A design system for homes and housing:  
A rationalised approach to housing supply for Auckland.

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Abstract

New Zealand is currently experiencing a housing shortage. The economical recession has also had implications on housing affordability and as a result more people are relying on the government to help meet their housing needs. The government have given Housing New Zealand Corporation a target of increasing their housing stock to 70,194 by 2012. This is an increase of five percent. There is also a need to revitalise the housing stock. Over seventy percent of the houses were built before the 1980s and the stock is dated, cold and often mouldy. This project proposes a hybrid prefabricated system to enable Hosing New Zealand Corporation to efficiently provide quality housing. Throughout time a one size fits all approach has been applied to state housing. There has been a European perspective in housing. Polynesians, Maori make up the majority of state house tenants with the other ethnicities including Asians and Middle Eastern. A survey of past and current models shows the flaws in their design. In order to meet the diverse needs of tenants, it is necessary to go beyond the current approach to state housing with prototype houses that were placed repeatedly within a site. This project does not intend on experimenting on the poor but instead apply a collaboration of proven techniques in terms of both design and construction. The answer to the problem is a flexible system consisting of a concrete service core and a library of timber framed wall panels that can be applied to a pre-fabricated floor panel. This system is suitable for sites throughout the country as it can be reconfigured to suit each individual site and orientation. It can also be configured in multiple ways to create variations suited to the different family dynamics of the Housing New Zealand tenants. The system is an efficient solution, minimising time on site and able to be produced in bulk. The solution demonstrates and showcases emerging trends in housing and is able to show Housing New Zealand Corporation and other housing agencies a new approach to the housing shortage solution. The proposed solution can improve the standard of state housing, minimise the health issues associated with state housing and provide a better home for members of our community. Quality and quantity can be achieved.
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Introduction

Shelter is recognised as an important human need, one that is basic yet gives us a sense of place and stability. Inadequate shelter can affect one’s health, education, physical and social wellbeing. Home ownership is decreasing in New Zealand, as is the availability of healthy, affordable homes. The rental sector is growing, and despite Government support there are still many people with high needs missing out on adequate housing.\(^1\)

State housing is a term given to housing provided to those who cannot otherwise provide for themselves. Housing New Zealand Corporation (HNZC) is New Zealand’s key agency for state housing and works with the government with a focus on improving the effectiveness and efficiency of housing services to New Zealanders. Managing a portfolio of over sixty-nine thousand houses valued at $14.5 Billion and with a waiting list of at least three and a half thousand priority occupants and their families, HNZC are continually trying to best meet the challenges of state housing with long term solutions.\(^2\) Providing state housing and tenancy management is HNZC’s core role and with the demand for state housing predicted to rise, the focus of HNZC is to help those that are most vulnerable and increase housing stock in areas of high demand.\(^3\) The national waiting list for state housing is increasing with the largest waiting list of 1,910 applicants in South Auckland and second largest waiting list with 1,418 applicants in Central Auckland. The Government have the expectation for HNZC to increase their national housing stock to 70,194 by mid 2012, which is an increase of five percent.\(^4\)

The current state housing stock in Auckland was designed with a European middle class perspective in mind, suitable to the typical nuclear families of past generations. The stock is not ideal for the changing family dynamics of state house tenants, unable to meet the needs of single people, single-parent families and large families. In the HNZC Statement of Intent the focus is to, “Develop the housing portfolio to be ‘fit for purpose’ by type and location..., and better match demand and changing needs of our customers.” \(^5\)

This research and design project intends to develop a new model for state housing to better meet the needs of its tenants and help HNZC achieve their goal of creating a housing stock that is fit for purpose. The solution will be an efficient response to quality housing. Firstly a literature review will be carried out to examine the existing knowledge of State Housing in New Zealand. The literature review will focus on the history of state housing in New Zealand including past models of state housing. A critical analysis of the Housing New Zealand strategies will also be included and will focus on the design guides provided by the corporation. Statistical information from the 2006 census will also be reviewed to help outline the current tenure of state housing in Auckland. A selection of current state housing will be analysed in order to understand the existing models being developed.

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\(^3\) Ibid. p.7.  
\(^4\) Ibid. p.24.  
\(^5\) Ibid. p.5.
The History of State Housing in New Zealand

State housing in New Zealand originated in 1905. Slum landlords were causing problems but they intimidated even the local authorities and got away with the low standards and high rents. The New Zealand Liberals decided the way to deal with the current conditions and resolve the slum problem was to move the city workers to the country. This would also prevent the farm industry declining which was a large part of New Zealand’s economy due to the food exports to Britain. The government did not want the cities to grow despite the fact that cities played an important role in the export industry by creating new technologies making farm labour less intense and being able to distribute the farm goods. The suburban allotments, located on the perimeter of the cities were established for the urban working families who would not go and work in the country and instead were available for casual employment. The suburban allotments were government owned land which gave the workers a chance to make a home for themselves. They were in close proximity to the city for work but also gave the workers a chance to remove themselves from the city and enjoy the home life comforts. The scheme never reached its full potential. The commuter trains were never established and the government refused to offer freehold or state credit for building. It was cheaper and easier for the workers to stay put in their overcrowded circumstances. The government learnt that they needed a scheme that provided both land and house.

The failure of the suburban allotment scheme, along with the ever worsening city slums and slum landlords, encouraged the government to build state houses. Most workers were giving a third of their wages to rent, leaving them little to buy consumables such as dairy, meat and eggs, thus effecting farm incomes. The Workers Dwelling Bill was established with the intention to improve the working class housing conditions. At this time the private landlords had control over the housing market, charging high rents for very poor living conditions. By entering the housing market the private landlords no longer had total control which resulted in market competition and lower costs for all. Although both freehold and leasehold were offered, the government were in favour of leasehold. Criticism was felt due to the suburban approach, with high transportation time and cost to people working at the ports. Still, the Bill must have been seen in good light as it passed sixty-four to two.

In attempt to avoid the generation of housing slums, the houses were of high quality resulting in escalating costs and higher rents than anticipated. This put them out of reach for the deserving poor. By 1910 only one hundred and twenty-six of the estimated five thousand had been built which was not meeting the increasing growth and demand. In a new approach the Government Advances to Workers Act of 1906 enabled workers to borrow four hundred and fifty pounds to build their home with a low interest rate of four and a half percent. This was a highly successful scheme with 1296 loans being granted.

1 Ben Schrader, We Call it Home: A history of State Housing in New Zealand, Reed Books, Auckland, 2005, p.17.
2 Ibid p.20.
5 Ibid p.27.
Case Study One: Workers Dwellings

The workers dwellings often had the sitting room face the street with the kitchen the ‘social hub’ of the home. Wanting to avoid future slums the Liberals created a range of houses that were built to a high standard and were indistinguishable from private houses. The well constructed and decorative houses with a high level of finishing and ornamentation were too expensive for those they were intended for and therefore it was called to create something simpler.
An ongoing debate on housing policy was generated by these two schemes. In 1919 the reform governments housing act was created to help workers own their own state built home. Home ownership was the focus until 1935 however it was impeded due to the high cost of the finished houses and the money was redirected to become loans to workers to build for themselves. The new loan scheme of 1923 made it possible for workers to be loaned ninety-five percent of the cost of their home, up to £1,250. This was a very popular scheme especially with the development of public transport meaning more people had easy access to the city if they lived in the suburbs. By the end of the 1920s nearly half of new houses being built in New Zealand were financed by the state. This was also the time the Californian Bungalow style emerged which was a popular design due to the easy plans obtained from pattern books and using less timber thus reducing the cost compared to the Villa and Cottages recently built.6

Public spending was cut in 1929 due to the Wall Street crash. The building industry began to disintegrate and the effects were felt for many years. The loan scheme became much stricter and along with the workers being jobless, resulted in many defaulting their loans and having to move out of their new homes. There were no new homes being built and many had to move in with family resulting in severe overcrowding occurred.7

The next focus for the government was the inner city slums. Many fell below the minimum standards and were not favourable for a healthy lifestyle. They were a disgrace. Environmentalists suggested people experiencing overcrowded and run-down homes were also showing signs of sickness, both physically and mentally. These ideas were not new. The British generations raised in the crowded cities were both physically and mentally inferior to those before them. During the South African war, New Zealand and Australian soldiers were taken over the British Soldiers as they were too unwell or weak to fight. It was in the social interest of New Zealand for the government to intervene and clean up the city slums. Demolition was ordered by the Government for slums that could not be brought up to standard. New planning controls were to be introduced to set a benchmark for new building so a repeat of the slums would not occur. However, the Coates Government was replaced by New Zealand’s first Labour Government in 1935, and things were changed. Their lending was tightened to no more than eighty-five percent and they disregarded the slum dwellers that had small hope of owning their own home. In 1936 a newspaper article finally addressed the issue of the city slums and outlined the housing crisis.8 Finally it was decided that the government needed to erect rental houses. These would give more work to the unemployed, generate economic growth by using local materials and also challenge the slum landlords by raising the standard of New Zealand housing. 5000 state houses were to be built, with a cost of 3 million pounds. The houses were to be built to a very high standard to avoid any future slums. This raised building costs, a repeat of the Working Dwellings, resulting in higher rents than anticipated. The government defended the higher rents by suggesting it would create balanced neighbourhoods with socially mixed tenure, not just a high concentration of poor people. The poor were unable to afford these houses, but a recycling of houses took place with people moving into the new homes and the poor moving into their old homes. The poor were further protected from the greedy landlords when strict rent controls were put in place. Despite a completion rate of fifty-seven new houses per week in early 1939, and expecting to increase to seventy per week by the end of the year, there were still ten thousand on the waiting list.9

The Second World War put a big halt on new construction in 1942. This created an even larger gap between supply and demand which was further increased when the government decided a portion of the state houses were to be reserved for the returning soldiers. By the end of the war the waiting list was at thirty thousand. The state was offering a high standard of houses at about half the rent of similar houses in the private sector. People were hoping to get a good deal and were applying for the state houses despite already living in suitable private sector rentals.10 “The making of a home develops the qualities of responsibility, self reliance, and thrift. These qualities are of the utmost importance in successful family life and national strength. They cannot be promoted if the conditions make it evident to the young people that they are not expected to be responsible for their own homes – that they are, in fact to be discouraged and told to take their place in the queue for state houses”11

The Labour State Housing programme was very successful in its aim to improve the quality of life and living standards for New Zealanders. By erecting a high standard of house they not only provided accommodation for those needing it, but also rivaled the private sector landlords who were charging sky high rents for shabby living conditions. The security of a state house was received well by most however some still wanted the kiwi dream of owning their own home. National tempted these people during the elections, offering them very generous terms of sale. This included a 40 year loan with a low interest rate of 4 percent, reduced to 3 percent if the occupants or the occupant’s family lived in the property. The houses were available on these terms for £2400. Further temptation was created by a £200 interest free loan. The catch was tenants only had three months to acquire the 5 percent deposit. After a slow response, the government tried again, lowering some of the asking prices. David and Mary McGregor took this offer in 1952 and became the first tenants to buy their house for £1,880. National promoted home ownership with having both economic and social rewards however the campaign was not overly successful. The state housing waiting list was still huge at forty-five thousand, and only thirty thousand houses had been built. National wanted to stop state housing being regarded as a cheaper option for people who could afford the market rents. They introduced an income bar of £520 for new applicants in attempt to redirect state housing to the people in greater need.12 This was a complete change to the Labour Government’s intention of state housing. The Labour State Housing scheme was comparable to overseas schemes where the state houses were considered another form of tenure where as the National government intended state houses for those who could not house themselves in

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6 Ibid p.31.  
7 Ibid.  
8 Ibid. p.34.  
9 Ibid p.41.  
10 Ibid p.42.  
11 Ibid.  
12 Ibid p.46.
Case Study Two: Star Blocks and Multi Unit Housing

In order to increase density and move on from Labours use of terrace Housing, chief architect of Housing Division in the Ministry of Works came up with a range of designs including the Star Flats. In contrast to the previous styles of state housing, a new modernist approach was taken, influenced by housing in Italy, Scandinavia and Britain. Named because of their shape, the star flats were three story blocks consisting of one, two and three bedroom units. Intended for teenagers and adults, though more commonly used for housing families, there were usually 12 units, grouped around a central stair way. External French sliding doors created indoor-outdoor flow, innovative for the time, allowing the living room to be opened up and resemble an outdoor room protected by balustrades. There were both positives and shortfalls of the Star Flats. Some did not like the ‘block’ living with the sounds of fighting in neighbouring flats, limited sun depending on the unit’s placement in the block, and lack of outdoor space for the children to play. Others however were more suited to this way of life. The Star Flats were much more affordable than private housing and were suited to adults without children.

Multi unit housing was criticised further for having very limited (if any) private outdoor space. A survey found that common outdoor spaces were underutilised due to the lack of visual privacy. Noise was another factor, coming from neighbouring walls as well as units above. Lack of privacy with some units facing the car park and street was another issue as well as having washing in full view of neighbours. The Multi unit housing was also criticised for looking dreary, row after row, resembling the mass produced terraced housing of Britain. Although these buildings were extremely well built a stigma arose with them being called “Shoddy, government, mass produced housing.”

1 Ben Schrader, We Call it Home: A History of State Housing in New Zealand, Reed Books, Auckland, 2005, p.117
Left to Right:
Star Flats at Talbot Park
The Dixon Street Flats
Taylors Ave State Houses
other ways. These changes made clear the National Government believed people should look to be in paid work and use their own resources to meet their housing needs, leaving the state housing stock to provide the poor with decent housing.

Due to the Labour Government high spending in the state housing sector, National needed to establish a plan to deal with the rising costs of state housing. The rents had already been raised and an income limit had been established, so they decided instead of raising rents further they would sell off some of their housing stock. They used a package that offered a low deposit, interest rate, loan and a lifetime mortgage to persuade tenants to sell. The Real Estate institute declared, “It would be difficult to find any property available on such favourable terms as offered by the stage.” There was still criticism that state tenants were being privileged compared to other New Zealanders. The Advantages of Home Ownership brochure was distributed to all tenants, promoting the Kiwi Dream. The promotion however lacked any advantages of home ownership. The pamphlet depicted the current life of state tenants rather than promoting the chance to renovate and transform the house on their own accord. Despite the initial response being prosperous, the overall response was lacking. Later a revised brochure was released titled Opportunity Knocks for you which promoted “Self reliance, a sense of pride and responsible citizenship.” Even so, the government only managed to sell 13300 houses, about 30 percent of the stock available for sale. The 1957 Labour Government banned state house sale promotion, and an ongoing battle between Labour and National continued for many years, with Labour restricting the sales and National encouraging them.

Different methods were applied for rent rates, but generally the richer tenants were paying more than the poorer. One method used in the 1970s by the labour government was setting the rent at 1/6 of the household income, or the fair rent, whichever were lesser. The household income was the main earners income and 2/3 if any additional income from spouses. Over the years it was realised that high income tenants were receiving subsidies they did not need, especially when in 1985 the fair rent was only half of the average market rent for similar houses. In July 1991 the National government introduced a new policy of full market rents, with the government subsiding state house rates for the lower income earners. This enabled the government to assist both those renting from the government and from the private sector. The Accommodation Supplement was administered by The Department of Welfare. The National government were changing how things worked as they believed there were too many relying on government support rather than getting into paid work to support themselves. This enabled them to focus on helping people with a genuine need. A good theory, but when put into practice it had great impact on some people. A report carried out by the Family Centre disclosed there was a twenty-two percent growth in households experiencing severe housing needs, which they held the increasing state housing rentals accountable for. Private sector tenants were also experiencing serious housing needs despite the government targeting them with the accommodation supplement. The report concluded that, “The housing reforms do not appear to have been successful in alleviating the housing problems low income New Zealanders experience. On the contrary these results suggest that this situation has deteriorated significantly.”

The reforms had further negative results with an increasing number of state houses being vacated due to the market rents. People looked to live in high numbers in order to deal with the rising housing costs. Overcrowding was a big problem, with forty percent of low income houses being overcrowded according to a survey carried out in 1990 (twenty-two percent Pakeha, fifty-one percent Maori, and sixty percent Pacific Island). Statistics New Zealand released a report showing that overcrowding had further implications in terms of health, with more cases of Tuberculosis, rheumatic fever and meningococcal. These implications had a flow on effect increasing public health costs and creating community disorder.

The 1999 Labour Government committed themselves to improving the conditions of State Housing and housing policies. Programmes to improve current housing stock were implemented. Improvements included modernising, insulating and upgrading with new layouts, installing new kitchens and bathrooms and enlarging the houses to accommodate the larger families of Pacific Islanders. In 2001, Labour decided it was time to create an agency that dealt with all policies and administrative functions to do with state housing. Housing New Zealand Corporation was established which combined Housing New Zealand Limited, Housing Corporation of New Zealand, Community Housing Limited and the housing policy unit of the Ministry of Social policy.

Housing New Zealand Corporation is now the government's main advisor on housing and services related to housing with the intention to provide New Zealanders with access to good quality, affordable homes.
State Housing in New Zealand Today

Currently in New Zealand Government assistance comes in two forms; it can either be in the form of a Housing New Zealand State house, or through accommodation subsidies and supplements to help assist with housing affordability in New Zealand. The Housing New Zealand Corporation’s purpose is to allocate suitable housing to New Zealanders in need. Applicants are scored against five factors:

- Affordability of current accommodation.
- Adequacy of current accommodation.
- Suitability of current accommodation—this includes number of bedrooms, design, and disabled access.
- Ability to access private sector accommodation.
- Sustainability—factors mostly relating to personal needs, capabilities and social functioning of the applicants.

From this, the applicants are assigned to one of four categories ranging from At Risk applicants to Low Level need applicants. They are then put on to a waiting list and allocated houses as they come available, on average 29 days for the At Risk tenants, and 73 days for the Serious Housing need households. The bottom two categories are rarely housed as the HNZC does not see these applicants as in great need.

Of the applicants’ allocated Housing New Zealand stock, eighty-nine percent pay income-related rents and receive support through the Income Related Rent Subsidy (IRRS). The IRRS is an arrangement where the level of rent paid is determined by the occupants’ income and is set at 25% of their net income until it reaches the levels of the National Superannuation. Each dollar earned above this level 50% is added to the rent until market rent is reached.

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3 Ibid.
4 Ibid.
5 Home and Housed, p. 15.
6 Ibid.
Left to Right:
The Nuclear Family
Social welfare family
Working parents
The Changing Face of Households

New Zealand is currently experiencing a housing shortage. The department of Building and Housing suggested there is a shortage of approximate 70,000 dwellings, with the greatest shortage in Auckland. In addition to this, the typical New Zealand household has transformed. No longer is the two-parent nuclear family the most common family structure. It is predicted that over the next twenty years single person households will rise from twenty-three percent (2006) to thirty percent and the number of larger families is also predicted to rise. There was an increase in demand for four, five and six bedroom houses from 1996-2006 which could be an indication to higher populated houses. Overall however, it is predicted the average household size will decline from 2.6 to 2.4 by 2031. The HNZC housing stock is currently unable to match the changing family dynamics. There is an oversupply of three bedroom houses, with eighty percent of Housing New Zealand houses being two or three bedroom. There is an undersupply of houses for singles and large families. This has resulted in a mismatch between the housing portfolio and the tenants’ requirements, with families being allocated houses that do not match their needs. The HNZC data in 2009 show that 2,711 properties were underutilised by two or more bedrooms and 2,739 were considered overcrowded. It is thought that this figure underestimates the overcrowding problem currently experienced in the housing stock. Overcrowding is a big problem in New Zealand’s state housing tenants, more so than compared with other New Zealanders. According to the 2006 census a shortage of one or more bedrooms was experienced by on average thirty-eight percent of tenants and forty-seven percent of applicants and twenty-four percent of applicants had a two or more bedroom shortage compared with less than four percent of New Zealanders. The overcrowding can also be caused by the increase in births at the same time and the tenants being unable to move to a larger home due to the waiting list. The shortage of housing and the changing family dynamics is also resulting in some customers being allocated homes with more bedrooms than they need. The HNZC target of eighty percent for 2009/2010 was not met, with only seventy-four percent of properties being the best match for tenants in terms of number of bedrooms.

Other initiatives have been set up to monitor and improve the standards of housing. The Housing Shareholders Advisory Group (HSA) was initiated by the Ministers of Finance and housing in February 2010. The purpose of this group is to advise the most productive and sustainable model for state housing services and to provide new ideas to best use current housing assets alongside the governments objectives for social housing. These objectives include:

- New Zealanders must have access to housing that meets their needs and is affordable.
- Assistance must be available to those most in need for the duration of their need and to be delivered in a cost-effective manner.

The HNZC housing stock is dated, and seventy-three percent of the houses were built before 1981 resulting in “old, cold and mouldy” houses. High housing costs mean the crown expenditure on social housing, almost doubling from 2001/02 to 2008/09, is unsustainable. The Healthy Housing programme is a collaboration with HNZC and the Ministry of health to improve the housing conditions. They aim to reduce the risk of diseases related to crowding and improve the condition of state housing. It is recorded that up to June 2010 more than 2000 families have benefited from the healthy housing solutions. HNZC are trying to improve the health standards of their stock with energy-efficient retrofitting of insulation in pre 1978 houses; however this has only reached twenty percent of the houses to date. The condition of the housing stock varies but there is a general agreement that some of the stock is in desperate need of being brought up to standards or is beyond repair and no longer of use.

The government have the expectation for HNZC to increase the amount of houses to 70,194 by mid 2012. HNZC are managing this target in various ways. Rather than focusing on recycling the stock and selling off houses in lower demand areas to free up funds to supply houses in higher demand areas, they will not sell as reducing stock numbers in the short term make this target harder to reach. This is complicated by the fact it would take the selling of more than one house in a low-demand or less desirable area to purchase one house in the higher demand areas thus reducing their stock further. HNZC are also tending to purchase new stock in bulk, resulting in high concentrations of state housing tenants with high needs and low incomes.

The proposed project will help HNZC increase their housing stock in a cost-efficient manner. On sites such as Caen Road in Panmure, single houses sit in the middle of large sections. Removing the uninhabitable or unhealthy homes from sites such as this and replacing with two houses using the proposed housing system would make the target of 70194 houses by 2012 realistic to reach. Increasing the density in areas such as central and south Auckland will also help reduce the growing waiting lists of these sought after areas.

\[1,2,3,4,5,6,7,8,9,10,11,12\]
Left to Right:
Maori coming to New Zealand
Immigrants from the Pacific Islands
Pacific Island state tenants
Discrimination, Pepperpotting and Cultural Awareness

In the search for a better lifestyle, the 1970’s and 1980’s saw large numbers of Pacific Islanders migrating to New Zealand from Samoa, Tonga and the Cook Islands. In 1986 it was realised by the Office of Race relations that discrimination against Maori and Pacific Islander tenants had become a problem in the private rental market, with landlords believing them to be, “Dirtier, less house proud, and more likely to overcrowd properties than Pakeha tenants.”\(^1\) A survey was done by the Office of the Race Relations Conciliator and in most cases landlords preferred to let their houses to NZ Europeans. Discrimination against non-New Zealand European was not new. The stereotypes were reinforced by limiting the Pacific Islanders and Maori to rundown houses in less desirable areas, with high rents resulting in occupants overcrowding.\(^2\) Discrimination was evident in the state housing sector up until 1940 also, with Maoris being excluded when the government decided they could not afford the state house rents. They also tried to keep Maori and Pakeha apart due to the stereotype of Maoris poor living standards and disruption to Pakeha neighbours. This resulted in the Maori living conditions diminishing even further, with many living in tents and shacks with poor cooking and sanitary facilities.\(^3\) In 1948 the Government decided to build state houses for Maori. A dilemma of how to incorporate Maori and Pacific Islanders successfully into a predominant European population arose. This did not go to plan. The Maoris resisted abandoning their way of life and it was evident that dispersing the Maori and Pacific Islanders into predominantly Pakeha communities was not working. Rather than participating in the community they were inclined to hide away and isolate themselves. Policies were changed and the Maori and Pacific Islanders were then allocated state housing just as the Europeans were. Pepper-potting did make people more aware of the discrimination occurring in the housing sector, and it became the aim of the government to end any decisions being based on race or ethnicity. After the abolishment of pepper-potting, large concentrations of beneficiaries have been created due to establishments such as Talbot Park. Negative stereotypes surround such establishments with complaints about noisy neighbours, unkempt sections and general anti-social behaviour.\(^7\)

State Housing in New Zealand began with the intent of ridding itself of inner city slums. Although the standard of state housing has improved in terms of building quality, the high concentration of state housing has resulted in negative attitudes towards the tenants and developments. People believe they are riddled with crime and filled with people who are not willing to support themselves.\(^8\) This negative perception of state housing from the public is due to poor spatial and social planning. When state housing was approved by the wider public it was of high quality, with balanced neighbourhoods created due to a selection process. Governments then became too caught up with numbers, meeting housing targets and minimising costs which resulted in poorly functioning communities.\(^9\) Single-class neighbourhoods have been created with high concentrations of unemployed. Although the government and HNZC have taken note and attempted to integrate their housing stock into, or near private housing, there are still problems. State housing still has a bad public image. The media has not helped with this matter.

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1 Ben Schrader, We Call it Home: A History of State Housing in New Zealand, Reed Books, Auckland, 2005, p.56
2 Ibid.
3 Ibid.
4 Ibid. p.57.
5 Ibid.
6 Ibid.
7 Ibid. p.61.
8 Ibid. p.215.
9 Ibid.
Left to Right:
Early State House Style
Labour Government state house style
Repetitive state house style
Social Cohesion and Social exclusion are two terms used frequently in the housing discussion. Social cohesion is something to strive for and is a characteristic of a society where individuals, groups, associations and territorial units share common values and recognise like aims and objectives, ensuring the welfare of all members and evade division. There is often a common set of morals and principles in which people adhere to and results in positive relations to one another. A cohesive society is cooperative, supportive and encourages individuals to achieve common goals and participate positively within the community. Social Exclusion is a term which draws attention to the relational issues of people in a community with a focus on what causes inequality within a community and weakening social cohesion. Social exclusion is to do with the lacking of participation and integration of a community. Unemployment, poor skills, low incomes and poor housing are all factors that could create social exclusion. The term is used in housing to analyse the social implications of poverty and is a label used when people or areas become victim to a string of problems with high crime, poor health and negative family dynamics. In order to reduce social exclusion and improve social cohesion it is important to improve the quality of the HNZC stock. Providing the state housing tenants with good quality, healthy housing will reduce the negative stigma communities have toward state housing caused by the current run down image they bring to neighbourhoods. The tenants will be less tainted and given the ability to make a life for themselves and participate in the community.

The proposed housing solution is suitable for both pepper-potting and higher density developments. It suits the idea pepper-potting state houses amongst private housing due to its flexible nature and being able to be applied to newly subdivided sections. Because the system is a set of components that can be put together in various ways, it does not matter what size or orientation the site is and a suitable configuration can be applied to various sites. The proposed solution is also suited to developments where multiple houses are erected, it provides the option of erecting a variety of house sizes and layouts.

The 2006 census of Population and Dwellings states that Pacific Islanders make up 7% of the total population with more than two thirds of them living in the Auckland region. In 2001 the average occupancy for a Tongan household was 4.6, while the national average was 2.7. This is due to the pacific island cultural tendency to have more than one family under one roof, or at least have a multi-generational family under one roof. England’s influence on the Pakeha New Zealand culture extends beyond the English language and Christian religion, with many similarities between the settlement patterns and urban layout. With influences also coming from Europe and America, urban layout and house design differs greatly from that of our Pacific Island neighbours.

“The Englishman’s home is his castle armoured to keep out intruders – not so the Polynesians from the islands; his home is open with the warmth of his land in his heart for any who desire to come within.”

The state housing stock in the Auckland area was designed with a European middle class perspective in mind in terms of the family demographics, social structure and working requirements. These dwellings provide for a ‘privatised’ lifestyle suited to the nuclear family with 2 parents and 2.11. A one size fits all approach was adopted due to the ease of construction, management and administration requirements, cost, and the idea of equity; so everyone gets the same regardless of their situation. This approach has been used worldwide for social and disaster relief housing.

The typical cultural activities and lifestyle of Pacific Island families differ greatly to those of European decent. From family dynamics to cultural and ceremonial functions, there is a need for formal and informal spaces and the ability to hide away food preparation spaces. Housing New Zealand Corporation, along with Pacific designers and in consultation with pacific communities, put together a Development Guide for Pacific Housing design which provides solutions for creating better housing for Pacific people. The guide outlines the cultural needs of pacific island tenants in terms of their housing environments. The design themes highlighted in this guide are as follows:

- Extended family living – Houses should be designed to accommodate more people than the standard New Zealand house.
- Flexible design – Houses must be flexible and adaptable in order to accommodate the Pacific Islanders every day activities as well as for formal occasions and an over flow of visitors.
- Multi – purpose spaces – Such as the garage, with better interior finishes so it can be used for extra living

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2. Ibid.
3. Ibid.
4. Ibid.
5. Alatini quoted in Joel Cayford.
6. Cayford.
space, bedrooms or whatever is needed.

- Openness – Inspired by the open, wall-less Pacific island house, verandas and transitional spaces help create indoor outdoor flow.

- Warmer living – Aim to achieve internal layouts and orientations to maximise solar gain and passive heating.

- Built to last – Durable, hardwearing materials to withstand the large numbers of occupants.

- Pacific identity – Providing shelter, protection, security whilst choosing materials, colours and finishes that relate to the Pacific island tenants.  

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Case Study Three: Talbot Park

Talbot Park is a Housing New Zealand Corporation development in Glen Innes, an eastern suburb of Auckland. It is part of the community renewal projects started by Housing New Zealand in 2001 which aims to address the problem of social exclusion and strengthen communities.1 It is a project that Housing New Zealand intended to use to demonstrate quality housing solutions, community partnerships, and sustainable building practices. It was intended to be a benchmark for other medium density housing.2 Glen Innes is a low socio-economic area and has approximately sixteen thousand residents, and about five thousand dwellings. Fifty-six percent of these dwellings (2,840) are owned by Housing New Zealand. Glen Innes is made up of many different cultures, with approximately fifty percent being of Pacific Island heritage. There is a high rate of social assistance needed in Glen Innes. Talbot Park houses families and individuals of varied ethnicities. Approximately fifty percent are Pacific Islanders, twenty percent Maori, twenty percent Asian and ten percent are other ethnic groups including Iraqi, Iranian, Fijian Indian and European. English is the second language for the majority of residents.3

The original Talbot Park was created in 1958. In attempt to avoid monotony, the designers juxtaposed star flats with multi unit and duplex housing in order to give visual interest by providing vertical and horizontal elements. The original Talbot Park also had a negative reputation. The 1960’s housing stock was of poor quality and there was often security and social problems within the complex. A public park ran through the site with the dwellings backing on to it which attracted crime and the tenants felt unsafe. As a result of this feedback, a sense of safety became paramount to the new project.4 The row upon row of multi unit housing was criticised by many, especially when compared to earlier developments with single houses.

2 Ibid.
3 Ibid.
4 Ibid.

Talbot Park, as part of the housing renewal programme, intended to:

- Improve and enhance the physical environment and amenities.
- Provide targeted needs-based tenancy and property management services.
- Use principles of community development and implement community-led solutions.
- Create links to programmes that increased resident employment and business growth.
- Provide access to affordable and appropriate community services and facilities that responded to changing community needs.
- Improve neighbourhood safety and reduce crime.
- Build social networks to facilitate residents supporting each other.

The master plan was an important part of Talbot Park to increase density whilst making sure the occupants felt safe. The first step was removing the public park which ran through the middle of the site. A 'land swap' with the city council saw the existing park removed and two new parks replacing it which had better urban relationships with the rest of the proposed complex. New site layouts were created with traffic plans, public and private space, varying housing typologies and improved urban design principles. These included better connectivity, layout and relationships between public and private spaces. A provision of units ranging from one bedroom apartments to eight bedroom houses meant a range of housing typologies to be integrated into this complex, with the higher density apartment buildings located against the main road to give a sense of protection to the rest of the complex.
The Statistics:

- Commenced in October 2002
- Completed in March 2007
- 4ha public housing site plus 1ha public reserve
- 167 Existing Housing New Zealand Corporation residential units
- Existing residential density at 33.4 units per hectare
- Residential Density 8b Zone adjacent to residential areas one unit per 100m² and up to four storeys (maximum 17m)
- 108 refurbished flat apartments
- 111 new medium density homes delivered
- Redeveloped residential density at 43.8 units per hectare
- 2 new parks
- 2 new streets
- Total project cost 46.1 million
- Relocated 167 tenants
- 30% of tenants returned
- Increase of 52 properties
- Population increased from approximately 500-700

Detailed master plan: Boffa Miskell with HNZC and Auckland City Council

Housing development: Architectus, Bailey Architects, Boffa Miskell, Common Ground, Design Group Crosson Clarke Car-

To try avoid monotony, HNZC used a variety of architects and typologies to create architectural diversity in the development. Although across the entire site there is variation in architecture, they have not been successful in avoiding repetition within each block. The diversity of the building blocks allow the tenants to establish a sense of identity, however within each block there is no sense of identity as one unit is identical to the neighbouring unit.

The star Blocks were the first to be renovated, with decks being added, opening up the ground floor lobbies, re-roofing, improving heating, and improving the kitchens.

Aesthetically the architecture of Talbot Park is acceptable in most cases; however the choice of materials such as the fibre-cement sheet cladding gives the sense of impermanence as it is light weight and almost of temporary nature. The bright colours of the family homes and more so the Triplex apartments characterise them as ‘social’ housing as this is a feature of many social housing developments worldwide. There was an intention for the bright colours to represent the Pacific Island aesthetic, as was the horizontal timber battens of the family homes.

The family homes range from four bedroom to eight bedroom dwellings, with two plan arrangements. One arrangement has the kitchen at the road side of the house; the other has the kitchen in the middle of the house. These houses were designed to meet the needs of various cultural lifestyles. Separate living rooms off the entry provide a formal reception for guests and attached garages allow flexible space to be used as additional sleeping quarters, further living space or a gym.

Sustainable features were important to this project. These were incorporated in the following ways:

- Higher levels of insulation than code requirements.
- Passive venting in aluminium windows.
- Range-hoods in all kitchens to extract damp air and reduce internal condensation.
- Solar water heating in some units – including all the Atrium apartments (capital cost approximately $6,000 per house and $2,000 per apartment)
- Rainwater collection into garden tanks supplying toilets and garden irrigation in some of the detached houses (capital cost $4,000/house) and one apartment complex.
- Rain gardens within the streets for treatment and detention of storm water.
- Permeable paving to reduce the amount of storm water leaving the site.
- A detention tank system to clean out solids from the storm water of the large parking areas beside the Atrium apartments (capital cost $50,000 – viable only through an Infrastructure Auckland grant).

A recent article in the Sunday Star Times highlighted the negative experiences of tenants at Talbot Park.
“They call it the mini-Bronx,” says Talbot Park resident Bobbie Walker.⁶

Despite the high standard of aesthetic, the large concentration of beneficiaries is proving to be an issue. Located in one of the most socially deprived parts of Auckland, the award winning Talbot Park is proving to be a slum. With over 700 socially deprived people living on top of each other, one tenant admits the “Flash homes are just window dressing”. Within metres of her state home Bobbie Walker points out a house that has all night parties, a unit where someone committed suicide, teenagers who are constantly fighting and bloody, glass and litter on the stairwell. There is also a flat where an elderly man was almost stabbed to death and another which acts as a drug house. Walker has been in Talbot Park since 2006 and claims the crime and lack of safety in this development has eroded her quality of life.

“I’d love to take my house and move. I love my house, I just don’t like this area,” she says. “It’s our home but it’s not our neighbourhood.”

⁷ Ibid.
Initial Design

The initial response to this design problem was a prototype house – a repeatable solution with known costs, zero design time and design cost, all consents granted and preferably a specialist construction team ready to begin. This would be a complete package ready to be applied to typical small redevelopment sites. The prototype would be applied to some of HNZC’s current sites in Panmure, where dated and small single houses are sitting on large sites. Two or more prototype houses could be applied to many of these Panmure sites to help reach the government goal of 70,194 state houses by mid 2012. The intention of the initial house design was to create a prototype that was sympathetic to the Maori and Pacific way of living, but equally suited to other New Zealand families. It was a house that should be able to be manipulated by its user, and that could be easily added to as the family grows or the tenants change. From the Housing New Zealand Corporation design guidelines and other research, a design checklist was created to help inform the design. The checklist consisted of over 100 points to consider ranging from passive design techniques, room size and placement and cultural considerations, (Appendix 1). From this research two house plans were created, a 2 bedroom house and a 4 bedroom house. The 2 bedroom house was used as the lower level plan for the 4 bedroom house in attempt to reduce costs by using like products and the building process of prefabrication could be utilised.

The plan for the 2 bedroom house consisted of one double and one single bedroom, an informal living space adjacent to the kitchen and dining, a formal living room, a bathroom with separate toilet, and a loft space. Some of the features from the design checklist include:

- The front path and entry door being overlooked from inside the house for security reasons.
- A covered entry providing an intermediate space and a suitable place to take off shoes.
- A formal lounge suited to the Pacific Island and Maori ceremonial needs. The formal space must be separated from cooking facilities, be able to be closed off from other spaces and have visual and physical connection to the outdoors.
- An informal living space with connection to the kitchen, dining and outdoors.
- A mezzanine / loft space suitable for multiple uses including a study area, play area and sleeping space
- Storage for such items as sleeping mats in the attic.

The larger house plan uses the exact floor plan of the smaller house plan for the lower level, with an additional level consisting of three double bedrooms, a bathroom and mezzanine/loft space. The three bedrooms are adjacent with movable walls allowing the user to manipulate the space, creating one large room or three smaller sleeping spaces. The upper level is light and airy with the mono-pitch roof allowing clerestory windows to bring light deep into the house.
Plans are not to scale.
Critique of Initial Design

The initial concept proposed would not be successful for various reasons. The design checklist was constraining the design and the result was something similar to what was already in the Housing New Zealand Stock. The design was not as transferable as it could be and instead of creating a house that could be applied to various sites and manipulated by the user it was closer to being the one size fits all approach that was meant to be avoided.

The intention of the two house plans was to enable the two bedroom house to be converted to a four plus bedroom if needed, however the raking roof does not tend itself to vertical additions. Overall the design was too broad, needed more exploration and future designs needed to prioritise of what is a must and what is less important. From this critique of the initial design potential progresses became evident. Progress from this design will see a new concept created that is more applicable to transferability with the ability to be manipulated and varied. A focus on prefabrication arose as a priority due to its many benefits in terms of quality control and off site production.
Prefabrication

“Human housing is a matter of mass demand. Just as it no longer occurs to ninety percent of the populations to have shoes made to measure but rather buy ready-made products that satisfy most individual requirements thanks to refined manufacturing methods, in the future the individual will be able to order from the warehouse the housing that is right for him. It is possible that present-day technology would already be capable of this, but the present day building industry is still almost completely dependent on traditional, craftmanly construction methods.” Walter Gropius: Wohnhaus-industrie, 1923.

Prefabrication is a process or type of construction which differs from traditional techniques by using factory-based systems and minimising onsite works. Prefabrication is a system or methodology to supply clients with a bundled package of products and services. Prefabrication has been around for many years and due to misunderstanding there is a lot of negativity towards the process resulting in friction from the government, building industry and the consumer. Prefabrication is commonly thought of as being synonymous with low-quality and criticised for being flimsy and one-size fits all. The prefabrication industry is broad, with confusion and misinformation not helping resistance to the process. The confusing nature of prefabrication was described by R.B White in 1965 as, “Prefabrication could not be treated as a science; it is neither a single process nor a combination of known processes identifiable and measurable. It may sometimes be viewed in abstract and subjective terms, but it does not of itself provide a philosophy of design.”

Prefabrication is often mistaken for terms such as mobile, portable, standardised and industrialised. Prefabrication refers to components constructed away from the site. Prefabrication can occur at different levels: component sub-assembly (stick and sub-assembly), non volumetric preassembly (panel), volumetric preassembly (module), complete buildings (box-form) and hybrid prefabrication which is the name given to systems that combine volumetric and panelised typologies (module plus panel). Often prefabrication is mistaken for high-volume industrialised construction. Industrialised systems use prefabrication but they are not the same. Industrialised construction is mostly used for a large market producing high volumes whereas prefabrication can apply to both large and small scale production and can refer to a whole building or a single part. Standardisation is the term given to the repetition of components, methods or processes such as standard building products, standard forms of contract, standard details, design or specs, and standard procedure or techniques.

Steel prefabrication techniques
Prefabricated wall panels being craned into place
Modular or Volumetric prefabrication
Prefabrication is not a new concept. In fact in the tenth century parts of buildings were being produced in factories and workshops. Prefabrication was a practical way to station troops with the fundamentals of western comfort and during the same period Red Cross became a client of Christoph and Unmack, manufacturers of German Houses. The twelfth century saw Japanese temples being constructed from pre-cut wooden elements. These pre-cut wooden elements and other materials such as bricks were acquired away from the building site and accumulated in mass rather than for any specific design. The use of pre-cut wooden elements was also seen in Russian and Scandinavian house construction by the eighteenth century. Prefabrication Historian Gilbert Herbert suggests it was, “During the 19th century for the first time in the long history of ‘man the builder’ that serious and sustained attempts were made to devise systems whereby most of the component parts of a building could be fabricated in a builders yard or workshop prior to their assembly on the actual building site. In other words men sought to devise construction processes that would shift the major components of labour... to the controlled and increasingly mechanized conditions of the factory.”

Prefabrication took off by the 20th century in order to increase production and multiple materials had been experimented with including timber, concrete and sheet metal. Although modernism is seen as the prefabrication boom, earlier models such as the Swedish wooden systems which were released to the British and German Markets by 1900, and wooden panel systems such as “Tektonhaus” by Karl Hangerer show that prefabrication was around much before. In 1906 Grosvenor Atterbury developed a system consisting of 170 standardised precast concrete panels. Instead of designing individual houses like most working on prefabrication at the time, he developed this revolutionary system of concrete panels which were to be assembled by crane. These panels were further extraordinary as they incorporated a hollow insulation void. This is one of the first steps towards integrating the needs of modern people into the construction process. It also emphasised the idea that prefabrication was about redesigning architecture itself, implementing new systems to better many projects, rather than to focus on just one commission.

Mail-Order housing catalogues produced by Sears, Rosebuck and company saw over one hundred thousand kitset homes build between 1908 and 1940. In attempt to make buying a house appear straightforward and affordable, the homes came with self build instructions and were able to be customised. Frank Lloyd Wright began to experiment with prefabricated housing too. He is highly regarded for his work with mass customisation and the “clustering of components”. He looked both to nature and to the industry for inspiration, and produced endless housing designs with his system of timber components and his series “American System Built Houses” or the “American Ready-Cut System.”

Prefabrication was also a core idea experimented with during the modernist phase. It was seen as a model of modern living, with explorations in both new techniques and new materials. The developments came from the modernist infatuation with the automobile when it came off the production line in 1907. In 1914 Le Corbusier designed Maison Domino which was intended to rebuild the north of France and Belgium post world war one. The severity of the war prevented any being built however the theory was revolutionary, the development of architecture purism, and the technique of rationalised frames and free forms was immensely influential on the modernist space making movement. Le Corbusier’s housing crisis solution Towards an Architecture 1923 addressed the idea that houses too could be the result of a rational design process incorporating standardized parts and types, similar to car production. All of a sudden attitudes to prefabrication had changed. The once ugly, boxy and boring stigma was replaced by stylish, smart and beautiful. Prefabrication even went as far as becoming an icon, sought by the consumer for being in vogue, not to mention the high quality and high design.

With experimentation, innovation and manufacturing occurring worldwide even New Zealand started playing with the ideas, applying prefabrication methods to construction. The European settler’s introduced prefabricated housing to New Zealand through imported panelised housing kits bought in from the United Kingdom and United States. A London carpenter, H. Manning, sold his Portable Colonial Cottages to British colonies in New Zealand through to the 1850s. Pattern books consisting of house designs from the United States grew in popularity throughout New Zealand. They were based on the idea of site-based construction of the basic structure according to the plan books, complemented by standardised parts such as cornices, eaves, veranda posts and gable ends which were ornamental and factory produced. Prefabricated houses were also exported out of New Zealand such as the Kauri Cottages from the Bay of Islands destined for the Californian goldfields. Pre fabrication was also seen on the smaller scale with housing sections preassembled in Auckland and transported elsewhere, as well as pre-cut building components created by local timber mills in 1870.
Prefabrication has been a part of New Zealand Government Housing for over a century. The New Zealand Railways Department was a huge project consisting of prefabricated housing. Due to the depression, post First World War housing shortage and declining timber supply, a standardised planning method was implemented consisting of pattern books with kitset houses, pre-cut ready for construction. The kit sets were transported by rail and assembled in just two weeks. The Labour Governments “Public State Housing Scheme” followed in the 1930’s with standard construction details and specifications, covering over 100 different house plans with standardised fittings such as baths, basins, cupboards as well as windows and doors. Fletchers obtained the contracting job and supplied pre-cut framing and wall panels. Over four hundred housing designs were commissioned, with colour schedules available for claddings, roof tiles and plasterworks to ensure that no two houses were exactly alike and to create an appealing neighbourhood grouping. The prefabricated wall panels that were transported to the various sites were often assembled by returned servicemen along with a trained builder. This panelised system was expected to speed up construction and save on costs however the scheme was brought to an end due to the high costs of additional joinery, the limited floor plans configurations and the need for level sites. Despite these shortfalls, the scheme is considered one of the most successful public housing scheme in the world.

By the mid 1900s experiments with prefabricated sections continued worldwide and in 1942 Andrew Fletcher from Fletcher Construction proposed a government competition won by RS Walker and Paul Pascoe displaying techniques of modern prefabrication in home building. The attitude to prefabrication was improving, with G.Wilson describing what is still the predominant method of construction today, partial prefabrication – projects that use prefabricating process in different ways and on different scales.

Prefabricated huts destined for camps at Cornwall Park, Hobson Park, Victoria Park and more dominated factories outputs during the Second World War. Post war the housing shortage resulted in ordering 1000 pre-cut houses from England and Austria. These imported houses required repainting or replacement of many of the timber components. Despite the building industry’s concern about losing work the industry gained skilled workers from Austria and the houses have outlived their 20 year life expectancy and were considered still structurally sound 40 years on. In 1956 experiments with precast concrete load bearing wall panels and timber roof trusses in homes were investigated as new methods of construction. This was a huge development and both techniques are widely used in construction today. The housing shortage post world war two, accompanied by the population hike resulted in a number of prefabricated housing businesses such as Keith Hay Homes and De Geest. The increased investment into housing by the government enabled these businesses to be founded. Beazley Homes was another company founded in 1953 which was later bought by Fletcher in 1973 and was made a part of Fletcher Home in 1990s.

In the past decade prefabrication has taken on a modern aesthetic and sustainable design features. Architects have had little success in establishing prefabricated housing companies or prototypes due to the high start up costs and low public perceptions of prefabricated housing. Andrew Patterson’s Relax series consisted of fifteen housing solutions, with his own batch a prototype for the transportable homes. The lack of success with these was put down to the high cost of transportation, infrastructure concerns and lack of public demand. Prefabrication has many potential advantages, though each individual example of prefabricated housing has used the prefabricating process in different ways and on different scales.

Prefabrication can offer:
- A high quality product with less time at the site.
- More control on the outcome, less unknowns.
- More energy efficiency for less resource use.

Prefabrication does not necessarily result in a more cost-effective solution which is often the consumer’s misconception. It does however have the advantage of a higher quality solution. This is achieved through the control of labour, materials, machinery and conditions of construction. The product has been tested and readied before being transported to the site.

Further merits of prefabrication include:

**Technical Merits:**
- Close control on workmanship.
- Control of materials.
- Increased speed of production.
- Reduction of defects due to increased testing.

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20 Bell, p.73.
22 Ben Schrader, We Call it Home: A History of State Housing in New Zealand, Reed Books, Auckland, 2005.
24 Bell, p. 79.
25 Ibid.
26 Ibid. p.89.
Social Merits:

- Able to work under cover during poor weather.
- Tools and amenities close at hand.
- Employment stability.
- Investment in machinery.

Economic Merits:

- Shorter time frames.
- Reduced defect liability periods.
- Time savings are potentially 30-60% of traditional construction.
- Decreased dependence on weather resulting in lower costs.
- Price advantages from bulk ordering.

Sustainability merits:

- Reduced material waste due to efficient ordering.
- Indoor protection.
- Pre planning, cutting and re-use.
- Less disruption on site in terms of noise, pollution, effluent, ground works, traffic and fewer deliveries.
- Improved technologies and tighter controls enable a tighter building envelope and better energy efficiencies for reduced running costs. There is also a reduced carbon footprint due to the minimised transportation. Deliveries to site can be reduced by 60% in some modular volumetric constructions.

With the current economic conditions there is a need for ‘lifestyle down-sizing’. Housing is unaffordable for many and high quality, affordable design is a motivator today. Prefabrication is becoming a focus of a number of today’s architects such as Michelle Kaufmann, Adam Kalkin, Teddy Cruz, Jennifer Siegal and more. Many began by designing and building a prototype for themselves, with a focus on modern, sustainable design. Prefabrication has become more publicised both through architectural websites such as Treehugger, and magazines such as Dwell. The architects delving into prefabrication advocate its open plan configurations with non load bearing internal walls allowing adaptability, along with the high quality components which offer flexibility, affordability and continual supply. Rather than the one size fits all stigma, the standardisation is replaced with mass customisation and multiple configurations. Variation in the housing design can come from a flexible component system, with modular pods for utilities.

It is estimated that thirteen to eighteen percent of materials delivered to a traditional construction site are wasted due to misuse and wastage.27

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Examples of Prefabrication in New Zealand

Examples of prefabrication in New Zealand today: The following inspiring examples show the breadth of activity in prefabrication construction currently in New Zealand.

DAVE STRACHAN’s UNITEC PROJECTS:

Unitec, along with Dave Strachan of Strachan Group Architects, have run a studio project for the past three years called Studio 19. The first two years saw the students create a complete, transportable living and sleeping module for a Northland property. They use standard construction methods and are on a very strict time frame. The following year they were required to build a Bach that could be transported to Onemana in the Coromandel. Innovative construction systems were used including new types of timber joinery, a structurally insulated metal panel roof system and laminated veneer lumber.1

CLICK RAFT:

Architect Chris Moller from Wellington has created a hands on, DIY prefabricated system that uses notched plywood cut outs that can be assembled by the user. According to Moller, “Clip raft is an inexpensive, minimal fabrication architecture developed from first principles where each component is reduced to its bare essentials” The flexibility offers various configurations which can then be clad.2

IPAD:

The IPAD by architect Andre Hodgskin, is a kitset system, designed to extend beyond the existing transportable size constraints. The building has walls that extend beyond the house boundaries offering extension as well as helping to brace the building. The living floor area is almost doubled by clip on decking which also allows the building to lose the strict dimensions and create interplay with the indoor and outdoor spaces. Once placed on the site the module plugs in using a singular site based connection. The IPAD can be used as a single module, or grouped as a series of pavilions. It is available in various cladding and colour options, and offers both on site kitset construction or can be entirely manufactured off site and transported to the site as a whole.3

Top to Bottom:
Port-A-Bach, Atelier Workshop.
Habode, Rob Gibson.
Port-A-Bach:

A structure that is between a tent and a house, William Giessen and Cecile Bonnifait’s (Atelier Workshop) Port-a-Bach was designed to meet the demands of affordable architecture, in particular an affordable Bach. The Port-A-Bach consists of a shipping container fitted with bamboo joinery, a fold down bed, partitioned shower and a kitcchenette. The concept relates to the pioneering spirit of New Zealand and offers a portable, secure Bach with a high level of finish that is transportable and offers an immediate yet flexible solution. It enables people to use their land without placing a permanent dwelling which is suitable for leasehold sections. It can be connected to available services or used independently, making it suitable to remote or non-serviced land. It consists of a fully enclosed exterior steel shell that can unfolded to create living space or refolded to create a secure unit for storage or relocation. An interior fabric screen system enables the user to create rooms within the large living space. The unit can be divided up into spaces for bunk beds, a double bedroom, dressing room, kitchen and bathroom. One of the external walls can be brought down to form an external deck and reveals a glass facade with doors and adjustable louvers creating a seamless relationship between the indoors and outdoors. A further canvas screen allows the exterior deck to be sheltered. It is a non-invasive system only requiring 6 concrete footings for placement.4

HABODE:

Rod Gibson, a Wellington based architect, created the Habode system in an attempt to find a “Solution to the tardiness of trades people which can disrupt the traditional building process.” He created an unfolding system that can be transported in its ‘shipping mode’ which meets international freight restrictions. Once on site and positioned on foundations, the panels unfold revealing an 80sqm floor plate. The butterfly roof is also unfolded from another set of hinged panels. The external wall panels, cabinetry and appliances were fitted into this container and can be fitted into place within a couple of days. The nature of this house means it can be packed up and moved easily. It can also easily be shipped internationally. Designed to suit the New Zealand conditions, the Habode can withstand extreme heat, winds and downpours.5

Design Development

The research carried out has resulted in a new concept being developed. The idea of a prototype house has been abolished due to the lack of flexibility. The fixed design makes it difficult for the prototype house to suit a variety of site sizes, orientations and tenants. The prototype house also runs the risk of awkward site placement for optimal orientation creating obscure outdoor areas that are left unused. Instead, a system of prefabricated panels and modules has been developed. Variable configurations can be erected which will optimise the potential of each site.

The system comprises of precast concrete panels, timber framed panels, a bedroom block, and a bathroom module. The idea of a wall system is not new. In 1906 Grosvenor Atterbury developed a system consisting of 170 standardised precast concrete panels. Instead of designing individual houses like most working on prefabrication at the time, he developed this revolutionary system of concrete panels which were to be assembled by crane. These panels were further extraordinary as they incorporated a hollow insulation void. He emphasised that architecture was about implementing new systems to better many projects, rather than to focus on just one commission.

The purpose of design is to create a suitable environment for people. This can vary depending on ones culture, value system and lifestyle. With multiple configurations this wall system could be used to erect 2 bedroom houses, 4 bedroom houses, houses with multiple living spaces, duplex and multi – unit housing. The system can be applied to flat sites, sloped sites, wide sites and narrow sites. On sloped sites precast concrete wall system would be applied to the basement level and also act as the main structure. There would then be a system of timber framed walls for subsequent levels. Unispan flooring can be used which enables large open spaces. The system does not restrict itself, it can be used for one off houses (making it a cost effective way to re introduce a modified pepper potting approach) or for many houses within a development.

Being able to manipulate the environment is a suitable response to the differing needs of tenants. Being able to change and adapt an environment rather than be forced to adapt to it is essential to good design. The design of current state housing projects constrains the user and they are unable to manipulate it. A movable wall system would be used in the proposed scheme to enable the user to close off and open up various spaces which allows the house to be suited to occupants with varying spatial needs, such as Pacific Islanders who require formal and informal spaces for ceremonial purposes. Manipulation of the outdoor space is also important. New Zealand’s climate is variable with changes in temperature, sun, rain and wind occurring frequently. Retractable awnings are suitable to allow the user to manipulate the outside space, offering sun and rain protection and extending the living space. Many state housing tenants erect tarpaulins to create covered outdoor area which look unsightly and further create negative reactions to state housing.
Critique of the Design

The concept, although having many benefits, needs to be pushed further. With the idea of prefabrication, there is a need to further minimise what is done on site with these individual elements. For example creating components designed with floor panels, or holes in the floor panels where the walls can slot in easily.

The idea of the service cube was strong but needs to be further developed. Including a kitchen module (either joined or separate) would be suitable for this project. The current bedroom block with the service cube is using up a lot of space for circulation. Using the service cube to divide space would be a way to reduce unnecessary circulation floor area and also move away from the expensive moveable wall idea. The moveable wall is not a strong idea in this concept and trying to predict behaviour of future tenants is dangerous. It is best to leave the open space without the moveable wall and if individual tenants want to close space off they can do it their own way whether it be with tapa cloths or screens.

The bedroom block design is questionable. The angled posts supporting the slope roof are unnecessary and adding additional cost to the project. The sloped roof being higher than that of the living space was questioned and being unable to build on top of the sloped roof could lead to configuration restrictions.

The idea of retractable awnings was well received, allowing the user to adapt and extend beyond the envelope of the main structure. The lack of internal and external storage needs to be addressed.
Modular Construction

“Recessions are times for innovation and re-education of the way the building industry works to make it more competitive and give people new options.” Brian Phillips of Interface Studio Architects LLC. 1

A modular home is a home constructed in multiple sections in a factory and is one of the prefabrication methods used in construction. It is built to the same building codes used by conventional site builders but is built off site and transported to the site to be placed. The factory environment is controlled, with specialists collaborating to create a finished module to be transported to site. Prefabrication and modular construction is more efficient with the use of repetitive elements. Repetition minimises waste and moulds can be reused making the initial start up costs more economical as more units are produced. The repetition of forms also helps to eliminate errors as through the construction process problems are able to be fixed.

In addition to the benefits of prefabrications, there are further benefits of modular housing: 2 3

- Modular construction can create a more air tight building. With on site construction, site conditions lead to expansion and contraction of the materials, in particular timber. This is eliminated in a well managed factory environment.
- Modular construction can also have better indoor air-quality compared to conventional construction methods as the materials are not exposed to bad weather, reducing the risk of trapped moisture which could create mould. It is important however that the storage of finished modules is in a dry, controlled setting and once taken to site the building is set and sealed quickly.
- Construction in the factory can be done alongside the site preparation. On-site work is reduced further because the modules are delivered and within days the home is closed and sealed. This makes the home available to potential tenants faster. There is less disturbance in terms of noise, traffic and debris experienced by neighbouring properties.
- Modular costs are fixed and modular construction can eliminate the chance of surprise costs because there is a detailed contract between the developer and the manufacturer.
- Modular units can be paid for as needed. Being able to order a certain number of modular units at a time allows HNZC to meet the demand of state housing efficiently. Due to the flexible nature of this system HNZC are able to order modules depending on the requirements eg number of bedrooms.

1 Karen Black, “Going Mod: Reducing housing costs in Philadelphia with Modular Construction”, Year unknown.
2 Ibid.
Case Study Four

System 3 is architects Oskar Leo Kaufmann and Albert Ruf’s most technologically advanced, flexible and cost effective model. It consists of a ‘serving’ space and a ‘naked’ space. The serving space is a completely prefabricated module providing the kitchen, bath, electricity, internet laundry, dishwashing, heating, cooling, ventilation and vertical circulation.

The ‘naked’ space comes as a series of elements; a floor slab, walls, windows, and optional skins and roof. It is a shell, the space defined by the furniture applied by the user. All the elements fit into a standard shipping container meaning it can easily be transported nationally and internationally. The design of flat floor and roof plates are suitable for stacking and rotating, the only rule is the vertical circulation must be maintained through the core.
• Modular buildings are easily able to be removed from site and reused elsewhere should the requirements change.

Construction waste is another factor that occurs in conventional building methods and can be reduced through modular prefabricated building. Common problems with conventional building methods include:

1. Detailing, changes in the design and errors in the design.
2. Poor storage conditions.
3. Poor handling of the materials.
4. Lack of initiative in terms of cutting or shaping materials.

The nature of prefabricated construction and modular housing allows for consistently high standards, achieving a better quality product that one could then assume leads on to an increased building life span and decreased maintenance.
Design Development: Part II

The development of the service cube has been a major part of this project. In order to make it an efficient module it made sense to include the kitchen.

Stage One:

The initial module contained a kitchen, bathroom, toilet, and circulation space.

Stage two:

The storage was replaced with a laundry so all services were within the core.
Stage three:
There was a lot of space being used up for circulation. The kitchen was far too small for a larger family and be-
cause the module needs to be suited to small and large families it needed addressing. One of the throughways has
been removed and the kitchen has been made wider.

It became apparent that the study was in an odd place. Studying requires quiet and concentration, yet it has been
placed in the service core which has constant activity whether it be people passing through, using the laundry or
using the bathroom. These are not ideal studying conditions.

It also became apparent that in order to be more efficient the rooms requiring services such as water should be ar-
ranged around a single source to limit pipe work and also enable the module to be easily stacked.

The stair was also an inefficient use of space. A straight stair is awkward to work with and makes it difficult to
create a stackable module. Having a U shaped stair is easier to deal with spatially. It is a better volume of space,
and is more ‘room’ like and less like a shaft or corridor making the dimensions easier to work with. The start and
finish are in the same place in plan so it is easier to arrange and provide a decent space for landing. The straight
stair well also poses safety issues if someone was to fall however the U shaped stair will break a fall and also of-
fers a point of rest on the way up.

The new service cube is an efficient arrangement. The kitchen, laundry, bathroom and toilet have been arranged
around a service riser which holds the pipe work. The kitchen opens out to where the lounge would be placed. A
corridor goes past a stairwell and storage cupboard and accesses the laundry, bathroom and toilet.

Variations were trialled. One included an entry into the service cube however it meant people were entering right
beside the laundry which is not ideal for the main entrance to a home. Having the entry fixed within the service
cube also limited the orientations of the cube and therefore limited possible configurations and site placements.

In order to further minimise the work needed to be done on site, this stage of the development moved away from
the concrete wall system and toward a modular scheme. The scheme consisted of the service module, a flexi-room
module that could be used for bedrooms, additional living or study spaces, a main bedroom module, an entry mod-
ule and a garage module. The module worked on a 1.2m grid.

The flexi-room and main bedroom module included space for circulation. Two flexi-rooms could be placed adja-
cent to each other to create one larger room. One of the walls in the flexi-room could be changed depending on
requirements. Substitutes included an internal timber framed wall, an exterior wall with window, an exterior wall
with a ranch slider and an exterior blank wall. The module is constructed out of precast concrete panels with a
timber panel that runs across it to break up the monotony of the concrete. A screen of slatted timber can be lifted
up to reveal the sliding window panel. The screen across the window allows the user to have privacy while the
window is open or closed but also allows them to open up the screen to let more light in.
Application to Site

In order to test the modular system, it needed to be applied to a site. The system has been designed regardless of site in order to avoid being influenced by features of a specific site e.g. size and orientation.

Panmure is a part of HNZC’s Tamaki Transformation project which aims to address the problem of social exclusion and strengthen communities. The chosen site is located between Coral Crescent and Mareth Street with an approximate area of 6,600m².

In terms of a master plan, a number of options were explored:

Option A)
Entry road along northern boundary, allowing potential development of the rest of the block. No driveways coming off bounding roads, closing off the site creating a sense of community within the development and also limiting hazards along the bounding roads.

Option B)
Entry road is off Coral Crescent and more central in the site. No driveways coming off bounding roads, closing off the site creating a sense of community within the development. Potential to have a road go through to Mareth Street also.

Option C)
A Variation of the Ventura Street Model. Limiting the number of driveways along Matapan Road and instead the perimeter houses share entrance on Coral Crescent and Mareth Street. ¹

Option D)
This site layout consists of a lane right through the site from Coral Crescent to Mareth Street. This offers a clearly articulated entry and exit for the site while providing pedestrian friendly access.

The Ventura model consisted of two houses on the southern boundary which meant two houses were being approached from the north, taking up important space that could better utilise the sun advantages. The proposed site layout has changed this, and only one row of houses is along the southern boundary.

¹ Ventura Street is a HNZC development in Mangere.
The modular housing concept was applied to this site. In order to create a hierarchy of spaces defined by the spatial layout, double story houses are located around the perimeter of the site, with single story houses fronting the lane through the site. These single level homes would be suited to the elderly or disabled and natural surveillance can occur as these tenants are often home and can see out onto the street. The two story houses have been placed around the perimeter of the site giving a sense of protection for the rest of the complex.

Low fence lines with hedging line the street and give definition of public and private areas without blocking the visual connection between the houses and the street. Having a defined front yard allows residents to personalise their gardens and create a sense of place.

The result of applying the modular system to the site showed flaws of the scheme. The layout was restricting the system and it still appeared to tend towards the ‘cookie-cutter’ approach to site planning. The modular system was lacking, it was not as efficient as intended and the different components were not working together well. There were too many variations in the dimensions and there was not a lot of flexibility in the design.
Final Development

Through the development for an efficient and flexible housing solution, the final design scheme has resulted in a hybrid system consisting of a service module, an entry module, a library of wall panels, floor plates and roof options. The concept uses both concrete and timber. Through critique of previous concepts, it was apparent that although concrete is a suitable material for prefabrication, it did not have as much flexibility as was desired. As a result prefabricated timber construction was preferable for the library of wall panels. Concrete is still used in the scheme for the service module which is the fixed component in each house. The material offers a sense of permanence. Timber is used for the wall elements and entry, the parts of the house that can be changed and added to. The lightweight material compliments the concrete core of the house.

The service core is a pre-cast concrete, prefabricated module brought onto site in its complete state. It is the constant in all the house configurations, with only a few possible variations. The service core consists of a kitchen, bathroom, toilet and laundry that all connect to the service riser – a central wall with a series of water pipes and electrical services. This is an efficient way of dealing with the various services on site as the module can be brought in and minimal work is needed to connect the riser, which services the entire house, to the mains supply. The service core also has the option of a stairwell, providing circulation between levels. This module can stack easily and is an efficient way of dealing with multiple-level dwellings. One variation of the service core enables additional bathrooms to be added. The service cube is halved and the additional bathroom can be stacked on top of the lower level bathroom and be serviced by the service riser. A variation for a stairwell section of the service module has also been included which is suitable for sites where a stairwell is needed at ground level to get up to the main living level.

The library of walls are of timber frame construction and enable multiple configurations to be created around a concrete slab or a timber framed prefabricated floor plate. The whole scheme works on a grid following the dimensions of the service cube in order to be able to configure and stack efficiently. Therefore, the walls are available in three pre-determined sizes. For the purpose of this project the walls are clad with a stained timber weatherboard finish, however, due to the nature of the timber construction it is easy to replace the stained timber board finish with any other panel-type or weatherboard claddings for variation. The flexibility of a wall system is most effective with various orientations and site applications possible, allowing each house to be ‘custom designed’ without the additional costs.
Service Cube Variations
Scale 1:100

Entry Cube Variations
Scale 1:100

Roof Library. No Scale.
The entry is an important component in houses. HNZC design guide have many requirements for the entry including:

- The front path and entry door should be overlooked from inside the house.
- There must be weather protection to front doors
- There must be good light to the entry

Placement of the entry is crucial. Initially the entry was included within the service module but when being applied to different sites it became apparent that having a fixed location for the entry restricted the orientation options for the service module. The proposed scheme includes an entry module which is also timber framed. It consists of a covered porch area and an entry cube with space to take off shoes and hang coats before entering the main living spaces. A slatted timber screen offers protection from the elements while still filtering in enough light to make the porch welcoming and differentiating it from the rest of the house. The entry module comes in two sizes so it can be attached to either dimension of the grid.

To provide further variation a library of roof options is available and can be applied to the configurations. There are three options, a pitched roof, a mono-pitch roof and a flat roof. Each offers a different aesthetic and will offer variation within developments.

To express the modular system and as a solution to the join details of the components of the system, a black aluminium strip will be used. The black strip will express the joins between wall panels, service core and entry while acting as a waterproofing flashing, protecting the joins from water penetration. The black will be continued in the joinery.

To provide tenants with useable and flexible outdoor spaces the awning system that was introduced in stage two of the development of this project will be used. With New Zealand’s varying climate, retractable awnings are suitable to allow the user to manipulate the outdoor space, offering sun and rain protection and extending that living space. The awning requires a fixed structure that can be applied to the wall system. The awning is a suitable way to extend outdoor living spaces and will prevent tenants making their own adjustments to the property.

The following pages provide examples of possible configurations and different roof options. There are many more possibilities.
Application to Site

The chosen site is located on Mays Road, Onehunga. It is a slightly sloped site with two existing garages on it. The site is underutilised and is surrounded by some medium density housing. The site runs on a north-south axis and is approximately 3580m². The houses bordering the east and west boundaries are all single story houses. The northern boundary has three level terraced housing with a balcony and courtyard acting as a buffer between the terraced houses and the boundary to this site.

The initial site layout consisted of a central road through the site with houses being applied to the east and west boundaries. Ten houses were applied, with a density of approximately 27 dwellings per hectare (DPH). Seven out of the ten houses had off street parking available. The remaining three houses had an on street parking bay. Variations included three, four and five bedroom houses, some with one large living space and others with additional smaller living spaces. This exploration allowed one to gain an understanding for the site. This particular layout will not be developed further as there is too much site coverage and it is creating some unfortunate spaces. A density of 27dph is high when each house is a detached dwelling and especially when dealing with large 5 bedroom houses. The site is congested, with a lack of outdoor space.

The final site layout addressed the issues of the initial layout. There are only 9 houses bringing the density down to 22 DPH but improving the relationship between houses. There is a road that runs up the western boundary of the property acting as a buffer between the medium density housing development on the neighbouring site. The road has a turning space at the end, suitable for a refuse truck. The front house faces Mays Road to maintain connection with the street, however access to the carport is still within the development. The first two houses are single level, two bedroom houses. They are of similar scale to the existing houses on Mays Road. The rest of the houses in the development are double storey houses. The entry is clearly defined for all houses and most have a front garden for the tenant to personalise. Fencing along the boundaries of each site provides security for the individual dwelling. Low fence lines along the front of each property maintain visual connection with the street for passive surveillance. From Mays Road you get glimpses of the double storey houses within the development. Each house is a varied configuration and size. High roofs have been applied to the houses at points within the development that mark the end or a turn in the road, offering a sense of landmark and self orientation. Although this development uses just timber cladding, it is possible to clad the houses in a variety of materials to give further diversity within a complex.

The larger houses have ample outdoor living space, with the use of the awning system to provide cover and protection from sun and light rain when needed. The varied levels of the site have created a terraced development providing different levels for outdoor living, further articulating the space and offering privacy. Planting of shrubs and trees provides further privacy.
House Plan Scale 1:200
House Plan Scale 1:200
Other Potential Applications

Due to the flexible nature and the basic forms of the system it is possible to use figure ground diagrams to investigate potential future developments. Below are two sites with the modules added in a figure ground diagram to see future development.

Site One: Caen Road Panmure. A lot of the Panmure state housing is at very low density, with small single level houses on a quarter acre section. The proposed scheme could be used to redevelop the whole block or be used to add houses to increase the site density.
The proposed scheme could also be applied to a vacant lot in Royal Oak. Although further investigation into this site would be needed in terms of site conditions (noise, access, and so on,) a figure ground diagram shows how the site could easily accommodate eight houses. The modular system and grid-like dimensions of the scheme make investigations such as this easy. This also demonstrates how the scheme is able to be applied to a variety of sites.
Conclusion

Some of Housing New Zealand’s projects, such as a recent project on Miranda Street in Auckland, are taking five years to create just forty houses. At this rate the Auckland housing shortage will not be remedied and people will be living in overcrowded, substandard houses. The proposed scheme revolutionises the process, enabling numerous houses to be built in minimal time. The scheme, though would take a year to detail, will result in unlimited houses that can each be built in a factory setting within a week and put together on site. It is a rationalised approach to housing supply. The form of the building scheme tends itself for reconfiguration. This is suitable for a state housing system as it provides the owner or landlord flexibility to reconfigure or create additions at the point where tenancies change, allowing them to respond to demographic change. The hybrid system avoids the one size fits all approach to many state housing developments Auckland wide. The variable plan configurations make it appropriate for tenants of all cultures.

The service core is innovative, efficient and hard wearing. It can be beneficial in terms of lowering energy consumption when used as a heat sink. It is able to be reused or moved when requirements change. The hard wearing concrete is suitable for such a space with constant use and foot traffic. It is also suitable for the wet areas as it is not affected by mould. The timber framed wall and roof library are flexible elements that work with the service core to provide a best fit house for the individual site. No longer are there orientation issues so common with prototype houses, instead each wall can be placed to get the best out of the site conditions. The timber framed wall also allows variation in aesthetic when clad with different materials, as does the choice of roof profile, which avoids the monotony of current state housing schemes.

One system with one set of details is able to provide an infinite number of houses. Quality and quantity has been achieved.

Future direction for this research includes exploring the system for densities higher than twenty two dwellings per hectare. Further research can be done into efficient building systems to achieve higher density and multi level paradigms.
Appendix 1

A study of the design guides provided by the Housing New Zealand Corporation informed the following design checklist. The design guidelines are provided to architects designing potential solutions and following these would create an acceptable solution. There are many design guides provided including design guides for Urban Planning, Houses for Pacific Islanders, houses for Maori and a general Architectural Guideline.

For the purpose of this project the guidelines have been organised into the following categories:

**Passive Design:**
- Maximise exposure to the sun, ensuring maximum solar gain and natural warmth.
- Minimise prevailing winds.
- Orientation of the building to allow for optimal North facing glazing.
- Maximise outdoor living to north.
- Insulation against heat loss through walls ceilings and floors.
- Protection of glazing (particularly west facing) to prevent overheating in summer. (This can be achieved through eaves, screens attached to the house, or through planting).
- Do not use large areas of south facing glazing, or unprotected glass facing prevailing winds.
- Thermal mass.
- A concrete floor slab may require perimeter insulation, depending on location. This should be polystyrene or another insulating material.
- Insulation must be provided under a suspended timber floor.
- Ventilation is required. Passive air vents are recommended when open windows aren’t suitable.
Active Design:
- Heating is required. One heat source must be provided for in the main living area of a house. If it is to be a gas burning or solid fuel burning heater then it must be flued to the outside.
- Adequate power outlets must be provided to minimise the use of double adapters, extension cords, or power boards.

Roof:
- Roof form appropriate to the new building but don’t ignore the existing character of the surrounds.

Access:
- The front path and entry door should be overlooked from inside the house.
- The path to the front entry door and the door itself should be clearly visible from the street.
- Progression through the house should be from public (entrance, living, dining) to private (bathrooms, laundry, bedrooms).
- There must be weather protection to front doors (a porch) for rain and wind.
- Retain good light to the entry.
- Access should where possible be level.
- It should not be possible to look from the street directly in the windows of a dwelling.
- Secondary entry should be provided – side or rear door.

Privacy
- Adequate visual privacy must be retained between occupancies within a development.
- Windows must not directly face those of habitable rooms or private open space in neighbouring dwellings.
- Balconies should be designed so they do not overlook adjacent private open space or habitable windows.

Outdoors:
- Provide sunny outdoor spaces, sheltering the occupants from prevailing winds with direct access to internal living spaces.
- Allow for landscaping –
  - a border between neighbouring properties
  - Shelter outdoor living spaces
- Space for a vegetable garden.
- Suitable fencing – lower at the front to maintain visual contact with street
- Transitional spaces e.g. verandas, patios, porches and decks – flow between indoors and out.
- The planning of a dwelling should allow for outdoor cooking.
- Safe access to outdoor living must be provided.
- Surfaces that are liable to become wet must be non-slip.
- Outdoor food prep and cooking must be covered.
- Outdoor living spaces sheltered from sun wind and rain.
- Provide indoor outdoor flow – open plan communal spaces.
Living and Dining:
- Formal Lounge – multipurpose, flexible, accommodate large numbers.
- Formal lounge must be separated from cooking space.
- Formal dining space (can be joined with formal lounge).
- Multiple entries to the formal space.
- Visual and physical connection between formal area and outdoor area e.g. French doors.
- Informal living and dining – open plan, connected to formal space and able to be opened to be one large space.
- Option to separate the formal and informal.
- Living room needs to be large enough e.g. 5m x 6m to accommodate 20 ppl.
- Large second living space desirable.
- Dining needs to be connected to both the kitchen and lounge.

Kitchen:
- Large kitchen.
- Able to be separated from formal space, but be part of the open plan informal space layout.
- Adequate storage.
- Robust and hard wearing materials – stainless steel sink benches.
- Ovens must not open into a traffic area and must have anti-tipping restraints.
- Bench space must be provided adjacent to cooking surfaces for placing hot items.
- Kitchens must be well ventilated. A range hood is required where sufficient natural ventilation is not avail-

Bathroom:
- Bathroom and toilet separate rooms.
- Walk in showers – no steps.
- Separate bath, not necessary though.
- Toilets must be accessed without walking through formal space.
- Two toilets preferable.
- New dwellings of over 2 bedrooms must have a WC and wash hand basin separate from the main bathroom for the dwelling.
- Showers must be separate enclosures - not positioned over a bath.
- Bathrooms must be well ventilated. For those areas that cannot be passively ventilated, forced extracts of a suitable capacity must be installed.
- A bath should be provided for households where there will be young children.
- Bathrooms require a shower, separate from a bath tub.
- A toilet and wash basin should be separate from bathroom.
- Provide discrete entry points to toilets.
Bedrooms
- Elderly accommodated inside.
- Female family members inside.
- Sleep outs reserved for teen males only.
- Combine smaller spaces into a bigger one due to overflow of visitors. Allow up to 5 or 6 sleeping spaces.
- Locate sleeping spaces away from living area.
- Provide indoor outdoor flow for sleeping spaces.
- Provide appropriate storage for things like sleep mats.
- Bedrooms need to be large enough for 2 or more adults/children plus study space.

Hallways/Circulation
- Use hallways for access to bathrooms and toilets.
- Stairways and circulation must be of adequate size for access and furniture moving.
- Where appropriate provide access ways along the warm side of the house to create heat sinks and for children to play.

Other:
- Allow for future extensions to the house and additional structures.
- Loft space – mezzanine Level – internal ceiling heights – create a multipurpose space e.g. secondary living area or dormitory for teens.
- Laundry must be separate and ventilated.

- Adequate internal storage must be provided for linen and clothing, cleaning equipment and kitchen utensils.
- External storage provision must be provided to house items such as lawnmowers, bicycles, and sports equipment.
- Where children are likely to be living, appropriate space should be provided for activities such as studying, in addition to sleeping space.
- Built-in shelving allows personalisation of space and should be provided in appropriate areas.
- Mezzanine space can be used for extra living or dorm space or office space.

Garages
- Garages must not dominate the built form.
- Garages should be integrated with the design of the building form and not compromise access visibility.
- Garage form should not be repeated along a street without variation.
- Garage – properly insulated and internally lined so it can be used for other uses.
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13 Patrick Street, Petone
Workers Dwelling
Image information: Taken by Albert Percy Godber, 1875-1949
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Family House at Talbot Park
Image information: Taken by Alyssa Roskruge

Talbot Park Site Plan
Image information: Unknown
Provided by Housing New Zealand Corporation

Apartment Living at Talbot Park
Image information: Taken by Alyssa Roskruge

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