A COMPACT COMMUNITY

A high-density housing development that explores the concepts of compactness, transformability and community

Explanatory Document

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ABSTRACT

Housing demand has been a long running issue in Auckland. Shortages, combined with the rapidly growing population have caused a steady increase in average house prices. High-income households are not affected by this phenomena, leaving the low and middle-income households in a dire situation. Affordability, population and demographic change, dwelling size, and housing intensification are four factors that influence architectural approaches to a resolution of this housing crisis. This thesis focuses on developing an unconventional housing model that incorporates greater compactness and transformability than usually considered in standard paradigms. These two concepts will be explored with the intention that they will provide an affordable and effective solution to the problem. A high-density development using these concepts will demonstrate the way in which housing for the selected demographic can be provided economically, as well as creating an environment that promotes communality.
ACKNOWLEDGEMENTS

After five long years of all-nighters, panic attacks and self-doubt I am proud to say that I have no regrets about my decision to pursue a career in Architecture. These past few months have highlighted my passion for housing, and I intend to follow this path in the very near future.

To my family: Your unwavering love and support has been the driving force behind my completion of this programme. A very special thank you to my father, Maurice, for always being there when I need him.

To my thesis supervisor, David: Thank you for your guidance and constant encouragement throughout this year.
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1 INTRODUCTION

Research Question

Can compact, transformable housing at high-density create a more functional and socially effective model for people living in suburban Auckland?

Could such a housing model create a better social community?
Key Terms

**Compact**: housing planned to minimise waste space, including site space & public external space.

**Transformable**: housing fitted with modular furniture that can be quickly and easily turned into something else in order to provide functional flexibility of floor space.

The furniture will make the dwellings dynamic, more interesting to live in, and disguise the true compactness of the space.

**Community**: included in the title to recognise that in a design for compact housing, proximity of people to each other imposes different social expectations. The careful treatment of external public spaces is, therefore, a necessary element in the overall design.

**Family**: “consists of a couple, with or without child(ren), or one parent with child(ren), usually living together in a household.”

This thesis will focus on couple-without-children families, two-parent families, and one-parent families.

**Household**: “consists of either one person usually living alone, or two or more people usually living together and sharing facilities (e.g. eating facilities, cooking facilities, bathroom and toilet facilities, a living area), in a private dwelling.”

Included in this research are family households, multi-person households, and one-person households.

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2 Ibid.
Background

Auckland’s housing crisis is a long running issue with no simple solution. The persistent under-supply of well designed, efficient and affordable housing puts a strain on the quality of life for everyone, and dampens the functionality of society and the economy. Auckland’s population is expected to rise from 1.4 million to approximately 2.5 million over the next 30 years. According to these statistics, roughly 400,000 additional dwellings will be required by 2040. In order to meet this demand 13,000 homes have to be built each year. Currently, this challenge is not being met. Rapid population growth combined with the housing shortage have caused a continuing increase in median house prices in Auckland, further pushing the housing market beyond the reach of the majority of Auckland’s population.

Housing affordability is a critical factor that contributes to the housing shortage in Auckland. The escalating shortage of housing available to people on low and modest incomes is a very real concern. There is a strong mismatch between the housing expectations of size, quality and location, and the ability to pay. This problem will continue to worsen as the demand for housing increases with a continuing shortfall in supply.

New Zealand’s building industry focuses on small-scale and one-off designs with construction skills shortages and low productivity. These factors impact the supply and prices of housing. A solution to this problem may be to develop an incentive for intensification by creating high density developments that make use of ‘smart’ technologies, and which are responsive to rapid change in demographic and socio-economic factors. The four main issues that will be researched in further detail in this paper are: affordability, population and demographic change, dwelling size, and housing intensification.

Family types will also continue to change over the next 30 years. According to Statistics New Zealand, by 2031 there will be a greater proportion of couple-without-children families. Couple-without-children families include: couples who will never have children, couples who will have children in the future, and couples whose children have left the parental home. The number of one-parent families is also projected to increase while there will be a smaller proportion of two-parent families. This is caused by the continuing trends towards single parenting and fewer couples having children. These smaller households further emphasizes the need to abandon large stand-alone dwellings and move towards a more compact and efficient system of housing.

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Current house sizes are also a major issue when dealing with densification. While the average household size has decreased, the size of a typical stand-alone dwelling is increasing. The average dwelling size has increased by 35% from 144m² in 1991 to 220m² in 2011. The average New Zealand house is now twice the size of dwellings in most European countries. While larger houses reflect changing social trends, they also have a significant impact on urban sprawl. Additionally, expectations of house sizes far exceed the average household income. Therefore, intensified housing seems like a viable solution.

It is becoming apparent that Auckland’s traditional stand-alone dwellings are not suitable to provide a solution to the housing crisis. In fact, they are part of the problem. Our increasing population, changes in demographics, and changing household preferences along with rapidly increasing house prices calls for a more aggressive approach – one that can generate new architectural possibilities.

Scope and Limitations

This thesis will focus on exploring a suitable way of solving the issue by formulating a high density housing typology that can create a more functional and effective housing model. This project will also explore ways in which a better social and communal environment can be created. The suburb in which this project is to be developed is Onehunga. The development will have a density of 100 dwellings per hectare and will comprise of homes that are compact and transformable. This proposed study is moving away from the conventions of suburban housing demonstrated on a large scale by the Auckland paradigm. Instead, I am proposing a study that investigates the concept of ‘compactness’. Auckland has started to respond to the new idea of compact living with developments such as Beaumont Quarter. However, I am interested in a more extensive approach to this concept.

Can the compactness of temporary living spaces such as caravans and yachts be applied to create more permanent living spaces? This design will aim to push the boundaries of current standard architectural practice in Auckland by utilising moving walls, partitions and hidden compartments to create more dynamic living spaces. The pushing and pulling of components to reveal different spaces is a very intriguing concept.

Through this research topic, the aim is to create a design that offers a great deal of functionality in very little space. The aim to create a high-density development has a direct impact on community. At this density it is impossible to achieve this principle of shared open spaces. A challenge of this thesis is how to create a synergy between high-density and a sense of community. The study will delve into how this concept of

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transformation can be utilised in a manner that extends to the wider community. How can these individual compact spaces transform into social and communal spaces?

**Research Objectives**

This research topic aims to achieve the following objectives:

- test by the processes of design, a more effective and efficient home that will cater to some sectors of society.

- create a model that can be used in all suburbs across Auckland.

- demonstrate the practicality of smaller living spaces in which space and volume is minimised, but amenity is maintained by ‘transformable’ design.

This project is aimed at people of different demographics, ethnicities, and social and economic backgrounds. One of the intentions of this project is to bring these different groups of people together as one compact community.
State of Knowledge in the Field

The need for a compact way of living in higher densities has been a long running issue and a vast amount of literature is available on this topic. One such book that has been recognised in this field is, “A House in the City” by Robert Dalziel and Sheila Qureshi-Cortale. This book examines the most successful housing types throughout the world – from old to new, high rise to low rise, and innovative to conventional. The authors examine the most significant elements of urban housing design which are: adaptability and flexibility, construction and sustainability, space and light, appearance and threshold, and density and urban form.6

Another book that sheds insight on the chosen topic and is included in the literature review is, “High-Density Housing: Concepts, Planning, Construction” by Christian Schittich. This author presents international projects documenting the complexity of the task from the design of floor plans to the use of economic and efficient building systems.7 “Forty-six Square Metres of Land Doesn't Normally Become a House: Maximising Living Space Australia and New Zealand” by Stuart Harrison explores how the constraints of space often result in the most innovative designs. The author showcases forty-five examples of smaller and efficient homes.8

“Flexible Housing” by Tatjana Schneider and Jeremy Till, is a good source in this field because it demonstrates housing that can adjust to changing needs and patterns, both social and technological.9 In “Flexible Housing”, Jeremy Till refers to another book, “The Transformable House” by Jonathan Bell and Sally Godwin. In this book, the authors question the conventional layout of suburban housing and try to push established boundaries. The authors explore the concept of transformability and how far it can go to achieve more efficient residential spaces.10

“Pocket” is a very successful property development in London that is effectively changing the way we look at compact housing. Their aim is to add new building standards to apartments, allowing the design of very smart and transformable ‘pockets’ of houses. This ensures the best possible use of space while still providing all the required facilities.11 While efforts are being made to tackle the issue of compact, high-density housing overseas, Auckland developers have been slow to respond. Nevertheless, schemes have been produced that demonstrate Auckland’s attempt at the matter. Although it does not encourage compact floor plans, Beaumont Quarter in Auckland’s CBD is a successful housing development because it caters to various household demographics while achieving a density of 100 dwellings per hectare. In terms of compact design, Hobsonville Point has tried to encourage compact living by building examples of well-designed, energy-efficient, smaller dwellings with floor areas of 40m2, 83m2 and 89m2. These dwellings are considerably smaller than what is being currently built, but the market acceptance indicates that people are prepared to live in more affordable, intensified housing, granted that the area has high amenity and a range of housing types.

Methodology

In order to complete the design objectives, my approach will include quantitative research, literature reviews, and precedent studies. This will involve reviewing the literature, precedents and statistics relating to current conditions. The precedent study is an important part of the research, as it will highlight what has worked and what has not worked within the current prototypes.

1) Literature review: identify housing design criteria appropriate to New Zealand cities where preferable circumstances are evident.

2) Quantitative research: research population trends, demographic factors (household size, age groups, etc.), and growth. These trends are well documented in recent Statistics New Zealand studies. The trend towards smaller household size, and single occupant housing, apparent in Australia, Canada, and the UK, is well known, and is now evident in New Zealand. The social groups affected by this, (categorised by age, occupation, and housing aspirations), and their relative income levels, are an important part of the study.

3) Precedent study: research current housing developments in New Zealand and around the world that are similar to my project. Small changes in housing happen all the time: details of many of the houses being built at Hobsonville at present, for instance, indicate the designer’s responses to market demand at a high-period market position. The precedent analysis will therefore look closely at house type plans in current projects to identify new spatial paradigms.

In terms of design, I will strive to work in plan and section simultaneously. While floor plans help to organise space, I am going to analyse how a section can be developed to connect spaces better.

Preliminary sketches, models and conceptual diagrams are very useful as they will quickly record initial ideas. These sketches can then be developed into working drawings.
2 PRIMARY FACTORS

There are four primary factors that affect a design approach to a resolution of Auckland's housing crisis: affordability, population and demographic change, dwelling size, and housing intensification. This section will study what effect each factor has on housing in Auckland, and will examine what strategies can be used to develop a successful design outcome.

Affordability

An item is considered ‘affordable’ if it can be paid for without financial difficulty by an individual or household. Housing affordability assesses people’s ability to pay for their housing needs. It is important because a large proportion of household income is spent on accommodation. In addition to house costs, home buyers have to service their mortgages, and renters have to meet house costs while maintaining the capacity to meet other essentials such as food and transport. Low income earners bear most of the brunt with this declining affordability. High rents also pose a problem for renters who are trying to save for a deposit to enter the housing market.\(^{12}\)

According to calculations done by the Productivity Commission, housing affordability increases with age (Figure 2.1). It can be assumed that higher incomes are attained with greater work experience. However, the oldest age group contradicts this trend, possibly suggesting that while most elderly people own their own home, the incomes tend to be lower due to retirement. This model also shows that the percentage of individuals that can afford to buy a house is higher for couples than for singles. This result is expected because couples often have higher combined income and wealth. Nevertheless, the results show that affordability fell for both groups between 2003/04 and 2007/08, and continue to decline.

Housing affordability also varies across ethnic groups. European New Zealanders have the highest capacity to buy a house while Pacific Islanders have the lowest (Figure 2.2). This may be caused by location choices and differences in average incomes and wealth. The results also show that affordability declined for both groups between

It is evident that housing affordability is a major concern for individuals who are younger, single, have lower incomes, or belong to an ethnic group other than New Zealand European. While it had previously primarily been an issue for lower income households, the recent house price boom has also limited the affordability for middle-income groups.

For these households, rental accommodation is likely to be a more permanent form of accommodation rather than a temporary stepping stone into the housing market. However, rental accommodation still remains a major issue for lower income households – many of whom spend more than 30% of their income on rent.14

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13 Ibid.
14 Ibid.
Population and Demographic Change

Over the last few decades New Zealand has experienced volatile immigration and a major transformation of family structure. These changes have caused a substantial increase in demand for housing.\textsuperscript{15}

Population growth is unequally distributed across the country. Internal migration differs by age groups. Generally 20-24 year olds are prone to move between regions to pursue tertiary education and job opportunities while people in the 60+ age group are more likely to relocate to retirement-friendly regions. Some regions such as Bay of Plenty and Canterbury have steadily experienced positive internal migration while others have experienced outflows (Figure 2.3).\textsuperscript{16} The results show that Auckland moved from being a recipient of internal migration to a considerable negative outflow in the past 15 years. It may be assumed that this large decline is in part caused by households in search of more affordable housing.

Figure 2.3: Average annual internal migration


\textsuperscript{16} Ibid.
Family Type

Significant changes in family structure have triggered a fall in the average household size. Couple-with-children families are no longer the primary family type. The household composition has been transformed with singles, couple-without-children families and one-parent families taking the lead. Couple-without children families are projected to increase at an average rate of 1.7 percent a year while one-parent families are projected to increase at an average of 0.8 percent a year. Because of the continuing trends towards single parenting and fewer couples having children, the number of two-parent families is expected to decrease (Figure 2.4).17

Couple-with-children families were the most common family type in 2006 and accounted for 41 percent of all families, while couple-without-children families accounted for 40 percent. However, the graph shows that by 2008 couple-without-children families surpassed two-parent families to become the most common family type. It is projected that by 2031, couple-without-children families will account for 50 percent of all families, while two-parent families decrease to 32 percent.18

Figure 2.4: Projected families by family type


18 Ibid.
Household Type

Statistics New Zealand projections suggest that one-person households will be the fastest-growing household type increasing at an average of 2.0 percent a year. By 2031, one-person households are expected to account for 29 percent of all households (Figure 2.5). This projection is mainly due to population ageing.

Family households are also projected to increase at an average rate of 0.9 percent a year. However, the steadier increase in the number of one-person households will cause the family households to account for a smaller share of all the households in 2031 than in 2006.

The number of households containing more than one person, but not containing a family (other multi-person households) is expected to increase at an average of 1.0 percent a year. This projection is due to the influx of the younger population (19 – 29 years) hoping to pursue tertiary education and jobs. With changing trends the average household size is projected to decrease from 2.6 to 2.4 people per household between 2006 and 2031. It is clear that the decline in size is due to the increase of one-person households and a decrease in the average size of family households.

Figure 2.5: Projected households by household type


19 Ibid.
20 Ibid.
Dwelling Size

While it is evident that the average household size is steadily decreasing, Auckland's dwelling sizes are increasing. Between 1991 and 2011, the size of an average stand-alone dwelling increased by 35% (Figure 2.6).\(^{21}\)

Despite the fact that nearly 50 percent of all households consists of a majority of two people, over two thirds of Auckland dwellings have three or more bedrooms. These larger houses may reflect the need for office space and storage, but expectations seem to exceed the households’ ability to afford them. According to Statistics New Zealand, over half of all four bedroom dwellings in Auckland have two or more spare bedrooms.\(^{22}\) This underutilisation of space does nothing to improve the crisis at hand.

According to a study carried out by the Auckland Council, there was a slight decrease in the number of three bedroom dwellings in Auckland since 2006. However, there has been an increase in four bedroom dwellings (Figure 2.7).\(^{23}\)

Although it is evident that three bedroom dwellings still make up the majority of dwellings in Auckland (41%), the jump in the percentage of four and five bedroom dwellings emphasises a mismatch between increasing dwelling sizes and decreasing household sizes.


Housing Intensification

As the population continues to increase and household sizes decrease, the main aim is to avoid urban sprawl. Therefore, strategies need to be placed in order to achieve intensified housing. Research by CHRANZ (Centre for Housing Research Aotearoa New Zealand) found that people were generally satisfied with homes and lifestyles that came with intensified housing. While it has its issues, Hobsonville Point development is a good example of the peoples’ positive response to medium-density housing. It confirms the acceptance of affordable and intensified houses as long as they are well designed and located in a high amenity region.24

The next step is to introduce high-density housing to Auckland suburbs. Careful consideration needs to go into maintaining the familiarity of a suburban home while reducing the plot size extensively. Apartment housing does very little to maintain this lifestyle. In order for intensification to be accepted in suburbs, sound decision-making, flexibility, and adaptability are vital.

Based on the following research, it is evident that there is a strong correlation between all four factors. The manipulation of one issue, in turn affects the other issues. By reducing the size of the average dwelling, construction costs decrease making it more affordable. Further intensification also means more dwellings being built in a small amount of time, which has a direct impact on the house prices. The reducing household sizes also emphasise the appropriate decision to move towards more compact living arrangements.

3 LITERATURE REVIEW

High-Density Housing: Concepts, Planning, Construction

With the growing diversity of lifestyles, the need for flexible and adaptable living spaces has become an important issue in residential building. Moreover, the constantly growing population can only be accommodated by high-density housing. This book - edited by Christian Schittich - displays international projects which document the challenges and complexities of designing high-density housing. However, this review focuses on the introductory contributions in the text which discuss the problems with the current state of residential building and the justification for high-density housing.

The Challenge of High-Density Housing

The demand for housing is not as great as the demand for flexible housing. Schittich suggests that the demands for apartments for specific household configurations and social groups, and for apartments that respond to changes in society are as great as ever. There seems to be a contradiction with the issue of housing. While the social structures have considerably changed - the decline of the average nuclear family - typical floor plans are still designed for the needs of such a family. This variety of lifestyles does not need specialized floor plans. "Rather what we need are flexible types that make it possible to react to changing life circumstances by simple means."

However, people are most conservative when it comes to housing. Therefore, since clients tend to take fewer risks in the housing sector innovative design is slow to gain acceptance. While latest design and technology methods are being embraced in other areas of life (transportation, computers, community buildings, etc.) housing tastes lean towards a more established and traditional approach. This phenomenon has a vital influence on the design. In order to fit the supply to growing demand, developers end up with nothing more than mass housing where the involvement of the individual is not considered.

Urban Planning

High-density housing needs to fulfil more than the individual’s needs and wants. According to Schittich, “Good housing is more than merely the individual building.” Various factors need to be considered in addition to the building. The social interaction of the inhabitants is a fundamental issue. Therefore, careful consideration needs to go into building access as well as the layout and design of outdoor spaces around

26 Ibid.
27 Ibid., 10.
and between buildings. These design methods impact the quality of the living space. Traffic links also need to be addressed along with accessibility to public facilities. "With the growing integration of living, work and leisure, there is a need for housing ensembles with facilities that go beyond the mere supply of living space."28

**Building Form**

The number of floors plays a vital role in high-density housing. Social problems are created in high-density apartment towers due to the lack of social interaction, the anonymity of inhospitable access routes and inadequate connections to outdoor spaces. Thus, a successful apartment block should not exceed five or six storeys.

**Access**

Access can be provided via stairwells or exterior corridors. These corridors need to be designed so that they can be seen as an extension of the living space. Exterior corridors and stairs also provide access to maisonettes making "it possible to transfer the qualities of the "little house" to multi-storey buildings."29

**Floor Plan**

The design of floor plans needs to take changing social conditions into account. Consequently, plans have to respond to altered household configurations and changes within the family. Shifting household configurations require flexible apartments where the usage of most rooms is neutral. These neutral spaces can be alternatively used as a guest room, or a study, or as room for an older child.

**From Isolation in the Periphery to the Highrise of Homes in the City**

According to Klaus-Dieter Weib, detached linear housing developments are described as individual isolation in an environment that offers neither spatial qualities nor urbanity.30 A modest distance of six meters between detached houses becomes an inhospitable nuisance rather than a place of individual freedom. Screening and independence from neighbours can be achieved with structural noise protection by technical means.31 When the immediate vicinity is separated visually and acoustically, the high-density apartment can be integrated into the fabric far more successfully than the detached family home. However, this can only occur if the alternative offers the same house-like qualities of living: in the interior and at the transition to exterior space.

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28 Ibid.
29 Ibid., 11.
30 Ibid., 13.
31 Ibid.
Living in a single-family house is one-dimensional living. It is not nearly as integrated as the transition between house and garden seems to suggest.\textsuperscript{32} While the available spaces are at ground level and are privately owned, it is virtually impossible to create a spatial context out of the legally imposed dividing strips. The largest section of the standard garden is a green space just for show and remains unused while still commanding maintenance. Hans-Paul Bahrdt, a German sociologist, stated that, “Suburban houses and single-family homes, set precisely into the centre of very small lots as a result of building regulations, are less responsive to the desire for privacy than apartments.”\textsuperscript{33} The ability to choose freely among many options is a quality that differentiates life in high-density housing from the suburban single-family house lifestyle.

\textbf{Integration}

The integration of individuals as a community is an essential criterion in high-density housing. One stand-alone building may be viewed as a work of architecture, but combine many buildings together and an art other than architecture is made possible.\textsuperscript{34} A group of buildings allows various opportunities which would be impossible in an isolated building. Walking through and past buildings provides inhabitants with the ability to interact and have experiences with other individuals.

\textbf{Inside and Outside – The Search for Spatial Qualities in Contemporary Housing}

So far, it is evident that the growing diversity of housing needs and the constant change in households demands flexibility in the use of accommodation. Steps were taken to provide a suitable proposal. One solution came from Mies van der Rohe who stated that, “If the architect limits himself to treating the kitchen and the bathroom as constants, because of their plumbing, while partitioning the remaining living area with movable walls, I believe that by these means it is possible to satisfy every reasonable dwelling need.”\textsuperscript{35} Using this theory he enlisted the help of twenty-nine architects and interior decorators to design floor plans that illustrated the potential for variability for his Werkbund exhibition “Die Wohnung” (The Apartment).

The floor plans are completely open plan except for a couple of internal structural columns. On the left side of the stairs is a 48m\textsuperscript{2} apartment while the right side has a larger 75m\textsuperscript{2} apartment. These dimensions are repeated on all levels. Bathrooms and kitchens are placed against the party wall and stair enclosure making it possible for the rest of the space to be open plan.

\begin{itemize}
\item \textsuperscript{32} Ibid., 16.
\item \textsuperscript{33} Ibid.
\item \textsuperscript{34} Ibid., 17.
\item \textsuperscript{35} Ibid., 27.
\end{itemize}
Some spaces are then fitted with internal partition walls, demonstrating the real practicality of Mies’ approach to flexibility (Figure 3.1). Through these designs, Mies van der Rohe was able to convincingly determine the success of flexibility. By considering different usage options, the criteria for established minimum standards were no longer essential.

Figure 3.1: Die Wohnung, various apartment configurations

The smaller apartment is furnished for a family with one child: one bedroom with a double bed, one bedroom with a single bed, a living room, a kitchen and a bathroom with some storage space. This configuration can also accommodate a childless couple and a guest.

This larger apartment is designed to accommodate two bedrooms; one with a double bed and one with two single beds, a large kitchen, a bathroom, a small dining/living room and a small study space which can also be used as a second living space. This particular configuration can accommodate a family with two children or it can alternatively be used as a larger dwelling for a childless couple with a guest bedroom.

The larger apartment is designed to accommodate two bedrooms; one with a double bed and one with two single beds, a large kitchen, a bathroom, a small dining/living room and a small study space which can also be used as a second living space. This particular configuration can accommodate a family with two children or it can alternatively be used as a larger dwelling for a childless couple with a guest bedroom.

The larger apartment is designed for a family of six: three bedrooms with two beds each based on the cabin principle, a large living room, a large kitchen and a bathroom with additional storage space. The movable partition wall separates the living area from the kitchen. This configuration can also accommodate six friends looking to live together.

Source: Adapted by author from Schittich, High-Density Housing, 28.
“As household and family constellations become more differentiated, the demands on housing and the housing environment have undergone a complete transformation.”

Individual lifestyle groups and specific demographics have different housing needs. However, what they all require is the familiarity that a single-home possesses. Therefore, high-density housing needs to share the same qualities. Important design criteria include: noise protection, flexible completion options, patios or yards and separate entrances.

By comparison to the suburban single-family home, high-density housing offers a number of advantages:

• Central location in the city, good connection to public transportation, short distances to schools, workplace, etc.

• Good communication with neighbours

• Good protection against intruders

• Decreased property costs as a result of cost-sharing among several units.

Cohousing: A Contemporary Approach to Housing Ourselves

Designing compact, flexible housing that is affordable is a challenge that architects are still trying to come to terms with. Housing designs are usually fixed and cannot adapt to changes in income, lifestyle or size of family. Apartments and houses are not good at adapting to changing life cycles. For example, a couple moves into a small apartment, moves to a bigger house to accommodate children, and then finds there is too much space when the children leave.

In a society with a constant changing demographic there is a great need for floor plans to be able to expand spatially or contract as the occupant’s lifestyle changes. Co-housing is a movement that attempts to provide a solution to flexible living. Co-housing is about the way a community functions. It is also about the way the built environment is put together in ways that work for the inhabitants.

37 Schittich, *High-Density Housing*, 27.
38 Ibid., 28.
39 Ibid., 29.
The Tinggarden development attempts to create flexible spaces within the private dwellings (Figure 3.2). These flexible rooms or “give and take” rooms can be exchanged between the dwellings on either side.41 This particular model highlights the importance of resident stability. If people move from the development because there is no space for growth, the benefits of a stable community are jeopardized. In essence, people’s lives are rarely static, and neither should their housing be.42 Dwellings with various sizes allow residents to move within the community as their needs dictate. While this approach ensures stability, this particular way of living poses a problem for my proposal. It means that two households within the community must have a good relationship. They must also want to exchange at the same time which is rarely the case. The exchanging process also depends on the type of ownership.

Figure 3.2: Tinggarden development, give and take rooms

![Figure 3.2: Tinggarden development, give and take rooms](image)


Figure 3.3: Various possible configurations

![Figure 3.3: Various possible configurations](image)

- Young Couple
- Couple with Older children
- Couple with Young Child
- Teenager Leaves Home
- Couple with Older children
- Retired Couple

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42 Ibid., 190.
What is also recognised from this research into cohousing is the movement’s sense of community. Since this thesis examines communal living, it is vital to understand the meaning of communal and community. These two words are very closely related yet have some very subtle differences. ‘Communal’ is defined as “shared by all members of a community; for common use.” This definition is evident in cohousing with the sharing of common facilities such as kitchens and living areas. ‘Community’ is defined as “a group of people living in the same place or having a particular characteristic in common”. In cohousing there are four common characteristics:

Participatory Process: Residents organise and participate in the planning and design process for the housing development, and are responsible for all final decisions.

Intentional Neighbourhood Design: The physical design encourages a strong sense of community.

Extensive Common Facilities: An integral part of the community; common areas are designed for daily use, to supplement private living areas.

Complete Resident Management: Residents manage the development, making decisions of common concern at community meetings.43

It is apparent that in order for people to accommodate a cohousing development, they have to abide by these specific characteristics, further emphasising that a community is a group of people having a particular characteristic in common.

From this research it is clear that the cohousing approach prioritises the idea of community. While this approach is not applicable to my project, what can be considered is the attempt at flexible living and the desire to live in a more communal manner. Cohousing defines ‘communal’ as the sharing of amenities such as a group kitchen. However, ‘communal’ in this thesis will relate to the sharing of external public/private space. It is a common external space shared by all members of the community. ‘Community’ will be defined as “a group of people living in the same place”. Density is a major factor in this project, therefore, the reality of communality is determined by the scale of density. With a required density of 100 dwellings per hectare, the protection of privacy becomes an important issue; possibly superseding communal living. By substituting shared interior spaces with shared external spaces, I have the opportunity to experiment with different ways to create a sense of community while still maintaining the need for privacy. By creating external spaces of varying types and dimensions, and levels of openness or enclosure, different communal activities can occur in a very flexible manner.

43 Ibid., 38.
4 PRECEDENTS

Transformer Apartment

Transformer apartments have been designed and have successfully accommodated people in North America and Asia. These compact and efficient dwellings are vital to this thesis project because they use transformable elements in a compact space in order to provide the necessary amenities without achieving waste space. One such apartment which can be classified as a good precedent is the ‘Origami’ apartment in Manhattan. It gets its name from the various elements that fold out of a custom furniture module.

This apartment is a renovation of a 37m2 studio and the client is a single male teacher who enjoys entertaining guests and works from home occasionally. Because of the small floor areas that characterise transformer apartments, the main challenge is to incorporate all of the aspects of a larger space within a small compact space. In this particular case, rather than dividing the small space into even smaller rooms a more flexible strategy is employed.44

Figure 4.1 shows a single custom module that is inserted along one wall which contains all the functional components of a larger apartment. It includes a bed, a closet, an office space and storage space. When the elements are packed away, there is enough open space to allow for other activities to occur. The domestic spaces can be manipulated via a reconfigurable series of doors and panels that can slide and pivot open, creating individual spaces in the apartment.

Figure 4.2 shows the various configurations that can take place with the implementation of the furniture module, while Figure 4.3 shows the different compartments in the module. When it is packed away, there is space for a large living room and dining area. The open space feels more airy and loft-like. Since this apartment was designed for a client who entertains frequently it is important to provide enough space to accommodate for a larger number of people. The party configuration allows space for a lounge area as well as a living room. For house guests, a pivoting panel in the custom module creates a separation between the client and the guest. The sleeping arrangement offers space for a bed, a home office and a living room. The partitioning of space creates different areas of overlap that are not necessarily separate but leak into one another.

Figure 4.2: Various possible configurations

Figure 4.3: Different compartments within furniture module

Source: Author.
Diagoon Houses

The Diagoon houses - as seen in Figure 4.4 - are eight units of terraced houses in Delft, Netherlands designed by Herman Hertzberger in the 1970s. The principle of these houses is based on the idea of the ‘incomplete building’. This method provides a basic frame that leaves space for the personalised interpretation of the user. The houses are designed to give the occupants the power to decide how to divide the spaces and how to use them. The house can be adjusted as the composition of the family changes.

The most intriguing approach in this design is the implementation of half-storey levels attached around two fixed cores. The use of split levels and a central void increases interaction by allowing for diagonal views between family members (Figure 4.5). This concept also makes it possible for different activities to take place on each level and provides a sense of privacy while still maintaining a connection.

Figure 4.4: Diagoon houses


Figure 4.5: Split level interior spaces

Odham’s Walk

Odham’s Walk estate in London (Figure 4.6) was completed in 1981 and was primarily designed by Donald Ball. This scheme is interesting because it successfully establishes a sense of community among its occupants without diminishing the need for privacy.

The estate has a hundred and two patio apartments which are set at different heights and accessed by open walkways and external stairs (Figure 4.7). Parking is placed underground, allowing the development to be pedestrianised. Each dwelling has its own entrance either at ground level or up an external staircase, thus reducing internal circulation and the size of the overall building. It also prompts residents to connect and get to know one another.

As seen in Figure 4.8, all apartments are centred around an internal ground floor public space which allows public access through the site. The residents have to weave their way through the public green space to get to their respective dwellings, emphasising a sort of social community.
Figure 4.8: Public access through site

Pocket Housing

Pocket is a property development company in London that specialises in designing apartments that are compact and which make the best possible use of space. Recently, Pocket invited various architects to take part in a competition which involved the design of compact and affordable two-bedroom apartments in London. Through this competition, pocket aims to create a new category within the Greater London Authority’s space standards. Currently, the GLA only recommends ‘two-bedroom/three-person’ units with a minimum measurement of 61m². The contest’s winning designs are smaller, ranging from 51m² to 58m².46

Figure 4.9 shows a 54m² proposal by Mikhail Riches Architects. It is no surprise to know that conventional two bedroom apartments often waste space. When the spare bedroom is not in use, the space should serve as an additional living space. Therefore, this proposal offers maximum space for living, with practical storage considerations.47 The somewhat generic two-bedroom floor plan is transformed through the application of a folding/sliding partition wall. The simple device makes it possible to accommodate different living patterns. In the first configuration, only one bedroom is in use, offering space for a larger living area. The second configuration sees the sliding partition in use, allowing space for an extra bedroom when needed as well as ample living space. The use of one movable appliance along with smart space planning, makes this apartment a very effective proposal.

47 Ibid., 25.
Figure 4.9: 54m², two-bedroom apartment

KEY
A: Maximised living space
B: Bedroom space that adapts to life
C: Practical storage and utility space

Hobsonville Point

Auckland, to an extent, has started to address the design of compact homes in order to maximise space. In early 2014, three compact houses were built in Hobsonville Point as part of a research and development project. The purpose of the project is to explore to what extent the concept of small homes can be taken. What is essentially being researched is the possibility of trading size for quality. The smallest dwelling is a 40m² one-bedroom house. Already, the total floor area and the market acceptance of this small house suggests that Hobsonville is moving in the right direction when it comes to compact living. However, some design decisions can do with some rethinking.

As it is demonstrated in Figure 4.10, entrance into the house is past the bedroom, creating an issue with privacy. Additionally, the angled walls on the eastern and western end of the house make it difficult to manoeuvre through the space. The odd angle in the bedroom makes most of the space unusable while the angle in the kitchen makes the area feel cramped.

While efforts are being made to condense the floor area, this dwelling still acts as a single detached house. The whole Southern end of the dwelling is one solid wall. The next step in this design is to develop a concept that can accommodate more of these compact dwellings in a group so as to minimise waste site space.
Beaumont Quarter

When it comes to meeting a high density, Beaumont Quarter is successful with a density of 100 dwellings per hectare. It also manages to effectively provide different housing typologies for different demographics. However, this particular development was not chosen as a precedent for its accomplishments, but rather for the underutilization of its public open spaces. As seen in Figure 4.12, while there is a sufficient amount of green spaces, none of them can be activated efficiently. What these spaces seem to be doing is acting as privacy buffers between dwellings. There is no public seating in any of these areas, making it difficult to imagine people occupying the spaces. The greenery makes for a good scenery when accessing the dwellings and does a fine job with separating the public and private sectors. However, more effort into making these spaces interactive may give the whole development a stronger sense of a community.
Figure 4.12: Underutilization of public outdoor spaces

5 DESIGN PROCESS AND DEVELOPMENT

Site Analysis

Onehunga

There are numerous opportunities for high-density housing in Auckland. Birdwood Crescent in Parnell was investigated for its suitability as a vehicle for this project. However, after further research it became evident that Parnell was not the right suburb. Other sites were also discussed before settling on Onehunga. According to Auckland’s Unitary Plan (Figure 5.1), Onehunga is identified as a principal centre. Principal centres, along with the city centre, form the main hubs for future intensification and development in Auckland. These centres are expected to be connected to the rest of the city by high-quality transport networks. By 2050, the Onehunga principle centre is expected to grow by at least an additional 3400 dwellings.48 The plan to further intensify Onehunga’s housing developments makes this site a candidate for redevelopment.

The chosen site is on the corner of Galway Street and Grey Street. It has an area of 0.5 hectares, a good size for my proposal of 100 dwellings per hectare. The strong points of this site is related to its favourable location within the Onehunga town centre, giving residents easy access to public transport, and a wide range of commercial services and facilities (Figure 5.2).

By 2050, Onehunga aims to be a significant centre in Auckland providing a safe and attractive environment in which to live, work and play. It will be successfully connected to the city and will be a well-used interchange for public transport – especially rail. Onehunga’s proximity to the Manukau Harbour and the airport will be utilised to support economic growth in the centre. With a wide range of activities being established in the centre including education, office, hotels, retail and community facilities, it is anticipated that Onehunga will become a dynamic, vibrant centre by 2050.49 These aspirations are what makes Onehunga a very apt suburb for this project. Careful measures are also being taken to plan for an increasingly ethnically diverse population. With ethnicity comes different social and economic factors. Onehunga will become a city centre that caters to residents with varying incomes. Since my approach is small and efficient housing with a strong emphasis on affordability, this objective further influences my choice of site.

49 Ibid.
Figure 5.1: Proposed unitary plan for Onehunga

Figure 5.2: Amenities

KEY
- Bus
- Train track
- Motorway access
- Site outline
- The Atrium on Main
- Church
- Vet clinic
- Commercial outlets and eateries
- Onehunga Primary School
- St. Joseph’s School
- Countdown
- Medical centre
- Community centre and library
- Sir William Jordan Recreation Centre
- Dress Smart outlet centre
- Jellicoe Park

Source: Author.
Atrium on Main

Another reason that makes my chosen site desirable is its adjacency to an apartment complex – The Atrium on Main (Figure 5.3). While this development is not a masterpiece, it is a good example of Onehunga’s growing interest in higher density schemes. The site was chosen in order to respond – in a more successful manner – to the already existing attempt at high-density.

The Atrium on Main is a single development with 112 units. It has a density of approximately 67 dwellings per hectare and is within 10 minutes of the new Onehunga train station and buses. The development comprises a range of housing types, from studio apartments to three-storey terraced housing. It is a mixed-use development with shops and offices at street level. Majority of the parking is located in a one-level underground carpark, with some two-storey units having individual parking accessed from the upper level courtyard. It was completed in 2005 and is fully occupied.50

This development was used as a case study in a research report prepared for the Auckland Council called “Future Intensive Insights for Auckland Housing”. The research concluded that medium density housing caters well for people at various stages of their life-cycle. It met the needs of different demographics seeking affordable housing. This development offered these groups more flexibility and options compared to detached suburban housing.51

51 Ibid.
The chosen site is shown in Figure 5.4. As seen in the Amenities diagram, this location has a great opportunity for walkability and access to public transport, the Onehunga town centre, and schools. The site is located in the suburban part of Onehunga in order to retain the feel of a housing complex while still having access to public amenities.

Currently the site is being used for the Onehunga Centennial Hall and a Samoan Church. According to the Unitary Plan, terraced housing and apartment buildings are proposed on this site, justifying my decision to strip away these buildings. Part of the western side of the site looks over the public green space of Atrium on Main. This allows for a possible link between the residents of Atrium on Main and my development.

Figure 5.4: Site location and area


Figure 5.5: View of site

View to west

View to south

Source: Author.
Site Contours

Figure 5.6 shows the layout of the contours on the site. There is a 1.5m drop from the top of the site to the bottom of the site which means it is relatively flat. This feature makes it easier to design a large housing development.

The contours, however, are not the same on the site that the Atrium on Main is built on. Here, there is a 5m drop from the top of the development to the bottom of the development. This steep decline justifies the implementation of an underground carpark for the Atrium on Main.

Since there is hardly a slope on the selected site, underground parking may not be possible. Therefore, another alternative for parking needs to be used.

Figure 5.6: Site contours and entry points

KEY
- Existing buildings
- The Atrium on Main
- Link between the Atrium on Main and proposed development
- Possible entry points into site

Target Households

Based on the research into decreasing household sizes and changing demographic trends, this project will provide accommodation for five different categories:

**Solo units:** will be designed for a one-person household that consists of a single person living alone or someone who doesn't usually stay with their partner or spouse. This design will focus on one occupant, while providing the flexibility to work from home and/or accommodate guests.

**Flatting units:** will cater to a multi-person household. Design for this unit will accommodate two people who are living together, but are not in a couple relationship with each other. Privacy is to be considered in this design, allowing the occupants to access the shared bathroom without entering the living space.

**Couple-without-children family units:** will accommodate a couple without children living together in a household. Like the solo unit, the design will provide more flexible opportunities.

**One-parent family units:** will be designed to accommodate a single parent and one child who are living together. The design will focus on providing the opportunity for privacy between both individuals while maintaining shared spaces.

**Two-parent family units:** will facilitate a couple with two children. This configuration may alternatively accommodate a couple with one child and a guest. Different configurations will allow for flexibility within the household.
Transformable Elements

From the precedent study, it is evident that transformer apartments use efficient space-saving strategies to make the spaces more dynamic and functional. The Auckland market has responded, to an extent, to this approach of reducing the demands on space with hide-after-use, multi-function furniture. On this basis this project proposes the use of various transformable furniture modules in all the dwellings in order to minimise waste space while providing the basic requirements of sleeping, storage and office space.

Module One

Module one contains all the necessary functional components required for a single resident. Its dimensions are 2500mm(long)x500mmx2000mm(high), allowing it to occupy very little space. As shown in Figure 5.7, the custom module includes a folding table mounted onto a vertical board with fasteners. When the table is pulled down it can be used as a two-seater dining table or as an office desk space. When the table is set back up, the vertical board folds down to reveal a double bed. Closets on either side of the bed provide space for storage.
Figure 5.7: Various configurations of module one

Source: Author.
Module Two

With dimensions of 3000mmx500mmx2000mm, module two provides the same functions but with different configurations (Figure 5.8). A long work table can be utilised for working or studying when required. The table can then slide up to reveal a fold-out single bed. The sliding mechanism ensures that the objects on the table remain in place when it is moved. Closet and storage space on either end of the bed and above complete the module.

Figure 5.8: Various configurations of module two

Source: Author
Module Three

Module three has the same dimensions as module two. However, in this design all the functional components are clearly separated. As shown in Figure 5.9, the module includes a fold-out single bed, a closet accessed by sliding doors, storage space and a transformable office/study space. This configuration permits all functions to be used simultaneously. When all the elements are hidden away, a blank surface is created. This creates more space for other activities to occur.

Figure 5.9: Various configurations of module three

Source: Author.
Module Four

Module four is the largest of all the modules with dimensions of 4000mmx500mmx2000mm. This module incorporates a built-in sofa making it possible for it to be used in a living space. When required, the wall behind the sofa folds out to reveal a double bed, and space is provided for an office desk (Figure 5.10). The size of this module and the additional closet and storage space enables its use in dwellings with couples.

Figure 5.10: Various configurations of module four

Source: Author.
Movable Partition Panels

While the modules provide the necessary functions required in a larger space, separation between different spaces is important. Therefore, movable partition panels will also be utilised in this project. As seen in the Pocket Housing example, the use of a simple sliding partition wall creates privacy between the spaces. As shown in Figure 5.11, this device can be placed against a wall when it is not in use. When required, the panels (400mm wide) can slide out to create a partition wall, transforming the space.

Figure 5.11: Various configurations of partition panels

Source: Author.
**Kitchen Configurations**

In this project, two different kitchen configurations will be used. The kitchen designs focus on what can be achieved within a length of 2500mm. This minimum requirement ensures that only the necessary elements will be incorporated. Configuration one, as shown in Figure 5.12, is a kitchenette that occupies only one wall. It provides the basic amenities, including a cooking range, sink, dishwasher and a below the counter refrigerator. Shelving above provides some storage space. This compact kitchenette occupies very little space, allowing the rest of the dwelling to be occupied efficiently.

Configuration two (Figure 5.13) is a larger option, but with an area of 5.5m² it achieves the absolute minimum requirements for a compact kitchen. Unlike configuration one, this variation occupies the corner of two walls, determining its position in the dwelling. In addition to the basic functions, a cavity under the countertop houses a dining table. When the dining table is not in use, it can be stowed away and the space used for other functions.
Compact Units Design Basis

The following units are designed for lower and middle-income households. Based on the previously researched primary factors, it is evident that housing affordability is a major concern for individuals who are younger, single and have lower incomes. The more compact the dwelling the more affordable it is to this demographic. The changing household sizes have also influenced the design of these compact spaces. By forgoing the conventional bedroom and living room, the designs depart from regulations that need to be followed in terms of minimum room sizes. The open plan allows for various configurations to take place during different times of the day. The transforming elements within the dwelling make the space more dynamic and interesting while disguising its true compactness. It is impossible to expect people who have experienced life in larger dwellings to give up the extra space and live in such a compact manner: these dwellings, however, are designed for people who cannot afford housing in the current market. These dwellings are acceptable if residents can “borrow” and share the urban infrastructure around them. The location of these houses on the site provides that, by ensuring close proximity to cafés, shopping, etc. as seen in Figure 5.2.
Solo Unit

The unit, with a floor area of 21m², caters for one person and is designed for self-contained amenity, including cooking, dining, entertaining, sleeping, working, storage, and private outdoor space. The utilisation of module one and the small kitchenette allows the space to be as compact as possible without sacrificing the basic amenities. Configuration one shows the make-shift dining table in use while allowing ample circulation within the space. A work space can also be accomplished in this configuration. Configuration two shows the transformation of the space into a bedroom while the partition panels temporarily screen the area for privacy (Figure 5.14). This allows the flexibility to accommodate guests who might visit or stay overnight. Orientation of the units will vary depending on their position on the site. However, consideration is taken to ensure that the private outdoor space faces either north, east or west, allowing ample sunlight into the dwelling.

Figure 5.14: Solo unit floor plan (21m²)

Source: Author.
Flatting Unit

Design for this unit accommodates a multi-person household. This unit caters to two people who are living together, but are not in a couple relationship. The dwelling, with a compact floor area of 35m², offers all the basic amenities required for shared living. The living room, kitchenette and bathroom are shared while two separate rooms ensure the privacy of both occupants. In configuration one, the transformability of module two provides a work space for the residents as well as sufficient circulation to the private outdoor space, while configuration two provides a conventional bedroom (Figure 5.15). The obvious need for private circulation in shared dwellings is not being met in current built projects in Auckland. A recent example is the Thompson Park apartments in Ellerslie where the floor plan forces residents to pass through the shared living room, dining room and kitchen in order to get to the bathroom (Figure 5.16). Privacy is an important factor in this design. Occupants need to be able to access the shared bathroom without having to enter the shared living spaces. This requirement is met with both rooms leading to the bathroom directly. Both rooms have their own private outdoor space, and the east-west orientation ensures all spaces receive sufficient sunlight.

Figure 5.15: Flatting unit floor plan (35m²)

Figure 5.16: Thompson Park apartment

Source: Author.

Source: Supervisor.
**Couple-without-children Family Unit**

This 26m2 unit utilises module four and the larger kitchen, allowing various configurations to be used (Figure 5.17). The unit is designed to accommodate a couple without children living together in a household. The design offers the essential amenities, including cooking, dining, entertaining, working, sleeping, storage, and private outdoor space. In configuration one, the static sofa incorporated into module four, and extra seating creates an adequate living space that can also be used as a place for entertaining guests. Configuration two shows the transformation of the space into a dining room. The dining table under the cavity in the kitchen is pulled out to create a space to sit and eat. Configuration three shows an additional transformation of the space into a bedroom. The movable partition creates a more private and enclosed space. The use of these various transformable elements offers all the basic functions that that are required in a conventional one-bedroom unit, but in an open plan. This strategy allows the dwelling to be as compact as possible while still providing all the necessary spaces. The unit will be oriented either to the north or the east. The shallow floor plate and the appropriate orientation allows sunlight to penetrate the whole space.

**Figure 5.17: Couple-without-children family unit floor plan (26m2)**

Source: Author.
One-parent Family Unit

This unit is designed to accommodate a single parent and one child who are living together. However, the configuration also allows for a couple and one child household. The unit is only 10m2 larger than the couple-without-children family unit and the design focuses on providing the opportunity for privacy between both individuals while maintaining shared spaces. The separating wall permits different activities to take place within the dwelling. Configuration one, as illustrated in Figure 5.18, shows the simultaneous use of an adequate living room as well as a dining room. These spaces can be shared by parent and child. Modules three and four are incorporated into this design to provide each individual with different sleeping arrangements. The modules also ensure that both the parent and the child have their own working/studying and closet space. In configuration two, the dining table goes back into the cavity in the kitchen to provide space for the child to sleep. The movable partition separates this space from the rest of the dwelling, allowing some privacy between occupants. Each resident has their own access to the private outdoor space. Like the previous unit, the private outdoor space will be oriented either to the north or the east ensuring that enough sunlight penetrates the whole space.

Figure 5.18: One-parent family unit floor plan (36m2)
Two-parent Family Unit

This unit is the largest with a floor area of 48m². Design for this unit is influenced by the split-level approach of the Diagoon houses and facilitates a couple with two children. The split-level concept makes it possible for different individuals to occupy each level. It provides a sense of privacy while still maintaining a connection between all occupants. Modules two and four are used in this design in order to provide the basic functions to all residents. In configuration one, the ground floor acts as the shared space for the whole household. The television set acts as a buffer between the living room and the dining room (Figure 5.19). The packing away of the dining table provides extra space to entertain guests. Modules on the first and second floor provide both children with their own space in which to work or study. In configuration two (Figure 5.20), part of the ground floor transforms into a private bedroom for the parents with the use of the movable partition. The modules on the first and second floor transform to create a space to sleep in, and the shared bathroom can be accessed by both children without having to move through any other space. Circulation to the private outdoor space is via all the rooms, providing the potential for interaction between all family members. Glazing for the private outdoor space allows sunlight to enter the central void and light up all areas. The unit will be oriented either to the north or the east allowing adequate daylighting of all spaces.
Figure 5.19: Two-parent family unit floor plan (48m²), configuration one

Source: Author.
Figure 5.20: Two-parent family unit floor plan (48m²), configuration two

Source: Author.
Site Planning and Massing

The site plan is a crucial part of this project because the arrangement needs to provide good solar access and an element of aspect (connection to external space) to all units. As previously discussed, the communal approach to this development is through the use of shared outdoor public spaces. An interconnected streetscape within these shared spaces provides the residents with alternative routes to their dwellings, and grants the potential for interaction.

Initial Site Plan

Figure 5.21 illustrates the initial site massing of two and three story blocks. The units were combined together to create seven different typologies that were then duplicated and distributed through the site. Since high-density is a core driver for the site arrangement, effort was made to meet the 100dph requirement. While the density was met (102dph) with 51 dwellings on site, the need for parking caused the site to be extremely compact. The prospect of underground parking was not explored in this iteration. Therefore, a third of the site was required for parking. In hindsight this approach was not a viable solution. This particular layout does not give enough axial organisation. The spaces between the blocks are similar to each other making it challenging to differentiate one area from another. Additionally, there is no primary entrance into the site. The multiplicity of entrances and exits on the northern and eastern side of the site makes it very difficult for security. Attempts were made to create three public outdoor spaces for seating and interaction, but the lack of a hierarchy between these spaces hindered the potential richness of the development.
Developed Site Plan

The developed site layout is shown in Figure 5.22. A further development of this layout will be used in the final design. The number of each unit on site is based on the demographic research and changing household sizes. Since one-person households are projected to be the fastest growing household type, majority of the dwellings are solo units (31 units). The site accommodates 28 couple-without-children family units since couple-without-children families are the most common family type. 14 flatting units, 12 one-parent family units and 7 two-parent family units complete the development. The decision to maintain two to three storey heights was made to allow the development to be a part of the surrounding one and two storey dwellings.

Density

With a total of 92 dwellings, this site layout variation achieves a density of 184dph - almost double the required density. This is the maximum capacity of the site and while it exceeds the favourable density, it allows the potential for reducing it for the final design. The development is designed on two levels - the original ground level and a platform above the underground carpark (Figure 5.23). Dwellings on the platform are the dominant element of the total provision, while the units become scarcer on the ground level, allowing for more outdoor public space. The line separating the houses on the platform from the houses on the ground is determined by the number of cars that can occupy the underground carpark. The number of cars is determined by the number of units on site: by pushing the line back fewer units will occupy the top platform, reducing the density and the size of the carpark. This strategy also allows an equal distribution of units on the ground level and platform. A variation of this planning method will be used in the final design.
Figure 5.23: Section through site showing the change in levels

Source: Author.

KEY
- Solo unit
- Flatting unit
- Couple-without-children family unit
- One-parent family unit
- Two-parent family unit
- The Atrium on Main
External Circulation

Circulation on site is restricted to pedestrians, with vehicular access limited to emergency services. Main pedestrian access onto the site is from the east via a public space, with a secondary entrance on the northern end. A restriction of two entry points reduces security issues and defines a clear access point. The pathways surround the perimeter of the buildings and lead residents to their respective dwellings. There is no setback of the private outdoor spaces from these pathways, and privacy is maintained with the use of high fencing. This strategy is used in Beaumont quarter and achieves good separation between private and public spaces (Figure 5.24). The widths of the pathways fluctuate, providing a sense of enclosure without restricting movement. Access to first floor units is via external corridors and stairs. In the Odham's Walk scheme this approach reduces internal circulation. It also prompts residents to interact with each other. Circulation from the carpark to the top platform is via stairs and a lift. The placement of the stairwell and lift ensures that residents weave their way through the site to get to their dwelling, with further opportunity for interaction.

Public and Semi-Public Space

Public open space is vital to this project because its use defines the communal objective. The outdoor spaces serve to balance the scale of the built environment and provide additional outdoor amenity to residents. The two main public spaces on the ground level of the site will be developed to utilise various transformable seating elements, taking the concept of transformability used in each housing unit and linking it to the external spaces. The incorporation of transformable components with these public spaces adds a poetic richness to the development. The outdoor furniture will also allow residents to socially activate and alter the spaces as they see fit, providing the opportunity for communal gatherings. The secondary public spaces on the platform do not have an indicated purpose. Rather, they are used as natural buffers between the units. Seating may be incorporated into these spaces but is not necessary. The configuration of the dwellings provides the potential for various semi-public spaces on the first floor. These spaces are only permitted to the residents of that block. Access to these spaces is via external staircases or shared external stairs that can also be used for seating (Figure 5.25). The hierarchy of public outdoor spaces influences their use allowing for diverse activities to take place.
Figure 5.26: Aerial view of development

Source: Author.
Structure & Materiality

Timber will make up majority of the structures on site with its use in floors and partitions. Acoustic considerations are required for all dwellings: precast concrete will be used for the party walls to ensure good sound insulation as well as fire protection. A more robust structure will be required for the first floor semi-public spaces, with concrete the preferred material for this element. Although concrete is an expensive material, its use in this larger development makes it an economic solution. Timber panelling offers an effective design aesthetic for residential architecture. The use of different horizontal and vertical panelling materials will be explored in the final design.

Parking

The site development strategy incorporates one level of underground parking to achieve the required density. Although this development is not located in the central city (where underground parking is expected), Onehunga supports its use, justified by the underground carpark in the Atrium on Main project even though its density is less than 100dph. One level of underground parking is expected to be sufficient for the final design.

This decision also creates a safer and welcoming streetscape on the ground level. Access into the carpark will be on the eastern side of the site from Galway Street as depicted in Figure 5.27. 1 car park per unit is allocated with the exception of the flating unit that is allowed 2 car parks. This decision is made under the assumption that couples can carpool when going to work, whereas residents in the flating units will need their individual car space. Therefore, a maximum of 106 spaces makes up the underground carpark. The alteration of the number of units on site in the final design will accordingly change the number of spaces required. Natural ventilation is provided on the eastern and southern end of the carpark. Since the eastern end faces the street, careful design of this elevation needs to be considered.

Security and Maintenance

Security will be provided to the lift, stairwell and underground carpark with swipe card access. This will ensure that only the residents of the development have access to the carpark. While the pathways and outdoor spaces within the development are designed to connect residents to their surroundings and to integrate the development with Onehunga, they are also available for public use. A resident building manager will be required for this development, to perform service tasks such as mail and courier deliveries, and ensuring that the appearance standards of the public outdoor spaces and pathways are maintained.
Figure 5.27: Aerial view of underground carpark

Source: Author.
CONCLUSION

Based on the research done in this thesis it is evident that Auckland needs a model that can ease the demand of housing. Compactness, transformability and community are the three concepts that have been explored in this project. While this housing model does not cater to everyone, it sets a benchmark for what can be achieved. By researching the primary factors of affordability, population and demographic change, dwelling size, and housing intensification the aim of this thesis was to develop a design that demonstrates the practicality of smaller living spaces and the use of transformable elements. It is apparent that high-income households are not expected to live in these dwellings. Therefore, the design was developed with lower and middle-income households in mind.

People are willing to forgo the conventional stand-alone large dwellings for more compact spaces provided that these houses are well designed and are in an area that has high amenity. When designing these compact units consideration went into how the individuals would use domestic space. Basic functions are catered for and the open plan design provides various configurations. The compactness of these units is disguised by the implementation of different transformable features.

Transformability adds another dimension to the compact units. Furniture modules make the units more dynamic by being manipulated to create different spaces. They also provide the basic amenities required in a dwelling. At the start of the thesis it was stated that the design aim was to push the boundaries of current architectural practice in Auckland through the use of transformable components. The different modules enhance the spaces they occupy and cater to all primary needs of different household profiles.

A challenge of this project was how to create a synergy between high-density and a sense of community. From the review of "Cohousing: A Contemporary Approach to Housing Ourselves" it became apparent that a sense of community will be established through the sharing of external public space. The developed design has catered to this need by providing enough space for resident interaction. While the external spaces have not been fully developed, the idea is to incorporate the concept of transformability so as to create links between the units and the communal areas.

This thesis has investigated how the primary factors have affected Auckland's current housing shortage, and has attempted to create a model that is another alternative to resolve the problem of under supply by the market. The architectural scheme provides a range of design solutions specific to lower and middle-income demographics of various household compositions. Compact, transformable housing can create a functional model in suburban Auckland, and its development as a high-density complex offers the potential for a socially vigorous community.
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APPENDIX: PRESENTATION DRAWINGS
COMMUNITY