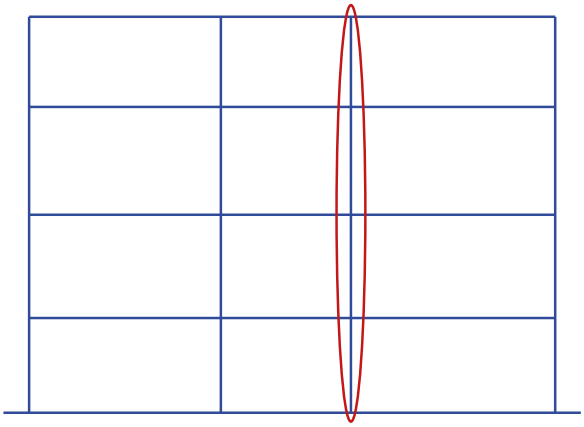
Field	Dist.	$f_{r,k}$	γ_m	k_{mod}	$f_{r,d}$	V_d	$\tau_{r,d}$	Ratio	
	[m]	[N/mm²]	[-]	[-]	[N/mm²]	[kN]	[N/mm²]		
1	6.34	1.15	1.30	0.80	0.71	-78.12	0.41	57%	LCO2
2	3.5	1.15	1.30	0.80	0.71	-49.34	0.26	36%	LCO2
3	0.0	1.15	1.30	0.80	0.71	78.12	0.41	57%	LCO2

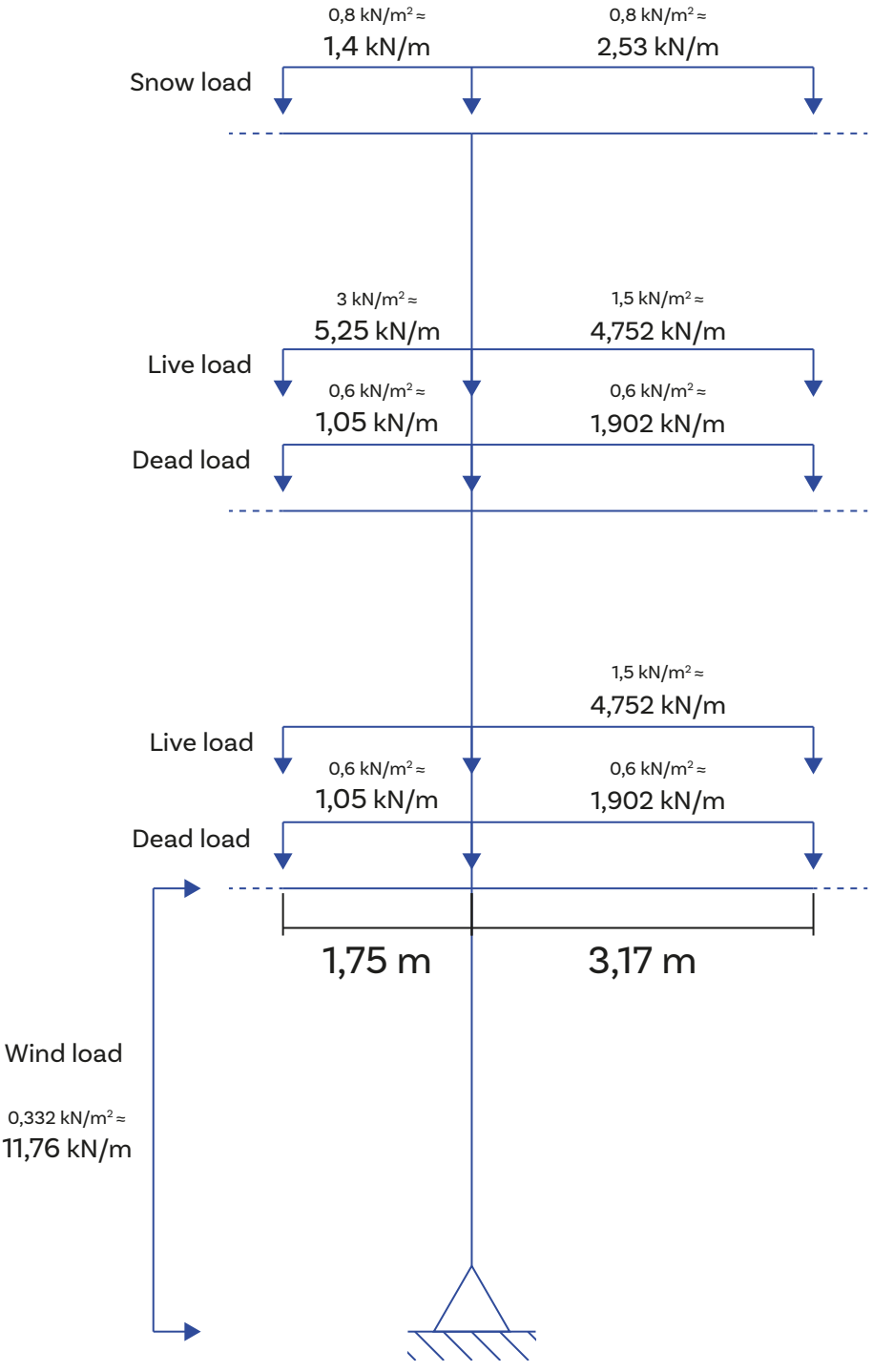
w_{inst} = w[char]

Field	K_{def}	Limit	w_{limit}	w_{calc}	Ratio
		[-]	[mm]	[mm]	
1	1	L/300	21.1	15.5	73%
2	1	L/300	11.7	0.7	6%
3	1	L/300	21.1	15.6	74%

w_{fin} = w[char] + w[q.p.]*kdef

Field	K_{def}	Limit	w_{limit}	w_{calc}	Ratio
		[-]	[mm]	[mm]	
1	1	L/250	25.3	23.8	94%
2	1	L/250	14.0	0.8	6%
3	1	L/250	25.3	23.9	94%




0,8 kN/m² ≈
1,4 kN/m
0,8 kN/m² ≈
2,53 kN/m
Snow load
3 kN/m² ≈
5,25 kN/m
1,5 kN/m² ≈
4,752 kN/m
Live load
0,6 kN/m² ≈
1,05 kN/m
0,6 kN/m² ≈
1,902 kN/m
Dead load
1,5 kN/m² ≈
4,752 kN/m
Live load
0,6 kN/m² ≈
1,05 kN/m
0,6 kN/m² ≈
1,902 kN/m
Dead load
1,75 m
3,17 m
Wind load
0,332 kN/m² ≈
11,76 kN/m

Section: CLT 140 C5s

Layer	Thickness	Orientation	Material
1	40.0 mm	90°	C24 spruce ETA (2022)
2	20.0 mm	0°	C24 spruce ETA (2022)
3	20.0 mm	90°	C24 spruce ETA (2022)
4	20.0 mm	0°	C24 spruce ETA (2022)
5	40.0 mm	90°	C24 spruce ETA (2022)
t_{CLT}	**140.0 mm**		

Material values

Material	$f_{m,k}$ [N/mm²]	$f_{t,0,k}$ [N/mm²]	$f_{t,90,k}$ [N/mm²]	$f_{c,0,k}$ [N/mm²]	$f_{c,90,k}$ [N/mm²]	$f_{v,k}$ [N/mm²]	$f_{v,roll,k}$ [N/mm²]	$E_{0,mean}$ [N/mm²]	G_{mean} [N/mm²]	$G_{r,mean}$ [N/mm²]
C24 spruce ETA (2022)	24.00	14.00	0.12	21.00	2.50	4.00	1.25	12,000.00	690.00	50.00

ULS Combinations

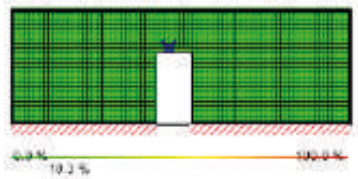
	Combination rule
LCO1	1.35/1.00 * LC1 + 1.35/1.00 * LC4
LCO2	1.35/1.00 * LC1 + 1.35/1.00 * LC4 + 1.50/0.00 * LC2
LCO3	1.35/1.00 * LC1 + 1.35/1.00 * LC4 + 1.50/0.00 * LC2 + 1.50/0.00 * 0.70 * LC3
LCO4	1.35/1.00 * LC1 + 1.35/1.00 * LC4 + 1.50/0.00 * LC2 + 1.50/0.00 * 0.70 * LC3 + 1.50/0.00 * 0.60 * LC5
LCO5	1.35/1.00 * LC1 + 1.35/1.00 * LC4 + 1.50/0.00 * LC3
LCO6	1.35/1.00 * LC1 + 1.35/1.00 * LC4 + 1.50/0.00 * LC3 + 1.50/0.00 * 0.70 * LC2
LCO7	1.35/1.00 * LC1 + 1.35/1.00 * LC4 + 1.50/0.00 * LC3 + 1.50/0.00 * 0.70 * LC2 + 1.50/0.00 * 0.60 * LC5
LCO8	1.35/1.00 * LC1 + 1.35/1.00 * LC4 + 1.50/0.00 * LC5
LCO9	1.35/1.00 * LC1 + 1.35/1.00 * LC4 + 1.50/0.00 * LC5 + 1.50/0.00 * 0.70 * LC2
LCO10	1.35/1.00 * LC1 + 1.35/1.00 * LC4 + 1.50/0.00 * LC5 + 1.50/0.00 * 0.70 * LC2 + 1.50/0.00 * 0.70 * LC3

Utilization rate of shear stress in plane on net section

LCO3

Id	X	Z	k_{mod}	f	Q	τ	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
1227	5.475	2.475	0.8	3.9	-3.63	0.60	25%

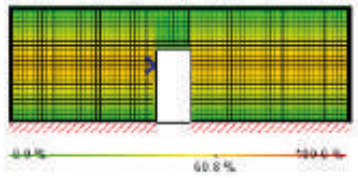
Utilization rate of axial force horizontal



LCO3

Id	X	Z	k_{mod}	$f_{t,0,d}$	N	σ	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
1153	4.875	2.325	0.8	8.62	5.35	0.89	10%

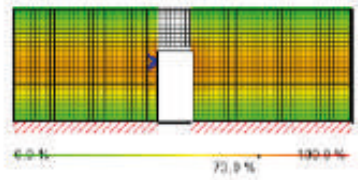
Utilization rate of axial force vertical



LCO10

Id	X	Z	k_{mod}	$f_{c,0,d}$	N	σ	Ratio
[-]	[m]	[m]	[-]	[N/mm	[kN]	[N/mm	[%]
870	4.425	1.725	0.9	14.54	-13.81	-0.92	61%

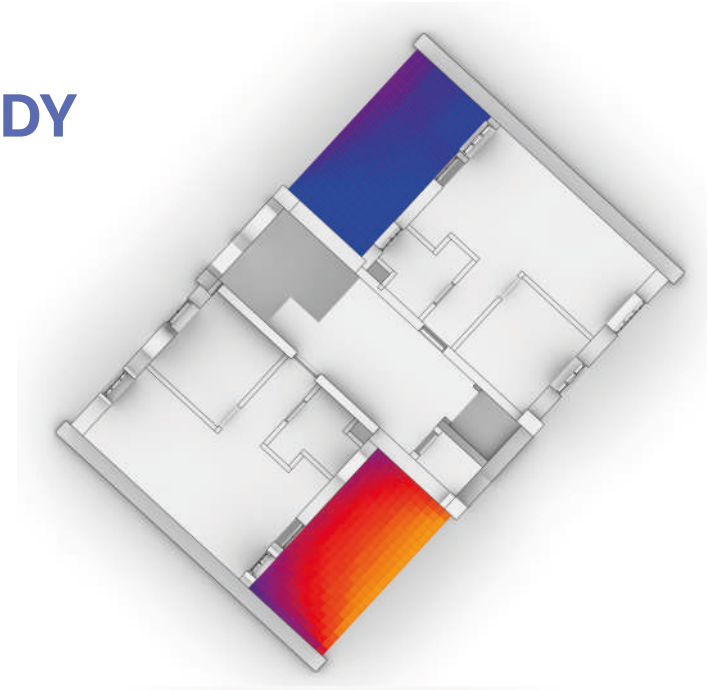
Utilization rate for buckling



LCO10

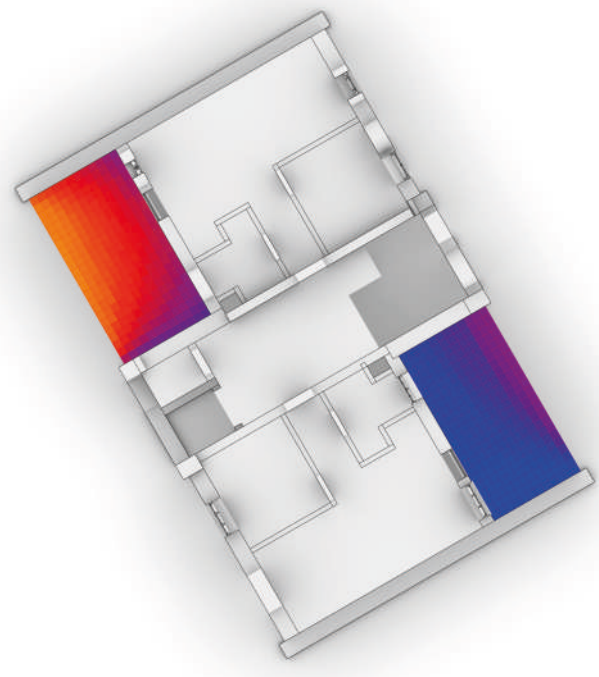
Id	X	Z	l_k	λ	β	k	f	σ	σ	Ratio
[-]	[m]	[m]	[m]	[-]	[-]	[-]	[N/m	[N/m	[N/m	[%]
940	4.425	1.875	3.5	76	0.2	0.52	14.54	-0.97	9.99	73%

5.6 SUN HOURS STUDY AT THE BALCONY



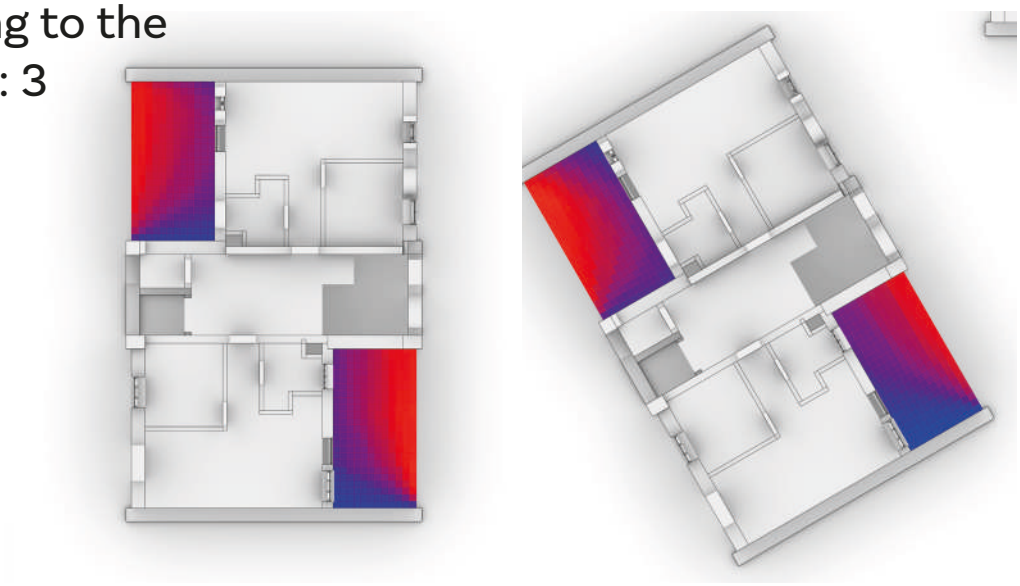
Iteration 1
Long building
Score comparing to the other iterations: 1

Iteration 2
Long building
Score comparing to the other iterations: 3

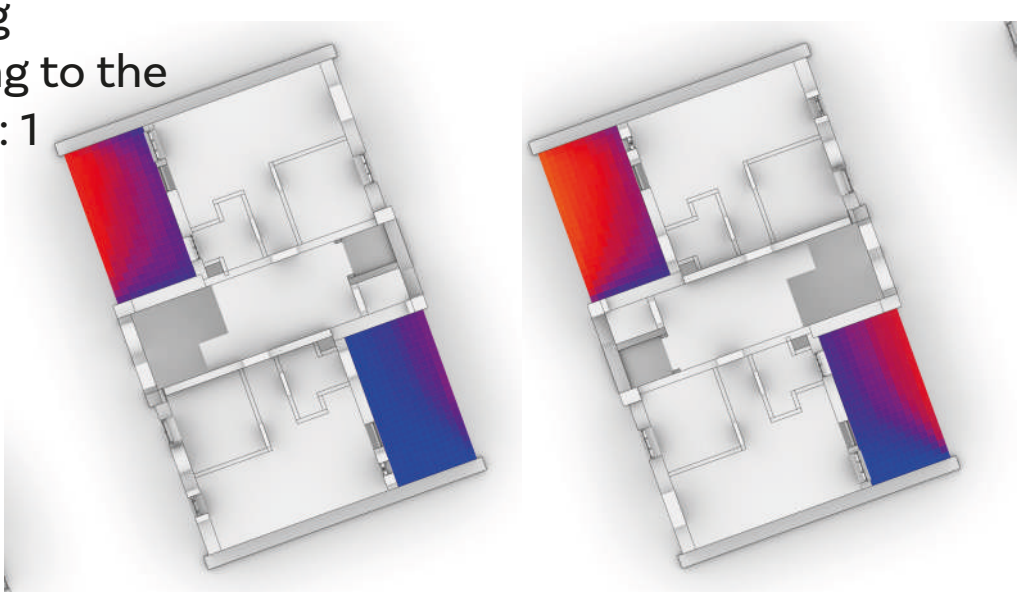


Iteration 3
Long building
Score comparing to the other iterations: 2

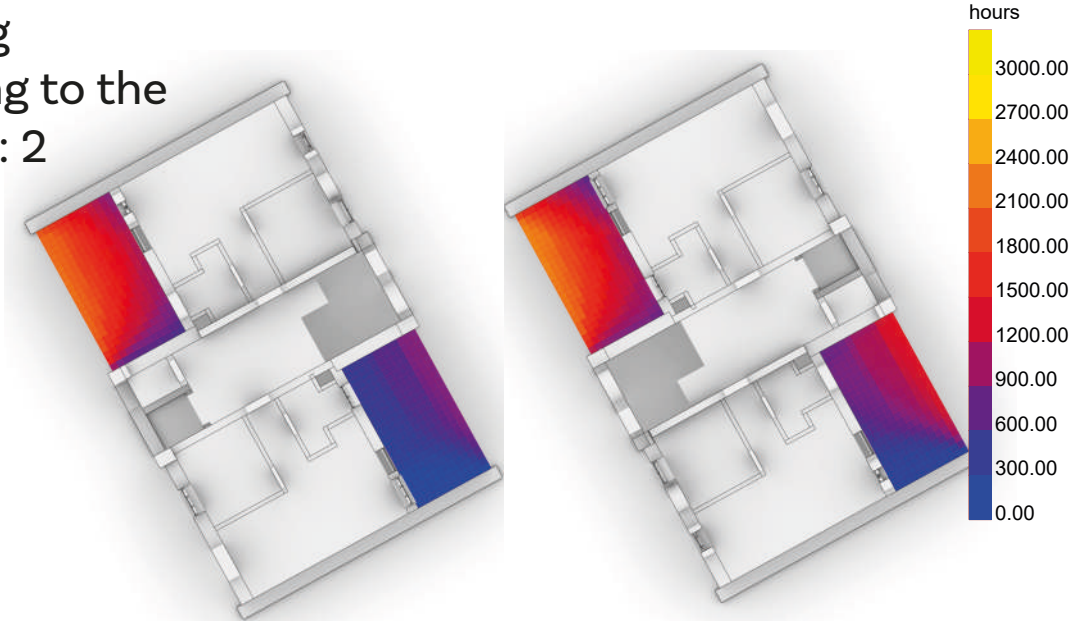
Iteration 1
Divided building
Score comparing to the other iterations: 3

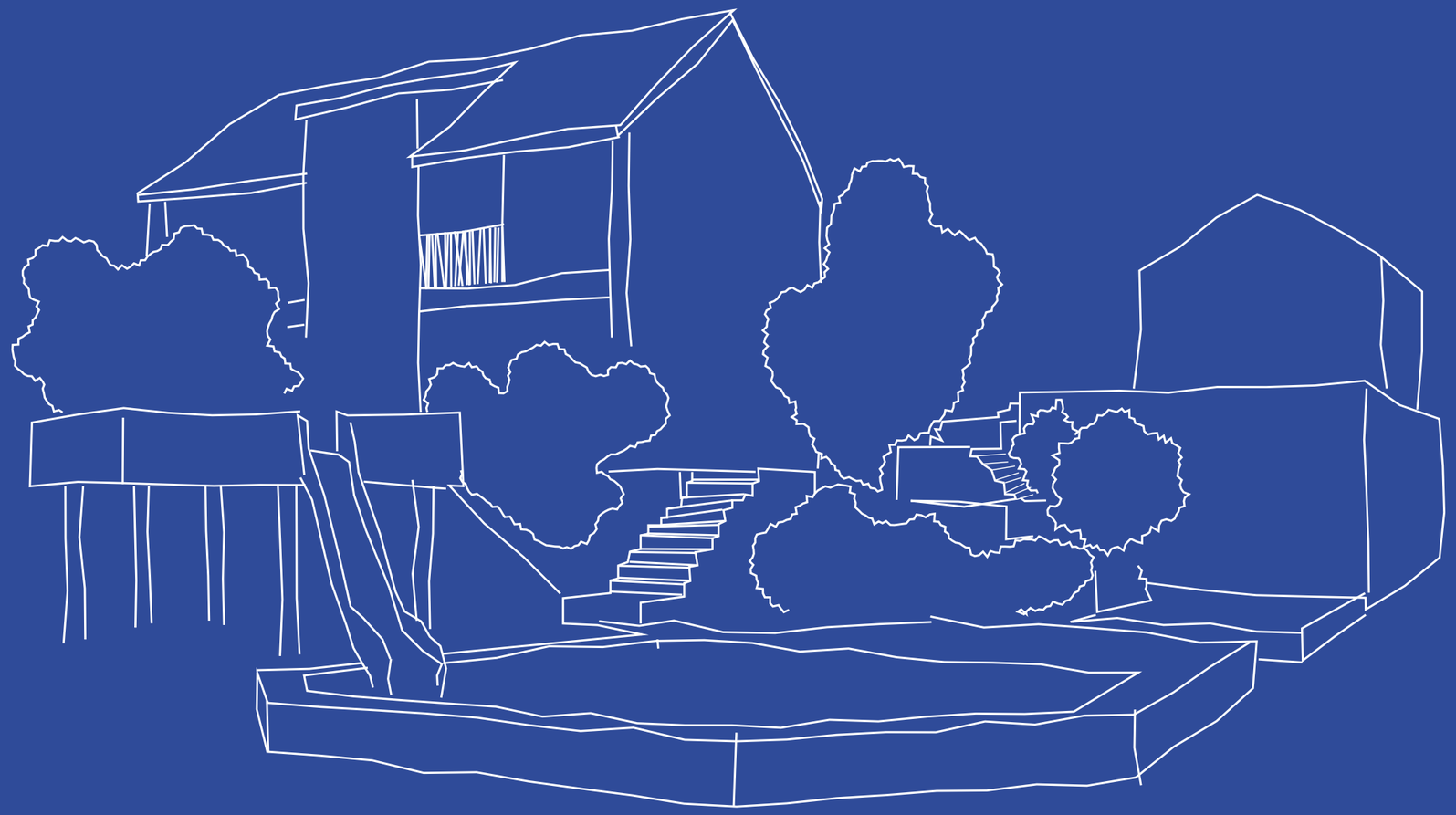


Iteration 2
Divided building
Score comparing to the other iterations: 1



Iteration 3
Divided building
Score comparing to the other iterations: 2





THE ADAPTIVE BLUEPRINT

OF CHRISTIANIA

DESIGN PRESENTATION

MSc04 ARC Group 11, May 2024

University: Aalborg University
Semester: MSc04 ARC
Project: Master Thesis
Main supervisor: Luis Santos
Technical supervisor: Anna Marszal-Pomianowska
Group number: 11
Project period: 01.02.2024 to 31.05.2024

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Anders Agerholm Petersen

.....

Frida Erika Linnea Böregård

.....

Markus Kjørvel-Hansen

A special thank you to the people of Christiania,
for their comittment to their values, for their fight
for their ethos and for inspiring a diverse and
colorful world.

A special thank you to

Mette Prag
Carlo (Carl Oskar Strange)
Joker

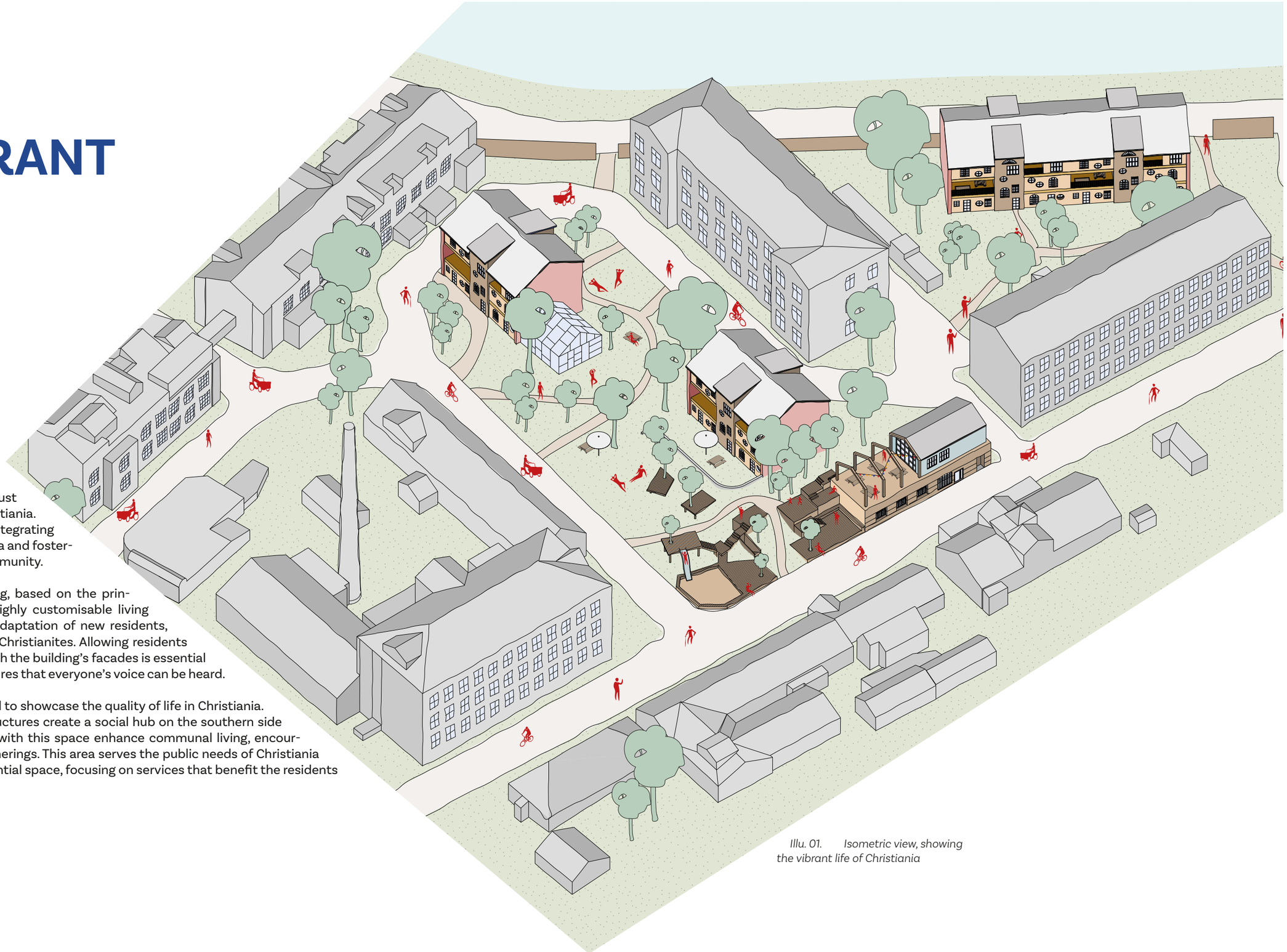
for your time and openness towards the project.
We wish you good luck with the development of
the freetown.

THE VIBRANT VILLAGE

Inspired by the existing structures and the vibrant life in front of the local grocery store, a more robust meeting space is emerging in Christiania. This site plays a crucial role in integrating newly arrived residents into the area and fostering connections with the local community.

The development of social housing, based on the principles of Christiania, provides a highly customisable living space designed to facilitate the adaptation of new residents, making equal opportunities for all Christianites. Allowing residents to express their individuality through the building's facades is essential for promoting integration, as it ensures that everyone's voice can be heard.

Moreover, the site has the potential to showcase the quality of life in Christiania. The existing infrastructure and structures create a social hub on the southern side of the area. Functions associated with this space enhance communal living, encouraging both brief and extended gatherings. This area serves the public needs of Christiania while respecting its role as a residential space, focusing on services that benefit the residents rather than commercial purposes.



Illu. 01. Isometric view, showing the vibrant life of Christiania

Illu. 02. Isometric view of the public building

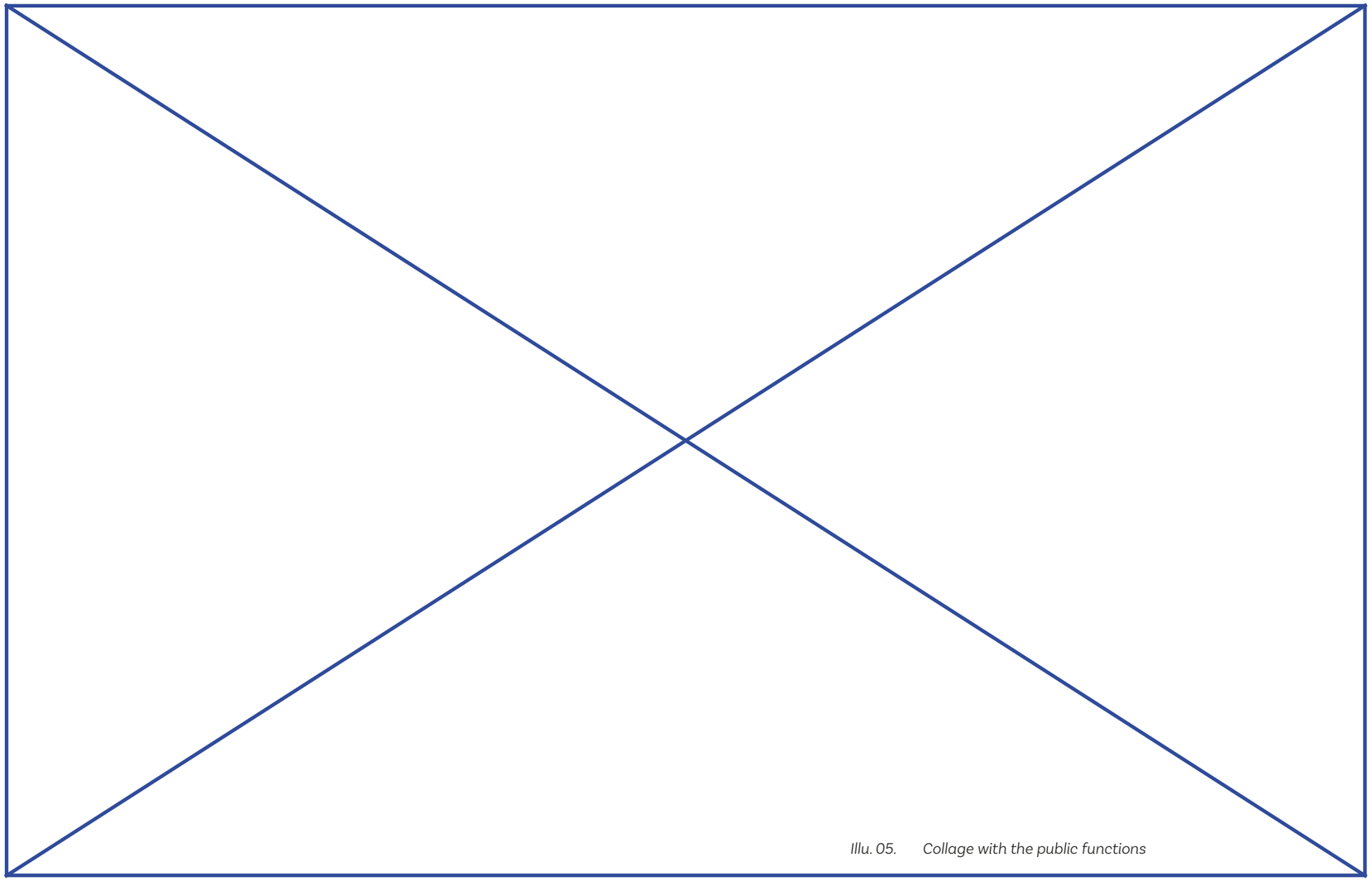
The community area is designed to provide a dedicated space for the residents of Christiania. Here, they have the opportunity to use the community kitchen, organise communal meals, or host parties on the terrace. They can utilise the seating area as they wish; perhaps someone wants to test out their music material and turn the space into a performance stage. The playground encourages activity and play, with platforms that frame the existing vegetation.

Illu. 03. Isometric view of the commmunity garden

The community garden, encompassing the new structures and the “Lion House”, is designed for appropriation by the occupants. The buildings frame a semi-private garden, providing residents with shelter and privacy. The existing vegetation differentiates the garden from the vibrant public atmosphere in front of the grocery store and creates a calmer area. This space could feature amenities such as a greenhouse, a woodworking shop, or additional play areas. The activities and life within this area are shaped solely by the residents’ needs and creativity.

Illu. 04. Isometric view of the housing building

The diverse facades symbolise the variety of people living in the area, narrating the story of Christiania and the values it has developed over the years. Freedom of expression is a key value embodied in the building, along with a commitment to environmental sustainability. The load-bearing elements are made of CLT, and the facades are encouraged to use recycled materials, reflecting the value of second chances. This, combined with the high level of adaptability, makes the building relevant over the years and inspires architects and engineers to create more sustainable buildings.



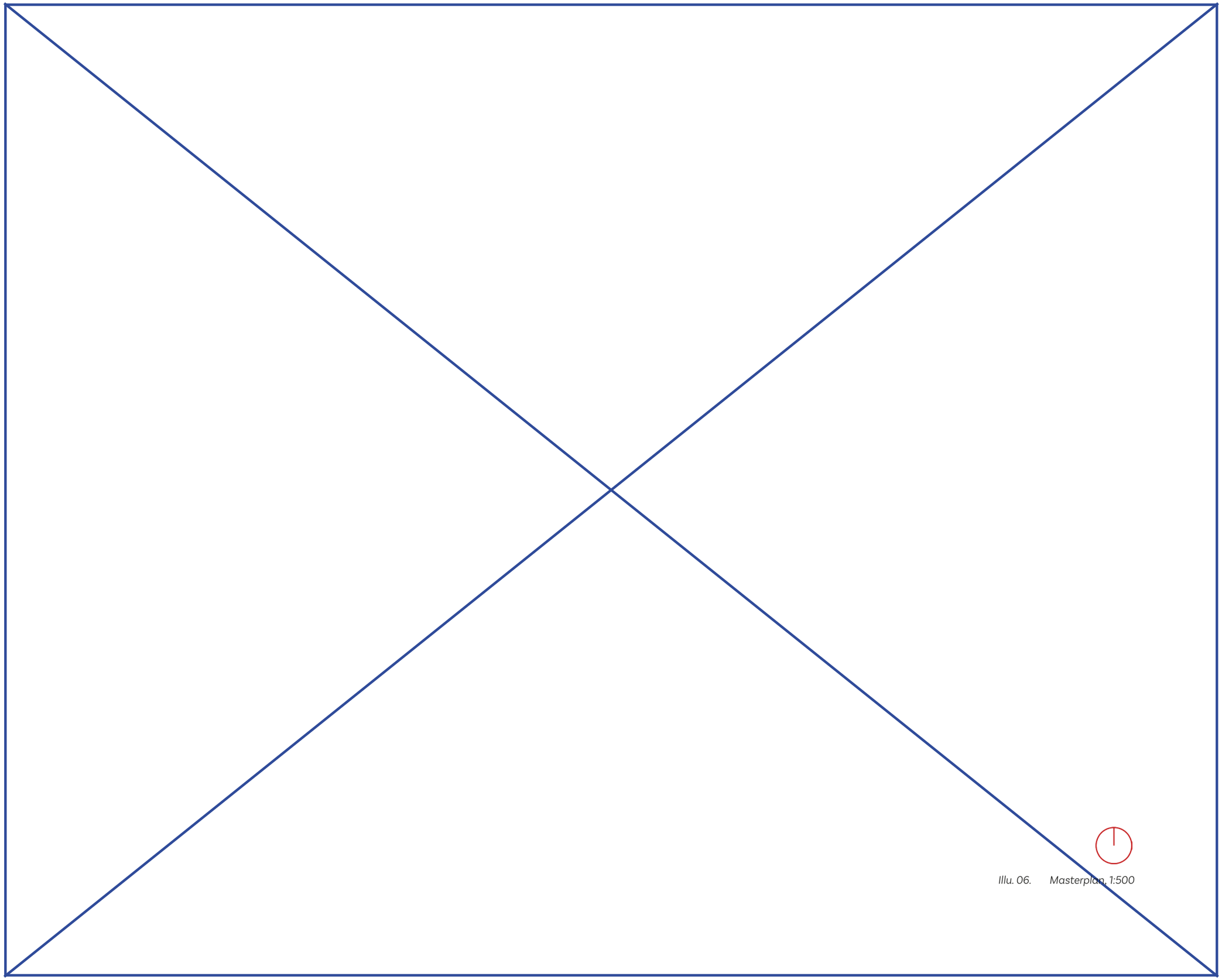
Illu. 05. Collage with the public functions

THE MASTERPLAN

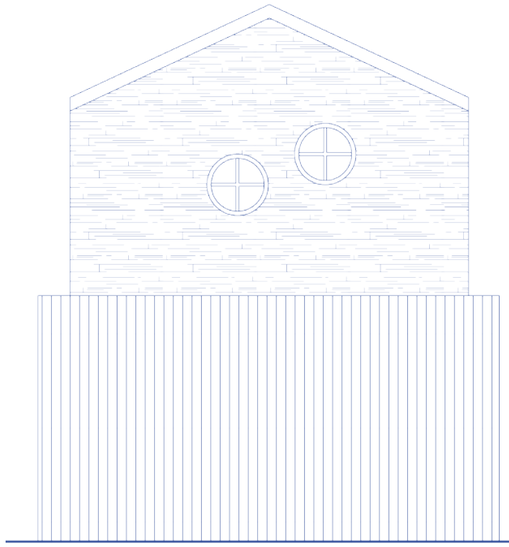
As the site features a vibrant public atmosphere in the south and a more private ambience in the north, these contrasting experiences blend into the site, shaping the architecture placed there. Situated in the self-governed and creatively rich community of Christiania, the site's architecture embodies the community's spirit of adaptability and self-expression.

In the south, a striking office building with a free-standing house on its roof stands as a testament to the creativity of Christiania's residents, its function evolving to meet their needs. Nearby, informal structures like the inhabitable platforms mirror the office building's form, creating inviting spaces for socialising and relaxation. The seating area seamlessly follows the site's natural topography, transitioning into playful structures that invite imagination and activity. The play zone gently follows the roads and heads down to the shower house and a verdant green area, offering a lush haven for games and relaxation.

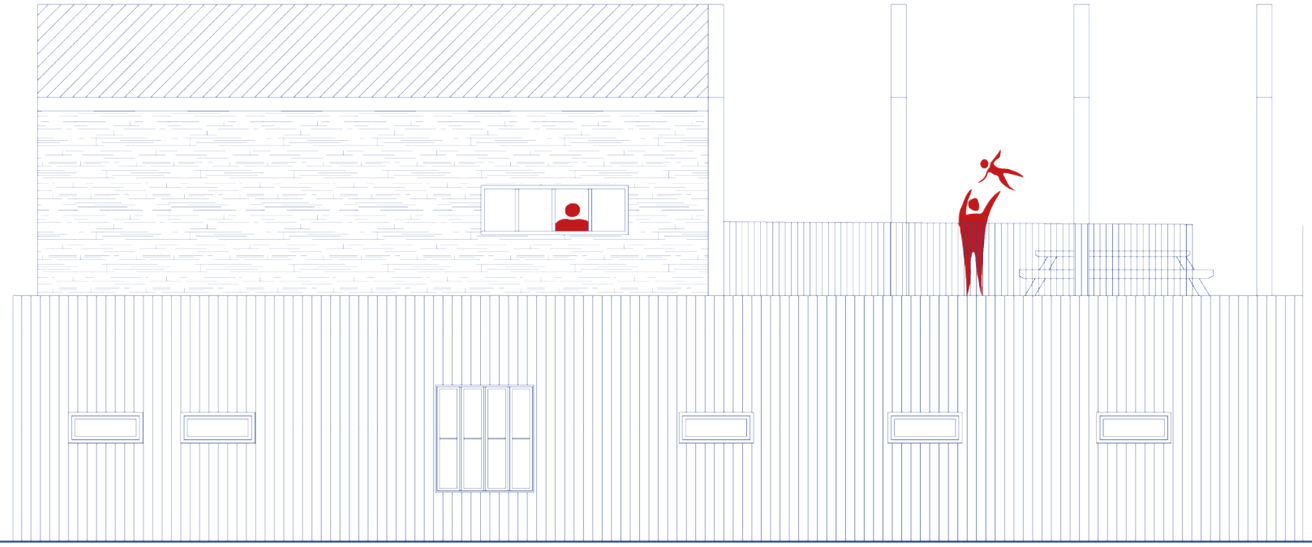
As you move north, the architecture subtly becomes more formal, signalling a shift towards a more private realm. Raised flower beds bursting with flora, buzzing beehives, and rows of parked bicycles paint a vivid picture of everyday life in this unique community. Two three-storey houses divide the green space into a more intimate garden, their architecture growing increasingly formal and refined by this green line running through the site, creating a sense of serenity and order. The varied expressions of the new buildings reflect the individuality of their inhabitants, adding multiple personal touches to this vibrant community.



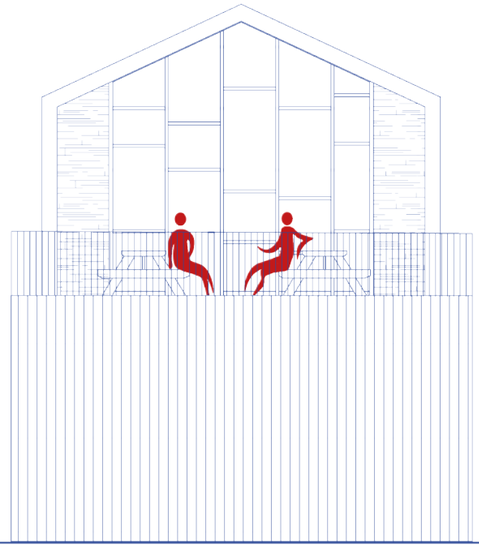
Illu. 06. Masterplan, 1:500



Illu. 07. Elevation North-East, 1:100



Illu. 08. Elevation North-West, 1:100

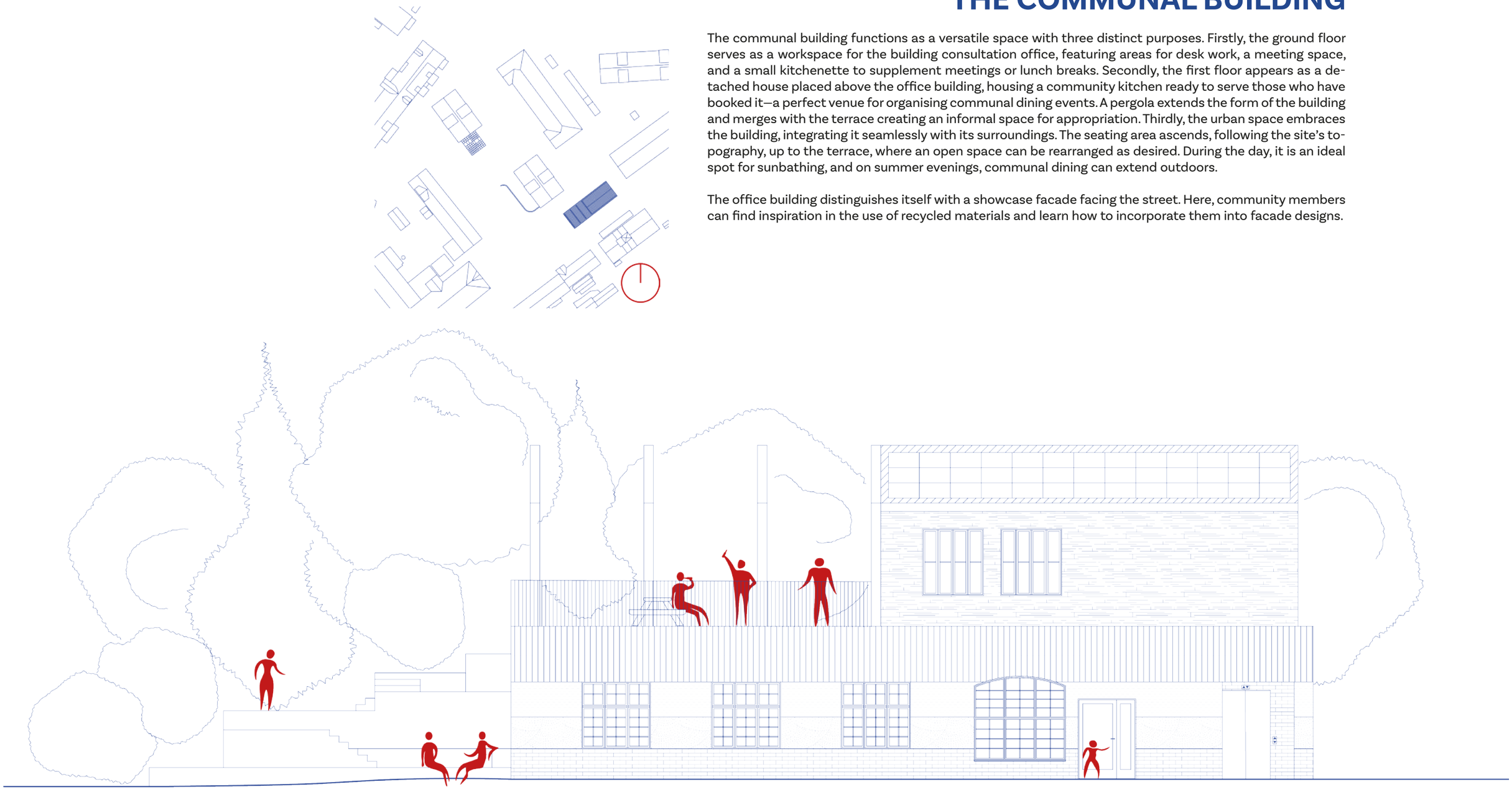


Illu. 09. Elevation South-West, 1:100

THE COMMUNAL BUILDING

The communal building functions as a versatile space with three distinct purposes. Firstly, the ground floor serves as a workspace for the building consultation office, featuring areas for desk work, a meeting space, and a small kitchenette to supplement meetings or lunch breaks. Secondly, the first floor appears as a detached house placed above the office building, housing a community kitchen ready to serve those who have booked it—a perfect venue for organising communal dining events. A pergola extends the form of the building and merges with the terrace creating an informal space for appropriation. Thirdly, the urban space embraces the building, integrating it seamlessly with its surroundings. The seating area ascends, following the site's topography, up to the terrace, where an open space can be rearranged as desired. During the day, it is an ideal spot for sunbathing, and on summer evenings, communal dining can extend outdoors.

The office building distinguishes itself with a showcase facade facing the street. Here, community members can find inspiration in the use of recycled materials and learn how to incorporate them into facade designs.

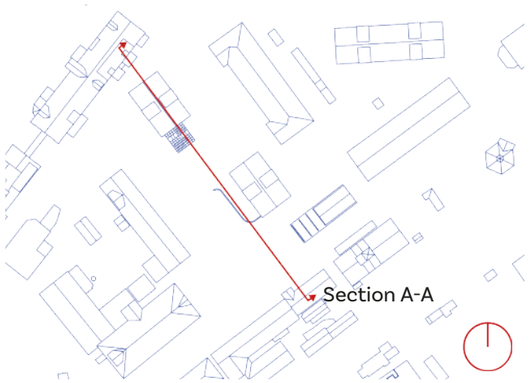


Illu. 10. Elevation South-East, 1:100

Illu. 11. *Groundfloor, the office. 1:100*

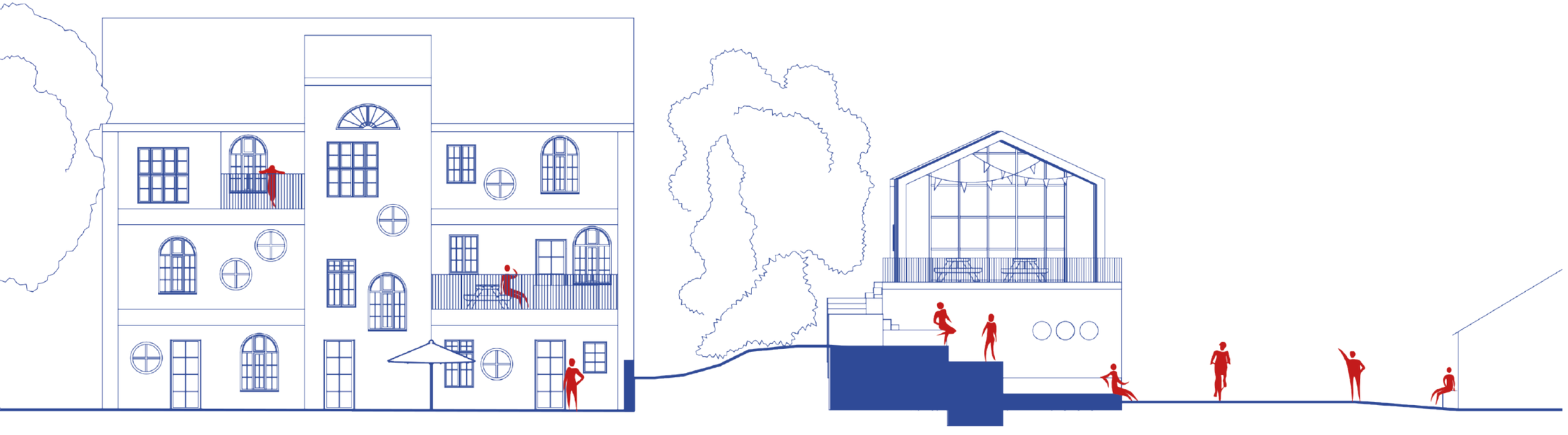
FLOOR PLANS - OFFICE BUILDING

Illu. 12. First floor, the community kitchen and urban terrace. 1:100



PRESERVING THE SITE

By utilising the existing structures, vegetation, and topography of the site, privacy is respected due to the clear division of the area. It forms distinct zones within the site, with the topography particularly creating a clear barrier. The most public areas are closely connected with the bustling life in front of the grocery store, and this energy is transferred into the site, providing ample space for both informal and formal conversations. This enhances the existing social hub and creates a stronger meeting space for the citizens of Christiania. By developing the qualities of such an important space, this serves as a strategy to integrate newcomers into the community, as well as a means of creating growth within the community.



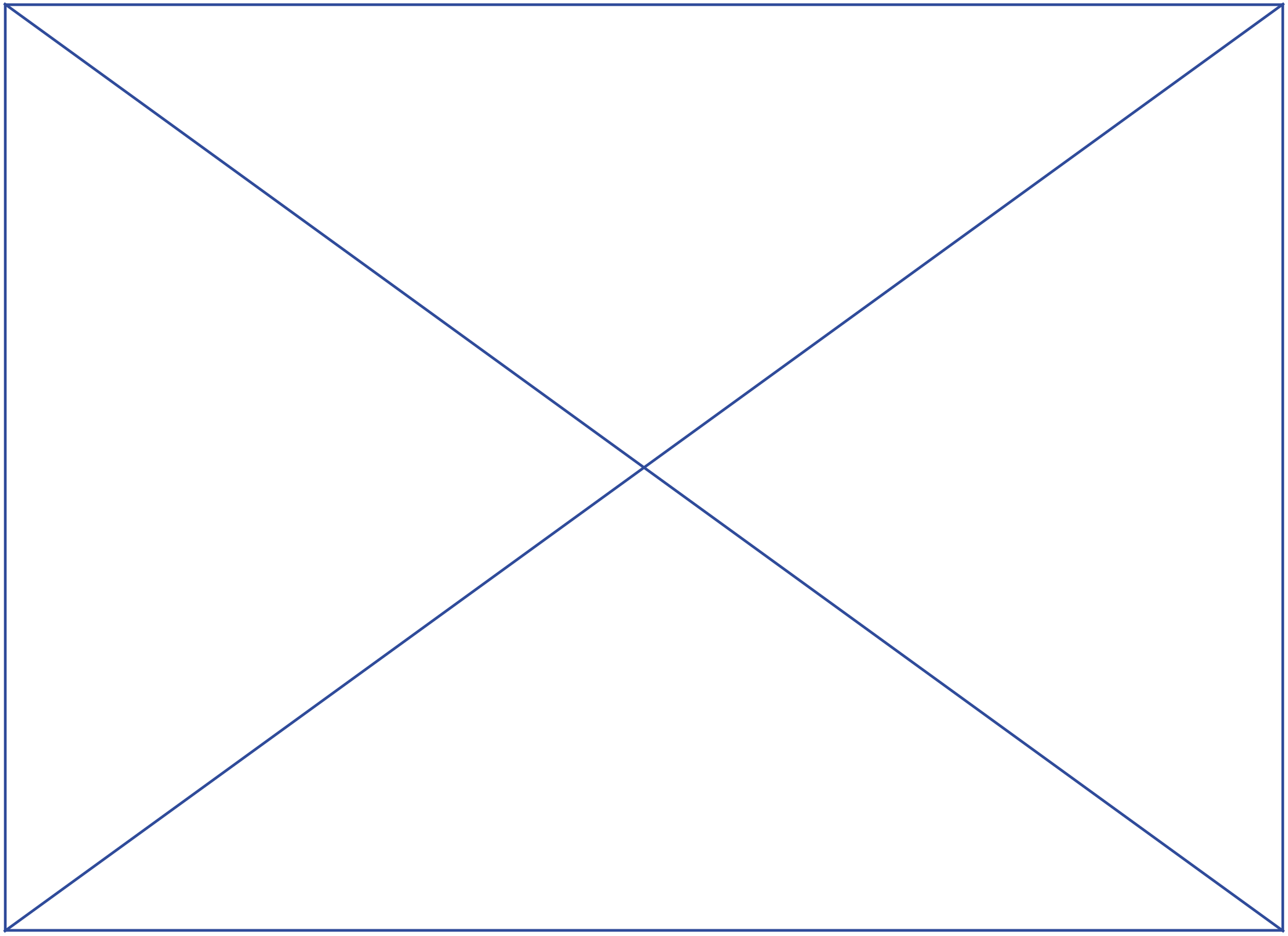
Illu. 13. Section A-A, 1:150

THE PRIVATE AREA

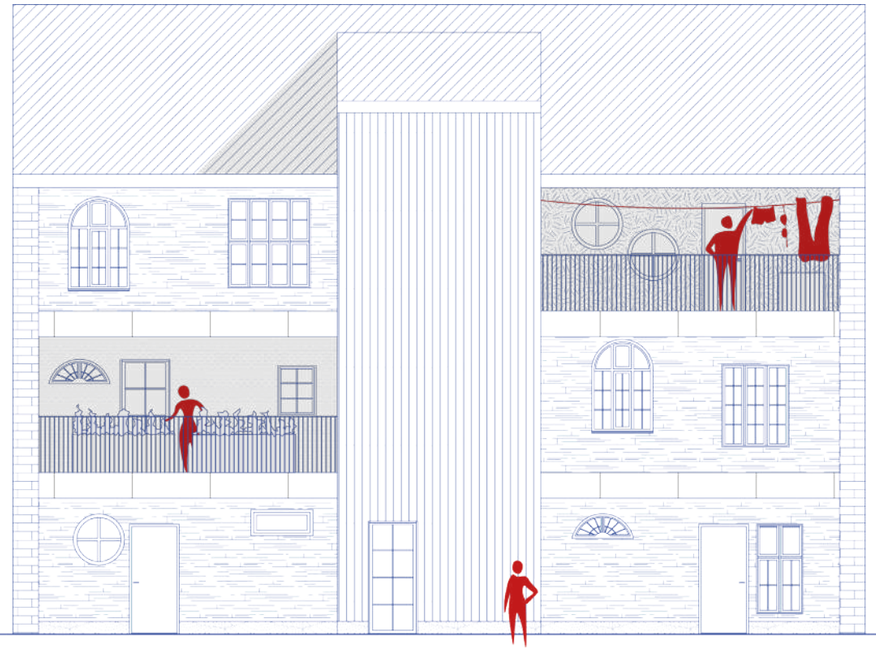
In the common garden, life takes a slower pace. The pathways become narrower as one enters the semi-private area, signalling to pedestrians and cyclists to slow down—this is not a transit zone. The functions of the area change over time as the residents adapt to it. Often, someone can be seen painting or repairing their chair in the shade of the ancient trees. This common sight often leads to a few more residents joining in, discussing the best way to solve the challenge or offering a beer to cool down.

As for the facades, there is much activity. Changes in materials, rhythms, and pace make them interesting to look at, and you will always discover a new detail or quirk you hadn't noticed before. The laundry flutters in the wind, and one can hear a neighbour playing the guitar from an open window.

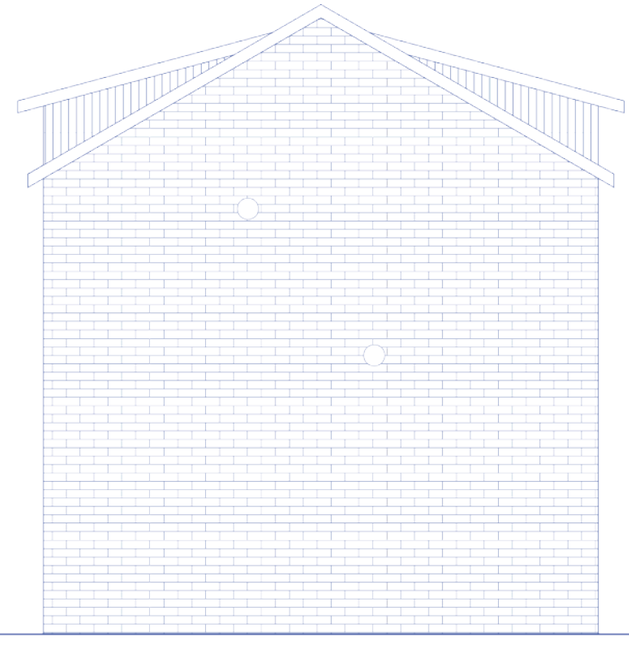
When developing the facades, adaptability and freedom of expression were key concepts. With a dynamic facade changing on every floor, the apartments become strong visual symbols of the lives within. By having the opportunity to express themsleves when moving into this settlement, new residents integrate into the core values of Christiania from the start. This is an essential step in welcoming new people into the community, ensuring they feel like true Christianites from day one.



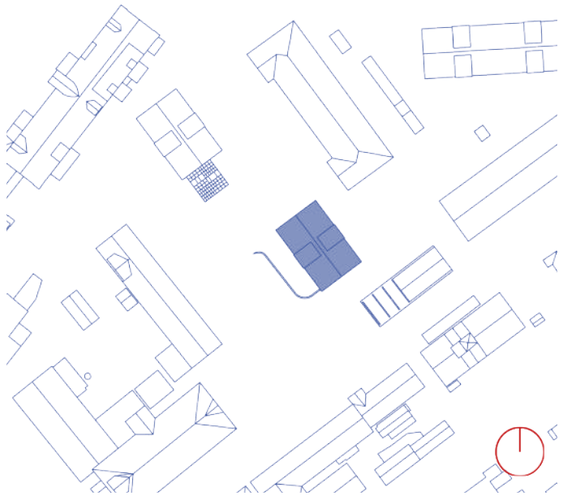
Illu. 14. A collage showing the life of the community garden



Illu. 15. Elevation of the dwelling North-East, 1:100



Illu. 16. Elevation of the gable North-West, 1:100

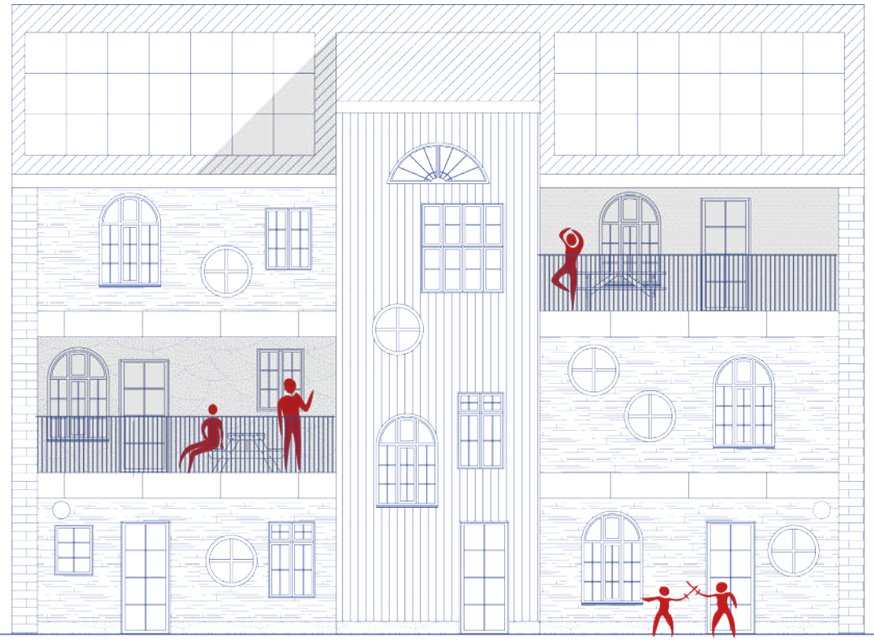


ELEVATIONS - DWELLINGS

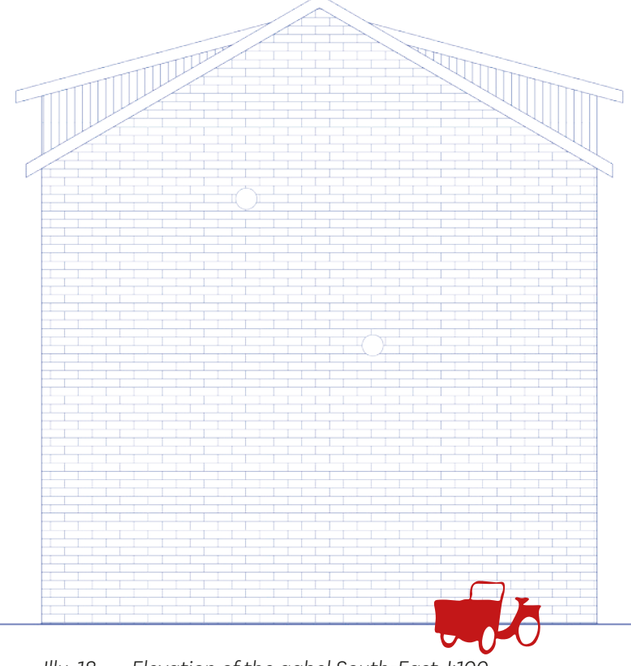
To ensure the quality of the building, the gables are made of bricks, an inorganic material that requires no vapour barrier. The gables also provide a canvas for the users, as graffiti is a common feature in the area.

The use of upcycled windows creates a stimulating expression with unpredictable outcomes. The type, size, placement, and form of the windows will be decided by the first residents moving into the dwelling, in an attempt to connect people with the architecture and the area more quickly.

The core has its own distinct expression, acting as a robust element that holds everything together. The shape of the roof creates a modern look while providing space for the elevator.



Illu. 17. Elevation of the dwelling South-West, 1:100



Illu. 18. Elevation of the gabel South-East, !:100

MATERIAL AND AESTHETICS

The priority of the facade is to visually express the diverse families and identities that occupy the building. Therefore, it is designed for maximum personalisation, encompassing various aspects such as window type, size, placement, and choice of materials. Illustration 19 demonstrates the project's capacity for customisation and diversity in other spaces as well, showcasing adaptable floorplans to meet different needs and preferences, with every second segment of the elevation being expandable.

To enhance the effect of the expandable facades, the slab and cores are clad in a neutral material, creating a solid base that contrasts with the personalised facades designed and built by the residents.

Illu. 19. *A collage of possible facades, showing the inherent diversity in the project*

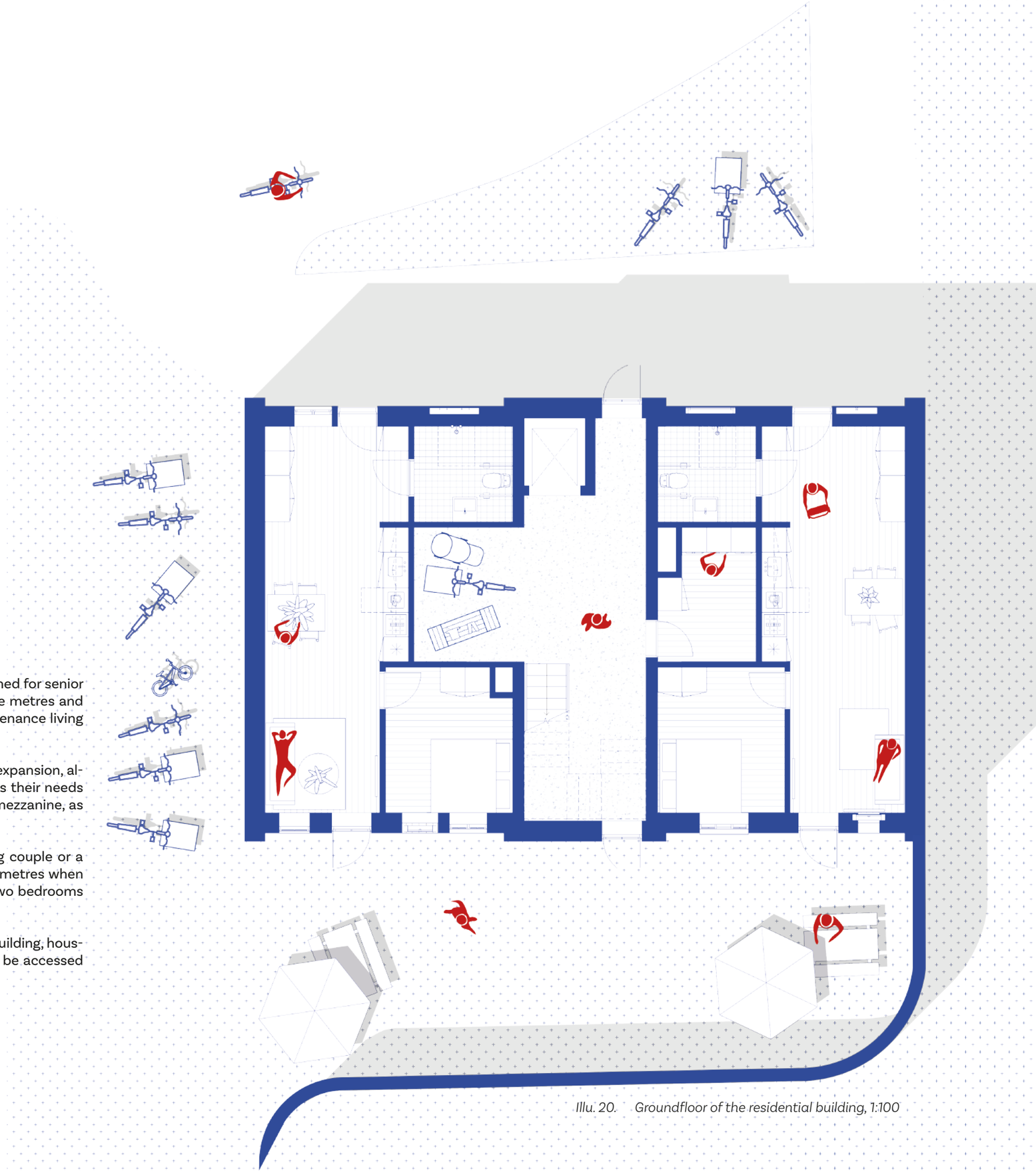
FLOOR PLANS - DWELLING

The floorplans are divided into two systems. The ground floor is designed for senior dwellings with a focus on accessibility. The apartments are 66 square metres and cannot be expanded, as the residents moving in here seek low-maintenance living as they grow older.

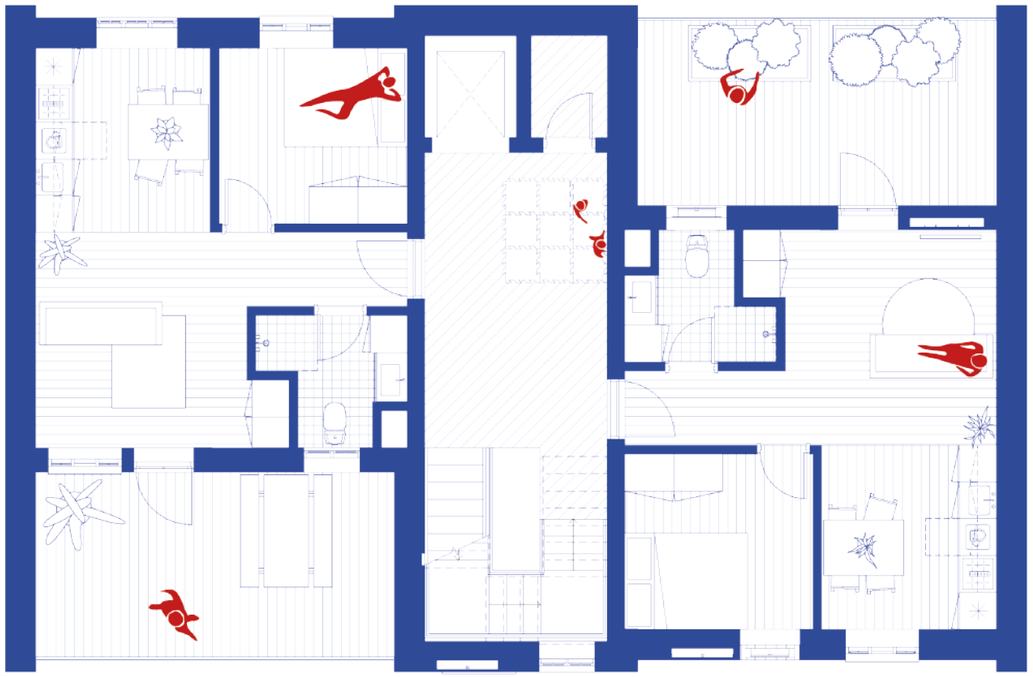
The first and second floors are designed with the same principles of expansion, allowing residents to replace their balconies with heated floor space as their needs change. The apartments on the second floor also offer the use of a mezzanine, as they feature raised ceilings.

The dwelling is designed for a newly arrived family, possibly a young couple or a small family with two young children. The apartments are 55 square metres when newly built, offering one bedroom, but can be extended to include two bedrooms and up to 79 square metres.

The internal core functions as a common circulation area within the building, housing shared spaces such as laundry rooms and flexible areas that can be accessed according to the residents' wishes.



Illu. 20. Groundfloor of the residential building, 1:100



Illu. 21. *First floor, 1:100*

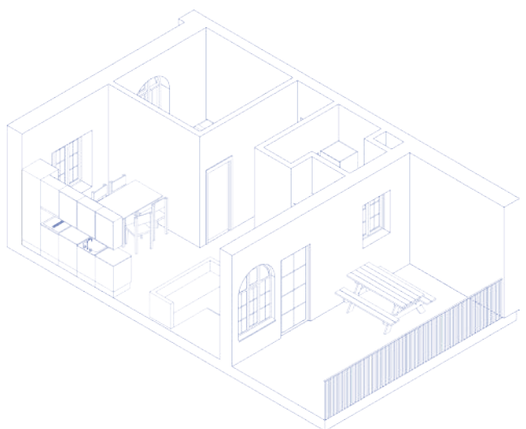
Illu. 22. *Second floor, 1:100*

VARIATIONS OF FLOORPLANS

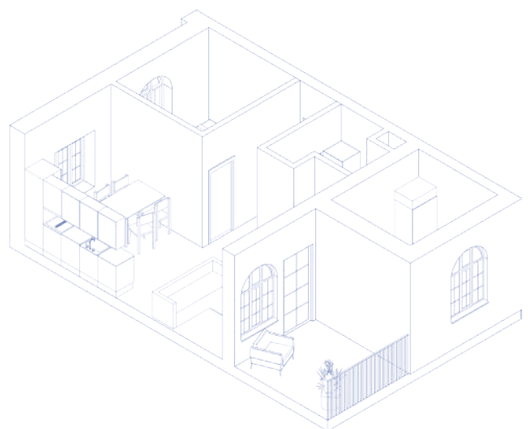
The floorplans are designed to be able to adapt as the demands from the user may change. The user themselves can adapt their apartment as they wish and in illustration 23-29, one can discover different solutions that should be seen as inspiration for the users.

The balcony can be incorporated into the building envelope in several solutions, but if built upon the occupant can add two extra rooms, or this can be included into the existing rooms. How to build these extensions and adaptations is further described in the Additive guide.

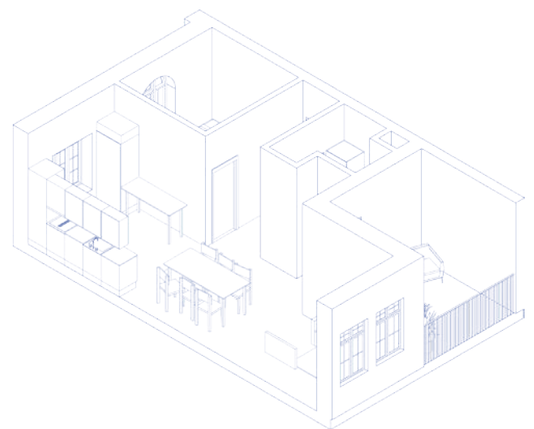
Furthermore, the original bedroom can also be changed over time and extend the kitchen area if needed.



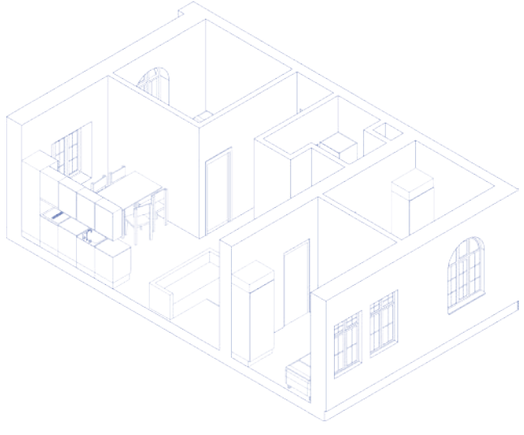
Illu. 23. The original floorplan, 1:100

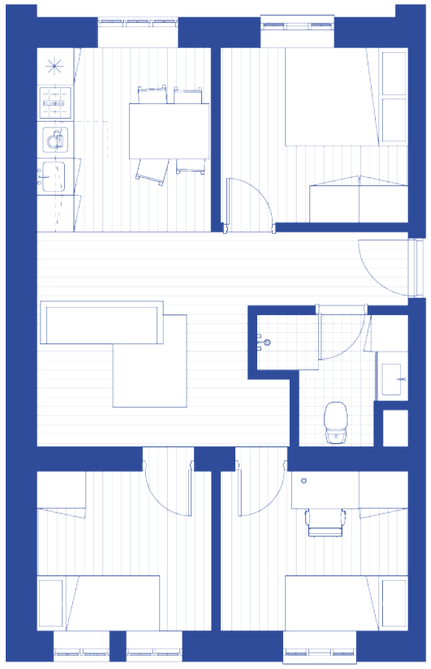


Illu. 24. Variation 1, 1:100

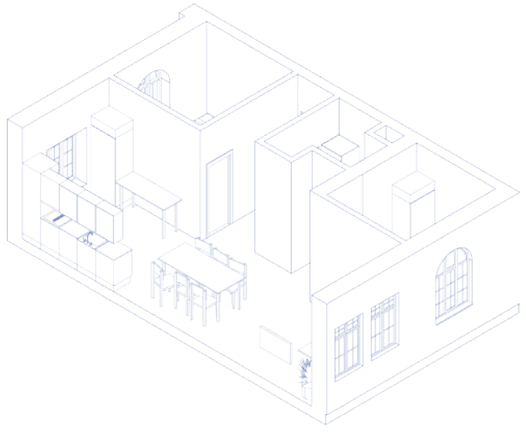


Illu. 25. Variation 2, 1:100

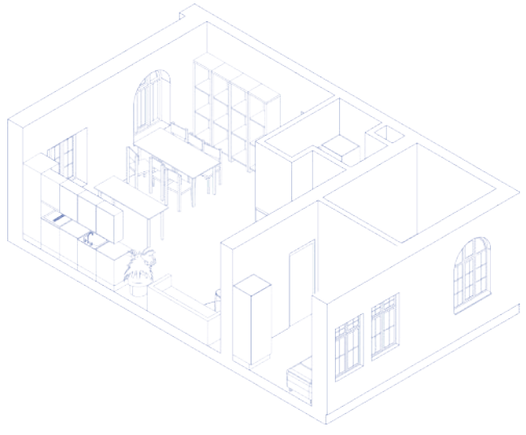


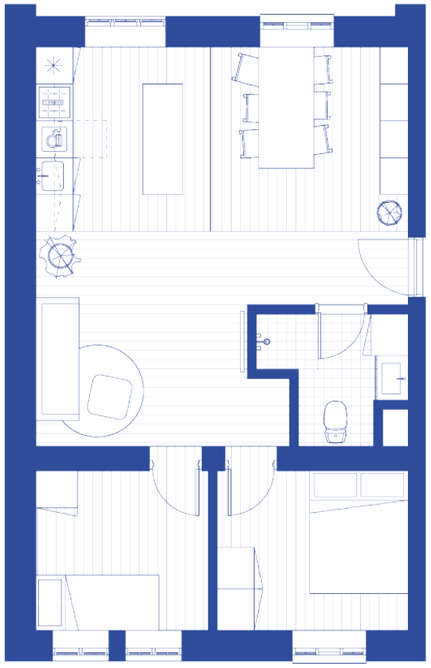


Illu. 26. Variation 3, 1:100

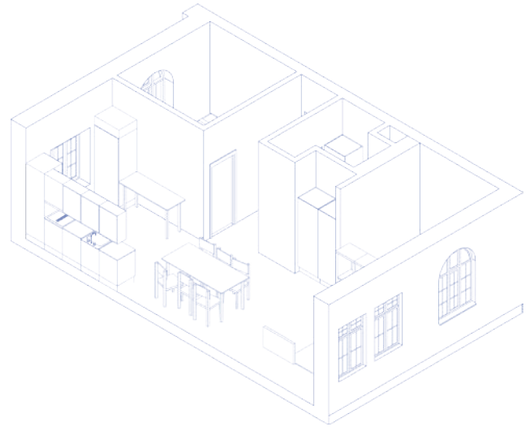


Illu. 27. Variation 4, 1:100

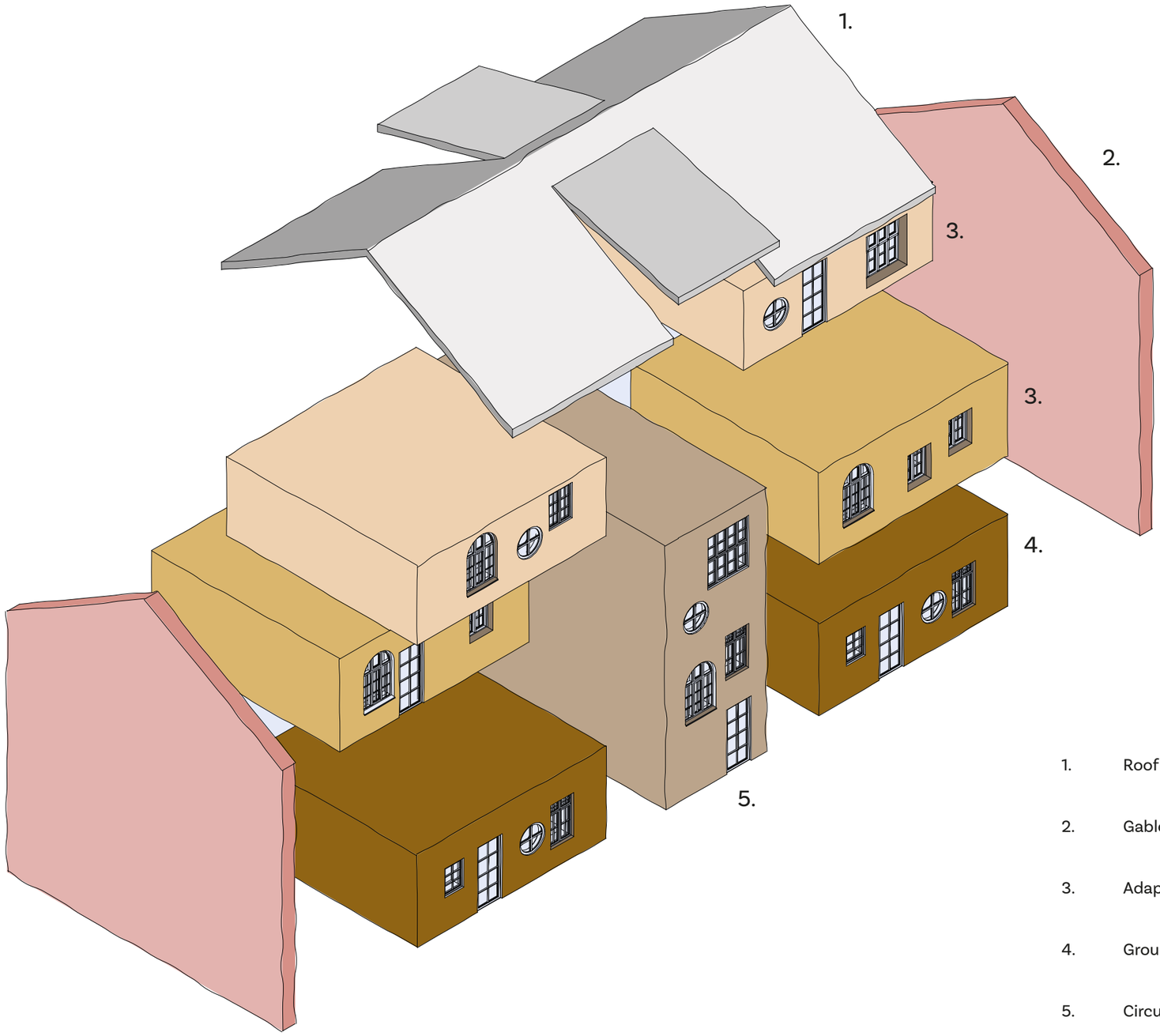




Illu. 28. Variation 5, 1:100



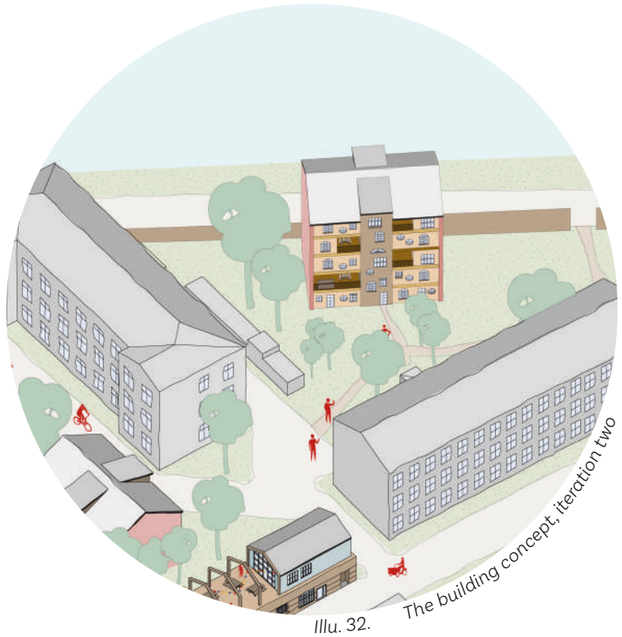
Illu. 29. Variation 6, 1:100



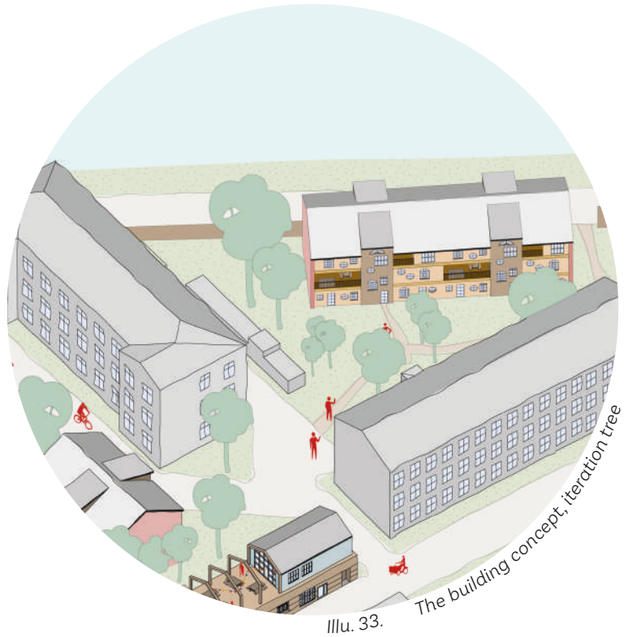
1. Roof
2. Gable wall in solid bricks
3. Adaptive apartments
4. Groundfloor apartments
5. Circulation core

Illu. 30. The different building parts

Illu. 31. The building concept, iteration one



Illu. 32. The building concept, iteration two



Illu. 33. The building concept, iteration tree

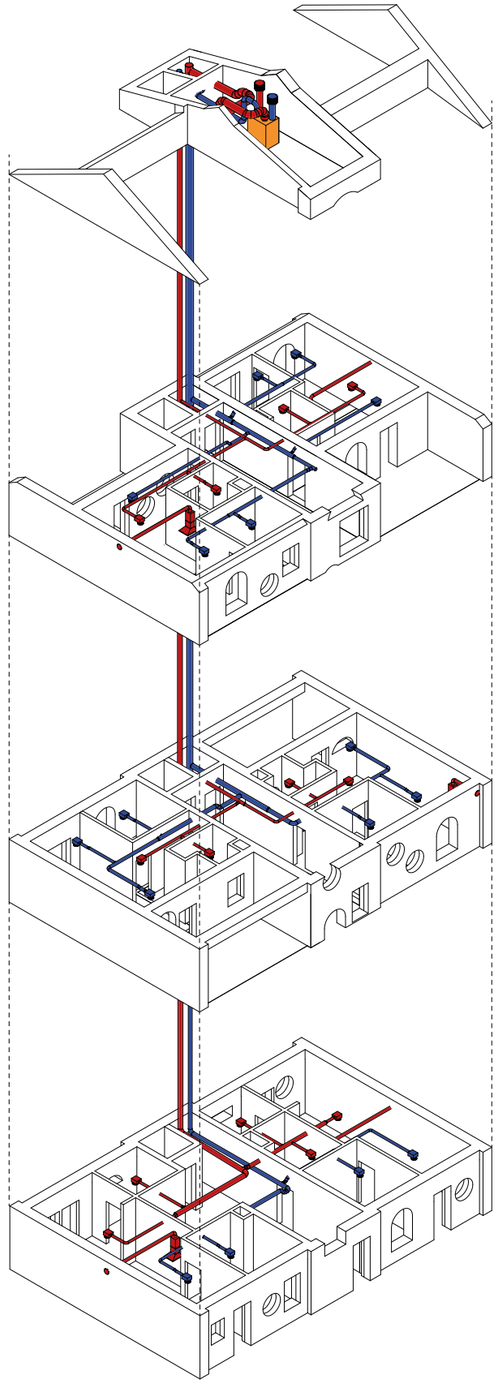
BUILDING VARIATION

Furthermore, the building not only possesses the ability to adapt for the user but it can also be put together in different variations. The building in itself includes a groundfloor, a core with apartments on both sides, two floorplans with shifting plans, two end gables and a roof. These parts can then combine into many different solutions, making the building fit other sites. As seen in illustration 31-33, the concept of the building is combined in three different solutions, resulting in three different designs.

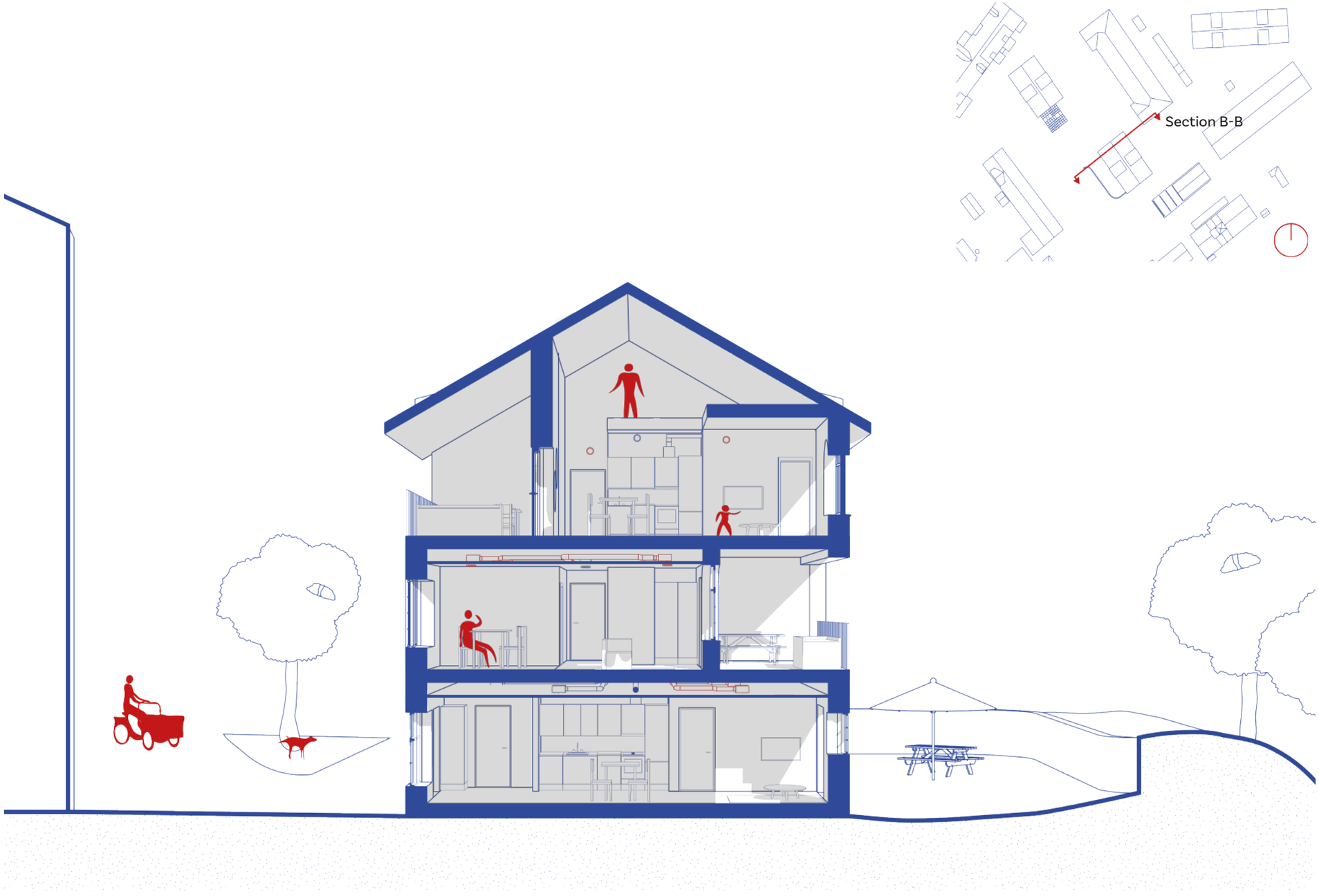
VENTILATION

The building features a dropped ceiling to accommodate mechanical ventilation and plumbing from the kitchen to the bathroom shaft. The ventilation system runs through the dropped ceiling to the staircase and then through a ventilation shaft to the roof, where the ventilation unit is placed.

A hybrid ventilation system is implemented to optimise the energy demand for ventilation, throughout the year. The mechanical ventilation system provides a base load ventilation rate of 0.5 air changes per hour, ensuring a healthy indoor environment during winter. Additionally, natural cross ventilation in the summer helps maintain a desired temperature and keeps CO_2 levels low, ensuring a comfortable living environment year-round.



Illu. 34. Ventilations diagram



Illu. 35. Perspective section B-B, 1:100

CONSTRUCTION

The construction of the roof, slab, foundation, and walls is designed to facilitate easy and buildable expansion of the envelope. The vapour barrier is strategically placed externally to the load-bearing elements to ensure that future expansions are possible. By positioning the vapour barrier outside the load-bearing system, most of the insulation must be placed externally to eliminate the risk of internal wall condensation.

The load-bearing system consists of CLT (cross-laminated timber) elements located in the floor slab, between apartments, and in the non-expandable facade. This design allows the facade facing the balcony to be non-load-bearing, enabling the use of lightweight wood construction that residents are familiar with and can partially dismantle or completely remove if wanted.

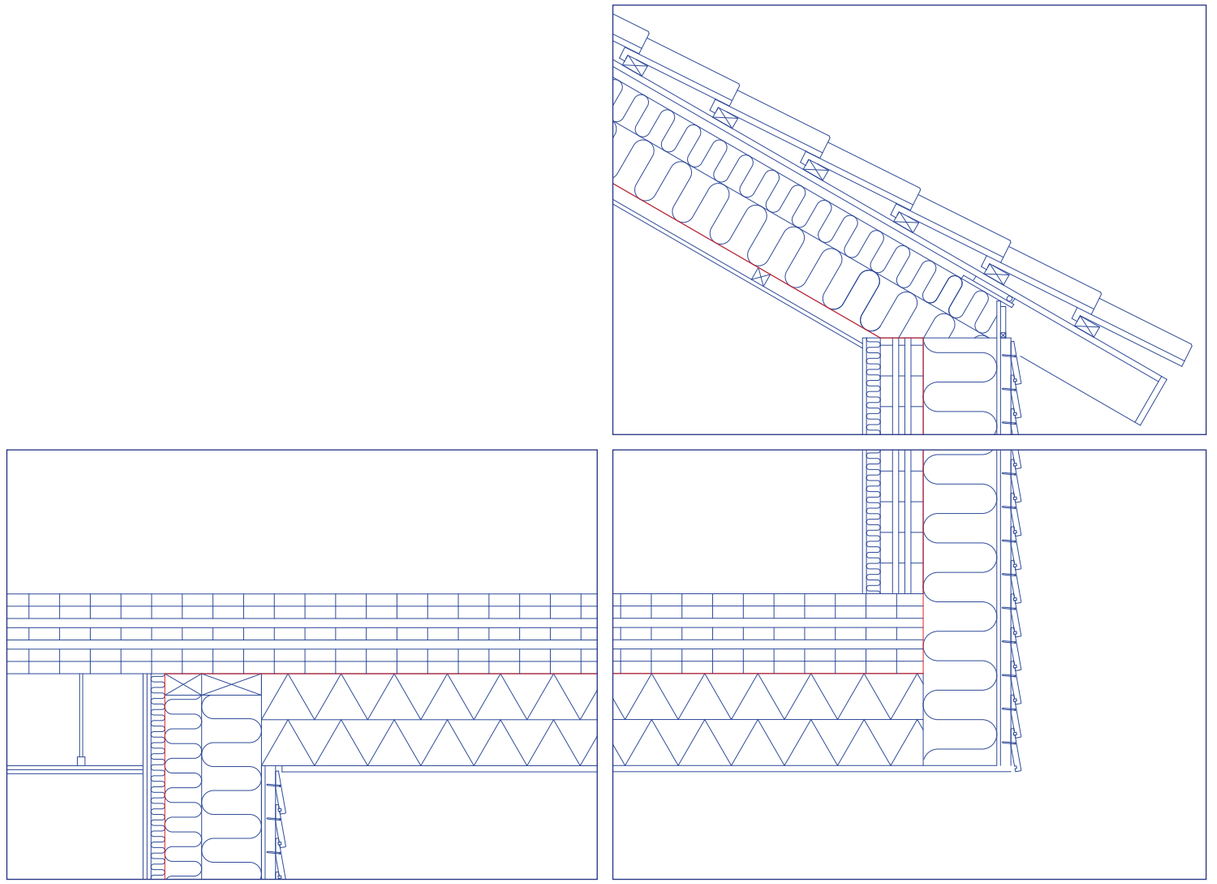


ILLUSTRATION REFERENCE

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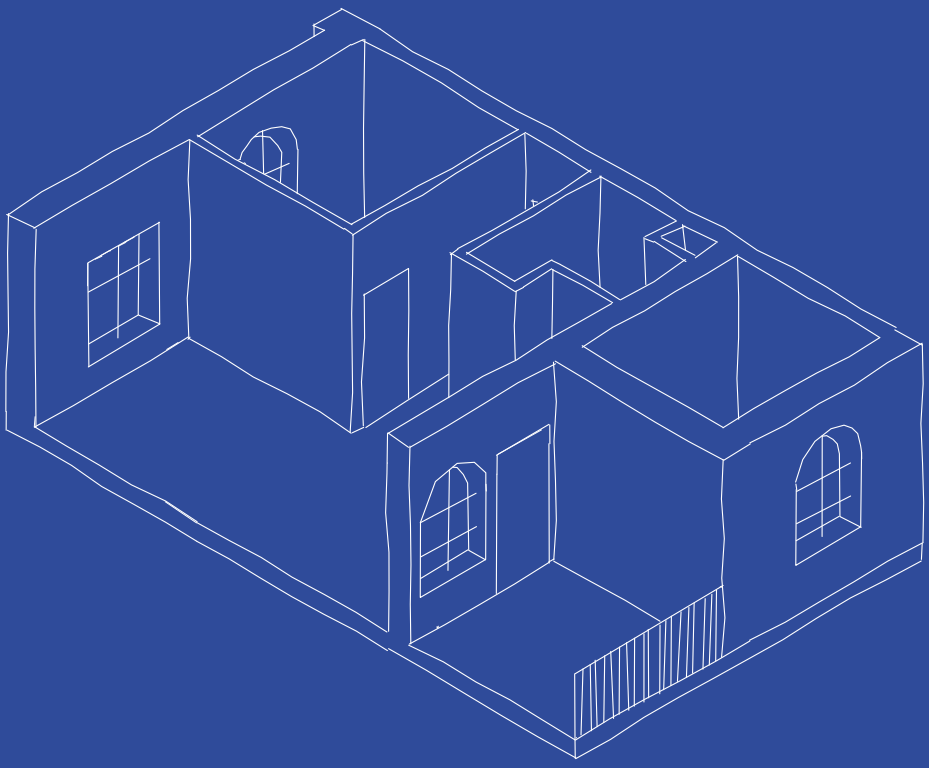


THE ADAPTIVE BLUEPRINT

OF CHRISTIANIA ADDITIVE GUIDE

MSc04 ARC Group 11, May 2024

WELCOME

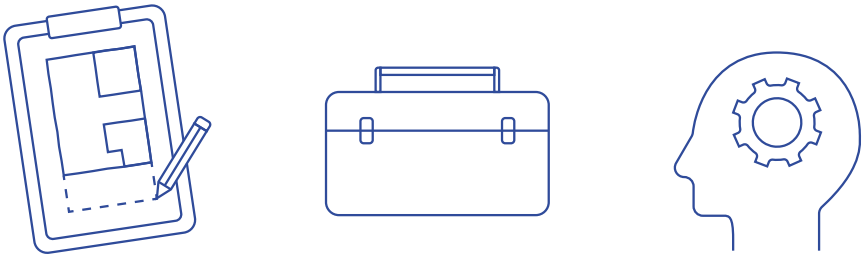
Welcome to Christiania and welcome to your new home. This is no ordinary social housing; it's a space designed to adapt to your lifestyle. Your apartment spans 55 square metres, featuring a balcony of 24 square metres, with the option to convert it into one or two additional rooms.

This guide will help you to understand your building as well as make you able to expand your own home. Your new abode is supported by two load-bearing walls with a fully functional kitchen, bathroom, living area, and bedroom. It's a canvas for customisation, capable of expanding in one or two phases. As you embark on this journey, remember to refer to this assembly guide diligently and consult with the building council whenever uncertainties arise.

This guide will go through the relevant aspects of adding these extensions, as to best prepare you to undertake the construction work required to do so. First, is a description of how the process of adding the actual extension is intended to proceed to ensure the easiest process. Secondly, there will be an explanation of all the different types of construction components that exist within the building. After that, it will describe the systems that exist within the building and how these interact with the perceived indoor comfort. Then comes the guide on the disassembly of the walls, ceiling, and balcony floor, and lastly is the guide on how to assemble a new extension.

Your new home is not just a dwelling; it's a canvas for self-expression and growth. With careful planning and adherence to this guide, may your Christiania residence become a sanctuary tailored to your unique needs and desires.

TABLE OF CONTENT



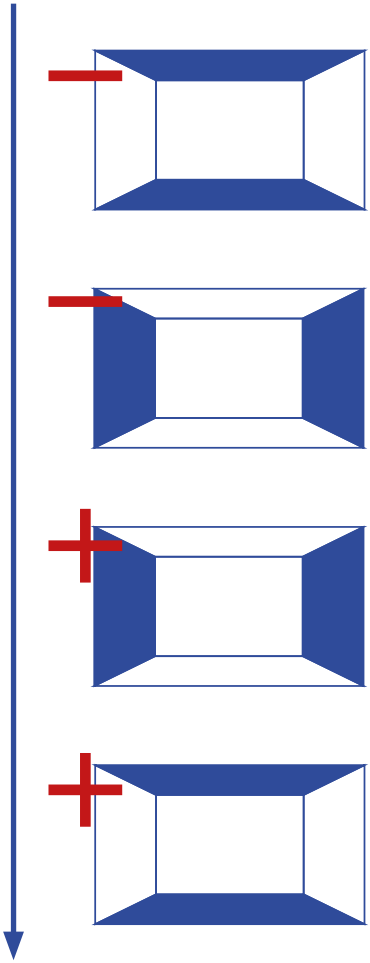
PLAN YOUR PROCESS,
GATHER TOOLS AND
KNOWLEDGE/COMPETENCE

START BY REMOVING CEILING AND FLOOR-ING AT THE BALCONY

REMOVE EXTERNAL WALL

RAISE THE NEW WALL STRUCTURES

FINISH UP WITH THE CEILING AND FLOORING



Illu. 01. Diagram of the additive process

HOW TO PLAN YOUR PROCESS

Before you go about tearing down walls to add another bedroom, you might want to plan the actual process in order for it to run smoothly and not take too long. If you are ever in doubt, consult the building consultation office.

First, you should plan the actual extension. How much more space do you need? What is it for? Questions like these help to inform you about the materials needed and the planning of the construction. Consider the design and layout, ensuring it meets your needs. You should also think about the long-term implications, such as how the extension will affect your home's overall functionality. Additionally, checking local building regulations is crucial before starting construction. This step will help you ensure that the extension is safe and up to code.

To successfully add an extension to your home, you need the right tools and a solid understanding of the construction process. Some of the basic tools you would need are a saw, hammer, drill, nails, and screws. Additionally, safety is important, which necessitates the use of safety goggles and gloves. More specialised tools, such as an angle grinder, might also be necessary depending on the specifics of your project.

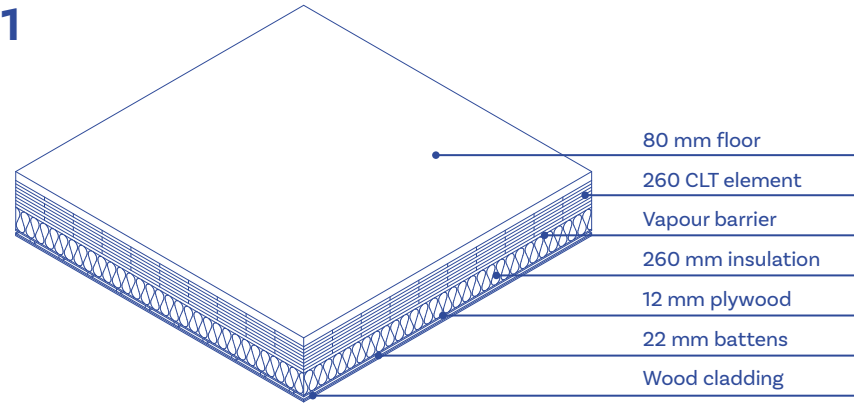
In addition to the tools, acquiring the knowledge on how to use them effectively is essential. If you do not consider yourself experienced in construction, ask someone with a craftsman background or refer to the building consultation office. Consulting with a professional or seeking advice from experienced friends or family members can provide practical insights and help you troubleshoot any issues that arise during the construction process.

When you start to disassemble the different components, it is recommended to first remove the balcony ceiling and floor, before removing the adjoining walls, ensuring adequate access to both. This order is reversed when assembling a new construction.

GENERAL INFORMATION OF YOUR MATERIALS

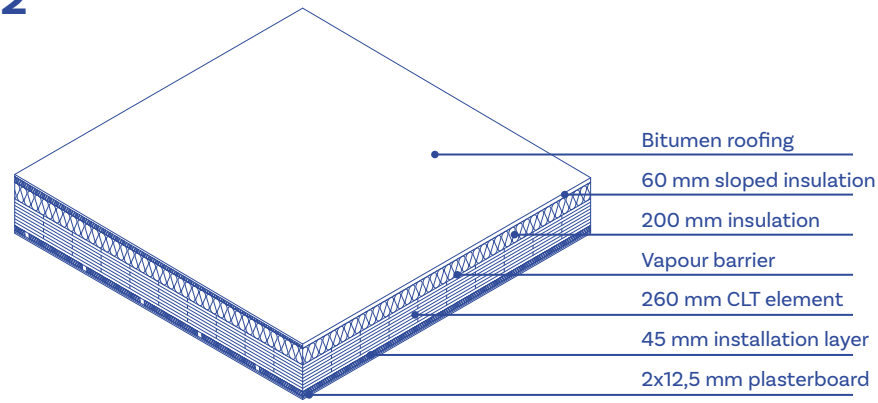
Your new home consists of a ceiling type (1), one flooring type (2), and three different wall types, one solid brick wall (3), one CLT-wall (4) along with a wooden skeleton structure (5). Most of the load-bearing construction parts are made of CLT, and additionally, the gables are made of a solid brick construction to stabilise the structure.

1



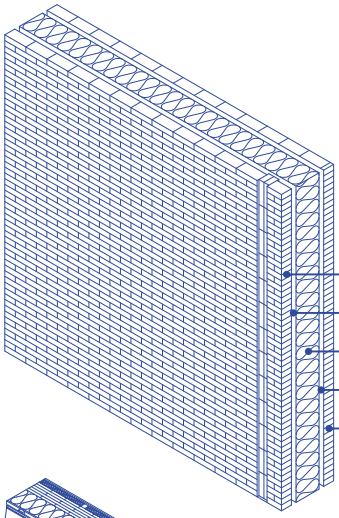
Illu. 02. A ceiling element

2



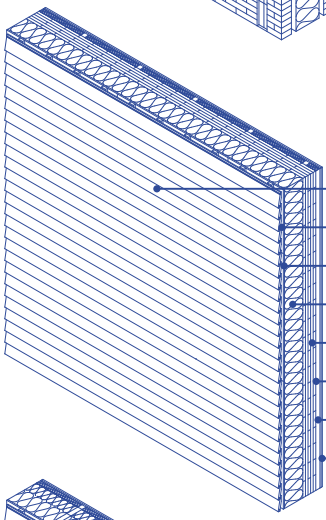
Illu. 03. A flooring element

3



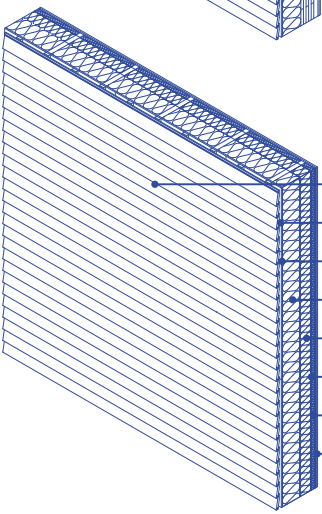
Illu. 04. A solid brick wall

4



Illu. 05. A CLT wall

5



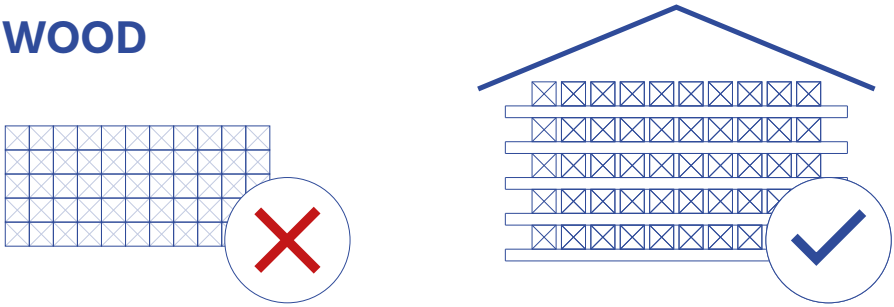
Illu. 06. A wooden skeleton wall

STORAGE RECOMMENDATIONS

To be able to reuse as much of the disassembled material as possible, proper storage during renovation is imperative, as weather conditions can alter the properties of the materials.

Therefore, always stack the materials as recommended:

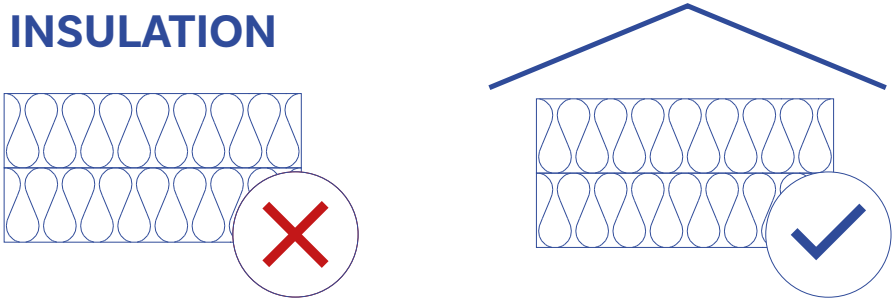
WOOD



Illu. 07. Guide how to storage wood-elements

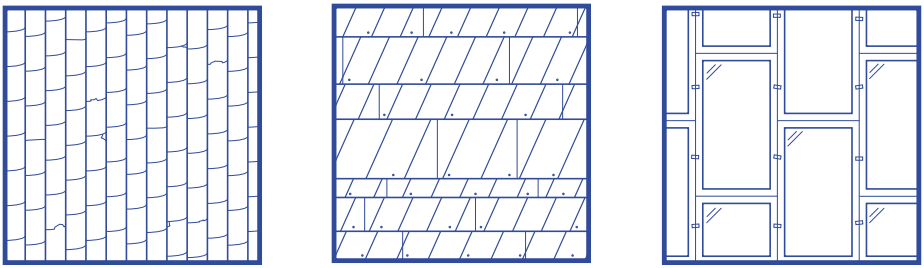
As wood is sensitive to moisture, it is imperative that the material is stored with air in between eache element, and covered for rain.

INSULATION



Illu. 08. Guide how to storage insulation

As for the insulation, it is important to cover it, and keep it out of moisture.



Illu. 09. Different types of reused materials

FACADE MATERIALS

The choice of facade material is your opportunity to be creative and express your originality to the world. Here is some inspiration to get you started.

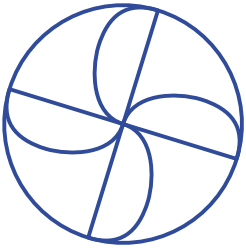
In line with the philosophy of Christiania, which emphasises environmental care, it is strongly recommended to use materials available in the Green Hall, the reuse and building material-center at Christiania. There, you might find reused clay roofing tiles, which provide a unique aesthetic. Reused metal is also recommended, as it is frequently utilised in the building sector. For example, aluminium ventilation shafts can be cut into new shapes and serve to protect your building from wind and water. And when you're at the Green Hall, take a look at their selection of windows. They offer various styles and sizes to choose from. You can read about what to consider when selecting windows on page 13.

Reused materials not only offer environmental benefits but also contribute to a high-quality aesthetic due to their patina. Additionally, reused materials come in pre-cut dimensions, allowing for creative facade design.

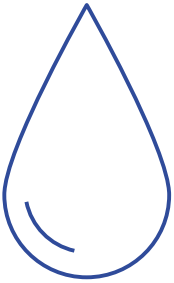
However, reused materials are a scarce resource. If none are available, wooden cladding can also offer a playful and appealing expression. Furthermore, wood has strong environmental benefits, even when newly produced, and is considered easy to assemble.

So, let your creativity flourish!

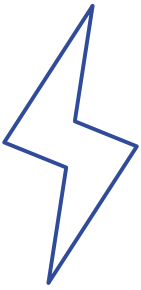
GENERAL INFORMATION OF YOUR SYSTEMS



Illu. 10. Ventilation



Illu. 11. Water

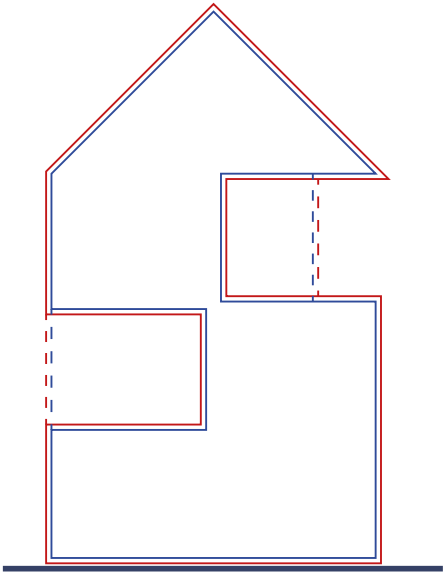


Illu. 12. Electricity

Your home embraces a **hybrid ventilation** system, blending mechanical and natural ventilation. Mechanical ventilation ensures a consistent airflow year-round, while natural ventilation becomes essential during the summer months. With heat recovery integrated into the mechanical ventilation, it's advisable to refrain from natural ventilation in the winter. Should you opt to expand your living space, ensure that the ventilation system is adjusted to accommodate the increased size.

Water and plumbing infrastructure are centralised within a shaft in the bathroom and run through the ceiling. Any modifications or adjustments to these systems should be overseen by professionals recommended by the building council. Additionally, if you plan to extend your home, seek expert assistance to integrate heating into your new spaces.

The **electricity** for your apartment runs in your ceiling and the inner layer of your walls, ensuring access while not puncturing the vapour barrier. For your own safety and the integrity of the rest of the installations in the building, always hire a professional to perform any modifications and adjustments to wires, as well as any extensions of the existing network.



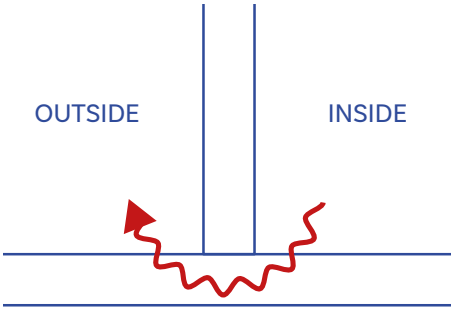
Illu. 13. The vapour barrier (the blue line) encloses the building, as a part of the building envelope (the red line)

TO HANDLE A VAPOUR BARRIER

One of the most important components in your walls, floor, and roof is the **vapour barrier**. It is the part of the building envelope that ensures that the moisture in the warm air indoors does not diffuse into the construction. If this did happen, it could lead to rot and fungi, which would compromise the indoor air comfort and the structural properties of the building.

It is generally a plastic foil about 0,2 mm thick and comes as a sheeting that is rolled onto the construction. It is placed no more than a third of the wall thickness from the warm side of the insulation, so it is not visible as it is inside of the construction component.

This membrane must not be perforated as this lessens the effect and could lead to rot. It needs to be mounted in a way that ensures airtightness, by using a specific type of tape, made for vapour barriers, on any holes. This also extends to the joints between different building components, that need to be ensured. There needs to be a continuation of the vapour barrier throughout the building envelope.
If you are ever in doubt on the subject of the vapour barrier, consult a professional from the building consultation office.



Illu. 14. Thermal bridge through flooring

WATCH OUT FOR THERMAL BRIDGES

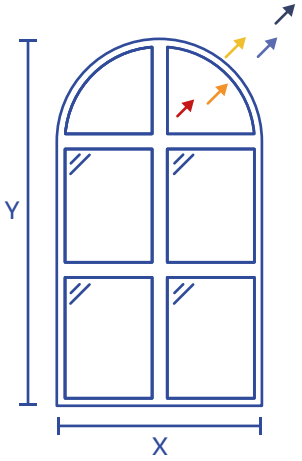
Another thing to avoid when adding extensions to your dwelling is **thermal bridges**. This happens when an unbroken material spans the whole depth of a construction component, for example, a beam spanning from the inside to the outside, or when the insulation is insufficient. It can happen in many ways but is generally linked to substandard constructions, and is made when the building is erected.

This is generally avoided by adequately planning the construction process and ensuring that no errors are made. when planning, it is important to have the insulation on the outside of the construction, and in this way create a thermal break, where the heat is not let out. Sometimes there is even a small strip of insulation used for this exact purpose, which generally happens in construction details such as joints.

The following manual is made to ensure that no thermal bridges are created, as long as you follow the directions and if there is ever any doubt, consult a professional.

DAYLIGHT RULES

The windows are one of the most important aspects of a building, especially in residential buildings. It is used for **light, heat, and visual comfort**, which makes it a versatile enhancement of the dwellings, but the risk of considerable heat loss or overheating is also prevalent.



Illu. 15. Window properties

To avoid this, guidelines have been created that ensure compliance with regulations, both in terms of energy demand, daylight, and overheating. These guidelines are based on the window-to-floor ration, meaning the amount of glass area divided by the floor area of the specific room, which means that you need to check the actual glass area of the window you are considering, as the area of the window hole and glass is not the same. The use of window-to-floor ratio means, that when you are looking at windows for your dwelling you have to consider the implications of the window type, placement, and size.

The type of window refers to its construction, which in this case means how many panes of glass it possesses and whether or not there is a secondary glazing. This affects the window's ability to transfer heat, light, and radiation from the sun. The worst performing window, that still holds up to regulations is a "1+2 energy" system, where the first denotes the amount of glass panes in the outer window, while the second denotes the number of panes in the secondary glazing. The inner panes must be energy panes as well. Any window performing better than this system would be viable to use.

The window-to-floor ratio has to be between 12%-24%, when the doors are excluded. It does depend on the use of the specific room, where the lower part of the range is best suited for bedrooms, and the upper parts for kitchens and living rooms. This is to ensure compliance with regulations, even in the event of an extension. This also extends to the extensions.

HOW TO DISASSEMBLE

In the following chapter, there will be a guide to disassemble your balcony. Firstly it will describe how to remove the floor and ceiling on your balcony, and then the adjoining walls.

Ceilling, *external ceiling at the balcony*

Balcony floor, *external flooring at the balcony*

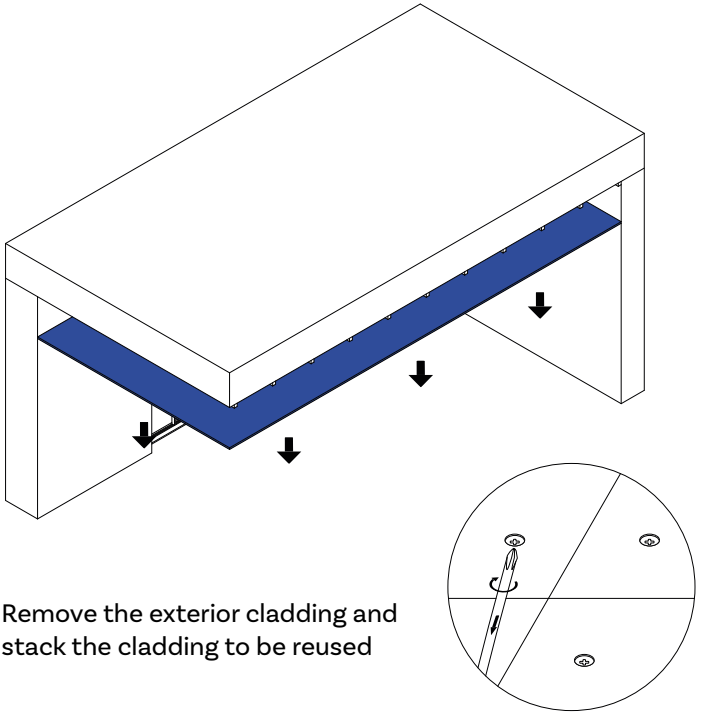
Wall type 1, *external wall, attached to the circulation cores*

Wall type 2, *external wall, attached to the dwelling*

Wall type 3, *external wall, attached to the gabels*

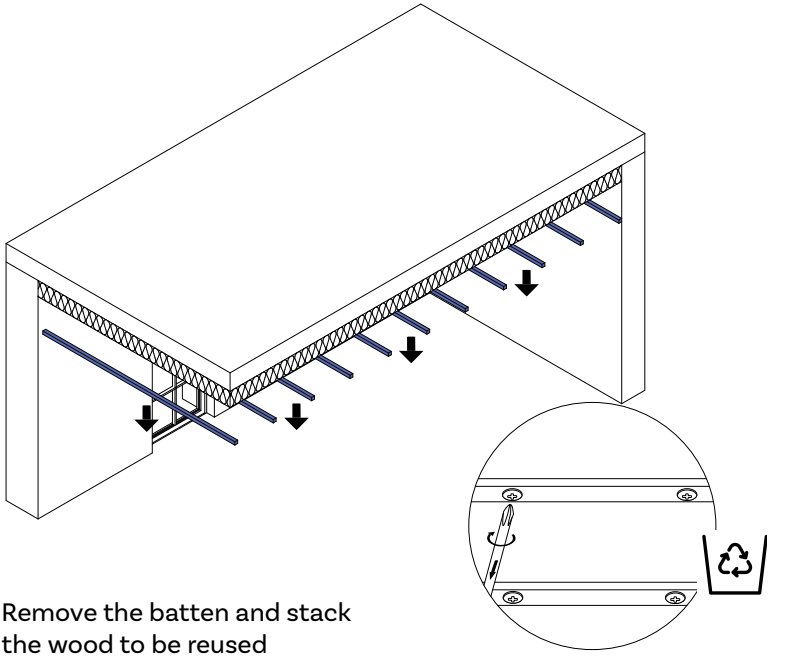
DISASSEMBLE CEILING

1



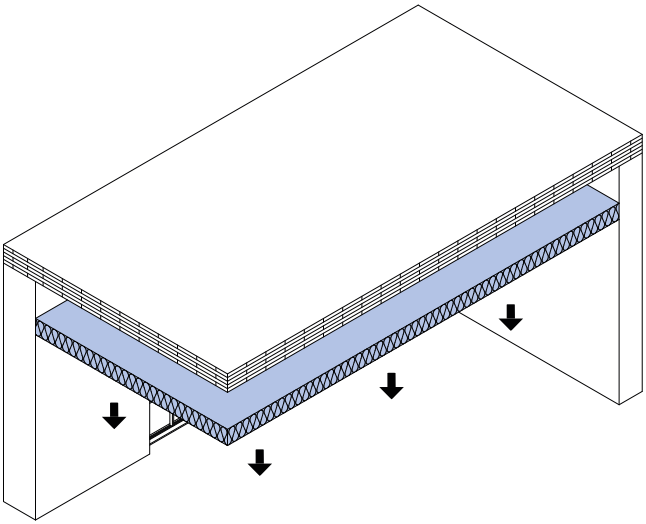
Remove the exterior cladding and stack the cladding to be reused

2



Remove the batten and stack the wood to be reused

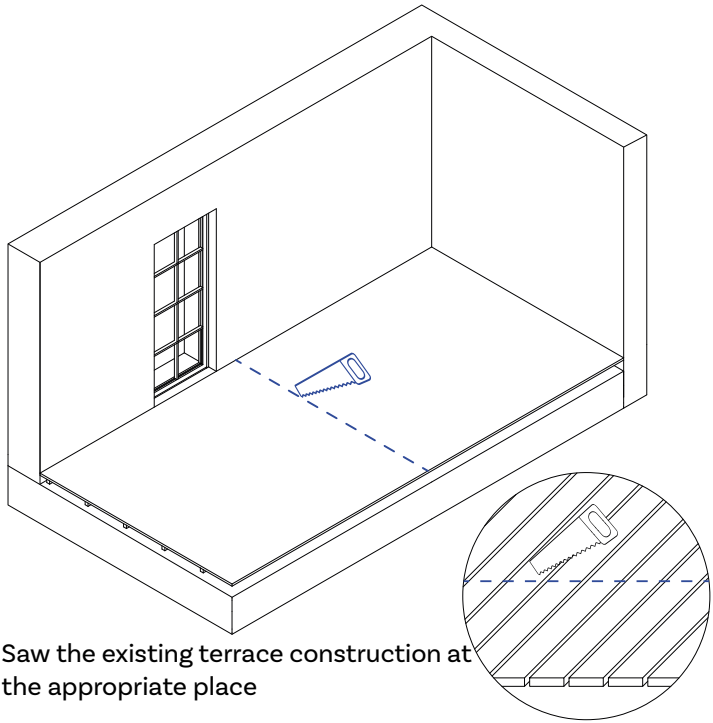
3



Remove insulation and stack the insulation to be reused

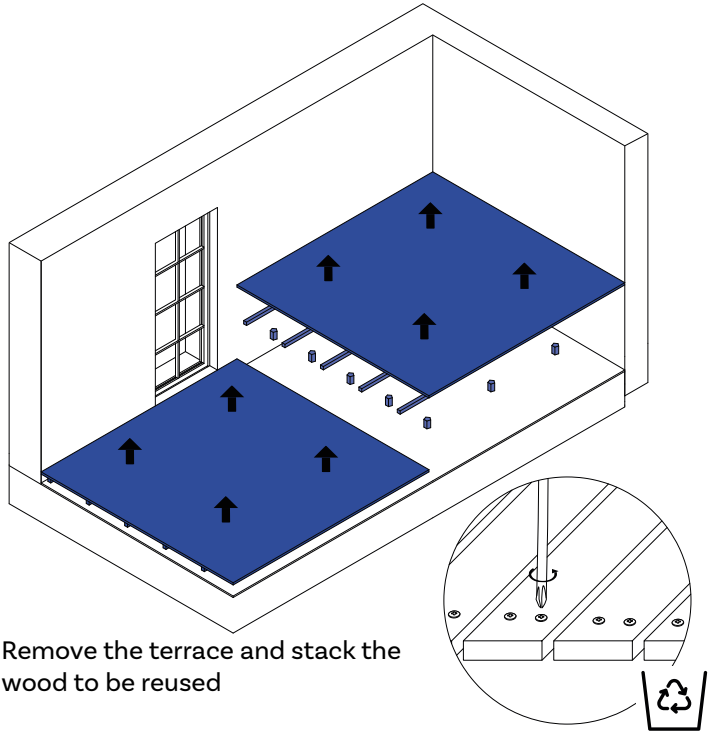
DISASSEMBLE THE BALCONY FLOOR

1



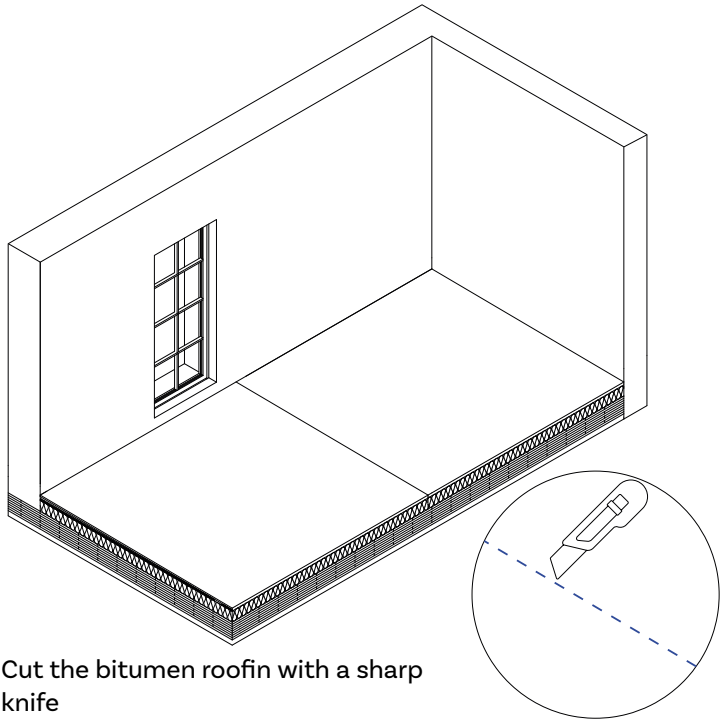
Saw the existing terrace construction at the appropriate place

2



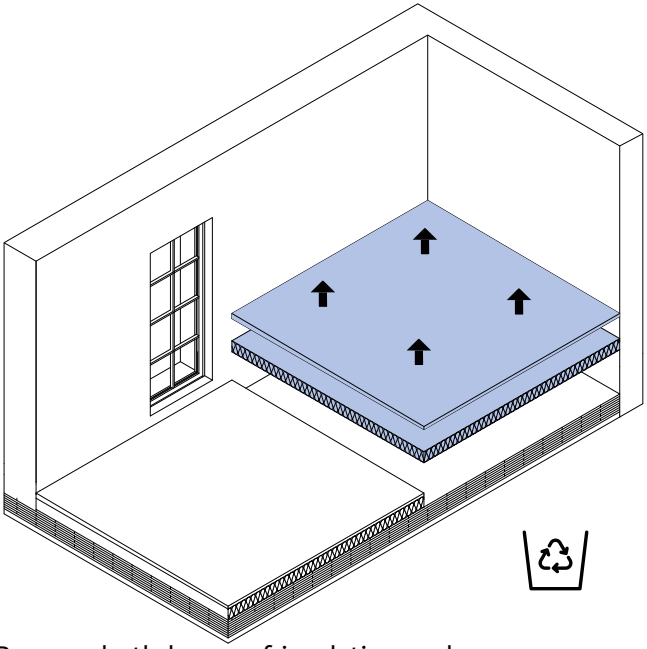
Remove the terrace and stack the wood to be reused

3



Cut the bitumen roofin with a sharp knife

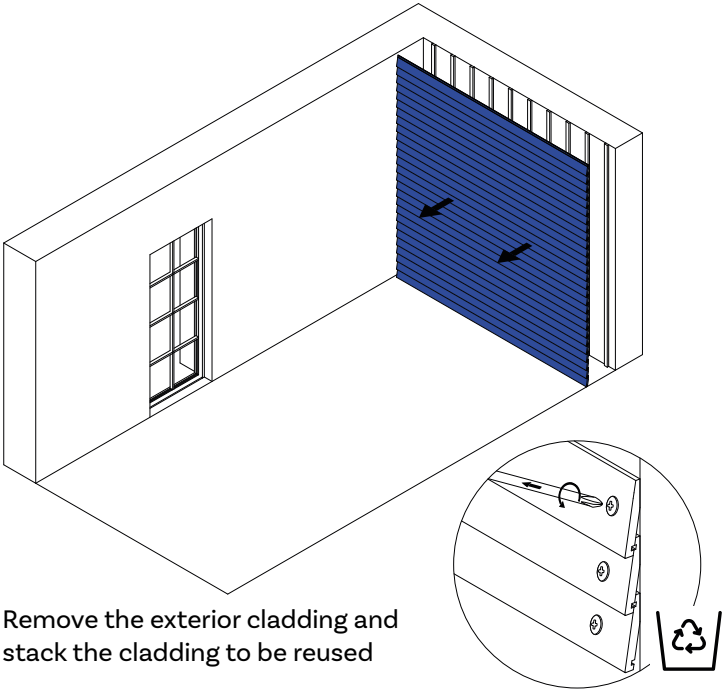
4



Remove both layers of insulation and stack it for reuse

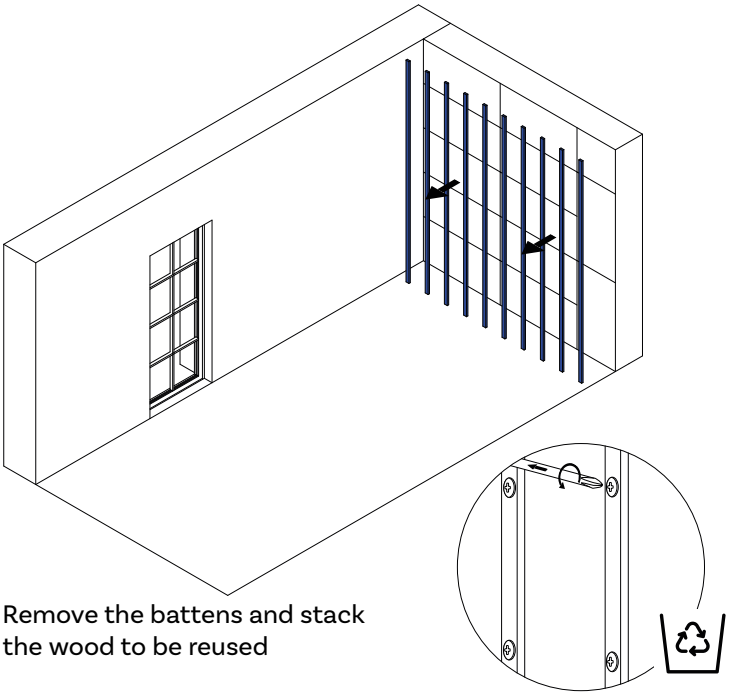
DISASSEMBLE WALLTYPE 1

1



Remove the exterior cladding and stack the cladding to be reused

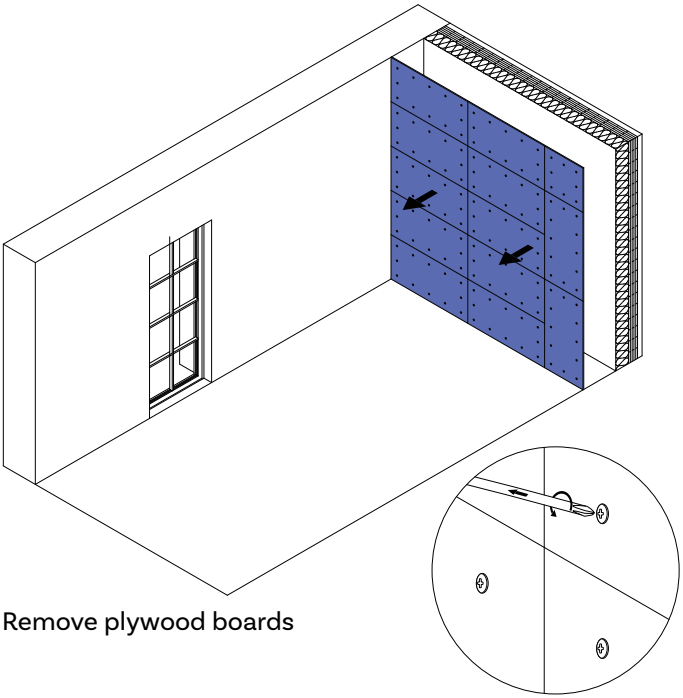
2



Remove the battens and stack the wood to be reused

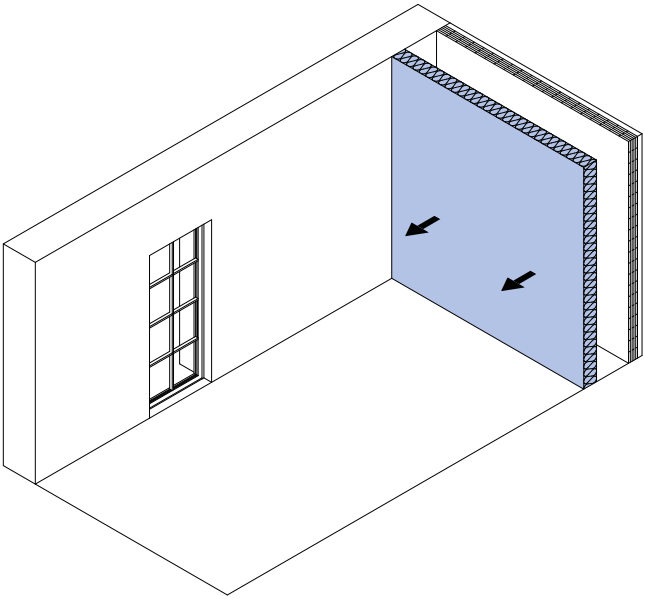
DISASSEMBLE WALLTYPE 1

3



Remove plywood boards

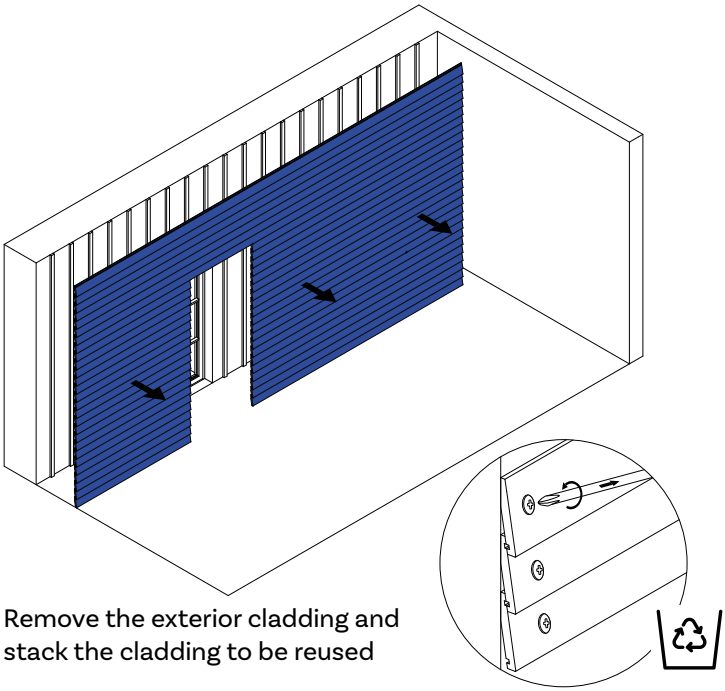
4



Remove insulation and stack the insulation to be reused

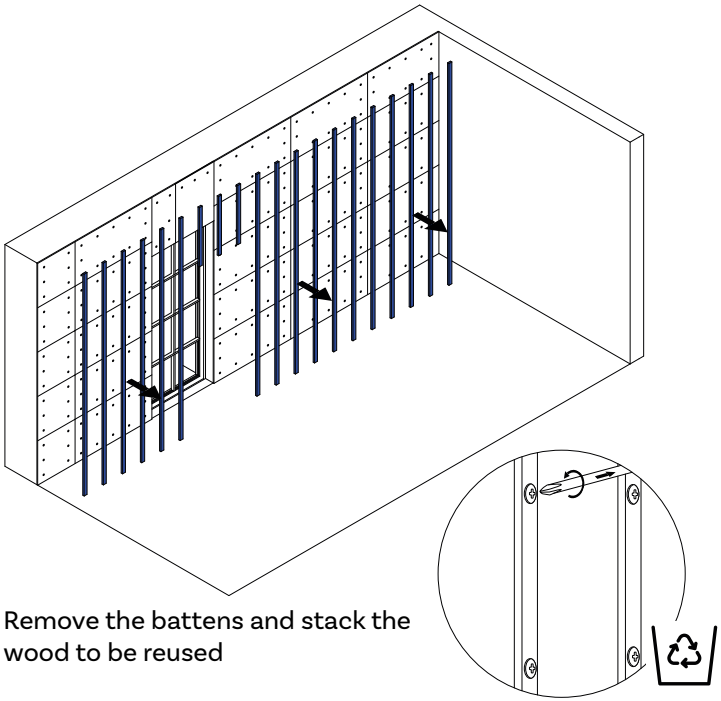
DISASSEMBLE WALLTYPE 2

1



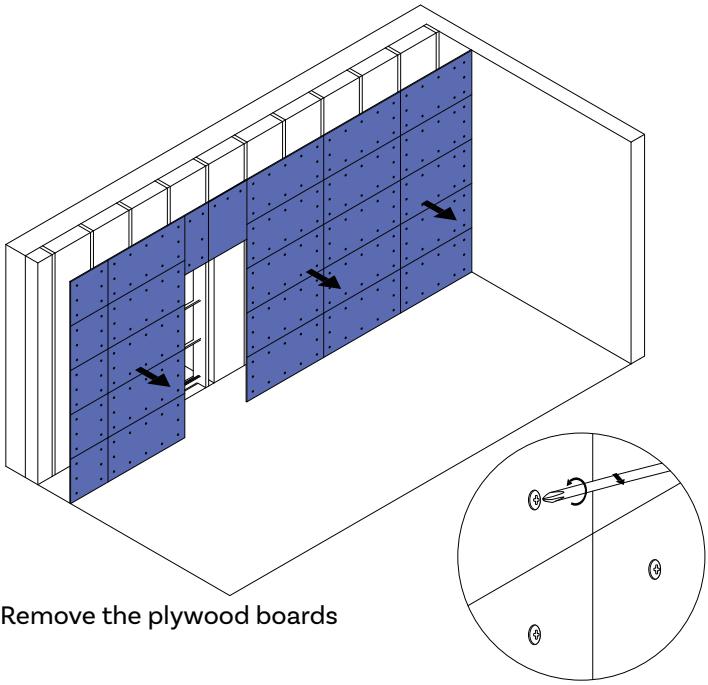
Remove the exterior cladding and stack the cladding to be reused

2



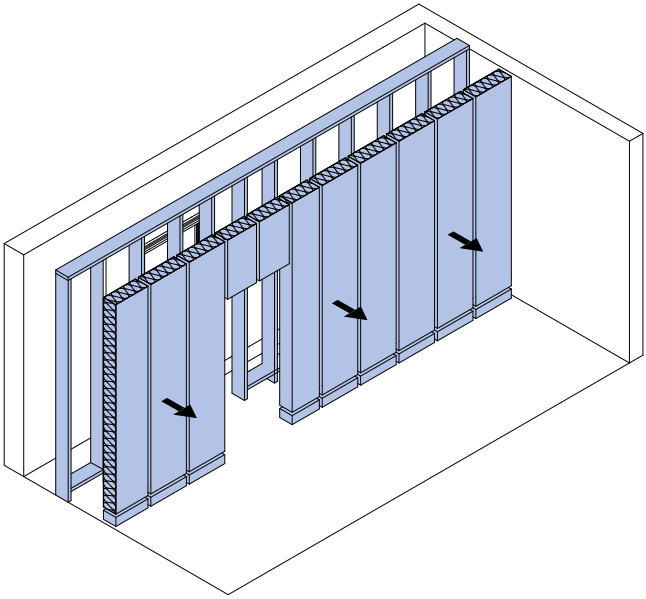
Remove the battens and stack the wood to be reused

3



Remove the plywood boards

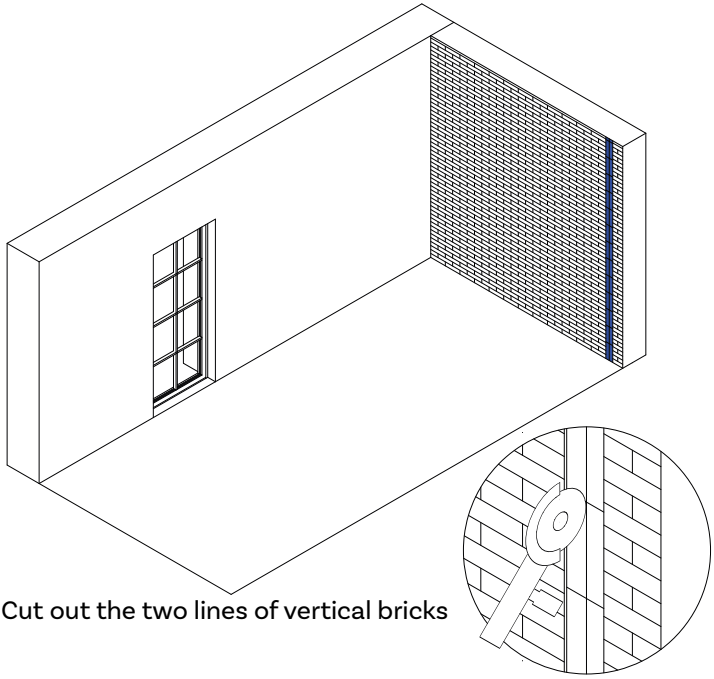
4



Remove insulation and stack the insulation to be reused

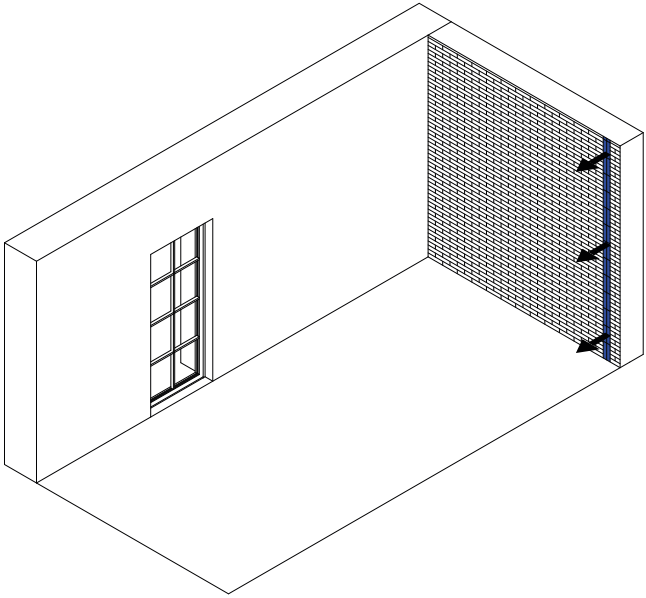
DISASSEMBLE WALLTYPE 3

1



Cut out the two lines of vertical bricks

2

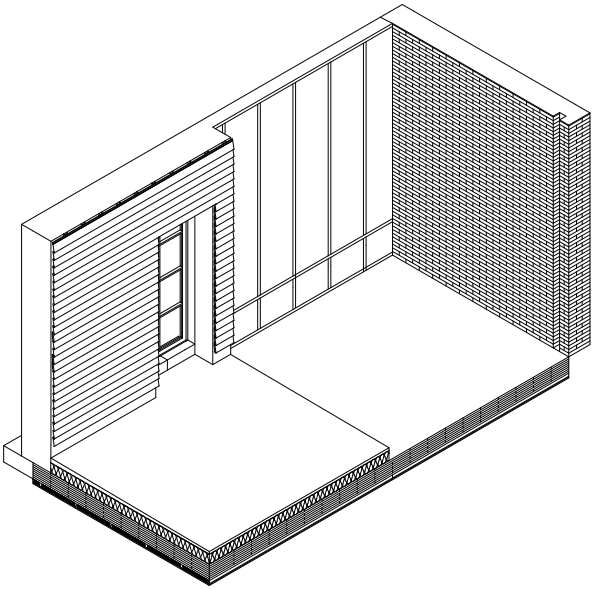


Remove the bricks and stack them for reuse

HOW TO ASSEMBLE

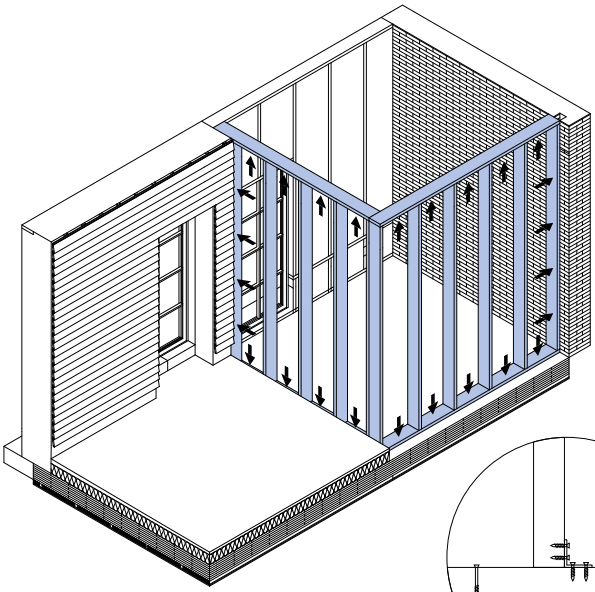
In the next section, you can find how to assembly your new extension. Firstly you will be guide to raise the structure, build up the external part of the wall, and lastly how to finish with the interior part of the wall.

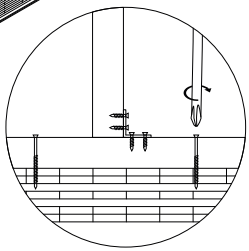
1



This is your starting point

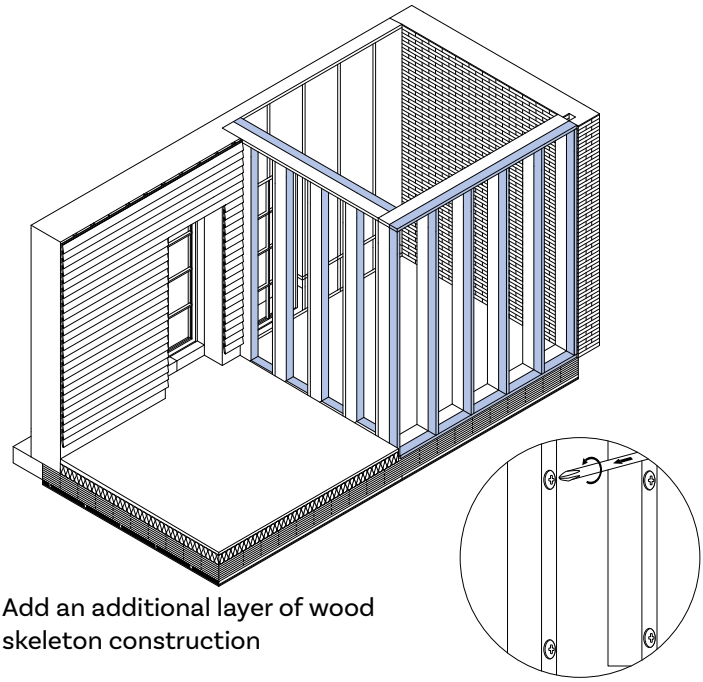
2





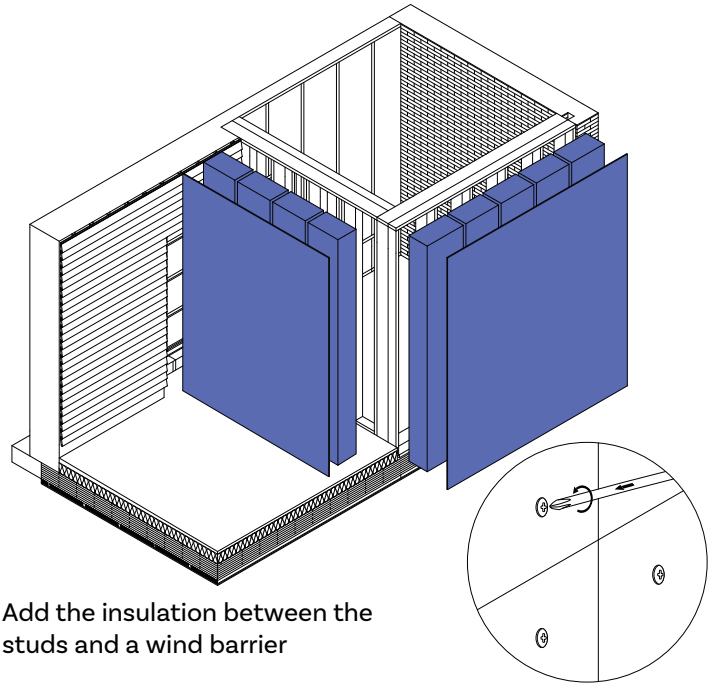
Screw the wallplate to the ceiling and floor, and raise the studs. For further detials of brick wall, see detail at page 34

3



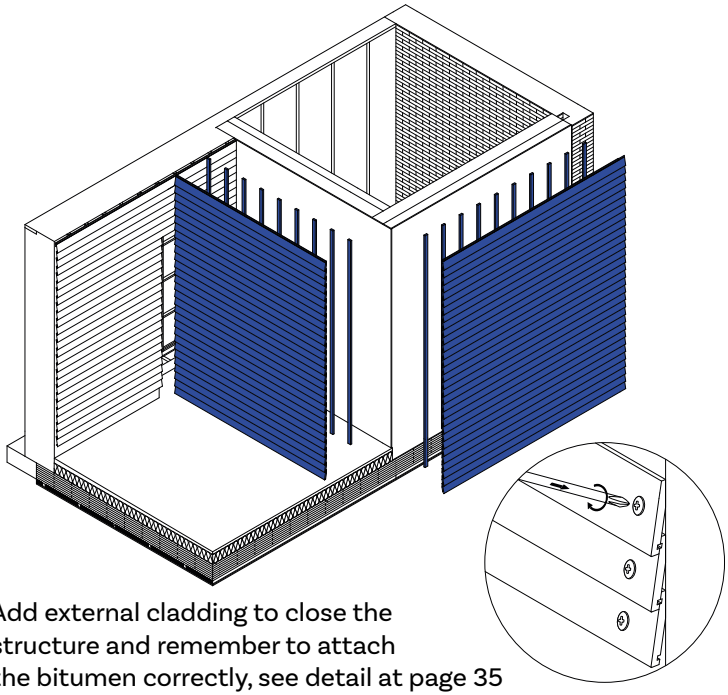
Add an additional layer of wood skeleton construction

4



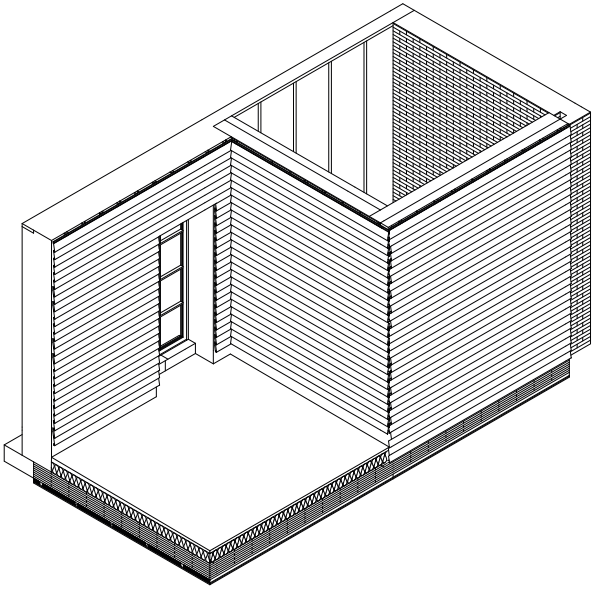
Add the insulation between the studs and a wind barrier

5



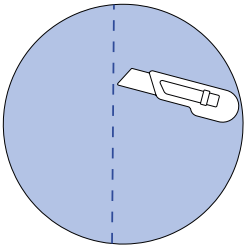
Add external cladding to close the structure and remember to attach the bitumen correctly, see detail at page 35

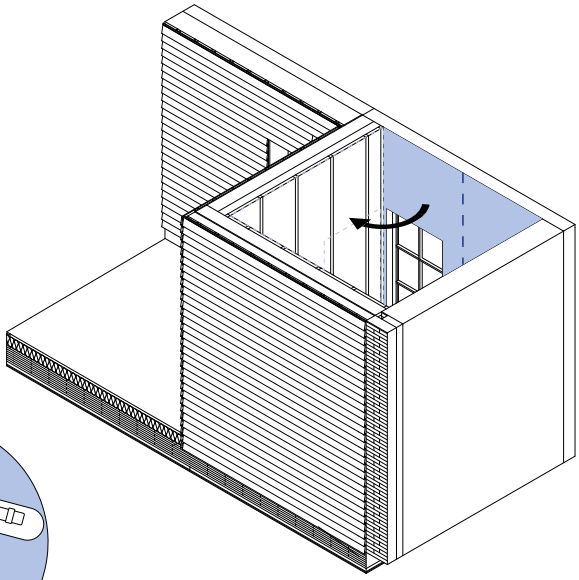
6



That was everything for the external construction, let us look at the internal now

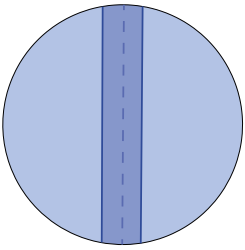
7

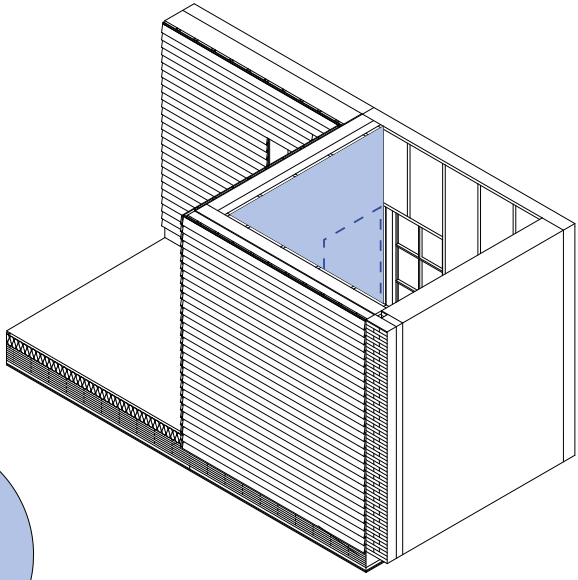




Cut the vapour barrier and move it into the new wall

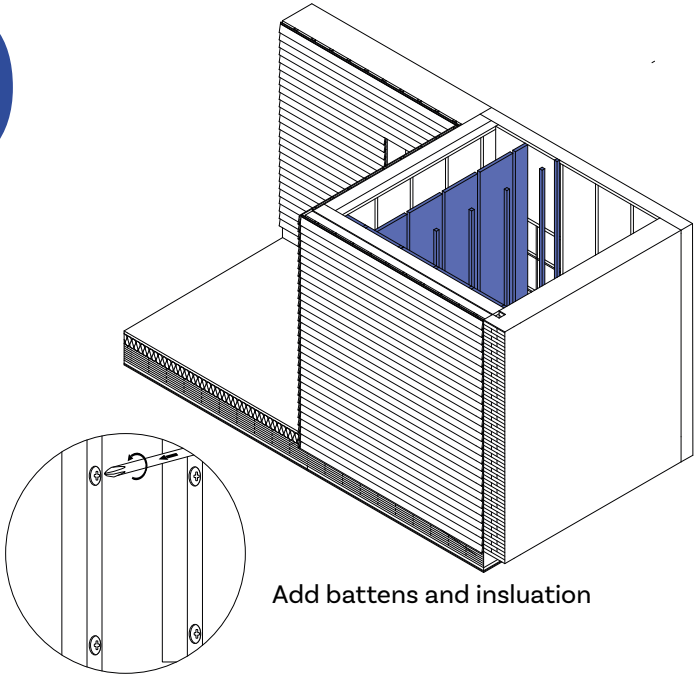
8





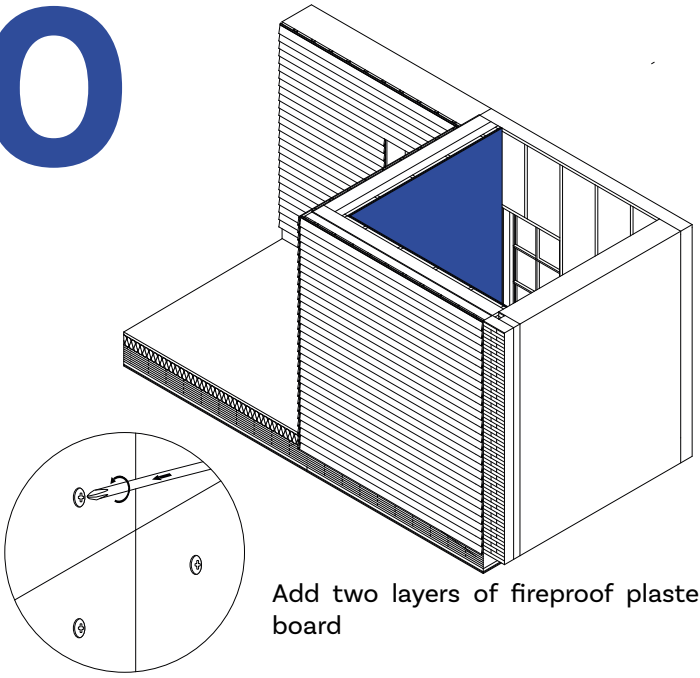
Secure the building envelope by sticking the two vapour barriers together with tape

9



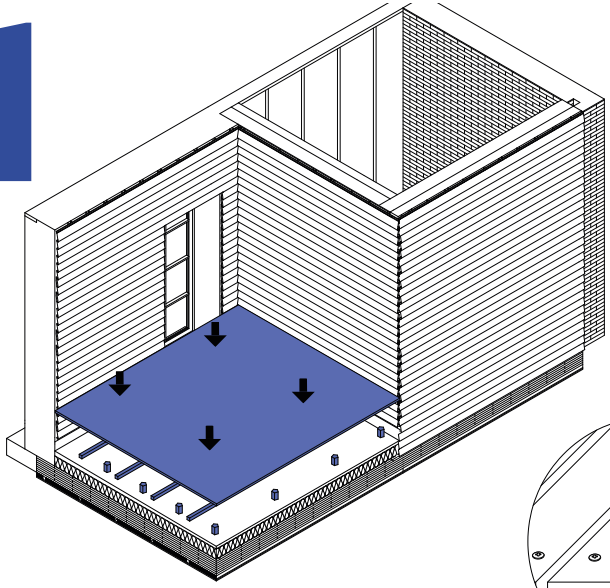
Add battens and insluation

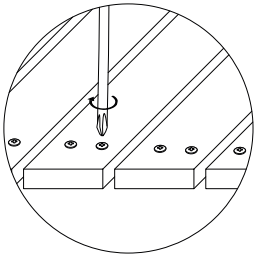
10



Add two layers of fireproof plaster board

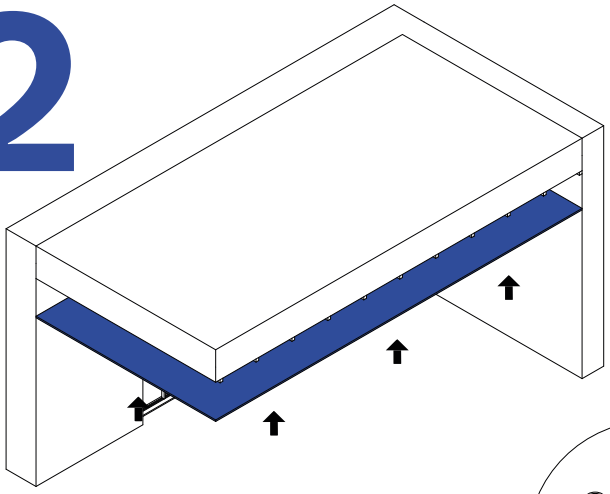
1

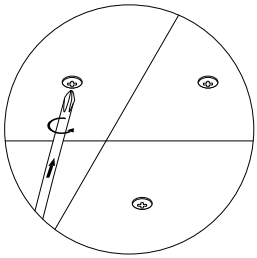




Install the terras again

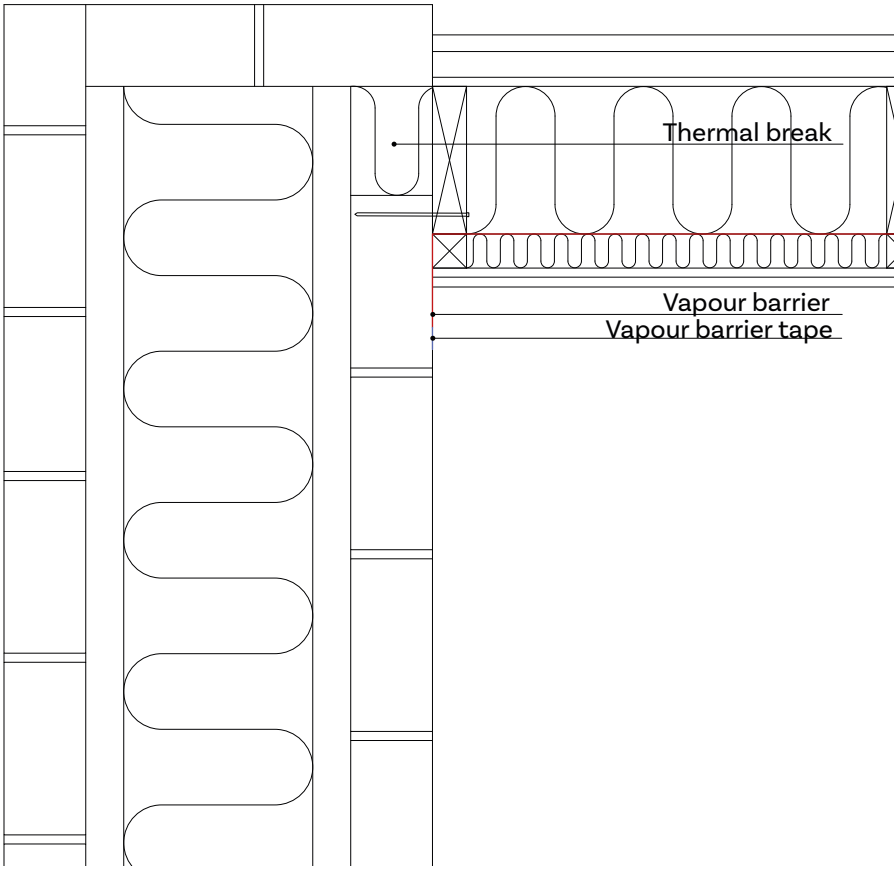
2



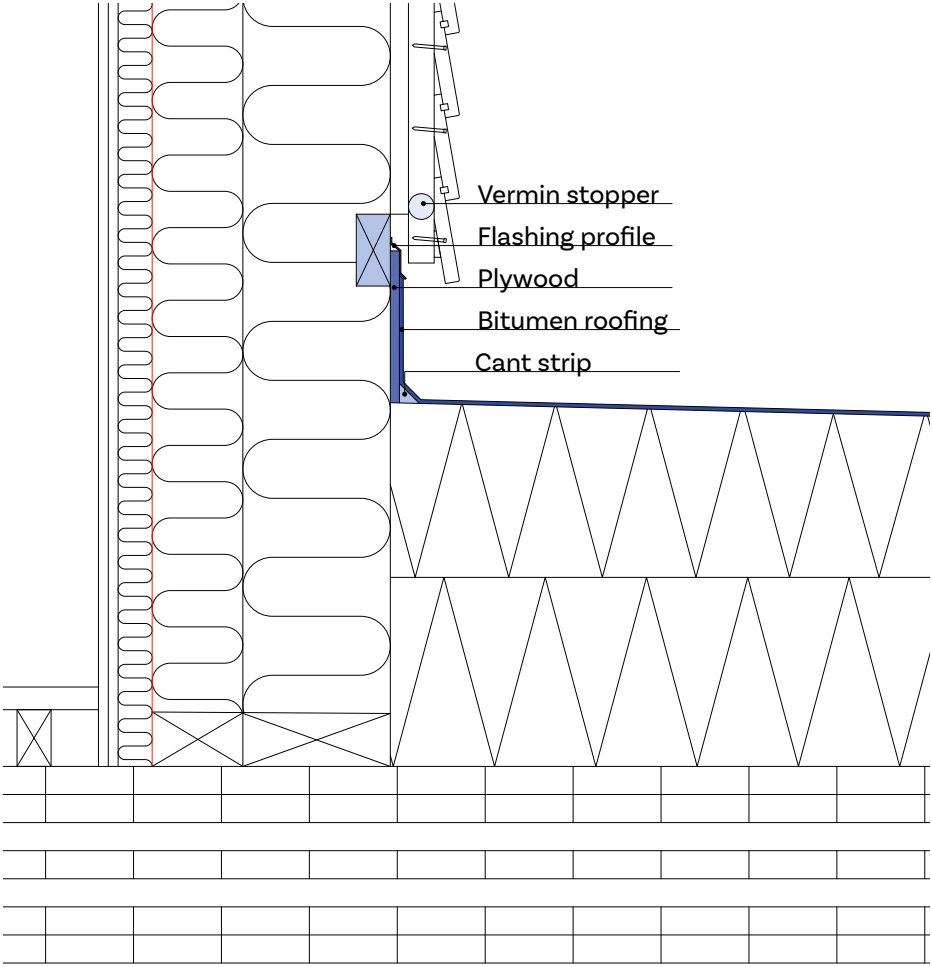


Remove the vapour barrier in the celining, see page 36 for construction details, and install the ceiling

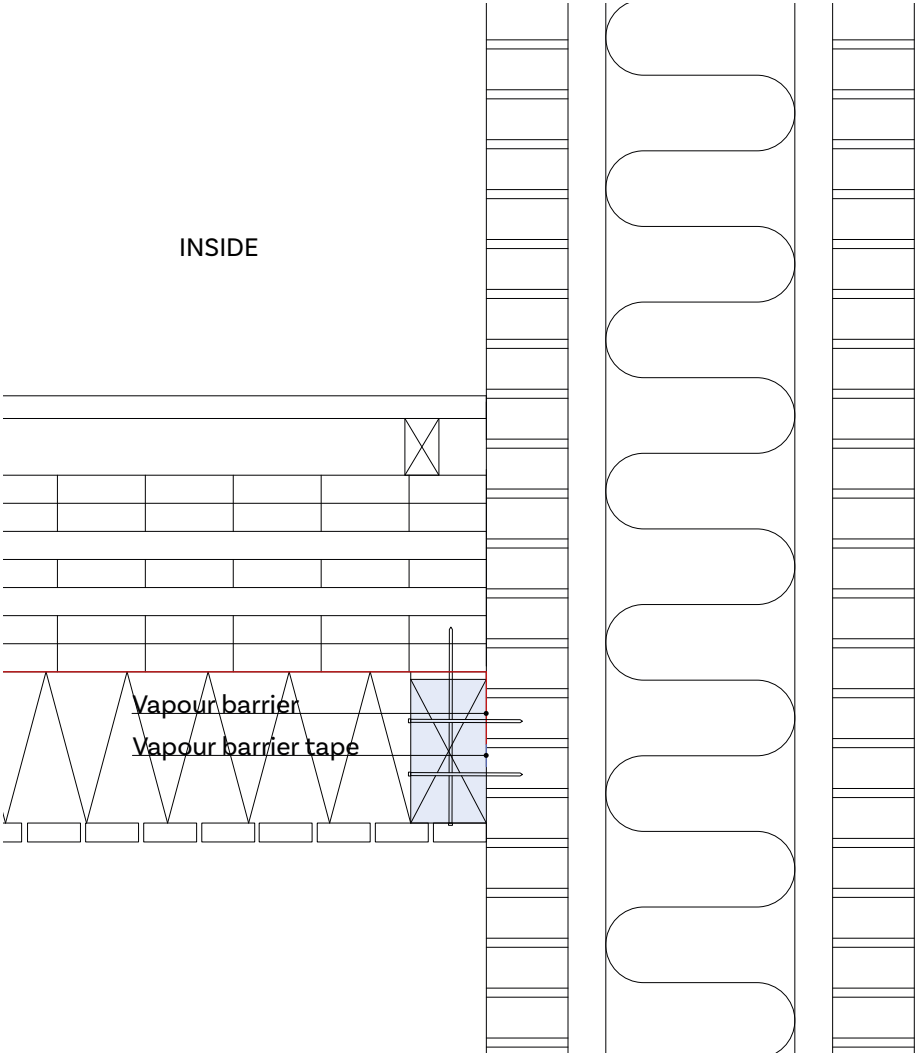
FURTHER DETAIL DRAWINGS OF JOINTS



Illu. 16. Construction drawing in plan of how to attach the vapour barrier to the brick-wall, 1:10



Illu. 17. Construction detail, in section bitumen roofing, 1:10



Illu. 18. Construction drawing in section, vapour barrier attached to the ceiling, 1:10

Anders Agerholm Petersen
Frida Erika Linnea Böregård
Markus Kjørvel-Hansen

Fra: John Futtrup
Sendt: 8. maj 2024 12:37
Til: Markus Kjørvel-Hansen
Emne: SV: Brug af diagrammer fra en specifik publikation til Speciale opgaver. Engangsbekræftelse

Kære Markus
Du og din gruppe har hermed tilladelse til at benytte diagrammet i: **Dit kandidatspeciale inden for Architecture og Urban Architecture**
Tilladelsen er eksklusiv og en engangstilladelse', der kun gælder ic: **Foråret 2024.**
Såfremt du har behov for at afvige herfra, må du søge om en ny dispensation fra ophavsretten.
Overtrædelse af denne begrænsede tilladelse vil blive retsforfulgt i henhold til opretshavsbestemmelserne.
På vegne af Aalborg Universitetsforlag
John Futtrup – maj 2024

håber I kommer godt igennem jeres projekt.
John Futtrup

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Piller, Frank <piller@time.rwth-aachen.de>

ma 26-02-2024 00:20

Til:Markus Kjørvel-Hansen <mkjarv19@student.aau.dk>;

Hi Markus,

Yes, happy to grant you permission to use this figure in your work. No need for asking also for other figures from my papers, as long as you provide correct reference to the source.

Best greetings
Frank

From: Markus Kjørvel-Hansen <mkjarv19@student.aau.dk>
Sent: Sunday, February 25, 2024 9:10 PM
To: Piller, Frank <piller@time.rwth-aachen.de>
Subject: Use of Diagrams for educational purposes

Hello Dr. Piller.

In relation to a master thesis in Architecture & Design at Aalborg University Denmark, we wanted to ask your permission to use a diagram from your publication " The Customer Centric Enterprise - Advances in Mass Customization and Personalization". It will be used in reference to Mass Customization and how it could be Applied in architecture. It is purely for educational purposes, but it will be published publically.

Thank you for your time.

Kind regards
Anders, Frida &

Vindue Hjælp — ons. 14. feb. 13.1

Søg

Rune Lyngvig Jespersen
Boligredegørelsen
Til: apet19@student.aau.dk, Cc: Charlotte Amalie Holst Malling

Indbakke - Exchange 13.17

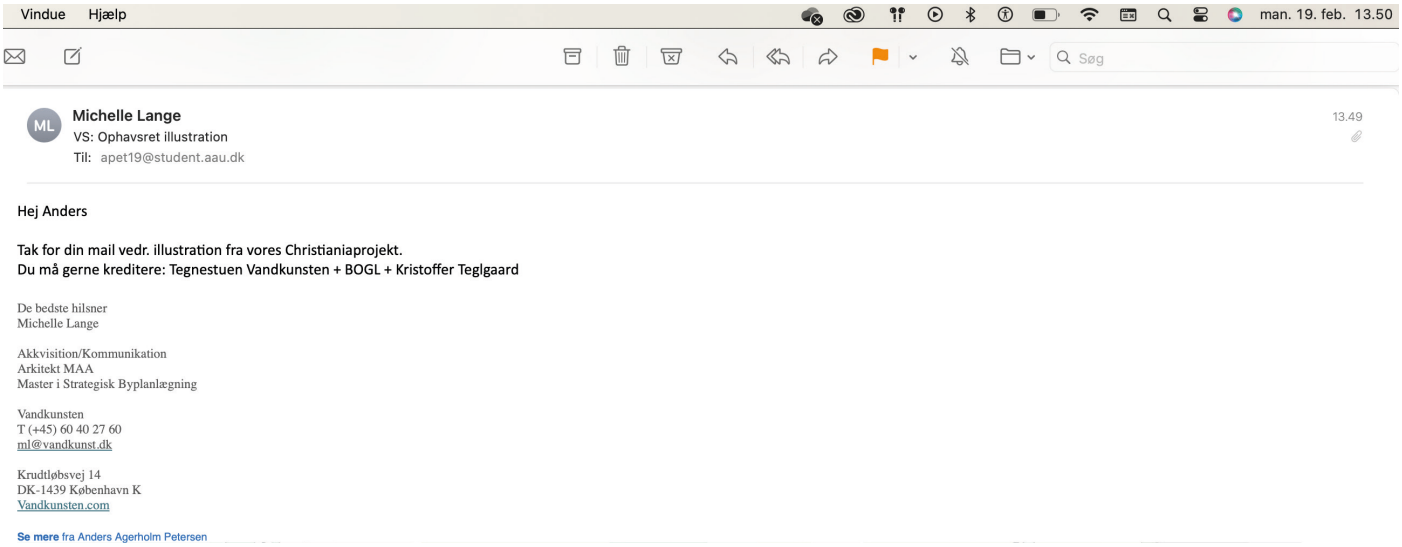
Flere oplysninger

Kære Anders

Du er velkommen til at benytte diagrammer fra Københavns Kommunes Boligredegørelse til dit speciale.

Hvis du har nogen spørgsmål eller lignende i den forbindelse, er du velkommen til at skrive til Charlotte Amalie Malling, som er cc på denne mail.

Mvh.
Rune



Vindue Hjælp — man. 19. feb. 13.50

Søg

Michelle Lange
VS: Ophavsret illustration
Til: apet19@student.aau.dk

13.49

Hej Anders

Tak for din mail vedr. illustration fra vores Christianiaprojekt.
Du må gerne kreditere: Tegnestuen Vandkunsten + BOGL + Kristoffer Teglgaard

De bedste hilsner
Michelle Lange

Akkvisition/Kommunikation
Arkitekt MAA
Master i Strategisk Byplanlægning

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Se mere fra Anders Agerholm Petersen

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