Where the Heck Do I Put the Barbeque?

High-Rise Housing for New Zealanders

Matthew Ashworth

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ABSTRACT

There is little doubt New Zealand is in the midst of a housing crisis. A growing population and a construction industry unable to meet demand makes housing supply an ongoing issue. The most sustainable way to meet housing demand is to increase density within existing city limits; however, growth in this way is problematic due to the stigma surrounding high-density housing. High-rise apartment living in particular is seen as undesirable to most New Zealanders.

This research investigates how high-rise apartment blocks can be better designed for the New Zealand context – specifically, how the provision of quality outdoor space can better align this typology with New Zealanders' affinity with the outdoors.

Three innovative high-rise typologies are tested on a central Wellington site. Each is designed for a different user group and provides occupants with private outdoor space that facilitates outdoor activities usually inhibited by high-rise apartment living. Accessways are investigated and reimagined as vibrant common spaces that provide occupants with additional outdoor space.

The design outcome provides residents with a diverse range of outdoor space. From common, semi-private, and fully private, this research demonstrates a range of outdoor spaces can exist in a high-rise setting. The design outcome shifts the high-rise apartment from an imported international model to a typology adapted to the New Zealand locale.

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1.0

THE PROBLEM

Figure 1.1: Existing New Zealand Apartment Blocks

1.0 INTRODUCTION

PROBLEM STATEMENT

The motivation for this research emanated from New Zealanders' negative attitudes towards high-rise apartment living. This typology is often viewed as second best; living in an apartment is a *have to*, opposed to a *want to*. Observing current housing stock highlighted a disconnect between high-rise apartments and a 'typical' New Zealand home: the provision of quality outdoor space. Apartment balconies provide outdoor space, but these generally provide a notion of outdoors with little value as a functional 'backyard'. Although the post-war 'quarter acre dream' is dead, the need for usable outdoor space still resonates with New Zealanders.

Without improved design, it is unlikely the stigma surrounding high-rise apartments will subside. This stigma is problematic as it limits the sustainable growth of New Zealand's cities. Traditional growth sprawls into arable land, placing pressure on transport infrastructure (Abrahamse 15). Increasing the intensity of our cities with high-rise developments is a more progressive approach. For this growth, high-rise apartments must appeal to the market, which highlights the importance of this research.

HUNCH

Although high-rise apartments cannot deliver equal outdoor amenity to a standalone house, I believe these two typologies can become closer.

AIM

To find ways to make the high-rise typology more appealing to New Zealanders through the provision of quality outdoor space that better aligns with New Zealander's outdoor lifestyle.

OBJECTIVES

- To provide quality outdoor space for occupants of high-rise apartments
- To promote community through the inclusion of communal space

SCOPE AND LIMITATIONS

This project's scope is specific to the site on which it is tested; however, design outcomes are relevant to the wider discipline. Although the architectural outcome is not applicable to other sites, the learnings and architectural strategies developed translate to the wider discipline.

A limitation of this project is that financial feasibility and affordability are not at the forefront of design decisions. A focus on outdoor space will likely make the design outcome less spatially efficient than a typical apartment block; however, existing apartments are generally viewed as undesirable, so generous outdoor spaces are justified to achieve the research objectives.

The methodology for this project is research by design. This method sees design as a particular way of thinking or approach to knowledge that helps to understand the broader issue. In this project the design will lead the research, rather than being the outcome of research (Frayling).

The design methodology is heavily weighted towards visual research. A series of iterative design studies is used to test and advance the design outcomes. Sketching and computer modelling are used extensively. These visual studies are complemented with aligning literature; however, this is not a focus of this research methodology.

Research will be extracted by reflecting throughout the design process and general design conclusions will be drawn at the end of each chapter. As each new design phase begins, new literature and precedents will be introduced to advance the research.

Figure 1.2: Methodology Diagram

The framework developed in this chapter formulated the following research question:

“How can high-rise housing provide better outdoor living environments for New Zealand occupants?”

2.0

“High density is nothing to fear. It’s bad design we need to guard against. It’s bad design that has frightened some off the high-density living our cities so desperately need.”
- David Shearer

2.1 New Zealand Housing: A History

New Zealanders' affinity for the outdoors can be partially attributed to the colonisation of our country. Briton Austin Mitchel referred to New Zealand as a "quarter-acre pavlova paradise" in reference to our plush green suburban sections. Inviting yards, expansive gardens and space for animals was in strong contrast to early nineteenth century Britain. This contrast was intentional to market New Zealand as a "rural paradise" to encourage immigration (Phillips 23). The average section at this time was a generous 1012m², hosting a 120m² house (figure 2.2) (Marriage 56). This settlement pattern established living expectations that are still prevalent for many people 40 years later.

Outdoor space, gardens, barbeques, backyard cricket etc. are still ingrained within our cultural preferences. Although a typical section is now 55% smaller than 40 years ago, it is still of sufficient size to accommodate many outdoor activities.

This reduction in section size can be attributed to increased land cost, smaller household sizes, and what will be referred to as the 'modern Kiwi dream'. An increasing focus (especially for younger generations) is on low maintenance, 'lock and leave' living. Occupants no longer want to spend weekends tending to large sections, but instead embrace a lifestyle of travel, work and entertainment. Apartment living is a suitable housing model to accommodate this 'modern Kiwi dream'. Although apartments fulfil part of this dream, they do not consider the need for outdoor space that is ingrained within our cultural preferences.

Finding a balance between easy 'lock and leave' living and the inclusion of outdoor space will make this adapted high-rise typology highly relevant to New Zealanders and is the aim of this research.

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Figure 2.1: Imagery promoting the paradise of New Zealand, 1912

Figure 2.2: House and section size comparison

Figure 2.3 Visualising the Kiwi Dream

2.2 Current New Zealand House & Section

Understanding how the typical New Zealand section operates is important so findings can be translated into a high-rise setting. Crofton Downs, Wellington, was chosen for this investigation as this modern suburb exemplifies current housing preferences.

64 Downing Street, Crofton Downs

59 Downing Street, Crofton Downs

65 Downing Street, Crofton Downs

54 Downing Street, Crofton Downs

Figure 2.8: Typical Kiwi Section Zoning

2.3 Research Conclusions: Current Sections

Studying Kiwi sections highlighted the distinct functions of the front and back yard. The front yard is a transitional space between the street and the dwelling's entry. The yard plays an important role in mediating between the public/private interface. Its semi-public nature makes the front yard suitable for gardening, cleaning, rubbish storage, parking, general storage, and interaction with passing neighbours.

In contrast, backyards are generally private spaces accessible from living areas. Increased privacy facilitates a number of more intimate recreational activities. Swimming pools, barbeques, outdoor seating and children's play areas are found here.

2.4 Current New Zealand Apartments

To improve high-rise apartments, an understanding of how current examples operate is vital. Through critical analysis of various apartments, conclusions will be drawn to allow a design response to be formulated. Wellington examples were studied to be consistent with the proposed design site.

Key areas of analysis were the:

- Provision and quality of private outdoor space
- Access method
- Provision of any communal space
- Entry/exit zones and the opportunity for spontaneous interaction between residents.

The following criteria were used to analyse each case study:

OUTDOOR SPACE	PRIVATE	RATING
	Quality of Private Outdoor Space:	★★★★★
	Size of Outdoor Space:	★★★★★
	Light Access:	★★★★★
	SHARED	
	Quality of Private Outdoor Space:	★★★★★
	Size of Outdoor Space:	★★★★★
	Light Access:	★★★★★
CIRCULATION	Natural Light Access:	★★★★★
	Generosity of Space:	★★★★★
	Likelihood of Casual Tenant Interaction:	★★★★★

This criteria were formulated from previous research into Kiwi sections and the elements occupants value.

Each category is rated out of five points with a possible total of 45.

Floor plans were analysed using the following colour codes:

Private Outdoor Space		Common Accessways
--	-----------------------	---	-------------------

**DNX Apartments,
111 Dixon Street, Wellington**

Number of Stories: 20
 Access Type: Point access
 Circulation as % of total typical floor plan: 21%

Figure 2.9: DNX Floor plan

DNX apartments provides balconies as private outdoor space; however these are not available for all apartments. Although provided, the balconies are ill-considered and limit usability. Balconies are offset from the access doors, limiting the opening between inside and out (figure 2.9). They are small and protrude from the façade so lack shelter.

Point access is adopted in this scheme; small access lobbies located linearly along the block are successful and are naturally lit by glass panels that enclose the stairwell. Each lobby serves four apartments, so the opportunity for resident interaction is relatively high. The common access space would be pleasant to inhabit, which is rare from the examples studied.

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Figure 2.10: DNX Street Front

OUTDOOR SPACE	PRIVATE	RATING
	Quality of Private Outdoor Space:	★★★★★
	Size of Outdoor Space:	★☆☆☆☆
	Light Access:	★★★★★
	SHARED	
	Quality of Private Outdoor Space:	★★★★★
	Size of Outdoor Space:	★★★★★
	Light Access:	★★★★★
CIRCULATION	Natural Light Access:	★★★★★
	Generosity of Space:	★☆☆☆☆
	Likelihood of Casual Tenant Interaction:	★★★☆☆

Victoria Street Precinct
160 Victoria Street, Wellington Central

Number of Stories: 12
Access Type: Central Core + Corridor
Circulation as % of total typical floor plan: 12%

This example provides no private outdoor space for occupants. Given the large family sized apartments, the choice to abandon outdoor space makes these apartments unappealing for ‘Kiwi living’. Connection to the outdoors is established with sliding doors, but no functional outdoor space is provided.

The access method is a centrally located core and access corridor. This is efficient in terms of floor area but the accessways are dark and isolated. Seven dwellings are on each floor, making interaction between occupants likely, but this will occur in an unappealing setting.

OUTDOOR SPACE	PRIVATE	RATING
	Quality of Private Outdoor Space:	★☆☆☆☆
	Size of Outdoor Space:	★☆☆☆☆
	Light Access:	★☆☆☆☆
	SHARED	
	Quality of Private Outdoor Space:	☆☆☆☆☆
	Size of Outdoor Space:	☆☆☆☆☆
	Light Access:	☆☆☆☆☆
CIRCULATION	Natural Light Access:	☆☆☆☆☆
	Generosity of Space:	★★☆☆☆
	Likelihood of Casual Tenant Interaction:	★★★☆☆

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Figure 2.12: Victoria Street Precinct

Figure 2.11: Victoria Street Precinct Floor plan

SOHO Apartments
72/80 Taranaki Street

Number of Stories: 16
 Access Type: External galleries
 Circulation as % of total typical floor plan:16%

Figure 2.13: SOHO Floor plan

OUTDOOR SPACE	PRIVATE	RATING
	Quality of Private Outdoor Space:	★★★★★
	Size of Outdoor Space:	★★★★★
	Light Access:	★★★★★
	SHARED	
	Quality of Private Outdoor Space:	★★★★★
	Size of Outdoor Space:	★★★★★
	Light Access:	★★★★★
CIRCULATION	Natural Light Access:	★★★★★
	Generosity of Space:	★★★★★
	Likelihood of Casual Tenant Interaction:	★★★★★

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Figure 2.14: SOHO Apartments

The SOHO apartments are one of few examples of gallery access in Wellington. Access placement on the exterior of the block creates naturally lit, wide spaces that are pleasant to occupy; however, outlook and expansive windows are limited to one aspect, as orientating these towards the gallery would compromise dwelling privacy.

Private outdoor space is provided by balconies. Although not huge, they are in proportion to the relatively small apartments; however, the tapering shape limits their usability.

2.5 Research Conclusions: Current Apartments

The study of Wellington apartments highlighted numerous issues:

Firstly, they *neglect to provide sufficient private outdoor space*. In most cases, no private outdoor space was provided. When provided, balconies were commonly orientated poorly for sunlight access, small, inflexible, poorly connected to the interior, and generally unattractive.

Secondly, *shared outdoor space was not available in all cases*. Shared facilities such as gyms and pools were sometimes provided, but large outdoor spaces suitable for gatherings were unavailable. This makes social interaction within a larger group difficult and inhibits the possible formation of a strong community.

Additionally, *the access method adopted in many cases did not allow for impromptu interaction between residents*. Many apartments utilised internal corridors with little to no outdoor awareness. Dark, narrow common accessways did not encourage occupation.

In these examples, circulation consumed up to one-fifth of the total typical floor area. Across an entire apartment block a significant percentage of total floor area is generally under-designed, undesirable space to occupy. These spaces will be a focus during the design phase.

2.6 High-rise Stigma

The contrast in outdoor space between a standalone home and apartment has seen a stigma surrounding high-rise housing. A national survey found 80% of respondents favoured detached homes with only 4% preferring an apartment (Preval et al. 40).

The adoption of high-rise living in New Zealand is limited as:

Residents are often less satisfied with storage, privacy, and quality of common areas. Specifically, residents have expressed concern about a lack of landscaping, poor orientation of units, lack of balconies or outdoor spaces, poor construction, cheap materials and not enough space (Dunbar 7).

Many of these concerns relate to the provision of outdoor space, which will be addressed in this research and will aid the typology in appealing to the New Zealand market.

2.7 Housing Demand

New Zealand is projected to have over 2.2 million households in 2038, 500,000 more than today (Statistics New Zealand). Meeting this demand without the use of high density housing would require a land area comparable to Hamilton City (assuming an average section size of 450m²) (Marriage 56). Developing high-rise apartments to at least partially fulfil this demand would be a more sustainable solution.

More than 60% of future households will house families (figure 2.15). However, current high-density living models are developed for other demographics and do little to consider family living (Witten 79). Witten attributes the lack of outdoor space provided as a key limitation of family apartment living (79).

The sizable gap between housing supply and demand could be met by high-rise apartment developments, but it is evident that, without design changes, the main projected household type of the future is not catered to. Increasing the outdoor space available will see apartment living as a viable option for a key household in the future.

Figure 2.15: Projected Household Types (Statistics New Zealand)

2.8 Overall Research Conclusions

- New Zealanders' affinity for the outdoors is longstanding and arose from historic settlement patterns.
- New Zealand sections are shrinking, demonstrating a lifestyle shift towards low maintenance living.
- Current high-rise apartments poorly consider private and common outdoor space.
- Demand for housing stock in New Zealand is significant, but a stigma towards high-rise housing prevents demand being fulfilled by this typology.

Parallels were drawn between the front and backyard, and the balcony and accessways of apartment buildings. The privacy of a backyard is mimicked by apartment balconies. This fully private space can be customised by the user and similar functions to a backyard occur here: entertaining, outdoor seating, and gardening.

The front yard (a transitional space between public and private) is mimicked by apartment accessways. Semi-private accessways facilitate movement from the public street into private dwellings. This space poses opportunity to operate as secondary common outdoor space (similarly to a front yard) that blurs the threshold between private dwelling and semi-private shared space.

However, the creation of these secondary outdoor spaces is inhibited by the access style adopted in most New Zealand apartment blocks: the double loaded internal corridor, that will be discussed further.

Figure 2.16: Diagram depicting correlation between aspects of a standalone house and apartment

These findings allowed the following design focus areas to be defined. These will be explored at various points throughout the design process

1. Outdoor Space
2. Circulation Method
3. Communal Facilities

3.0

3.0 DESIGN TESTING

Figure 3.1: Collage One

Figure 3.2: Collage Two

Prior to commencing formal design work, a series of collages was created to establish the design direction. The outdoor space provided by a standalone house and an apartment are in strong contrast, which highlights why a stigma towards high-rise apartments exists – Kiwis are unable to perform many activities carried out on a typical section in a high-rise setting. This visual depiction of an attempt to carry out tasks on a apartment balcony makes the further consideration of these spaces evident.

The journey from an occupant's car to their dwelling was mapped for a standalone home and an apartment (left). The difference between these journeys is significant. In an apartment, occupants experience monotonous dark double loaded corridors. For reasons of cost savings, the paths to apartments are kept as short as possible, until nothing is left but a functional remnant that compels users to get through this space as quickly as possible (Ebner 20). Hence, there is little chance for interaction, and if interaction does occur it is in an uninviting setting.

In contrast, the journey between the street and front door of a suburban home is a shorter, richer experience. The semi-public nature of a front yard creates multiple opportunities for interaction over the fence. The pleasantness of this journey is in strong contrast to an apartment as the occupant is outside as opposed to contained.

A series of collages (right) critiques the consideration of accessways as solely functional, and questions if these spaces can instead be active communal hubs. Can accessways serve a dual function of moving residents from street to dwelling, while also providing exciting communal space? Can gardens, outdoor seating, barbeque areas, and animal parks be introduced to enrich these common spaces?

Figure 3.3 (left): Diagram of access, home vs. apartment

Figure 3.4 (top): Reimagining the core, collage one

Figure 3.5 (bottom): Reimagining the core, collage two.

Figure 3.6: Sketch model, reimagining the core

A sketch model explores this further, proposing an access core can act as a functional and community core. Although not intended to be an architectural depiction, these visual studies were used to define the design focus going forward.

3.1 Access Methods

This explorative work defined apartment accessways as the initial scope for this research. To fully understand access, access methods were studied below.

PERIMETER CORRIDOR

A corridor running the length of the building, pushed to the outside of the building envelope. Similar to an access gallery, however enclosed, could be well suited to New Zealand's climate. Shared by many households - could be an active communal space.

CENTRAL CORRIDOR

This is the most common circulation method in New Zealand apartments. It is efficient but placing the circulation centrally in plan limits natural light and creates unpleasant spaces to occupy.

GALLERY ACCESS

An external walkway open to the elements, running the longest direction of the block. Allows few lifts to service many apartments. Privacy issues are created, which converts dual aspect apartments to single aspect in effort to maintain privacy.

DETACHED GALLERY

Has the advantages of a traditional access gallery, but mitigates privacy issues. Detaching and distancing the gallery from the main building mass maintains privacy in both aspects.

POINT ACCESS

Although increased vertical transport systems are required, this access method is efficient as it requires limited corridors. It can be difficult to establish a sense of community as the accessway is shared by few households.

Figure 3.7: Access diagrams

After the study of access methods, galleries were highlighted as a potential access strategy. If circulation is to become additional outdoor space that operates as a 'front yard', the availability of natural light makes gallery access a logical choice.

A literature review and precedent studies will be carried out to inform initial design work.

3.2 Access Galleries; Literature Review

Gallery access was a response to criticism of double loaded corridors identified in New Zealand apartment buildings. Stairwells and hallways lead to unlit dark zones that become angst areas within apartment blocks (Klaffke 12). By moving the circulation to the external envelope, these access corridors no longer provoke angst or displeasure as they are well lit, open spaces. This movement towards galleries was considered an important shift in bringing residents together informally by these new inhabitable spaces. The choice of access galleries over internal corridors helped to strengthen the sense of community as it encouraged residents to interact in a pleasant environment they would occupy by choice (Klaffke 10). Access galleries were intended to operate as secondary outdoor seating areas, resident meeting places and all-weather playgrounds. They are therefore a significant enhancement for the apartment units.

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Galleries were popularised by post-war British architects Alison and Peter Smithson. Their goal was to reconnect families with each other by designing "streets in the air". Their work, alongside others, will be studied here.

Robin Hood Gardens

Poplar, London
Alison and Peter Smithson
1972

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Robin Hood Gardens was the Smithson’s first realised project using gallery access. The pair believed creating “streets in the sky” was a way to design “street life” back into housing developments (Moran 166). This was a rebuttal to tower block developments of the time, which the pair felt lacked a sense of community life. Wide external galleries were designed for children to play and to encourage interaction between tenants.

Figure 3.9

Figure 3.10

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An innovative aspect of the scheme is the twinned front doors (figure 3.13). Two unit doors are set back and face each other to give a sense of ownership to the entry zone as it is not in the immediate traffic of the gallery. This introduces a different condition between the private and public threshold.

Although well intended, the access gallery proved problematic as it inhibited light access and reduced privacy due to the gallery placement at the edge of the apartment block. Dual aspect apartments effectively became single aspect as the gallery side was relatively closed off to ensure privacy was not compromised.

Figure 3.11

Figure 3.12

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Figure 3.13: Plan, including twinned front doors

REDACTED

Figure 3.14: Plan, including 'yards' off gallery access

REDACTED

REDACTED

Figure 3.15 Customised outdoor 'yard'

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Figure 3.17: Section

Figure 3.16: Street frontage with gallery access

Housing for the Elderly

Amersfoort, Koekoekstraat

KCAP, Rotterdam

1996

This precedent extends the idea of active galleries. To maximise sun exposure, the access gallery is set 3m in front of the façade. Its width is maximised in an effort to transform the accessways into living streets.

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A unique design decision is the placement of private balconies adjacent to the common accessway, linking the 'living street' to the front door. As figure 3.14 shows, voids either side of the balcony maximise a sense of space, light and establish privacy.

The balconies (which are accessed from glass double doors) are the size of a small room and can be used as a recreational space, vestibule, study or winter garden. Flexibility is maximised as the resident can customise the privacy of this space. The areas can be part of the resident's private home, or can open up to become shared space connecting to the gallery. As figure 3.15 shows, planting and/or fences are used by residents to enclose or open the space as desired. The balconies operate as a threshold between public and private, and the way this threshold can be dictated by the occupant makes the precedent relevant to this research.

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Figure 3.18 (Top) Voids between gallery facing 'yards'

Figure 3.19 (Above) Close relationship between yard and gallery

ALTERNATING FACADE

A series of sketch models explored various ways galleries can be implemented.

Alternating façade: allows for double height galleries that allow greater light access to apartments; however, twice the vertical circulation is required.

Detached + Bridged: Maintains privacy as the distance between windows and gallery is maximised. Pulling the gallery away from the block increases shading.

Gallery every second floor, with stairs to upper level floor: Good privacy for upper apartments as they are located above the common walkway. High intensity common spaces are created as two galleries are consolidated into one.

DETACHED / BRIDGED

EVERY SECOND FLOOR, STAIRED

GALLERY SKETCH MODELS

Figure 3.20: Cardboard Sketch Model Series

What if the gallery becomes communal space: the shared garden, swimming pool, or outdoor shared BBQ area. This is how this design experimentation started: pushing galleries to the point where they became equal part communal space and access.

A wide access gallery acting as an active façade was initially explored.

Experiments in geometry, scale, and arrangement in section were made to maximise dwelling privacy (figure 3.21). This was partially successful and dual aspect outlook could be maintained, even with access on one side.

Figure 3.22 explores how privacy is established through various physical means. Planting, fences, or movable screens that allow the occupant to dictate the privacy of their outdoor space are explored.

Figure 3.22: Privacy Sketch Experiments

Figure 3.21: Gallery Iterative Design Process

The initial design response used a combination of raised platforms in section, and orientation in plan to maintain privacy. Raising the entry platforms 750mm above the gallery was effective as it created a clear boundary between accessways and the private outdoor space, retained privacy of the home by offsetting eye levels between the private home and the gallery, and created the opportunity for integrated outdoor storage in this 750mm cavity.

The raised entry platforms are intended to operate as semi-private 'front yards' where interaction between residents is desired. The staggering in plan is designed to create a more private corner of the front yard, which is visually hidden from the accessway. Fully private space (a 'back yard') is provided for each dwelling by a more traditional balcony.

Figure 3.23: Sketch Plan

Figure 3.24: Perspective Sketch - Gallery as a common yard

3.3 Gallery as Common Yard

Figure 3.24 explores utilising galleries as common active façades. Pulling and pushing the form in plan allowed for the creation of deeper zones that can facilitate planting and common leisure facilities. Barbeque areas, common gardens, outdoor seating, paddling pools, sandpits and various other leisure zones are created. These accessways are active living façades that facilitate the creation of community by accommodating activities usually inhibited by apartment living.

3.4 Design Conclusions

Design was used as a tool to test the viability of gallery access in apartment blocks. An issue with this access method is sunlight access. When placed on the northern façade, sunlight to the accessway is maximised, yet sun and daylight to the apartments is limited. Conversely, when placed on the southern façade, apartments receive maximum sun, but the communal space is compromised due to its orientation.

Although galleries can facilitate common activity, the intensity of these spaces may prevent their success. With a gallery on each floor, the foot traffic through each common gallery may be insufficient to create busy active spaces.

This design test produced valuable research outcomes relating to the threshold between common and private space. Investigations into how separation can be achieved through the use of levels and barriers is knowledge that will be taken forward into future design work.

This design test raised the following questions:

Is the intensity of occupants per floor sufficient that such spaces will not be abandoned?
Will outdoor communal spaces be viable given New Zealand's climate?

3.5 Introduction of Site

Research findings from the sketch design highlighted the effect orientation has on sunlight access to outdoor spaces. Defining a site will inform design outcomes by introducing site characteristics, including orientation and shading.

The site, on the corner of Broderick Road and Bannister Avenue in Johnsonville, Wellington, has been chosen given the proposed development strategy outlined in the Johnsonville Town Centre Plan. Increased density is encouraged through the amendment of zoning rules to allow for apartment living in the town centre (Wellington City Council 15).

Johnsonville's location relative to Wellington CBD makes it well suited to increased urban intensity. Satellite towns with strong transport links are appropriate locations for high-density developments (Southcombe 39). This is supported by the provision of local amenities in Johnsonville, which have further capacity to cater for an increased population in the future.

Within the overall context of Johnsonville, the site is suitable. The shopping centre on Johnsonville Road and the train station are within five to ten minutes walking distance. This proximity is ideal as it is within these limits that people consider walking to make use of such facilities (Wellington City Council 3).

Key aspects for choosing this site:

- The presence of dual street frontages for maximum light access.
- Northern aspect.
- Flat topography ideal for development.
- The site's proximity to outdoor recreation facilities such as Alex Moore Park.

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Figure 3.26: Existing Site

Figure 3.27: Site and surrounds plan

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Further precedent studies are introduced to further the research and answer questions raised by previous design work. Techniques to increase the intensity of accessways are a focus.

Precedent Study; Unité d'Habitation, Marseille, France. Le Corbusier, 1952.

Unité d'Habitation has been studied to understand its unique method of consolidating access routes to maximise intensity. As figure 3.29 depicts, interlocking split-level dwellings require one access corridor per three residential floors. Entry to each dwelling is through a generous internal double loaded corridor.

The advantages of this access arrangement include:

- Increased intensity of accessways, i.e. one corridor is used to serve two apartments in section. This is a 200% increase in intensity, and therefore heightens the possibility for interaction between residents.
- Efficient model as corridors are minimised, hence occupiable apartment floor area is maximised.
- The intensity of these accessways allows for generously proportioned "streets" to be designed. As figure 3.30 shows, colourful wide accessways can facilitate activities such as children's bike riding.
- The apartment and access arrangement allows for: dual aspect apartments that maximises all-day sun access and, the inclusion of double-height living spaces.

This work has also been studied due to the array of public/private facilities throughout. At ground level, the building mass is lifted up to accommodate a public park. An 'interior road' on level 7 has public facilities including a small shopping centre. This is supplemented by a rooftop kindergarten and nursery, garden and a small swimming pool. This project demonstrates how outdoor space has been considered across multiple scales.

Figure 3.29: Section

Figure 3.30: Internal Corridors

REDACTED

3.6 Sketch Design

Drawing research conclusions from the initial design exploration and introducing further precedent studies allows a new design phase to commence. The area of focus for this phase will be increasing the intensity of circulation routes, and maximising sun access to apartments and common outdoor spaces.

Although Unité d'Habitation created intensive accessways, the access streets were also criticised as lacking natural lighting and are rather dark and gloomy even with Corbusier's use of bright colour. Although intensity had been achieved to promote the inhabitation of this space, ultimately, dark, uninviting double loaded corridors are the result. These are not visually or environmentally appealing spaces to occupy.

This design phase began by proposing a blend of the previous two design concepts: the open-air gallery, and an internal corridor every three floors to increase intensity. Initial sketches explore this:

Figure 3.31: Plan

Figure 3.32: Section

The proposal places two gallery access blocks together, creating a central common 'arcade'. Research findings from the gallery exploration have been adopted with shifts in height used to maximise privacy. The raised access platforms are intended to operate as 'front yards'. Unlike Unité d'Habitation where the threshold between common space and apartment was clearly defined by a front door, this threshold will be softer with a closer relationship between private and common realms.

This design creates a more functional common arcade but does not yet address how natural light will be introduced. Figure 3.33 demonstrates how this is achieved:

Figure 3.33: Form Comparison

A fragmented building form is achieved by stacking irregular shaped typologies to create a porous block. This allows light to access the central arcade, which is open to the elements and includes double height spaces. This addresses the concern of natural light, while also allowing the large-scale space to facilitate a wealth of common outdoor activities.

The variants that construct this porous form are:

- 3 Bedroom Family Unit.
- 2 Bedroom (level) designed for the elderly.
- 2 Bedroom.
- 1 Bedroom Studio.

Through this stacking, the roof of one apartment becomes the outdoor garden space of another. By arranging the typologies purposely, larger outdoor spaces are allocated to apartment variants that require more outdoor space.

TYPOLOGIES

Figure 3.34: Typology Diagram

The width of the common arcade is maximised to facilitate common activities. Biking, gardening and children's play can occur here. Separation of each household's 'front yard' is established by raising the front door and a small deck 750mm from the common arcade. This shift creates a barrier to define the common and semi-private zones and maintains privacy as eye levels between public and private are offset. To further increase usability, the 'front yards' have been angled to create a greater expanse of usable wall for the occupant, and this creates a private zone in the corner (figure 3.35).

To increase the lightness of the central arcade and to create a larger common area, a secondary arcade runs perpendicular to the primary axis. This space (from which no apartments are accessed and hence privacy is not compromised) provides a large common garden and seating area for residents. A typical floor plan is shown below. The shaded areas indicate where building forms cross the arcade overhead.

Figure 3.36

Figure 3.37

The perspectives above show the complexity of the arcade space. The various typologies allow the stacking process to create interesting outdoor spaces on levels above the arcade. The porous fabric allows for natural light access and double height spaces. The interplay between levels creates moments of connection and a sense of community is established where residents can interact at the arcade level, but interaction can also take place across/between other levels.

3.7 Design Conclusions

A criticism of design phase 1 was the choice of site. The resistance to increased density from locals and the small scale of the existing urban fabric made the scheme inappropriate for Johnsonville. Choosing a site with a larger northern face was encouraged given the research focus on outdoor space. Central Wellington sites will be investigated in the following design phase.

The progression of Le Corbusier's access corridor created an innovative outcome that solved issues of intensity and light access; however, implementing this in a high-rise building greater than five floors would likely create dark spaces that would not function as intended. To maintain relevance, design outcomes should be applicable and translatable to the wider discipline; in its current form, it has limited significance to other projects. Alternative access methods should be explored to ensure design outcomes operate in a high-rise setting, regardless of building height.

Further concern surrounds the difficulty to maintain privacy in an environment where there are viewshafts into and across the common arcade. A sense of surveillance may occur that would limit one's enjoyment of their home. Additionally, the arrangement of apartments results in some units having south orientated balconies, which makes for unappealing outdoor spaces. This highlights that focus is needed on the design of private outdoor space, which was under-considered in this design phase.

An overall critique was that the site was not sufficiently engaged with, hence the design had a sense of placelessness. The site did not yet inform the design, which is a weakness of the scheme. The importance of site will be stressed going forward, with comprehensive site analysis informing future design work.

4.0

4.1 Change of Site

A change of site was necessary as concluded at the end of the sketch design phase. The scheme is more appropriate for Central Wellington.

The proposed site incorporates 50 – 68 Cable Street and 197-217 Wakefield Streets, as shown in figure 4.2. The 5500m² site is currently undeveloped and utilised solely for parking.

The site has been chosen for the following reasons:

- Larger site allows for greater testing of different typologies.
- Strong access routes for pedestrians.
- Large north face.
- Accessible by car, due to proximity to two one-way systems.
- Proximity to the waterfront leisure precinct.
- Proximity to the Courtenay Place entertainment precinct.
- Proximity to the Lambton Quay business precinct.

The development of a high-rise block may pose shading issues. To test the site's suitability, a study of the existing urban fabric was conducted (figure 4.1). The majority of shading is to the south, which includes no residential developments and is earmarked for a supermarket. This site is therefore suited to high-rise development.

Figure 4.1: Site Surrounds

Figure 4.3: Site Analysis

4.2 Photographic Study; Site and Context

PEDESTRIAN APPROACH

COURTENAY PLACE APPROACH

TE PAPA APPROACH

SURROUNDING
UBRAN FABRIC

WAKEFIELD ST, WEST

WAKEFIELD ST, EAST

This site is commonly used as a pedestrian thoroughfare between Courtenay Place and the waterfront. The pedestrian journey along this path was documented, as maintaining a public accessway may be appropriate.

The surrounding urban fabric is suitable for residential development. Many of the neighbouring buildings are apartments; the Piermont and Portal apartments are located to the east and west respectively.

CABLE STREET, EAST

CABLE STREET, WEST

Figure 4.4: Photographic Study

4.3 User Groups

The site's scale allows various housing typologies to be accommodated. Research into the projected household composition of New Zealand homes in the future highlighted three main types (Statistics New Zealand):

- 1) Living alone or couple with no children.
- 2) Middle aged couple with older children.
- 3) Family with younger children.

These proposed groups meet the expected housing demands in the future, and the use of multiple typologies fosters a sense of community within the overall development. Residential developments that provide a variety of typologies for an appropriate range of living choices; tenures and occupancies help to sustain local neighbourhoods (Housing New Zealand 22).

To provide a design framework, a brief for each typology was formulated:

YOUNG FAMILY

- Multiple outdoor areas to facilitate a range of outdoor activities
- 3/4 Bedroom apartments
- Generous living zones to accommodate large families.
- 2 Bathrooms
- Outdoor storage space
- A large area where families can gather at a wider scale as a community

SINGLE / COUPLE

- Outdoor space should not be compromised just because it is a one bedroom apartment. A flexible outdoor space is required
- 1 bedroom
- 1 bathroom
- Living zone
- Good connection to outdoor area

**OLDER COUPLE WITH
ADOLESCENT CHILD**

- A private space to interact as a family
- 3 Bedrooms
- 2 Bathrooms
- Generous living spaces
- Common spaces that encourage interaction with the wider community
- Outdoor storage space

Further site planning was conducted with the three typologies in mind. A perimeter block style development suited the site geometry and allowed for the creation of a potential common park.

The rough placement of each typology on site placed the lower rise family typology on the north, with the higher tower typology for smaller families to the south

4.5 Scheme Overview

The site's geometry lends itself to an adaptation of a perimeter block typology. The expansive site with various street frontages facilitates three building types, one for each user group. These are arranged around a central park. Buildings were placed in accordance to a sun study to minimize site shading. The lowest building is located on the northern boundary, and the high-rise tower to the south. As the research is focused on outdoor space, the inclusion of a common park was a means to test the potential value of common outdoor space. The scheme offers residents a gradient of outdoor space, moving from private balcony to shared accessways and a common park.

The design process of each typology will be documented individually, with precedents introduced when necessary.

Figure 4.8: Birdseye Site Overview (top)

To begin, precedents that used building form to maximise outdoor space were explored. This was particularly important for the family units where greater outdoor space is desired.

Brunswick Centre. Camden, London. Patrick Hodgkinson, 1972

Hodgkinson originally intended to design two tower blocks for this site but was unable to, given planning restrictions. However, he still wanted to achieve the same density as a tower block. His solution was a series of terraced rows flanking an open shopping street that sits above two levels of underground parking. The housing blocks were stepped to open the shopping street to the sky, and this aided every apartment in receiving at least two hours of direct sunlight daily.

The scheme adopts access galleries that are accessed via external lift and stair cores (figure 4.9). The integration of the public arcade is interesting and relevant. In section this allows for the inclusion of outdoor gardens on the roof of these retail tenancies (figure 4.10). By separating these in section, a clear divide between the private and public areas of the site is established. This is an aspect that needs to be considered in the scheme considering the proposed pedestrian walkway between Cable Street and Wakefield Street.

REDACTED

Figure 4.9: Brunswick Centre Plan

REDACTED

Figure 4.10: Brunswick Centre Section

REDACTED

Terracing allowed for the creation of generous outdoor spaces. Enclosed sunrooms and outdoor balconies are provided for each apartment. This offers the occupant flexible outdoor spaces that receive good sunlight due to their terraced form.

4.6 Terrace Typology

The Brunswick Centre influenced the design of the terrace typology. The site's north orientation made terracing appropriate to maximise sunny outdoor space. This typology is designed for families where generous outdoor space is desired to facilitate children's play, etc. As figure 4.12 shows, terracing creates large outdoor spaces, and this shift allows for a combination of covered and uncovered outdoor space.

The floor plan consists of three generous bedrooms, two bathrooms and a central living area (figure 4.13). The northern wall of the living area has been pulled back to maximise light penetration in plan, and to create a larger covered outdoor area. Two apartments are arranged, side by side, mirrored in orientation.

Figure 4.12: Terracing Diagram (right)

Figure 4.13: Terrace Floor plan (below)

Access

Opposed to galleries running parallel to the block, which creates privacy and shading issues, the galleries run perpendicular. As figure 4.14 shows, a series of cores, with connecting access platforms run the length of the block. The platforms (shown in yellow) are wide and operate as a shared common space for gardening, biking and other outdoor activities.

Figure 4.14: Common Entry Platforms

The platform connects to a back 'porch', shared between two neighboring dwellings. This is a variation of the Smithsons' twinned front door design discussed earlier. This space provides additional outdoor space suited to storage of shoes, etc. A 'shed' opens from this porch, providing storage, which is commonly overlooked in the design of family apartments

Figure 4.15: Common Entry Platforms - Perspective

Figure 4.16 Common Entry Platforms - Plan

The figures above show how the gallery platform and back 'porch' for each apartment operates. This space is shared by two households and can facilitate outdoor activities and/or common garden space.

4.7 Tower Typology

The tower block is located on the southern boundary facing Wakefield Street. This location is well suited for this typology as site shading will be mitigated. Point access is adopted, with lift cores serving two apartments per floor. These are set back from the north and south façade for visual interest, but it also allows for better light access to the apartments. The apartments are 2-bedroom, 2-bathroom units with north facing living zones. The shape of the floor plan maximises light, opening up the northern corner of each apartment. Two balconies are provided: the main north facing living room balcony, and a secondary south facing balcony off the master bedroom. The corner of the living room is angled to maximise the depth of the balcony, which is a key aspect to creating a usable, flexible outdoor space.

Figure 4.17: Balcony design (left)
Figure 4.18: Tower exterior (above)
Figure 4.19: Tower floor plan (below)

4.8 Studio Typology

The one-bedroom studio typology wraps around the eastern site boundary. Findings from previous design and precedent studies highlighted gallery access as suitable considering the typology's placement on site. Because the typology sits on the boundary, its outlook to the east is highly limited. Hence, these apartments are designed as single aspect, west facing units. Although there is no outlook to the east, there is good light access due to the provision of a large lightwell of the adjacent Piermont Apartments. Because of this, the gallery is placed on the east side of the block, which does not limit sun or light access to the apartments, but also makes for attractive accessways.

Figure 4.20: Studio sketch plan

Figure 4.21: Studio sketch section

The plan and sectional studies show the relationship to the adjacent lightwell. Six levels of apartments sit above an open-air level that provides a sheltered area for the common park at ground level.

Figure 4.22: Studio sketch perspective

Figure 4.23: Studio Plan

To maximise light access to the interior, the depth of the apartments is minimised. The 6m deep floorplate is well illuminated even with single aspect glazing.

Rooms are arranged in a series from least to most private. The occupant enters their full depth outdoor area via the gallery and moves into their living/ kitchen/dining room, from which a bedroom and bathroom are accessed. Although compact, large full height sliding doors between each room allow for expansion and increase the flexibility of the home.

With good daylight on each side and a shallow floor plate, an innovative full-depth outdoor space has been designed. This gives the overall form a porosity as is shown in figure 4.24. The yards are accessed by large sliding doors opening off the living space, making for a seamless transition between inside and outside.

Figure 4.24: Studio Elevation

Figure 4.25: Scheme section

A section between Cable and Wakefield Streets shows the public walkway separated in height from the common park. This allows pedestrians to experience the park without gaining access. Extensive planting provides shelter and large open park areas accommodate outdoor activities. This park is activated by residents moving through the space to access their apartment's lift cores.

Figure 4.26: Site Plan

Three typologies wrap around the central common park. The front terrace block is sliced to maximise sun access to the central park.

4.9 Design Conclusions

TERRACE The terrace typology maximised north facing outdoor space but also raised numerous issues. The integration with the urban fabric was problematic because the terraced form (sitting between two masses flush with the street) looks visually disjointed in elevation. Secondly, the terraced form encloses the central park, limiting sun access. The disruption to the park is further exacerbated by the lift access cores that intrude into the common park. Although breaks in the terrace were designed to maximise light access to the park, the Cable Street façade is visually disjointed.

STUDIO The studio apartment is the most successful typology. While its simplistic planning is effective, it requires further refinement to ensure the apartments are of functional size. The location of the urban yards adjacent and accessible from the access gallery was innovative and addressed the research question.

A future area of design focus is the threshold between the public accessway and private yard. Because these are in such close proximity, mediating between them is important. Investigation into this threshold will be explored in subsequent design work.

TOWER This typology requires significant development and will be the priority for design phase two. The response to access methods is very typical. Previous research into innovative access methods was not architecturalised in this case. The outdoor space is not an improvement on many current apartments. Although two balconies are included per dwelling, the size, shape and usability of these are not unique. Additionally, common space and access routes are under-considered and should be addressed moving forward.

OVERALL SCHEME The creation of three typologies that investigate access and outdoor space was successful due to its broad relevance to the discipline. This creates three examples of how this research can be expressed in various architectural forms. The initial site analysis and subsequent placement of building mass based off sunlight and neighboring buildings was seen as a highly considered response to site. However, further development of the western boundary is needed as this part of the site is undeveloped dead space.

An area of critique for the scheme was the central common park. Although the inclusion of a park has conceptual merit, in its unresolved state it is unconvincing and offers little to the scheme. Key issues are: the terrace typology enclosing this space, access shafts intruding into the park, as well as limited sun access. This space risks becoming inactive dead space, but the inclusion of retail or common amenity is a possible solution to invigorate this space.

Although the public thoroughfare was conceptually promising and would be well used, careful consideration of the mediation between public and private is required. This will be a focus of the next design phase to ensure separation is achieved.

5.0

5.0 DEVELOPED DESIGN

5.1 Scheme Overview

A similar site arrangement remains, with three typologies arranged around a central common park. The typology facing Cable Street, and the high-rise typology have both been radically redesigned to be more porous allowing more light to enter the park.

The process that led to this point is documented in this chapter. Each typology's design process is documented independently, beginning with the high-rise tower.

Figure 5.1: Site Overview (top)

46 Rue de l'Ourcq, Paris
Philippe Gazeau, 1993

The previous chapter concluded a new access method for the high-rise tower is necessary. Phillippe Gazeau's housing development adopts a unique access method.

26 apartments are accessed from a series of staggered access platforms (figure 5.5). These are not solely accessways, with the oversized wooden platforms also operating as a common leisure terrace. Their staggered geometry creates double height spaces that maximise light access and the usability of the space.

These platforms could be adapted for New Zealand; however, consideration for our colder climate and how these would operate in a high-rise setting would be needed. Shelter, particularly from wind, would be needed to make this access method viable for Wellington.

REDACTED

Figure 5.2: Street Elevation

REDACTED

Figure 5.3: Rear Elevation

REDACTED

REDACTED

Figure 5.4: Access Platforms

Figure 5.5: Section

5.2 Tower Typology - Access and Outdoor Yards

Based on the findings of the initial design phase and further precedent studies, an alternative access method has been devised. This method is an adaptation of gallery access, which mitigates the loss of privacy and sun access issues. As figure 5.6 shows, a traditional access gallery runs longitudinally along a block, which turns dual aspect apartments into single aspect to maintain privacy. The proposed access method instead runs accessways transversely, cutting through the form. The apartments are accessed from the side, while maintaining dual aspects to the north and south. This effectively becomes a form of point access. These accessways can maintain an open-air nature and potentially provide additional outdoor space associated with individual apartments.

Initial sketches show how this operates in section: a platform every floor, accessed by a stair and lift core to the south. In plan, the platform operates as a shared 'front yard' for the two adjacent apartments. This shared space would not compromise privacy to the extent of a traditional gallery, as this space is only accessed by two households, so fewer residents move through this space.

Limitations are also identified in this access method. Although the platform yards are intended to be outdoors, they are enclosed on three sides, and are limited in scale due to the inter-floor height. The lift and stair placement blocks outlook or sun access to the south. Although this solution looks viable, it is questionable whether these spaces would be pleasant to occupy.

Figure 5.6: Access Diagram

Figure 5.7: Section

Figure 5.8: Plan

Figure 5.9: Sectional study

Subsequent sketch work focused on making the platforms more open by increasing the inter-floor height. Through the design of split level apartments, the access platforms can be arranged to achieve a double height exterior space of 6m. This arrangement is shown in figure 5.9, with access platforms only necessary every alternate floor. By increasing the inter-floor height of the outdoor platforms to 6m, the outdoor space becomes lighter, more practical, and versatile. Adopting a split-level apartment design also aids in maintaining privacy for residents. As figure 5.9 depicts, by arranging the bedrooms on the upper floor of this double height outdoor space, users of the yard below are unable to see into more private areas of the home. Conversely, the kitchen/living/dining zone opens freely onto this supplementary outdoor space.

A split-level apartment design improved the quality of the outdoor platforms and addressed issues of privacy; however, the use of a relatively small three-bedroom split-level apartment model is problematic for planning. Stairs use a relatively large floor area, which wastes significant space. Further, liveability would be compromised as the internal flow will not be as pleasant as a single level apartment.

The final concept addresses the identified issues by reversing the previous model: having split level platforms, and single level apartments. As the sketch work below depicts, the access platforms alternate between north and south orientation, and are linked by central stairs. This is advantageous for many reasons:

- 1) Centrally located stairs prevent any light blockage from the north or south, which ensures natural light floods these outdoor spaces.
- 2) More engagement is encouraged between neighbours as the relationship between platforms in section is established more closely.
- 3) Single level apartments are maintained, while privacy for bedrooms etc. is maintained.

Split level access platforms require two variations of floor plan. The shifting orientation requires north and south entry floor plans to be designed; however, this is advantageous to the scheme as repetition of identical floor plans can make for a monotonous uninteresting design outcome.

Figure 5.10: Various sketches

Figure 5.11: Site massing experiments

Prior to detailed design commencing, minimum and ideal sizes for the apartment and circulation 'modules' need to be established. The size of the three-bedroom apartment was established through the study of precedent floor plans. A module of 8m by 16m deep was chosen. This depth was tested and found to reduce the occurrence of internal rooms with no outdoor connection and awareness.

For the outdoor and circulation areas, the same depth of 16m is adopted, with a width of 5m. This was partially determined by the total site width but was also judged as sufficient space for circulation and wide enough that each adjacent apartment has a sense of its own outdoor space. These modules were tested on site. A number of iterations were explored, shifting these modules across the site to determine the site layout that is the most efficient and with the most aesthetic site planning potential (figure 5.11).

Access Module: Development

Maximising light access to the platforms was the area of focus for the initial design. For this reason, the following design decisions were made:

- Locate the main lift-shaft in the adjacent tower block to limit light obstruction.
- Align stairs centrally in plan so voids can be created either side. This also increases privacy and light to the apartments.
- Use perforated materials throughout, open air risers to reduce visual bulk and maximise light access.

Figure 5.12: Access Module

Figure 5.13: North Entry Apartment Floor plan

Figure 5.14: South Entry Apartment Floor plan

North Entry

This research is focused on quality outdoor space; hence living and outdoor spaces are north oriented. The apartment is entered via a shared outdoor platform. This space is intended to operate as a front yard, with informal, functional outdoor activities facilitated here. A double door “shed” is included to store tools, outdoor furniture, bikes, kayaks etc. A recessed front door provides sheltered storage space. The north orientated open plan living/dining/kitchen is generous and well lit. A generous balcony flows from the living space. The ensuite and main bathroom are placed centrally in plan as their lack of outdoor awareness or light is not of concern. Of the three bedrooms, two are generous doubles. Their sizing is based on the Auckland design guide, which optimises the flexibility of the space (figure 5.15). The third bedroom is compromised in scale due to the lift placement. This is suited for use as a single room or study.

REDACTED

Figure 5.15: Optimal Bedroom Sizing

South Entry

Mirroring the northern floor plan vertically could have been a solution, but this would have positioned the balcony and living areas to the south, which is not desirable. Instead, the living area and balcony remain on the north, and access is provided by a small hallway. This variation includes a sheltered front door and storage ‘shed’. The remainder of the floor plan is similar to the north orientation – 3 bedrooms, with 2 bathrooms arranged centrally. The hallway compromises the amount of storage in the apartment slightly; however the advantage of the alternating outdoor platforms creating double height external space outweighs this compromise.

Limitations

The intrusion of the lift core on the floor plan is a limitation of this access model. Positioning the lift within the apartment module maximised light penetration to the outdoor access platforms but had a greater impact on planning than anticipated. The shaft takes up significant floor area and turns a 3-bedroom apartment, into a 2.5 bedroom unit. To rectify this, refinement of the access module is investigated.

A study of alternative stair arrangements was carried out.

The design test altered the stair type and relocated the lift shaft. The initial stairs were a single flight with a return platform. This required the occupant to walk along a platform before proceeding up the next flight. This lengthened the access route, but also made maneuvering furniture difficult due to the longer distance and tight corners.

Through an iterative study, a switchback stair was found as the best solution to connect the platforms. This solution uses the existing outdoor platforms as landings, which reduces the overall depth of the stair unit, maximising the size and flexibility of the platform 'front yards'. The lift core is relocated to the south of the stairs. This frees up internal floor space, allowing all apartments to be generous 3-bedrooms.

Figure 5.16: Stair study

Final Stair Solution

Figure 5.17

Final Stair Solution: Section

Figure 5.18

Figure 5.19: Final North Entry Apartment Floor Plan

Figure 5.20: Final South Entry Apartment Floor Plan

The relocation of the lift shaft has improved the apartment floor plans significantly. All three bedrooms are functional doubles that allow for flexibility and additional furniture. Outdoor awareness, storage and good natural light are provided to each bedroom. The bathrooms are generous, and include storage. The open plan living/kitchen/dining includes a study nook and good storage throughout. In both the north and south iteration, the living and balcony are north-orientated to maximise sunlight.

5.3 Highrise Tower; Façade Design

The Wakefield Street façade is complex and has many aspects that need consideration. The façade is expansive due to the height of the high-rise tower and needs to operate as a clearly legible entrance to the through site access. Careful consideration of the surrounding urban fabric is required to ensure the design sits well in the setting.

The site is neighboured by Fuji Xerox (a historic four story brick building) to the west and the Piermont Apartments (a contemporary ten storey block) to the east. Both buildings (shown above) influenced the initial sketch design, which aimed to create clear relationships to this existing building context through façade design.

Initial sketches investigate how the rhythm of the façade can echo the surrounds. The pronounced vertical 'shafts' spaced evenly across the façade of the Piermont Apartments are echoed through the repeated open-air access yards that adopt this same rhythm.

The tower's height raised concern given its visual contrast to the historic four-story Fuji Xerox building to the west. The initial sketch (figure 5.23) explores how using a different cladding and formal setback in part of the western façade can visually relate these two façades.

5.4 Public Through Site Access

The site axis has been used to inform the placement of this thoroughfare, and to make it clearly legible. At this pivot point the building mass has been extruded as shown in figure 5.24. This visual expression in the façade is legible from the street and removing the lower four floors of this extrusion creates a public accessway.

In section, there are many aspects that require consideration. The heights of the common park and public walkway have been established by the design of the Cable Street entrance, as shown in figure 5.25. With Wakefield Street sitting lower than the public walkway, a ramp has been used to move pedestrians up to the walkway. The choice of a ramp makes the walkway highly accessible and creates a seamless transition through the site.

Materials have been used as a tool to further express this entrance. Perforated metal cladding wraps around the front façade and through the public walkway to add direction to the façade. This also accommodates large windows without compromising the privacy of the common amenity included in the lower levels.

Figure 5.24: Public through site access entrance. View moving from west to east across the façade, demonstrating it is visually pronounced from all angles.

Figure 5.25: Slice through pedestrian entry - looking west

Figure 5.26: Slice through pedestrian entry - looking east

5.5 Inclusion of Shared Amenity - Tower Typology

The inclusion of common amenity in the scheme was necessary.

Participation in community activities in apartments cultivates a sense of community and belonging and thus forms a stable community culture in apartment complexes (Cho 1439). In general, well-established community spaces supply more choices for residents and eventually increase residential satisfaction (Cho 1431).

The base of the tower block was the appropriate place to locate this amenity. Due to the fall across the site and by raising the common park, in section there is a one-story difference between the level of the common park, and that of Wakefield Street (figure 5.27).

Figure 5.27: Plinth design - relationship to park and street

A two level 'plinth' on which the tower block sits has been designed. On the ground floor, retail tenancies accessible from Wakefield Street are proposed, with common amenity placed on the second level opening to the common park. This split-level design is effective at maintaining privacy for the common amenity as it sits above street level.

Figure 5.28: Plinth design - Access

Figure 5.28 shows how the access cores along the façade will connect the public street to the common park. Secure access doors lead to a double height lobby with lift shaft and stairs up to a secondary lobby at park level. The lift shaft is double sided, so level access is achieved from both the street and park lobbies.

The elevation in figure 5.29 shows these cores spaced along Wakefield Street.

The following common amenities, and ground floor retail are integrated between the cores: a swimming pool, gym, events centre, business centre, commercial kitchen and workshop.

These are included for the resident's benefit as the facilities allow activities related to a typical house to be carried out in a higher density setting. For example, large birthday parties can be held by booking the events center. Working from home is also viable as a business center is included.

Figure 5.29: Wakefield Street Elevation

Figure 5.30: Plinth Floor Plan

Placement of these common amenities is indicated in figure 5.30.

The workshop and kitchen have been placed in the southeastern corner as this receives the least sunlight. This is not an issue as these are not light dependent activities. Conversely, the pool has been placed in the sunniest corner of the park. It receives light from the park but also has expansive street facing glazing. The pool's connection to the outdoors is important, so large stacker sliding doors allow for expansive level access to the common park when weather permits.

The gym has been placed alongside the pool, so changing room facilities can be shared. This gym, which also has outlook to the park and the street, is accessed from the adjacent access core, which allows for the ability to have membership options for the general public. Swipe access could be given to members to allow access to this core only, ensuring access to the overall development is limited.

5.6 Urban Yard Typology

The terraced block proposed for the Cable Street boundary intended to maximise north facing outdoor space. This was achieved, but its terraced geometry shaded and enclosed the common park.

A redesign was necessary. The potential of entering an apartment through a yard (in a similar manner to the redesigned tower block) will be explored. This emulates how a standalone house is accessed via a front yard.

These apartments are designed for families with children and multiple outdoor spaces are desired.

In section, two split level apartments interlock. This gives an apartment module height of three stories. Considering the north aspect and shading implications, this module will repeat twice, creating six floors of apartments. Between these two modules, an open air common access floor is proposed. The overall building height is nine floors: one level of Cable Street retail; six levels of apartments; an intermediate access yard floor; and a rooftop access floor (figure 5.31).

The journey from street to dwelling is radically different to existing access models. Access cores are located at the east, west and centre of the block. Unlike traditional apartments where a lift services every floor, lift access is limited to the intermediate and rooftop access floors. This intensifies access routes, meaning there is far greater chance for resident interaction, which promotes the creation of community within these common zones.

Figure 5.31: Section

Figure 5.32: Cable Street Elevation

Figure 5.33: Plan

From the lift cores, residents move down an open air central corridor zone with yards on either side (figure 5.33). These yards will be semi enclosed with low fences to establish boundaries without limiting light access. To maximise light access to this open level, the interfloor height was increased to 4m.

From this shared corridor, residents move through their own outdoor 'front yard' and proceed up or down stairs to their apartment above/below the common yard level, depending on the apartment variation.

Figure 5.34

Figure 5.35

UPSTAIRS ACCESS TO APARTMENT

DOWNSTAIRS ACCESS TO APARTMENT

An advantage of placing the yards on a separate floor is that it allows their scale to be maximised. If outdoor spaces this size were placed off living zones in a similar fashion to a typical balcony, daylight entering the apartment would be severely limited. The proposed arrangement ensures the living area and yard both receive maximum daylight.

It is necessary to include a supplementary outdoor space adjacent to the living areas to provide a private 'back yard' for occupants. Without these, the flow between inside and outside would be hindered, as the only outdoor space would be on a different level. A more traditional north facing balcony integrated into the Cable Street façade provides occupants with the flexibility of multiple outdoor spaces.

The initial floor plans for the two apartment variations are shown on the next page.

Figure 5.36: Relationship between balcony and urban yard above

TYPOLGY A

(accessed down stairs from either the common yard floor, or rooftop yards)

TYPOLGY B

(accessed up stairs from either the common yard floor, or common park)

The initial design concept was successful; however, its massing overshadowed the park. The concept has been refined by terracing the inside face of the top module of apartments to maximise a sense of space in the park (figure 5.37). Terracing is achieved by decreasing the depth of the apartments moving up the building. This required two additional floor plans to be designed.

Figure 5.37: Revision of form in section

The variations are as follows:

A: Ground floor apartment accessed via the central common park

B: Split level apartment on the 2nd/3rd floor accessed by stairs down from the open yard level

C: Split level apartment on the 4th/5th floor accessed up stairs from the open yard level

D: Split level apartment on the 5th/6th floor accessed by stairs down from the rooftop yards

Figure 5.38: Floor plan variation diagram

TYOLOGY A

1:200

LOWER

UPPER

TYOLOGY B

1:200

UPPER

LOWER

TPOLOGY C

1:200

LOWER

UPPER

UPPER

TPOLOGY D

1:200

LOWER

5.7 Access Development

Apartment access via the intermediate yard floor was developed further, with a particular focus on Apartment C's access method. The original solution (an individual staircase linking each yard to the apartment above) used significant floor-area and reduced outdoor space. The stair direction was also problematic as it was not oriented towards the central corridor (figure 5.39).

Figure 5.39: 3D Model showing conflicting directions of entry

The initial development is shown in figure 5.40. A return stair was adopted so its direction was aligned with the access direction. Two identical stairs were aligned next to each other: one for each neighbouring apartment. The two stairs are separated by a privacy screen. This solution addressed the problem of the stair access direction.

To maximise light access to the south orientated yards, light wells were carved from the terraced form above the stairs. This adds interest to the external form, while creating lighter, more attractive outdoor spaces (figure 5.41).

Figure 5.40: Stair solution, from internal access corridor.

Figure 5.41: Stair solution, external perspective.

The previous solution provided a set of stairs for each apartment. Although functionally preferable, the number of stairs required on the open-air level created a strong sense of enclosure. A solution was to consolidate these stairs, with one set of stairs serving two apartments. This required rearrangement as opposed to entering through a personal yard; the stairs must come from the shared accessway. The entry of these stairs therefore needed to be contained outside of each apartment's respective private yard.

This was achieved by the use of fences and planters to physically separate the stair from the adjacent yards, without feeling enclosed (figures 5.42 and 5.43).

Figure 5.42: Access stair viewed from central corridor (top)

Figure 5.43: Access stair viewed from the exterior (bottom)

5.8 Urban Yard Design

Finalising the access method allowed for a more detailed design of the urban yards to commence. This generous outdoor space facilitates family outdoor activities such as drying washing, children's activities, storing outdoor leisure equipment, and gardening. These activities are usually inhibited by small apartment balconies.

To cater for these activities the yards are a generous 8m wide and 6m deep. This expansive space maximises flexibility. 3D sketch models were used to investigate how these yards could be separated from the central accessway without enclosing the space. Low walls were utilised, and the taller storage 'shed' was located along the side of the yard to limit obstruction of light to the accessway. Glass balustrading wraps around the front of the yards to allow for interaction between the private balcony below.

Figure 5.44 Urban yard, establishing connection to balcony below.

Figure 5.45 Urban yard, draft plan

This initial design response limited the amount of useable space in the yards because the access space in front of the storage 'shed' became dead space. Although the half walls were good for light access, they did not act as sufficient privacy screens, which detracted from the usability of the yard.

The final design solution rectified these concerns. First, the storage 'shed' was positioned parallel to the access corridor, from which it is also accessed. This allowed for the back of this storage shed (orientated toward the yard) to be used as a 'substrate' for folding washing lines, climbing plants and so on. Having the storage accessible from the shared accessway activates this shared space and makes storage of large items easier without having to manoeuvre items through the yard.

The partition walls between the yard and accessway have also been altered to increase privacy yet maximise light access. Taller wooded louvred fences have been used in place of solid low walls. This maintains both privacy and light access.

Figure 5.46: Urban yards arranged either side of shared open-air access corridor

Figure 5.47: Flexible Urban Yard

The occupant's ability to mediate between public/private space has been explored in the yard design. Maximum flexibility is desired so the occupant can carry out suburban activities in an urban setting. To facilitate this, the yards can expand and contract using sliding screens depending on spatial requirements. The yards are arranged in a 'cell' of four. Each yard can be fully enclosed (private), open to their neighbours (shared), or open to their neighbours and the access way (common). Expansion to this degree allows residents to open up and share outdoor space with neighbours for larger gatherings, or for activities such as children's biking.

ROOF

INTERMEDIATE FLOOR

Multiple variations in yard design have been designed to add interest to the scheme and demonstrates how the flexible spaces can be customised to the occupants' needs.

The rooftop gardens following a similar access arrangement to the north facing yards on the intermediate level.

Figure 5.48: Access diagram

Figure 5.49: Terrace Garden Sketch Series

+ disconnect between private + public too great. How can this be reversed in places? → develop

5.9 Outdoor Terraces - Apartment A Access Method

Unlike the other floor plan variations, Apartment A is accessed via a garden adjacent to the common park. The garden has a role of mediating between the public park and private home.

The initial response was to separate these zones using levels in section. This was appropriate considering the apartment entry sits 3.5m higher than the common park. Initial design sketch work details a full width (8m) series of two terraces moving the occupant from common park to private dwelling (figure 5.49).

The two terraces are connected with stairs.

The initial terrace is lower and separates the yard from the common park. Trees are utilised to maintain privacy.

This creates a less dominating privacy separation, compared to the use of higher concrete block walls.

The second terrace is increased in height to accommodate an outdoor storage space. The 2m between the first and second terrace provide generous space for gardening tools, bikes etc.

The initial design was effective at separating the common and private zones, but the use of walls created a sense of enclosure. Given the park's relatively small proportions, maximising a sense of space is desired. This led to further investigation using slope and planting.

The use of a slope creates less of a physical boundary, and the garden feels like a spatial continuation of the common park.

However, it is important the sloped section is private, even though it 'flows' from the park. Planting has been used to create this boundary. The use of trees creates a barrier without a sense of enclosure.

Use of slope.

It is proposed approximately half of the 8m wide garden will be sloped, with the other half adopting the terrace format developed previously. The terrace areas will include a formal outdoor seating area, raised garden, and integrated outdoor storage. The sloped section will be grassed and can be used for recreational activities.

Figure 5.49: Terrace Garden Sketch Series

Figure 5.49: Terrace Garden Sketch Series

Final sketches show how these two sections of the outdoor yard operate.

Outdoor Terraces - Final Design

Figure 5.50: Terrace Garden Final Design

Figure 5.51: Terrace Garden Perspective

5.10 Design Testing - Cable Street Pedestrian Entry

The focus area for this design investigation is pedestrian entry from Cable Street. It was not legible in the initial design. The first action taken was to remove the central access core.

Originally, three access cores served 30 apartments. This is excessive, wastes space, and is expensive to build. For this reason, the central core has been removed, leaving cores at the east and west boundary. By removing the central core, a more pronounced, legible entrance and through-site-link can be formed.

Figure 5.52: Removal of central access core

Figure 5.53: Geometry investigations to create a legible entrance and maximise sun access to the park

Figure 5.54: Tapering technique, section

Figure 5.55: Tapering technique, perspective

Initially tapering the upper form in section was explored. This aimed to maximise light access to the common park. The section and perspective sketches above show how this would operate. Reducing the narrow 8m apartment further to accommodate the taper creates planning issues.

Instead, a single apartment module is removed, reducing the building height to 12m around the entrance. This is effective because it allows greater sun access to the common park, facilitates the creation of a rooftop garden on the intermediate level, and creates a visually legible entrance on Cable Street.

As opposed to apartments on the ground floor, a café/restaurant is included alongside the public walkway (figure 5.56).

Figure 5.56: Elevation, Cable Street

Figure 5.58: Section, private access

Figure 5.57: Plan

Subsequent sketch work investigating public/private access and separating these by using levels in section.

Design Sketch

Figure 5.59

Figure 5.60 Cable Street entrance and surrounds

Final Design Visualisations

The masses adjacent to the walkway have been shifted back in plan and are treated with a different cladding. The café (right) is wrapped in zinc seamed panels, and the private entry (left) is glass. This visually accentuates the walkway entrance and stresses the site geometry change point, which is why the entry was located here.

CABLE STREET

Figure 5.63: Cable Street public and private entrance, plan

The purpose of this design study was to create a legible entrance to the pedestrian walkway and to optimise sun access to the internal park. The design solution breaks down the scale, and makes the entrance legible to pedestrians. Removing the central access core allowed for a more generous opening to be established. To further maximise sun access, a top series of apartments was removed from the western side. However, because an access core was removed, this design created an net increase in the number of apartments.

The location of this pedestrian access is in response to site analysis. Using the change point in the site geometry as the point for this pedestrian access created a clear axis and access point in plan and resolved the awkward geometric shift within the site planning.

In section, levels were used to separate public and private access. To maintain a simple, clean aesthetic for the façade, one prominent visual entrance was desired. However, this had to serve as both a public entrance to the through site walkway, and a private accessway to the common park. In plan, these sit alongside each other (figure 5.63). Private access is via a ramped corridor enclosed within a glass curtain wall. This is a continuation of the design language established by the glass curtain walls of the retail tenancies along the front façade. This gives the impression of a glass base, on which the apartments sit. Horizontal louvers wrap around the glass box to create a sense of movement toward the site's centre, and prevent overheating.

Unlike the private access that ramps up to the raised park, the public entrance remains level with Cable Street. For this accessway to look appealing, it was important it was activated; hence a café is included to the west of the walkway. Large sliding glass doors allow this café to open up to the walkway and the included outdoor seating. A small public park with raised planter boxes is included to the south of the café.

Overall, the design solution is visually balanced and highly practical at differentiating between public and private access. The space is designed to be active and engaging to encourage pedestrians to utilise the through site access.

5.11 Studio Typology Development

The studio typology requires the least development given its simple yet considered design in the previous design phase. Areas of focus going forward are:

- Integration with adjacent access cores
- Refinement of floor plan
- Refinement of façade

Access

It was always anticipated this typology would share access routes with the adjacent Tower and Urban Yard typologies given the small number of apartments. These typologies have access cores in the corners of the site, allowing these to be shared. The core that serves the urban yard typology also contains a second lift and stairwell, orientated towards the studio typology. The remaining space in the core houses a one-bedroom apartment. Widths of the access gallery and lobby have been maximised to allow for the maneuvering of large furniture, etc.

To the south, access is integrated with the tower typology access platform. The open-air lift and stairs connect to the apartment's rear access gallery.

Floor Plan Development

The depth of the floor plan was increased to make the interior spaces more generous. The additional depth allowed increased storage within the apartment and the inclusion of an exterior storage 'shed' accessible from the gallery. Although the living areas are compact, the sliding glass doors allow the space to expand to the exterior seamlessly.

Façade Development

The façade remains simple, but the addition of horizontal fins adds a greater sense of movement to the façade. These slatted wooden fins sit above the expansive windows, aiding with shading to prevent overheating (figure 5.66).

Because the access route for the studios is dictated by the adjacent buildings, the building height is split to match the height of the urban yard to the north, and tower block to the south. This gives a staggered appearance in elevation, and allowed for the inclusion of a small common garden on the roof of the north section.

Figure 5.65: Studio plan (top)

Figure 5.66: Perspective from common park

Figure 5.67: Elevation (right)

5.12 Common Park

Elements adjacent to the park required designing prior to detailed design of the park commencing. There are many surrounding relationships to consider:

- The private terrace yards to the north.
- The common amenity access to the south.
- The interaction with the public walkway.
- The treatment of the eastern and western corners.

A series of site diagrams was drawn to identify access paths within the site. These would subsequently dictate the placement of paths and program within the park.

Figure 5.68 Primary and secondary access routes

Primary accessways (those associated with access cores and lobbies) are indicated in yellow.

Secondary access paths from the common amenity and terraced yards are indicated in purple.

Mapping these accessways allowed perimeter pathways to be established. The east quadrant was split down the middle with an additional path to shorten walking distances.

Placement of Program

Proceeding from the allocation of areas of important indoor/outdoor flow, placement of general program was considered.

The park is split into two halves, linked by a bridge across the public walkway. The main park zone to the east includes an open grassed area for leisure, a community garden plot, and a paved outdoor seating area adjacent to the pool. To the west, a smaller 'family' yard includes a playground and additional grassed zones. Its placement in the southwestern corner is to mitigate noise and privacy issues as this is the least populous corner of the site (Marcus and Sarkissian 109).

Figure 5.71 Program Placement

Special attention was paid to the east and west extremes of the site to ensure they were active spaces. Due to their isolation, if not designed as 'destinations' these spaces may detract from the success of the scheme. These spaces provide sheltered outdoor space as they sit under the raised studio typology. To the east, a terraced seating area provides informal seating overlooking the paved pool zone. A covered barbeque area and bike racks are also located under the east wing. To the west, part of the children's play area is sheltered, and an additional barbeque area/ bike rack is included.

EAST WING PLAN

Figure 5.72

WEST WING PLAN

Figure 5.73

Figure 5.74: Common Park - Overview Perspective

Figure 5.74 shows a view from the urban yard level overlooking the southeastern corner of the common park, with raised community garden beds, a paved outdoor pool area and terraced seating located in the background. A grassed multiuse area and paved seating area is located in the foreground.

The inclusion of common outdoor space in a high-rise scheme is supported, with Levitt writing that shared outdoor space can greatly benefit this typology (11). A major limitation of high-rise living, especially for family living, is the lack of safe space for children to play close to home (Abrahamse 85). The design provides numerous outdoor spaces for families. The site geometry created a range of outdoor spaces: gardens, large grassed areas, seating areas, and playground. The creation of many smaller connected zones within the overall park is more suitable than one larger, or several identical spaces (Marcus and Sarkissian 124).

5.13 Public Walkway

A unique site condition was the inclusion of a public walkway through the site linking Cable and Wakefield Streets. Careful consideration was required to mediate between the public walkway and common park. This was addressed in section by setting the public walkway below the level of the common park. This height difference, although not significant, creates clear separation. This shift in height is enough to separate the walkway, yet still allows pedestrians a view into the park as their eye level is above the park height. A series of sketches explores strategies to separate the walkway and park:

RECESSED

Recessing the public walkway 1.5m below the park is effective at separating the public and private realms. The height of 1.5m has been adopted as it is a sufficient physical barrier, but is low enough that the average person retains outlook into the park.

RECESSED + STEPPED

Terraced planting was included on one side of the walkway to soften this threshold. Bringing the park down into the public walkway makes the public walkway more pleasant, opposed to funneling pedestrians through an uninspired, segregated space.

STEPPED + SLANTED

Terraced planting too easily operated as stairs, i.e. members of the public could use these forms to gain access to the park. A single planter box was adopted to mitigate this risk. To add complexity to the space, a sloped planted wall is proposed for the other side. This makes the walkway feel more expansive.

ADOPTING PLANTING AS A PRIVACY TOOL

Although the aim of the public walkway was to create a sense of inclusion to public pedestrians, it is important privacy is still maintained for residents. To achieve this, strategic planting was adopted surrounding the walkway. The use of trees to obscure viewshafts deep into the park is an effective tool to maintain privacy.

Figure 5.75: Walkway Sectional Sketch Series

Public Walkway - Plan
Figure 5.76

The site axis informed the geometry of the public walkway. The angular form makes for an interesting journey through the site, but also acts as a tool to break the large common park into multiple zones.

Pedestrian Journey Cable Street - Wakefield Street

Figure 5.77

The pedestrian journey begins seamlessly with level access from Cable Street. An active entrance is created through the inclusion of a public café to the right.

A public seating area provides outdoor seating for the café and general bench seating is provided. Planting is brought down to this level to create a pleasant space.

A connection to the park is maintained by visually connecting the levels through the use of a raised planter bed and a sloped planter wall. The ramped pedestrian bridge across the walkway connects each half of the common park.

The journey ends with a ramp returning pedestrians to Wakefield Street. A ramp was adopted for seamless access. Balconies on the right are outdoor areas for the events center located in the base of the high-rise tower block.

Figure 5.77: Common Park Design, Plan

5.14 Private Outdoor Space

Detailed design of private outdoor spaces for each typology is required. Common space and accessways have been resolved, but the relationship between home and outdoor space requires development.

Design investigation will commence with general research into outdoor space, and architectural devices that are adopted. From here, each typology's outdoor space will be investigated separately.

Door Study

Figure 5.78

BIFOLD - EXTERNAL

Bifold doors maximise the external opening. The opening method requires a lot of space to open, which limits the placement of outdoor furniture in front of the opening.

BIFOLD - INTERNAL

A solution is to hinge bifold doors internally into the larger living space. This creates a large opening but does not compromise balcony usability; however, corners are often preferable in balcony design to accommodate furniture. The use of bifold doors does not create any corners.

SLIDING- 1 PANEL, SIDE

Sliding doors are particularly good for creating a large unobstructed 'wall' to place furniture against. Only one panel opens, leaving the remaining two fixed glazed panes free to place furniture, etc. against; however, this does limit the flow between inside and outside because only one-third of the wall is openable.

SLIDING- 1 PANEL, CENTRAL

Locating this single sliding pane centrally is more effective as it allows for the creation of two corner zones. This increases the flexibility and usability of the balcony; however, this only provides a single openable pane between inside and outside.

SLIDING- STACKING

The best solution is the use of a sliding stacker door. A three-pane sliding door allows 2/3 of the panes to open. This is the best solution to create a connection between inside and out without compromising the usability of the balcony.

Threshold Study

Figure 5.79

The treatment of the threshold between inside and outside can affect the usability of a balcony. The following design options were analysed.

LEVEL

Allows for easiest transition between inside and out. Flush door styles make the movement of furniture easy. As the inside and outside are level, a sense of space is maximised.

LOWERED BALCONY

Creates an occupiable edge, which can operate as an integrated bench seat. This maximises usability, but can make the balcony feel small as it does not flow seamlessly from the interior.

RAISED BALCONY

Similarly to the lowered balcony, an occupiable edge is created, but in this case it is orientated towards the interior. Adds enhancement to interior space opposed to exterior. The balcony may also feel enclosed and small because it does not flow to the interior.

Façade Relationship Study

Figure 5.80

'STICK ON' BALCONY

This style of balcony maximises sun access; however, it creates exposure issues relating to privacy and wind. Usability is compromised due to lack of shelter, which is unsuitable given Wellington's climate.

RECESSED BALCONY

This is the most private balcony; however light penetration into the apartment is limited. It is very sheltered, and the occupant does not feel exposed in their outdoor space.

SPLIT BALCONY

A combination of a recessed and external balcony retains privacy and shelter, while also allowing daylight into internal spaces. The small recess is enough to shelter the entry zone, allowing doors to be opened in wet weather.

This study identified desirable attributes of balcony design that will be implemented during the design process.

Urban Yard Typology

An extensive design process was carried out for this typologies' common yard floor; however design of the additional private balconies is required.

Each apartment has a generous north-facing private balcony. The research conducted into balcony design formulated key areas of focus for this typology:

- Creating a strong connection between interior and exterior
- Providing shelter from the street, given the pedestrian and traffic movement on Cable Street.
- Maximising usable outdoor space.

Figure 5.81

There are two variations of the urban yard balcony:

1. A single level balcony that acts as the apartment entry downstairs from the urban yard floor
2. A double level balcony accessible from the downstairs living zone

First, the double level balcony will be designed.

Initial sketches in elevation and plan implemented findings from the balcony study to maximise usable space. A four-panel stacking sliding door creates a large opening and maintains a usable corner. The proposed window has a solid bottom panel to allow for a garden planter or similar to be placed in this corner.

Figure 5.82: Balcony elevation (above)

Figure 5.83: Balcony plan (left)

Figure 5.83 Elevation and sectional balcony sketch study.

The relationship with the second floor was sketched, which identified the need for shelter over the sliding door. A wooden slatted screen provides shelter and acts as a privacy screen – obscuring occupants' view into the balcony from the bedrooms on the second floor.

Figure 5.84: Perspective of balcony configuration

Next, shelter from the street was considered. Given the northern aspect and proximity to Cable Street, consideration of wind, noise and privacy was vital. A combination of glazed balustrading and solid planter boxes is proposed. Glass allows good light access, whereas the wrap around planter box creates a visual barrier, increasing privacy.

A full height glass panel on one side creates an enclosed corner. This functions as a windbreak, making this zone appropriate for drying clothes outside.

Figure 5.85: Final Plan, Balcony variation one

Figure 5.86: Sketch plan

Figure 5.87: Inhabitation of the edge

Urban Yard: Balcony Variation Two

The second balcony variant is accessed by stairs from the common yard level above.

The study of thresholds highlighted how raised edges can function as informal seating, increasing usability. This strategy is adopted through the design of an oversized raised landing at the bottom of the stairs. The plan and perspective show how this step is implemented.

The general arrangement is similar to the first variant - a wraparound planter box in one corner and a full height glazed section for wind shelter in the other.

Figure 5.88: Perspective of balcony configuration

Figure 5.89: Final Plan, Balcony variation two

Figure 5.90: Quick renders of the relationship between indoors and outdoors

Tower Typology: Outdoor Access Platforms

Given the site's north aspect and the building height, strong wind could compromise the usability of the outdoor platform yards. To address this, an automated movable panel system integrated into both façades is proposed.

Initial sketches investigate how a double skin balustrade could provide shelter from the wind (figure 5.91). The design consists of two parts: a fixed perforated metal balustrade running along the edge of the platform, and a movable perforated metal panel suspended in front of the floor plate. An automated system is adopted to deploy the secondary panel when wind conditions require.

Figure 5.91: Wind shelter mechanism design

To increase wind protection the secondary panel size was doubled in height, extending 1200mm above and below the floor slab. This increases protection from the wind, but also adds visual regularity to the façade in elevation when in the retracted position. Originally constructed from metal perforated sheets, glass was adopted as the final panel material. This ensures the outdoor space receives maximum sunlight, which would be compromised if metal panels of this size were used.

Figure 5.92: Wind shelter diagram

This design is particularly effective given the staggered floor levels. Although each level is not fully enclosed, because of the offset floor levels, there is effectively 100% coverage from crosswinds.

RETRACTED

DEPLOYED

Tower Typology : Outdoor Platform, Detailed Design

The two variations of access platform (north and south entry) have different characteristics and will be designed independently, beginning with the south access platform. The access routes of general residents and the tenant were mapped in purple and yellow respectively. Mapping of the tenant accessways demonstrates how this shared platform required further design to divide the platform space between the two adjacent households.

Figure 5.93: Mapping of occupant movement through shared platform space.

Separation could be achieved using a physical wall, but this would create unusable narrow shared yards. Division in a less intrusive way is achieved using a planter to the south of the lift shaft. Intended to encourage growth to conceal the lift shaft, this planter's edge is also an important tool to visually split the platform for each household.

Figure 5.94: Using devices to define areas of the platform

Combining this with a planter box located centrally against the balustrade creates an imaginary division of this space, defining a yard for each apartment. Although a planter against the balustrade was the initial solution, a design that can accommodate many functions is proposed.

A narrow wooden surface extends out into the shared platform. As the sketches below explore, this divides the space but is more functional than a planter box. The surface can be used as: a shelf for plants; a small table with stools that stow underneath; and a bench seat. This division device works well at dividing the space, but also makes the outdoor space more functional.

Figure 5.95: Various functions of the division device

Figure 5.96: View from balustrade looking across common yard, towards northern access platform

North Platform Design

A similar approach was taken to design the northern platform. Common and tenant access routes were mapped, which highlighted the reduced privacy of the northern platforms because there is no stair landing. The common circulation route intrudes into the shared landing. Varying floor treatments around the public circulation path is a technique adopted to ensure passerby do not intrude into the platforms.

Figure 5.97: North platform, movement mapping and division devices.

In contrast to the south platform, the north entry apartments are directly accessible from the platform yard via adjacent private balconies. This relationship between the common platform and private balcony was explored by separating these spaces using levels; however, it was more advantageous to have the balcony and platforms on the same level to create one expansive space. A movable privacy screen was designed, allowing the occupant to open their private balcony to the common platform as desired. When opened, the combined balcony and platform space connect freely, and can facilitate group gatherings or other larger scale leisure activities. Figure 5.98 shows how the sliding panel can mediate privacy for the occupant.

Figure 5.98: Moving privacy screen

North Entry Balcony Design

Figure 5.99

Because the north access platform and balcony are closely related, the balcony will now be designed. Similar design decisions were made to the urban yard typology. Usable balcony space is maximised by creating corners and using appropriate doors. A wrap around planter box provides shelter and a small garden area for occupants. Stacker sliding doors minimise disruption of the balcony space.

South Entry Balcony Design

Figure 5.100

The south entry apartment retains a north facing balcony, but it is accessed from the living room and has no immediate connection to the shared platform yard; however, it does retain a relationship to the access platform below, as it overlooks it. This connection is maintained by using a combination of a glass balustrade and full height screen to allow outlook to the platform while also establishing privacy.

Figure 5.101: North platform, showing relationship with neighbor above.

Studio Typology Outdoor Space

The findings of the design process from previous outdoor spaces have been applied to the studio typology. Screens are used to mediate between public and private. Figure 5.102 shows how the large slider works, allowing the user to extend their outdoor space into the accessway as desired.

Figure 5.102: Sliding fence, perspective

As figure 5.103 shows, a planter runs the length of the outdoor yard creating a pleasant outlook from the adjacent living area. A stacking sliding door is used to maximise the opening size. This planter sits in front of a solid wall, which facilitates climbing plants, or the attachment of fittings and fixtures for storage. Simple glass balustrading, with a strip drain in front, encloses the yard.

Figure 5.103: Sliding fence, plan Garden

Figure 5.104 (top): Final Studio and yard floor plan

Figure 5.105 (right): Yard perspective from the adjacent gallery

6.0

6.0 FINAL DESIGN

Figure 6.1 Final Site Arrangement

6.1 Scheme Overview

The final scheme retains a similar arrangement to earlier: three building types arranged around a central common park. Due to the focus on outdoor space in this research sun/shade was an important consideration. To maximise sun access, the lowest building type, the 'urban yards', is positioned on the northern boundary. In elevation this form has been sculpted to create a legible pedestrian entry from Cable Street. This form is also informed by sun studies to allow maximum light into the common park.

The east and west boundaries are 'bookended' by one-bedroom Studio Units. These enjoy good morning and evening sun due to their orientation. They capitalise on the existing light wells of the adjacent apartment buildings, and many apartments are lit from both sides. They are accessed via wide rear galleries that integrate with the access cores of the urban yard and tower typologies.

Lastly, the tower block envelopes the southern boundary. As the tallest block, its placement here limits site shading. The base of this building contains common amenities that are accessible from the central park. The apartments in this block are accessed via open air platforms that operate as 'front yards'. These slices through the building create a sense of openness, ensuring the park does not feel enclosed.

Figure 6.2: Cable Street perspective

North approach from Cable Street. A sense of floating is achieved by using glazing on the ground floor. This is repeated for the second apartment module, which also appears to float above the common yard floor. The main site entrance is expressed by breaking down the form and adopting different materials.

Figure 6.3: Wakefield Street perspective

The south façade has been broken up visually using materials and form. The two lower floors accommodate street front retail and café tenancies, as well as communal amenities for residents. These are primarily glazed and form a podium for the tower. Access lobbies protrude in plan to express the entries. From these lobbies, vertical 'slices' create rhythm up the façade. A combination of cedar panels, aluminium cladding and glazing are used. A sense of elegance is achieved by highlighting ever second floor plate, which increases visual verticality.

Figure 6.4: Through Site Public Accessway - Wakefield Street (southern façade)

Figure 6.5: Typical Floor plan

Figure 6.6: Common Park

GROUND FLOOR / LANDSCAPE PLAN
1:200

WAKEFIELD STREET

CABLE STREET

----- PUBLIC ACCESS -----
----- PRIVATE ACCESS -----

This architectural ground floor landscape plan for Common Park illustrates the layout of buildings and outdoor spaces. The plan is bounded by Wakefield Street to the north and Cable Street to the south. It features several building footprints with internal room divisions, including a large pool area, a cafe, a reception area, and various retail and office spaces. Outdoor spaces are depicted with trees, shrubs, and seating areas. Access routes are clearly marked: dashed orange lines indicate public access, while dashed blue lines indicate private access. A central area is labeled 'PUBLIC THROUGHWAY'. The plan also shows a 'SPRINKLER POOL BUILDING SERVICES' area and a 'TERRACE' area. The scale is 1:200, and the orientation is indicated by a north arrow in the top right corner.

Figure 6.7

Ramps are utilised where possible to make movement from the street up into the common park seamless.

Figure 6.8

View from the common central park into the public seating area below. Maintains a connection while preventing general public having access to the park.

URBAN YARD TYPOLOGY

Figure 6.9

The innovative access method accomodates large urban yards on a intermediate level, offering families flexible outdoor space that can faciliate various outdoor activities.

Figure 6.10

For the ground floor variation A, access is instead by a terraced outdoor yard that mediates between the common park and private house. This is particularly suited to outdoor activities which can flow freely from the yard, to the larger shared park.

URBAN YARDS
1:200

Figure 6.11

Figure 6.12
View from intermediate yard level looking across the common park below

Figure 6.13
Each dwelling's urban yard can expand by opening sliding panels to create a shared space for large scale gatherings or leisure activities

The final floor plans focused on spatial efficiency by integrating storage/work areas into circulation zones to create more usable homes within the same floor area.

URBAN YARDS - TYPOLOGY A

Figure 6.14

160M²
NO. IN SCHEME : 7

1:100

UPPER FLOOR

LOWER FLOOR

URBAN YARDS - TYPOLOGY B

Figure 6.15

162M²

NO. IN SCHEME : 7

1:100

LOWER FLOOR

UPPER FLOOR

URBAN YARDS - TYPOLOGY C

Figure 6.16

155M²

NO. IN SCHEME : 7

1:100

UPPER FLOOR

LOWER FLOOR

URBAN YARDS - TYPOLOGY D

Figure 6.17

115M²

NO. IN SCHEME : 7

1:100

GROUND FLOOR +00

FIRST FLOOR +03

SECOND FLOOR +06

THIRD FLOOR +09

URBAN YARDS +12

ROOF GARDENS +25.5

SEVENTH FLOOR +22.5

SIXTH FLOOR +19.5

FIFTH FLOOR +16.5

Figure 6.18: Urban Yards, sequential floor plan series.

SHORT SECTION
1:200

Figure 6.19: Site section, Cable Street - Wakefield Street

The urban yard typology on Cable Street extends over the footpath to provide shelter but this also increases privacy as it inhibits pedestrian viewshafts into the generous north orientated balconies.

The porosity of the surrounding buildings was intentional to maximise lightness in the common park. Tapering the urban yard typology in section creates a sense of openness. The full depth balconies of the studio type, and the open-air platforms of the tower block, all allow for light access and greater outdoor awareness from the park.

Underground parking is accessible from Wakefield Street and also provides additional storage for each unit.

Figure 6.20: Shared front yards become overflow spaces for some afternoon activity. Generous double height light filled outdoor space. Staggered floor levels increase privacy.

Figure 6.21: These spaces facilitate spontaneous resident interaction. Relationship to balconies above, and movable screens allow the user to control their level of privacy.

Figure 6.22: Apartment access via front balcony. Moveable screens allow for the user to either have a fully private balcony, or open to shared yard as an overflow space. Inbuilt furniture used to demarcate 'half' of shared front yard.

TOWER APARTMENTS - NORTH ENTRY 1:100

Figure 6.23

105M²

NO. IN SCHEME : 60

TOWER APARTMENTS - SOUTH ENTRY

1:100

Figure 6.24

103M²

NO. IN SCHEME : 60

Figure 6.25: Tower typology, sequential floor plan series

THIRD / FIFTH FLOOR

SECOND / FOURTH FLOOR

FIRST FLOOR +03

GROUND FLOOR +00

SEVENTH FLOOR
(REPEATS EVERY SECOND STORY TO FLOOR TWENTY-ONE)

SIXTH FLOOR
(REPEATS EVERY SECOND STORY TO FLOOR TWENTY-TWO)

STUDIO TYPOLOGY

Figure 6.26:
Perspective looking into the full depth balcony when opened to the wide gallery.

STUDIO TYPOLOGY

Figure 6.27

41M²

NO. IN SCHEME : 21

1:100

CABLE STREET ELEVATION

Figure 6.28

WAKEFIELD STREET ELEVATION

Figure 6.29

6.5 Summary: Spatial Efficiency

The design provides occupants with quality outdoor space while remaining viable due to effective use of total floor area. The innovative circulation methods developed are in some cases equally efficient to traditional apartment blocks, whilst providing vastly superior outdoor space. Detailed working for these calculations can be found in the appendix.

URBAN YARD TYPOLOGY

Average Unit Floor Area (m2)	Average Outdoor Space per Unit (m2)	Outdoor Space as a Percentage of Total Floor Area
148	65	44%

Average Unit Floor Area (m2)*	Number of Units	Total Apartment Floor Area (m2)
213	28	5964

*Including outdoor space

Total Circulation (m2)	Total Apartment Floor Area (m2)	Circulation as Percentage of Total Floor Area
1120	5964	19%

Achieving 44% of each unit's floor area as outdoor space is desirable to provide dual outdoor spaces for a large family. Achieving such generous outdoor spaces would not be possible without the innovative access method developed for this typology.

Consolidating accessways to the roof and intermediate floor minimises total circulation space whilst creating lively more intense accessways.

TOWER TYPOLOGY

Average Unit Floor Area (m2)	Average Outdoor Space per Unit (m2)*	Outdoor Space as a Percentage of Total Floor Area
112	33.75	30%

*Private balcony and 1/2 of the shared 'front yard'

Average Unit Floor Area (m2)*	Number of Units	Total Apartment Floor Area (m2)
145.75	120	17490

*Including outdoor space

Total Circulation (m2)	Total Apartment Floor Area (m2)	Circulation as Percentage of Total Floor Area
1065	17490	6%

This percentage of total floor area is particularly low in this typology because of the way the access is arranged. The open-air access yards are considered outdoor space, not circulation; so the only areas classified as access are the ground floor lobbies, lifts, landings and stairs.

STUDIO TYPOLOGY

Average Unit Floor Area (m2)	Average Outdoor Space per Unit (m2)	Outdoor Space as a Percentage of Total Floor Area
44	13.2	30%

Average Unit Floor Area (m2)*	Number of Units**	Total Apartment Floor Area (m2)
57.2	49	2802.8

*Including outdoor space

**Includes 12 units integrated into the shared urban yard core.

Total Circulation (m2)	Total Apartment Floor Area (m2)	Circulation as Percentage of Total Floor Area
1796	2802.8	64%

The efficiency of this typology is less because the access method and placement were chosen to maximise the quality of the outdoor spaces. Although 63% of the total floor area is circulation, the majority of this area is wide well-lit external galleries. These spaces include gardens and flow freely from the full depth urban yards. They operate equally as outdoor space making the real percentage of floor areas used for access far less.

OVERALL SCHEME

TYPOLOGY	AVERAGE OCCUPANTS PER HOUSEHOLD	NUMBER OF HOUSEHOLDS	APPROXIMATE POPULATION
STUDIO	1.5	49*	72
TOWER	3	120	360
URBAN YARD	4	28	112
			544

Total Number of Dwellings	Site Area (Ha)	Density (Dwellings/Ha)
197	0.55	358

The overall scheme achieves high density, whilst maintaining quality outdoor space for all occupants. This scheme proves that density does not need to compromise the provision of outdoor space. All typologies have a minimum of 30% of unit total floor area designed as outdoor space.

7.0

7.1 Research Conclusions

This thesis reimagined high rise apartment buildings for the New Zealand context, focusing on the provision of quality outdoor space. In response to research into the outdoor living preferences of New Zealand homes, analysis of existing apartment models, and a design led research process, the outcome is a high-rise housing model that is suited to the New Zealand context.

Through reimagining circulation routes as active, open air spaces that encourage occupation, secondary common spaces are provided for all apartments. These are in addition to large, private balconies provided for each apartment, which have been designed to be flexible outdoor spaces to suit occupants' needs. Together these two spaces provide a gradient of private/shared outdoor space for each apartment. The threshold between these private balcony zones and the shared access ways was also challenged. Moving screens allow the user to mediate this public/private interface allowing their private outdoor space to expand into the shared space, or be fully enclosed at the occupant's discretion.

These outdoor spaces are supplemented with large shared common spaces throughout: the inclusion of a common central park, and the development of rooftop spaces and smaller common zones throughout the scheme.

As a whole, the design investigation demonstrates that it is possible to provide occupants with an array of outdoor space, varying from fully private to communal in a high-density urban setting. This design outcome aligns with New Zealanders' way of living. The design created is highly relevant to what New Zealanders want from their housing, but is also relevant to New Zealand's current housing demands, which as the case studies showed, too often result in apartments with marginal if any external space.

The development of three unique typologies gives this research broad relevance to the discipline. Each typology is distinctly different, but each demonstrates how attractive outdoor spaces can be provided using different access methods. The geometry of each typology is also unique, which allows these designs to be applied to other sites, demonstrating that this research is relevant and applicable to the wider context.

7.2 Opportunities

Due to the scale of the chosen site and the duration of this research, investigation of outdoor space at a smaller scale was limited. Resolving the overall site arrangement and designing the innovative typologies took priority over smaller aspects of the design. The relationship between indoor and outdoor spaces could have been studied in further detail. Although innovative and generous outdoor spaces were provided, further research into how these related to internal space threshold and how they were used would have added additional depth to the research.

Consideration of how these typologies could more closely interrelate is also a possible area for future research. Rather than each typology being isolated to its respective building, mixing of these throughout the site may potentially create a more diverse neighborhood, and add richness and complexity to the design development.

Further design of the high-rise rooftop space is also needed. Although it is proposed that the rooftop is landscaped to offer outdoor space, this has not yet been designed in detail. While some attention was given, externally the high-rise block is also least developed, particularly the façade mass. Refinement of the Wakefield Street façade, to break up the building mass and add complexity, would potentially result in a more visually interesting final form.

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APPENDIX

Appendix 1 : Efficiency Calculations

~~Standard~~ Urban Yard

Average outdoor space per apartment:

1. Balcony: $7.7 \times 2.5 = 19.25 \text{ m}^2$

2. { Yard: $6 \times 8 = 48 \text{ m}^2$
or Garden: $8 \times 5 = 40 \text{ m}^2$ } average = 46.5 m^2

total outdoor space
per family unit = 65 m^2

Average # apartment size (excluding outdoors)

A: $(8 \times 12.5) = 100$ $(8 \times 7.5) = 60$ (160)

B: 162

C: 155

D: 115

units
average
= 148 m^2
average %
of floorplan
as yard = 44%

Circulation:

1 Lobby ~~15 x 8~~ $8 \times 15 = 120 \text{ m}^2$

2 lift floors = $8 \times 7.5 = 60 \times 2 = 120 \text{ m}^2$

6 typical floors = $8 \times 4 = 32 \times 6 = 192 \text{ m}^2$

368 m^2 total circ.
for block! in cores

Shatts etc = $368 \text{ m}^2 \times 2 (\text{shatt}) = 736$

"corridor"

left bridge right
 $(3 \text{ m wide} \times 40) + (3 \times 8) + (3 \times 24) = 216 \text{ m}^2$

Roof "corridor"

left right
 $(3 \times 40) + (3 \times 16) = 168 \text{ m}^2$

Total circulation = 216

168
 736
 1120 m^2

Apartment

~~Total~~ Floor area (including outdoors)

$$A (160 \times 7) + (65 \times 7) = 1575$$

$$B (162 \times 7) + (65 \times 7) = 1589$$

$$C (155 \times 7) + (65 \times 7) = 1540$$

$$D = (115 \times 7) + (65 \times 7) = 1260$$

$$5964 m^2$$

Percentage of circulation of total apartment floor area

$$(1120 \div 5964) \times 100 = 18.7\%$$

Tower Typology.

Floorplan North Entry

$$\text{Apartment size (excluding outdoors)} = (8 \times 14) = 112 m^2$$

$$\text{Outdoor space (balcony + shared frontyard)} = (8 \times 2.5) = 20$$

$$0.5(5.5 \times 5) = \frac{13.75}{27.5}$$

Floorplan ^{South}~~North~~ Entry

$$\frac{13.75}{27.5} = 33.75 m^2$$

$$\text{Apartment size (excluding outdoors)} = (8 \times 14) = 112 m^2$$

$$\text{Outdoor space (balcony + shared frontyard)} = (8 \times 2.5) = 20$$

$$0.5(5.5 \times 5) = 13.75$$

$$33.75$$

Circulation space

Lobby

$$4 \text{ lobbies} \times (5 \times 15 \text{ m}) = 300 \text{ m}^2$$

Lift + landings

$$9 (2.8 \times 3) = 75.6 \text{ per core}$$

$$75.6 \times 4 = 302.4 \text{ m}^2$$

Stairs

$$9 (2.8 \times 4.5) = 113.4 \text{ per core}$$

$$113.4 \times 4 = 453.6 \text{ m}^2$$

$$\begin{array}{r} \text{Total} \\ \text{circulation} \\ \hline 1056 \text{ m}^2 \end{array}$$

Total ^{apartment} Floor - area excluding outdoors

$$\text{North } 112 \times 60 = 6720 \text{ m}^2$$

$$\begin{array}{r} \text{South } 112 \times 60 = 6720 \text{ m}^2 \\ \hline 13,440 \text{ m}^2 \end{array}$$

Total apartment floor area including outdoor

$$13,440 + 120(33.75) = 17,490 \text{ m}^2$$

Circulation as % of total apartment floor area (including yards) = 6%

Studio Typology

Apartment size (excluding outdoors) = $(4.9 \times 9) = 44.1 \text{ m}^2$

Outdoor space = $(4.9 \times 2.7) = 13.2 \text{ m}^2$

Total dwelling size = 57.2 m^2

% of outdoor space to floor area = 23%

dwellings = 23 (east) + 14 (west)

Total dwelling floor area $(23 \times 57.2) + (14 \times 57.2) =$
 2116.4 m^2

Circulation

Cores

Shared core w/ urban yard typology

9 floors $\times 48 \text{ m}^2$ core = $432 \text{ m}^2 \times 2$ cores (east + west)
= 864 m^2

Shared core w/ South West tower typology
(required anyway) = 0 m^2

Gallery

$(2.1 \text{ m wide} \times 12 \text{ m long}) \times 37$ dwellings = 932 m^2

Total ~~Dwelling~~ Typology floor area = 2116.4 m^2

Total circulation area = 1796 m^2

Circulation as % of floor area = 84%