

INTERIOR INFILL

URBAN DEVELOPMENT GUIDE

How can the reuse of historic buildings through interior architecture, increase residential density?

by

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ABSTRACT

This design research portfolio examines how interior architectural strategies might increase residential density through the adaptive reuse of historic buildings. The research aim is consistent with the Wellington City Council (WCC) urban development guide; with a projected Wellington population increase of around 45,000 by 2043¹. Such an increase justifies the research of strategies for increasing the density of residential areas. The urban development guide also outlines the projected population growth in specific areas of priority in Wellington (see numbers below). The overarching tone and message of the guide is consistent with *The Atlantic's* understanding that “reasons for preserving our existing building stock aren’t strictly cultural and sentimental; preservation should be understood as a land-use and economic tool that can be used to build denser, more attractive cities”². The main focus of the research is therefore to use interior architecture to produce a ‘liveable’ and ‘compact’ city³, including how interior architecture could protect and enhance the special character of the inner city suburbs (a desire of the WCC).

20 %

Wellington Population
Increase by 2043

28 %

Increase in Residential
Dwellings needed by 2043

20 - 34 yrs

Newtown Population
Demographic by 2043

2500

Required Dwelling
Increase in Newtown by
2043

1-Wellington City Council, *Wellington Urban Growth Plan*. 19

2-Benfield, “The Advantages of Reusing Old Buildings” n.p

3-Wellington City Council, *Wellington Urban Growth Plan*. 9

ACKNOWLEDGEMENTS

This research portfolio is the product of not only me, but many sources of advice and support. Many of whom I'm sure are sick of hearing 'density' and 'residential' in the same sentence. My first honourable mention is Christine McCarthy, whose honest approach removed the unnecessary aspect to all my work, current and future. Those in my thesis stream Michelle, Luke and Gemma, and my flat mates, friends and family who provided a great distraction, and at times produced helpful insight.

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1.

INTRODUCTION

The aim of this research is to produce interior architectural strategies in order to increase residential density, while considering the desire of WCC to “Protect and enhance the special character of our suburbs particularly the highly valued existing character of our inner city suburbs”¹. One of these inner city suburbs is Newtown (especially Adelaide Road), where the expected increase in dwellings required by 2043 is more than 2500². This suburb has been identified by WCC as an area of growth, as well as having a highly valued ‘character’. Consequently the sites used in this design research are located here.

The two sites chosen for the research are 26 Stoke Street, in Berhampore and 194 Adelaide Road nearly in Newtown. 26 Stoke Street (220m²) is a two storey timber residence, typical of the 1-2 storey buildings in this suburb. It is a heritage-listed dwelling, due to its retention of many Edwardian villa features. The heritage listing pertains to the exterior only, with special mention of the porch and the small changes from the consent drawings. It was built in 1905 with a small alteration and extension during 1988.

194 Adelaide Road, also known as the Tip Top Factory, is a abandoned site, comprising of three large buildings, (the chosen building is 680m²). 1913 was the year of the first recorded development on the site after the demolition of houses similar to 26 Stoke Street. The Tip Top building faces the street and was originally built around 1930s. It was significantly altered in the mid-1970s to accommodate the main factory floor, freight access and corporate offices above. The choice of a timber-framed residential building and a concrete abandoned factory has been intentional in order to determine the different constraints and challenges to densifying the types of sites and different density histories.

The distinction between the two sites (in terms of historic value), is that 26 Stoke Street is ‘heritage ‘listed, while 194 Adelaide Road is a ‘character’ building. Heritage sites “have lasting value in their own right and provide evidence of the origins of New Zealand’s distinct society”³. The WCC’s District Plan, chapter 20A.2.12 outlines the restricted activities which cannot take place on listed heritage buildings (such as 26 Stoke Street). This is any alteration/s to “height, coverage, bulk and massing of buildings (to the extent that these affect historic heritage)”⁴. The Tip Top factory does not have these restrictions, making it more malleable to any external changes. Heritage New Zealand does have definitions for such buildings, this is as follows:

“While heritage areas often contain a concentration of listed heritage items, they also contain other ‘contributing buildings’ that contribute to the character and coherence of the heritage area”⁵.

This research classifies the Tip Top Buildings is one of these; contributing buildings’ making it suitable to become a high density residential buildings through interior infill, because the building attributes to the character of Newtown. The research therefore identifies selected interior methods to increase densification, and investigate whether or not they are viable ways to achieve increased residential densification. To accomplish this aim the following methodology has been adopted:

1. Conduct a literature review, including relevant council policy.
2. Analyse case studies.
3. Identify interior/modular furniture strategies.
4. Apply strategies on a residential site.
5. Review each technique to inform a final design.
6. Apply strategies to an industrial site as a residential adaptive reuse proposal.
7. Develop a concept (through working drawings) for

1-Wellington City Council, *Wellington Urban Growth Plan*. 19
2-Wellington City Council, *Wellington Urban Growth Plan*. 58

3-Heritage New Zealand Pouhere Taonga Act 2014. 6
4-Wellington City Council, *Wellington City District Plan*. 20/11
5-Wellington City Council, *Wellington City District Plan*. 21/5

the industrial site.

8. Evaluate the design outcome and potential of interior architectural methods as an approach to increase densification

The experimentation and testing of interior methods will be achieved through redesigning the interiors of one building on each of the sites. The initial stage undertakes a series of tests of each in order to identify the limitations and strengths of each method prior to a design proposal which draws on all of the methods. This design approach also includes drawing at a 1:1 scale in order to further test the planning of one unit proposed for Stoke Street.

Interior infill is the main idea referred to throughout this research. It is understood to be the identification and implementation of interior architectural methods to densify space. Infill is the use of vacant space; in the context of interior infill (for this research) it also incorporates the redesigning of space in order to increase density. Interior infill will be based around the understanding of the spatial needs of the occupant and understanding what activities could take place. The ultimate goal is the optimisation of space; this will determine the effective ability of interior infill to increase residential densification.

This research is organized as follows:

Chapter 1 The introduction to the subject matter researched, and the method used.

Chapter 2 A literature review which examines ideas relating to residential densification, and their relevance to interior infill.


Chapter 3 The identification and analysis of chosen case studies, to produce distinctive methods for interior architectural densification.

Chapter 4 Site analysis of 26 Stoke Street and 194 Adelaide Road.

Chapter 5 Testing the strategies identified in chapter 3, on 26 Stoke Street, resulting in an optimized design.

Chapter 6 The final design development of a interior densification scheme for 194 Adelaide Road.

Chapter 7 Conclusion on this research and the outcomes produced.

With the 75% submission for this research portfolio, some of the images and plans have already been marked. These will be indicated with a blue square. 

2 .

L I T E R A T U R E R E V I E W

This literature review examines interior architectural strategies for increased residential density. It first outlines broader architectural strategies to increase density, before identifying a lack of literature on interior architectural methods. The broader architectural methods fit into four categories: residential infill, adaptive reuse, shared functions and spatial reconfiguration. This review outlines the unique characteristics of each strategy and examines the reasons supporting the architectural strategy (to achieve an increase of residential density). Finally, through comparing and contrasting of each strategy, this review identifies the strengths and weaknesses of each of the four categories.

Infill

Infill is the redevelopment of land (or called Brownfield development) within built-up areas¹. Broitman and Koomen explore “How the processes of densification (adding housing units to existing urban areas) and urban expansion related?”² They found that as the distance from the development to the urban centre is decreased, the residential density increases. Broitman and Koomen conclude that a combination of new housing units and the alteration of existing units would produce an increase in density of 9% over ten years³. Their work developed from research at the University of Bologna, Italy, where the location of ‘urban aspects’ (the layout of the commercial centre) determined the sites selected for densification. For Broitman and Kooman densification by ‘infill’ is a system which relies on figures and data to be implemented, without any other considerations evident. This contrasts the approach taken by “The Politics of Place” by Poppe, Will and Young⁴, whose research also focused on the implementation of increased housing units through infill, but contrasts Broitman and Koomen’s research in how the communities were examined, and how the authors justified the conclusions drawn about the benefits to residential Infill. Poppe et al. comment on the positives and negatives of

Brownfield developments, stating that: “Tower residents often oppose densification and favour improved social and retail amenities, in addition to public safety and access to natural green spaces”⁵. They found that the occupants of the towers ‘favoured’ the brownfield development approach to infill, because this would not reduce the green space as the existing architecture was already confined (due to the close proximity between residential towers) with a corridor of green space being the only other place infill could take place. Poppe, et al. concluded that a greenfield approach (only the addition of new units) would achieve a greater densification, however the integrity of the community would be lost, and the implementation of these new units would bring much opposition. Poppe, et al. contrast Broitman and Koomen’s with their awareness of social issues surrounding densification, apparent in the survey they conducted of the residents affected by densification. Broitman and Koomen, focus on the physical data, rather than any subsequent social effects densification would have. These are different ways to implement residential infill, from the use of ‘vacant’ space to the utilisation of already occupied land and structures. Infill is shown to be an invasive densification method, due to its potential negative impact on existing neighbourhoods and their identity of place. It is the consideration of both the increase in dwellings, the average decrease of unit size, and examining ideas about communal identity, that allows residential infill to be a viable method. Poppe, et al. give insight into issues of identity of place, which is heavily connected to existing buildings (as this research will be concerned with).

1-Broitman and Koomen. “Residential density change” 30.

2-Broitman and Koomen. “Residential density change” 32.

3-Broitman and Koomen. “Residential density change” 35.

4-Poppe, Will, and Young. “The Politics of Place” 613-621.

5-Poppe, Will, and Young. “The Politics of Place” 620.

Adaptive Reuse

Joachim defines adaptive reuse as: “To prolong the period from cradle-to-grave for a building by retaining all or most of the structural system and as much as possible of other elements, such as cladding, glass, and interior partitions. Reuse, re-adaptation, re-appropriation of existing or a built structure which have remote historical precedents”⁶.

Unlike ‘infill’, adaptive reuse reduces the materials required, and can emphasise a contrast between existing and new. This is especially pertinent for historic buildings such as the ones this research is aimed at. Antonini et al.⁷ explain how important adaptive reuse is for the longevity and financial feasibility of a building’s future operation. They state that: “the retrofitting and rationalization of the stock emerge not only as unavoidable remedial measure to be adopted in short term, but also as strategic perspective for the future”⁸.

Svensson’s research also acknowledges the positive effect adaptive reuse has on increasing the lifespan of the building. Antonini et al. complement Svensson’s research by outlining three retrofitting strategies to produce the best architectural outcome with the residential future in mind. These are summarised as:

- 1-Adapting the size and equipment the apartments contain (by looking at social trends of household size).
- 2-Improving functionality and usability performances of the building/s (these include seismic safety and user comfort).
- 3-Intensifying the utilization ratio of the building estate and increasing settlement density (with the addition of new volumes to both enlarge housing and feed financial mechanisms realise the initial and on-going adaptive reuse)

Once Antonini et al. established these three underlying considerations for every design decision, they illustrated several architectural techniques to reuse existing structures (in their research this is a collection of mid-century social housing towers). These four techniques also consider the increase of m² in order to make the reuse more viable (for functional requirements etc), these are:

- 1-The addition of new ‘volumes’ in space outside the building,
- 2-Basement additions through excavating the base of the structure,
- 3-Façade additions (can include cantilevered structures or extending the whole façade)
- 4-Rooftop additions, which depends on the structural condition of the roof, as well as the existing geometry (these two factors can also affect the other three methods mentioned).

An additional consideration which permeates throughout Antonini et al.’s research is, not only the reuse of existing buildings (and subsequent densification), but also spatial efficiency and environmental impacts. Adaptive reuse, as a densification technique, brings other considerations into play, as is evident in Svensson’s and Antonini et al.’s research. The key difference between the literature on adaptive reuse and residential infill is the architectural detail the authors went into, Poppe et al. did not explicitly describe the physical buildings forms of infill. In contrast Antonini et al. give a list describing not only the different forms of adaptive reuse, but also the underlying goals for the design. It is clear from the research that infill as a densification method is understood to accommodate a wider range of design solutions for a specific site, requiring a less detailed definition. In contrast adaptive reuse is a more complicated design approach because it is site-specific and responds to the detail of existing structures to achieve heritage and sustainability aims.

6-Joachim. “MIT East Campus Life Cycle Assessment” n.p

7-Antonini, Gaspari and Olivieri. “Densifying to upgrading” 306-314

8-Antonini, Gaspari and Olivieri. “Densifying to upgrading” 307.

Shared Spaces

Shared spaces achieves urban densification through the externalisation of specific functions, either designing communal facilities, or relying on existing neighbourhood infrastructure (such as cafés and laundromats) to provide these functions. Densification is thus achieved through a more efficient use of space through the communal sharing of the facilities. Belpoliti et al. consider the limitations of such techniques in their examination of the residential development of a former military base. They argued that in order to achieve the desired density, some buildings needed to accommodate shared spaces, while other “buildings might only require to be secured to host temporary functions such as the market or cultural events”⁹.

Dessi suggested that adaptive reuse can be achieved with the sharing of space (productive activities. The literature suggests that when producing shared spaces (often for both residents and members of the public); the approach to take is how to consider the longevity of a developed space, and how its function/s could be changed as required.

It is important to note that Belpoliti et al. and Dessi are not prescriptive in their outline of shared space functions, nor of the ramifications of shared spaces for the occupants of densification schemes. Greenstein’s research focuses on the environmental and social impacts of shared laundries¹⁰. She compares international examples of communal laundries in three different geographical locations, where historically such spaces were seen to be divided by social boundaries (between different users), and concludes that these shared spaces brought a distinct social identity for those who used the laundries, as well as the benefit of water reductions for the areas which had communal laundromats.

Shared laundries are not uncommon for high density residential buildings, but the externalisation of the kitchen might be considered by many to be a completely ridiculous proposal, but there are historical examples removing the kitchen. For example Evans’ looked into Britain’s national kitchen movement (1917 and 1919) in response to national famine and food shortages¹¹. At its height the scheme included over 1000 communal kitchens throughout Britain. They were run as soup kitchens, instead of a space for households to cook individually. Harshman’s research also examines an historical example like Evan’s, which also identifies that the introduction of these shared spaces was not about convenience or densification, but rather a lack of resources and government intervention into everyday living. He states that “Despite these trends, there is plenty of evidence to suggest that national kitchens could have persisted in the post-war period”¹². Evans’ research concludes with the suggestion that national kitchens could have been retained post World War I, however the downsizing of the Ministry of Food lead to its eventual disbandment. His concluding statement sums up what lead the scheme to fail: “the result of political will rather than public indifference or cultural contempt”¹³.

Harshman’s research focused on early Soviet State communal kitchens¹⁴. The reason for these communal kitchens was to control the hygiene of the citizens by containing where food was prepped and eaten. The public views of these state developed spaces was manipulated through propaganda, the glamorizing of public assets (including not only communal kitchens but also nurseries, workers’ clubs and factories), and condemning of individual household living. Unlike Evans’ work, Harshman highlighted the public’s negative perception of these kitchens. The government chose to look for a quick resolution to hygiene issues from food

9-Belpoliti, Boarin and Davoli . “Densifying the city” 191.

10-Greenstein. “Sharing water sharing space” 66

11-Evans. “The national kitchen in Britain” 114.

12-Evans. “The national kitchen in Britain” 128.

13-Evans. “The national kitchen in Britain” 128.

14-Harshman. “Cooking up a new everyday” 211-233

prep and the co occupation of spaces (such as bedrooms and kitchens) by repackaging soup kitchens into these communal kitchens. She writes that:

The assumption was that because their programmes would be helpful and beneficial to society as a whole, they did not need to seek the approval or even consent of the urban populations who used the kitchens. Plans to re-design a space, particularly a space used every day, are by their very nature invasive; in these plans, concerns about the disruption of residents are mentioned only peripherally¹⁵.

It is clear throughout Harshman's research that the idea to recreate 'the new everyday life' was an effort to minimise state spending, the cost of redeveloping the individual homes being far more time consuming than the introduction and propaganda-led approach of the communal kitchens. Both Evans' and Harshman's research shows the volatile nature of the externalisation of space for the individual, the wider community and even state level. The failure of such schemes is founded on the misrepresentation of public needs, accompanied with a failure to gauge public option. Shared spaces for some functions is a densification method that will never be suitable for 100% of the population. It is clear from the examples in Russia and Britain that different political influences dictate the reception of any change affecting the everyday living of the population. Any externalisation must be either in close proximity, or be available in another form within the building.

Spatial Reconfigurations

The final category identified in the literature to achieve densification is spatial reconfiguration which includes multi-functional space. Antonini et al. propose the adaptation of apartments (by changing size and facilities) to match the changing demands (such as variation between one and two bedroom units). With the changes to each apartment to match the intended occupant (as the occupancy changes), "the next step foresees changes to the indoor distribution of the units aimed at achieving a proper sizing of the living spaces"¹⁶. Changes to residential policy (council district plans) can also contribute to such method (this is true to all the methods discussed, however especially with spatial reconfiguration). Dessi examines the varying degrees of densification fostered by Barcelona policies¹⁷. Such policy changes include altering the minimum density thresholds and lifting of minimum plot-size/dwelling restrictions. Densification is achieved by interventions which work solely within the existing confines of the chosen building. The spatial reconfiguration literature examined everyday activities where changes will allow space-saving techniques to allow more dwellings, while still providing quality homes. Martin's research, "Place Framing", examines ideas about sharing space (through spatial reconfiguration) as an opportunity for the occupants to better control and engage with the space, he examines "how residents analyse, conceptualize and react to the socio-spatial re-ordering of their everyday environment. There has been a concept developed of place-framing, constituting a 'motivating discourse' that unites residents behind a socially produced and shared understanding of the everyday spaces they inhabit"¹⁸. The way in which spatial reconfiguration is approached requires a deep understanding of the site and who will occupy the space. There is value in understanding the activities and spatial needs of the inhabitants, to save space and increase the density, while keeping the identity of the building intact.

15-Harshman. "Cooking up a new everyday" 214.

16-Boeri, Danila and Roversi. "Urban renewal" 175.

17-Dessi. "Environmental sustainability vs livability" 82.

18- Martin. "Place-framing' as place-making" 50.

Conclusion

The densification of cities is achieved through many different means. Residential Infill, Adaptive Reuse, Shared Space and Spatial Re-configurations are the methods found in the literature which help achieve denser residential dwellings. This literature demonstrates the spectrum of architectural methods available. The next chapter (through case studies and experiments) develops interior architectural methods which could increase density. This is strengthened when the specific site fosters an approach which further integrates the history of the site. The conclusion is that while the literature shows densification can be achieved, the smaller scale, interior architectural methods are not well documented. The reasons for such a 'gap' can be attributed to the developer focus that the literature shows. The direction of the literature, being based on a larger urban scale, could have meant that smaller scale methods may not have been deemed effective at the desired scale. Physical transformations (residential infill and adaptive reuse) are the most frequently discussed ideas (and are further explained in the following chapter), while the more spatial aspects appear to still require more research and connection to the ways in which interior architecture can intensify density. A greater number of interior architectural methods have been identified from the case studies in chapter 4. The imbalance in the literature could be due to the different venues that research material has been published in, specifically journals on urban development, environmental impact and architectural issues and interior projects in design magazines.

3 .

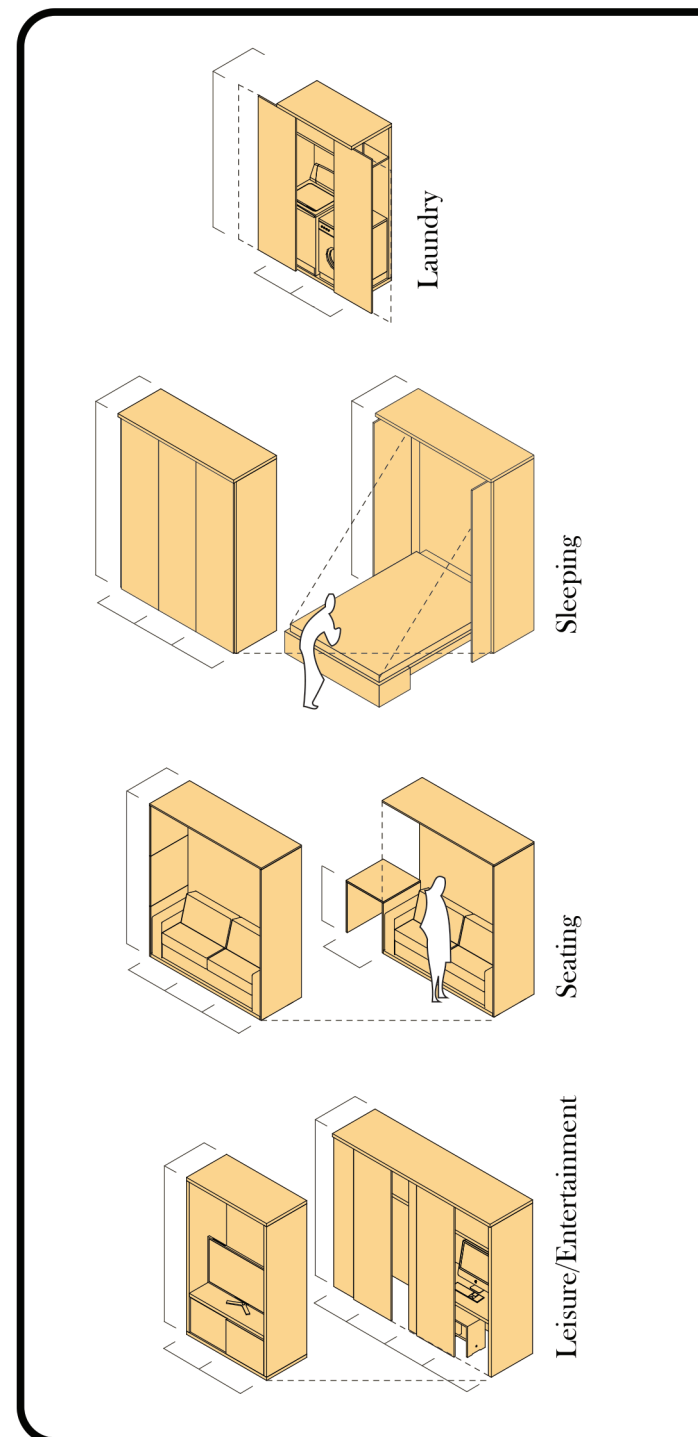
CASE STUDIES

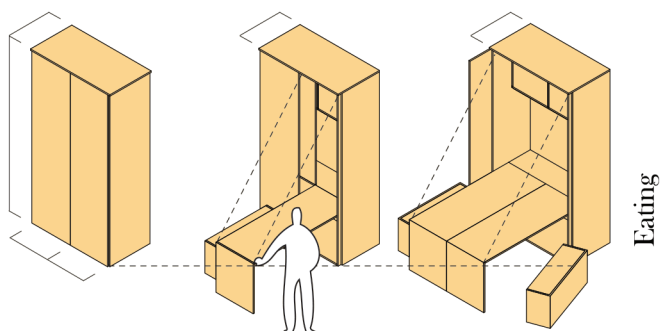
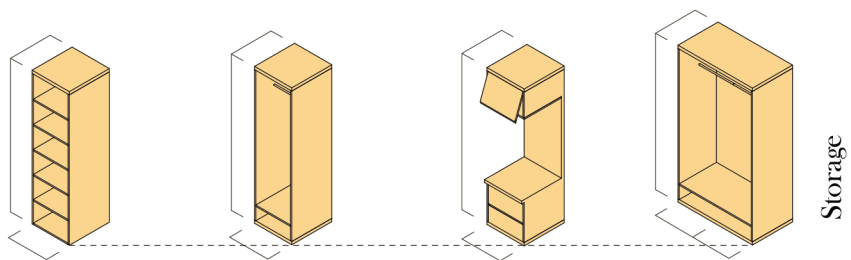
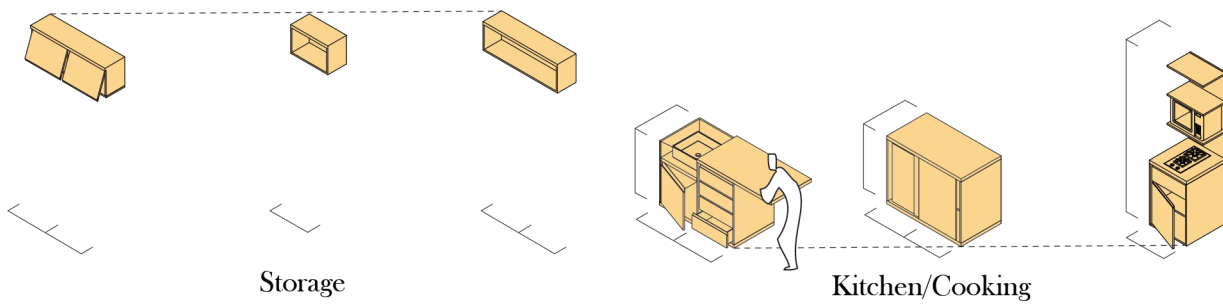
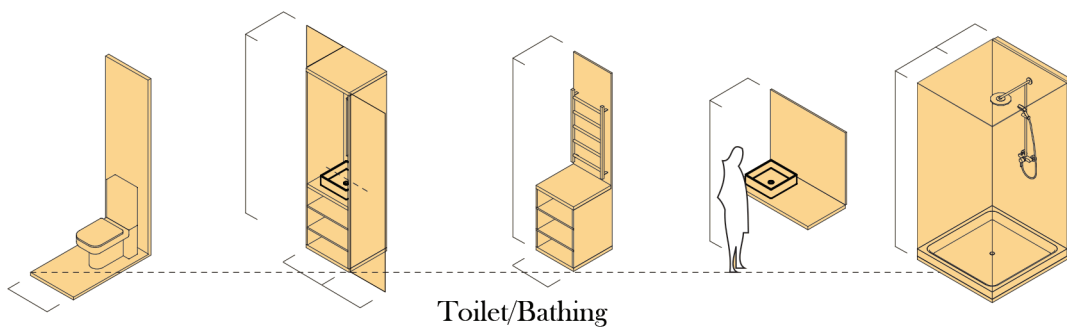
This chapter identifies five distinct categories of interior architectural methods from the case studies to test on the selected sites. These are Unit Joinery, Modular, Adaptive Partitions, Vertical Infill and Shared Spaces. The chapter is organized into five sections, one for each category. Each is described and illustrated to produce a base method and geometry for experimentation and testing. Relevant case studies follow this description. The selection of the case studies was determined from the following criteria:

- 1-Inclusion of a residential component.
- 2-The potential to achieve increased density.
- 3-The ability to adapt and refer to existing features.

UNIT JOINERY

The term “Unitjoinery” is used to describe a collection of small ‘pieces’ which are grouped by function (such as cooking or sleeping). As a collection the units can define several areas of space. This is achieved through the design by allowing the joinery to ‘borrow’ from adjoining spaces to create an illusion of space. As a series they can include an interactive element, such as foldable surfaces or in-build furniture elements, to reveal and hide functions on a smaller scale. This is to maximize the usability of each unit. The joinery is designed in repeatable modules of 600mm, which are fixed to the walls of the apartment, because they are not intended to be self-supporting. The intention is each unit can be quickly installed with a large amount of flexibility.





STUDIOMAMA (2017)

“Adaptable furniture creates what might be London’s smallest house”¹

[Overview]. This distinctive design focuses on a flexible living space which appears large. In reality the former office is only 13m² in size, making the inclusion of all expected living amenities more impressive. The design development used methods of caravan and boat joinery construction (including the mechanisms to hinge the seating and fold down the bed). Every element has a specific purpose, every shelf and hidden storage is ergonomically designed to fit a specific purpose. The drive for the firm and designers was as follows. “We see the issues of how to live in a compact living space to be of growing importance, especially given the trends towards urbanization and rise of megacities.”² The design achieved what Studiomama determined is all that is needed to live comfortably in confined spaces.

[Interior Techniques]. The design achieved has a cohesive appearance, through the use of birch ply on the walls, floor and ceiling. This “seamless” approach follows onto shelving with sliding panels and hinged doors, allowing cavities for storage to be hidden in plain sight for easy access by the occupant. These integrated storage and seating elements have “discreet dual functions” where certain panels can be extended to create surfaces for many functions. This allows the one large space (minus the separate bathroom) to change as required thanks to clever joinery and extensive understanding of the daily needs for the occupant. This is vital to such a small design, because if any one function is removed, or not given its required elements, the whole space becomes unusable.

[Design Method]. The overarching goal for Studiomama was to “get the space to work intuitively, without too many electronic or hidden functions.”³ This approach was brought into their design method by testing every joinery element, looking at 1:1 scale and practically. This simple approach to adaptive joinery is shown in such pieces like the dining area, with hinged elements allowing some flexibility to the space.

Fig 3.01 Study space

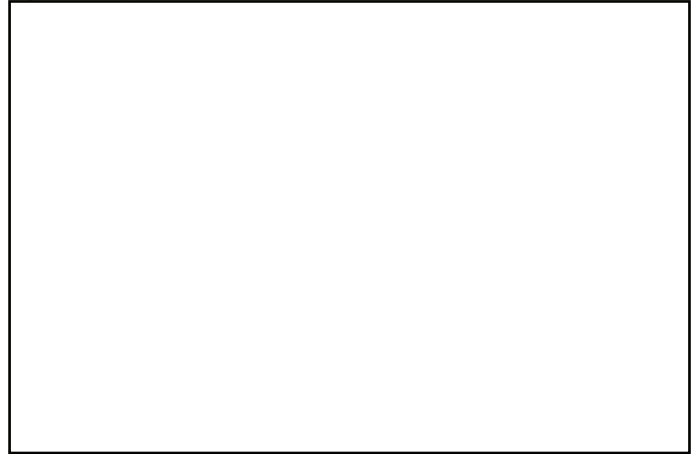


Fig 3.02 Folding bed

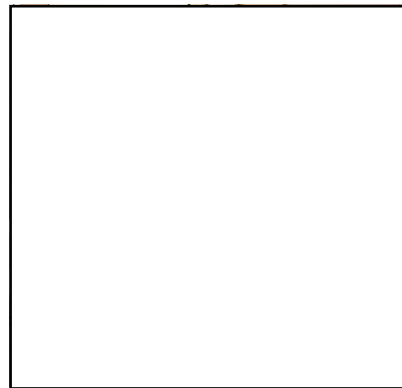
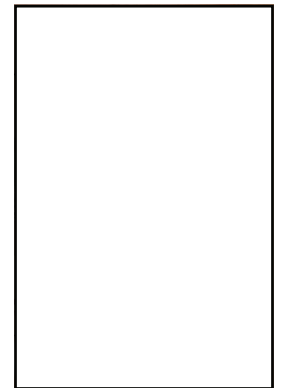


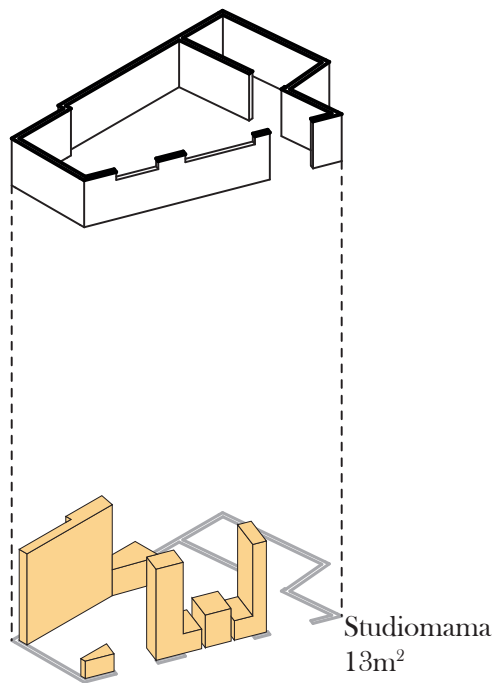
Fig 3.03 Dining furniture



1-“Studiomama uses adaptable furniture” n.p

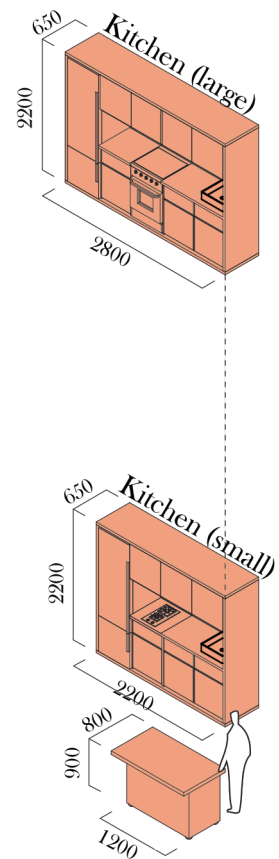
2-“Studiomama uses adaptable furniture” n.p

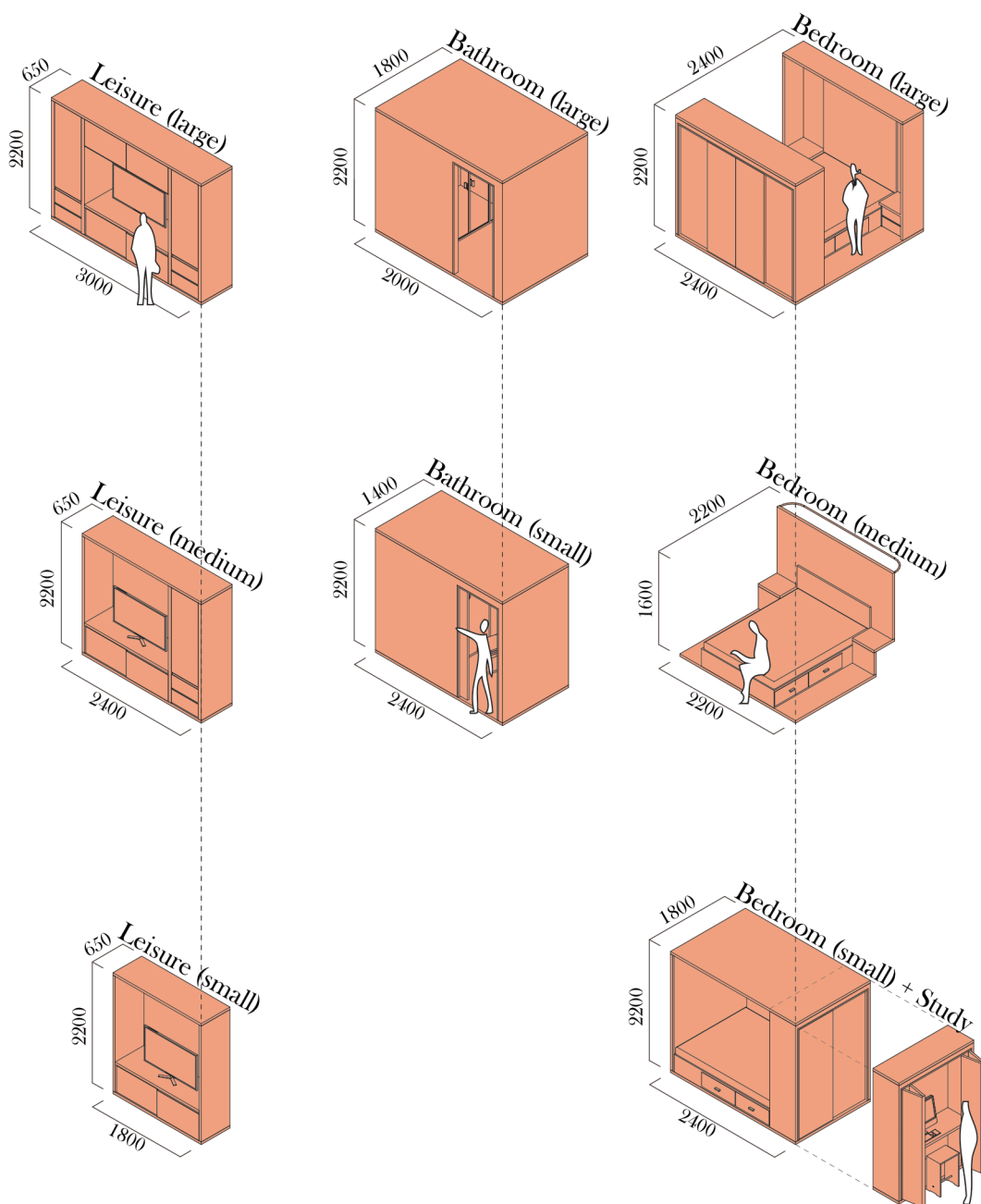
3-“Studiomama uses adaptable furniture” n.p



MODULAR

The modular system uses a range of cabinets which are designed as distinct furniture pieces. These both contain functions, and act as spatial partitions when needed. The scale of the modules means that they contribute to shaping a specific room. This size and spatial function differentiates them from Unit Joinery. Unlike Unit Joinery the modules are intended to be self-supporting, not reliant on existing wall structures for their installation. Their placement is intended to be pivotal in their influence on the occupant (by defining space, circulation and function routes). The four categories of cabinet modules are kitchen, leisure, bathroom (independent rooms) and bedroom. These range in size to give flexibility for installation.





CATSEYE (2016)

“Renovation of a studio apartment to create distinct spaces for eating, sleeping and living”⁴.

[Overview]. This case study looks at how one joinery element can define several areas of space. For Catseye design, the brief was to produce a design for a short term space, such as for rented apartments, however the first outcome could also support a long term apartment occupancy. The temporal aspect to the module solves issues of tenancy length by being quickly installed and changed if needed between tenancies. This is achieved by not restricting the space, and allowing the joinery to ‘borrow’ from adjoining spaces in order to create the illusion of open space, within the tight confines of 32 m².

[Interior Techniques]. The simple design retains certain existing interior features from the restored Art Deco building in inner Sydney, while adding a unique aesthetic from the joinery unit. The intervention has been designed as a free standing element, it could therefore be introduced into other sites with similar results. The space is configured around the bedroom, with separate kitchen and bathrooms using existing architectural features. The custom joinery acts as both an architectural intervention and furniture, where it is both a partition and functional bed, sofa, and storage. This approach saves space, while creating a room which can change depending on use, or be completely removed without damage to the retained features.

[Design Method]. The approach to designing such a vital element for this project required an:

open-ended, exploratory process, sitting in the space, allowing its possibilities to unfold, and seeing what it would yield/give up, before taking those ideas through model making and in-situ prototyping processes⁵.

This malleable approach allowed a simple idea to address more complex issues of spatial flow, outlook, and to maximize the storage spaces accommodated by the joinery unit.

Fig 3.04 Entry view

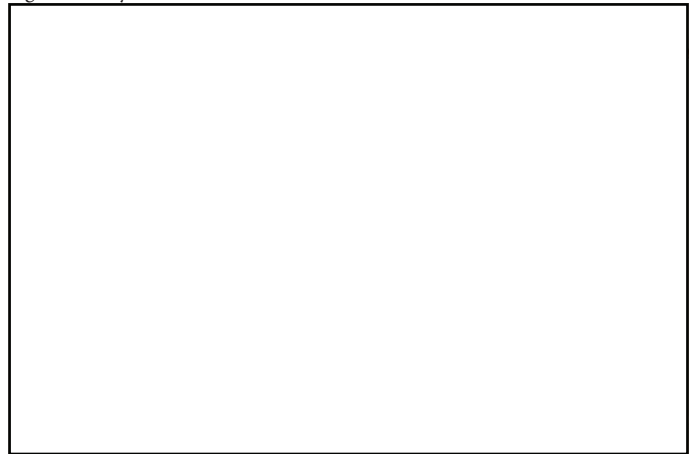


Fig 3.05 Sleeping and sitting

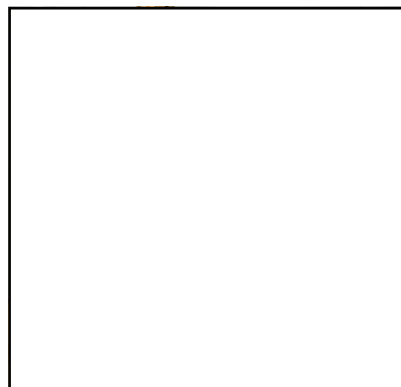
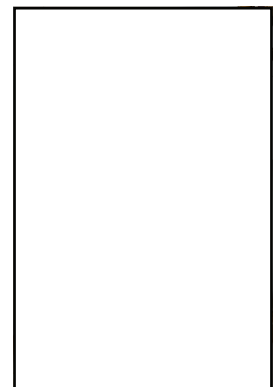
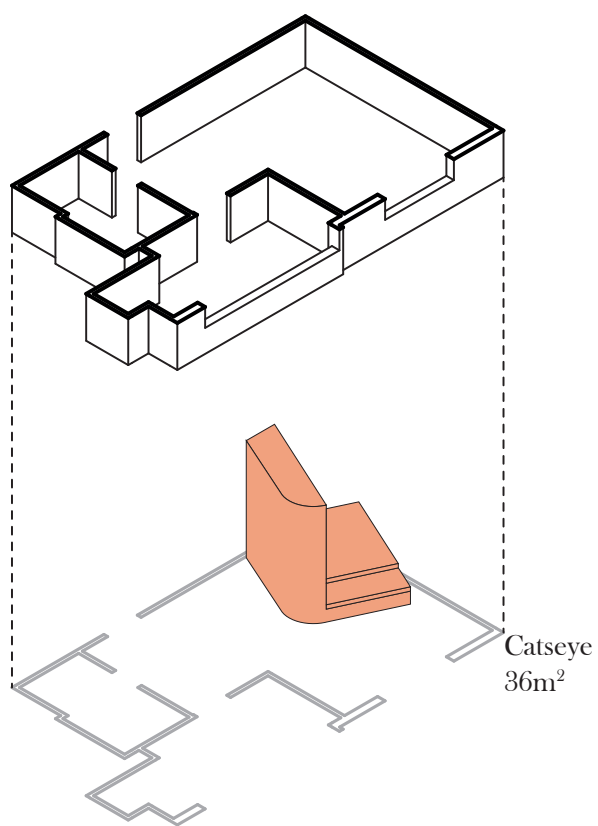


Fig 3.06 Existing features



4-“Small and Sculpted Studio Apartment“ n.p

5-“Small and Sculpted Studio Apartment“ n.p



W A A T A A (2 0 1 7)

“Transforms Lisbon offices into compact studio apartments with fold-out furniture”⁶.

[Overview]. The case study shows the execution of a design scheme focusing on merging spaces into large joinery units. The converted building houses two distinctive ‘modules’ which sit independent of the surrounding space. The method of joinery is similar to Studiomama with fold out furniture recessed in both the ‘modules’ and apartment walls. The reason for foregoing a more traditional layout (such as the Icarai Apartment, see p34) was due to “the nature of its pre-existence, the housing core to be generated could not and should not follow conventional patterns”⁷.

[Interior Techniques]. Limited floor space was the dominant issue influencing the design of this case study.

“The incorporation of fold-away furniture in the design is both a rational space-saving mechanism and an opportunity of interaction with one’s own house, favoring the overlapping and intertwining of spatial functions according to the moment’s necessity”⁸.

This approach is also relevant for Unit Joinery, as that method directly interacts with the existing. Such a method could guide the development for increasing density at 26 Stokes Street Newtown. The design uses the concealment of such joinery as the dining table and bed to be available at chosen times throughout the day. This technique is explored through the unit joinery.

[Design Method]. Waataa does not explain their design method in the Dezeen article.

Fig 3.07 Space between modules

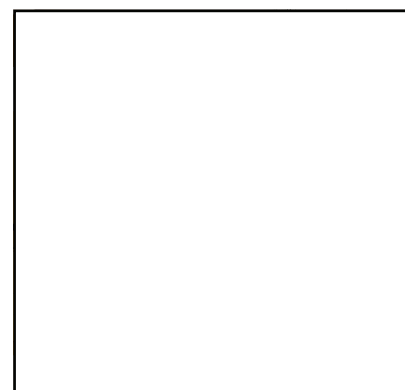
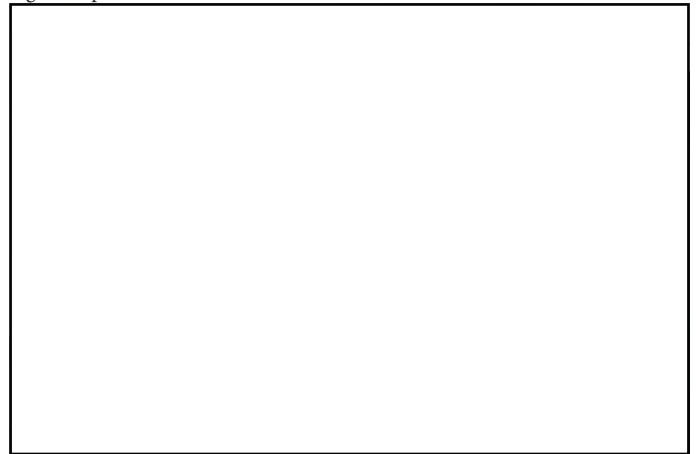


Fig 3.08 Small version of sleeping

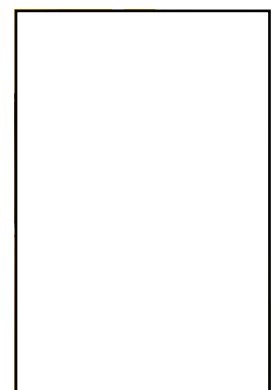
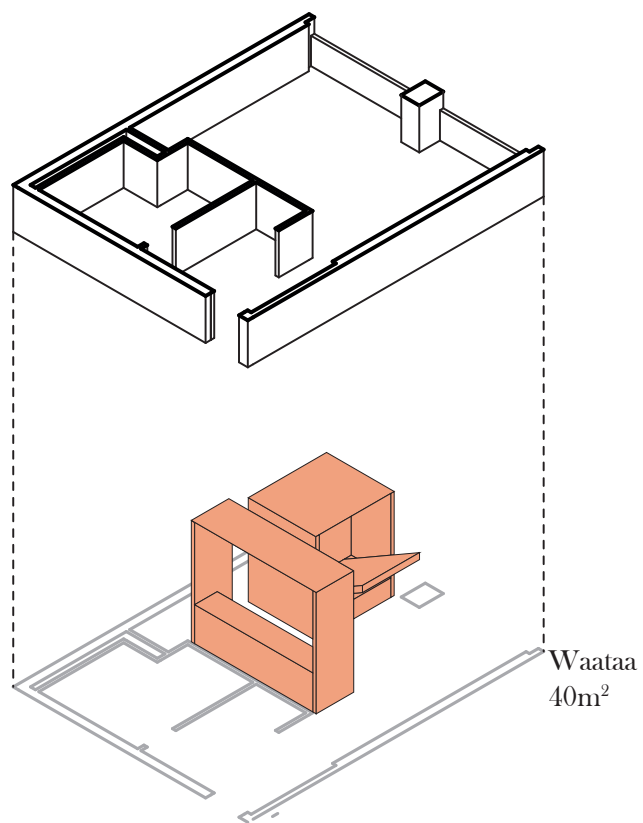


Fig 3.09 Kitchen and stairs

6-“Waataa transforms Lisbon Offices” n.p

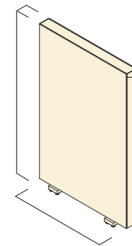
7-“Waataa transforms Lisbon Offices” n.p

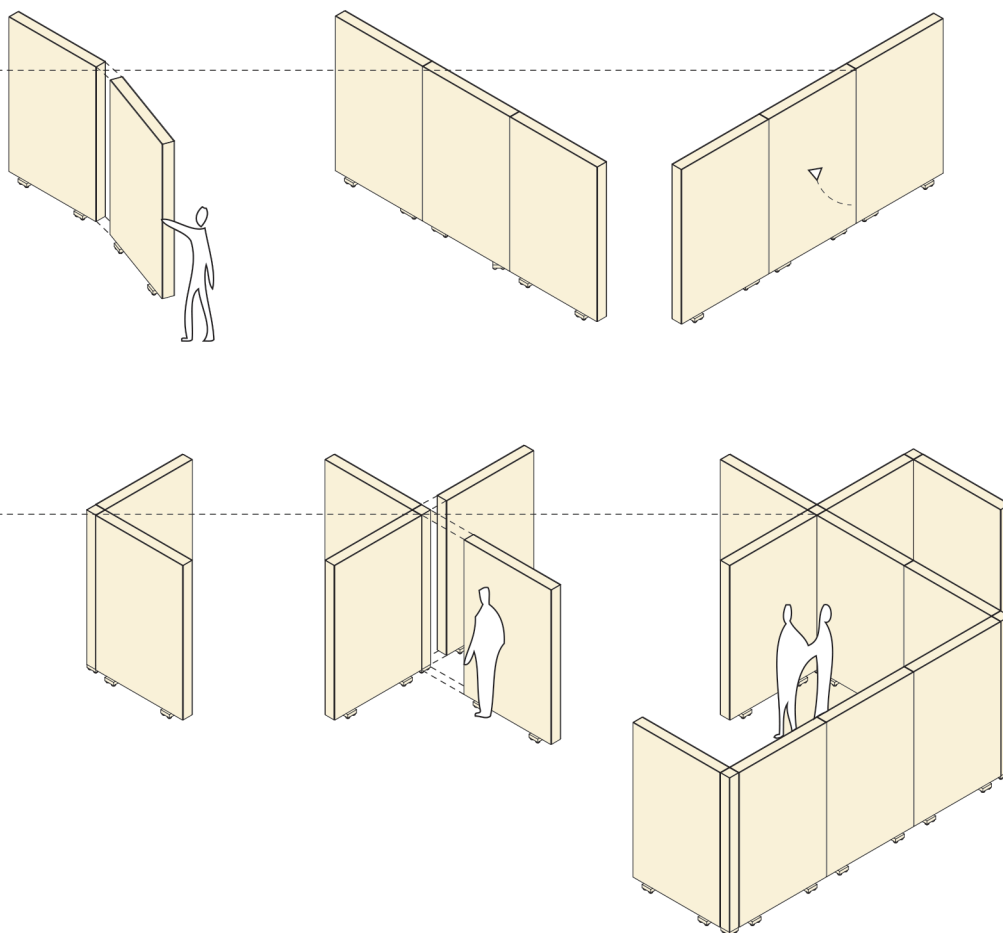
8-“Waataa transforms Lisbon Offices” n.p



PARTITIONS

Partitions are very user-based, with the movement and the interaction between occupant and partition being the method used to create and change space. The intention is to use the flexibility of the partition system (or furniture piece) to create the boundaries of rooms, which can be moved as needed. The configuration/s relies on simple spaces with square corners. Each partition length is 1200mm.





C I A A

(2 0 1 6)

“Icarai Apartment ”

[Overview]. This project has a narrow floor plan that uses moving panels to define and change space. The goal for CIAA was to give the home a “young and dynamic Character”⁹ by using the longitudinal axis to create a sequence of space. The Brazilian design does this through colour, and the concentration of critical services, similar to the multiuse furniture in the Sydney and German designs. With a footprint of 80m², it is the largest case study; however its approach to flexible space could be taken into a one bedroom design.

[Interior Techniques]. The main intervention comes from a large multifunctional shelf-wall which runs right through the apartment (the movement is the key technique). This intervention creates a clear separation between intimate and social spaces, which can transform into coloured panels and moving furniture. It also allows for easy installation of services such as electrical, data, illumination and plumbing, by creating the required cavity in the center of the room, with access panels to perform maintenance if needed. When introducing residential ‘units’ within existing structures (at times without a residential history) these services can become a challenge to install without affecting the design.

[Design Method]. CIAA have produced a series of axonometric images showing how the design developed into a final form. This method of design and testing has been used in this thesis in order to give simple representation of each technique derived from the case studies. CIAA uses these quick diagrams to show the different configurations for the space, as they change throughout the day. This approach could prove useful in the research implementation at a later stage, to illustrate the relationship between form and function.

Fig 3.10 Wall closed

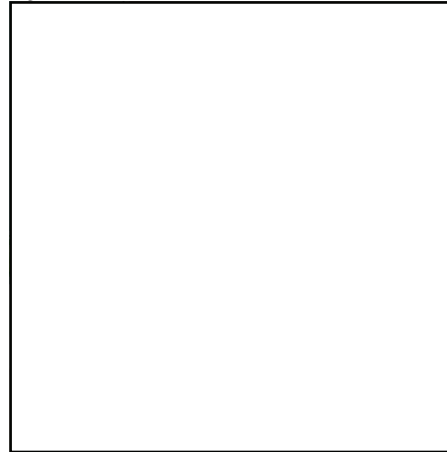


Fig 3.11 Shelf intervention

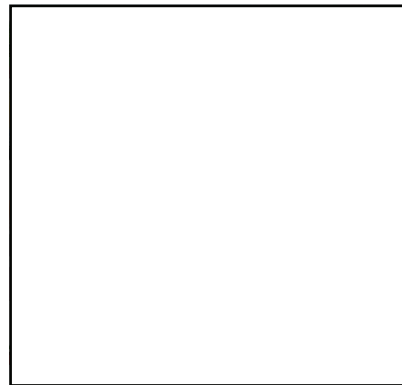
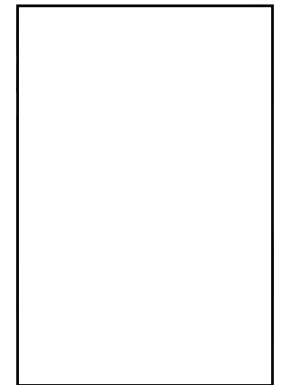
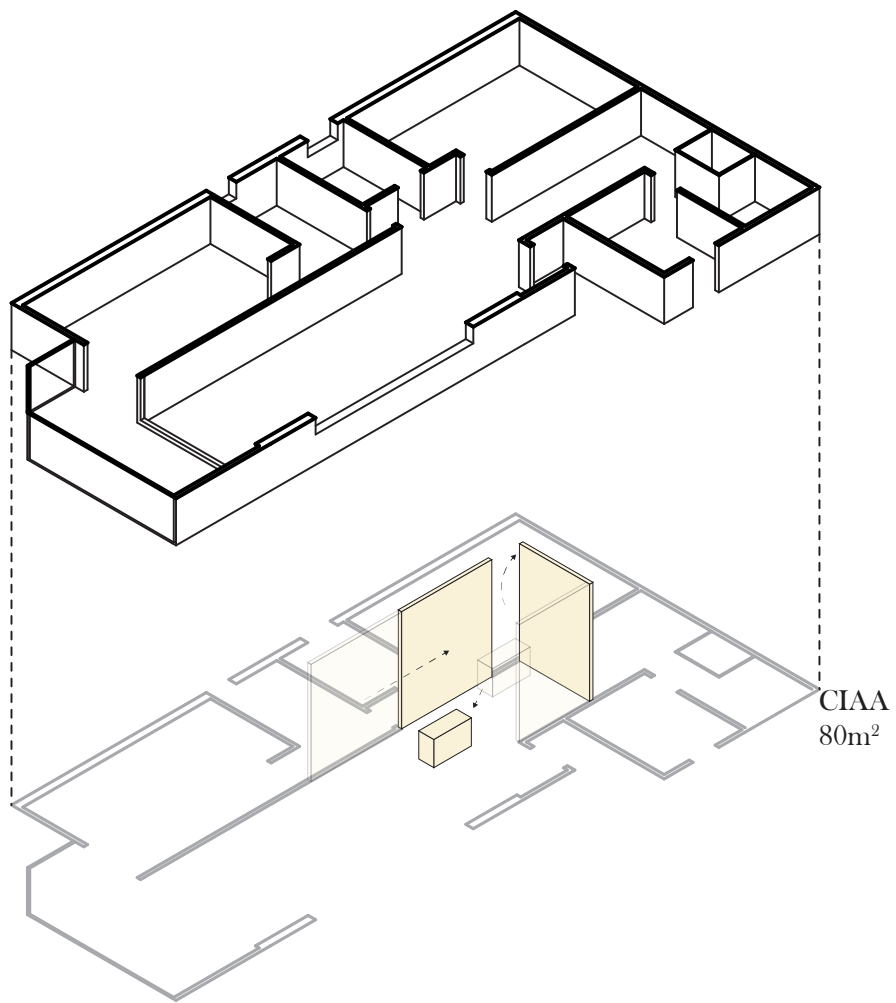


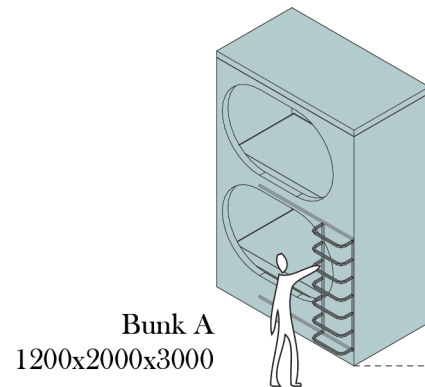
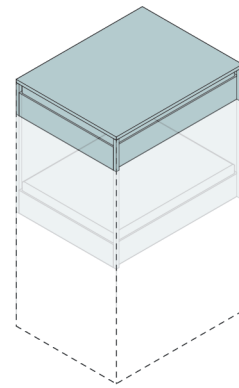
Fig 3.12 Interaction

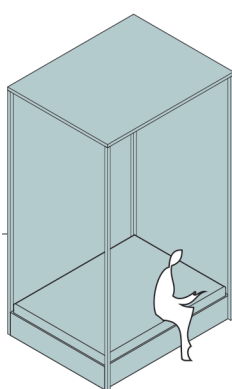
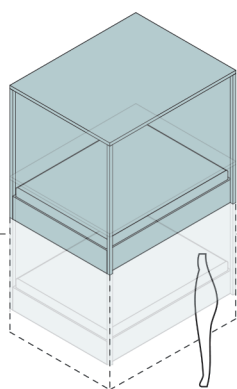




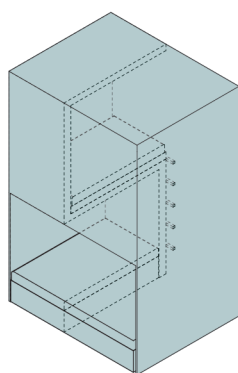
VERTICAL INFILL

Vertical Infill is the utilization of internal vertical space. Sleeping space, as well as shelving and storage are common functions to be housed above. The implementation of this method comes in several forms (as shown), including a kinetic aspect (in some instances), a stacked system and a larger scale intervention. A clear issue with this method is need for sufficient vertical space. The ‘stacking’ of space can maximize the use of space.

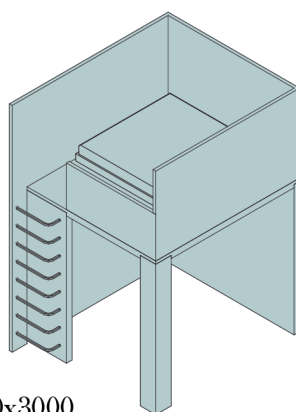




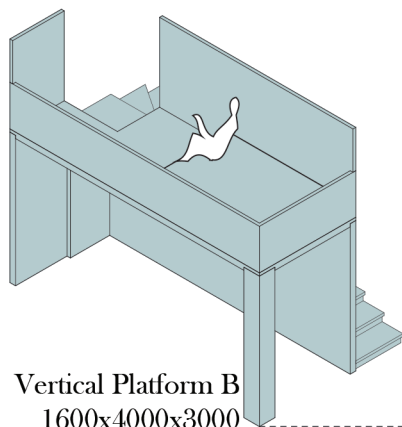
Kinetic Bed
1800x2000xSpace from ceiling to floor
Motor to lower bed on cables



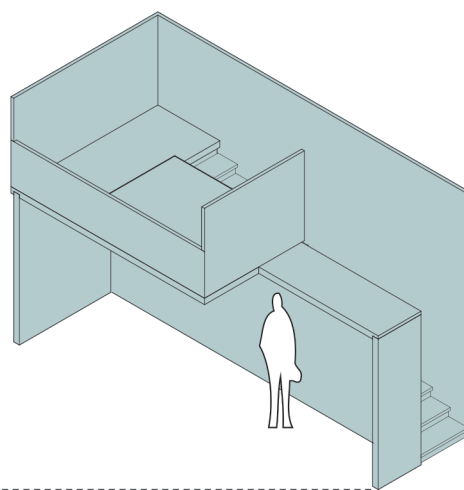
Bunk B
1500x1800x3000



Vertical Platform A
2000x2400x3000



Vertical Platform B
1600x4000x3000



Vertical Platform C
2200x4600x3000

SPAMROOM + JOHNPAULCOSS (2015)

“Due to the 21m² footprint of the plan, it was necessary to rethink the spatial capacity of the flat”¹⁰.

[Overview]. This project has a similar approach to Catseye Bay’s apartment (see p28), being one large joinery element. The interior of the apartment was gutted, with only external walls and overall proportions retained. The footprint of the apartment is only 21m². The goal was a comfortable space that could be redecorated by the occupant (through a basic layout and white space). Once again multi-use joinery creates surfaces (above the mainfloor) to address functional needs, with storage hidden behind panels and in the elevated bedroom. Spatial boundaries are less defined as each area is blended together to use every inch of space and allow the occupant to use their own furniture to define space (by function).

[Interior Techniques]. For Spamroom and Johnpaulcross the joinery wraps around the center of the room, from the kitchen to the living space. The original horizontal proportions are retained due to the new spaces using the vertical space, with the new spaces being limited to the mezzanine bedroom housed above the bathroom and entry. The original “Altnau” (1900s German home) had high ceilings allowing the stacking of the spaces to create more open space below, while still addressing the sleeping needs of the occupant.

[Design Method]. The design approach taken is not explicitly outlined, but assumptions can be made from the outcomes and design language. The key driver seems to be the limits of inhabitable living space. This connects back to the thesis intention to research and produce a model to increase residential density by building within the spatial limits of the existing building stock, and raises the question of at what point does a space become unliveable due to a push to fit in the smallest space possible.

Fig 3.13 Storage

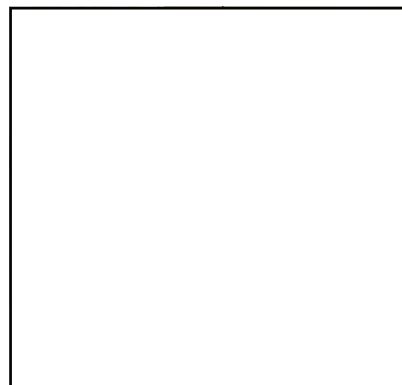
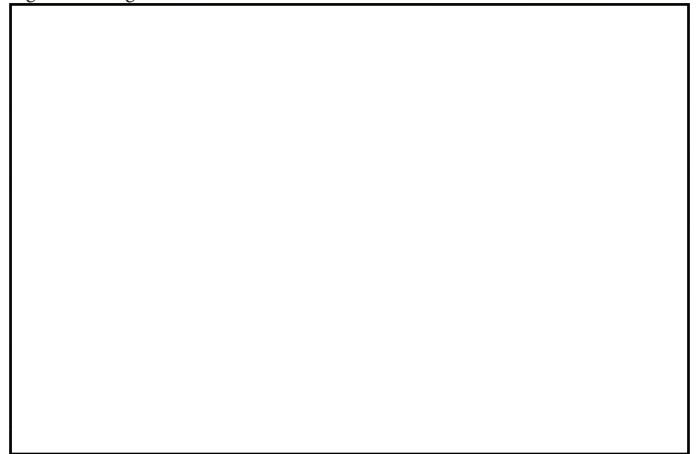


Fig 3.14 Living space

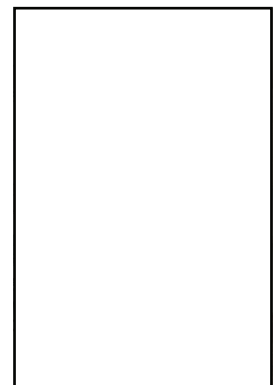
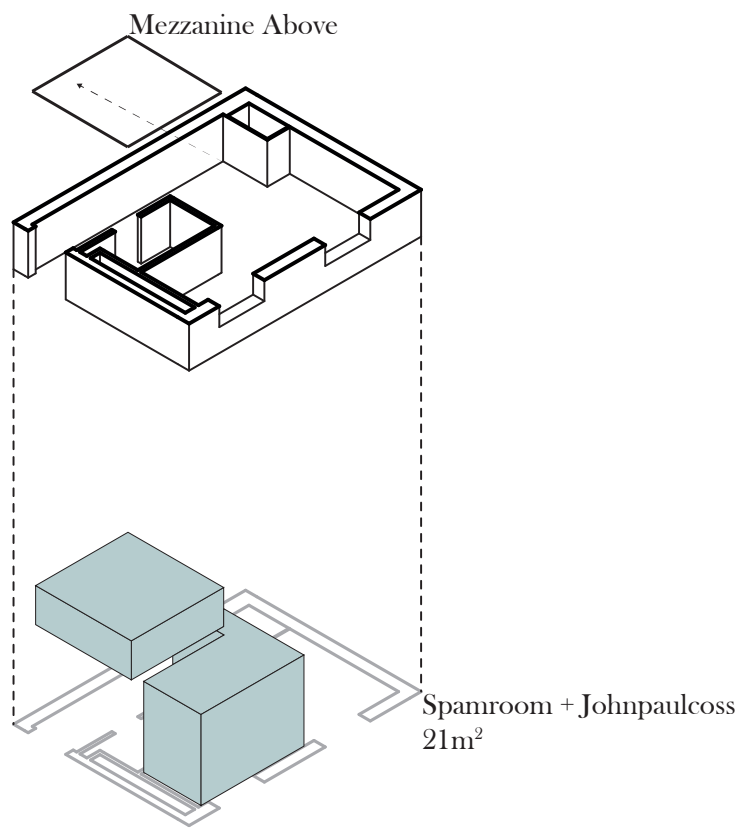


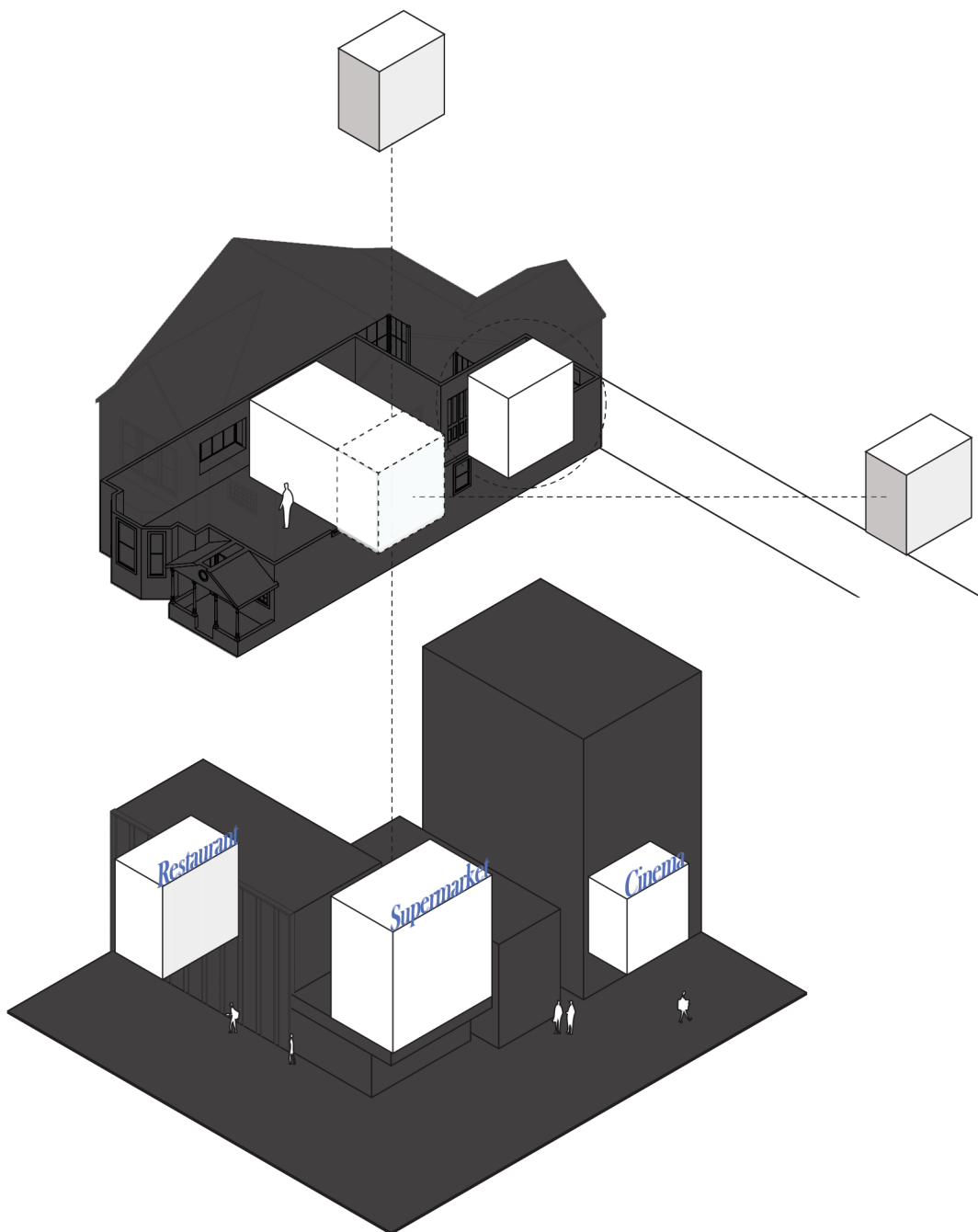
Fig 3.15 Kitchen

10-“Micro-apartment in Berlin“ n.p



SHARED SPACE

Shared spaces is harder to illustrate because it focuses on the externalization of functions (either outside the apartment or outside the apartment building). These can include the sharing of spaces between dwellings, such as a laundry or communal cooking. This approach does presume that the fulfillment of the removed function can be provided outside the individual apartment and possibly in the surrounding neighbourhood context. Shared spaces also assume that the occupants are happy to share such functions.



NARCHITECTS (2015)

“New York’s first micro-apartment building”¹¹.

[Overview]. These ‘micro’ apartments are part of a modular residential tower in New York as a solution to the affordable housing shortage in Manhattan. NArchitects developed this scheme for a brief that wanted to solve the issue in current apartment projects for New York, where individual units were much larger than needed. “Architecture with a sense of social purpose is becoming increasingly rare”¹² was the key focus for their project. This was also combined with the focus on improving the quality of small dwellings, “the project focuses on quality and liveability through features that highlight the use of space, light and air”¹³. The implementation of many shared spaces helped reduce the individual apartment footprints (including a communal gym, small lounge, a roof terrace, bicycle storage and a garden).

[Interior Techniques]. For the apartment design there is a total of seven configurations to enable the maximum number of occupants. This approach is similar to Waata’s approach to the smaller scale modules for the ‘pods’, considering an adaptive design to maximize the variation between apartments’. This idea is also evident in the apartments’ programme where functional blocks are introduced to maximize space (and simplify the joinery). The externalization of typical cooking facilities (deemed acceptable due to the apartments proximity to restaurants and bars), combined with shared spaces in the apartment building (mentioned in the overview), enabled these smaller apartments.

[Design Method]. The basis for the design was to understand the requirements of the occupant and produce the minimum required elements for a functioning one bedroom apartment. With the number of bars, restaurants, clubs and other buildings (in the vicinity), a majority of cooking facilities were removed, as well as any space solely for leisure/entertainment. This was due to the target occupants (young professionals aged 20-35) being seen to prefer such external facilities over individual spaces in the apartment.

Fig 3.16 Kitchen

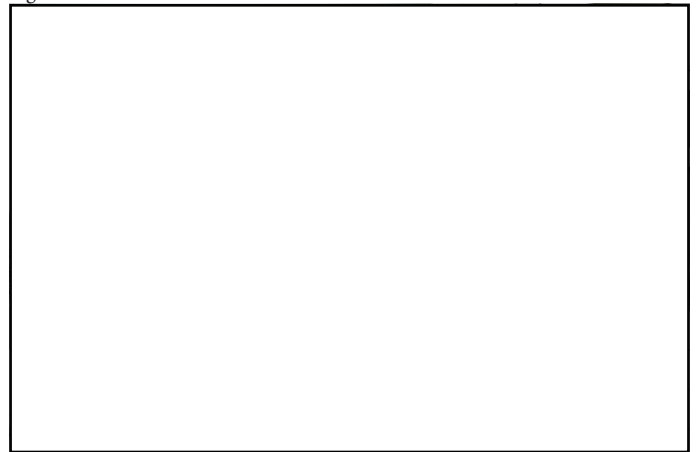


Fig 3.17 Exterior

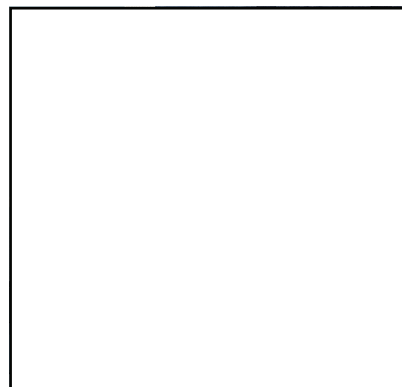
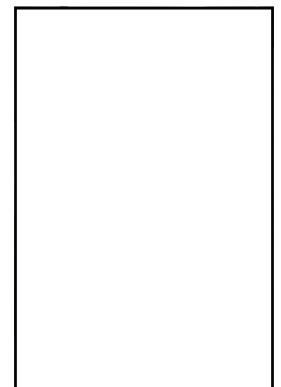


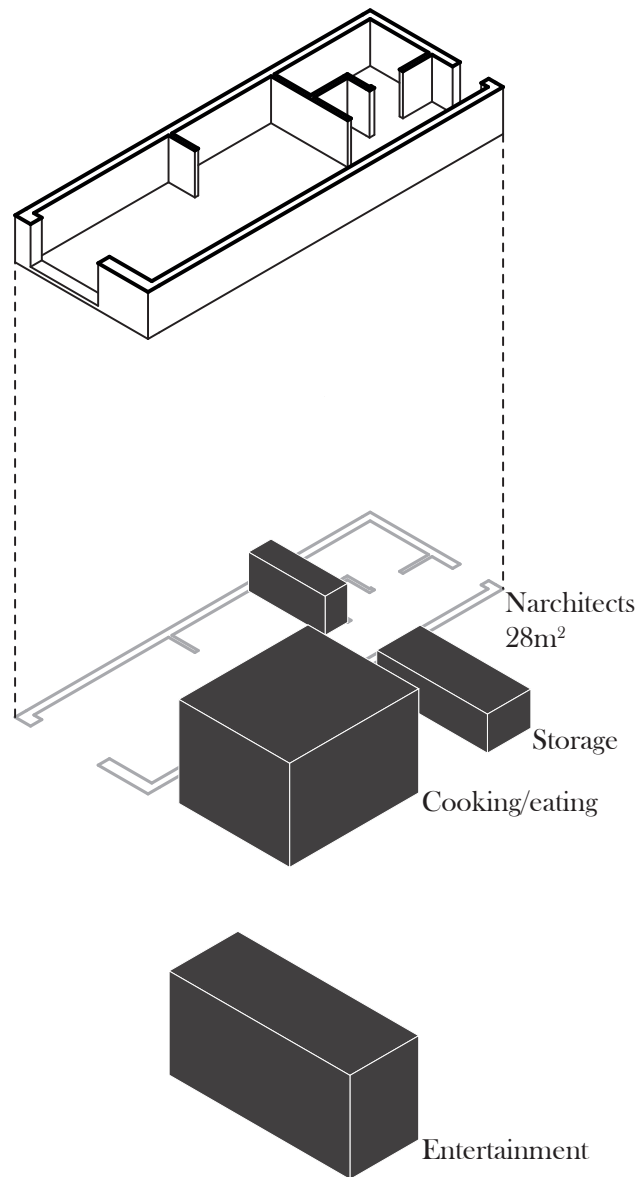
Fig 3.18 Entry



11-“New York’s First Micro-apartment” n.p

12-“New York’s First Micro-apartment” n.p

13-“New York’s First Micro-apartment” n.p



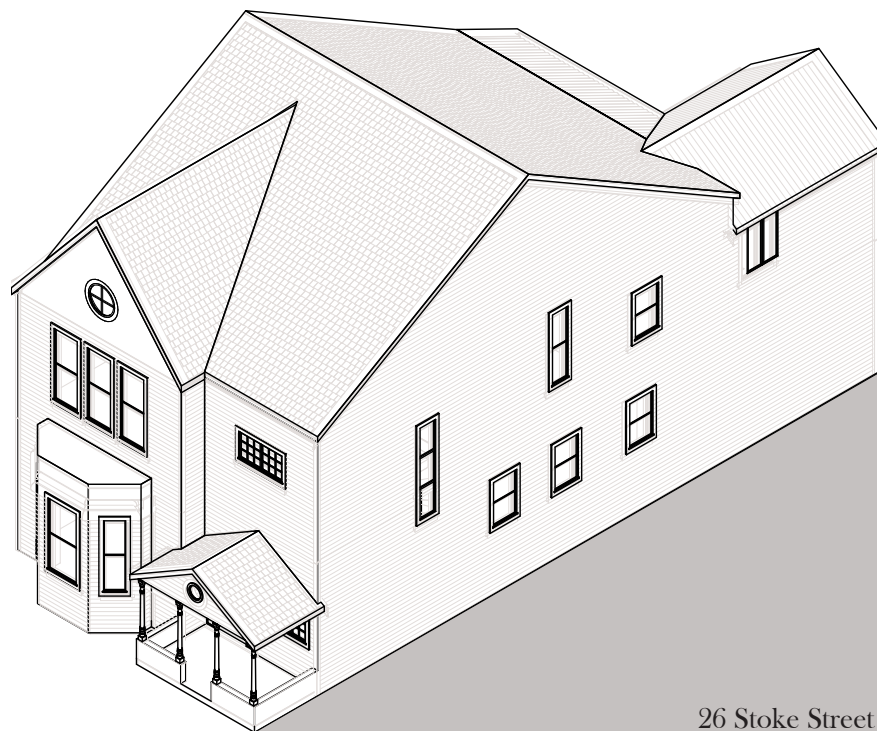
SUMMARY OF CASE STUDIES

While this chapter is divided into five individual case study techniques, it is important to note, in reality that all of the projects have used a combination of techniques. The individual techniques enable spatial efficiency, however not all of the case studies are very small apartments (such as CIAA). The testing in chapter five aims to examine these techniques individually, unlike the case studies the context for their testing on interior density will be kept consistent (26 Stoke Street). The axonometric image for each case study serve to show the spatial ratio between the technique, and the building's interior (all the case studies were one bedroom, except CIAA with two), illustrating the variation of dwelling size between the case studies.

4 .

S I T E A N A L Y S I S

The collection and subsequent analysis of the case studies in the previous chapter identified suitable interior architectural methods to then test these in the selected sites. Five distinct categories have been identified to produce a base method and geometry for the experimentation and testing which is documented in chapter 4. This chapter analyses the two sites which will be used to test the interior architectural methods.



SITE MAPS



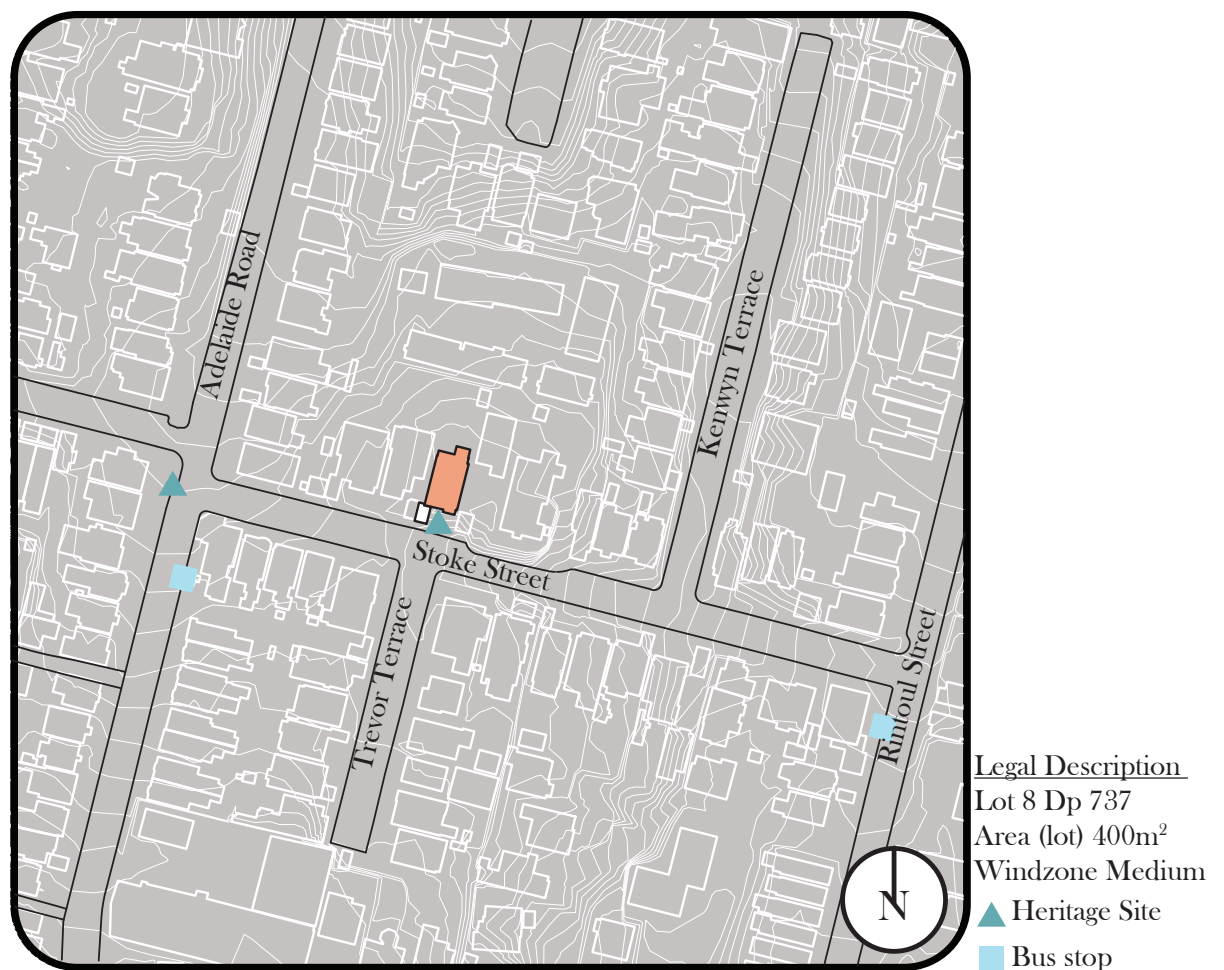
This map shows the boundaries for each Wellington suburb. The suburb of Newtown, the suburb both the chosen sites are located in, is highlighted.

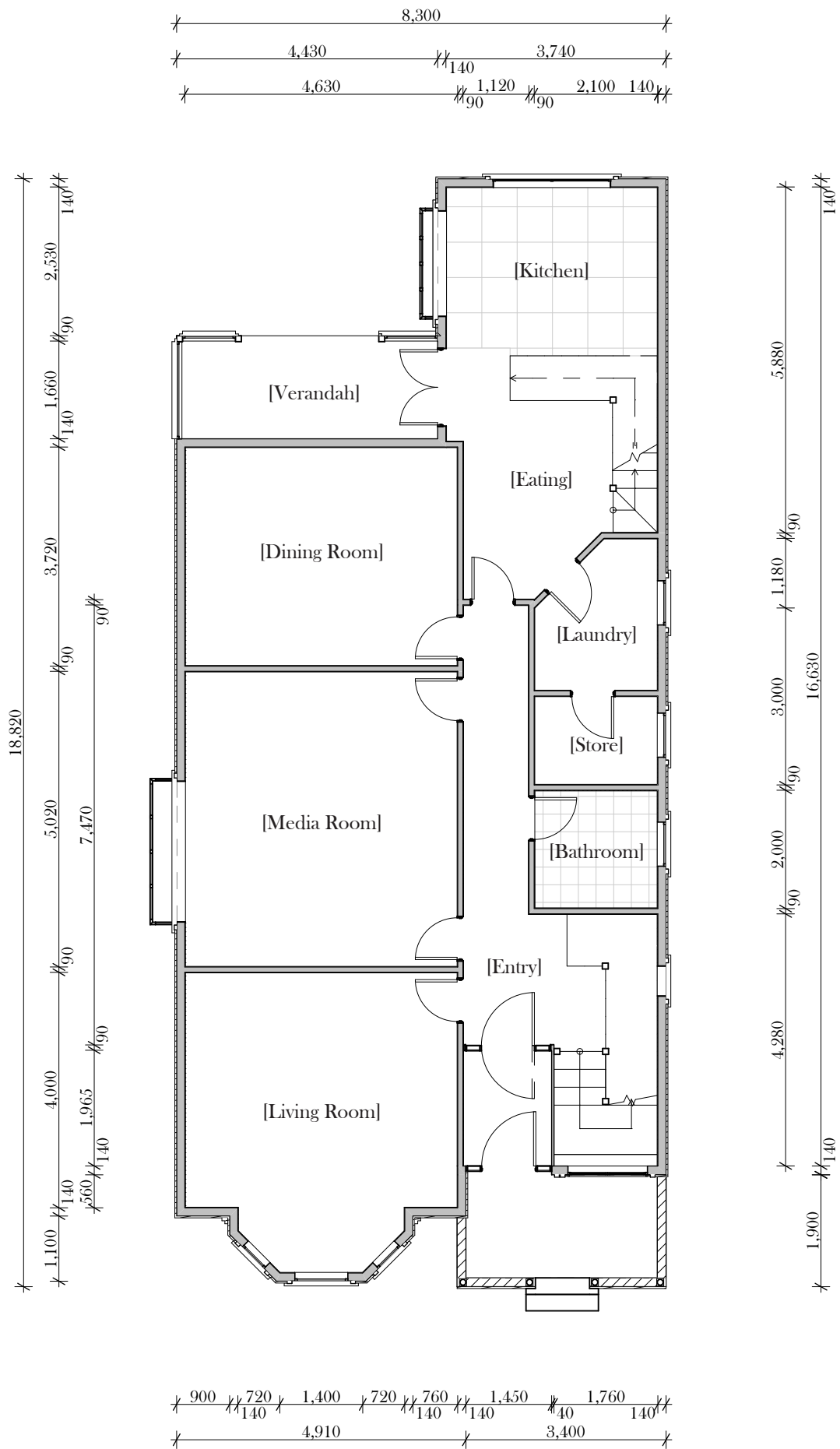


This map shows the street layout for Newtown. The locations of the two sites are highlighted.

26 STROKE STREET

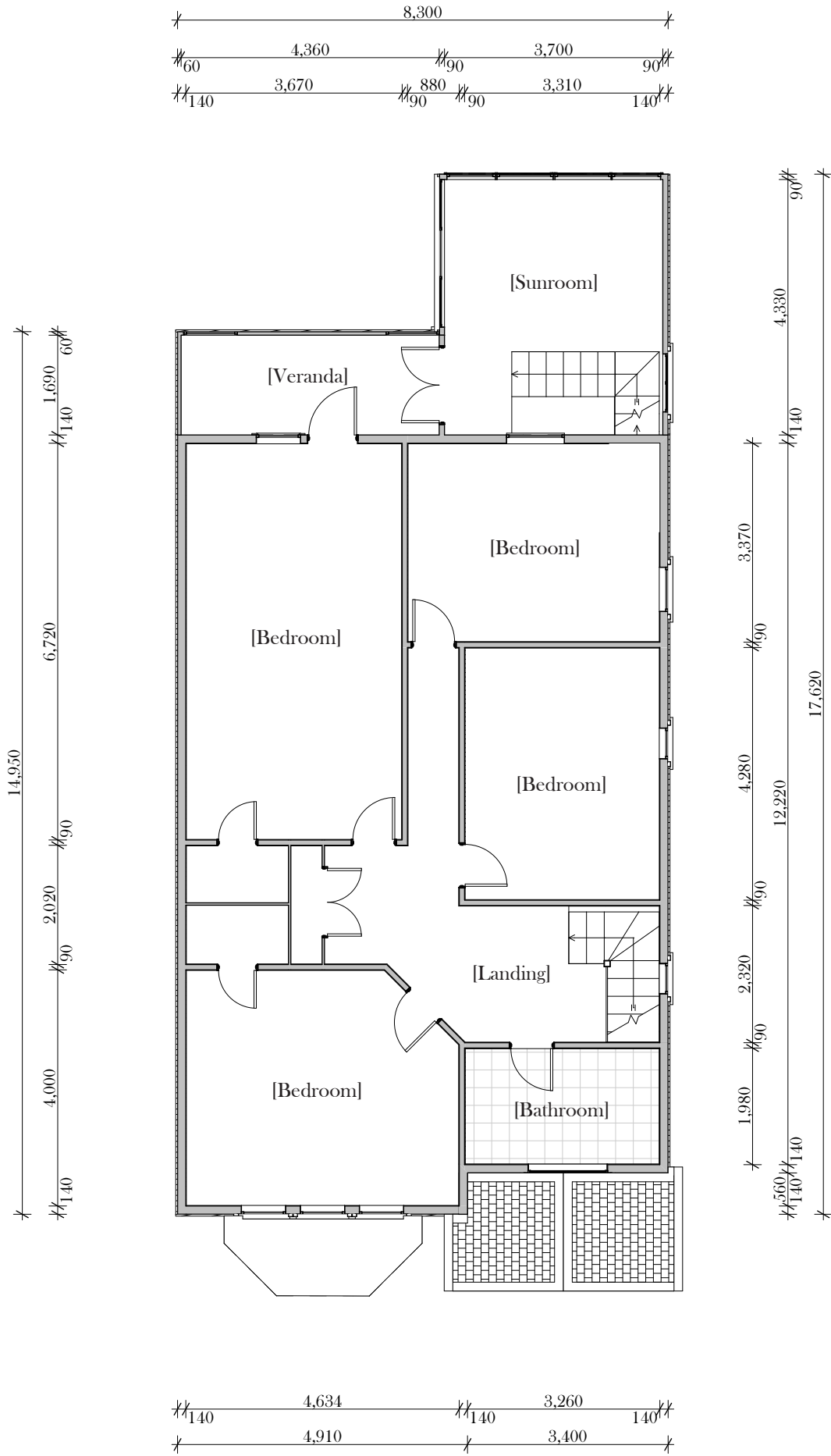
26 Stoke Street (Footprint of 220m²) is a two storey timber residence, typical of the 1-2 storey buildings in Newtown providing for one dwelling. It provides the site for the first stage of experimentation testing the identified interior methods. It is a heritage-listed dwelling, due to its retention of many Edwardian villa features.





1:100 Existing Ground Floor

N



1:100 Existing First Floor

N



Fig 4.01 Entry to 26 Stoke Street



Fig 4.02 Street Facade

POINTS OF INTEREST

Heritage Values and Technique Viability

26 Stoke Street is documented by the Wellington City Heritage report as an Edwardian Villa. It is identified as having significant cultural value due to its unusual but well-proportioned street façade. The palette of details and ornamental features¹ are also noted as unique to 26 Stoke Street.

The street façade appearance is strongly impacted by the steeply pitched roof with ‘Carpenter Gothic’ carved barge boards. Below the barge boards is the projected bay window (on the ground floor) paired with the tripartite set of sash windows (on the first)².

The Wellington City Heritage report suggested that while the property has had some intrusive alterations over the last century (e.g. the addition of the sunroom and verandah), its contribution to the sense of community remains strong. The original built fabric (on the street façade) being intact is the dominant reason for this assessment.

From an interior architectural view, the entry foyer and staircase are all original, as well as a majority of the 1905 layout and general proportions. It will be the role of the experimentation to consider these features, as well as retaining the protected street façade, in the testing and hypothetical installation of the identified methods of densification. This research presumes, for example, the modular strategy could use the north façade for the installation of joinery which would otherwise not fit through the front face without the possibility of damage.

1- WCC “House and Garage” n.p

2- WCC “House and Garage” n.p

194 ADELAIDE ROAD

194 Adelaide Road, is also known as the Tip Top Factory (680m²). It is a abandoned site, comprised of three large buildings. 1913 was the first recorded development on the site after the demolition of houses similar to 26 Stoke Street. The building identified (in orange) will be used to test the design techniques proposed for 26 Stoke Street.

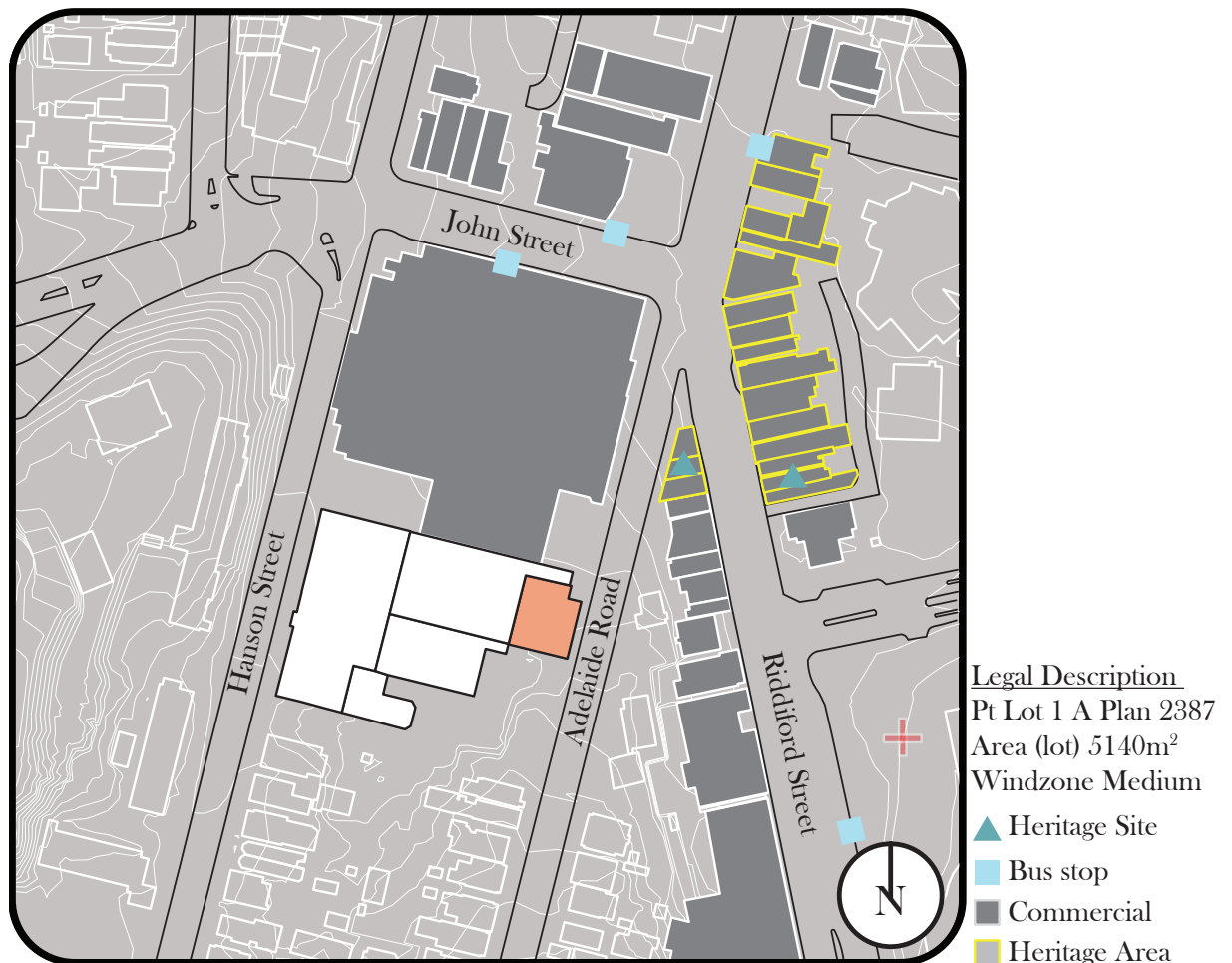


Fig 4.03 North East Corner



Fig 4.04 South West Corner

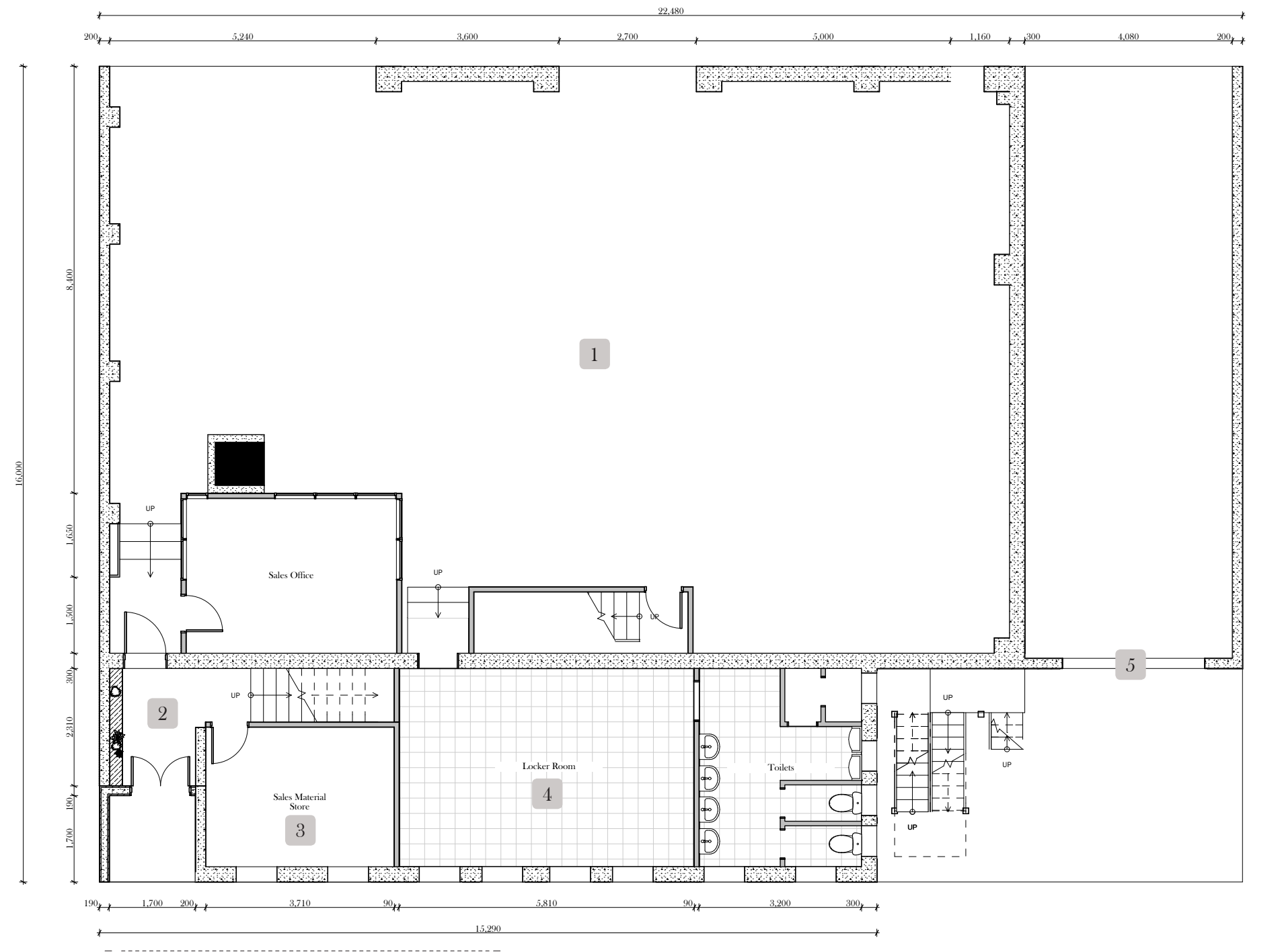
Fig 4.05 Heritage Area



Fig 4.06 North Boundary

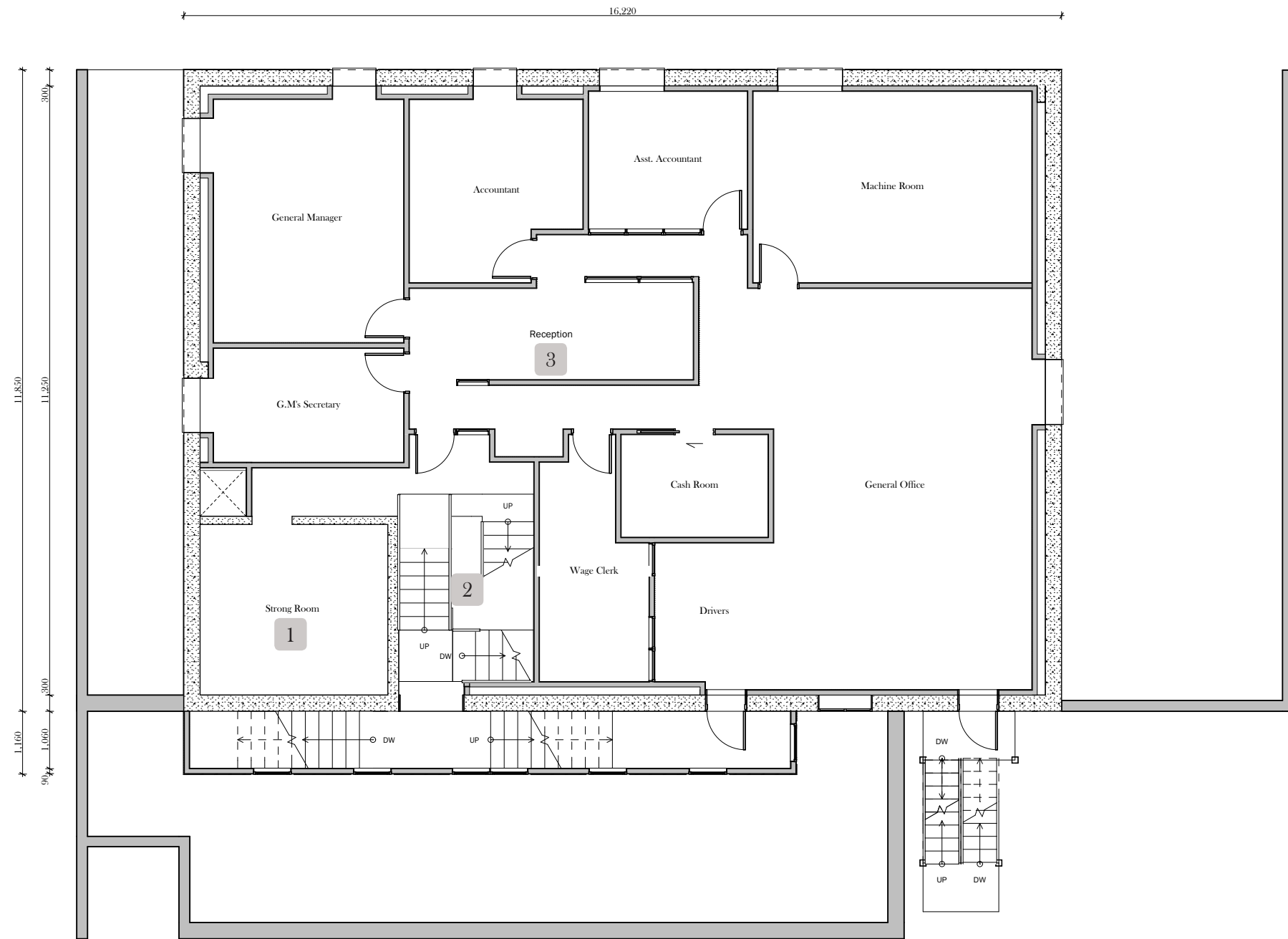


Fig 4.07 Adjacent Car Park and What Remains of the Factory.



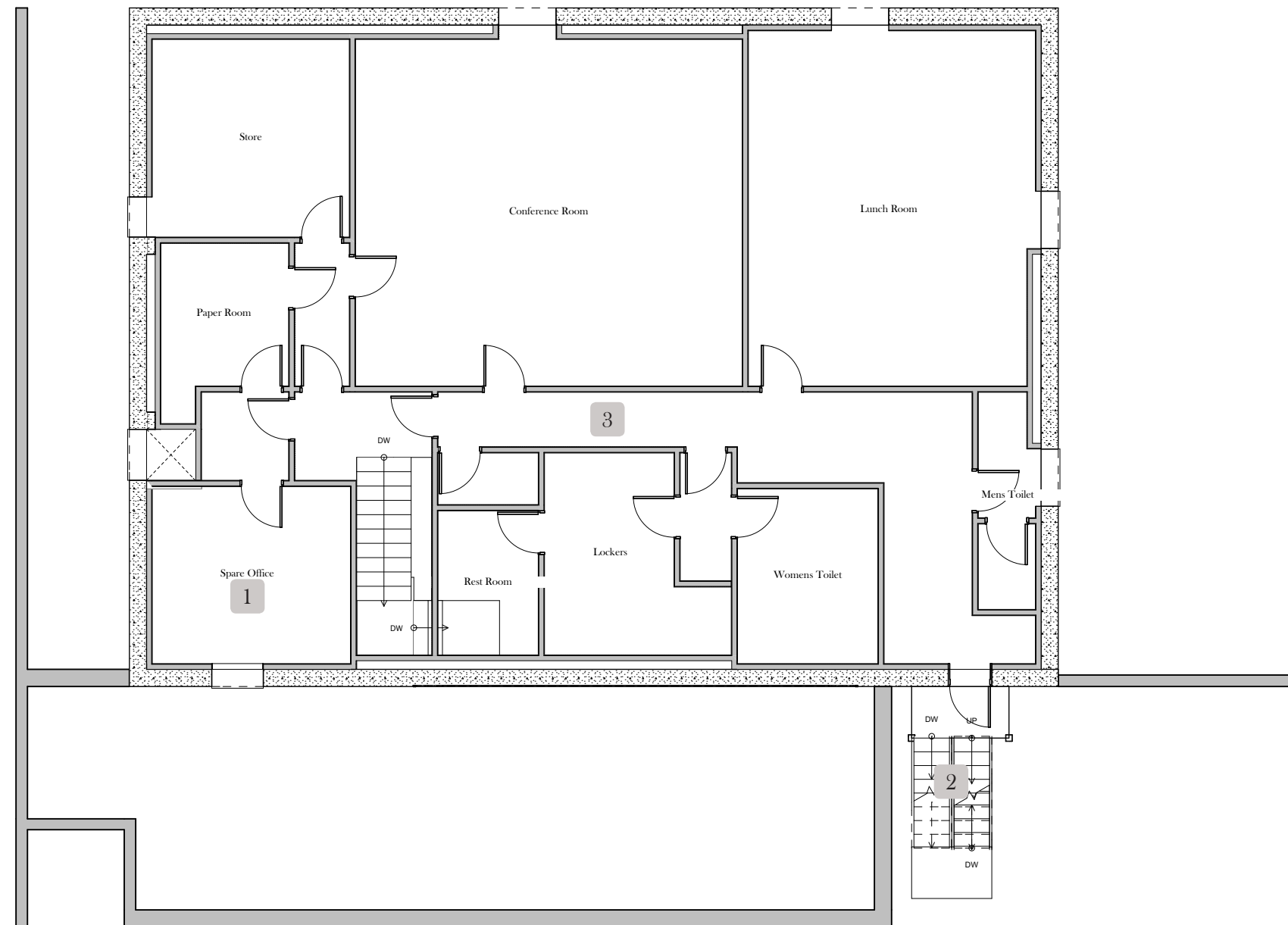
1:100 Original Ground Floor

- 1-This large open space was once the main factory floor. The slab sits slightly below the ground plane, with a floor to ceiling height of around 4 meters. This large volume could become a public space given it does not seem suitable for apartments with the lack of natural light and proximity to the street.
- 2-The current entry to the office floors above the factory floor. There are two routes to the first floor, with this staircase being a addition during the late 1980's remodel and strengthening.
- 3-Small room on the same level as the entry could be used for a shared Laundromat or possibly occupant storage.
- 4-Lockeroom and toilets for the factory workers, elevated off the factory floor. These two spaces currently take up a majority of the Adelaide Road interface, interventions to this area could enhance the street interaction and presence.
- 5-Freight access (different to the sending and receiving on the opposite end of the site), with the addition of an entry to the factory floor, this could be used to access the public space and the apartments.



- 1-The strong room could be converted to storage for the apartments on this floor, there is also a dumbwaiter which could be used for rubbish or laundry.
- 2-This stairwell continues to the second floor and is the only access (other than the fire escape).
- 3-The layout in general is fragmented, making it more difficult to retain the original partitions (compared to Stoke Street).

1:100 Original First Floor



- 1-Similar to the strong room (on the first floor), this room could be used for occupant storage, as the stairwell and corridor disconnect it from the other spaces.
- 2-The fire escape (in its current location) requires a long corridor so any additional apartments can reach the exit.
- 3-The layout once again is fragmented, making it more difficult to retain the original partitions (compared to Stoke Street).

1:100 Original Second Floor

5 .

STOKE STREET

(TECHNIQUE
EXPERIMENTATION &
OPTIMISED DESIGN)

As outlined in the introduction, this stage of the research applies the identified techniques (from the case studies) to a residential site, 26 Stoke Street. The aim is to test each of the five techniques individually. This individual application is to examine the positives and negatives (of each) with the aim to increase residential density. The outcome should be the understanding of what makes each method unique, and its effectiveness to densify 26 Stoke Street. Currently 26 Stoke Street is only one dwelling, however it does have four bedrooms (ranging from 14-24m²) averaging at 17m². This is the base interior density from which to evaluate the testing. The ‘rules’ listed below will be used to balance requirements for densification and respect for the building’s heritage status. This will also ensure a level of comparability between technique experiments.

- 1 The partial removal of elements to enable adequate circulation space is allowed. Structural elements can be added to allow this change if necessary.
- 2 Door frames can be removed to enclose individual apartments.
- 3 Partitions can be added to enclose bathrooms and for toilets or individual apartments.
- 4 Other than the above, all internal partitions will be retained.

ADAPTIVE UNITS





The arrangement of joinery ‘units’ followed the approach of Studiomama¹, which using the internal envelope of the apartment to provide structural support for the installation. The success of the unit joinery technique is due to the 600mm modules, which are placed in the existing layout, enabling the retention of a majority of existing partitions. This method produced 4 one bedroom dwellings, and 2 two bedroom dwellings, of an average floor area of 34m² per dwelling. Currently Newtown has a total of 3,417 dwellings² (both occupied and unoccupied), with the 2500 more dwellings needed by 2043³, this approach would require roughly 400 dwellings altered with this technique to meet WCC’s target (without considering any new construction). However this technique does have some clear design difficulties, these relate to the interactive aspects of the joinery, mainly the dining and bedroom units, where the current design uses folding mechanisms to share space.

1-“Studiomama uses adaptable furniture” n.p

2-“Newtown Population, dwellings and ethnicity” n.p

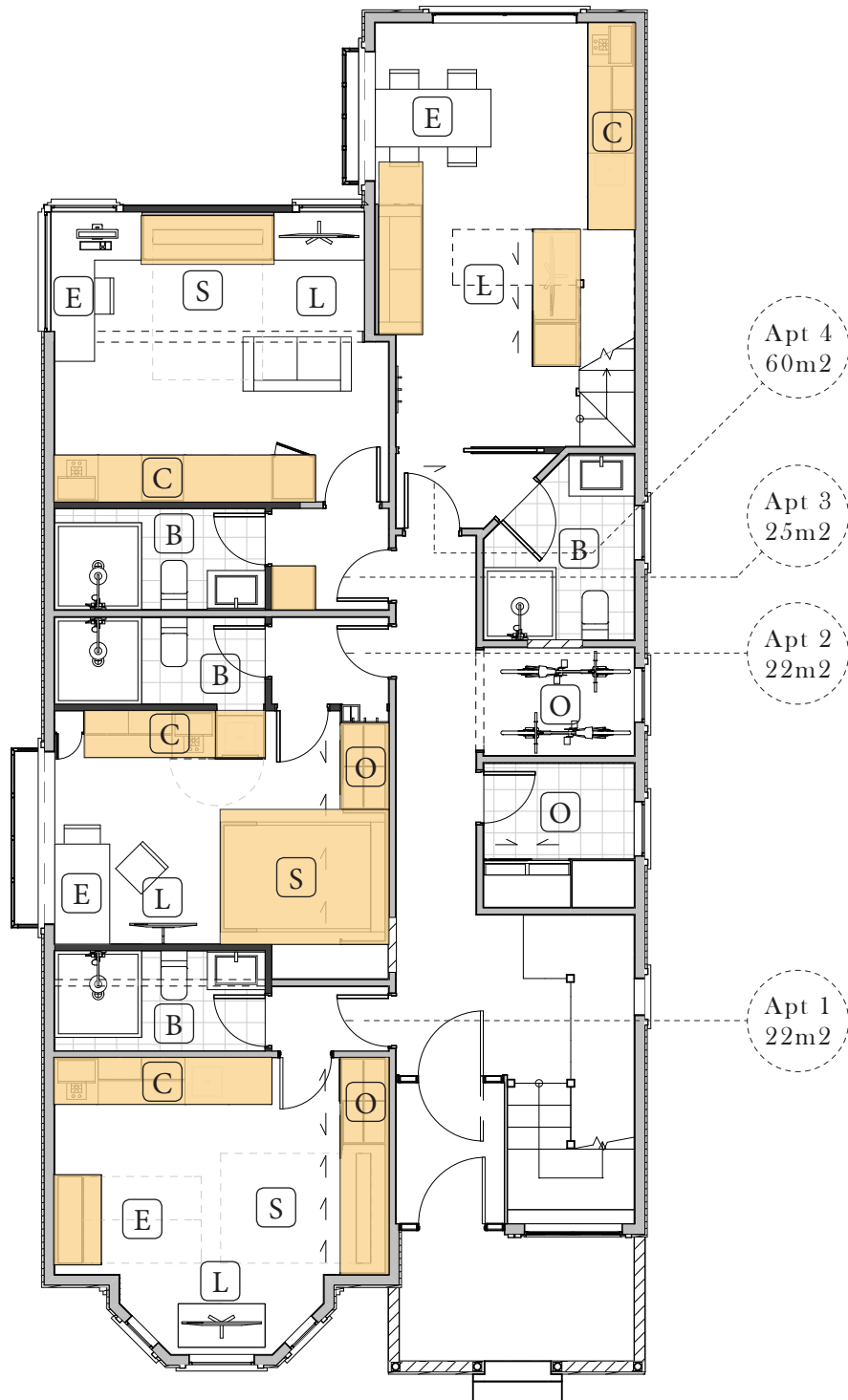
3-Wellington City Council, *Wellington Urban Growth Plan*. 58

[Key]

-  New Wall
-  Removed Structure
-  Closed Element
-  Other

[Functions]

-  Cooking
-  Eating
-  Leisure
-  Sleeping
-  Bathroom
-  Other/Storage







1:100







Adaptive Units Ground Floor

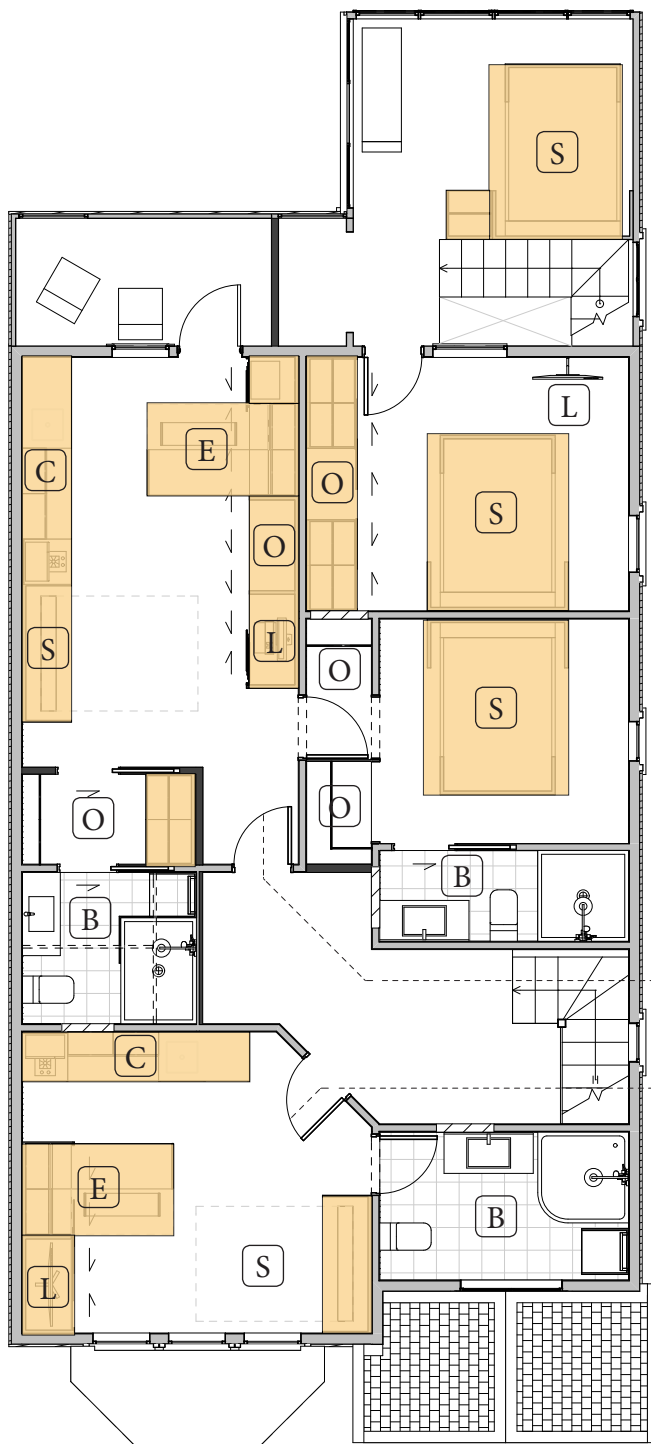
N

[Key]

-  New Wall
-  Removed Structure
-  Closed Element
-  Other

[Functions]

-  Cooking
-  Eating
-  Leisure
-  Sleeping
-  Bathroom
-  Other/Storage



Apt 6
52m²

Apt 5
24m²

1:100

Adaptive Units First Floor

N





MODULAR

The modular technique was a more difficult design to produce than Unit Joinery because of the inflexibility of the large sized units. This method produced four 1 bedroom and one 2 bedroom dwelling, with the impact on the existing building plan being similar to that of Unit Joinery (once again the irregular first floor plan was the most altered aspect). The plan exposes the key problem with this method, being there is a lot of space left ‘undefined’ (without purpose), which in a scheme to densify space becomes problematic. This problem is not as evident in Catseye⁴ and Waataa⁵ designs, where the images focus solely on the modules and not the space surrounding them. While this test has shown how simple the apartments could be, it still leaves plenty of room for development to reduce wasted space.





4-“Small and Sculpted Studio Apartment“ n.p

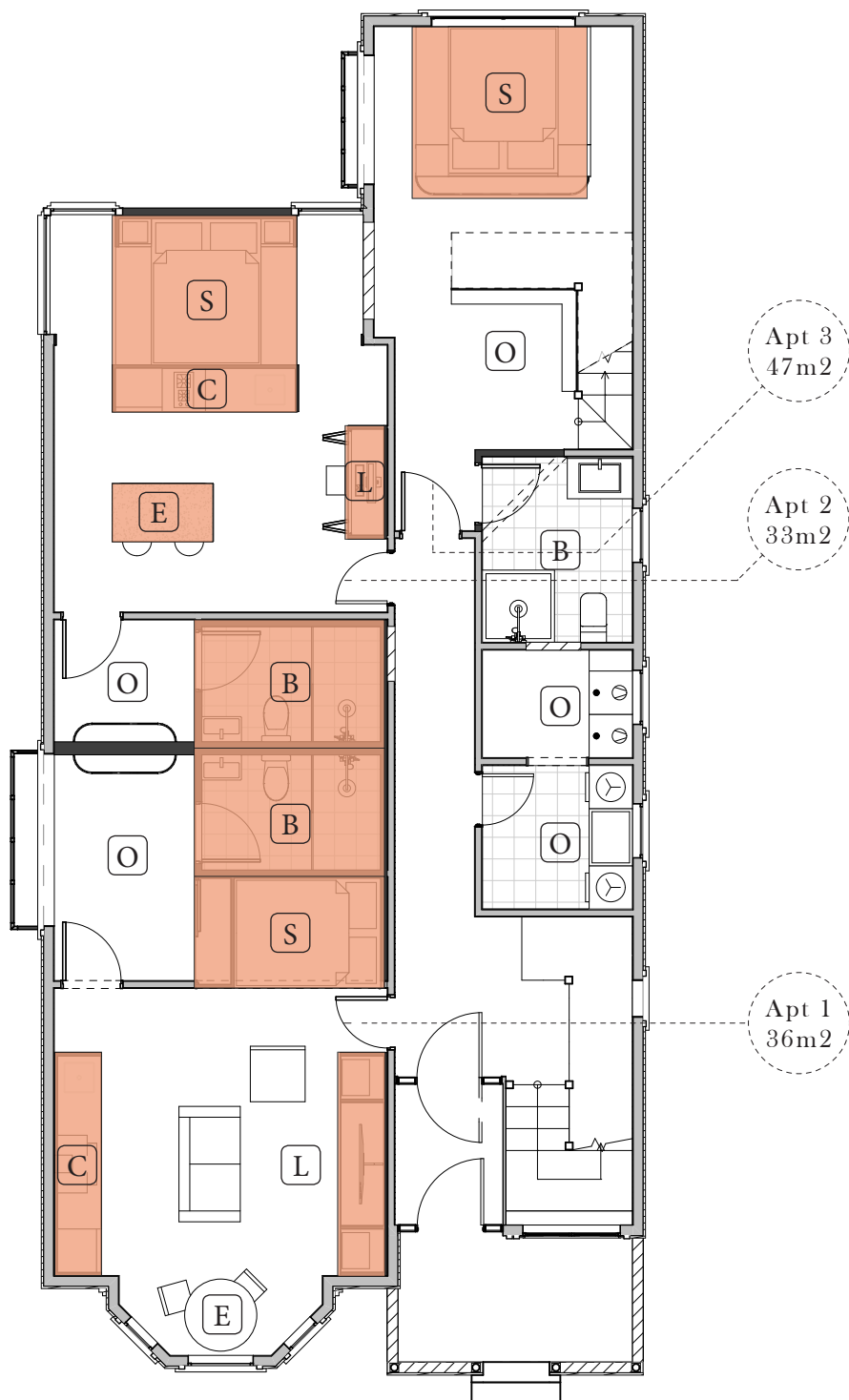
5-“Waataa transforms Lisbon Offices” n.p

[Key]

-  New Wall
-  Removed Structure
-  Closed Element
-  Other

[Functions]

-  Cooking
-  Eating
-  Leisure
-  Sleeping
-  Bathroom
-  Other/Storage







1:100







Modules Ground Floor

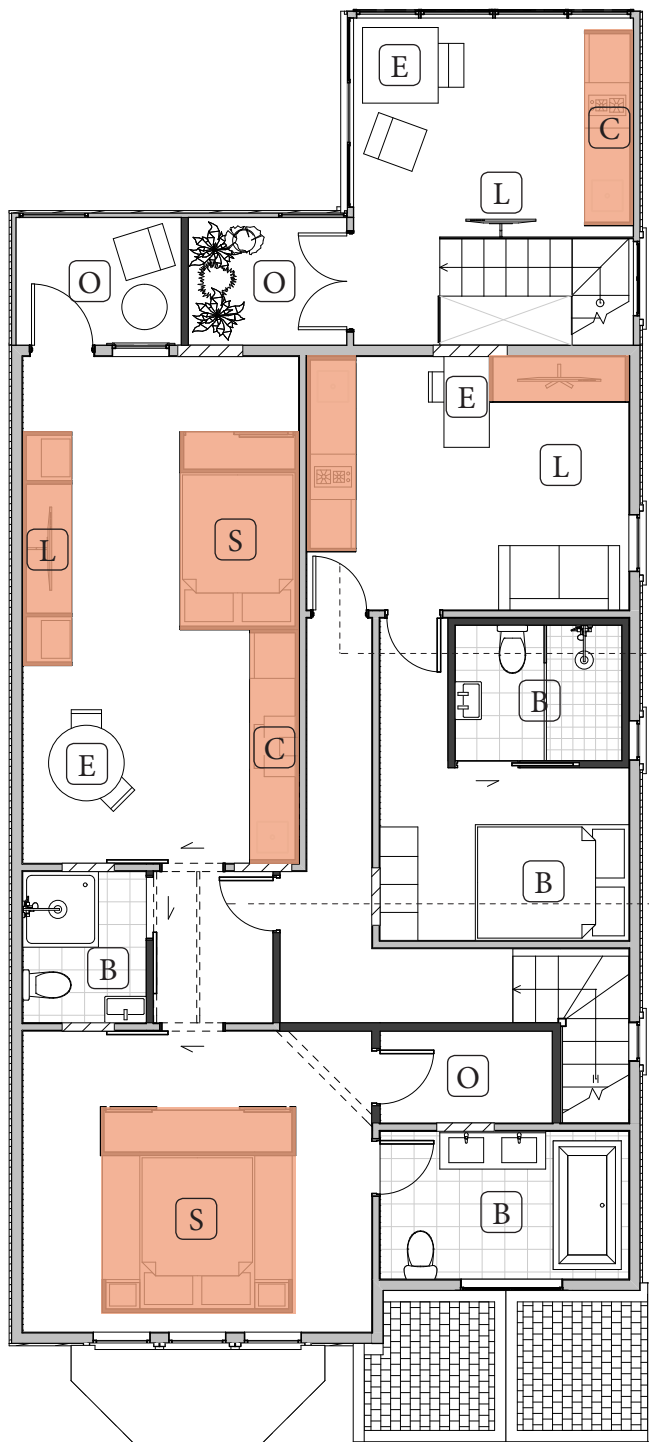
N

[Key]

-  New Wall
-  Removed Structure
-  Closed Element
-  Other

[Functions]

-  Cooking
-  Eating
-  Leisure
-  Sleeping
-  Bathroom
-  Other/Storage



Apt 5
29m²

Apt 4
64m²

1:100

Modules FirstFloor





N

PARTITIONS






Partitions produced the fewest number of dwellings in the experimentation. However the method did allow the design to use a majority of the existing space without too many alterations. The way in which the partitions are used let the apartments become flexible in their design, where methods such as modules did not have this flexibility (in response to the existing building fabric). While this method did produce the smallest increase in densification (apartments average at 54m²), the kinetic aspect to the division of space is something which could be developed in future designs. It gives the occupant some control of their space, by not fixing such elements in place, it allows a less intrusive approach to densifying 26 Stoke Street.

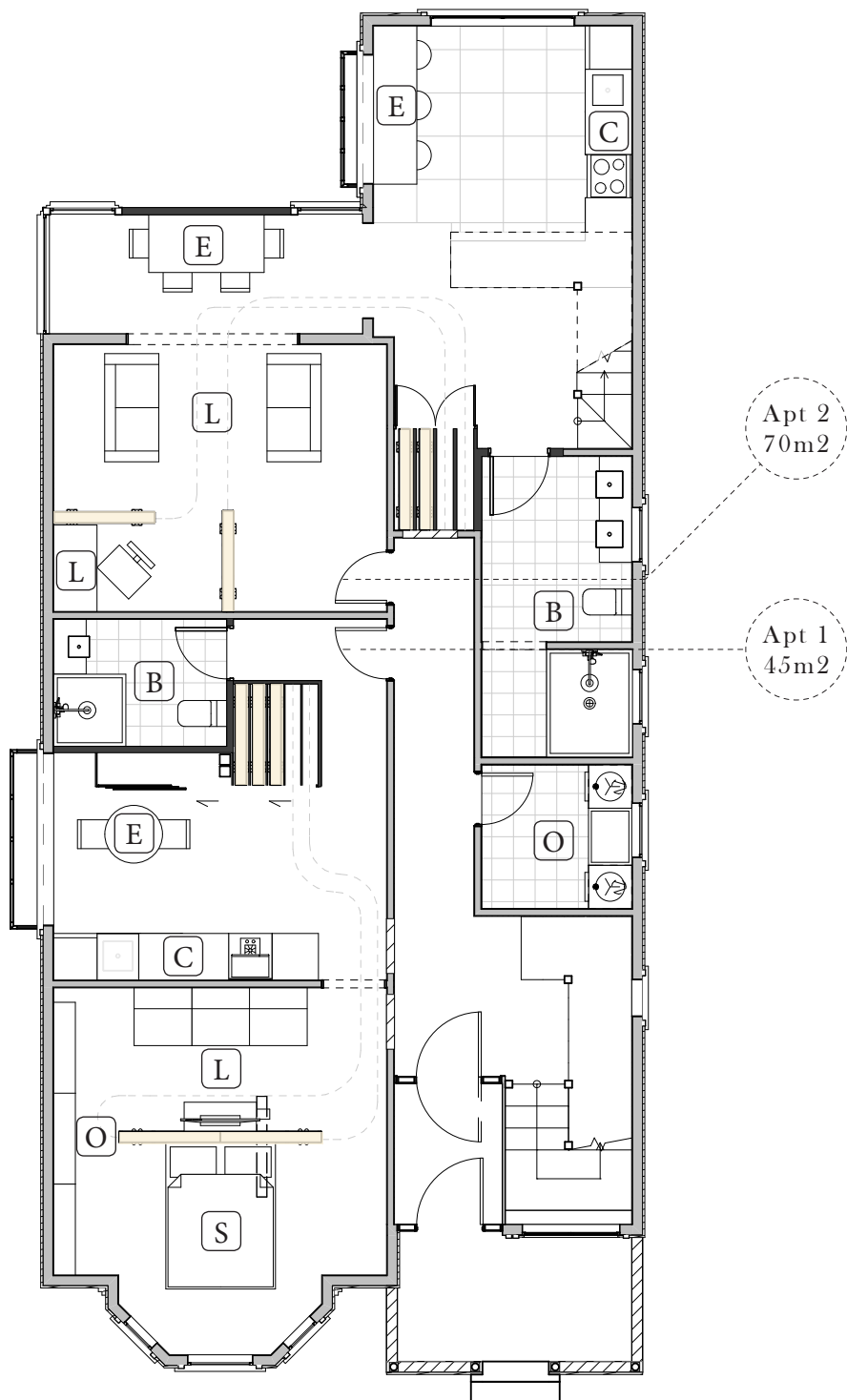
(In the plans, the arrangement of function is an example of how the partitions could be used for the division of space, as they are not static interventions)

[Key]

-  New Wall
-  Removed Structure
-  Closed Element
-  Other

[Functions]

-  Cooking
-  Eating
-  Leisure
-  Sleeping
-  Bathroom
-  Other/Storage







1:100







Partition Ground Floor

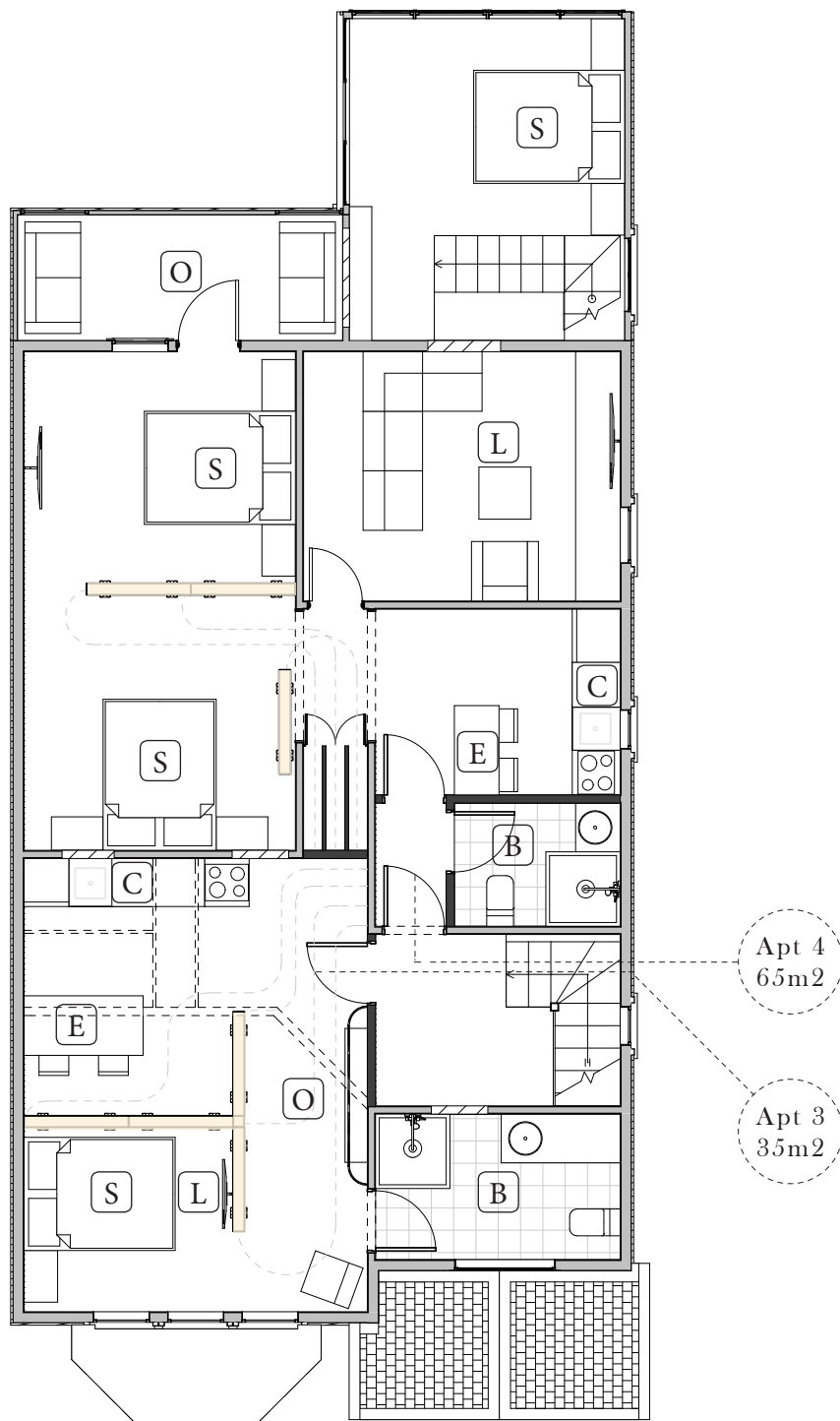
N

[Key]

-  New Wall
-  Removed Structure
-  Closed Element
-  Other

[Functions]

-  Cooking
-  Eating
-  Leisure
-  Sleeping
-  Bathroom
-  Other/Storage

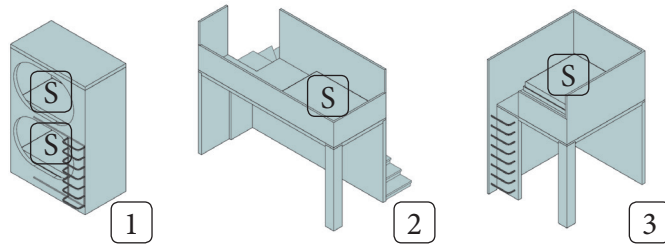


1:100 Partition First Floor

VERTICAL INFILL

Vertical infill produces six 1 bedroom apartments, with an average floor area of 36m². This method uses vertical space, following the Spanroom and Johnpaul-cross⁶ use of joinery/mezzanine platforms to house sleeping spaces (and storage). This method increased density with only one intervention (coloured in blue) for each apartment, exhibiting the impact that vertical infill can have on one bedroom apartments. The combination of the base designs allowed the variation of apartment size to dictate the chosen sleeping 'unit'. Similar to the module technique, there is space which is under-utilized. Such realisations start to influence decisions for the 'final' design for 26 Stoke Street.

6-“Micro-apartment in Berlin“ n.p

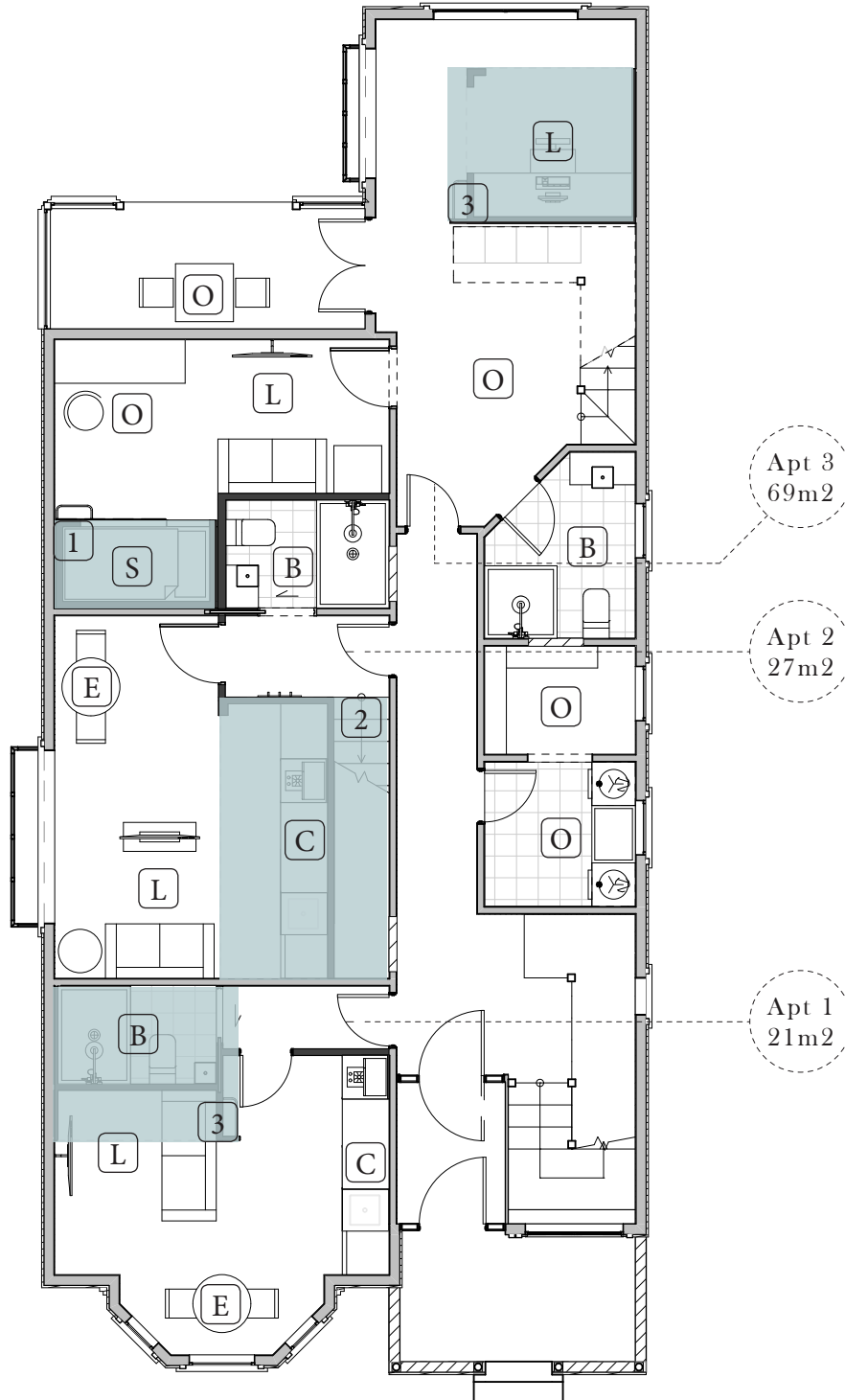


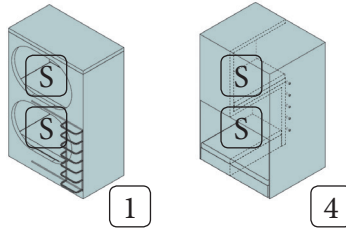
[Key]

- New Wall
- Removed Structure
- Closed Element
- Other





[Functions]

- Cooking
- Eating
- Leisure
- Sleeping
- Bathroom
- Other/Storage







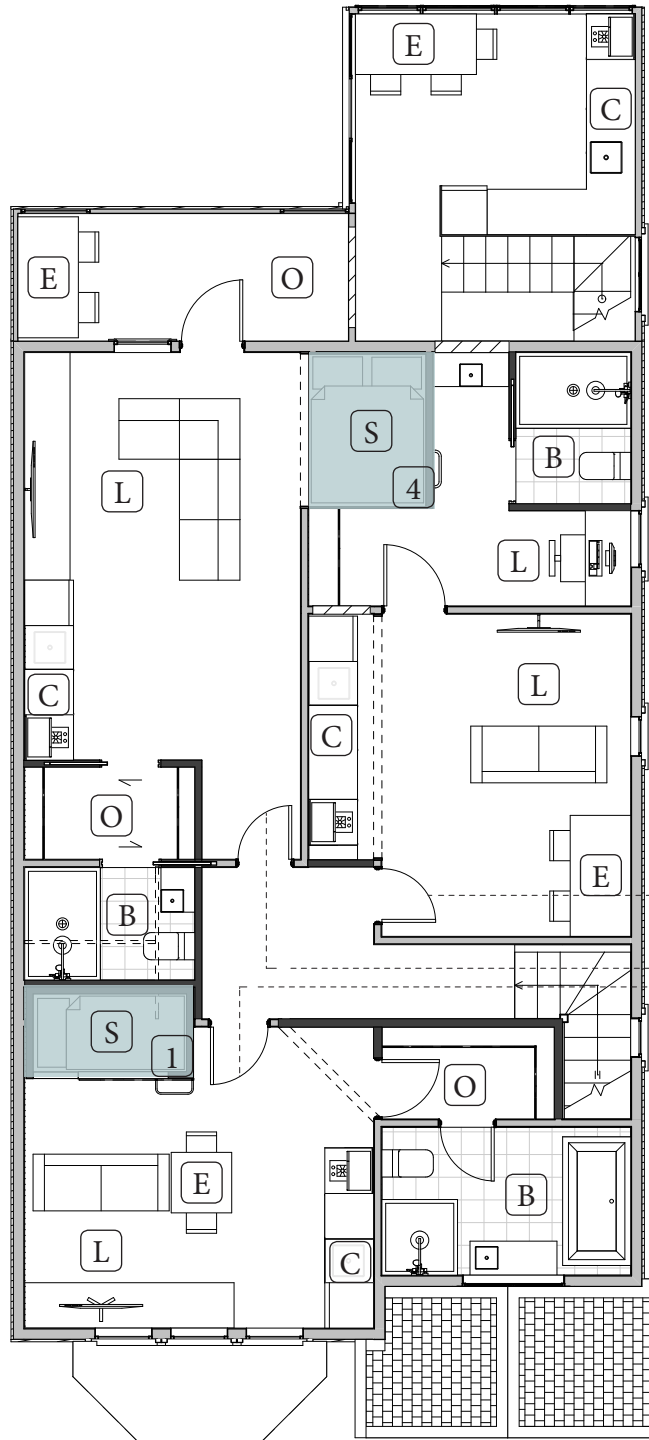


[Key]

-  New Wall
-  Removed Structure
-  Closed Element
-  Other

[Functions]

-  Cooking
-  Eating
-  Leisure
-  Sleeping
-  Bathroom
-  Other/Storage



Apt 6
30m²

Apt 5
38m²

Apt 4
30m²

1:100

Vertical Infill First Floor





N

SHARED SPACE






The design outcome from this method results in ‘hotel units’ rather than apartments. The kitchen and dining was external to the individual apartments but not the site of 26 Stoke Street. The site map (p51) shows that there are no commercial buildings in the vicinity, in contrast to the Narchitects⁷ project which is why shared space could not be assumed to be external to this site. While this design does show how sharing space can increase density, in this context such kitchen facilities look more temporary than suitable for a longer lease tenancy. Student hostels and backpackers have a similar approach to external spaces, suggesting this would only be viable for certain groups of people (generalised to around 18-30 year olds).

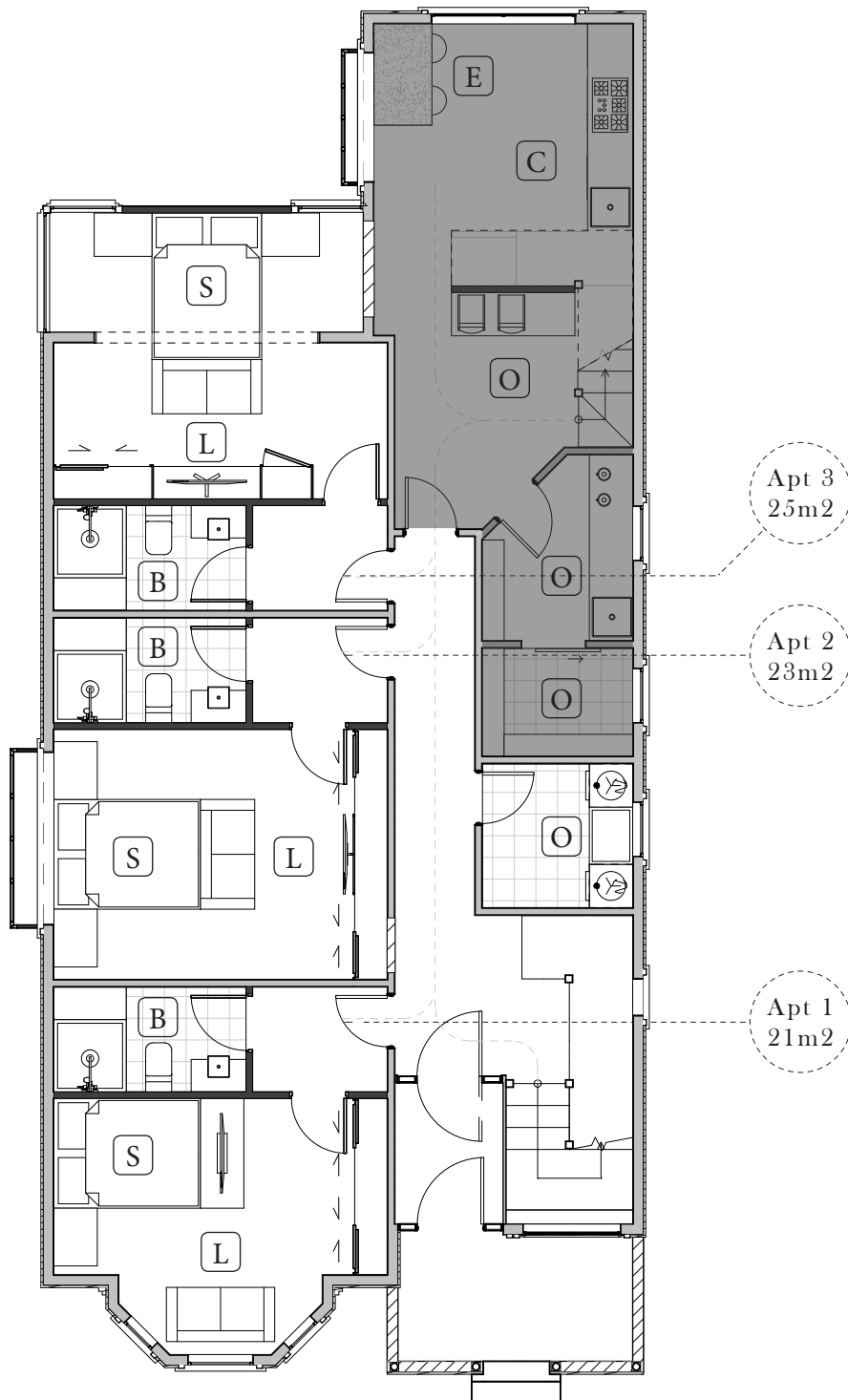
7-“New York’s First Micro-apartment” n.p

[Key]

-  New Wall
-  Removed Structure
-  Closed Element
-  Other

[Functions]

-  Cooking
-  Eating
-  Leisure
-  Sleeping
-  Bathroom
-  Other/Storage







1:100







Shared Space Ground Floor

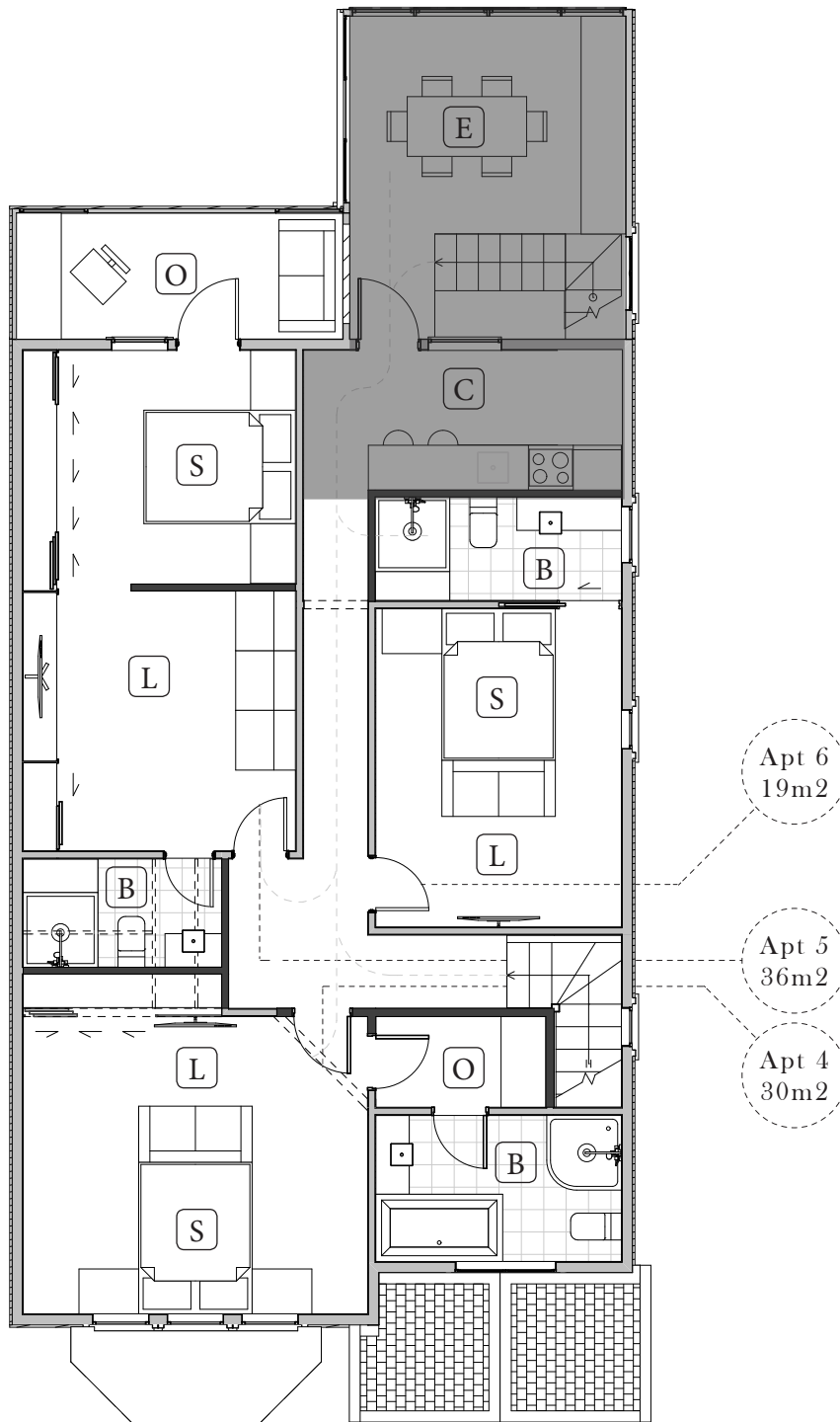
N

[Key]

-  New Wall
-  Removed Structure
-  Closed Element
-  Other

[Functions]

-  Cooking
-  Eating
-  Leisure
-  Sleeping
-  Bathroom
-  Other/Storage

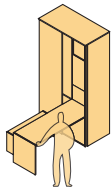


1:100

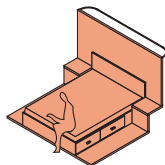
Shared Space First Floor

N

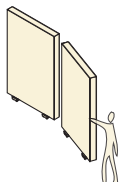
TECHNIQUE EVALUATION



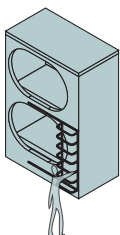
- + Most compact technique, allowed for best adaption to irregular spatial arrangements.
- Folding surfaces and bed mechanism bringing issues of stability and intrusion of circulation space.



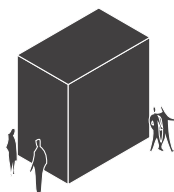
- + Large modules created simple apartments, without the need for direct connection to the existing building fabric.
- The size of this technique made it difficult to best use every square meter of space between modules.



- + Unrestricted space that could be quickly adapted as required, allowing for temporary spaces.
- Full potential of such a kinetic technique limited by the narrow confines of Stoke Street.



- + Freed up space below to provide extra storage or amenities, incorporated the existing stud height.
- Similar issue to “modular”, where the size of the technique created ‘inactive’ space in each apartment.



- + Externalising functions which are not used every day such as laundry frees up space for storage or extra living space.
- Such removal of functions such as a kitchen in this experiment could be polarising to the general public.

1:1 T E S T

For every test, the front apartment on the ground floor became the catalyst for each method's implementation. Once this apartment was completed the 'base' design was adapted in other parts of the building to densify the building. The heritage bay window was always a feature in this apartment, reiterating the unique aspect that the reuse of 26 Stoke Street would produce.



Fig 5.01 First 1:1 outline



Fig 5.02 Functional aspects



Fig 5.04 Considering moveable 'partition' to open space

These images show a process of 1:1 testing which informed the development of the optimised Stoke Street design is the ideas about opening space, which is considered further in the Tip Top design, and the exploring the boundaries between functions.

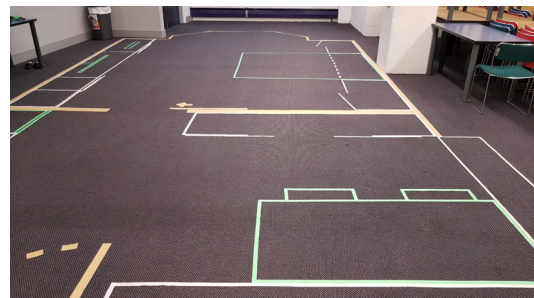


Fig 5.03 Problem space, dining to bedroom partition

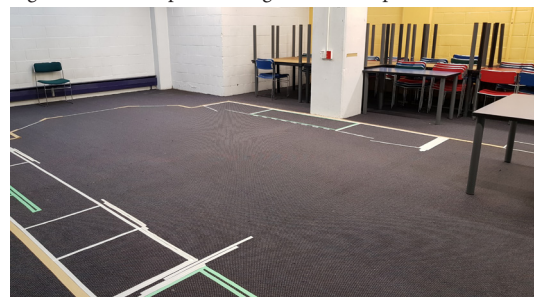


Fig 5.05 Final outcome from 1:1

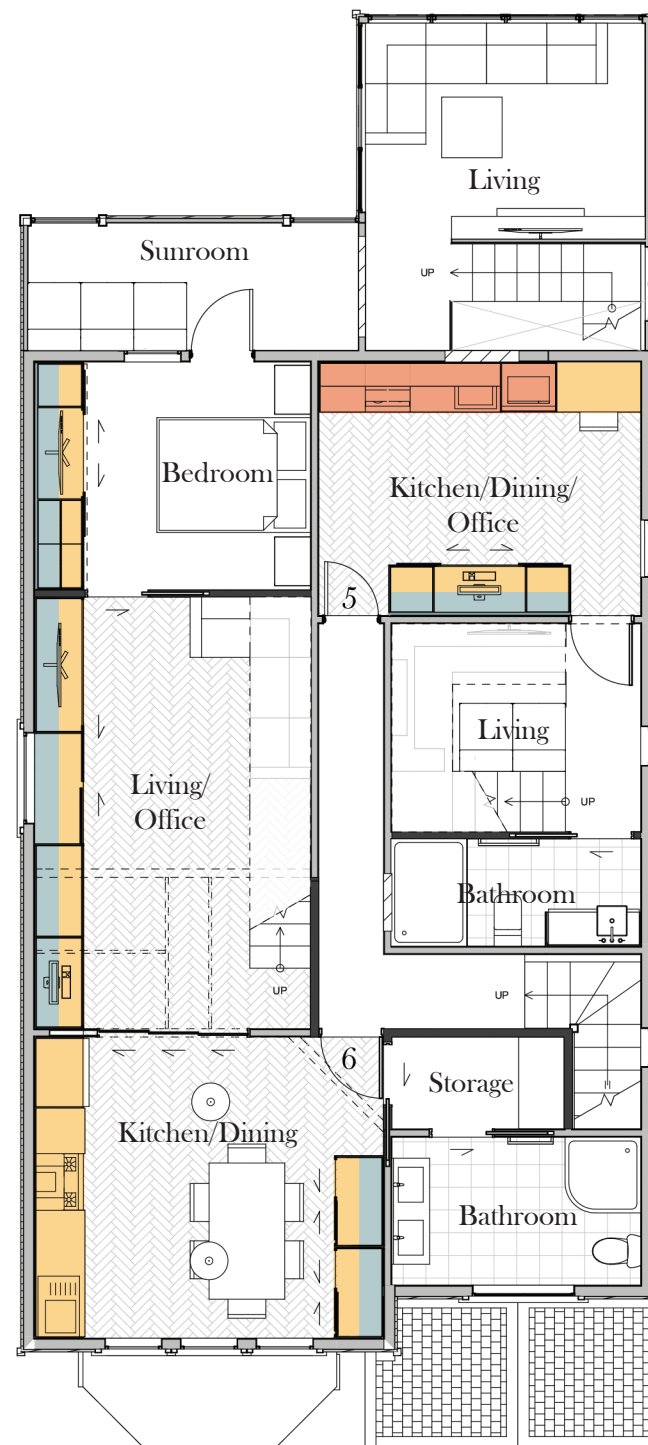
OPTIMUM DESIGN

From this testing of the five identified techniques it was important to produce a feasible design which drew on a variety of techniques. This is due to an understanding that any optimal design would not be restricted to one method of densification. The tests of techniques earlier in the chapter aimed to understand the comparisons between the five methods, and to identify the unique aspects to each. The following design has continued the colour-coding established in the previous chapter in order to easily identify the different techniques, adaptive units with aspects of modules, vertical infill and a shared laundry. Partitions is the only technique which was not adapted for the final design, this is due to the ability of the units and modules to create partitions, meaning that the value of these partitions would be limited. The optimum design retains as much of the existing features as possible, most importantly the street façade and the entry foyer (including the high ceiling height).

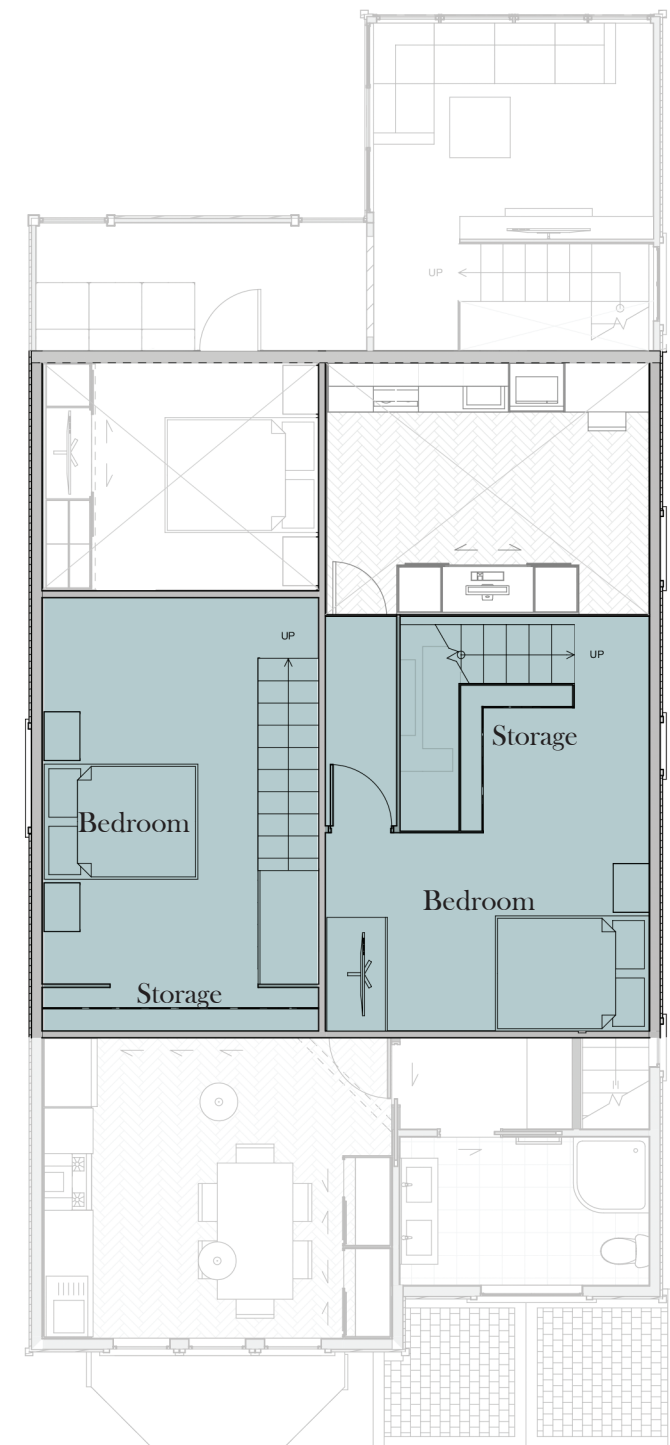
This design shows how a combination of the five techniques might densify a heritage residential building, from being a single dwelling to become two 1 bedroom and two 2 bedroom units. The final design has a full occupancy of 12 people, and four addresses. While the apartments are not the smallest achieved in the tests earlier on 26 Stoke Street (due to evaluating the spaces produced with the ‘extreme’ notion of only one densification method), this optimised design aims to maximise the positive and ameliorate the negative aspects of each method.



GROUND FLOOR



FIRST FLOOR



SECOND FLOOR

- 1- Entry & Hall (13m²) 4- Apt B (66m²)
 2- Shared Laundry (8m²) 5- Apt C (53m²)
 3- Apt A (44m²) 6- Apt D (89m²)



Joinery Units



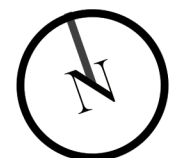
Modules



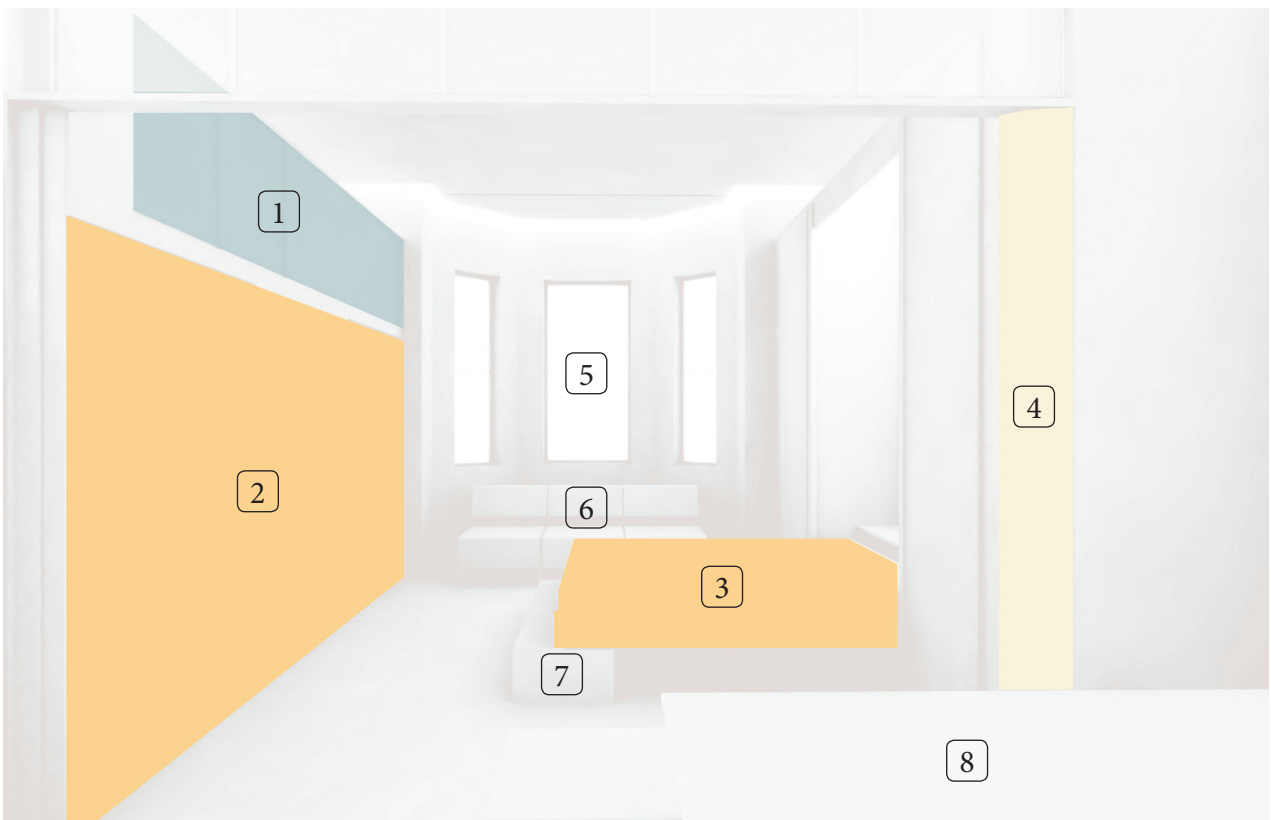
Vertical Infill



Shared Space



STOKE STREET 1:100

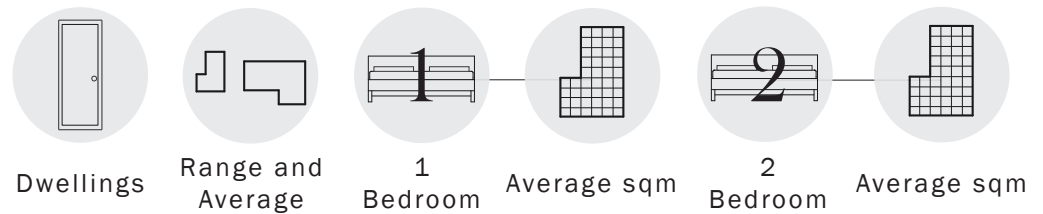


A 3D visualization of apartment 1 in the optimised design, showing the combination of different methods working together in one space.

- 1-Vertical Infill Storage
- 2-Joinery Unit
- 3-Joinery Unit Folding Bed
- 4-Partition Sliding Divider
- 5-Bay Window
- 6-Sofa
- 7-Coffee Table (Supports Bed)
- 8-Dining Table

DENSIFICATION COMPARISON

This simple table serves to compare the key figures produced from each technique experiment. Such figures include average meterage, number of dwellings, and number of one and two bedroom apartments, also minimum and maximum sqm.



| | Dwellings | Range and Average | 1 Bedroom | Average sqm | 2 Bedroom | Average sqm |
|---------------------|-----------|---|-----------------------|------------------|-----------|------------------|
| Original | 1 | 220m ² 220m ² | 4 (Not full Units) | NA | 0 | NA |
| Adaptive Joinery | 6 | 22-60m ² 34m ² | 4 | 23m ² | 2 | 56m ² |
| Modular | 5 | 29-64m ² 42m ² | 4 | 37m ² | 1 | 64m ² |
| Adaptive Partitions | 4 | 35-70m ² 54m ² | 3 | 50m ² | 1 | 65m ² |
| 'Building Up' | 6 | 21-69m ² 36m ² | 6 | 36m ² | 0 | NA |
| Shared Space | 6 | 19-36m ² 26m ² | 6 | 26m ² | 0 | NA |
| Final Design | 4 | 44-89m ² 63m ² | 2 | 48m ² | 2 | 77m ² |

6 .

TIP TOP

(DESIGN DEVELOPMENT)

INTRODUCTION

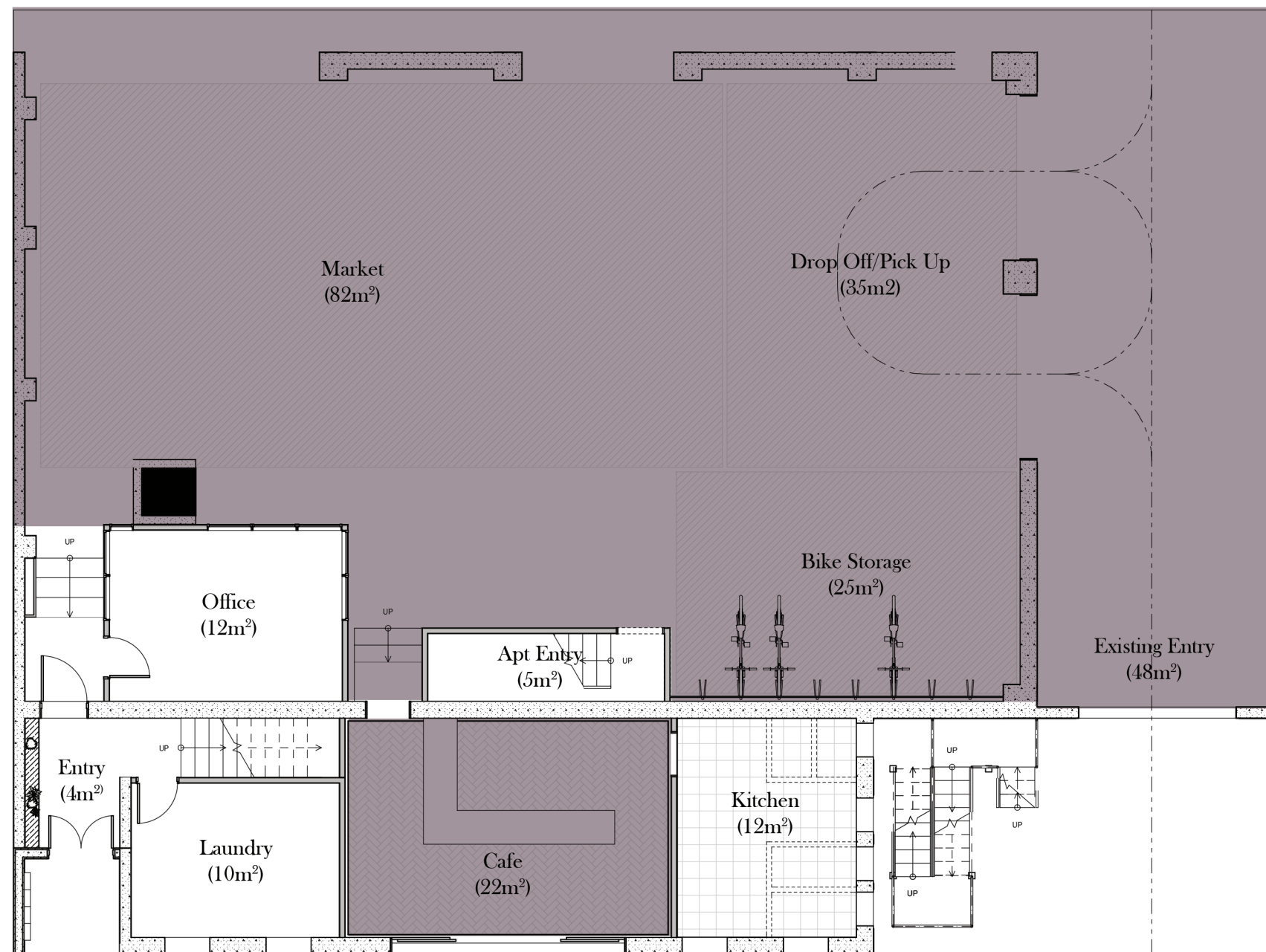
As in the introduction for the Tip Top factory, there has been no residential history on the site since 1913. The current benchmark for density is therefore zero dwellings meaning that any increase in density is positive. However, the average sqm enabled at Stoke Street provides another measure against which the density achieved at the Tip Top factory can be measured against. As a character building, rather than a heritage listed building, there is a greater scope for alterations in the Tip Top proposal, though recognition is given to its importance as a presence in the community.

Population projections indicate that the 20-34 age group will become the dominate demographic by 2043, making up 38.1% of Newtown's population¹ This will consequently be the target occupant, giving some more guidance for the appearance and function for the final design.

The Tip Top factory design documented in this chapter adopts the outcome of the 26 Stoke Street experimentation. Unlike Stoke Street, Tip Top will have two distinct spaces, the public and private boundaries, separated by the ground and first floor level. Aspects affecting the design adaptation include their heritage status, function and construction. This process has resulted in two design explorations for the Tip Top building. The first adapts the interior of the Tip Top building in a way similar to the optimized Stoke Street design. The second proposal takes advantage of the lesser need to respect the building from a heritage perspective and essentially guts the interior, enabling the development of a more spatially efficient unit unimpeded by existing walls.

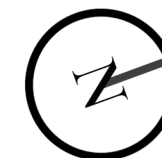
1-"Newtown Population, dwellings and ethnicity" n.p

TIP TOP GROUND FLOOR 1:100



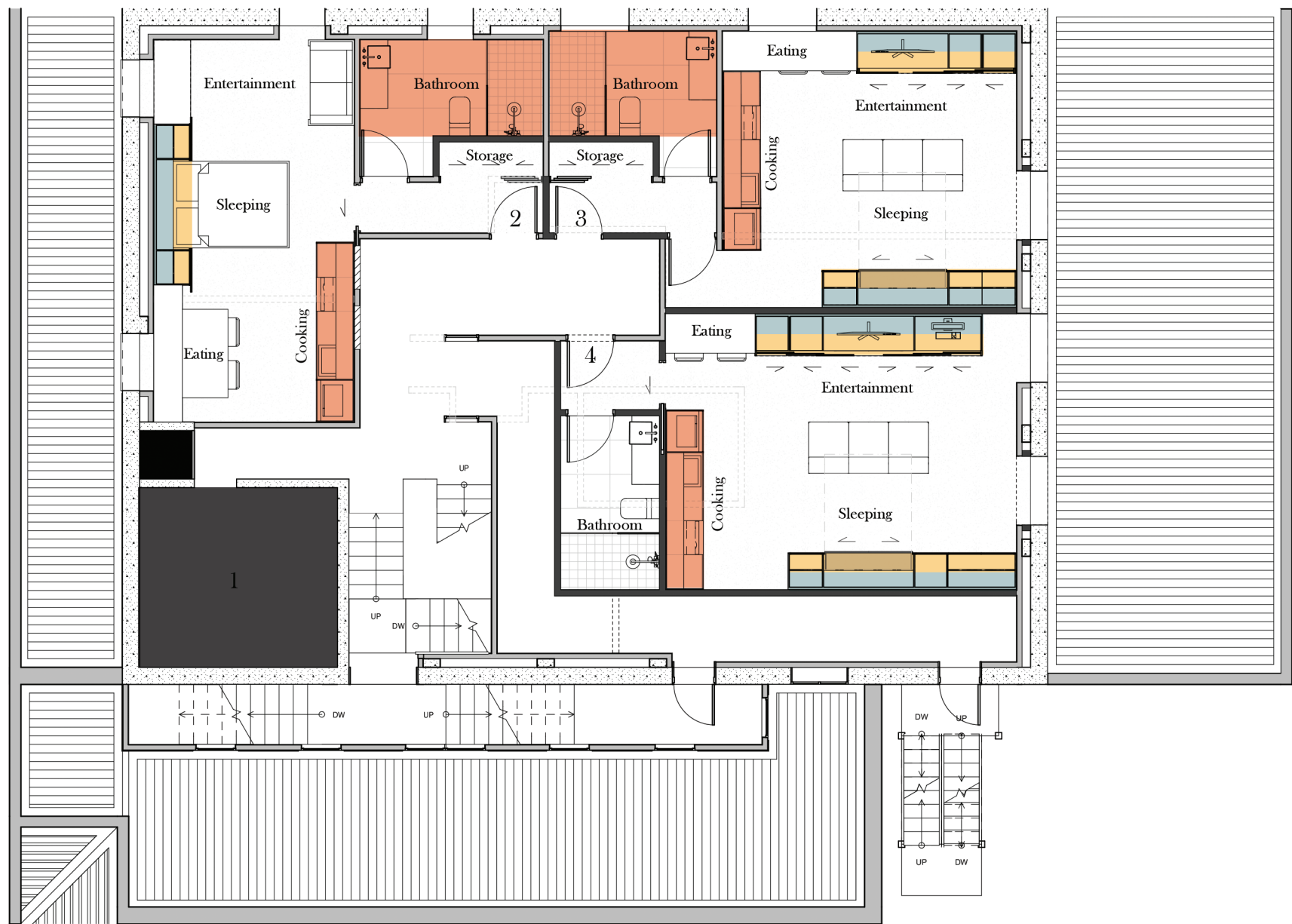
The ground floor is based around shared space for both members of the public and apartment occupants. The idea is to create a better street interface; and some amenities for the occupants (similar to Narchitects approach to shared spaces in dense residential buildings). These include a laundry, café, bike storage and possibly a space for different markets or events. The circulation was another design consideration, looking at points of entry for the apartment, and vertical access. Tenant parking is intended to be located to the left where it current parking is situated.

Public Space

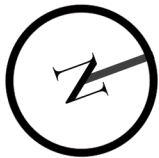


TIP TOP FIRST FLOOR 1:100

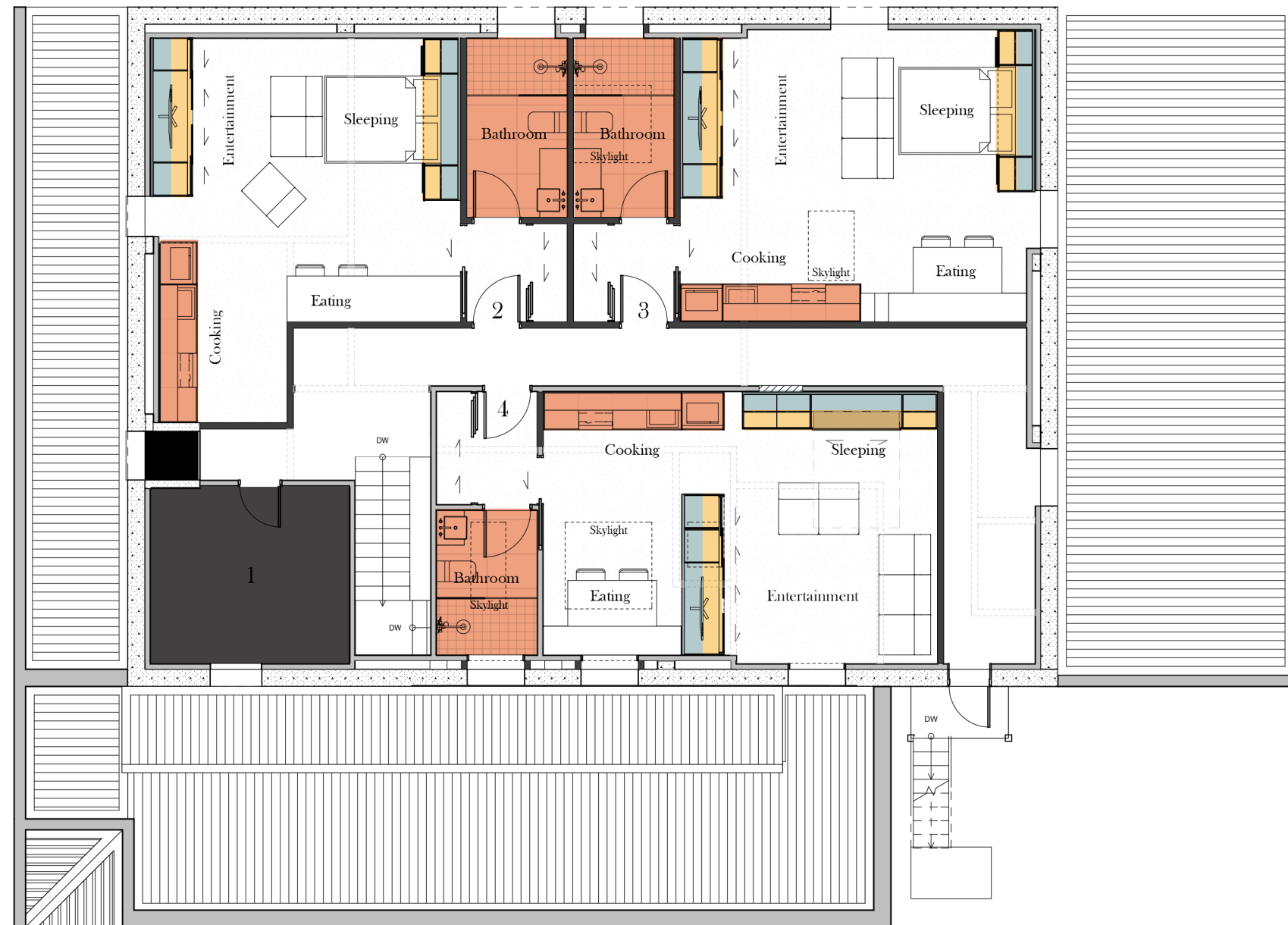
The colour coding indicates the use of different techniques previously used in the 26 Stoke Street design, to reflect where the revised interior architectural methods have been used. The same parameters have been used for any alterations to the existing building fabric (from page 55). This is again in an attempt to keep the changes required between intentions (for densification) controlled in a manner which keeps them comparable, which is between the two different sites. The outcome for the first floor is three 1 bedroom apartments using the same interior architectural method developed from the testing of 26 Stoke Street.



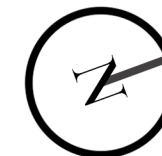
Joinery Units
 Modules
 Vertical Infill
 Shared Space
 1- Storage (11m²) 3- Apt 2 (38m²)
 2- Apt 1 (35m²) 4- Apt 3 (38m²)



TIP TOP SECOND FLOOR 1:100



Joinery Units
 Modules
 Vertical Infill
 Shared Space
 1- Storage (11m²) 3- Apt 2 (41m²)
 2- Apt 1 (39m²) 4- Apt 3 (41m²)



With the floor plan between the first and second floors being similar, the outcome is also three 1 bedroom apartments. The design includes the inclusion of existing circulation and storage spaces (in Black). The apartment plans are based on the 1:1 testing done for Stoke Street. The apartment plan differs between the six apartments, but includes the same interior features. These include an entry space for storage, and a self-contained bathroom, which is separate from the main living space by a door. The main space for each apartment contains cooking, eating, entertainment and sleeping spaces. The adaptive units are grouped to serve specific functions, and are placed between existing windows and partitions.

ADAPT FOR CHANGE

To produce a more unified densification method, further case studies have been examined to inform the second proposal to the Tip Top factory. Creating a more spatially efficient method is the main focus for the final proposal in this research. This was the recurring problem found after the identification and subsequent testing of the five methods. The sharing of space (with-in the individual apartments) for multiple functions was the design intention for the proposed ‘pods’. The reason for these two case studies exclusion from Chapter three, is because they were not collected and examined until the design stage of the research, specifically the design of the Tip Top factory ‘pods’.

GARY CHANG

“Urbanism and his metamorphic apartment”²

[Overview]. Gary Chang founded the interdisciplinary practice Edge Design Institute in Hong Kong. Their focus is on the necessity for compact domestic space and how design can respond to urban density³. These are two issues which underpin this research, which is why his design has become a principle case study for the developed densification method. This design in particular was produced from a series of drawings imaged from his cramped childhood home. Chang mentions how the dense population and spatial needs of Hong Kong are a challenge which he decided to take on through his architectural design. The layout was a experimentation examining how the implementation of multi-tasking (often through mechanical rooms) could become a solution to issues of density and function.

[Interior Techniques]. The apartment fits inside a 32m² space, which is similar to the one bedroom apartment sizes produced from the experimentation on 26 Stoke Street. The term metamorphic is derived from the series of walls which move on tracks to reveal different programmes (as needed). These include “large kitchen, guest bedroom, library, dining room, laundry room and, most luxuriously, a full spa”⁴.

[Method]. The majority of the moving components rely on simple tracks with ball bearings allowing the gliding of the walls. The interesting aspect which Chang incorporated is the ability to control a majority of the apartment from your smart phone, including the lighting, electrical and other moving elements such as the bed. The following statement from Chang best reflects his design approach, and what this final design needs to consider:



Fig 6.01 Library to spa

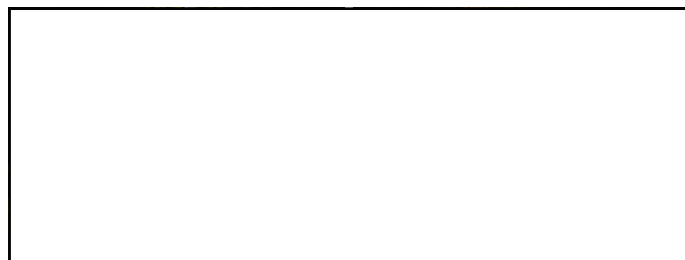


Fig 6.02 Living to bedroom



Fig 6.03 Kitchen and living

2-“Gary Chang on Urbanism and His Metamorphic Apartment.” n.p

3-“Gary Chang on Urbanism and His Metamorphic Apartment.” n.p

4-“Gary Chang on Urbanism and His Metamorphic Apartment.” n.p

YUKO SHIBATA

“Called Switch, the project features one partition that slides out over the dining table to create a meeting room on one side and library on the other.”⁵

[Overview]. Yuko Shibata is a Japanese designer who was tasked to separate living and working spaces in a Tokyo Apartment. This project was called ‘Switch’ as the idea was that the user could switch between living and working with the simple action of sliding a wall (fig 6.04-6.05). The introduction of bookcases, that also acted as doors were used to maximise the surface area of the walls. The original intention was to enable the user to change the whole layout of the apartment. However this idea was rendered impossible with the box frame construction with reinforced concrete, with almost all the walls acting as supporting building frames⁶. The two sliding walls were seen as a good compromise.

[Interior Techniques]. The space was previously only a residential space. The intent was to introduce an office space, while providing the option to change function outside working hours. This is achieved with the sharing of a large table (fig 6.05). When comparing this idea to all the other case studies examined in this research, this gesture seems basic and could have been pushed further. The value is in the idea about space changing programme with a moving element, where densification is achieved by not located programmes in ‘permanent’ places. Rather sharing the volume of space to give the requires spaces for activity.

[Method]. Unlike Chang’s approach with a lot of kinetic elements, for Shibata this movement is reliant on two walls, one which runs on tracks similar to Chang, and the other pivots to open or close space. The walls (and moving bookcases) give the ability to adapt from home to office and office to home. This is achieved while keeping the original floor plan intact.

Fig 6.04 Meeting room

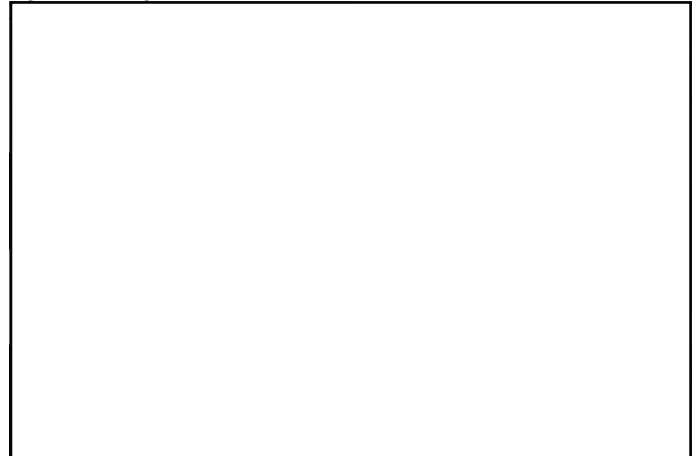


Fig 6.05 Shared table



5-“Switch by Yuko Shibata” n.p

6-“Switch by Yuko Shibata” n.p

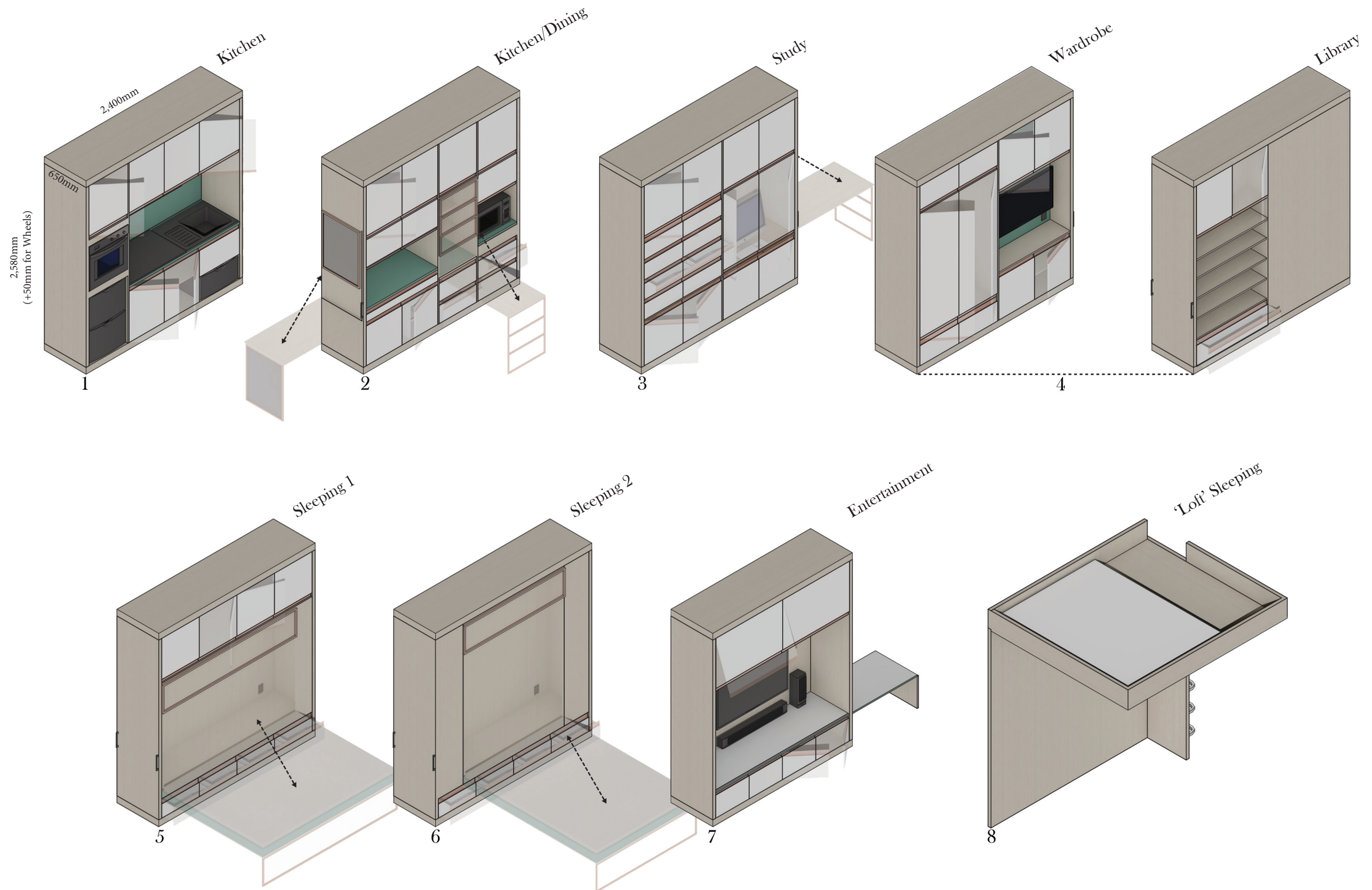
UNIT DESIGN

“I don’t mean this from an angle of eco-design, but somehow we touch on that by simple reduction. How big do you need a volume at different times? This is a very good example of flexibility in the sense of blurring the boundary of public and private, or simply [architecture as] a device able to adapt for change.”⁷

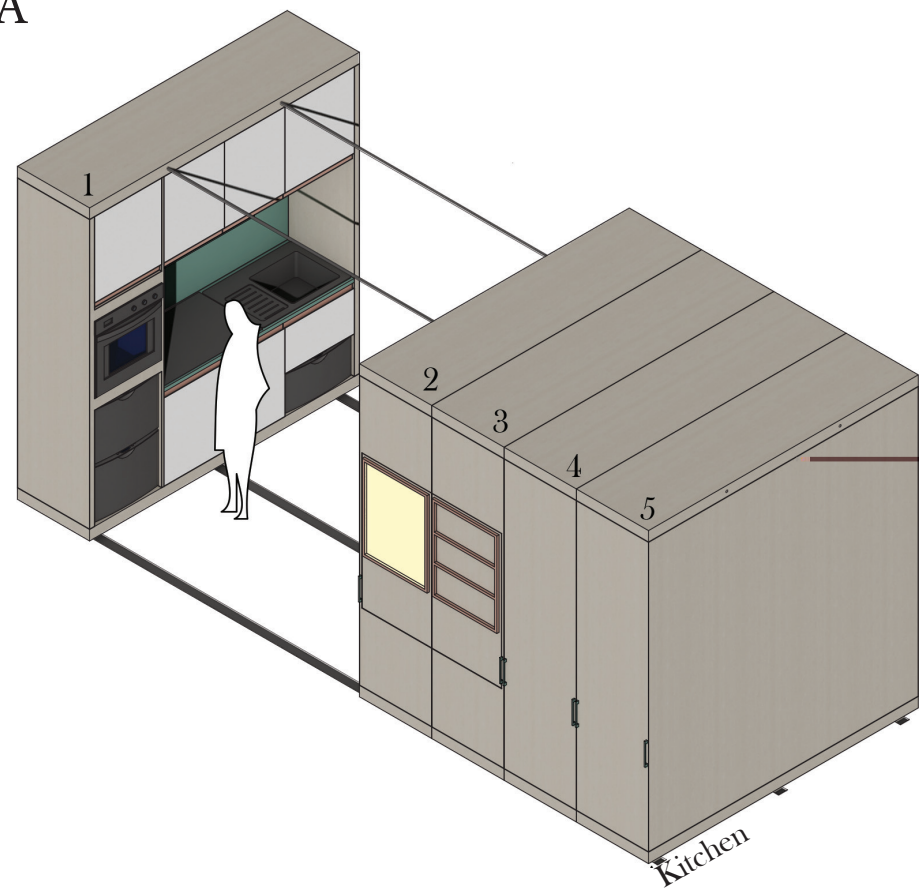
This quote from Gary Chang was the direction that was taken in the design and implementation of the series of ‘pods’. From a simple series of moveable walls, it developed into the concept ‘pods’ which hold all the required elements for a specific function. Their design is taken from the Unit joinery and Modular research and testing, with their effect on space coming from the two additional case studies. The compact nature requires that the Pods share space and play with the boundaries of programme. In this case the boundaries of the internal apartment, between such functions as kitchen, dining, study, storage and sleeping (reflected in the five types of Pods).

They intended to be run on tracks which are inserted into channels cut in the concrete slab, with guiding rail above. Such structure would not be as viable in a timber building (including the ‘pods’ weight), such as 26 Stoke Street. They can be manually moved, or by the use of a mechanical button on the side to each Pod. In their current state they serve as a conceptual design. Page 101 and 102 show the different configurations, including the elements which fold out to allow more space saving elements. The Pods are intentionally designed to move on one axis, as the remaining space is to serve as a static space for the occupant to define, rather than be affected by the Pods as they are moved. The ergonomics have been based around standard conventions on adequate heights, and take into consideration the finished floor height and the offset the wheels produce on the individual Pods.

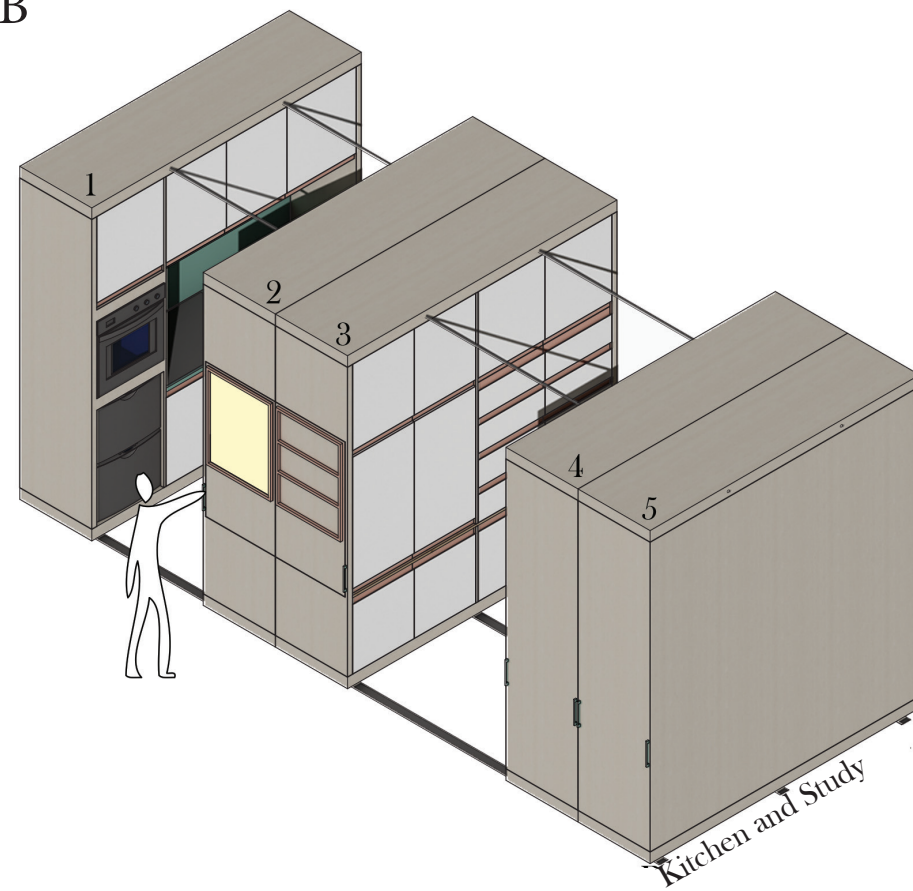
⁷—Gary Chang on Urbanism and His Metamorphic Apartment.” n.p



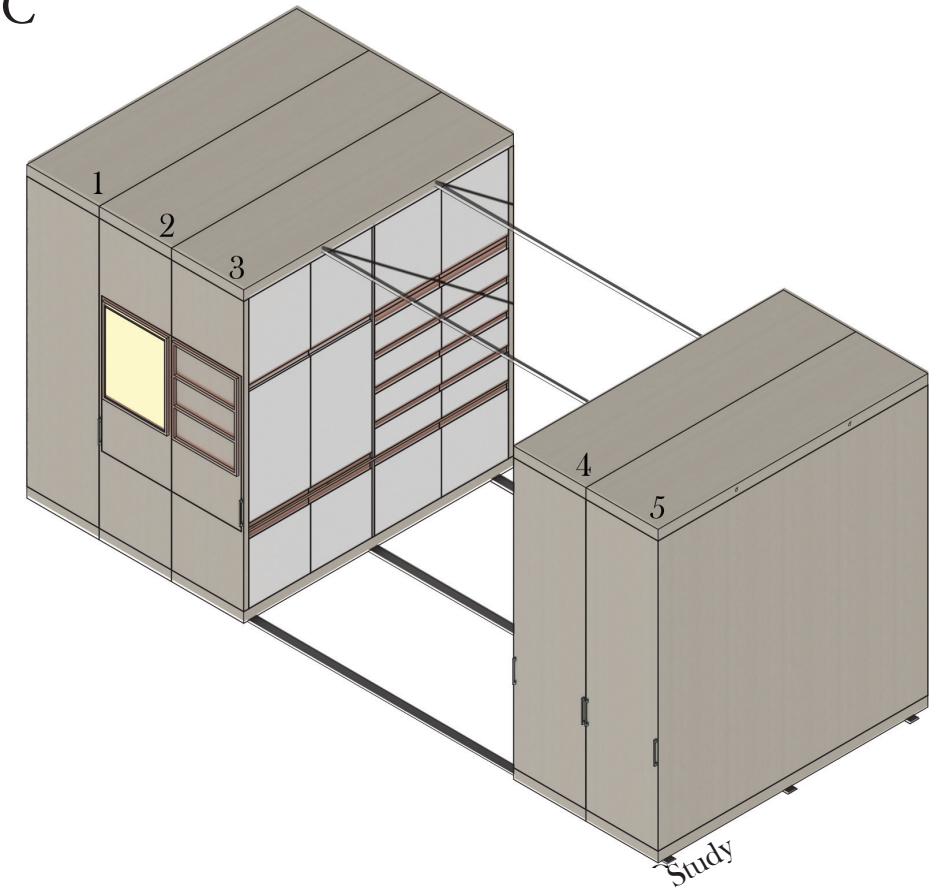
A



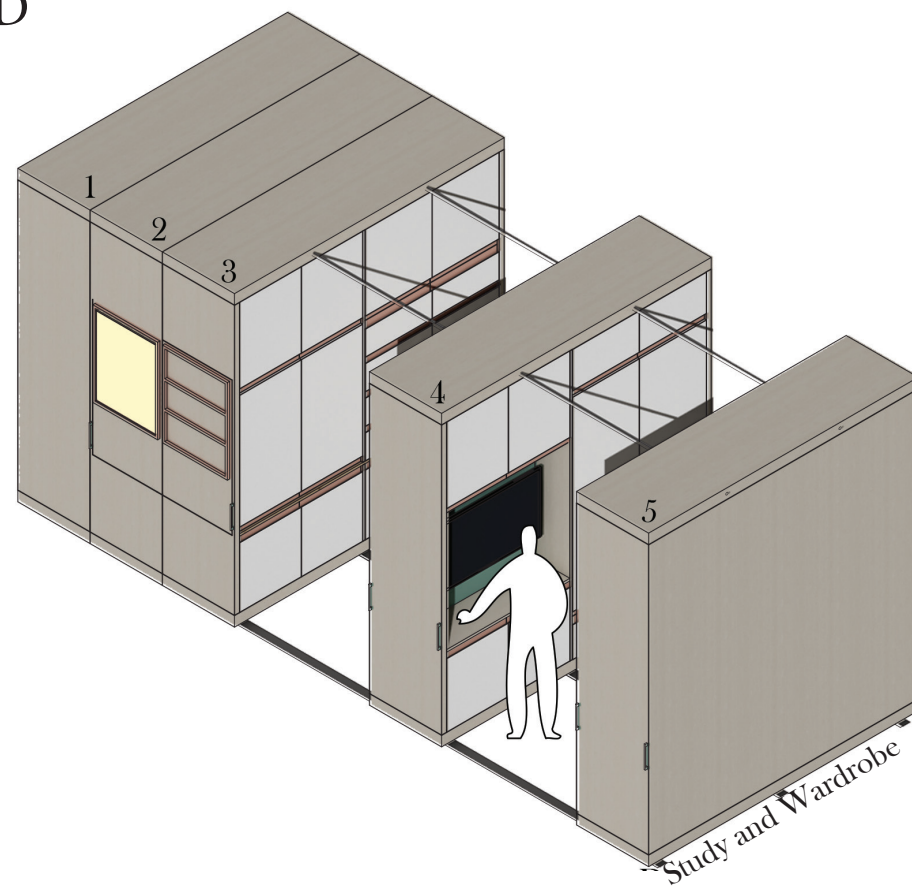
B



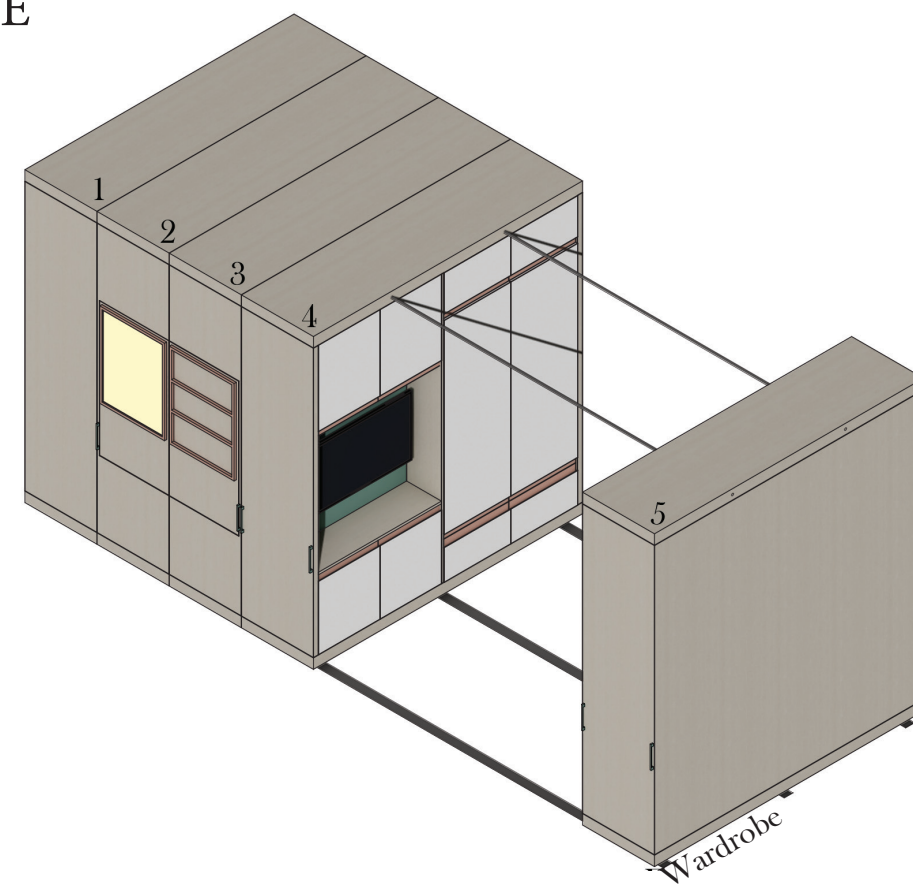
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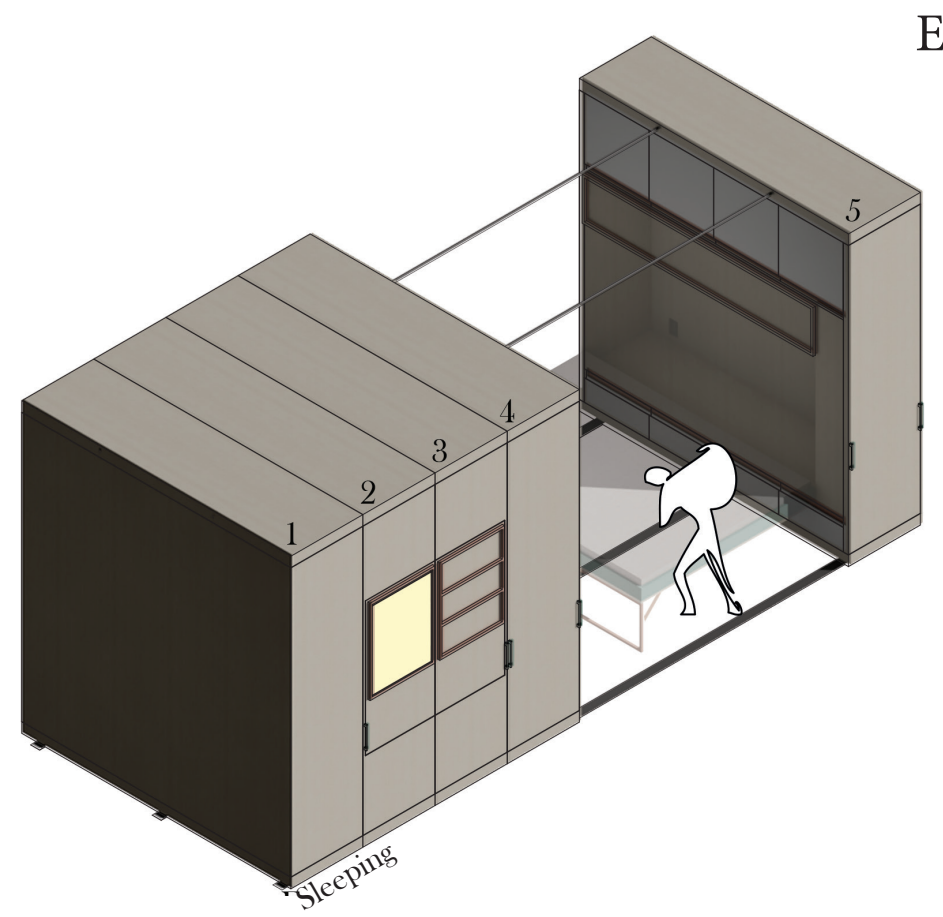
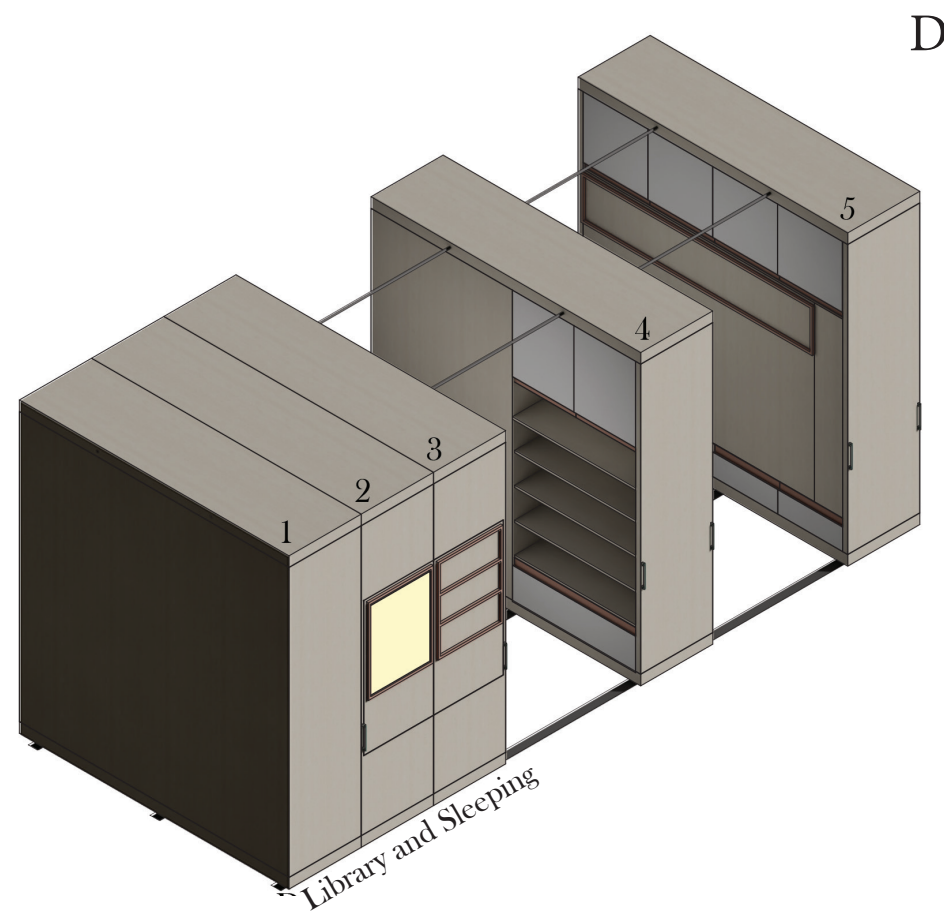
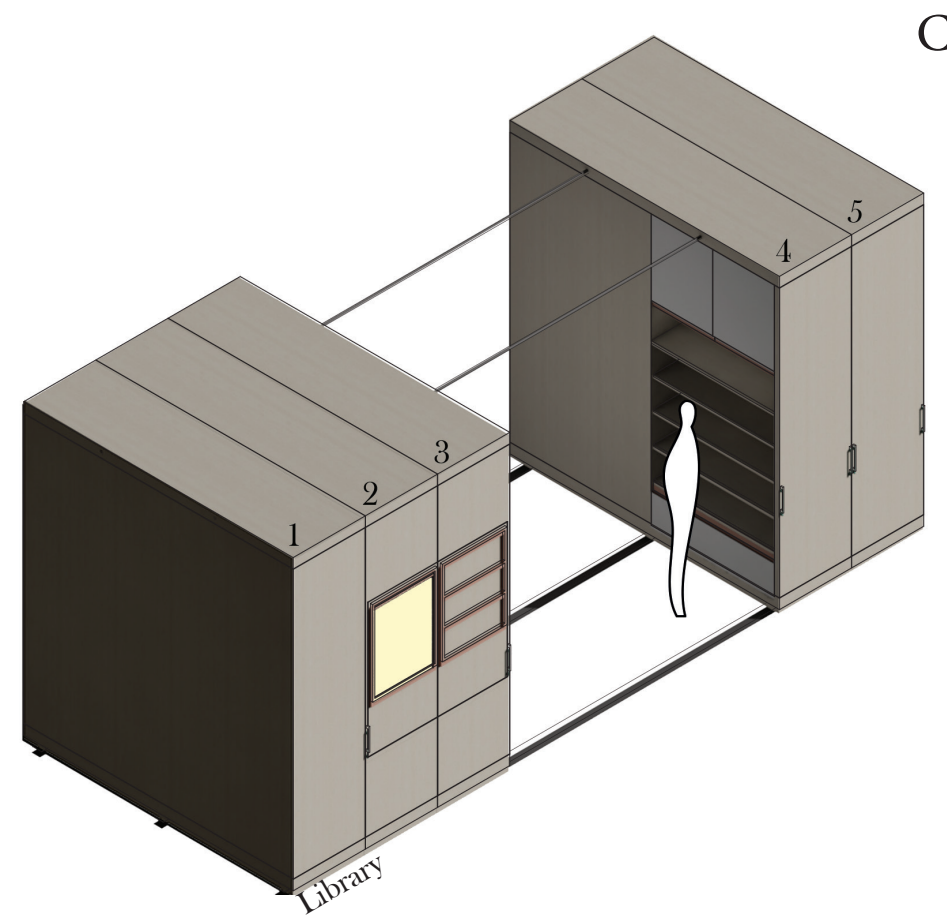
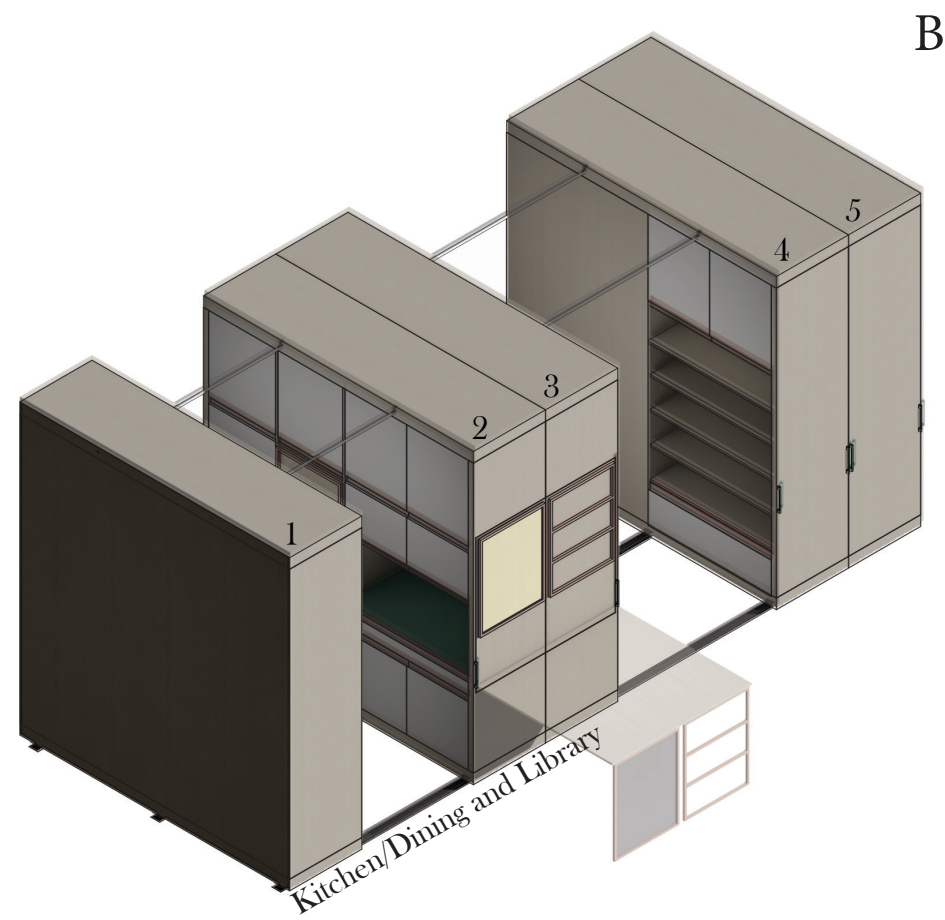
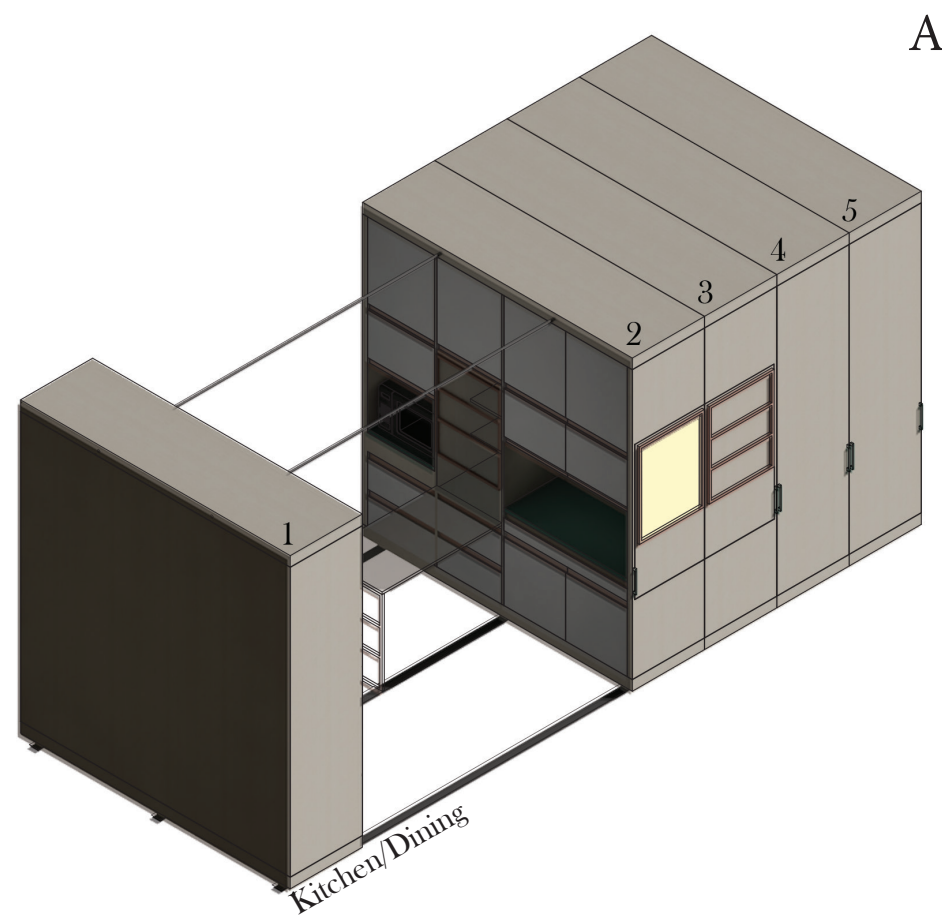
D



E



POD LAYOUT



POD LAYOUT REVERSE

NEW DESIGN

The second proposal is a combination of what the research understands to be the optimum approach to increase residential density for abandoned industrial buildings. The implementation of the Pods is to both show their impact ability to maximise dense apartment design, and provide a guideline for other projects which want to densify the interior of an existing building. This design questions the buildings character, the sequential reuse existing buildings (in this case abandoned industrial sites), and how to reintroduce them to the community. This design takes ideas formed from the first Tip Top design regarding public space. The main focus is on the residential focus, however the public space has been developed to consider the apartments above, and is less concerned with the retention of any existing features (outlined on p92)

The important change is letting the densification take priority for this design, with the ability to remove existing walls to achieve this. The balance between giving the factory a new identity and increasing density will be the challenge (explored in the renders).

DESIGN EXPLANATION

Page 105 - The ground floor design is based around a new circulation 'core' to service the apartments. This addition was to regulate the floors above and give the occupants a connection to the ground floor and provide an elevator for both people and freight. As part of the reintroduction of the Tip Top factory to Newtown, the café takes a majority of the street frontage, including a walk-by window for coffee, and milkshake bar and open eating area which overlooks the original factory floor. Other notable additions include a space for functions or markets, a communal laundry for both occupants and the general public and finally services for the apartments (including bike storage and a new entry for cars).

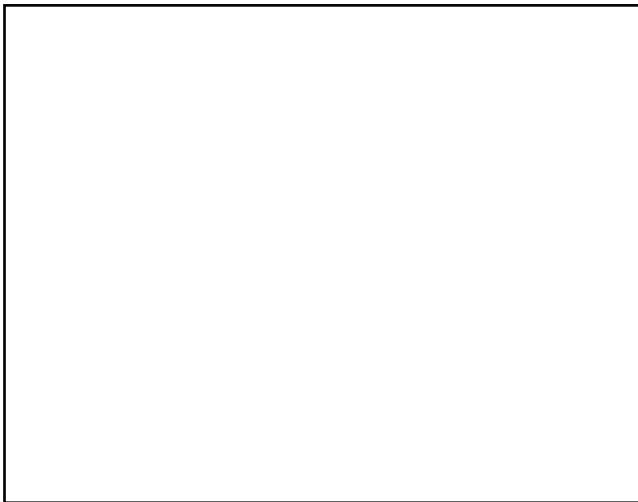


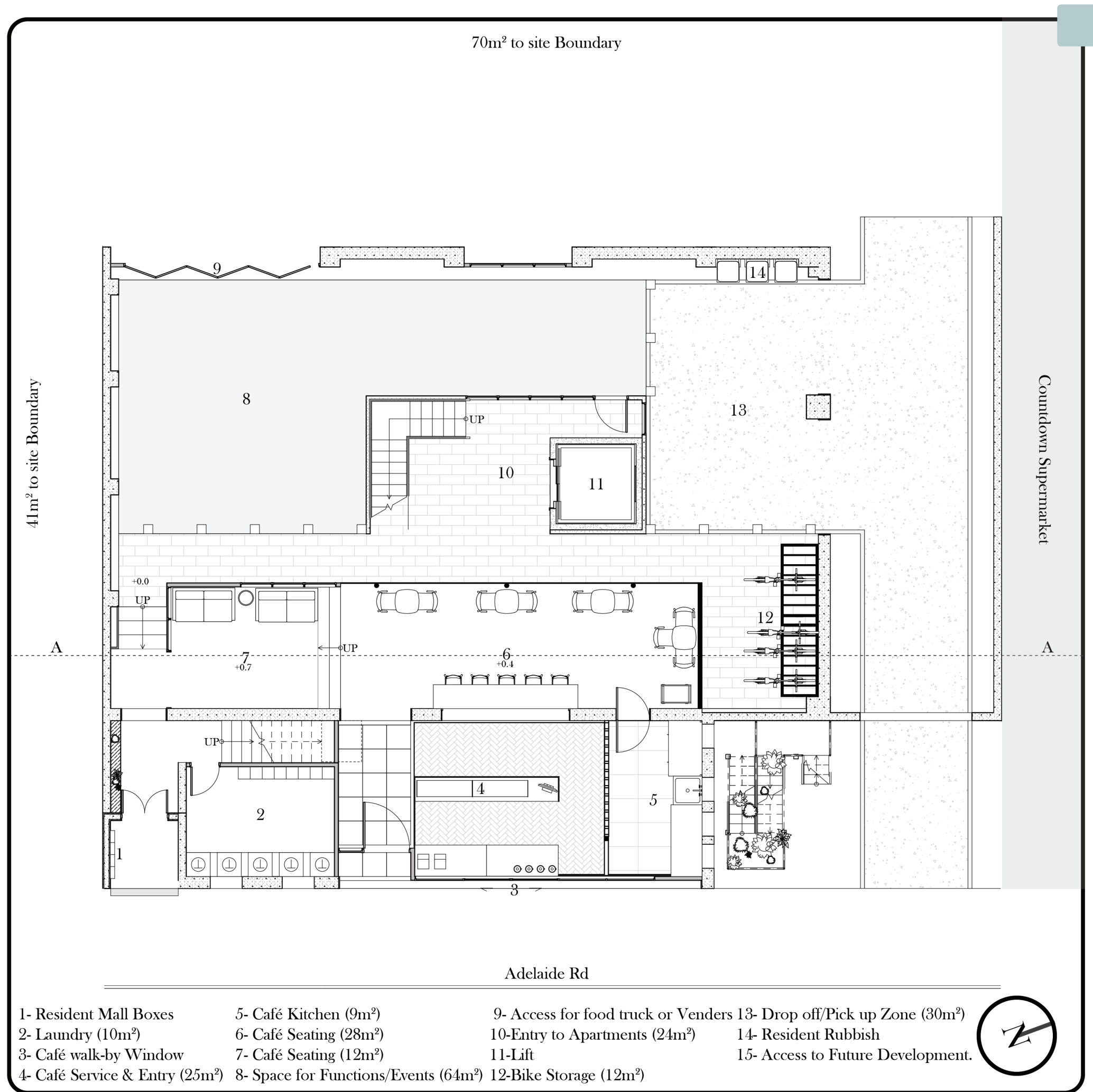
Fig 6.06 Olympia Milk Bar Wellington

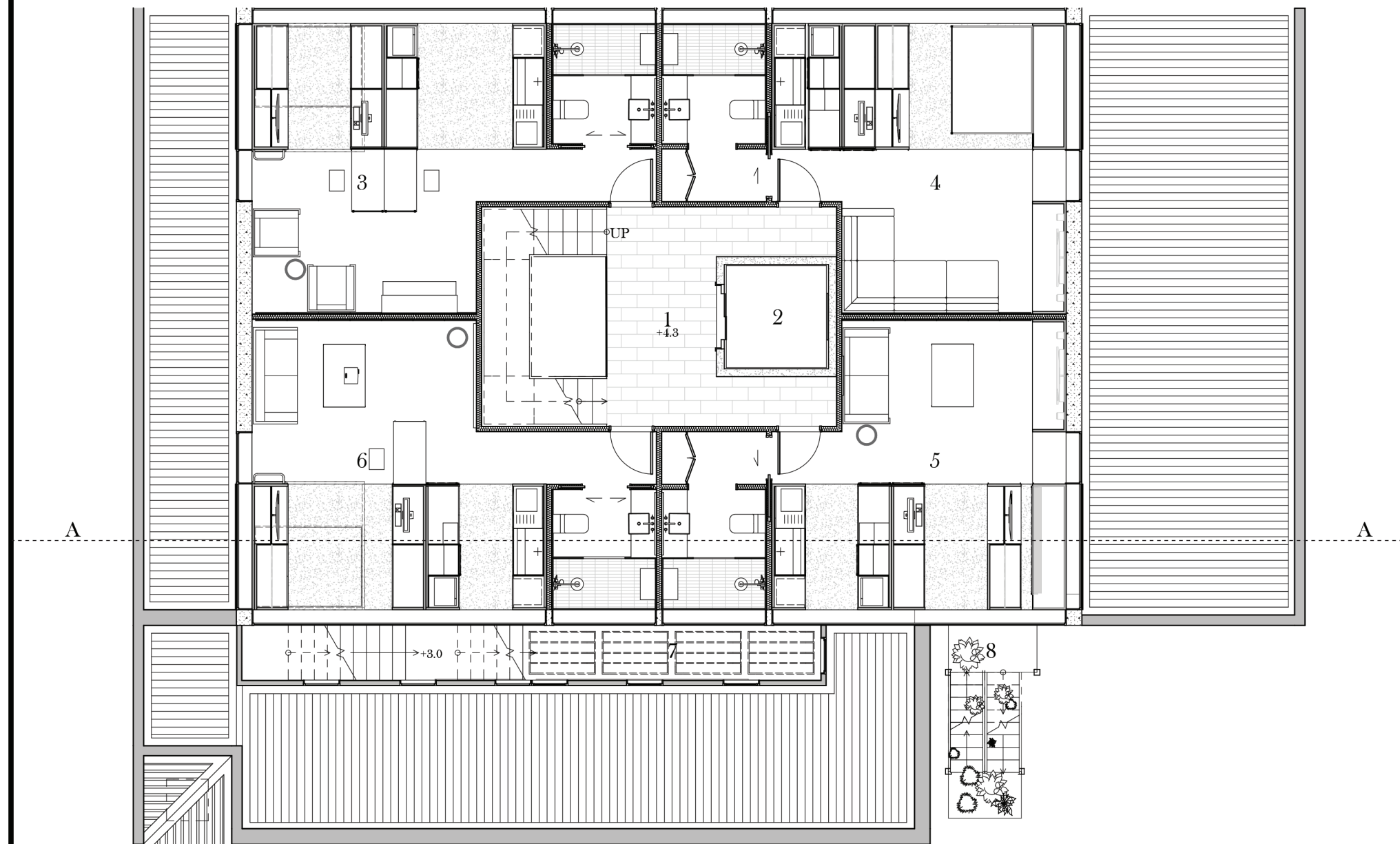
Page 106 - With the new staircase, the removal of the original plan for the two office floors was needed to fit in another two apartments (compared to the first Tip Top proposal). The apartment design is repeated to allow a focus on the quality of the design, as well as considering how such units would be marketed (as all 35m²). The nature of the individual apartment is explained on the 1:20 Plans. They all include a bathroom, storage space and the main living space. The

original corridor, which sits above the café has been designed to have lines for drying washing which can be lowered. The addition of new windows responds to a need for natural light (there are shown on page 119).

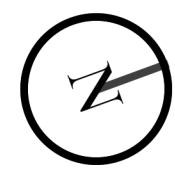
Page 107 - The layout, as mentioned before has been repeated throughout the building to give the greatest densification of the two floors. For every apartment the different Pod configurations show the range of options for the occupant. The layout of the 'static space' is individualized for each apartment, exhibiting how the occupant can personalize this space, by bringing a few personal items of furniture (due to the pods integrating a majority of required furniture/joinery).

Page 108 - The section presents two key aspects of this design. The first is the design of the public space, especially the café roof, with a mid-century influence (taken from the buildings original construction) made to look like an outdoor structure contained on the interior. The second aspect is the apartment layout, including the relationship to the new windows. The section also shows the bathroom core, and the space for services above.

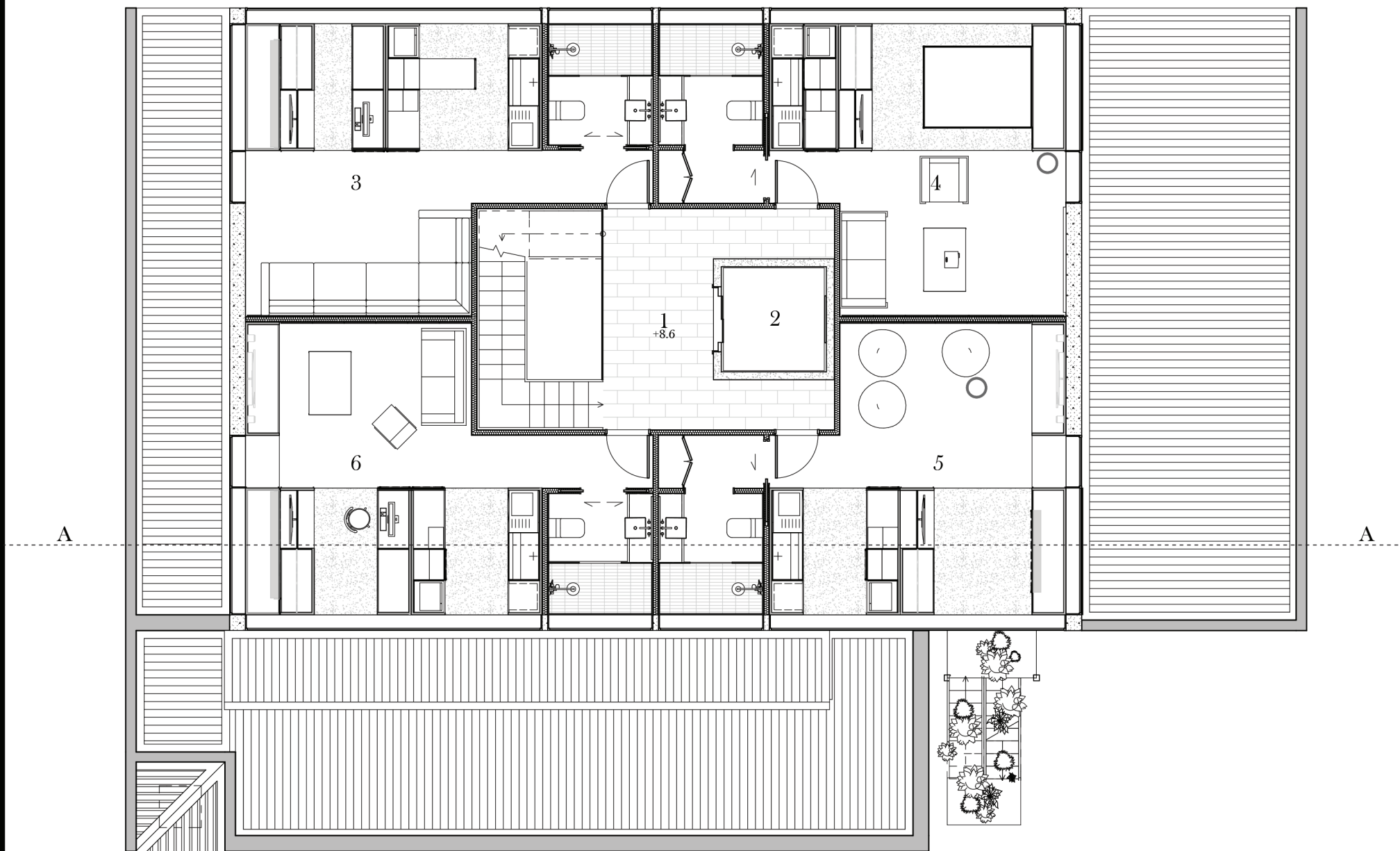




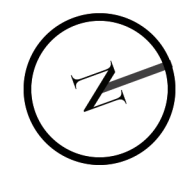
- | | |
|------------------------------|--|
| 1- Lobby (13m ²) | 5- Apt C (35m ²) |
| 2- Lift | 6- Apt D (35m ²) |
| 3- Apt A (35m ²) | 7- Retractable Laundry Line (6m ²) |
| 4- Apt B (35m ²) | 8- Old Staircase Planter |



FIRST FLOOR 1:100



- 1- Lobby (13m²)
- 2- Lift
- 3- Apt E (35m²)
- 4- Apt F (35m²)
- 5- Apt G (35m²)
- 6- Apt H (35m²)



SECOND FLOOR 1:100



SECTION AA 1:100

- | | | |
|--------------------|---------------------------|----------|
| 1- Apartment Entry | 5- Drop off/Pick up Entry | 9- Apt H |
| 2- Café Seating | 6- Apt C | |
| 3- Café Seating | 7- Apt D | |
| 4- Bike Storage | 8- Apt G | |

APARTMENT DESIGN

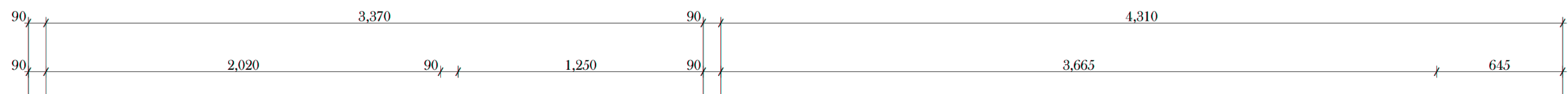
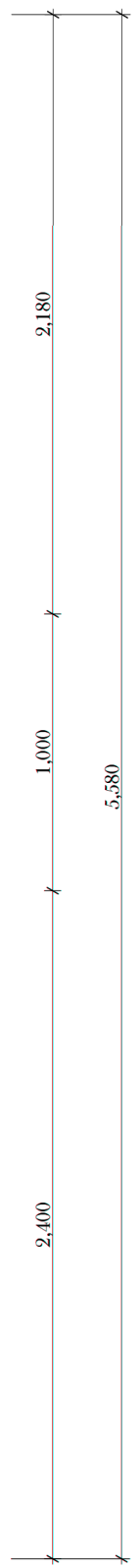
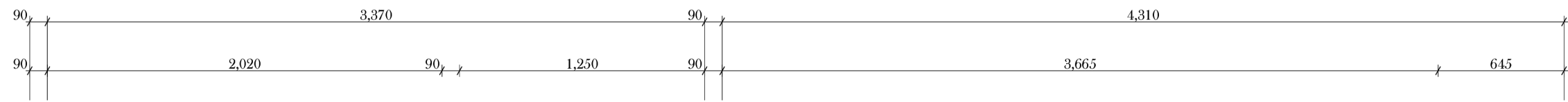
Page 110 is a representation of a typical apartment (located in the first floor building plans in Apartment C). The plan has been divided into two distinct spaces (in the key). The “kinetic space” is where the Pods are located, on the plan they have been arranged in one possible configuration. In the layout shown there is access to the kitchen, office and storage. Other features include the entertainment Pod (will can be removed) in the static space, to connect the apartment with continuing the same joinery units. The intention is that occupants could also remove an individual Pod if it was not required (as shown in the 1:100 plans p106-107).

The chosen finishes are a simple palette of pastel colours and timber veneer. With the target occupant of 20-35 years a durable material was required to keep maintenance to the Pods to a minimum. A stainless steel plate is used on the floor slab to reduce wear from the wheels of the Pods. The flooring retains the original concrete finish, with the addition of a vinyl dark grey speckle flooring in the static space is to also distinguish the difference in use.

There is full height window at the end of the circulation space, with a window seat (with a bookcase below) to give every area a purpose. There is a separate bathroom, complete with additional storage and internal sliding door to again save space.

The apartment section (page 111) shows the difference in the Pods storage and functional response. Each is related to a specific function, and this is taken into consideration for what it must achieve, from the kitchen Pod, with all the expected appliances, to the office Pod with space for a desk and storage above. The original ceiling height is retained, and gives a sense of space in rather tight confines.

A long LED strip light is used to further divide the two spaces further, and guide the occupant from the entry to the open space, towards the new view out the window over Newtown. The colours of pink and green are used to highlight the space, from joinery hardware to accents on the wall panels, and are continued in the public spaces on the ground floor.



- 1- Bathroom
- 2- Cooking Unit
- 3- Kitchen Unit
- 4- Study Unit
- 5-Storage Unit
- 6- Sleeping Unit
- 7- Feature Wall
- 8- Linear LED Light
- 9- Space for Services



RENDERS



LIVING



In this configuration the 'Pods' give the occupant access to the kitchen and study spaces. The image also shows the relationship between the static space and the kinetic space for the 'Pods'. The palette includes birch veneer and pastel tones throughout the apartment.

SLEEPING



In this image the bed has been brought down from the sleeping 'Pod'. Also in the image is another view of the guiding rail for the 'Pods', as well as illustrating the new windows, added thanks to the building not being heritage listed, allowing external changes.

‘P O D S’



Another image of the ‘Pods’ configurations, of the same apartment as page 113, however with new occupants. Showing the idea that the ‘Pods’ remain between occupants but can allow flexibility to their use, with new personal items shown on the pin board and shelving. Lighting for the apartments was always a key consideration, adding to the sense of space in the confines of each space

GROUND FLOOR CAFE SPACE



The final image shows the public space, specifically the café, situated on the ground floor. This addition is to reintroduce a public presence, and also serve both the occupants of the apartments, and the public of Newtown. The colouring of soft pastels has been carried through into the café, with a new eating area placed in the interior (page 108 label 3).

TIP TOP CONCLUSION



When it came time to test the five techniques in the confines of the Tip Top factory, I first retested the final outcome from Stoke Street, in order to examine the effect this method had on a completely different building (precast concrete industrial building). The different heritage features and lack of district plan heritage protection supported a new design which learnt from the original five techniques and exploited the greater flexibility of re-using a character building. This design enabled greater cohesion between the different aspects which made each method unique.

The final units resulted in a new interior strategy which could be implemented (specifically industrial buildings) for or the densification of existing units. The majority of design effort was focused on the units themselves, understanding a target occupant. A secondary concern was how to enhance the building to support its new found sense of identity as an apartment building. This came from understanding Tip Tops past and its context within Newtown. The research concluded that a public presence would increase the longevity of this hypothetical scheme (this is reinforced by the literature on adaptive reuse).

This enhancement in the case of Tip Top, includes the reintroduction of public use to the site. However the literature review also suggests other issues which could hinder such densification. The compact nature of the design has social implications, in its current form it is suited for small numbers occupants (one or two), rather than larger 'flats'. The social interaction between the apartments is something which would need to be considered for any work towards densification (it has considered briefly, such as the laundry's and café's role in the design scheme).

7.

CONCLUSION

The purpose of this thesis was the examination (and subsequent testing) of interior architectural strategies which may increase residential density in the context of the historic suburb Newtown in Wellington, New Zealand. The literature review identified a gap in this issue, and the case studies suggested possible techniques and strategies which might increase the density of existing buildings by using interior architecture. These were tested on the designs of two selected buildings. The first was an historic residential home (26 Stoke Street). This initial testing enabled the understanding of the five techniques, where each produced increased densification. A second test combined the techniques into a design that balanced, increased density, basic guidelines for residential design (including Auckland Apartment Guidelines) and the response to the existing context and heritage features. While this design successfully maximised density, the outcome was very specific to Stoke Street and relied on features specific to historic residential buildings.

From the 26 Stoke Street testing and optimum design, the focus shifted to the second site, the Tip Top factory. The design of the 'pods' was the revision of the methods produced from the case studies, into a more durable technique, which focused on their implementation for abandoned industrial buildings. Residential introduction is the base programme for this design, achieved through designing dense apartments (while considering the flexibility towards existing internal fabric). Compared to the initial design for Tip Top, this change allowing more internal layout changes, giving the outcome of eight dwellings. With the figures outlined by the WWC to produce another 2500 dwellings by 2043¹, approximately 310 interior densification projects (for industrial buildings) would be required, or 12 per year. Of course in reality this would never be achieved by the sole use of this method, but it could be used as scheme

combined with other methods to densify (outlined in the literature review), accompanied with the desire to retain existing character, it produces a strong argument in favor of such an approach for urban densification.

This research, titled Interior Infill, has proposed an approach to densify two historic buildings, which has been solely using interior architectural methods, to illustrate how they can be a viable response to the WCC's guidelines for the increasing residential density (28% increase required by 2043²). The buildings became the platform to show how such strategies can also respond and even enhance (through the identification and incorporation) the historic characteristics and features which are desired to be kept in neighbourhoods (by both the council and the general public). Densification has ultimately been increased (through the comparison of existing and proposed occupant density) by only the use of interior strategies. This was the question proposed by the initial research, to identify and simplify a selection of methods, with the aim to highlight the viability of Interior Infill.

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2-"Newtown Population, dwellings and ethnicity" n.p

8.

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