Makers Mix Workhome

A return of dwelling and fabrication within the city

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1.0 Research Plan

1.1 Introduction

Over the previous two decades people all over the world have been increasingly working from home or living at their workplace with the global North especially seeing a resurgence in this form of living. With the restrictions imposed on travel and social distancing at work brought about by the current COVID-19 pandemic ,however,this trend has been drastically accelerated, and in doing so has highlighted failings with the quality and availability of workspaces within the current housing stock. Based on this growing need and the predicted future demands it's time to re-examine our relationship with working and living in monofunctioning determinate dwellings.

Therefore in this forthcoming research project I aim to explore what Frances Hollis states to be a 'workhome' (Holliss, 2015, p2), a building that combines both dwelling and working, focusing on examining this architypes spatial strategy in addressing current problems facing a work force increasingly working from their home. This report will thus advocate a return of this typology to the building stock in the Netherlands, highlighting its historical relevance and the benefits a building of this nature can bring in its duality.

This research will further examine the municipality of Rotterdam's ambitions for the project site in Keilekwartier, and how a workhome can achieve these goals while also alleviating current workspace shortage facing the city. A spatial framework will then be delineated in association with case study plan analysis to form the basis point for the following graduation design assignment.

Top
Figure 1. A traditional Dutch Workhome:
Gillis Salomonsz Rombout, *Weavers Workshop* (1656).

1.2 Problem Statement

Edward Hopper's infamous *Morning Sun* depicts isolation and spatial bleakness in a typical residential urban setting. The tone and subject of this painting can be said to be representative of the current unease facing many workers in the Netherlands who now find themselves alienated and at home in unsatisfactory conditions.

The Knowledge Institute for Mobility Policy (KiM) in collaboration with the Ministry of Infrastructure and Water Management have been monitoring these conditions and have discovered that 30-45% of the Dutch workforce have had a negative experience since the start of the outbreak in working from home with 35% stating that they were unsatisfied with their current work from home facilities (Hamersma, 2020, p27). The problems raised have been the disruption of their work-life balance brought about by the lack of spatial boundaries, social isolation and an increase in depressive symptoms due to poor spatial qualities (2020, p17).

In conjunction with unsatisfactory workspaces, the city of Rotterdam is also currently lacking workshop and studio facilities for entrepreneurs and the creative sector. Stichting Kunstaccommodatie Rotterdam (SKAR), is a non-profit organization based in the city that is the main distributor of affordable workspace for creators and artists. The organisation has forecast that an additional 36,000 m2 net studio space will be required by 2025 to keep up with the current demand (SKAR, 2020, p6). However, based on their resources they project they will only be able to meet 30% of this demand by 2024 (2020, p.12), leaving a deficit of 25,200 m2 of requiredstudio space.

With a future forecast that 67% of the workforce view they will work more regularly from home post Covid-19 (Hamersma, 2020, p35) and 560 creators needing workshop facilities by 2025 (SKAR, 2020, p6) it is time to address the global shift in how work-related space is distributed within housing. Therefore the following research question will be asked:

1.3 Research Question

How can the introduction of a workhome typology within Keilekwartier address the global shift in required work-related space within housing while alleviating creative workspace shortages in Rotterdam?

1.3.1 Sub Questions

- How can a mixed-purpose development benefit Keilekwartier while achieving the aims of the municipality of Rotterdam for the area?
- What are the current issues and needs facing creators and entrepreneurs working from home?
- What work facilities can benefit the community?

Top
Figure 2. Edward Hopper, *Morning Sun* (1952)

1.4 Relevance and Position

Developments in infrastructure and the digital world have allowed more people than ever to work in alternative settings then the traditional centralised workspace model. The binary separation between life and work is unravelling thus becoming more fluid. It is a characteristic of the current generation, with all indications that this lifestyle is here to stay and accordingly must be addressed.

However unlike the 19th century where dwellings evolved to meet new innovative industrial processes, the 21st century's global shift to work-based dwellings is currently absent or at least rare in the modern housing market in the Netherlands. This can be attributed to what Holliss (2015, p202) states to be over-regulation of urban policy coupled with property developers unwilling to take a risk on an evolving market when similar financial gains can be maintained on standard residential layouts.

Of particular note is that in Keilekwartier, the area has been categorised specifically for this mixed form of living with recommendations for special typologies and architecture (Municipality of Rotterdam, 2019, p52) hence this research is an opportunity to investigate the strategies and frameworks that can allow for work-based dwellings and can contribute to the reengagement of this absent typology within the modern city. The consequences due to the lack of this archetypes implementation has both sustainable and social implications ranging from an increase in carbon emissions from commuting to the workplace (RIBA, 2020) to contributing to the homogenisation of areas of the city with predefined functions. As Jane Jacobs infers in The Death and Life of Great American Cities (1961) that mixing the use of land and buildings is central to creating conditions for a city's diversity and liveliness.

Nonetheless, this research cannot ignore that working from home can also be problematic and not suitable for everyone. Hence, this research finds it especially important to underscore the importance of the municipalities aim to attract and maintain a creative community that likes to experiment (2019, p35). Therefore, although this research represents only a sub sector of the community, it is one in which the spectrum of public and private within work-based dwellings can be thoroughly investigated.

1.5 Source Analysis

Within this report a range of academic books and reports have been utilized to give a thorough analysis on the topic of work-based living and the need for creative workspaces in Rotterdam. Governmental reports and statistics have thus been used to analyse current trends and issues facing the work-force adapting to working from home along with private organisations and municipality reports dealing with workspaces shortages. However, with this being an ongoing development figures and issues related to this subject matter are likely to evolve.

The most thorough source of information on this topic of work based living is Frances Holliss *Beyond Live/ Work* (2015). Holliss, an architect and Emeritus Reader in Architecture at London Metropolitan University, provides a comprehensive historic overview of the importance of this building type as well as its future potential. The book provides an analysis of spaces and lives of 86 contemporary UK and US home-based workers from across the social spectrum and in diverse occupations. Holliss coined the term workhome to describe all building types with dual function of living and working (2015 , p2) and argues that the workhome can transform our cities, offering not only a vital economic driver, but a sustainable model for the future (2015, p204).

Thomas Dolan's *Live-Work Planning and Design* (2012) and Howard Davis' *Living Over the Store: Architecture and Local Urban Life* (2012) have also been detailed sources on the matter. Dolans Live-Work Planning and Design advocates the need to return to work-based homes to underpin the ideals of a sustainable community in offering zero-commute living.
Dolan argues that this form of living eliminates the separation between the most important parts of our lives thus resulting in more liveable and fulfilling environments for all (2012, p. xi).

Davis *Living over the Store* on the other hand is an investigation into the concept of dwelling adjacent to the workplace to investigate the extent to which the hybrid form of the shop/ house initiates resilient urbanism. It further provides greater understanding of the socio-economic life of the community while arguing that this form of living supports both the physical continuity and the social stability of the neighbourhood (2012, p87).

These sources provide detailed research in the need for a return to work-based living, however, the provided examples by both Holliss and Davis are limited to individual buildings, often singular homes or retrofits. Clear strategies to allow for functional workhomes on a medium density and scale are thus missing.

1.6 Methodology

In this report's essence , quantitative and qualitative data is used, based on academic literature and scientific and governmental reports, to support its analysis.

Praxeology is further employed when analysing the spatial issues affecting entrepreneurs and creatives working from home using empirical research in the form of a questionnaire. Questions regarding their current workspace, spatial issues and preference in work space were asked (a sample of this questionnaire can be found in Appendix I). The data collected was then used to compare with findings by Hollies to determine if similar spatial issues are facing creatives in Rotterdam as there are in the UK to better inform future integrated design proposals. Due to limitations imposed by the COVID-19 outbreak however, the questionnaire was limited to a Creatives in Rotterdam Facebook page (conducted on the 26th of November) receiving 18 responses, all from creators working at home with an average work experience of 12 years for the respondents.

Finally, visual qualitative research is used in analysing case study floor plans to investigate correlational data in their layout, circulation and massing.

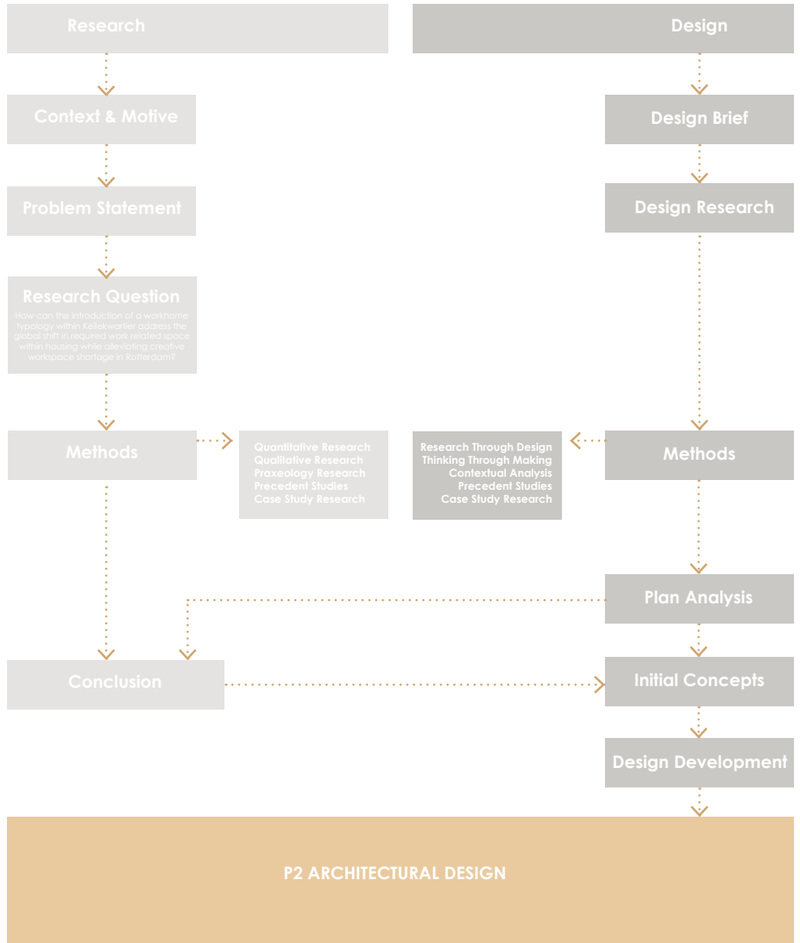

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Figure 3. Diagram of Research Structure

2.0 Research Report
Trend in Working from Home

2.1 The Netherlands - 2019

Prior to the national restrictions imposed by the COVID-19 virus the Netherlands was Europe's leading nation in people working remotely from home. In 2019, it represented 14.1% of the workforce putting it in the top position in front of Luxembourg at 12.7% and Finland at 12.3% (Bishop, 2020). A further 34% of the workforce have had the opportunity to work occasionally from home, representing roughly 1 in every 3 Dutch workers, with almost 6% of this group doing so exclusively at home (Hamersma, 2020, p35). In 2019 the predicted annual growth in the trend of working remotely was 7% (Hamersma, 2020, p37).

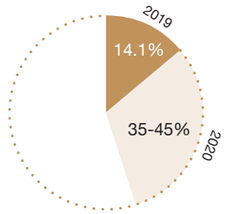
The reasons for this high rate of working from home compared to other European nations can be linked to the Netherlands also having the number one position in the Remote Workers Index. This index judge's countries on a range of criteria such as number of co-working spaces available, number of WiFi spots as well the happiness index score etc. with all factors contributing to the accessibility and happiness of remote workers (Luthra, 2020). In addition, since January 1st 2016, The Flexible Working Act has been in force in the Netherlands (Korthals, 2016). Within this act, which also covers a range of employment conditions, it states that an employee who has been employed for more than 26 weeks can request that their place of work or working hours be adjusted (Luthra, 2020) allowing for a flexible work home based lifestyle.

2.1.2 The Current Trend

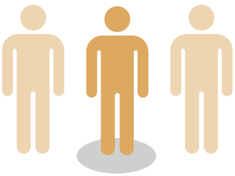
In 2020 with the imposed national restrictions to work from home where possible in order to counter the spread of the virus KiM has estimated that between 35-45% of the total Dutch workforce is currently working from home full-time as of September (Hamersma, 2020, p33). The report noted from this group 59% felt productive and 55-70% have had a positive experience (2020, p27). The future forecast of this trend is that a significant portion of home workers, roughly 67% expect to go or work from home more often after the corona crisis than before (Hamersma, 2020, p35). The largest group of these workers expects to work from home between 1 and 3 days after the corona crisis (2020, p35). A maximum of 10% of home workers expect to work from home full-time or almost full-time after the corona crisis (2020, p35). Other nations such as Germany anticipate this shift to home-based work by providing employees the legal right to request to work from home (Solomon, 2020).

As Lord Norman Foster stated in an address to the United Nations that instead of change being brought about in the built environment from the effects of COVID 19, it has merely hastened and accelerated trends that were already apparent before the pandemic (United Nations, 2020).

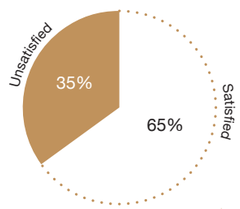
To understand how a future workhome can thus be developed it is important to first understand the history of working from home.



Working From Home

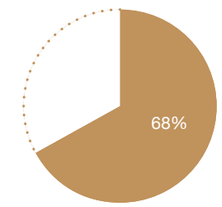


1 in 3 worked from home occasionally in 2019



Satisfaction with Home Facilities

10% want to work from home full-time post COVID-19



Predicted Future Increase in Working from Home

7% Growth annually working from home

1ST Remote Workers Index

2016 Flexible Work Act

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2.2 History of Workhomes

2.2.1 Origins

The notion of a dwelling that combines space for both living and working is as intertwined and as old of a story as that of when early man started to construct their first shelters. Its origin is universal and can be found in every culture and country with diversity and variations in its duality spread throughout. From medieval farmers living with their livestock for protection and shared heat to industrial age weavers creating linen from their homes, production and domestic work have always been linked. The history of the workhome is thus long and varied, but its importance is only recently starting to be rediscovered. This chapter will look at notable historic examples of the workhome within the Netherlands as well as the decline and separation of this typology from our cities.

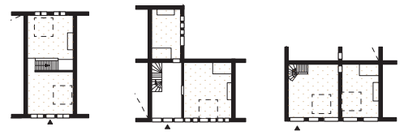
2.2.2 Workhomes in the Netherlands

In the Netherlands two of the most notable examples of this typology is the 17th century Dutch Merchant house and that of the more humble Weaver's home. The later, typical of the era was built as a popular lure to attract the lucrative wool industry at the time with providing functional homes for workers that could be both lived and worked in (Schreurs, 2019, p25). The design principal of these homes was that of work-dominated orientation in that each room was constructed large enough to contain a weaver's loom of 2x2m and from this to be flexible in interchanging its function from working to living depending on the time of day (Schreurs, 2019, p30). The Dutch merchant house on the other hand provides more definitive separation of functions with the attic and ground floor used for goods storage and commercial activity while the in-between levels are dedicated to the living functions of the house (Davis, 2012, p55).

2.2.3 Separation of Home and Work

It was not until the turn of the 20th century that the shift in balance in working from home changed drastically. The shift that arose was largely ideological with employers being its catalyst ,opposed to the reduced control they had over their employees working far from view (Holliss, 2019, p7). Unions further opposed this architype due to fear of worker exploitation being part of an unregulated work force that contained the most vulnerable in society and finally social reformers were in opposition to them due to aligning them with poor sanitation and overcrowding in lower class homes at the time (2019, p7).

The birth of social housing during this time period resulted in the clearance of swathes of the city that housed these flexible homes in favour of the high density 'Model House' of the time. These new homes' 'sparse but hygienic environments generally arranged vertically…' replaced the complex but squalid layers of public, semi-public and private space where home-based work had flourished



Dedicated Workspace

Flexible Workspace

Top Left.
Figure 4. Dutch Merchant Homes.

Bottom Left.
Figure 5. Weaver homes.

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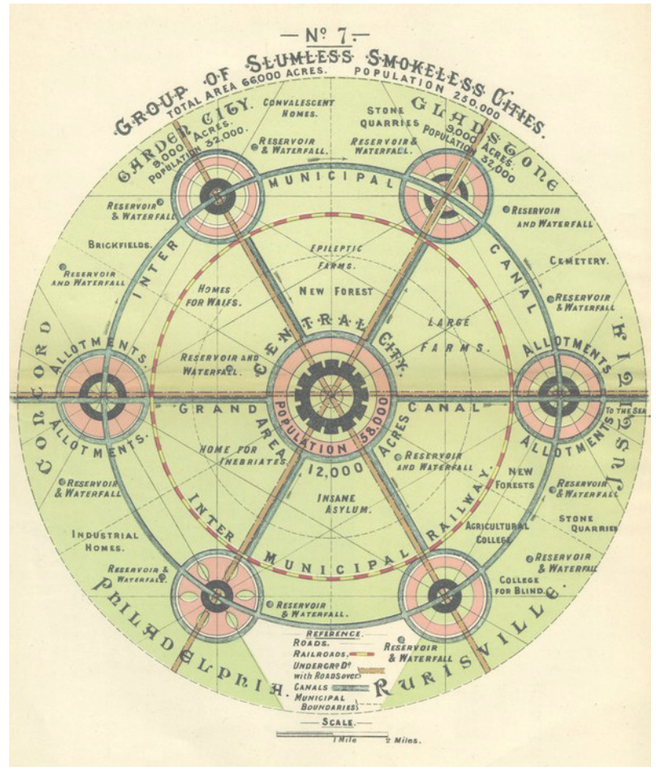
'(Holliss, 2015, p124). In 1898 Ebenezer Howards' radical 'Town-country Garden City' concept was published and later widely adopted throughout the world (Figure 6). In it Ebenezer Howards called for creation of three complete separate zones in the city for living, employment and civic activities. Employment would be located at the periphery, civic at the centre and residential zones sandwiched in-between. This solution was effective in its goal of reducing pollution from factories but simultaneously, and not accidentally, efficiently wiped out home-based work (2015, p126). The result was this typology largely disappearing from the housing stock in most developed countries at the time.

However, in the 1960s, Jane Jacobs in her book The Death and Life of Great American Cities (1961) started to question the form that zoning played in urban planning. Jacobs suggests that a city needs diversity which is only created when four conditions are applied. The first, that city districts must serve two functions to attract people with different purposes throughout the day and night. Second, that city blocks must have dense interaction spots to allow opportunities to interact. Third, buildings must be diverse in age and form to support a wide economic class. Finally, there must be a sufficient density of people (Jacobs, 2011, p150). These findings were hugely influential and resulted in the late 1960's of the Live/Work movement forming in opposition to a proposed new freeway cutting through the SoHo District of Manhattan. This movement promoted the inhabitation of the post-industrial buildings in this area by artists, instead of their planned removal. The spaces offered both a place to work and live affordably, supporting Jacobs theories on the benefits this diversity has on the city. Though successful in stopping the freeway, in the 90's with increase in real estate value these unconventional spatial units were sold by the artists who once occupied them thus promoting the 'live/work' spatial typology associating it more with bohemian lifestyles then its intended work function (Holliss, 2019, p8).

Though the live/work movement spread internationally in promoting these unconventional living spaces in post industrial buildings it ultimately failed due to adverse governance, property taxation and the rapid transformation of light industrial land into residential areas functioning rarely as work spaces, leading to an embargo on these types of units in both the US and the UK that is still largely in place to this day (2019, p8).



Top
Figure 6. Ebenezer Howards *Town-country Garden City* (1898).

2.3 Issues with working from home

2.3.1 General

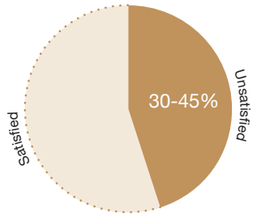
As mentioned in the Netherlands KiM have been monitoring the effects of working from home and although 55-70% of Dutch people have had positive experiences, 30-45% have not (Hamersma, 2020, p27). In addition, a further 35% have stated they are currently unsatisfied with their current work from home facilities (2020, p27). The main problems highlighted from working from home have been the disruption of their work-life balance, brought about by the lack of defined boundaries, as well as social isolation (2020, p17). This is particular the case for younger adults and single dwellers who do not have a family unit to interact with. The spatial quality and standard of the dwelling has also been 'associated with increased risk of depressive symptoms'(Amerio, 2020, p1), during this time period . In particular, living in apartments that have poor views and scarce indoor quality (2020, p1). In general, studies into these matters have shown differences in advantages and disadvantages based on individual characteristics dependent on gender, age, education, work experience, and experience in working from home (Raisiene, 2020).

2.3.2 Creatives

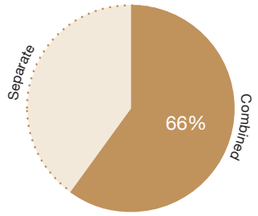
Particular issues that arise for creators and entrepreneurs tend to be spatially-orientated, confirmed by an online survey (conducted on the 26 November, 2020). Of the 18 respondents, all were associated with the creative industry and worked from home, with the average work experience being 14 years.

The results from this survey showed that 72% required only a desk for work with 17% and 11% usually needing a studio and workshop. Currently 66 % did not have a separate work space in their dwelling for work with 64% of this group having issues with this arrangement. The main issue highlighted by the survey was 77% were unsatisfied with their current work storage needs in their home and 52% finding noise and odours to be a distraction while working. Furthermore, a large 84% would also find it difficult to invite clients to their home workspace. Other nuisances mentioned were an increase in energy costs, irritation brought about by clutter and work-related fatigue due to the imbalance of separating home from work.

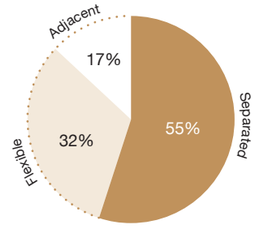
Finally, the respondents were asked if given the choose in the future what their work arrangement preference would be; If they prefer a flexible space in their home that can be used for both working and living at no additional costs; A workspace in separate building at additional costs; Or a dedicated workspace in their dwelling with separate access at no additional costs but reduced unit GFA. The results from this were 55%, 32%, 17% respectively.



Issue with working from home



Do not have separate work space



Preferred workspace arrangement

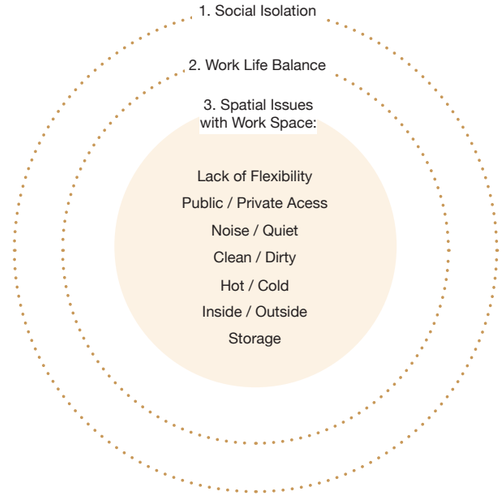


Diagram of work from home issues

2.4 Workspace Issues in Rotterdam

2.4.1 An Overview

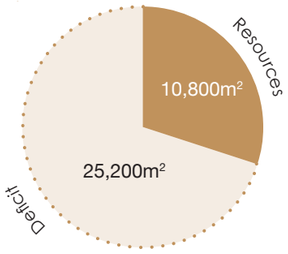
The Netherlands creative industry is one of the top ten performing in the world and one of the strongest performing in Europe (Ministry of Economic Affairs of the Netherlands, 2018). The annual turnover from this industry equates to roughly €7.1 billion euros annually, representing 1.9% of the Dutch economy (2018). It employs 172,000 people and counts roughly 57,600 designers, 66% of which are self-employed (2018). The industry is thus categorised in the top 9 producing sectors in the economy with the future aim to strengthen and further support the industry as a whole (Ministry of Economic Affairs and Climate, 2020). However, due to the continued growth of the economy and changing market conditions have greatly increased pressure on the property market leading to a considerable reduction in the availability of workshop spaces for the industry. This is due in part to workshop and studio spaces often being located in underdeveloped areas of the city that are now being transformed to meet the increased needs of the residential market.

2.4.2 Workspaces issues in Rotterdam

As mentioned previously Stichting Kunstaccommodatie Rotterdam (SKAR) is the main distributor of affordable workspace for creators and artists throughout the city. The organisation currently forecasts that an additional 36,000 m2 net studio space will be required by 2025 to keep up with the current demand (SKAR, 2020, p6). However, based on their resources they project they will only be able to meet 30% of this demand by 2024 (2020, p.12), leaving a deficit of 25,200 m2 of required studio space equating to roughly 560 creators not having a place to work in the future.

The organization further notes issues with the current workshop facilities on offer, in particular, that they all suffer from a lack of traffic flow and dynamism. This is due in part to the vast majority of current creators renewing their leases making it difficult for young creators to find a workplace and has therefore retained the ingrained patterns of the buildings current users leading to stagnation (2020, p.12).

Furthermore, the organisation along with the Rotterdam Council for Art and Culture, have identified the disadvantage of having numerous workshops catering to similar areas of creative focus spread out throughout the city. They have therefore identified that need to create a clustered approach to accommodate an ecology of creativity, in which, in addition to artists and designers, and also makers, entrepreneurs and more, have a place to interact and collaborate and thus become more commercially sustainable (SKAR, 2020, p17). This ecology makes it easier to bundle investments particularly working on a focused one per cluster program, for example around experimental research and innovation (2020, p17).



2025: Required Studio Space

36,000m²

2025: Creators Needing Workspace

x 560

"We envision a creative industry sector with a solid infrastructure in which designers and makers have access to affordable workspace in creative hubs, where the exchange of knowledge and resources is stimulated. We want to invest in a flourishing creative ecosystem where there is room for research, reflection and experiment. "

Rotterdam cultural policy 2021-2024

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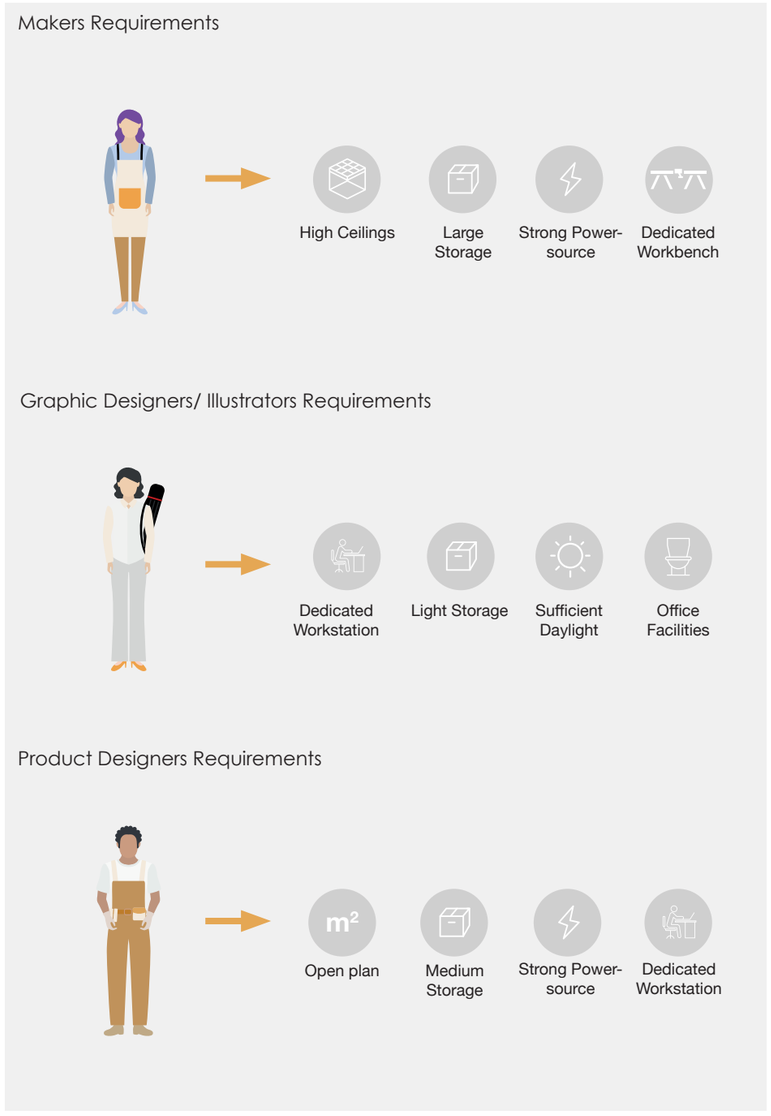
2.5 Creative Workspace Requirements



The following information has been distilled from spatial requirements conducted by SKAR(2017, p11) and RRKC (2020, P.5)

2.6 Comparison Workspace Case Study:
RDM Campus Facilities

Current facilities on offer by the RDM Campus in Rotterdam that specialises in innovation and manufacturing.

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2.7 The Municipality of Rotterdam ambitions for Keilekwartier

The Municipality and the Port Authority of Rotterdam have joined forces to jointly redevelop the Merwe-Vierhaven (M4H) into a breeding ground for innovative manufacturing industry. The area, along with the former RDM shipyard that is on the adjacent banks of the Masse river, will form a new area of the city called 'The Rotterdam Makers District'. Here pioneering institutions, start-ups, business incubators and accelerators whose work is focused on 'making' will come together in a new mixed-use development.

The area of Keilekwartier, within M4H, in which this research report will focus on, has in particular been designated as a living-work environment with space for traditional and creative manufacturing (Municipality of Rotterdam, 2019, p4). The municipality states that they expect living among the makers will appeal to a certain target group that likes to experiment, thus, the setting will be reflected in special housing typologies and architecture, often in the form of collectives (2019, p52). The basis for this mixed-use area will be small households for residents to exercise their production and also to share them in places where encounters are optimally facilitated (2019, p52).

An example of the makers that Rotterdam envision for this environment are: designers, industrial designers, artists, architectural firms, interior builders, textile-wood-paper processing, small-scale food production (city brewery, bakery, urban agriculture), repair workshops, studios, printing, small-scale workshops and fabrication (Municipality of Rotterdam, 2019, p52).

Keilekwartier along with the rest of the district will also simultaneously be the breeding ground, testing ground and showcase for the new circular economy of the future for the entire region. Here collectivity forms the basis for circularity, as cooperation increases the chance of crossovers, which in turn contribute to new inventions and plans and thus increasing social cohesion in the area (2018, p100).

The municipality along with all actors on the site has further developed eight principles for the area to produce a more circular, inclusive and sustainable outcome for the future. These eight principles are:

- M4H offers permanent space to different types of makers.
- M4H prefers sharing facilities over individual ownership.
- M4H allows room for experimentation and learning.
- M4H produces and uses sustainable energy.
- M4H values residual flows.
- M4H makes it possible to opt for sustainable mobility.
- M4H works as one resilient climate adaptive system.
- M4H builds on the industrial capacity and quality of the area.

Left
Figure 7. Map of M4H

2.8 Workhome Typologies

The workhome typology according to Holliss can be categorised by its dominate function that of either being mostly a workspace or mostly a dwelling. These are therefore identified as being either work-dominated or home-dominated (Hollies, 2015, p90).

Home-dominated workhomes are typically houses or apartments, providing either a dedicated space to work such as a spare room, a desk, or more loosely a kitchen table. Work-Dominated workhomes have a wider variety such as industrial units, live/work units, funeral parlours, care homes, mechanics, and hotels etc. . A third category also exists for buildings that do not have either dominate home or work function, that of equal-status. These spaces are typically separated either having separate access or being physically apart such as a garden shed.

2.8.1 Spatial Strategies

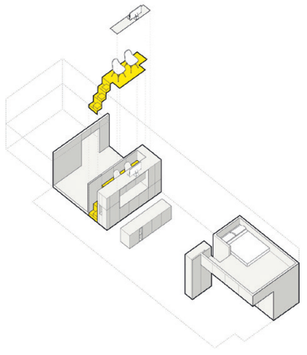
Within these established categories three spatial design strategies have been identified first by Dolan (2012, p12), then further developed upon by Holliss (2015, p92); that of no spatial separation, some spatial separation and total separation.

No spatial separation or 'live-with' is the most common arrangement with the dwelling and workplace in effect a 'single compartment with one front door' (Holliss, 2015, p93). The live-with unit encompasses within that single space: a kitchen/dining area, bathroom and sleeping space with the contiguous work space (Dolan 2012, p17). The 'Microloft' by Suprblk Studio (Figure 9) is an excellent modern example of how this strategy can be employed.

Some spatial separation or 'live-adjacent' workhomes are work and living spaces contained in separate compartments that are typically next door to each other, above, below or side by side, each with its own entrance to the street (Holliss, 2015, p93). This separation can minimize disturbance to other members living in the dwelling as well as reducing exposure to hazardous materials or high-impact work activity and provides greater control over one's work life balance (Dolan 2012, p18).

Total separation or 'live-nearby' is when the dwelling and the workspace are physically detached from each other and are typically a small distance apart. Dolan states that although these workspaces are usually garages or outbuildings they can in fact be not part of the same property but up to five minutes' walk away in the neighbourhood (Dolan 2012, p19).

In Chapter 3 a plan analysis comparing four projects will analyze their different workhome spatial strategies comparing their dwelling, workspace and circulation layouts.



Top Right
Figure 8. Spatial Strategies.

Top Left
Figure 9. Microloft by Suprblk Studio.

Bottom Left
Figure 10. Isometric of raised work-space due to generous ceiling height.

2.9 How a Workhome can Achieve Rotterdams Ambitions for Keilekwartier

2.9.1 Circularity
As stated previously collectivity forms the basis for circularity in Keilekwartier. The below workspaces promote circularity through peer production, the sharing economy, and collaborative consumption, therefore making them ideal candidates to be facilitated within the Makers Mix Workhome.

Fab Labs
Digital fabrication laboratories (Fab Labs) is a movement founded by MIT with the goal to inspire people and entrepreneurs to turn their ideas into new products and prototypes by giving them access to a range of advanced digital manufacturing technologies that was previously only available to the manufacturing industry (Lena-Acebo ,2019, p125). With currently 1750 workspaces throughout the world, the main hallmark of the organisation is that along with having shared sets of tools and processes, public access is essential. A Fab Lab is about democratizing access to the tools for personal expression and invention therefore the culture of DIY or DIWO (do it with others) is ingrained in its being. These workspaces promote sustainable innovation and strengthens local entrepreneurship and industry development (2019, p127).

Makerspace
Makerspaces are public workshops where creators and makers can share tools and knowledge (Taylor, 2016, p1415). Seen by many authors as the start of third industrial revolution (Anderson, 2014) the purpose of these spaces is to provide a broad range of equipment to allow the community to address local challenges, to decentralized production and promote ecological design and repair-culture (Gadjanski ,2015, P3). Less rigid in organisation compared to the FabLab movement these spaces offer adaptability when it comes to equipment and are either free to use or a low-cost workspace.

Co-Working Spaces
Co-working spaces are shared office environments that are typically desk-based in which a group of workers pay to use as their place of work. However, these spaces are not just selected because of their work space environment but also as a focal point for finding people, ideas and other resources when you lack the information necessary for coordination (Waters-Lynch, 2017, p417). In this way, these workspaces become entrepreneurially constructed focal-points of tacit coordination in which workers anticipate finding each other in order to cooperate jointly on projects (2017 p430). Therefore, providing this space in a maker's environment can draw additional actors to the site promoting collaborative consumption and peer production.

Fab Lab

Co-Working

Makerspace

Makers Mix Workhome

2.9.2 Sustainability

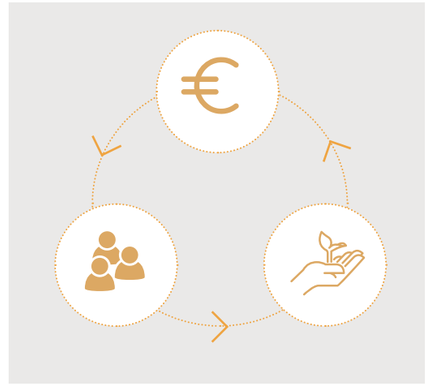
Sustainability depends not only on reducing carbon emissions but also on providing closer social ties and promoting regenerative local economies, therefore the following three will be analysed for a workhome:

Economically
A recent study conducted by The Rebel Group and in cooperation with creative institutions in Rotterdam, Amsterdam and Utrecht provides insight into the economic value that creative workplaces such as studios and incubators can have for an area over the long term (15 years) for an area. The research noted that real estate ignites strong economic activity with every euro spent on either workspace rent or property investment generating no less than €24 in expenditure and value increase (Rebel, 2020, p6). Moreover, the workplaces also generate employment with each realised workplace generating approx. 0.6 FTE in additional jobs (2020, p6). Furthermore, government income is increased with every euro invested in real estate yielding 11 times the return for the government (2020, p6). The study concluded that in almost all areas creative workspace provides more value than housing, providing jobs and adding to local economy, however this was only after a 15-year period of occupation.

Social Sustainability
M4H is a dynamic up and coming economic area however, in the surrounding areas, there are social issues with up to 25% unemployment, 80% of peoplefrom migratory backgrounds, rising debt problems and a struggle against drug trafficking, its use and anti-social behaviour. It is categorised as one of the most difficult urban environments in the Netherlands (Municipality of Rotterdam, 2016, p114).

Providing facilities such as fab labs and maker spaces can provide a platform for engaging in interests in science and engineering (STEM) with large gaps being noted in the demography of low income earners (Barton, 2016, p11). In the informal maker community, it has the potential role in breaking down long standing barriers allowing for a democratising effect to take place ultimately producing a robust social network that can further reinforce social cohesion and promote social entrepreneurship (2016, p11).

Environmentally sustainable.
In providing separate buildings for the purpose of living and working it doubles up on resources, and therefore embodied-carbon, through the construction of separate buildings for a singular function and is thus inherently wasteful. These buildings are then occupied for only a portion of the day with places of work being left empty on the weekends and holidays. It is an inefficient use of space and resources. Furthermore, energy is constantly wasted in this process. Homes are generally heated in the morning, left to cool down during the day and then reheated in the evening, while workplaces are heated during the day and left cool down at night. This wastes significant energy compared to a continuously occupied space. Thermal solar gains generated by the sun used to heat the spaces during the day are also squandered in this process. Having to commute to and from your place of work in addition also contributes significantly to greenhouse emission, therefore providing a building that contains dual functions removes these unnecessary journeys. Workhomes can thus be categorised as environmentally sustainable allowing us to reduce carbon emissions by helping us to build less, heat less and travel less (Hollies, p169).

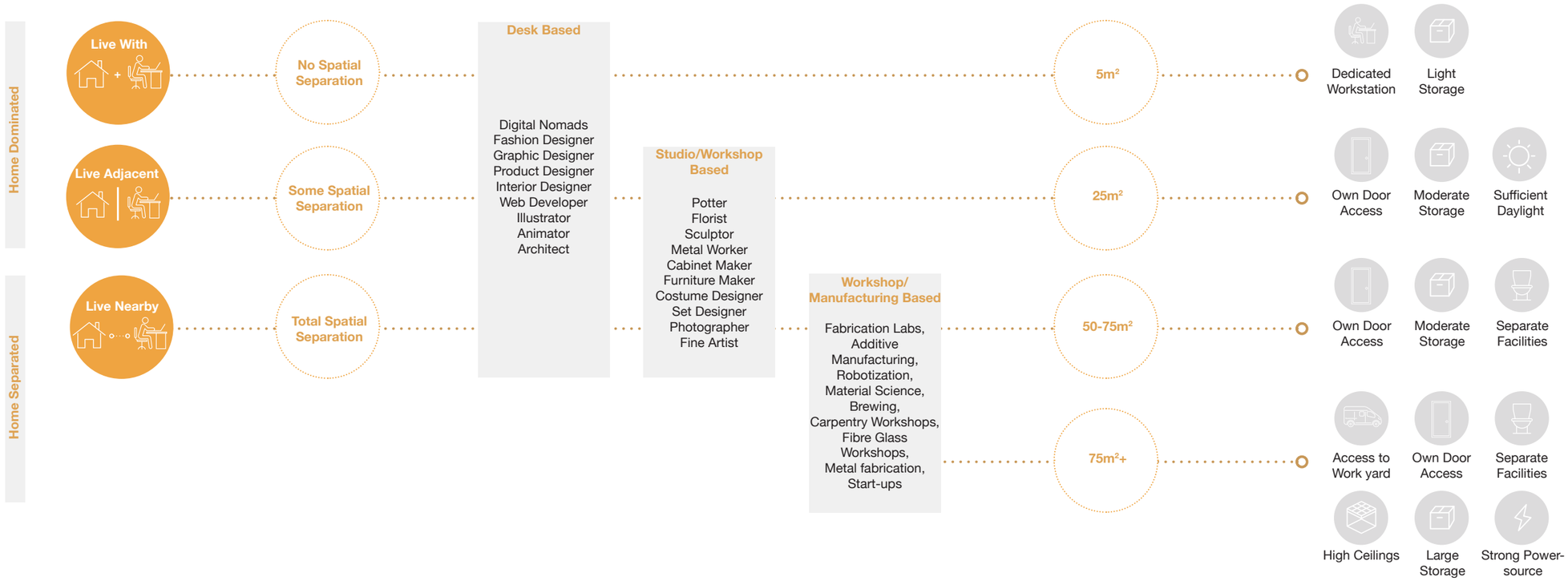


Workshop Value

€1 Invested = €24 Generated

***Based on a 15 year period**

2.10 A Creative Workhome Framework



2.10.1 Overview

The above diagram has been created by the author to distil the spatial design strategies of workhomes for creative professionals and their desired workspace size and spatial requirements as indicated previously. Professions have been condensed to desk-based, studio/workshop-based and workshop/ manufacturing-based workspaces. This framework will thus form the base for spatial needs of work related space in the design of a workhome in Keilekwartier.

2.11 Conclusion

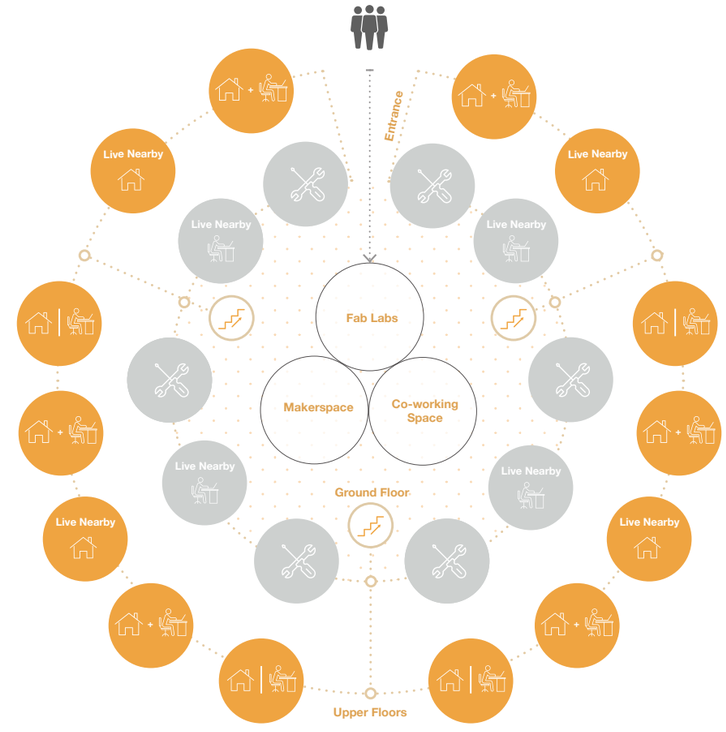
This research aimed to focus on the need for a workhome typology to address the global shift in required work-related space within housing as well as alleviating workspace shortages in Rotterdam. Based on quantitative and qualitative analysis it has identified that large portions of the workforce want to continue partially or full time in working from home in the future. However, through praxeology, spatial issues have been analysed that inhibit creators and entrepreneurs in this regard. Through identifying spatial strategies and the needs of creators, this research has thus generated a framework that can be used to design a workhome with a variety of workspaces to help alleviate this shortage in the workspace.
This framework achieves the municipalities goal of creating a circular and sustainable built environment in Keilekwartier.

Although this research focused on this particular site area, the framework suggested and the following design hypothesis can be adapted and built upon for other locations and target groups. Furthermore, in contrast to Holliss Beyond /Live/Work and Dolans Live-Work Planning and Design that only identify small scale examples or retrofit workhomes, a clear strategy is formulated to allow for designing workhomes on a medium density and scale to be achieved.

In identifying the anthropic and environmental advantages for this typology to be reestablished in our modern cities, the ongoing uncertainty in achieving a sustainable future for not just Rotterdam, but all of the Netherlands, is delineated more clearly through the prospect of this development.

2.11.1 Design Hypothesis

Informed through research the following design hypothesis has been produced to provide a basic strategy in approaching the layout of a workhome within Keilekwartier.
Within the adjacent diagram collectivity forms the basis of circularity with all independent workspace facilities located on the ground floor clustered into forming a ‘work yard’ where visual sightlines on activity can be maintained and collaborations formed. The public and non-residents are able to freely enter this space to view activity and engage in business and trade. Community workspaces such as the Fab Lab provide a draw for the creative community allowing for social cohesion and peer networking. Circulation cores are accessed of this space contributing to a sense of a connected community while residential dwellings are reserved for the upper levels catering for live-with and adjacent spatial work strategies. Public access to these upper levels and residential amenity space will be further investigated in the conceptual design.



Top
Figure 11. Workhome Spatial Design Hypothesis Diagram.

03. Plan Analysis

3.1 Plan Analysis

3.1.1 Introduction
Part of the research towards readdressing workspaces within dwellings is examining existing modern dual-functioning residential buildings that attempt to accomplish this issue. The four projects selected have been chosen due to their different spatial strategies to achieve this goal being analysed through their typology and morphology.

3.1.2 Research Question
What spatial strategies are used to separate workspaces from dwellings and how are these spaces then accessed by the public?

3.3 Relevance
This research gives insight into how residential buildings can operate withdual functions and its findings will support design decisions in creating a workhome in Keilekwartier

3.4 Hypothesis
Workspaces are clustered together to limit encounters with non-residents when accessing private dwellings.

3.5 Method
Visual qualitative research was used in analysing four case study floor plans to investigate correlational data in their workspace spatial separation strategy, the public circulation to access these workspaces and the dwelling features of combined living and working units. The four case studies are: Houtsma Live/ Work Factory (Amsterdam), The Doors (Amsterdam), Former Berlin Flower Market (Berlin) and Haus A (Zurich).

The Doors

Architects:	Space Encounters
Location:	Amsterdam, The Netherlands
Completed:	2021
Typology:	Mixed-Use Housing
Dwelling Units:	12
Commercial Space:	12 studio spaces

Haus A

Architects:	Duplex Architekten
Location:	Zurich, Switzerland
Completed:	2015
Typology:	Co-Living
Dwelling Units:	11 Clustered Flats
Commercial Space:	415 m²

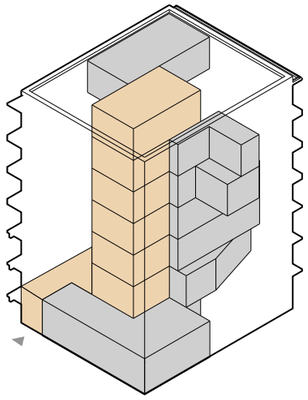
Former Berlin Flower Market

Architects:	Heide & von Beckerath, ifau
Location:	Berlin, Germany
Completed:	2018
Typology:	Mixed-Use Housing
Dwelling Units:	66
Commercial Space:	17 independent studios and 3 commercial units

Houtsma Live / Work Factory

Architects:	Architectenbureau Marlies Rohmer
Location:	Amsterdam, The Netherlands
Completed:	2010
Typology:	Mixed-Use Housing
Dwelling Units:	24
Commercial Space:	10 studios and workshops

3.2 Spatial Strategy

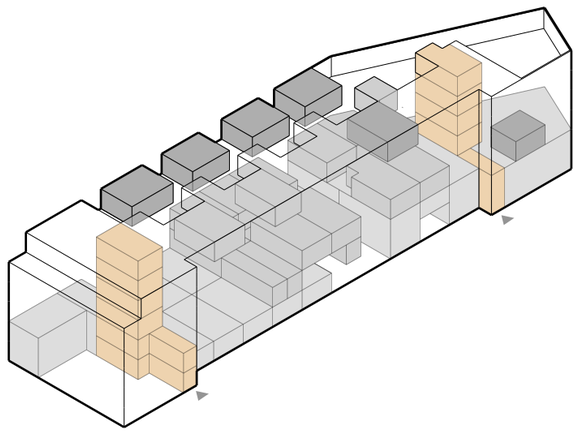


Offices (Live-Adjacent)
Circulation Cores

The Doors

Work spaces are located adjacent to each of the two dwellings per floor with dedicated own door access.

Spatial Strategy

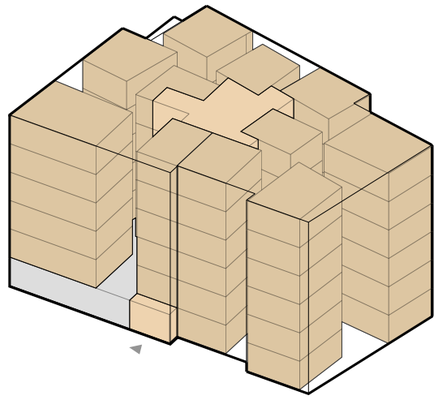


Atelier (Live-Nearby)
Studios (Live-Adjacent)
Workshops (Live-Nearby)
Circulation Cores

Former Berlin Flower Market

All workshop spaces are located on the ground floor with front door access. Dedicated ateliers are located on top floor with integrated studios located adjacent to their dwellings offering own door access.

Spatial Strategy

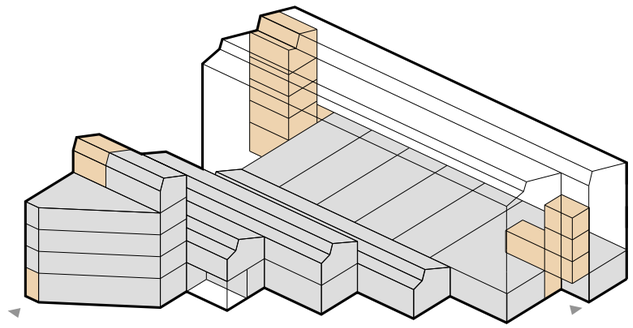


Flexible space (Live-With)
Offices (Live-Nearby)
Circulation Cores

Haus A

Although designed as a co-living scheme the separate clustered living spaces are ideal for flexible work spaces within the dwellings

Spatial Strategy



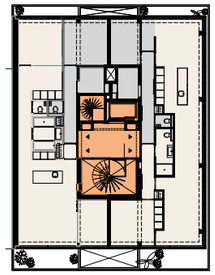
Workshops (Live-Nearby)
Circulation Cores

Houtsma Live / Work Factory

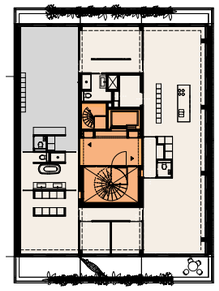
Work spaces are separated in this building with all workshops located on the ground floor or in a dedicated block with separate circulation.

Spatial Strategy

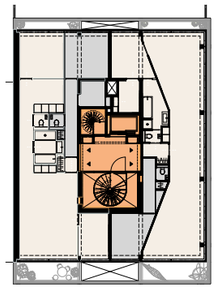
3.3 Circulation



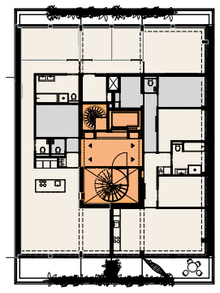
Level 02



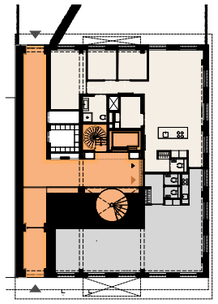
Level 05



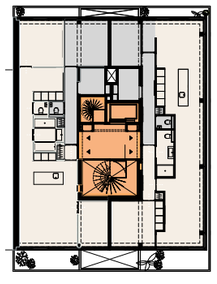
Level 01



Level 04



Ground Floor Plan



Level 03

- Workspaces
- Dwellings
- Circulation

The Doors

A centralised circulation core that is shared by both residents and the public is used to provide access to the two workspaces and the dwellings at each level.

0m 5m 10m 15m 1:500

Ground Floor Plan

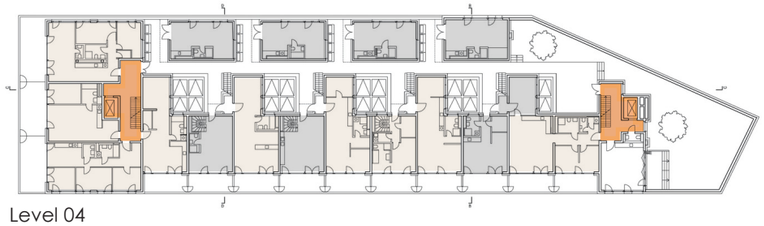
Level 05

Haus A

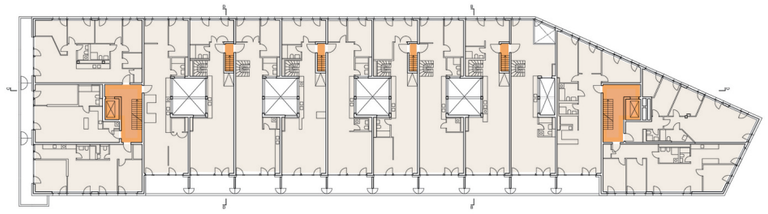
A centralised circulation atrium is used to provide access to each of the two apartments on each level. The clustered rooms that surround each of the apartments would be ideal for a live-with typology meaning the public would have to be guided through the shared living space.

- Workspaces
- Flexible Workspaces
- Dwellings
- Circulation

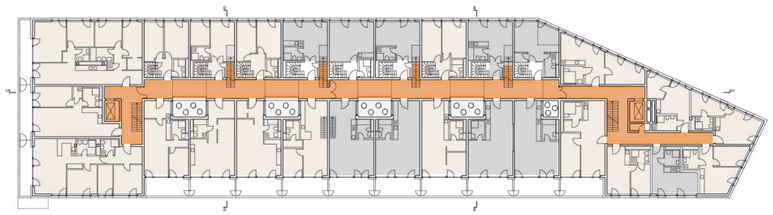
0m 5m 10m 15m 1:500



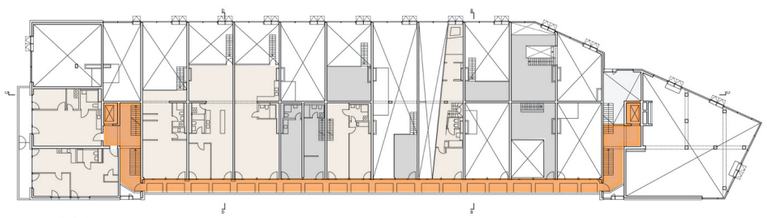
Level 04



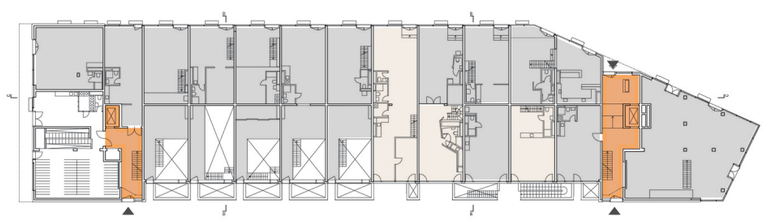
Level 03



Level 02



Level 01



Ground Floor Plan

Workspaces
Dwellings
Circulation

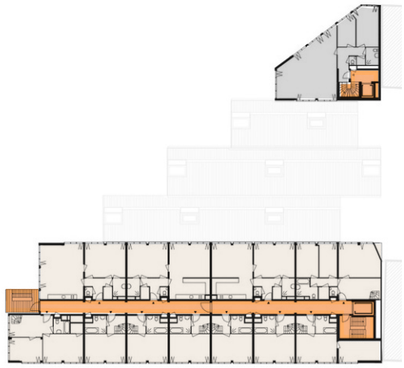
0m 5m 10m 15m 1:500

◄ Former Berlin Flower Market

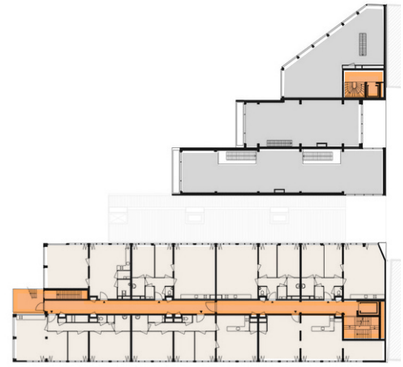
All ground floor units have direct access to the street. The upper floors are accessed by both public and residents by circulation cores at either end. The main live adjacent work units are clustered together and accessed at level 02 while separate ateliers are located on the top floor by roof access all of which are public access.

Houtsma Live / Work Factory ►

The ground floor is solely dedicated to workspaces with direct public access. The building is separated into separate blocks with one dedicated to residential with its own private circulation located and accessed on the south and west façade. The north-east core provides dedicated circulation for workspaces.



Level 02



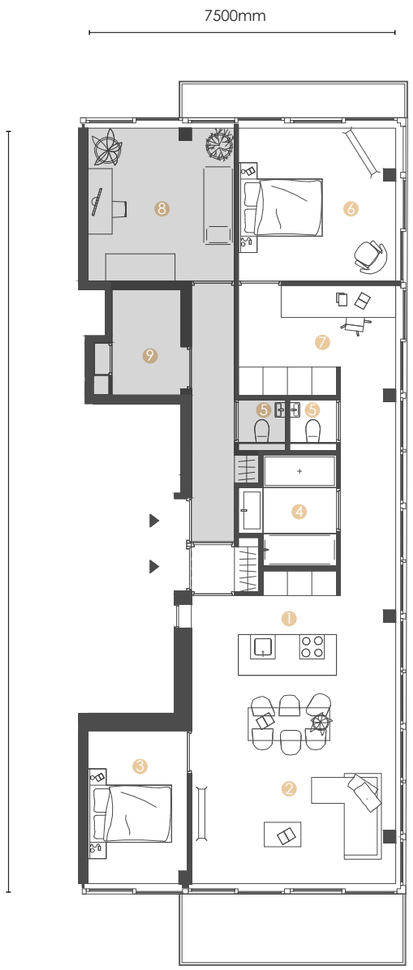
Level 01

Ground Floor Plan

Workspaces
Dwellings
Circulation

0m 5m 10m 15m 1:500

3.4 Dwelling Layout

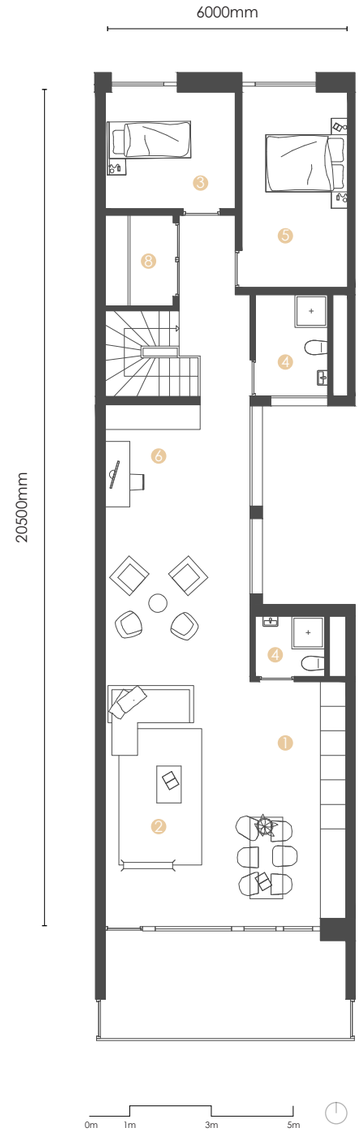


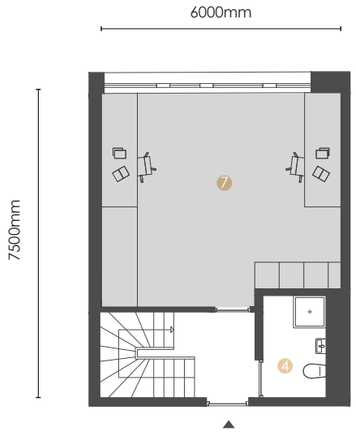
1 Kitchen
2 Living Room
3 Bedroom
4 Bathroom
5 W.C
6 Master Bedroom
7 Study
8 Office
9 Storage
Work-zone

The Doors
Scale 1:150

1 Kitchen
2 Living Room
3 Private Living Room
4 Bedroom
5 Bathroom
6 W.C
7 Ensuite Bedroom
8 Study
9 Storage
Adapatable Work-zones

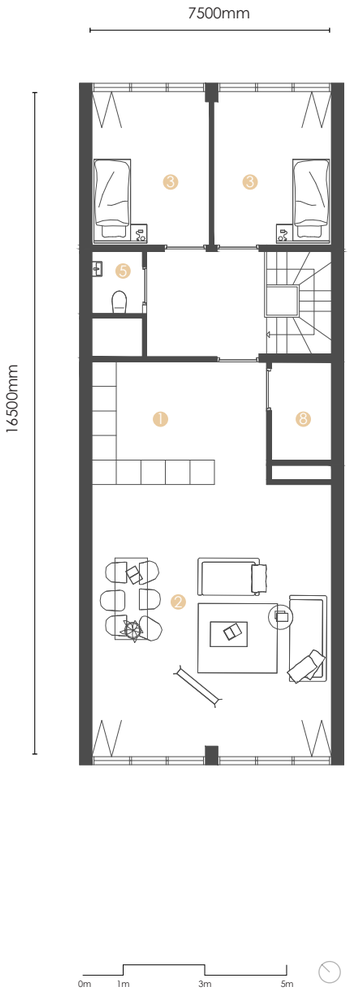
Haus A
Scale 1:200

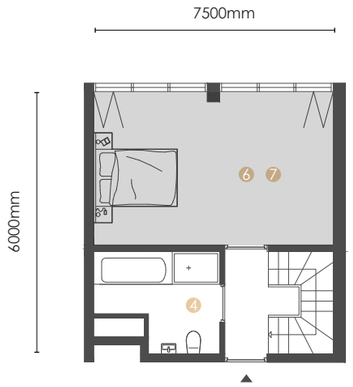




1 Kitchen
2 Living Room
3 Bedroom
4 Bathroom
5 Master Bedroom
6 Study
7 Office
8 Storage
Work-zone

Former Berlin Flower Market
Scale 1:150





1 Kitchen
2 Living Room
3 Bedroom
4 Bathroom
5 W.C
6 Master Bedroom
7 Office
8 Storage
Adapatable Work-zones

Houtsma Live / Work Factory
Scale 1:150

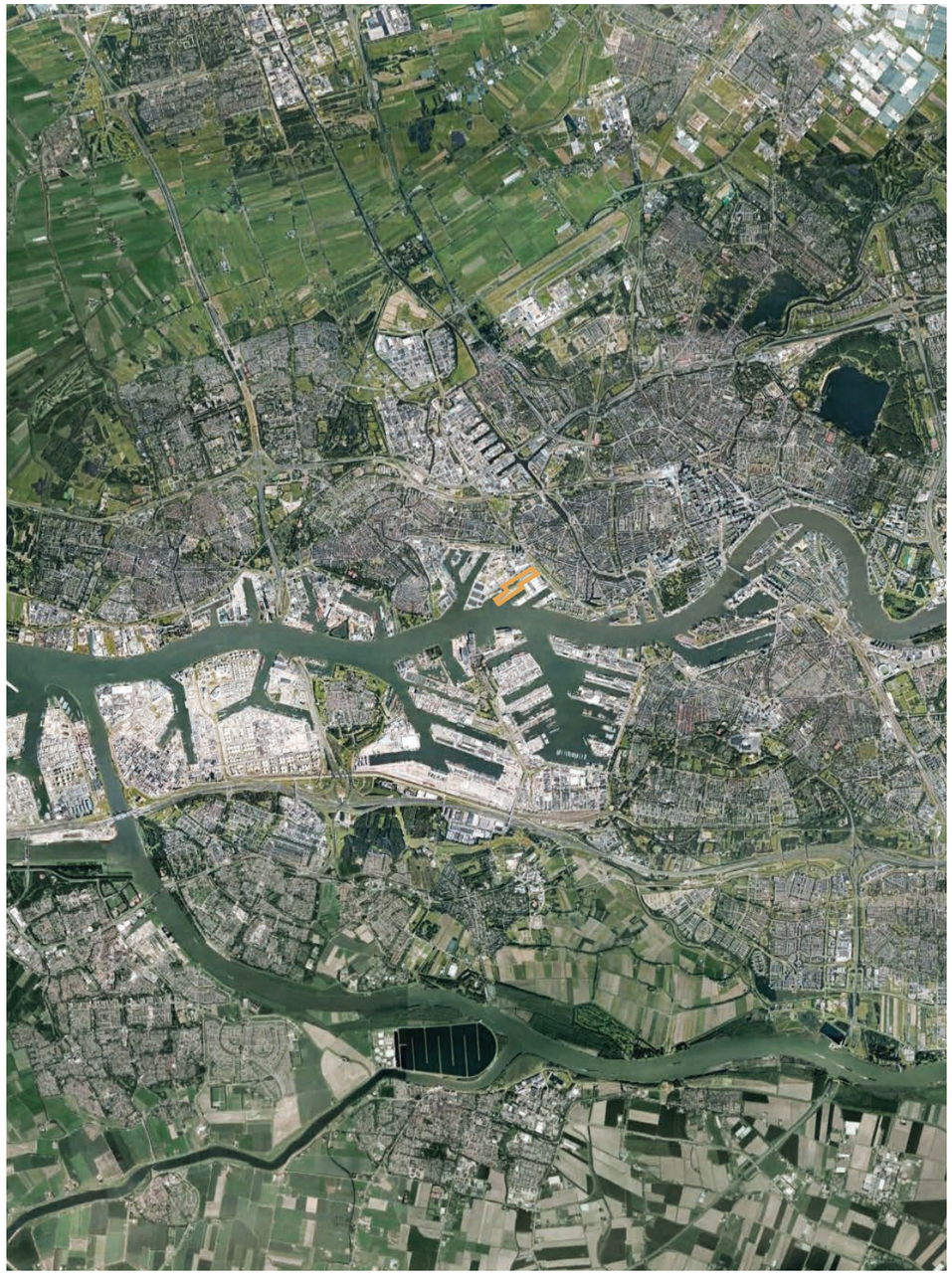
04. Masterplan

4.1 Keilekwartier

4.1.1 Introduction
The site location for the Advanced Housing Design Graduation Studio is the M4H-area in Rotterdam, on the north bank of the Maas river. The municipality's objective with regard to this soon to be transformed harbour area is to create an innovative live-work environment, intended to bring creativity, innovation and making together.

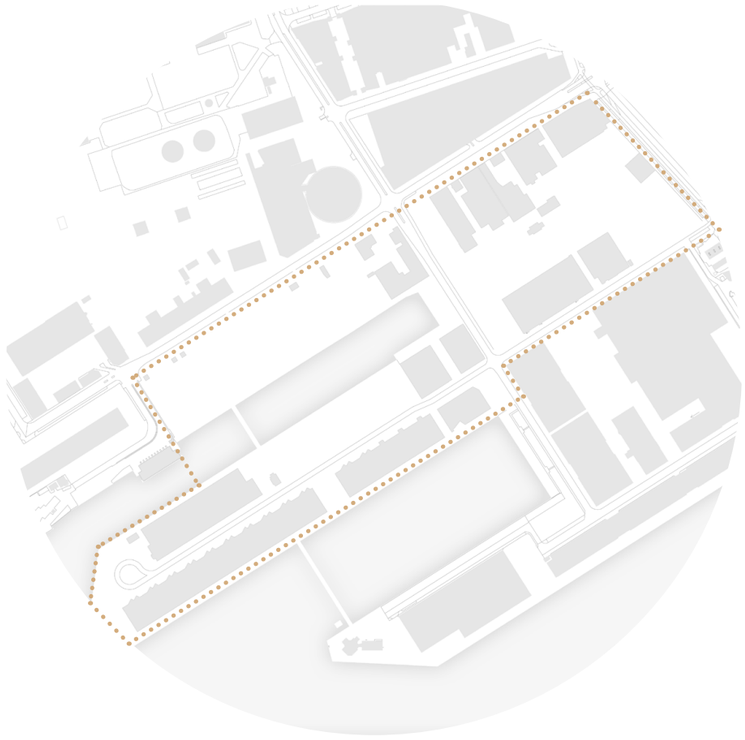
This studio is focusing on the Keilekwartier area within M4H, which is characterised by industrial buildings, commercial warehouses and brown fields sites. As such the first task was to design a masterplan for this area that can facilities dwellings and provide space for creativity and innovation. To accomplish this the studio was divided into four quadrants on the site, each with its own references projects to be infused with the overall design of the area. The following pages illustrate the outcomes of this process.

Right
Figure 12. Dock cranes loading cargo in M4H



Makers Mix Workhome

Makers Mix Workhome

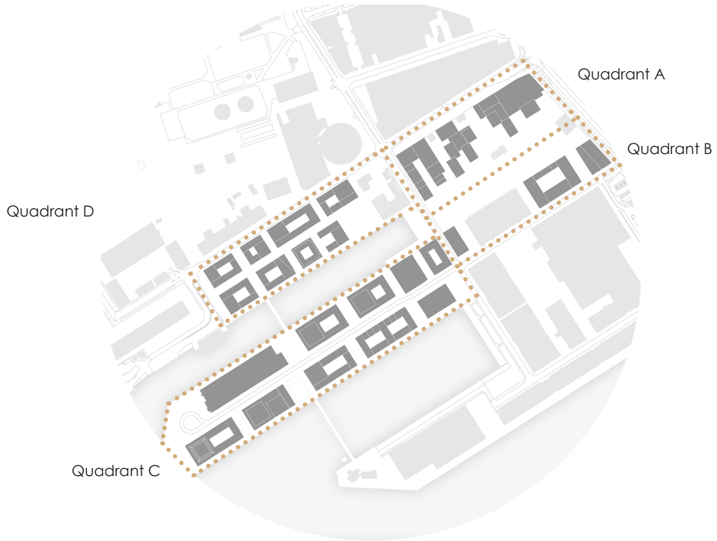


Site Boundary

Existing Site Plan

New Buildings

Proposed Masterplan



Quadrant Division

Building Functions

Positive Noilli Map

Negative Noilli Map

- Monument Buildings
- Iconic Buildings

Historic Structures

- Commercial Zone

Commercial Plinths

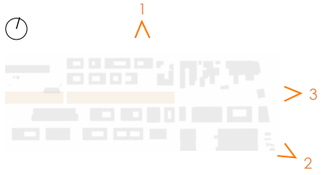
- Vehicular routes
- Bicycle routes
- Pedestrian routes

Site Circulation

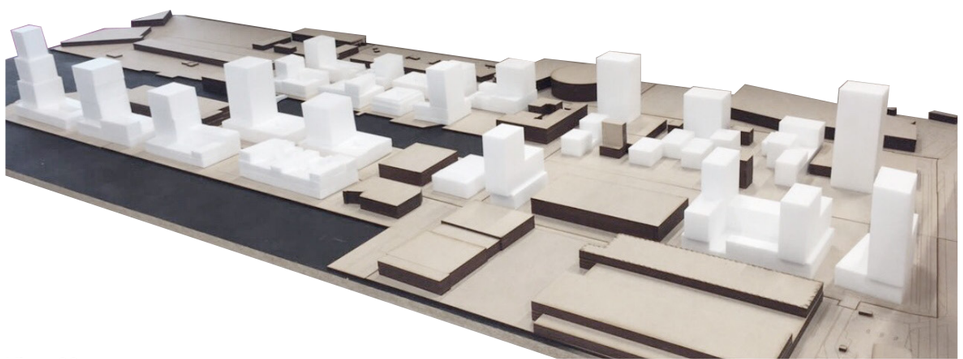
- Green space

Green Space

4.2 Model Photos



View 01



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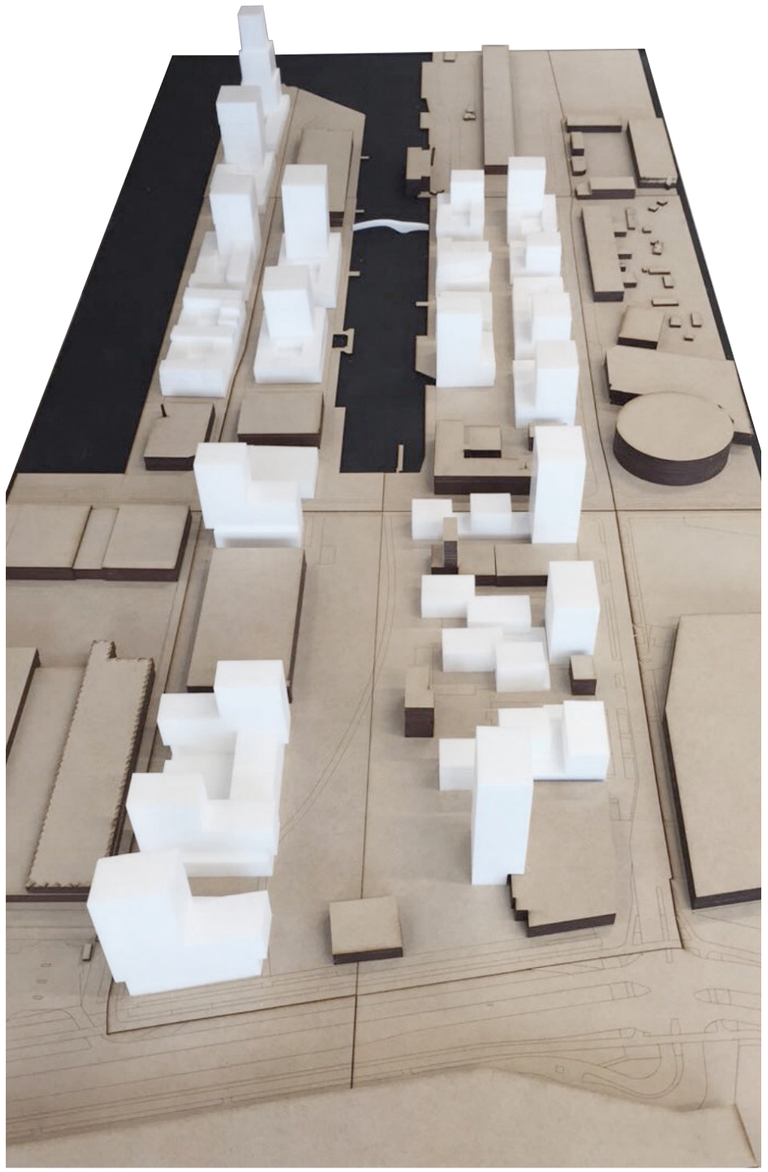
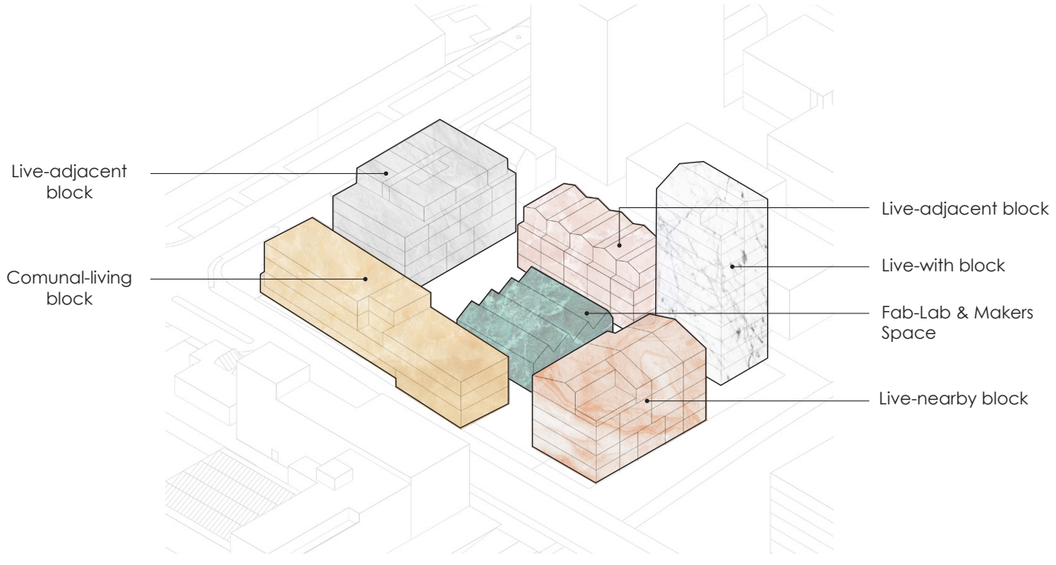


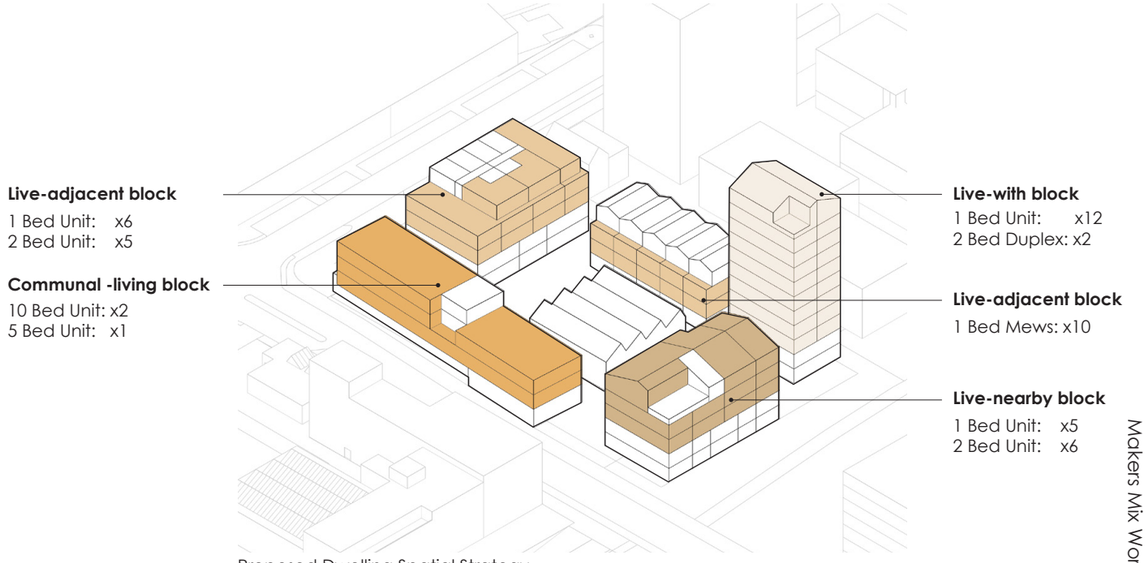
View 03

05. Concept Design

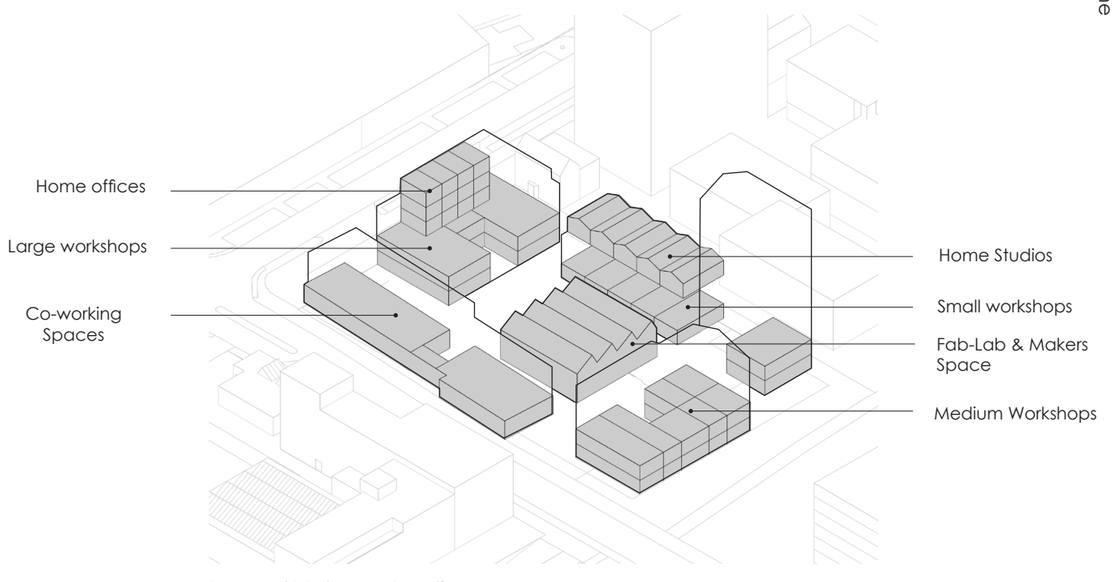
Conceptual Design



Isometric of Proposed Massing

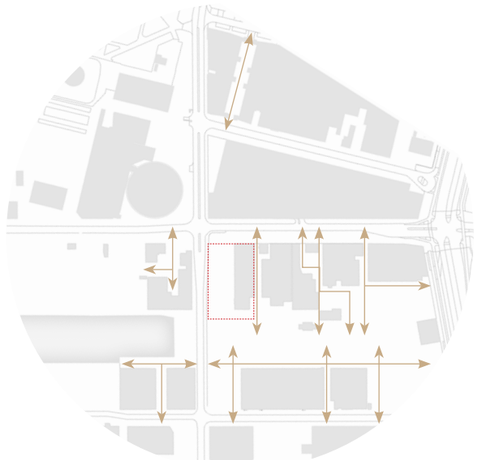


Proposed Dwelling Spatial Strategy



Proposed Workspace Location

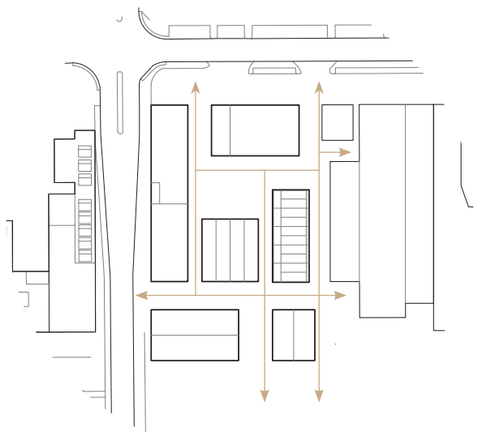
Block Layout



Alleyways

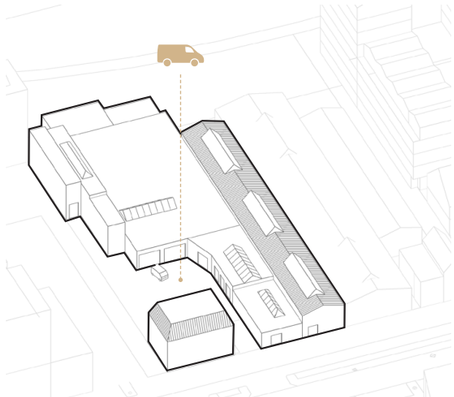
Site

Keilekwartier Site Plan

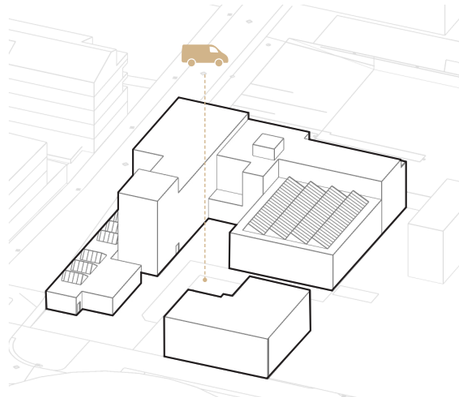


Proposed Block Location

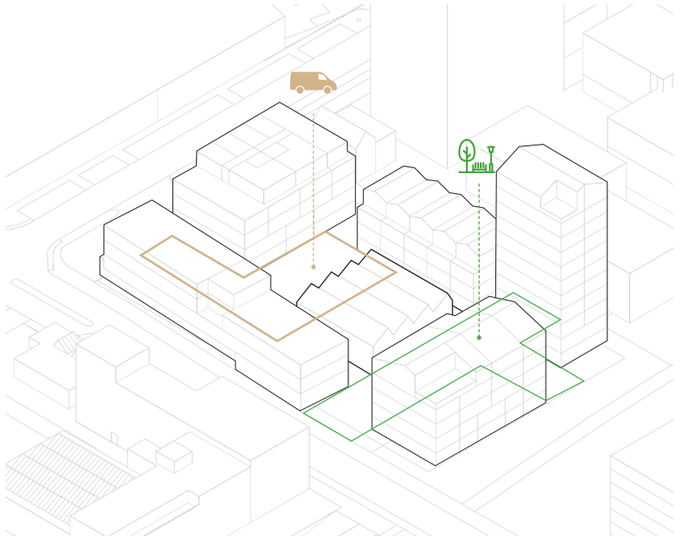
Concept: The Workyard



12 Keileweg, Keilekwartier

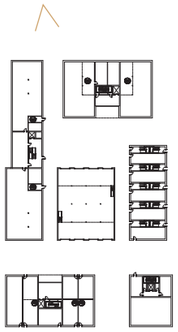


Kunst & Complex, Keilekwartier

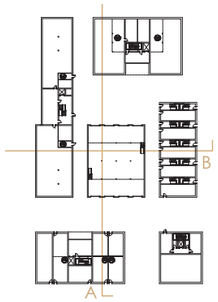


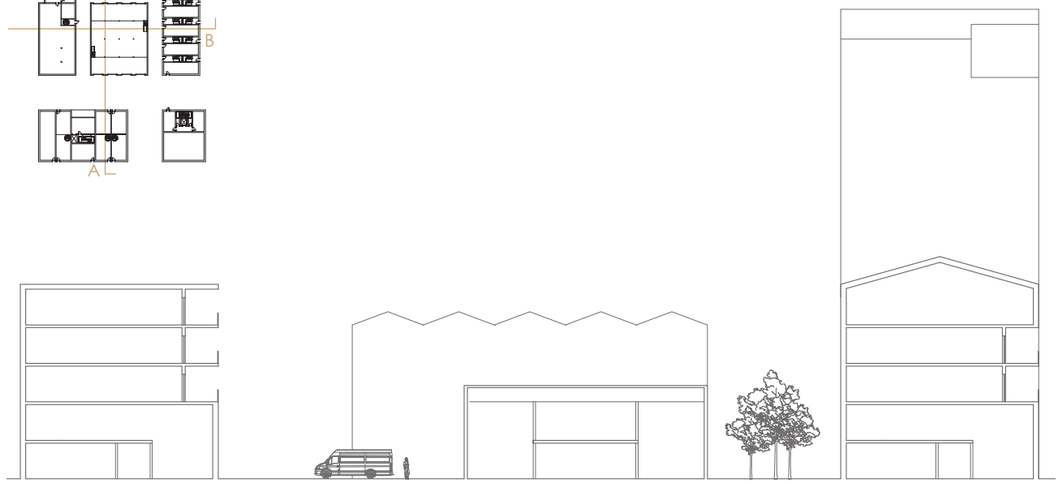
Workyard

Urban Square



Conceptual Photomontage





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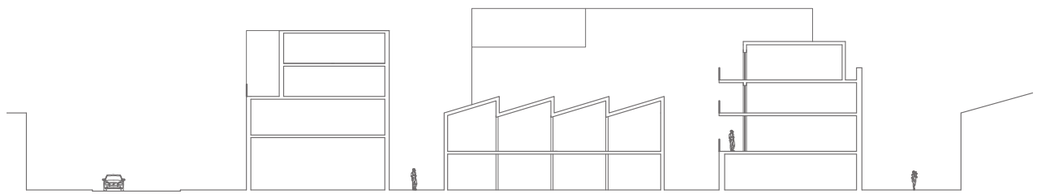

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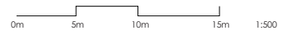
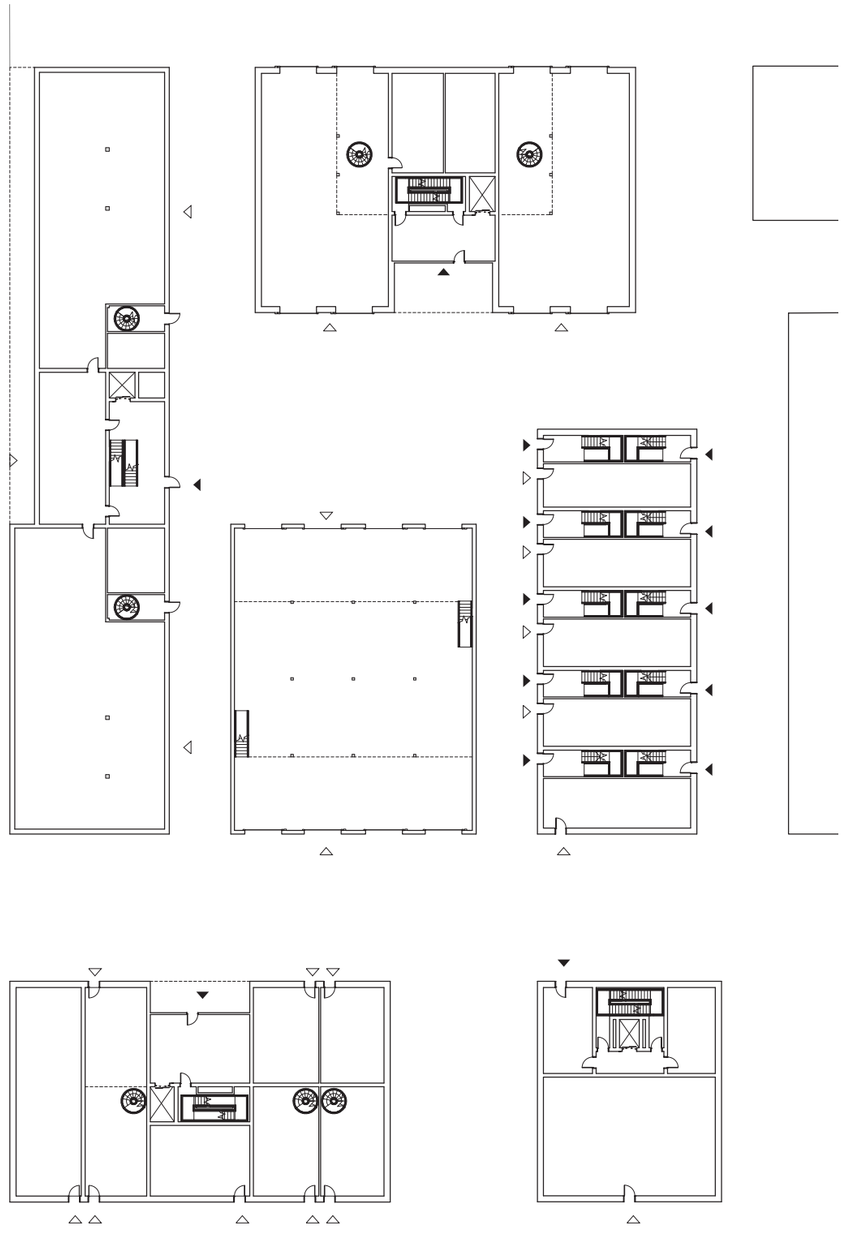




Ground Floor Plan

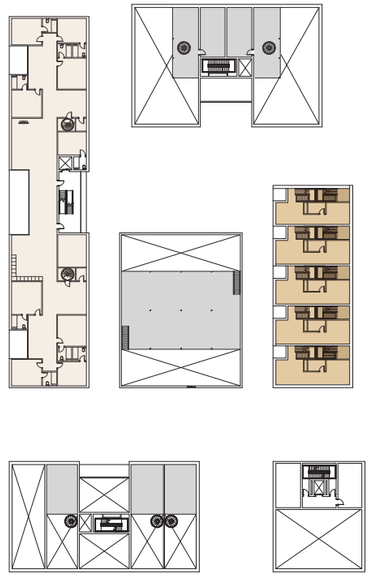
0m 5m 10m 15m 1:500

Level 02

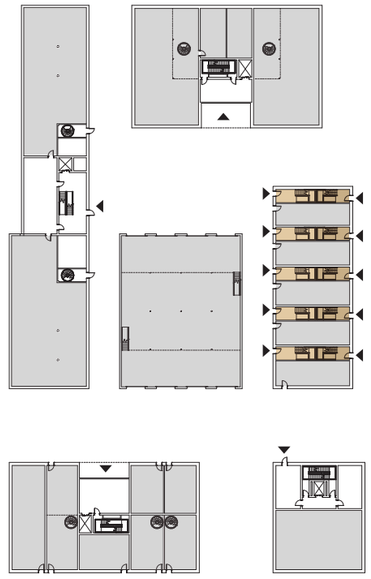
0m 5m 10m 15m 1:500

Floor Plans

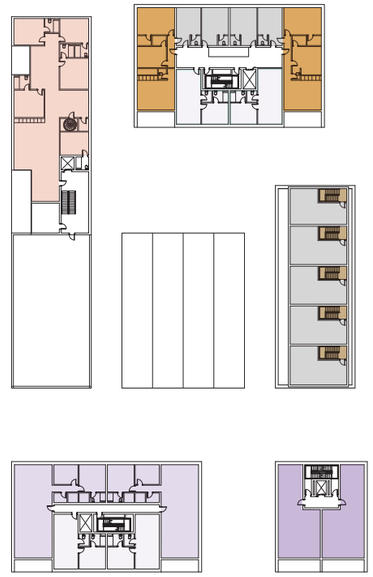
- Workshops/ Ateliers
- Type A (600m²)
  10 bedroom Communal Living space with an assortment of social and work spaces.
- Type A-2 (300m²)
  5 bedroom Communal Living space with an assortment of social and work spaces.
- Type B (60m²)
  1 Bedroom Mews house with own front door access and ground floor workspace.
- Type B -2 (60m²)
  1 Bedroom Mews house with own front door access and 3rd floor workspace.
- Type C (80m²)
  2 Bedroom unit with adjacent workspace
- Type D (50m²)
  1 Bedroom unit with adjacent workspace
- Type E (120m²)
  2 Bedroom spacious unit
- Type F (70m²)
  1 Bedroom unit with integrated workspace



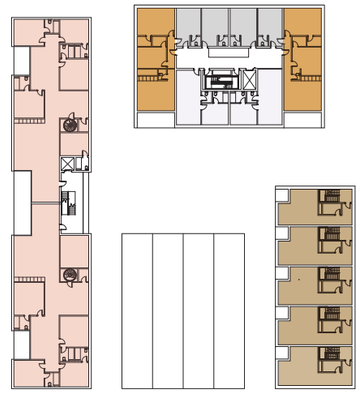
Level 01



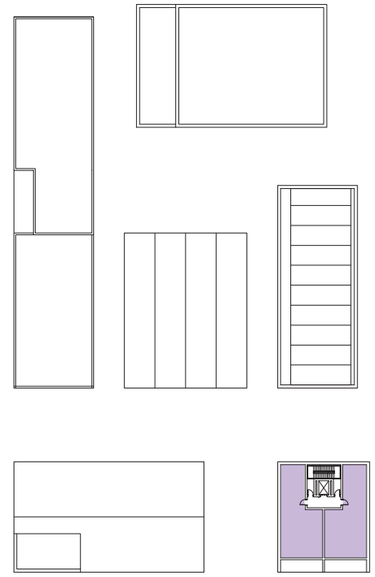
Ground Floor Plan



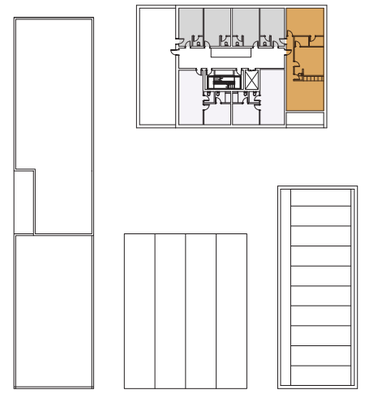
Level 03



Level 02



Level 05-10



Level 04

5.1 Design Requirements

Building Blocks
- Individual building blocks have their own identity and workhome spatial strategies.
- Building entrances are facing onto communal courtyards.
- Blocks are positioned so all living spaces have optimal sunlight.

Facilities:
- Residential access to roof top terraces.
- Bicycles parking.

Workspaces:

A Centralised Fab-Lab and Makers Spaces:	x1 (700sqm)
Co-working space:	x1 (300-500sqm)
Offices:	x 12 (25sqm)
Studios:	x 12 (25–50sqm)
Workshops:	x 3 (50-200sqm)

Dwellings:

1 Bedroom:	x 29 (50-70sqm)
2 Bedroom:	x 13 (100-120sqm)
2 Bed Duplex:	x 4 (120sqm)
Communal living:	x 3 Units (300-600sqm) , 25 Beds+

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Figure 1
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Figure 5
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Figure 6
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Figure 9
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Figure 10
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Figure 11
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Figure 12
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Appendix I.

Working from Home as a Creative or Entrepreneur sample questionaire:

1. Did you previously work at home full time before 2020?
2. Do you currently live alone or with other people/family?
3. Does your work require A desk, A studio, A workshop?
4. Do you work in a shared space such as a kitchen or bedroom?
5. Do you have a separate space, such as an office or spare room, to work in at home?
6. Are you satisfied with this arrangement?
7. Would you prefer your home to be more flexible for work space?
8. Please name an issue you have with your current arrangement?
9. Do you have enough storage space for your work?
10. Do you find it difficult inviting clients to your workspace in your home?
11. Do you find it difficult to work due to noise at home?
12. Does your work produce noise and is this a problem?
13. Does your work generate odour's or leaves a mess such as dust?
14. Is this an issue where you live?
15. You are satisfied with current work home arrangement?
16. If given the choice future work spatial arrangement what would you choice:
    - Would you prefer a workspace in a separate building even if it the costs were additional to rent?
    - Would you would prefer a flexible space in your home for working and living at no additional rent costs?
    - Would you prefer a dedicated workspace in your dwelling with separate access at no additional costs but a reduced unit ground floor area?

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Advanced Housing Design M4H Rotterdam

Maker Mix Workhome - M4H, Rotterdam

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