



**CHALMERS**  
UNIVERSITY OF TECHNOLOGY

# *Trädgårdsängen*

## NATURE CLOSE AT HAND

ACEX35

Jonas Delin 2022  
Chalmers School of Architecture  
Examiner: Björn Gross  
Supervisor: Mikael Ekegren

*Trädgårdsängen*  
*NATURE CLOSE AT HAND*

*Jonas Delin*  
*2022 / Gothenburg*



**CHALMERS**  
UNIVERSITY OF TECHNOLOGY

*Chalmers School of Architecture*  
*Master's Programme*  
*in Architecture and Urban Design*  
*(MPARC)*

*Examiner: Björn Gross*  
*Tutor: Mikael Ekegren*

## ABSTRACT

*More people move from larger cities to other municipalities than ever before.*

*The net emigration from Stockholm 2020 was 4618 individuals compared to 2019 where the net-immigration was 4870 individuals. This is also the trend in Gothenburg where the total loss of population was 2382 in 2020. There is a preponderance in these numbers of families with children and most move to smaller municipalities close to their original cities.*

*The reasons are problems in the housing market as well as a rise in environmental interests such as closeness to nature, the possibility to cultivate crops and to provide a healthy environment for children to grow up in.*

*This does not only affect the larger municipalities as an excessive loss of tax income but also leads to an ageing population in cities.*

*Farmable land is also destroyed in the process of creating dwelling in smaller municipalities and farmers all over Sweden are pulling the breaks on developing land for housing.*

*If the same kind of typology could be found in the same municipality as cities, this loss of tax and destruction of farmland could be avoided, as well as keeping the younger adult population.*

*This project circles around how one could design affordable single-family housing of the villa-typology within, or in the suburbs of, a city.*

*The project incorporates proximity to nature as well as gradients of private outdoor space in an urban setting. Accessibility of and within the community is of great importance as well as a sense of privacy between residents.*

*The cost of the production is kept low using pre-fabricated modules of light wooden construction, including furnished kitchen, toilets and fixed furnishings. This significantly decreases work-time on site as well as opening the possibility of creating quality houses in bulk.*

*The chosen site, Angered, has nature close at hand and here it is close to both swimming, fishing, mushroom picking and outdoor life in the nature reserve Vättlefjäll with its untouched nature.*

*Keywords : Housing, pre-fabrication, wooden construction.*

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JONAS DELIN  
MASTER THESIS STUDENT  
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CHALMERS *School of Architecture*  
EXAMINER *Björn Gross*  
SUPERVISOR *Mikael Ekegren*

# *Trädgårdsängen* HOUSING ESTATE

## STUDENT BACKGROUND

*Bachelor of Architecture*

*Chalmers University of Technology  
Gothenburg, Sweden  
2017-2020*

*Practice*

*LT Engineering firm  
Project manager  
2020-2021*

## THESIS QUESTION

*“How can one design affordable housing of the single house typology in the municipality of Gothenburg?”*

## *Topics*

- *Housing*
- *Wooden construction*
- *Pre-fabrication*

## INTRODUCTION

*The purpose of this investigation is giving all individuals a better chance at owning property, with a sense of privacy and dignity. The end product is approximation of what a economically sustainable single house, for a single family, could look like.*

*The project incorporates the efficiency of prefabricated module houses with the design school of architecture aiming to provide well planned dwelling with better aesthetics.*

*The main questions found in the project are:*

*“How could you increase building density without sacrificing privacy of a plot?”*

*“Does a lower price necessarily correspond with a lower aesthetic?”*

*The objectives that shaped the project are:*

*“Following a detail plan while still maintaining a design of purpose, not need.”*

*“Working with modular construction while still maintaining a sense of unity.”*

*The methodological approach for this thesis started with gathering a library of reference projects and breaking them down into what qualities they provided.*

*Using the site as a design tool also brought the thesis forward, testing different volumes on each plot to determine the maximum living area of each unit while still following the detail plan and keeping cost to a minimum.*

*The methods also included an empirical approach where most solutions were tested, broken down and then reassembled after consultation with experts, such as Robert Jockwer (Dipl.-Ing. Dr. sc. ETH, Chalmers ACE), Tobias Persson (Product owner, Derome) and supervisor Mikael Ekegren (SAR/MSA, Lecturer, Chalmers ACE)*

*The delimitations for the projects was mostly found in the detail plan of the chosen site, this led to the project being anchored in reality and the design to be more plausible.*

*Using modular theory also brought its challenges, mostly through limitations of module width and height to be allowed to safely be transported to site. The traces of these limits can be found in the final plans but were also an interesting challenge to work around.*

*As far as references and theory goes, the most prominent inspiration came from project such as Äppelträdgården (White, 2011), Boklok (Skanska & IKEA, 1996), as well as literature such as “Att bygga ett land” (Caldenby, 1998).*

## BACKGROUND

*More people move from larger cities to other municipalities than ever before. The net emigration from Stockholm 2020 was 4618 individuals compared to 2019 where the net-immigration was 4870 individuals. This is also the trend in Gothenburg where the total loss of population was 2382 in 2020.*

*There is a preponderance of families with children and the highly educated in the statistics and most move to smaller municipalities close to their original cities. The reason for this the problems in the housing market as well as a rise in environmental interests such as closeness to nature, the possibility to cultivate crops and to provide a healthy environment for children to grow up in.*

*This does not only affect the larger municipalities as an excessive loss of tax income but also leads to an ageing population in cities. Farmable land is also destroyed in the process of creating dwelling in smaller municipalities and farmers all over Sweden are pulling the breaks on developing land for housing (Damberg, 2021).*

*If the same kind of typology could be found in the same municipality as cities, this loss of tax and destruction of farmland could be avoided, as well as keeping the younger adult population.*

## PROJECT SITE

*Trädgårdsängen, Tolerefs gård, Angered*

*Living in Angered means the opportunity to combine rural and city life in an uncomplicated way. 15 minutes from the centre of Gothenburg is a mix of building typologies in vast nature.*

*The beautiful nature and the fertile soil attracted people to settle here already in the Middle Ages. In the early 1960s, the farms were joined by modern housing. Since then, Angered has received many residential areas with different character.*

*With a sense of Swedish small-town idyll, this area is an oasis in the middle of the city. Here you will find everything from grocery stores and clothing stores to a health centre, library and a lively market shop. On the square is also Blå Stället which is a cultural centre with theatre, cinema, swimming and ice rink and other leisure activities.*

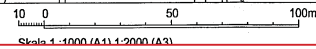
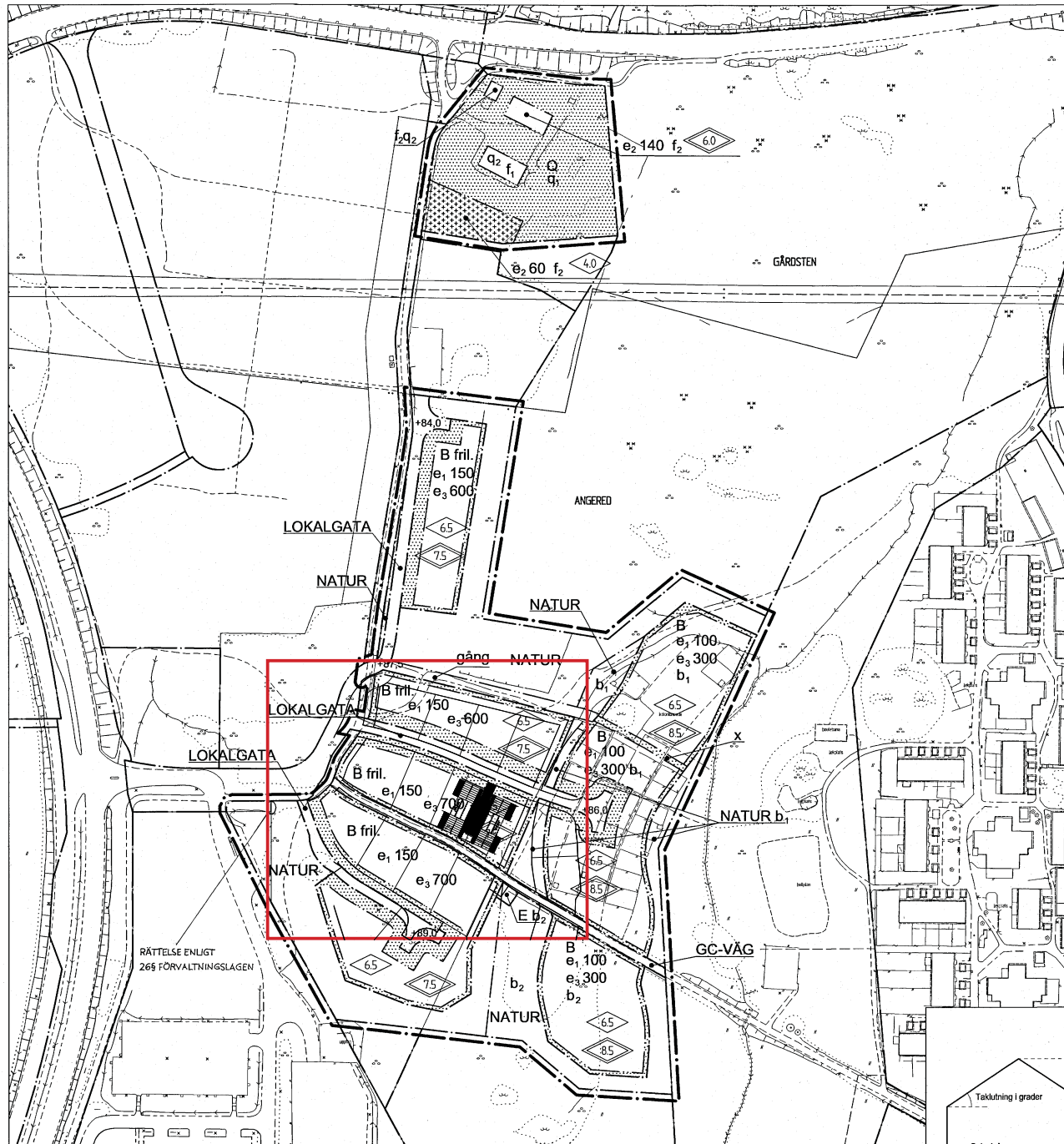
*Angered has nature close at hand and here it is close to both swimming, fishing, mushroom picking and outdoor life in the nature reserve Vättlefjäll with its untouched nature. Here you live close to good communications and everyday convenience with nearby shops.*



*Trädgårdsängen  
View from North*



*Trädgårdsängen  
View from South*



- BETECKNINGAR PÅ PLANKARTAN**
- Linje som ligger 3 m utanför planområdets gräns
  - Användningsgräns
  - Egenskapsgräns
- PLANBESTÄMMELSER**
- Följande gäller inom områden med nedanstående beteckningar. Där beteckning saknas gäller bestämmelsen inom hela området. Endast angiven användning och utformning är tillåten.
- ANVÄNDNING AV ALLMÄN PLATS**
    - LOKALGATA** Lokal trafik
    - GC-VÄG** Gång- och cykelväg
    - NATUR** Naturområde
  - ANVÄNDNING AV KVARTERSMARK**
    - B** Bostäder, bostadsanknuten verksamhet medges på bostadsfastigheten
    - E** Tekniska anläggningar
    - Q** Användning anpassad till bebyggelsens kulturvärden
  - UTFORMNING AV ALLMÄN PLATS**
    - +0.0** Föreslagen höjd över nollplanet.
    - gång** Gångväg
  - UTNYTTJANDEGRAD**
    - e<sub>1</sub>** Största byggnadsarea i m<sup>2</sup> för varje huvudbyggnad. Komplementbyggnad får uppföras med största sammanlagda arean 40 m<sup>2</sup>.

- e<sub>2</sub>** Största byggnadsarea i m<sup>2</sup> för varje byggnad.
  - e<sub>3</sub>** Minsta tomtstorlek i m<sup>2</sup>.
- 5. BEGRÄNSNINGAR AV MARKENS BEBYGGANDE**
- Byggnad får ej uppföras.
  - Marken får endast bebyggas med växthus och bodar.
  - Marken skall vara tillgänglig för allmän gångtrafik.
- 6. MARKENS ANORDNANDE**
- q<sub>1</sub>** Tomtplatsen med gräsmatta, fruktträd och grusad gårdsplan ska vidmakthållas.
- 7. PLACERING, UTFORMNING OCH UTFÖRANDE**
- 0.0** Högsta byggnadshöjd i meter.
  - 0.0** Högsta nockhöjd i meter.
  - fril** Endast friliggande hus.
  - f<sub>1</sub>** Byggnad skall med hänsyn till material, färg och form anpassas till miljöns kulturhistoriska karaktär.
  - f<sub>2</sub>** Ny byggnad skall ges en enkel traditionell utformning med sadeltak av lertegel och rödstämrad träpanel som förstärker den samlade miljö- upplevelsen av äldre lantbruksgård och mangårdens arkitektoniska dominans.
- b<sub>1</sub>** Marken får av stabilitetsskäl inte belastas mer än 30 kPa utgående från befintliga marknivåer enligt grundkartan.
  - b<sub>2</sub>** Marken får av stabilitetsskäl inte belastas mer än 20 kPa utgående från befintliga marknivåer enligt grundkartan.
  - q<sub>2</sub>** Kulturhistoriskt värdefull byggnad som inte får rivas. Exteriören skall till såväl helhet som material och detaljer bevaras så att byggnadens kulturhistoriska kvaliteter, arkitektoniska egenart och betydelse i landskapsrummet inte försvåras.
- Högsta nockhöjd för komplementbyggnad/carport är 3,0 meter.
- Lägsta golvnivå 0,3 m över marknivå i förbindelsepunkten.
- 8. ADMINISTRATIVA BESTÄMMELSER**
- Genomförandetiden är 10 år från den dag planen vinner laga kraft.
- UPPLYSNINGAR**
- Planområdet ligger inom skyddsområde för Göta älv. Dag- och dränvatten inom tomtmark skall i första hand omhändertaras lokalt genom infiltration. I andra hand kan anslutning ske till allmän dagvattenledning.

RÄTTELSE ENLIGT 26§ FÖRVALTNINGSLAGEN  
 Markerad användningsgräns ska rätteligen utgå.

Göteborg 2014-05-20  
 BN's ordförande *[Signature]*

BESLUT	PLANHANDLINGAR
(Plankarta, -bestämmelser)	- plankarta med bestämmelser
BN utställning 2012-06-19 § 267	- planbeskrivning
BN godk./antag. 2012-12-18 § 470	- genomförandebeskrivning
KF-antagande- Laga kraft 2013-03-27 /EW	

**GRUNDKARTAN**

Grundkartan upprättad genom utdrag ur digitala primärkartans databas. Referenssystem i plan/ höjd: SWEREF 99 12 00/ GH 88

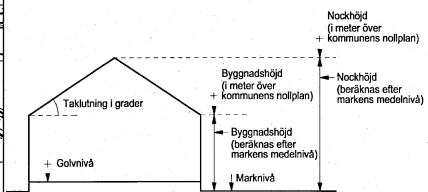
Beteckningar: Enligt Lantmäteriverkets Handbok till Mätningsskullelsen - Kartografi (HMK-Ka) med de avvikelser som redovisats i beteckningarna.

**Göteborgs Stad**  
 Stadsbyggnadskontoret

**Detaljplan för Bostäder vid Toleredes Gård inom stadsdelarna Angered och Gårdsten i Göteborg**

Göteborg 2012-06-19, Rev 2012-12-18

*[Signatures]*  
 Gunnel Jonsson Planchef  
 Sirpa Ruuskanen Johansson Konsultsamordnare  
 Anna Tällström Planarkitekt COWI AB



Fila 5161 3 st

# Site plan



*Limitations from the detail plan:*

*No more than 150 sqm built area per plot.*

*Only freestanding houses.*

*Minimum of 9m between houses.*

*No building closer than 4,5m from main road.*

*No buildings closer than 2,5m from walking path.*

*Dashed lines showing plotlines, distance between houses and roads.*



PLAN 1:200 (A3)



*Situation plan:*

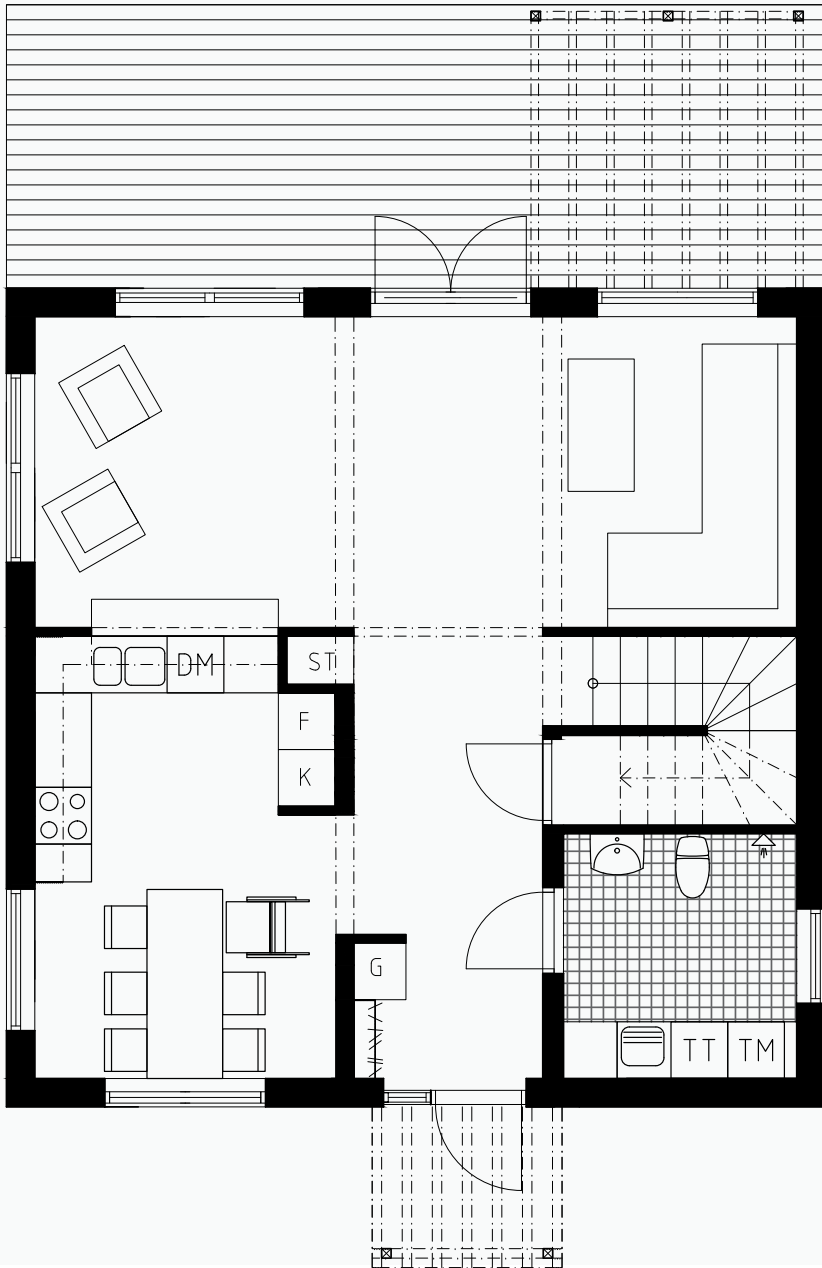
*The shape of the different plots on site allows showcasing different configuration of the houses.*

*On tighter plots two houses can stand together while still maintaining the social courtyard.*

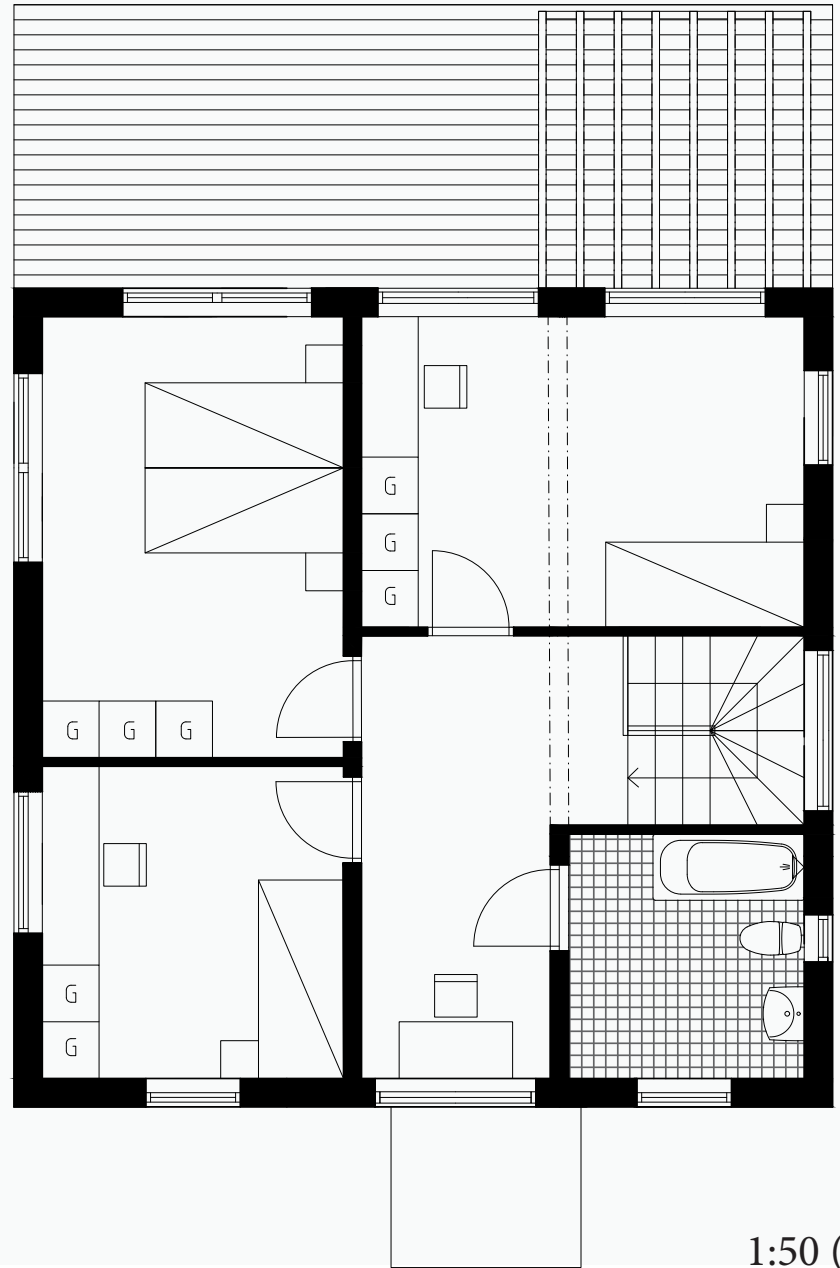
PLAN 1:500 (A3)

# Plans

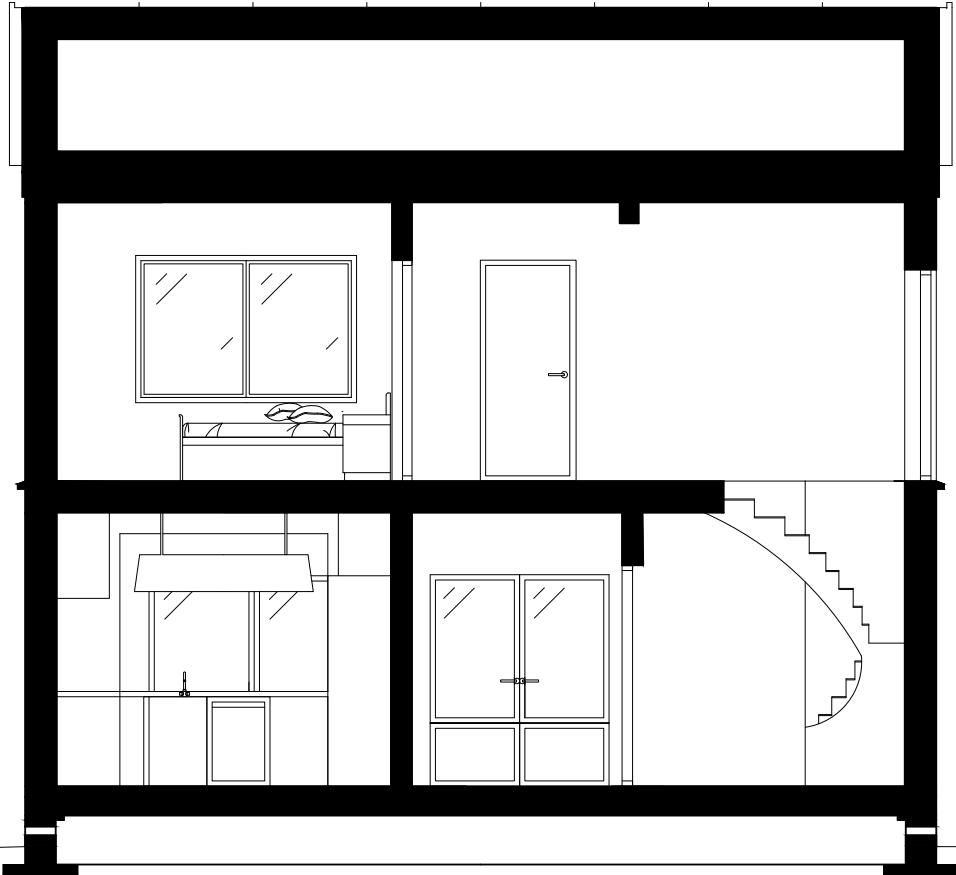
## 1st floor



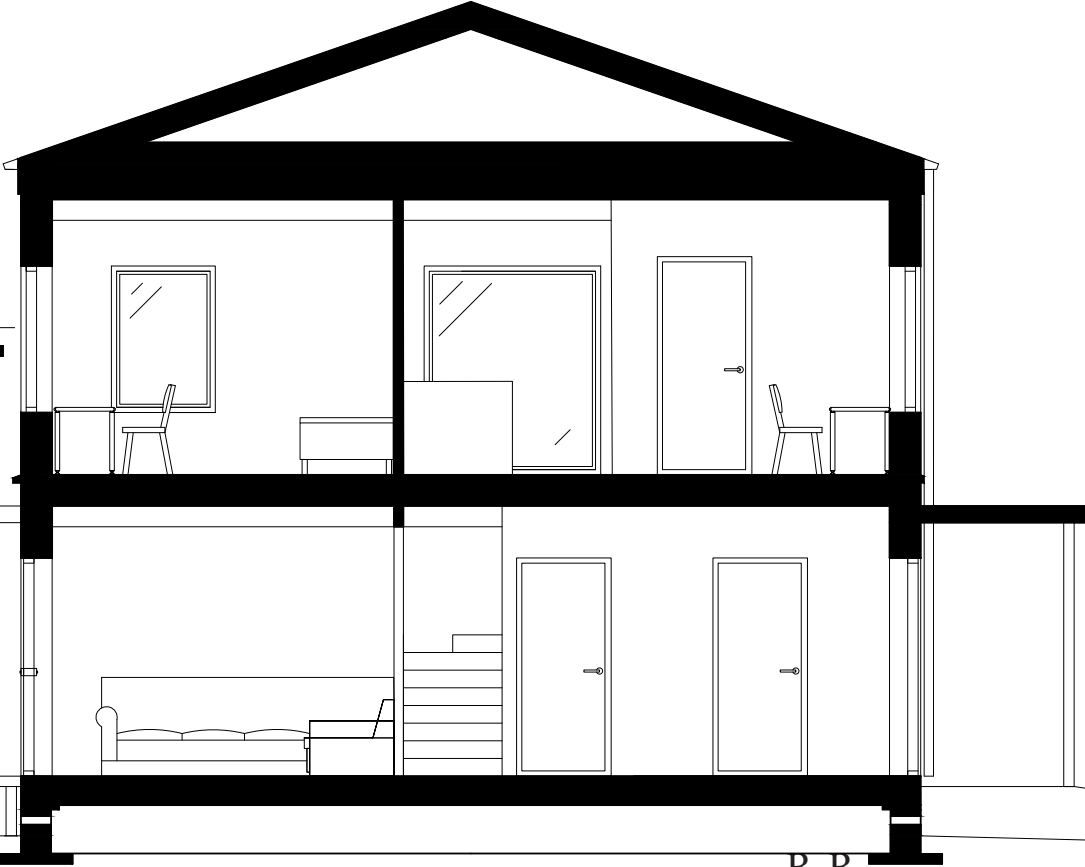
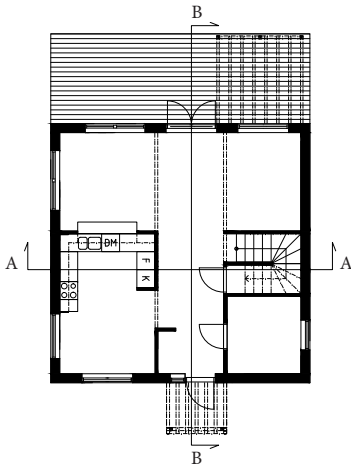
## 2nd floor



Section



A-A



B-B



*Trädgårdsängen  
View showing communication be-  
tween houses*



*Trädgårdsängen  
Shared courtyard between houses  
and plots.*



*Trädgårdsängen  
Backyard and deck, hedge  
separating the plots and creating  
privacy between residents*



*Trädgårdsängen  
Interior view  
Showing the communication  
between kitchen and social space.*



*Trädgårdsängen  
Interior view  
Social space*



*Trädgårdsängen*  
*Module seams and beams create a*  
*division of the room*



*Trädgårdsängen  
Interior view  
Stairs with big window*



*Trädgårdsängen  
Interior view  
Upstairs home office*

# Facades



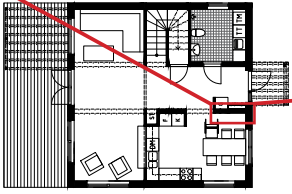


- 22 x 145 Rebated boarding
- 34 x 70 Nail batten s600
- 34 x 70 Nail batten s600
- 9 Wind-proof board
- 45 x 45 Beam s600
- 45 Insulation
- 195 Beam s600
- 0,2 Vapor barrier
- 45 x 45 Beam s600
- 45 Insulation
- 12 OSB
- 22 x 45 Nail batten s600
- 14 x 120 Boarding

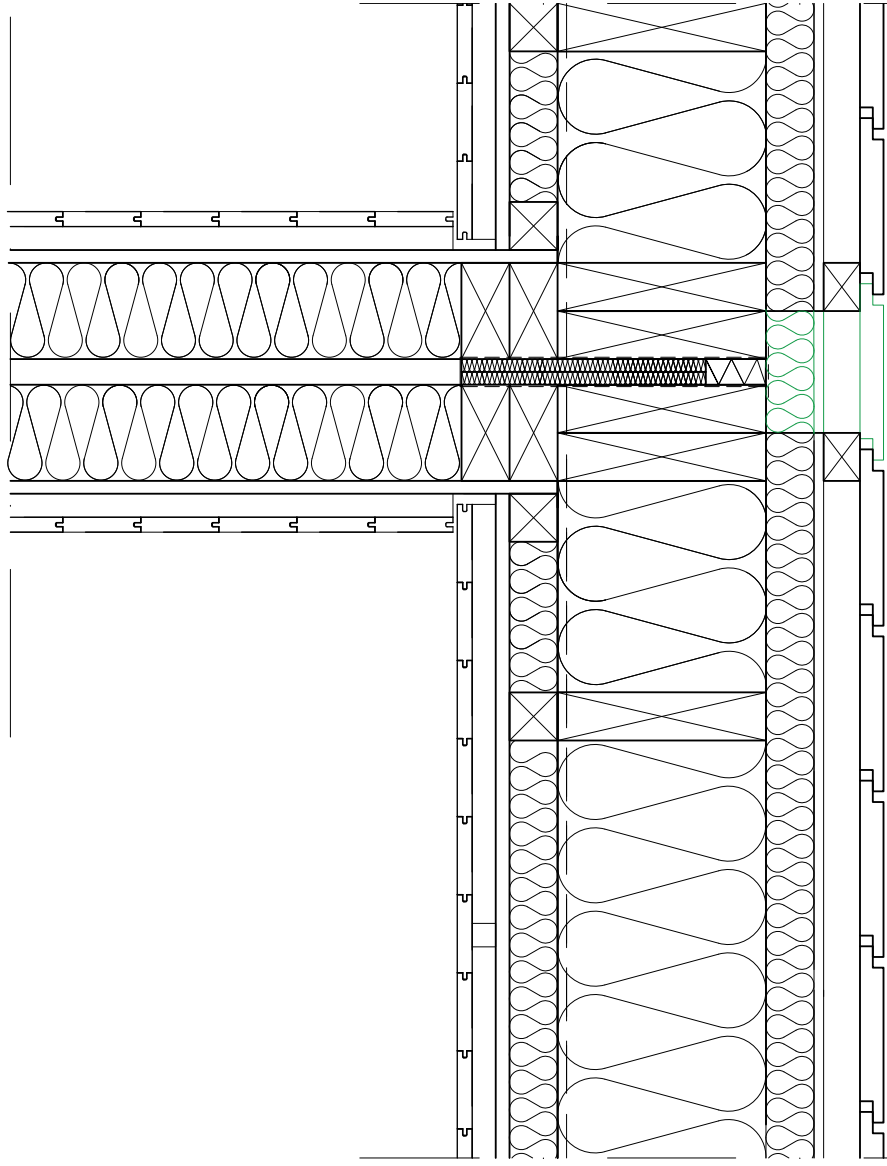
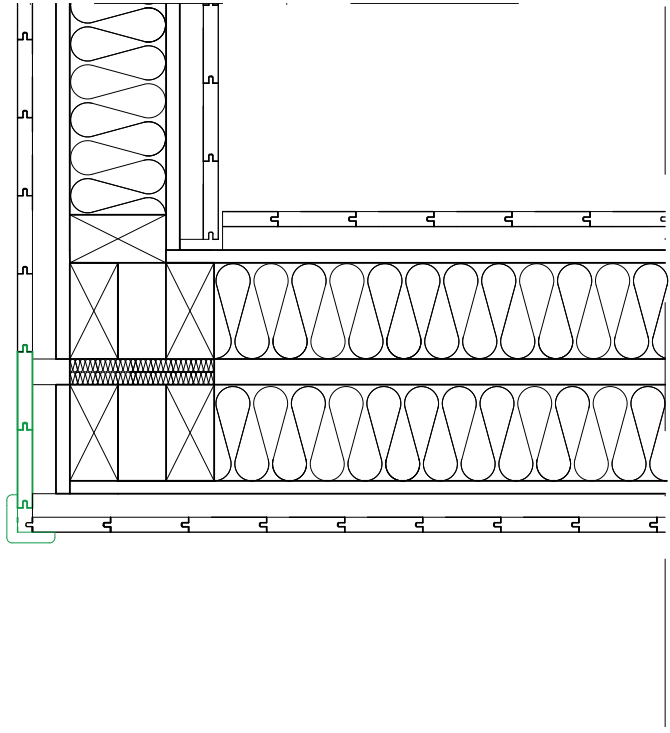
- 14 Parquet
- 3 Foam
- 22 Under flooring
- 45 Insulation
- 45 x 195 Beam s600
- 195 / 45 Insulation
- 28 x 70 Spaced boarding s600
- 13 Plaster board

- 14 Parquet
- 3 Foam
- 22 Under flooring
- 45 x 195 Beam s600
- 195 / 45 Insulation
- 28 x 70 Spaced boarding s600
- 100 Cellular plastic
- Macadam
- Fiber carpet

Facade section 1:20 (A3)



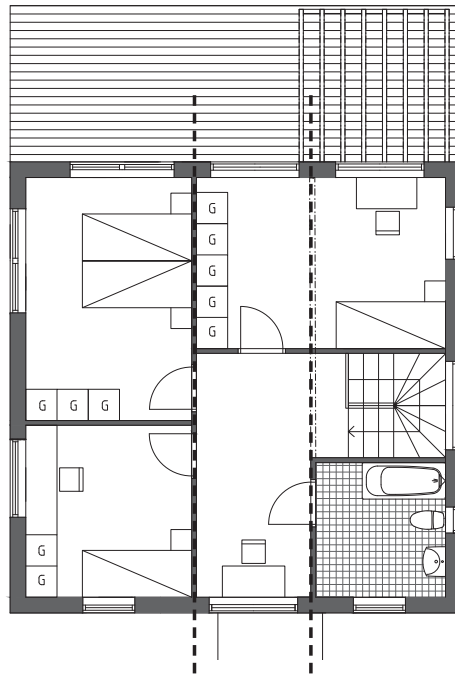
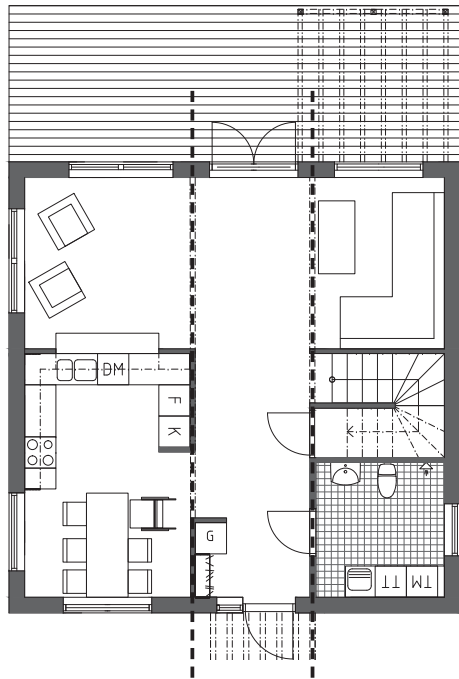
Addition on site



Addition on site

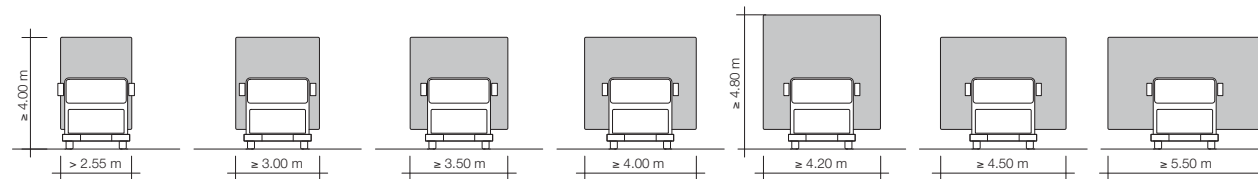
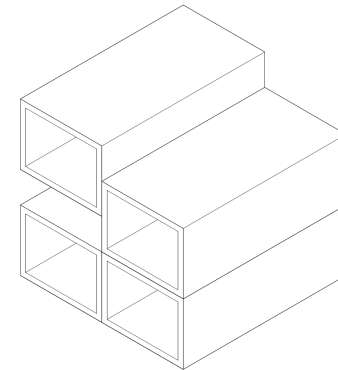
Horizontal detail showing meeting between modules 1:5 (A3)

# Modular construction theory



The cost of the production is kept low using pre-fabricated modules of light wooden construction, including furnished kitchen, toilets and fixed furnishings. Six modules are stacked together to form both the interior and exterior. The roof is later added, its frame modular as the units with cladding placed on site.

A priority is keeping the width of the modules under 4m to allow transport to the site without special permits.



## REFLECTIONS & DISCUSSION

*What started this project was a desire to actually design something that my friends and relatives could take part of. Regardless of their financial situation, everyone should have the opportunity to have their own property.*

*In the beginning of the project I looked at some other built examples of smaller villas. While all of them contributed with qualities and function, they all shared a much higher price tag than I intended to have. So, in order to bring the same qualities to my project, while simultaneously diminishing the cost, was a top priority.*

*Throughout the duration of the project, I came across a few obstacles. Most of them being that module construction as a whole is not a big part of today's industry, and therefore, I couldn't find as many examples online, especially ones of single houses. I solved this, however, by contacting knowledgeable and experienced people (such as Tobias Persson at Derome, as well as our excellent expert engineer Robert Jockwer) who managed to help me work out the details and create a plausible project.*

*Further into the project, I concluded that the boundary between outside and inside was not a top priority. Instead, the importance lay in a sense of one's own backyard. The project offers a proper private outdoor seating area in the backyard, with the option to wall off the patio to further increase privacy. The front courtyard offers the shared social experience of living in a neighbourhood; where children could play football, some daily meetings could be held, or just to sit on your front porch and grab a cup of coffee.*

Throughout my time at Chalmers (both the Bachelor and the Masters courses), I have always dreamed of designing villas. This time I had the chance to, and it proved much more challenging than I could ever imagine. To draw something big and grandiose—such as multifamily housing projects, or a hotel—would hide some of what was lacking in the bigger picture, but in a villa, there is nowhere to hide. The devil truly is in the details.

I would have liked to prioritize my time better by reading literature and finding examples of previous work, instead of sitting and drawing lines back and forth in a “trial and error” fashion. This is something that I wished I had spent more time on in the design phase of the project. Gathering more references would have eased the workload and prevented some mistakes I made.

At the start of the project, it was clear to me that the education at Chalmers has been lacking design and construction theory of single housing. This project however, spiked a whole new interest in me that I will continue to nourish throughout my years as a practicing architect.

In general, I am happy with the final result. I think that the project has a pleasing aesthetic, and a room configuration that suits everyday life. Furthermore, the materials I have chosen, as well as the production method, makes it economically sustainable and affordable for most.

Some design choices, such as the window mirror and the tin guard between the modules, added to the cost of production. This was, however, to add value to the property, since sacrificing all aesthetics to cost was not a viable action.

What came out of this thesis was a type house that could be bought and placed anywhere, as well as a concept for increased density between plots.

## REFERENCES

*Fredriksson, M., & Warne B. (1993) På Akacians Villkor: Att bygga och bo i samklang med naturen. Partille: Warne Förlag*

*Christopher A, Ishikawa S, Silverstein M. (1977) A Pattern language. Oxford University Press.*

*Hansson, S. (2020) Lush Living. Chalmers University of Technology / Department of Architecture and Civil Engineering*

*Nylander, O., & Eriksson, A. (2009). Så använder vi våra bostäder. Chalmers University of Technology [https://publications.lib.chalmers.se/records/fulltext/164495/local\\_164495.pdf](https://publications.lib.chalmers.se/records/fulltext/164495/local_164495.pdf)*

*Caldenby, C., Andersson, T. (1998). Att bygga ett Land. Byggforskningsrådet.*

*Kaufmann, Hermann, et al. (2018) Manual of Multistorey Timber Construction, Detail Business Information GmbH, The, 2018.*

*Damberg J. (2021) Utflyttarnas val, Arkitektur <https://arkitektur.se/reportage/utflyttarna/> Accessed 2022-03-16.*

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