An Investigation on how Modular Construction can be used to Create Long-Lasting Communities in Ireland’s Housing Crisis

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Acknowledgments

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A special thanks to Sima Rouholamin & Martin Spillane who have tutored me through my final year making it an enjoyable and unforgettable experience.

& to my friends & family for there constant support

Introduction

The issue of housing supply problem is nothing new to the ears of the residents of Ireland. Subsequent to the recent economic recession there was a period of significant stagnation in terms of the construction of housing. In addition, for years we have also been battling a growing population with a housing supply chain that cannot keep up. We continue to announce ambitious yearly goals on housing unit targets and have failed repeatedly. In this thesis paper I will highlight the current situation and explore a viable way to potentially assist in combating this key issue. I will look at how we have historically managed to put people into homes during other times of crisis. By comparing different case studies, noting both their valuable aspects and what failed for them I hope to create a clear picture of at least one way we can design and build to tackle the housing crisis we are in while putting people into well-built communities.

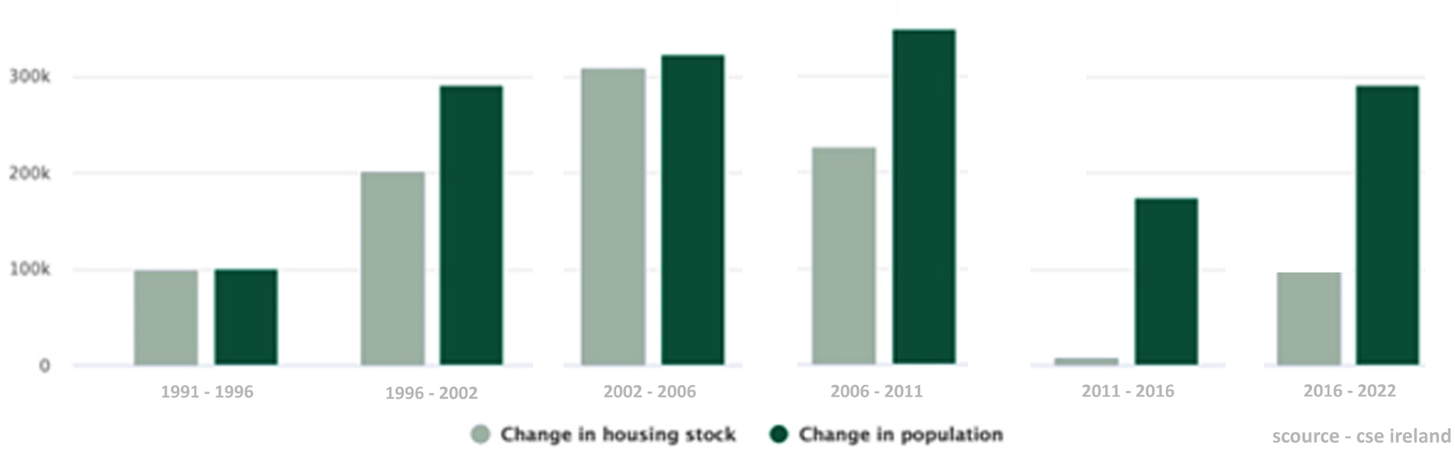
Image A. Long Queues Seen Outside Dublin Apartment as Housing Crisis Engulfs Ireland

The Present Situation

According to official census data, the percentage of homeownership among 25- 39 year olds has dropped from 22% in 2011 to 16% in 2016. Six years on it stands at approximately 18% (CSO statistical publication, 30 August 2022). There are many difficulties when trying to buy a home in Ireland and in recent years the housing market prices have surged again. The average yearly salary in Ireland in 2022 was €45,324 (CSO statistical publication, 30 August 2022). As demonstrated on 'Myhome.ie' or 'Daft.ie' a two-bed house in suburban Dublin is difficult to obtain for any less than €350,000. That is almost eight times the average annual salary, a massive investment leaving residents in debt for years with only a minority fortunate enough afford high-quality home in terms of location, amenities, design, and orientation. There are many reasons for this rise in house values. Land prices are 'continuously getting more expensive' along with 'building material shortages.' This is making the building cost of homes higher which is therefore influencing the cost of buying. There is also 'Personnel shortages' in Ireland, finding skilled trade workers has proven to be 'difficult' resulting in a slower delivery of finished housing schemes. Research gathered by Dooley Cummins architects and engineers shows 'an increase of up to 40% in building costs in some areas' since 2021 (Build a House in Ireland, 2022). Dooley Cummin Architects also highlight 'Brexit related delivery issues' and of course, 'the Ukraine invasion' as driving factors in the rise of building costs. With the supply and demand chain in Ireland struggling due to the lack of supply and increasing demand the competition for home buyers is continuing to push the price of these homes higher and higher. To the right is a graph comparing the change in housing stock to the change in population.There are always new methods of construction being considered to try to solve the issue of increasing construction costs. It has been seen as "a commercial opportunity" (Piece by Piece, 2021). Modular construction is a Modern Method of Construction or MMC.

These methods include off-site construction and are already widely used in the commercial sector where we see hospitals and schools adopting this form of construction. It is now being looked at to speed up the building of houses and other necessary buildings while incorporating more sustainability. Modular construction consists of prefabricated elements that can be transported and dropped into place on-site, however, the idea of constructing buildings away from the site has a long history dating back as far as the '16th century'. Using modular construction allows for quick on-site assembly. The elements can be mass-produced off-site. The approach is 'scalable'. Factories require limited equipment and 'low utility capacity' to set up. They don't manufacture the parts themselves, rather they assemble a kit of parts.

A mixture of skilled and semi-skilled workers can be tightly supervised in the factories, 'adding to the building control quality of the elements before they leave for the site.' (Aecom, 2017 on Modular Construction). The beauty of this is the efficiency of production, logistical challenges are eased with quicker on-site construction time, less on-site labour is needed and there is no need for substantial amounts of storage or laydown areas. Ireland needs an "average of 33,000 homes constructed per annum until 2030" to meet new housing unit targets, as outlined in the National Planning Framework (Housing for All, 2021). There were 20,526 new homes built in 2020 and 20,433 in 2021 (CSO statistical publication, January 2022). The target is ambitions with a 50% increase in finished housing units for the next eight years.



UK Post-War Push

If we look back to a time Modern Methods of Construction were used during a housing crisis the UK post-war transitional period is a noticeable time, when modular construction was used. This was due to the acceleration in demand for housing after 'over 200,000 homes were destroyed by aerial bombing raids' (Historic England, 2022). This gave an opportunity for innovative technologies to be deployed in search of a remedy for the supply issue. Vacant arms factories would become factories for the fabrication of building elements (Historic England, 2022). Ex-servicemen and women were given the opportunity to work in controlled factory conditions producing these elements. This also helped to target the employment issue at the time. Modular houses were a temporary fix and were not designed for longevity. This was about getting people out of slums while towns and cities could be rebuilt using traditional building methods (Historic England, 2022). So, bombsites were cleared to make way for the timber and steel frame prefabs. There were many different variations of the modular homes used but for the most part, they were single-storey bungalows. In total around 156'623 prefabricated bungalows were built between 1945 and 1949 (Prefab Museum, 2016). At the time the prefabs had an average cost of £1,200 compared to the average cost of £1,900 for a traditionally built home in the 1940s (Prefab Museum, 2016). In today's money that would be £69,000 for a new home, the average salary then was £10 per week, roughly £365 now (CPI Inflation Calculator). The average house cost was three and a half times the average annual salary at the time. Although initially planned as a temporary fix around 8000 of these homes still stand today with 16 of them being listed buildings. Those that have survived have been "well maintained and loved" by their owners and are still lived in. Although asbestos was used as a popular cladding material at the time a lot of the prefabs had steel cladding. Its common for the cladding to have been altered over the years (Historic England Archive). There were many different manufacturers producing these homes and some of the most popular prefab homes would have been:

Image 1. Phoenix Type temporary bungalows in Hemel Hempstead, Hertfordshire. Historic England Archive P/H00099/003

The Phoenix Type

Designed by John Laing, McAlpine and Henry Boot LTD. These prefabs were timber framed with asbestos cladding. There was 2,428 of these homes built. Despite the prefabricated homes' temporary status around 16 of these homes still stand today (Historic England Archive).

Image 2. Uni-Seco prefabricated houses in Brixton, London. One of the most numerous prefabs of the post-war era. Historic England Archive P/H00049/005.

The Uni-Seco

Designed by George Fejer was also a timber frame design with asbestos cladding. However, this was an adaptable design that could be assembled in different variations to suit the site. They also came with a modern kitchen with built-in storage. Approximately 30,000 of the units were built. (Historic England Archive).

Image 3. An AIROH House being assembled on the grounds of the Tate Gallery, London. Historic England Archive P/H00042/003.

The AIROH House London

Designed by Morrisons Engineering company is another interesting unit worth mentioning. AIROH stands for Aircraft Industries Research Organization for Housing. They used an aluminum structure. The AIROH brought together several aircraft manufacturers to diversify their product lines in the immediate post-war period. With the capacity to produce vast quantities of aluminum, the AIROH was made in large numbers. 54,500 of these homes were built. (Historic England Archive).

Ballymun Social Housing Ireland

Modular construction also has been used in Ireland as a method of delivering fast-build housing solutions. The Ballymun flats were high-rise prefabricated flats that were constructed to accommodate inner-city tenants under the “process of urban slum clearances” (Olivia Kelly, The Irish Time). The estate consisted of seven 15-story blocks nineteen 8-story blocks and four hundred houses in terraces of five. Their construction was completed in 1969. Unlike the modular units that were constructed away from the site in the UK, the Ballymun scheme which was on a greenfield site in a suburban area, had temporary sheds set up where the components would be assembled before being lifted into place. The sheds were then disassembled after construction was complete. The scheme was widely considered a ‘failure’ mostly due to it being unfinished. Residents were left isolated in suburban Ballymun with few community facilities. The proposed facilities were never delivered. The promised swimming pool, bowling alley, cinema, ballroom and landscaping had never been built due to the budget being overspent on the development of the towers. (Rowley, 2018).

The flats themselves were of decent size and had central heating and water, which were luxuries of the time. However, residents soon started to struggle with the lifestyle in the new living quarters. Inge Miss a community social worker said to reporter Colin Bird in an interview for RTE “it’s of vital importance in the early planning stages to consider the human element” she goes on to point out the sole concentration on the economic side of things. “Can we not also give some thought to the humanitarian aspect” many of the grievances in the estates were of the women who found themselves “locked into top-story flats with young children” (Modern Housing Ireland, 1969) there was a real lack of playing space for the children. The residents in the towers had no private open space, just a small balcony.

In 1998 a survey was carried out and 64.7% of residents in the scheme said they would prefer more traditional housing with front and back gardens (CHS, 2020). The towers were also badly maintained, and it wasn’t long before social issues became notorious in the estates. Residents reported feeling “unsafe” and “terrified” at times (Modern Housing Ireland, 1969). Demolition of the towers began in 2004. The final tower was demolished in 2015 almost 50 years since it was built (Olivia Kelly, The Irish Time). However not every part of the Ballymun scheme was a complete failure. They have been described as “architecturally fabulous” by architect Hugh Wallace in an interview with Ray D’Arcy (RTE Radio 1, 2018). The actual failures of the scheme were the lack of facilities, maintenance issues and building towers too high without any adequate private open space or connection to the site. The scheme was also 100% social housing bring lots of people of similar ethnical background and bunching them together on a suburban site with nothing around them lead to the increased probability of the development becoming a “ghetto” (Modern Housing Ireland, 1969).

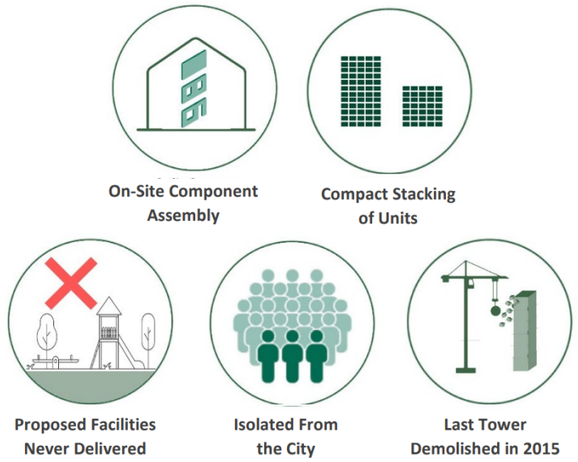


Image 4. Ballymun. Flats 1972

Ballymun Social Housing Scheme Ireland

Modular Constructed Towers Housing 40,000 people as part of a Urban Slum Clearance Scheme carried out in Dublin- 1969

Dortheavej Copenhagen - Denmark

A contemporary social housing scheme that was much more successful than the Ballymun flats is Dortheavej in Copenhagen. BIG Architects were “commissioned to design Dortheavej in 2013” by the Danish non-profit affordable housing association Lejerbo (Diego Hernandez, Arch Daily). Dortheavej is a Social Housing Scheme in Copenhagen, Denmark, consisting of 66 apartments. It was completed in 2018. The site is located in “one of the most multi-ethnical, low-income neighbourhoods in Copenhagen” (Bjarke Ingels, Founding Partner, The BIG Philosophy). Bjarke Ingels speaks of this project and helps us understand how complicated it is to attempt to build “top-quality homes” on a “limited budget”. The architects came up with a solution involving the use of a “single prefabricated rectangular module, repeated and stacked in alternation to form a configuration in which the spaces gain a metre of height, reaching the considerable height of 3 and a half metres” (Diego Hernandez, Arch Daily). Each unit has 60-115 sqm of floor area. The stacking of the units creates additional space for each apartment to have a small terrace, providing a setting for healthy, sustainable living. The material pallet was kept simple with wood, concrete and glass dominating the project. The concrete is used in the structure and is expressed inside the interior of the units. Using concrete will give the scheme a long lifespan compared to the wooden frame flat pack style modular housing. However, the concrete will have an embodied carbon cost over the timber structure. BIG architects have considered the user and the surrounding contexts, allowing the scheme to be permeable at ground level, for the ease of movement for the public to the green courtyard provided. The scheme is five units high rather than the twelve in Ballymun keeping the users on the higher floors from feeling out of reach from the park below but is kept dense enough to let ground space be left for shared amenities. The courtyards on either side of the scheme are open to the public. The floor-to-ceiling windows allow the residents to take advantage of the views while providing passive surveillance of the public realm below. “Residents can look out from their balconies and the surrounding community can see the activity inside” (Bjarke Ingels, Founding Partner, The BIG Philosophy). The consideration for the user in the design is what makes this scheme most successful. The design of the site plan shows the absolute importance for a strong connection between the user and the site along with its natural and designed amenities and the surrounding area.

Dortheavej Copenhagen, designed by, BIG Architects.
Location: Copenhagen, Denmark
Construction: 2016 – 2018
Size: 66 units – 60-155 sqm Per Unit
Budget: 9.8 Million Euro- €148,000 Per Unit

Image 5. Dortheavej Copenhagen, designed by, BIG Architects. Site Plan

Metabolism Architecture

Metabolically designed architecture is built around a spine-like infrastructure with prefabricated, replaceable cell-like parts easily attached and readily removable when their lifespan is over. It first came about in the 1960s (Ushering in the 1960s With New Ways of Thinking, 2019 Jackie Craven).
A precedent worth looking at is the Nakagin Capsule Tower, designed by Kisho Kurokawa. The tower was opened in 1972. The post-war economy led to an explosive growth period in Japan called the 'Economic Miracle'. In 1945 50% of Japan's population lived in rural areas, but by 1970 that figure was less than 30% (Japan's Post-War Economic Miracle, 2022 Lawrence W. Reed).
With Tokyo at the epicentre of migration, affordable living spaces became increasingly elusive. This brought forward the metabolism movement. A design philosophy based on organic biological growth. Basically, the idea of organic life being able to grow and adapted to its surroundings being implemented into architecture. The philosophy targets many relevant key issues we face today. Metabolism architecture contributes to a circular economy as the considerations of 'adaptation' and 'replacement' of old perished building components are at the core of the design from the beginning (Ushering in the 1960s With New Ways of Thinking, 2019 Jackie Craven).
Nakagin Capsule Tower was assembled in just 30 days as the 9 sqm concrete pods were constructed outside of Tokyo and transported onto the site. The building consists of 140 self-contained capsules that are connected to the shaft with just 'four high-tension bolts' (A Century of Prototypes, Nick Jones). The original plan was to replace the capsules with new ones every 25 years. However, this didn't end up being the case.
Each capsule was individually owned by different people and the need to remove many capsules to replace one of them caused conflicts and disagreements with the residents. This was a flaw in the design. Today the tower is in a state of disrepair with only a hand full of residents living in the tower and only about 30 capsules in use (A Century of Prototypes, Nick Jones). The tower was recently demolished in April 2022, and the capsules are expected to be seen in museums around the world. The Capsule Tower is a great case study highlighting the speed of construction using the modular systems and stretches the ambition for the future of modern methods of construction contributing to a circular economy. Although ultimately failing due to logistical issues. I found myself intrigued by this adaptable architecture even though it didn't work out with Kurokawa' s design.

Image 7. Nakagin Capsule Tower

Nakagin Capsule Tower

Nakagin Capsule Tower, designed by Kisho Kurokawa. Precedent of Metabolism Architecture

Shimbashi, Tokyo, Japan
Construction: 1972
Size: 140 units – 9 sqm Per Unit
Now demolished

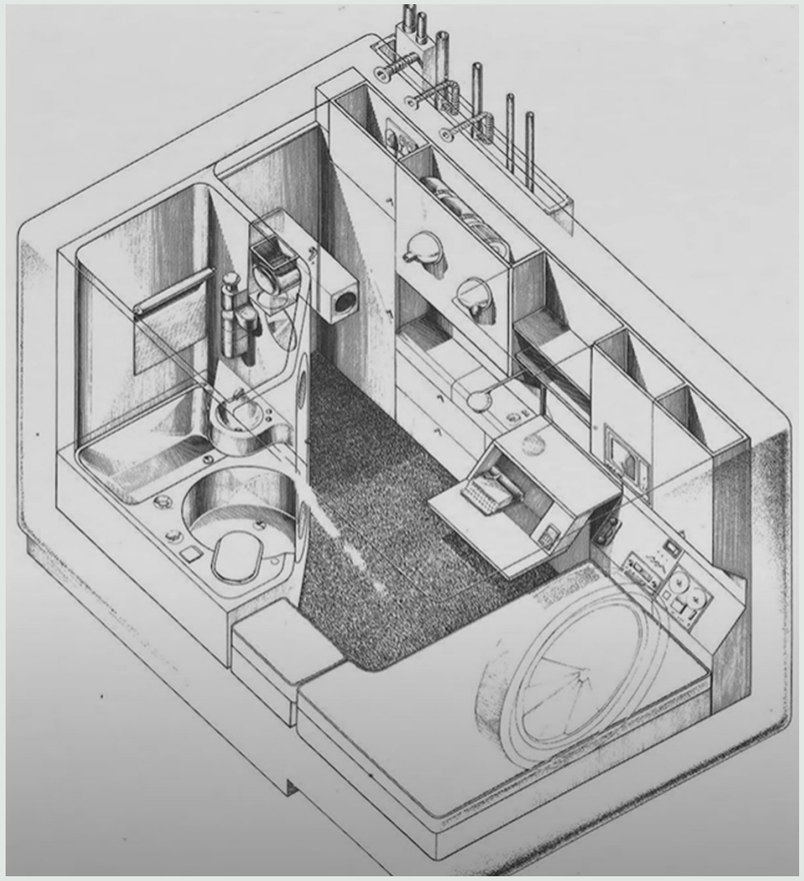


Image 8. Nakagin Capsule Tower, designed by Kisho Kurokawa. 9 sqm Capsule

Conclusion

The progression of modular technology has proven that the modern method of construction can absolutely create long lasting communities in Ireland and much faster than traditional building methods. We learn from the UKs post war transitional period that good quality materials and servicing is of vital importance for their success. The Ballymun scheme accentuates the importance of integration of different socio-economic groups being a key factor in the development and progress of an estate. Comparing Dortheavej social housing to Ballymun puts the spotlight on how crucial it is to provide amenities and spaces for community interaction, furthermore, highlighting the significant importance of the relationship between the designed scheme and its surrounding context. BIG Architects consideration of life within the units is of huge value, providing the necessary space to live and play in a light filled space. The Capsular Tower, that represents an evolving organism, identifies the potential of modular constructions adaptablility values where the consideration of replacing and adding modular components in an effienient way is starting to be imagined.

Reused and Sustainable Materials

Renewable Energy

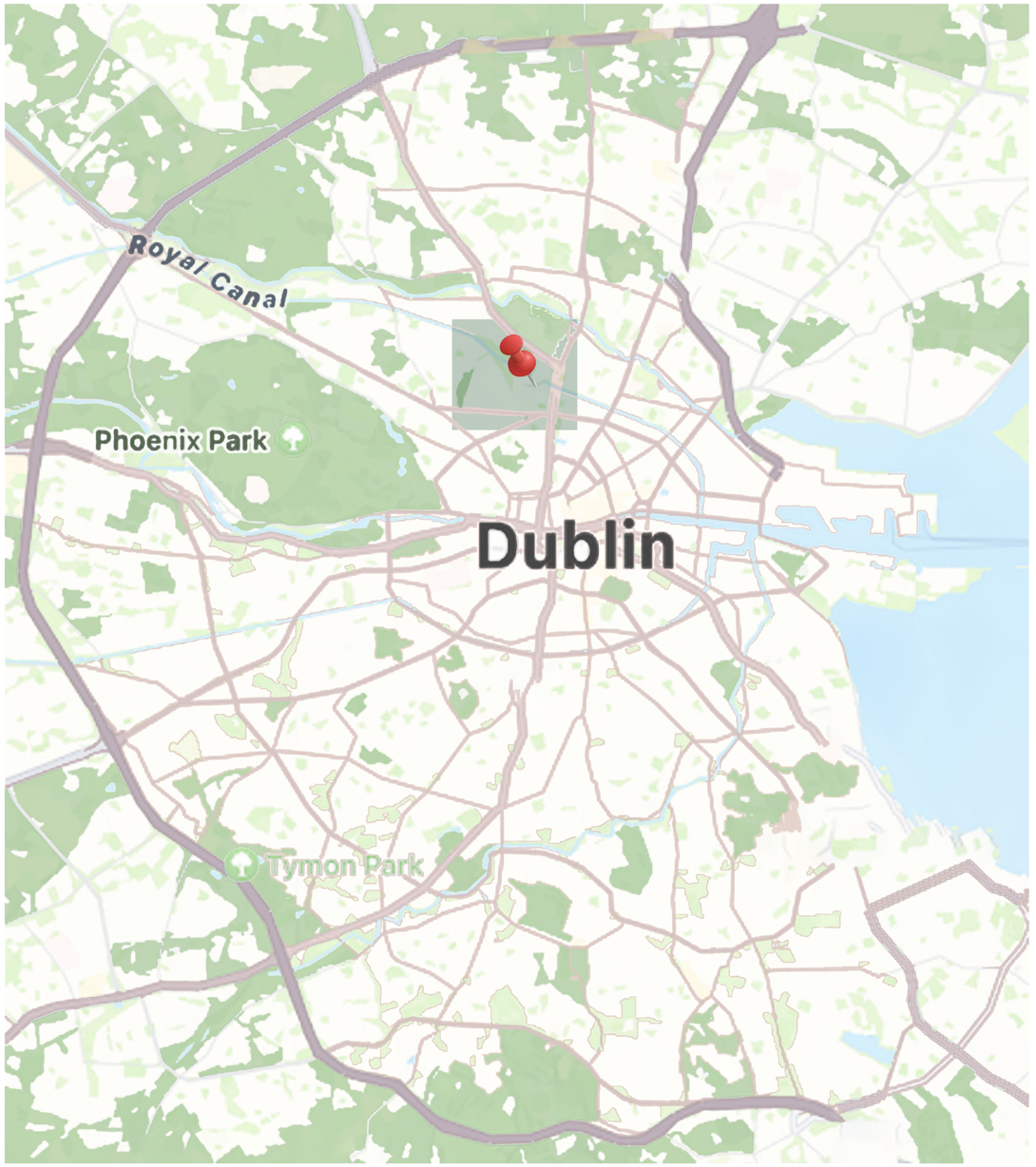
Social Interaction

Ease of movement

Thesis Location

I aim to design a modular housing scheme in the Talka Valley region in North Co. Dublin, Ireland. Dublin's North-west Inner city is a high-density area with people from many different socio-economic backgrounds, with both ends of poverty and affluence highly present. The area has a large industrial region in close proximity to residential areas. The Talka Valley region suffers from a high volume of anti-social behavior and the need for community and social belonging is urgent.

The use of a grids and a common interlocking systems will allow for a component based design system to be used in various locations that can be assembled in a short period of time. I will aspire to design high quality living spaces within a sustainable scheme that allows for areas of interaction and community to strive bringing people together. 'Relationships with ongoing environments, people, flora and fauna that exist through time as well as in space' (Fitz, Karsny, 2019).



Talka Valley Loose Space & dereliction

The Talka Valley is an area thats undergoing significant change as housing is taking priority over industry in the area. The industrial estates were once at the edge of Dublin city but the urban sprawl has reinstated there location as central. With many cul de sacs, meandering roads, The Royal Canal, train tracks and the valley itself, the region has got a strong East to West movement flow, making it difficult to move fluidly through the area. The region has plenty of derelict sites and buildings along with many interesting Loose Spaces.

Loose space - spaces for people that are used outside of the norm, spaces for imagination and alternative use, allowing for inclusion and unanticipated activities.

Derelict - Derelict Sites Act 1990 (as amended). A site can be classified as 'derelict' if it meets the following criteria: It contains land or structures that are in a neglected or unsightly condition. It contains dangerous or ruinous structures.

Buildings in disrepair - abandoned buildings that are slightly dilapidated but are good for materials.

Vacant buildings with signs of decay- empty buildings that show signs of neglect but are ready to be reused with a bit of fixing.

Dormant buildings- vacant buildings where the surrounding space is used by others.

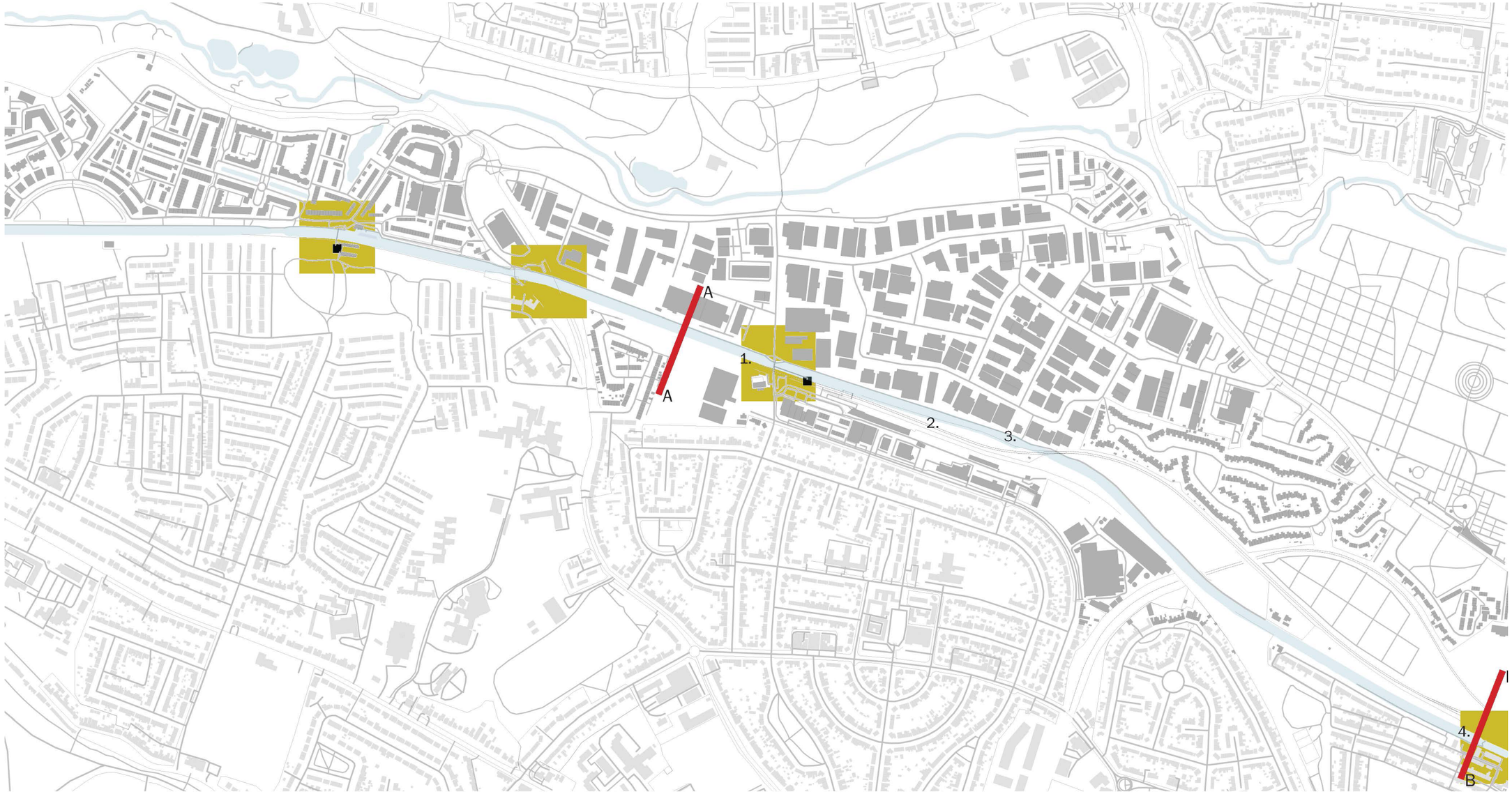
Buildings of scheduled use- buildings that are vacant more than they are used.

Talka Valley Overview

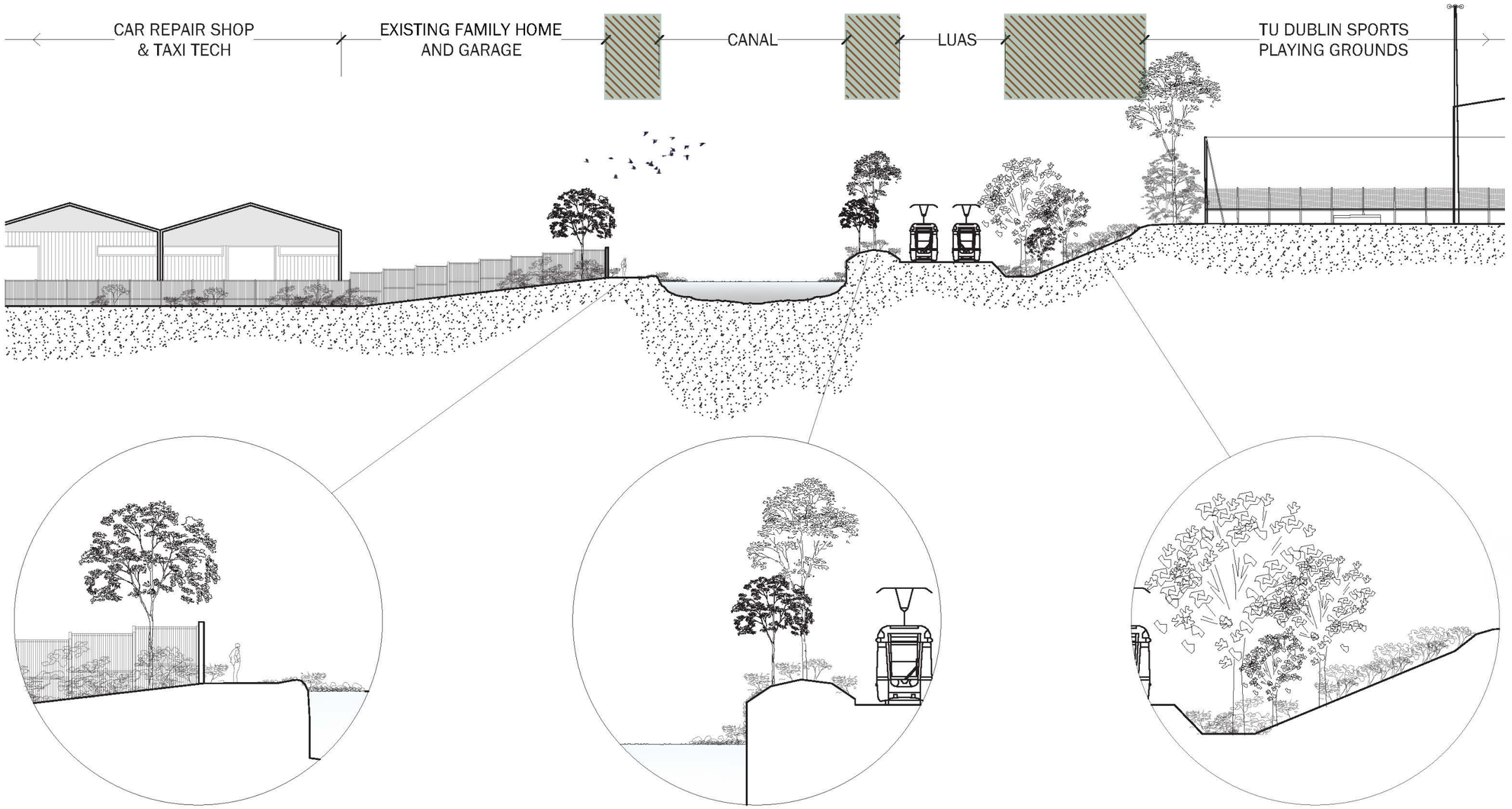
This zoomed out Area Plan is to highlight the context of the Talka Valley Region

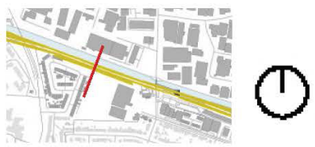
Talka Valley Overview Loose Space & Dereliction

- 4 Points to Cross The Royal Canal



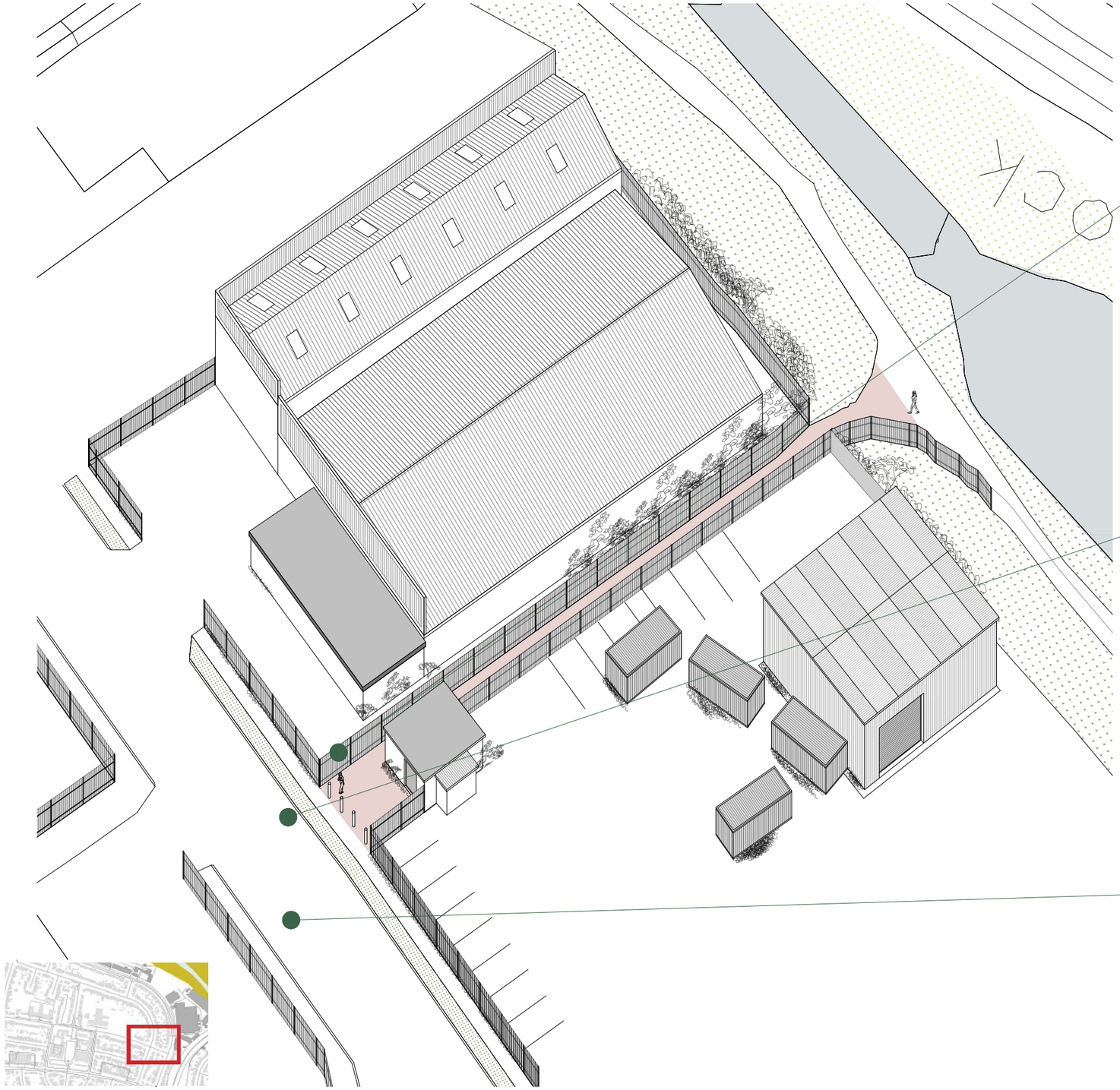
Talka Valley Loose Space & Dereliction
- Section A-A





Talka Valley Overview Loose Space & Dereliction
- Short Cut Axo

As a result of the lack of permeability residents have started to find there own was to navigate the Industrial estate by finding unsafe short cuts through narrow alley ways.



Imaginative Collaborative project

The opportunity to work on a one week presentation sheet, alone side other students, to come up with an imaginative intervention to combat the issue of permeability and lack of passive surveillance around the Talka Valley region was a valuable experience.

Sa Spéir connects the Tolka River with the Royal Canal. Encouraging activity, engagement and biodiversity. The platform adds to the passive surveillance in the area, allowing people to wander in a safe environment. The bridge encourages life and excitement throughout the otherwise sombre industrial state. It creates a new perspective of the surrounding urban center and reveals the rolling fields in the distance.

Conclusion:

The intervention seems bold. A direct solution to a number of key issues, however, the industrial estate would be better off considered an area that can be transformed rather then passed over.

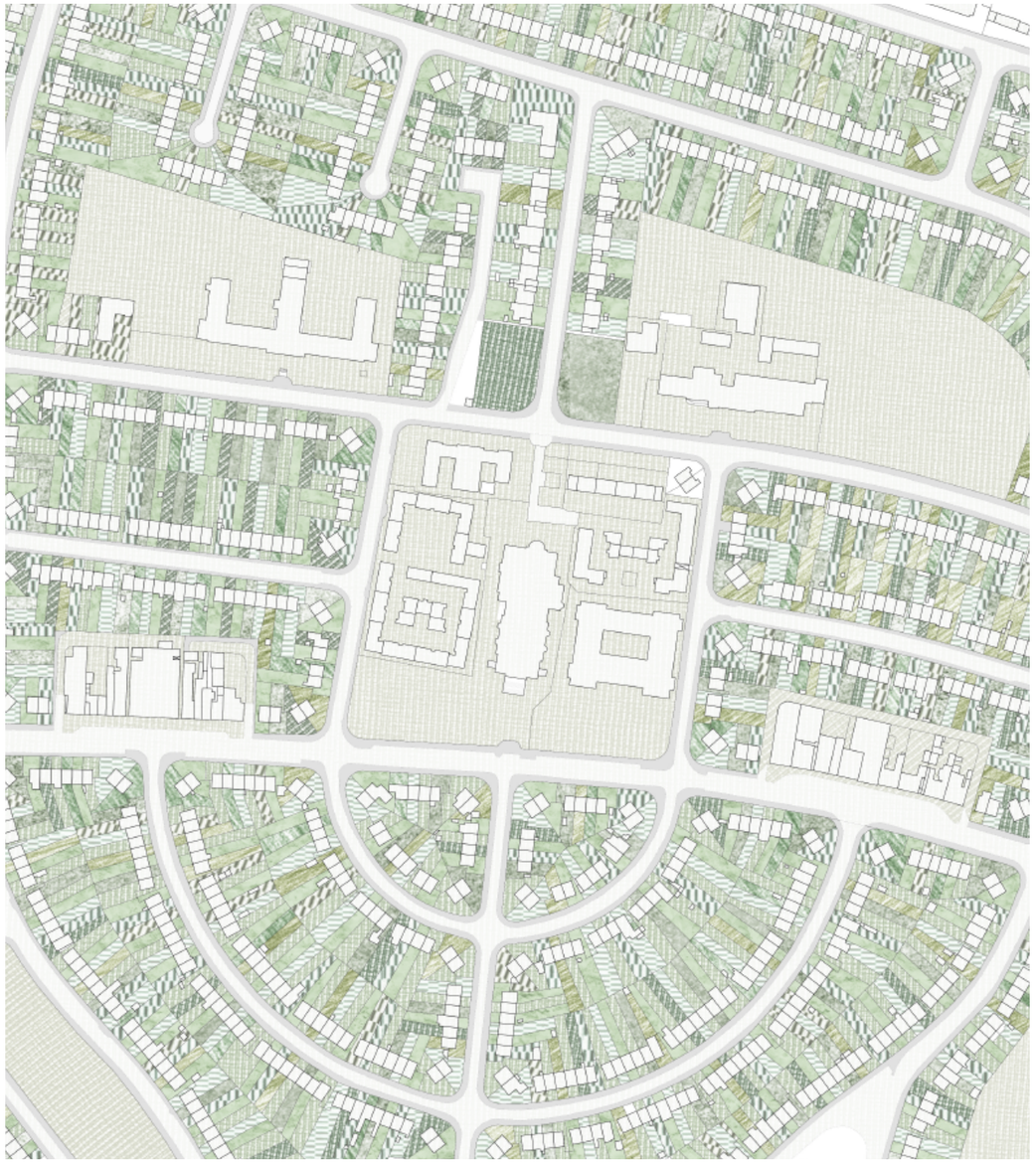
Collaborative project 2

I had the opportunity to work on a collaborative presentation along side Architectural Technology students. The 4 week project had a of theme of Urgency and Sustainability.

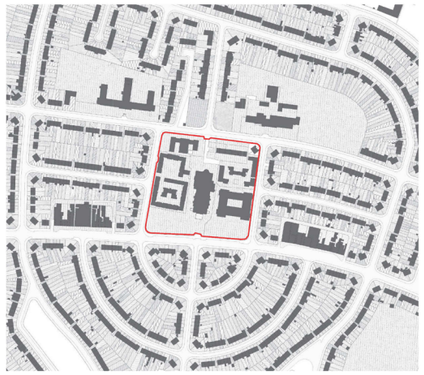
Here we took an under used church in the center of Cabra and repurposed it as an oasis for the community. Incorporating clean energy harvesting and an adaptable modular system that can change to meet the needs of the community. We were able to bring our interests together and begin to test our Individual thesis ideas at a small scale

The addition of a market place and a shared study, work and learning center was deemed necessary as the two schools adjacent to the site are struggling to find space for the growing size of the their classes as the population in Cabra surges.

Often, we think of buildings as eternal, so we design them that way. The end cycle of a building isn't always due to structural failure but also because of a paradigm shift in demands due to changes in social environments.
The value of a building is justified by its need and all it has to do is adapt and find a need that adores it again.

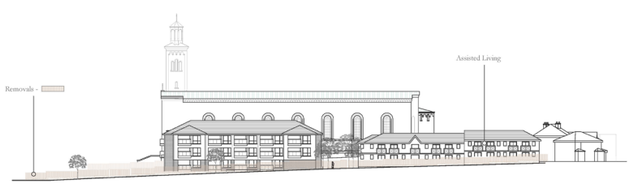


The Church of the Most Precious Blood



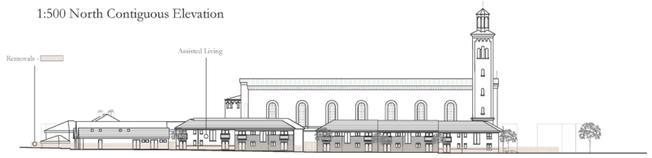
1:3000 Site Location Plan

1:500 South Contiguous Elevation

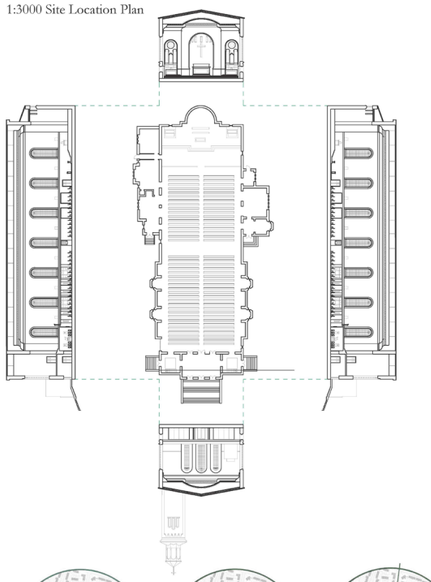


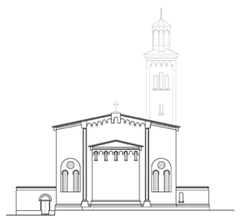
1:500 East Contiguous Elevation

1:500 North Contiguous Elevation



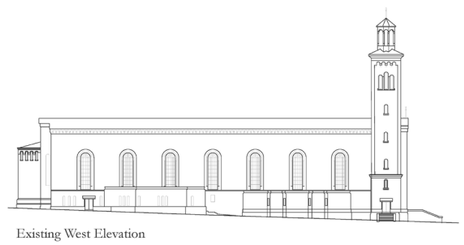
1:500 West Contiguous Elevation





Existing North Elevation

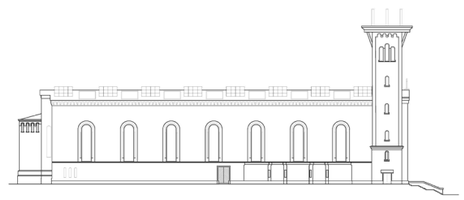
Existing South Elevation



Existing West Elevation

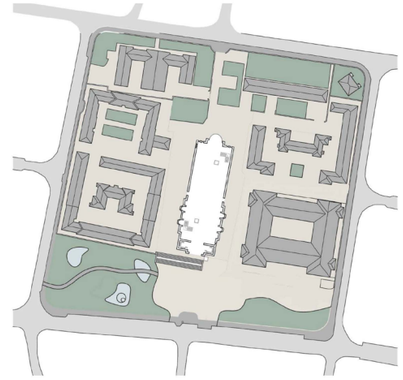
Proposed North Elevation

Proposed South Elevation

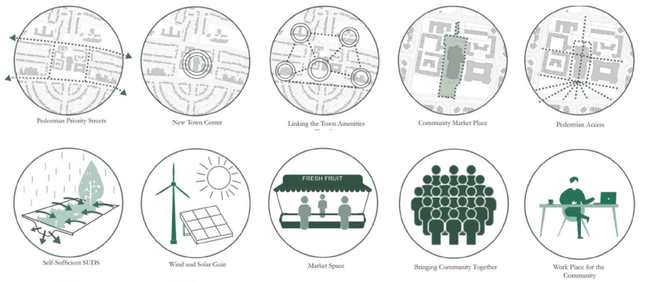


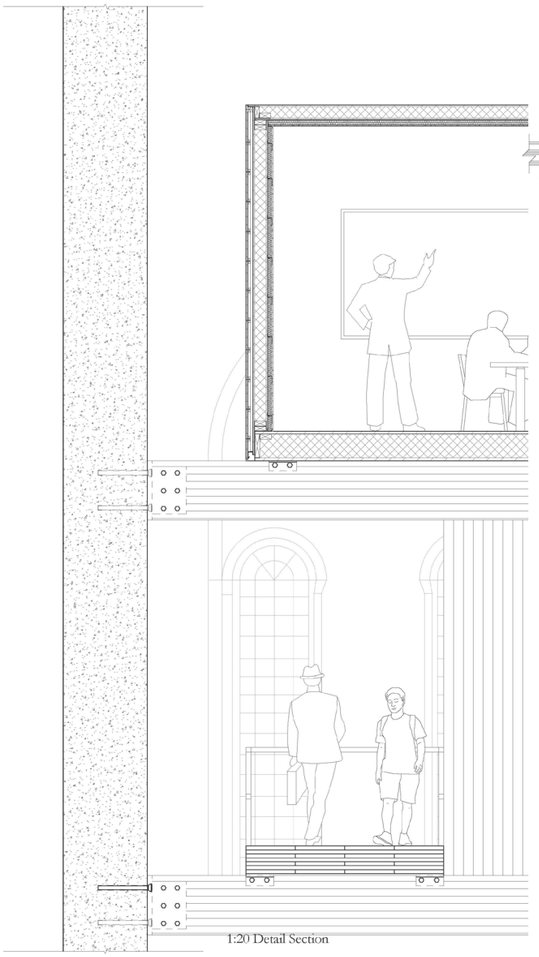
Proposed West Elevation

1:200 Site Section



1:1000 Site Plan Including Drainage

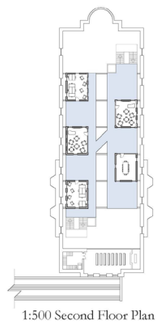




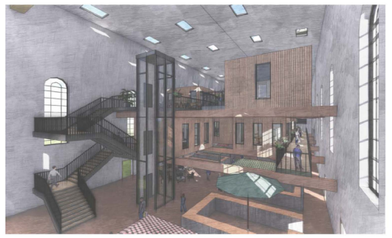
1:20 Detail Section

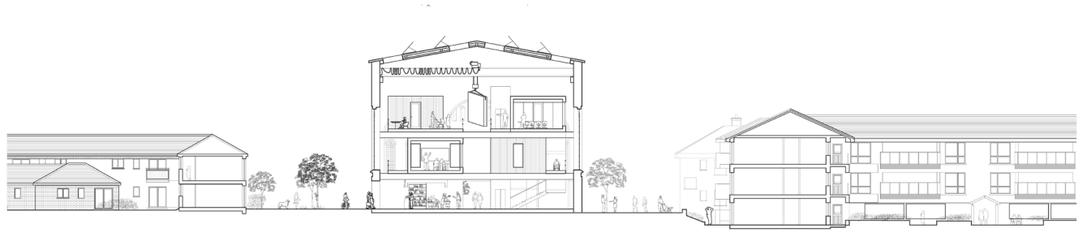
1:500 Ground Floor Plan

1:500 First Floor Plan

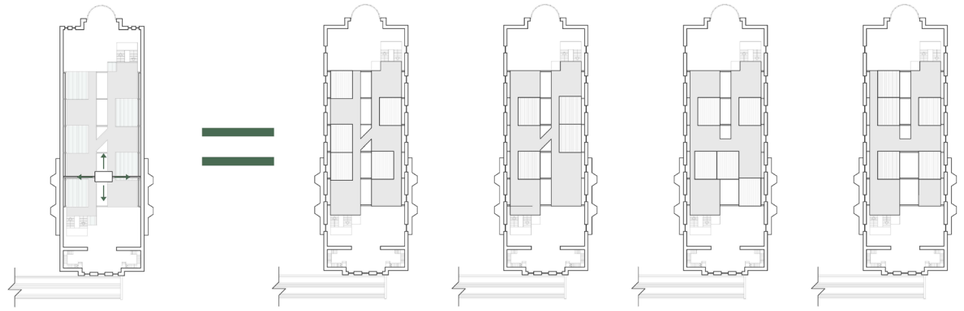


1:500 Second Floor Plan





1:200 Site Section



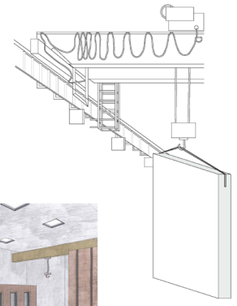
1:500 Hoist Floor Plan

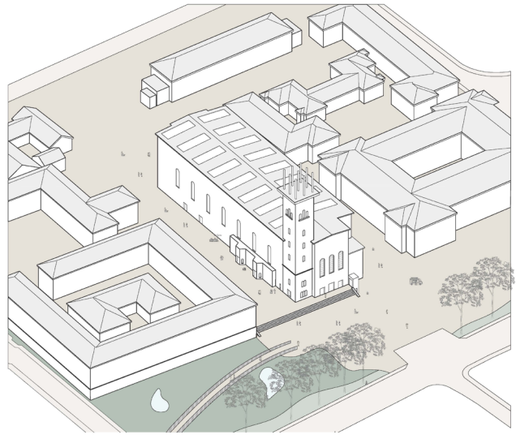
1:500 Adapable Floor Plan Option 1

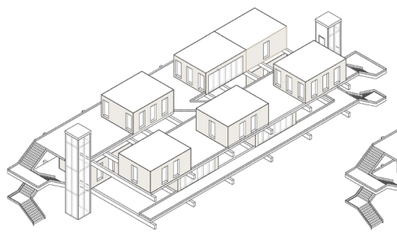
1:500 Adapable Floor Plan Option 2

1:500 Adapable Floor Plan Option 3

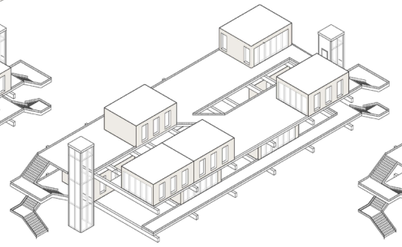
1:500 Adapable Floor Plan Option 4



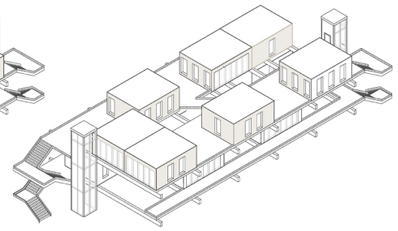




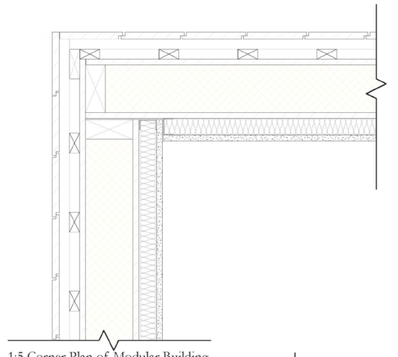
Future Adaption Option 1



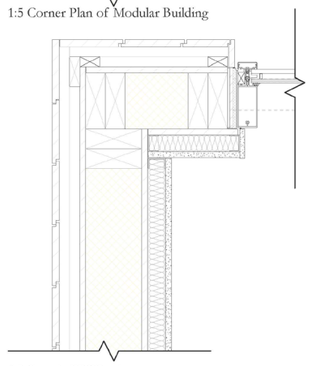
Future Adaption Option 2



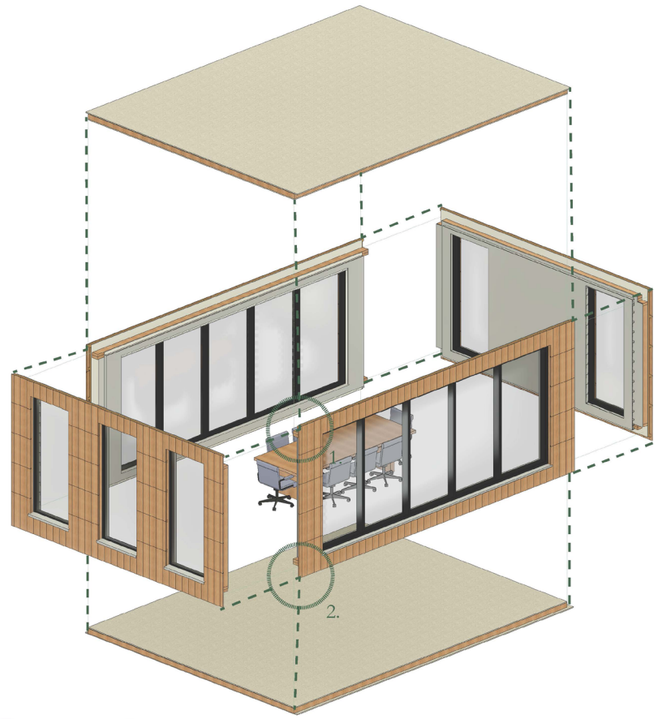
Future Adaption Option 3

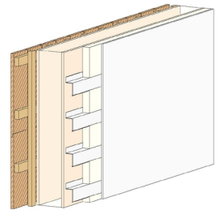


1:5 Corner Plan of Modular Building

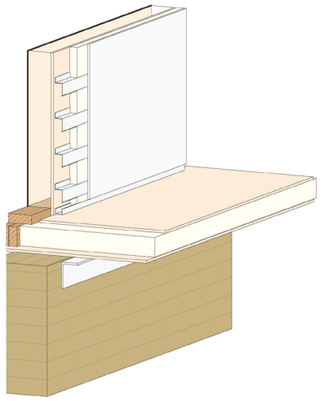


1:5 Curtain Wall Jamb



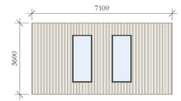


1:10 3D Wall Build-Up

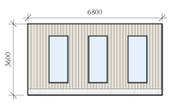


1:10 3D Modular Floor to Beam

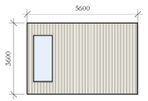
Variations of Modular Elements



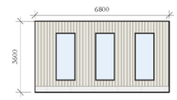
Modular Long Panel 1



Modular Long Panel 4

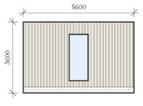


Modular Short Panel 2

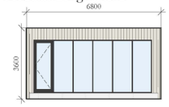


Modular Long Panel 2

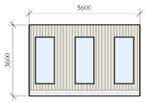
Modular Long Panel 5



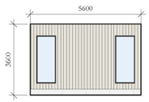
Modular Short Panel 3



Modular Long Panel 3



Modular Short Panel 1



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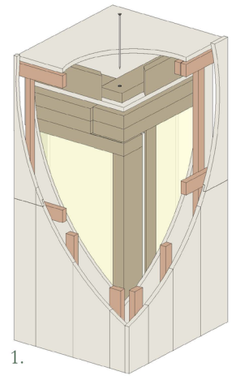
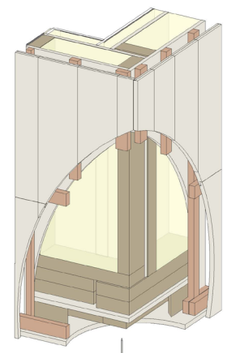


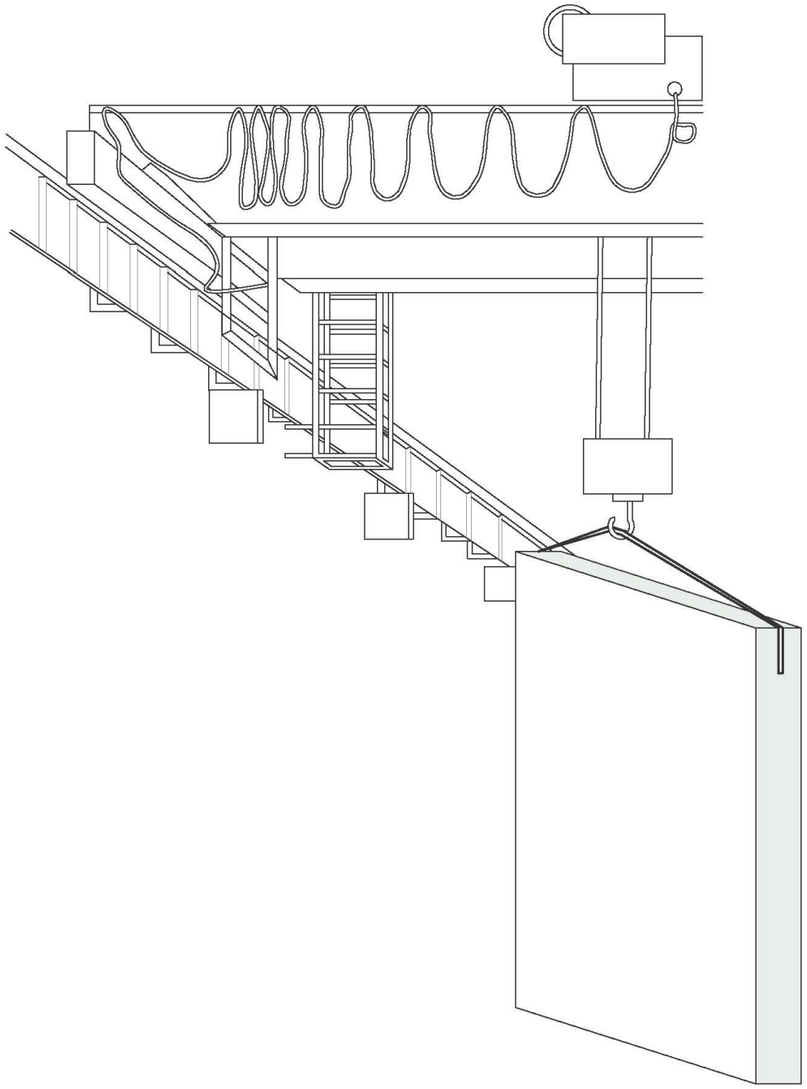
1.

Corner Detail



2.

Corner Detail



Collaborative project - Conclusion

Working with Architectural Technology students was a great opportunity to get a detailed insight into how component elements would be detailed in a way for them to be assembled and dissembled in a short time. The self contained pods needed to be well insulated for acoustic equability withing them.

The pods could then sit on glulam beams that span between the walls of the church.

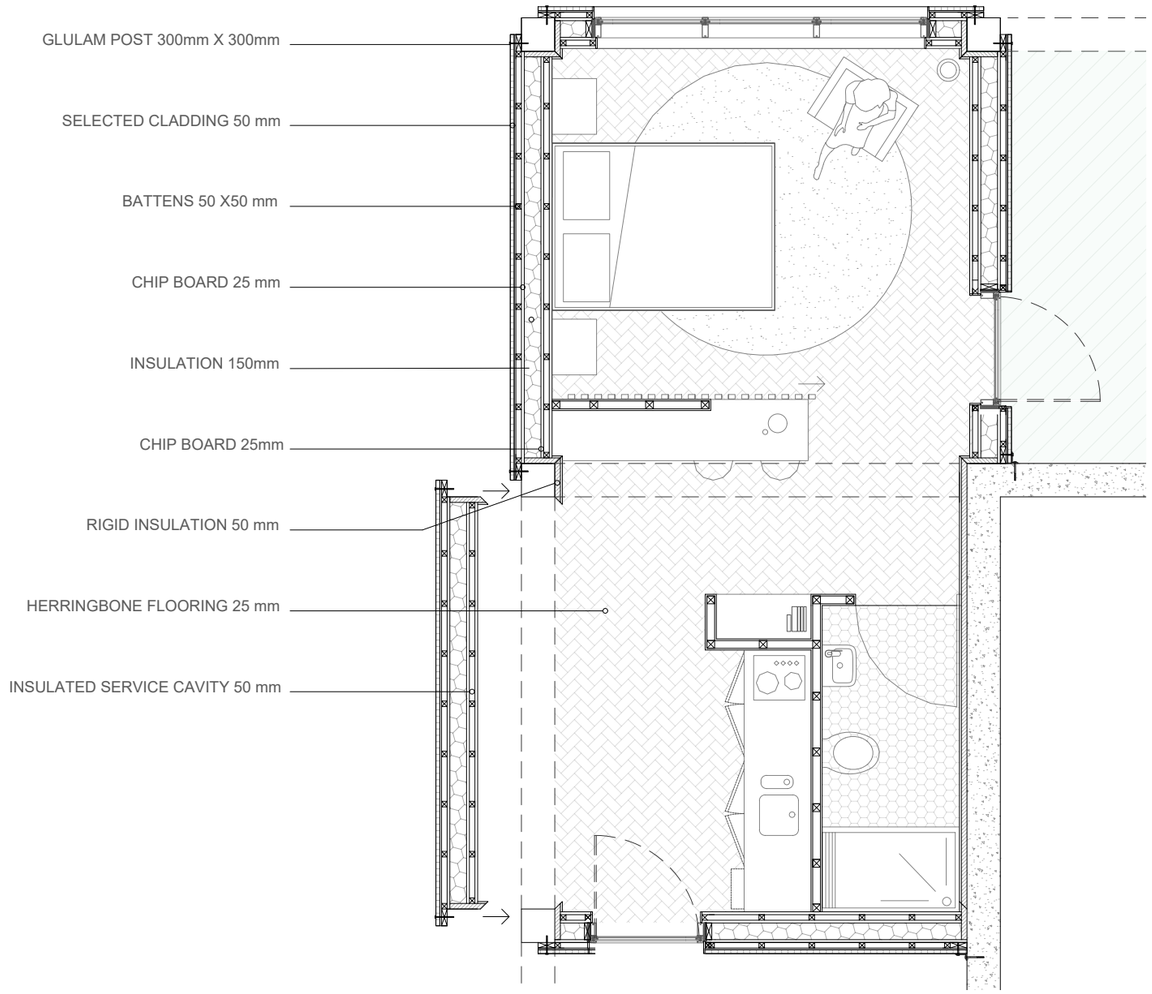
Rather than the rearrangement of the pods themselves we decided that the importance of smaller elements with a lighter load would be more advantages. A hoist that hangs over head that can move these elements to there desired location would make for a fast adapting space.

The important Public market at the ground level is imagined as a vibrant social space that will bring people to the area, while breaking down the boundaries on the site, would allow for the movement of pedestrians and cyclists to be more fluid through the town

Component Based Design System

Being able to test an adaptable modular system at a small scale was of vital importance in order to understand some key considerations when designing for adaptability and change. Next was to apply the research and testing to component based design system that can be used to create long lasting homes and communities with in the city.

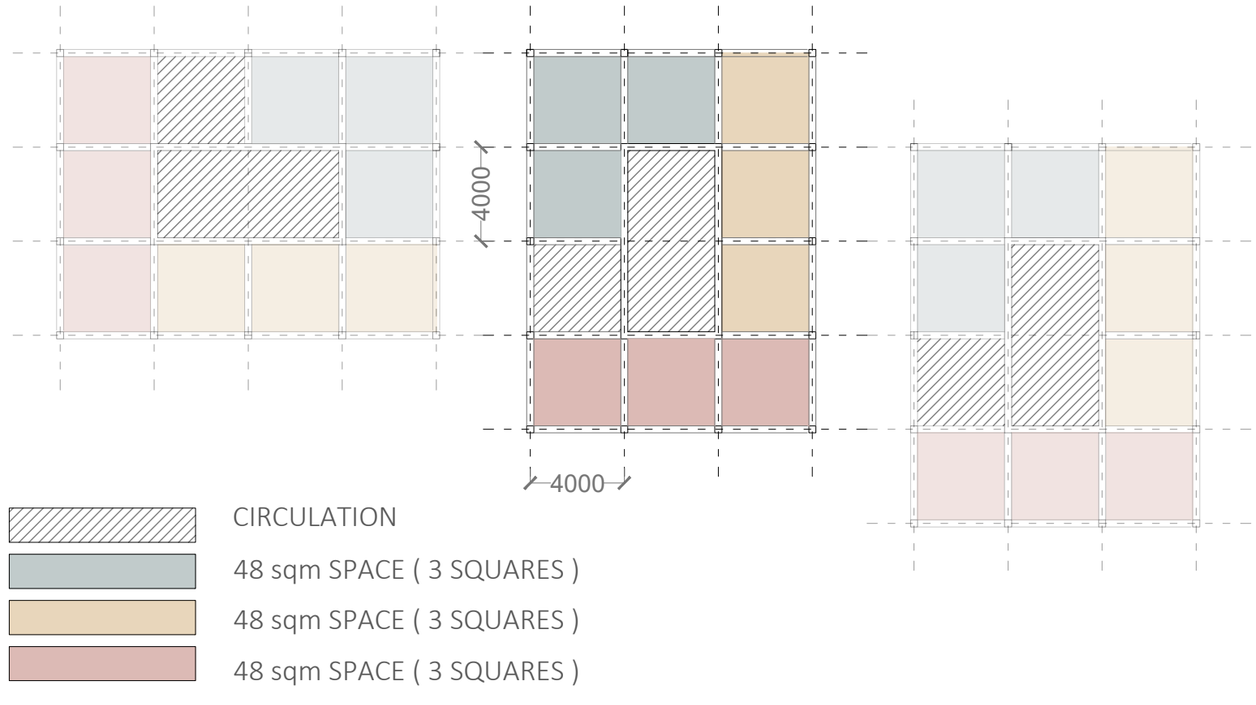
The component based design has had many versions that has been refined down to one final system considering the ability for adaptations allowing the residents to grow and change their space as they need. Like the collaborative project the system is made up of smaller components that have little load. This is important so that the adaptations don’t rely on heavy machinery to be set up on site to move large components. This also has a positive impact when it comes to transporting them to these desired locations.

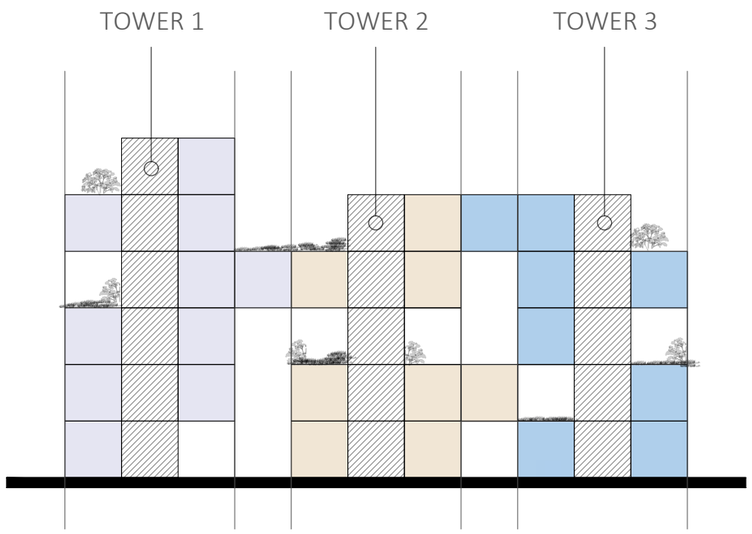


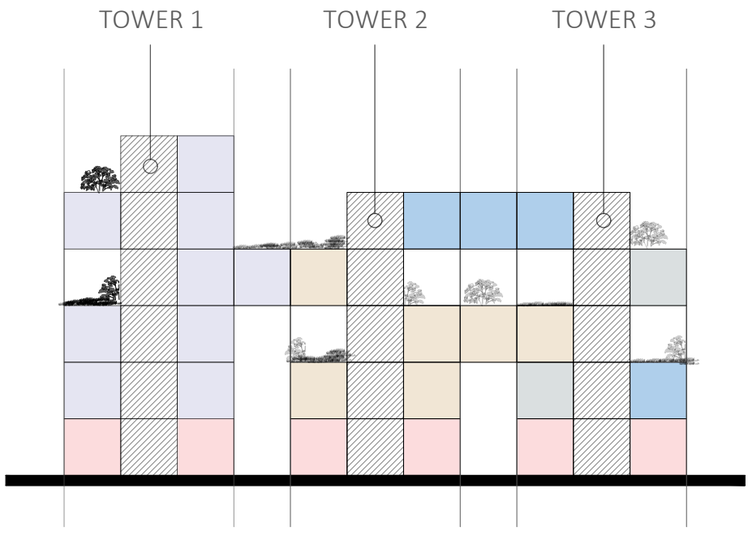
4 X 4 X 4 Grid

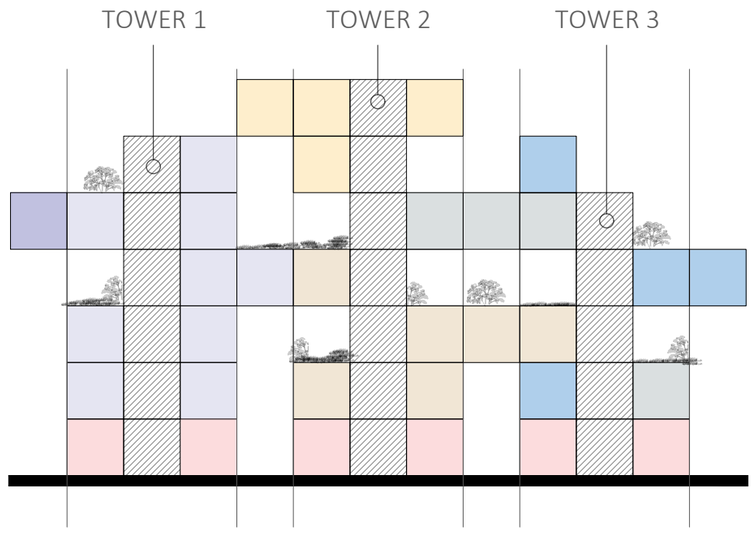
A tight and efficient grid system that allows for repetition, linking towers together to create one scheme was important to make the system as flexible as possible to work well at different scales. The system allows for voids and openings where desired allowing for flexibility in the programing making it possible to have terraces and shared spaces incorporated where needed.

The towers can be orientated any way as long as they sit on the grid then they can be connected



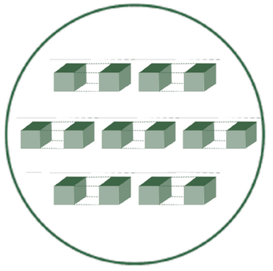




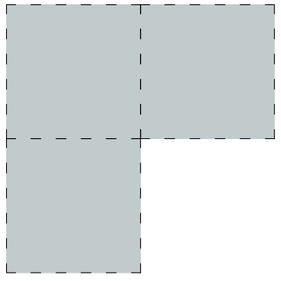


4 X 4 X 4 Grid - Adaptability

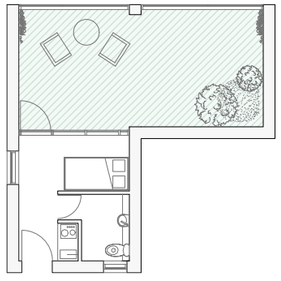
Each box represents a 16 sqm space. Everyone gets 3 4x4x4 boxes. The residents can fit them out and grow as they please. This allows for flexibility and adaptability within a set of rules. This is import as we know that the Capsule Towers biggest downfall was that the capsules were never replaced due to the need to unplug many modules to replace one. The system in this case allows for change at any time without interfering with your neighbors.



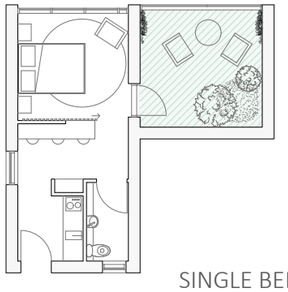
Space to Grow



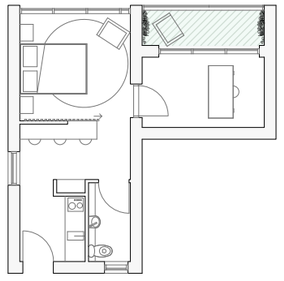
48 sqm SPACE (3 SQUARES)



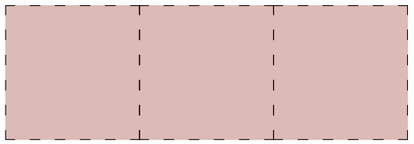
SINGLE BED - 1 PERSON



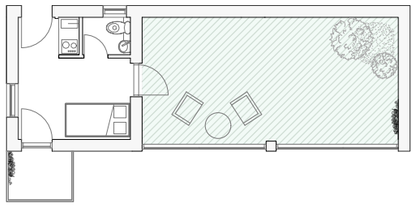
SINGLE BED - 2 PERSON



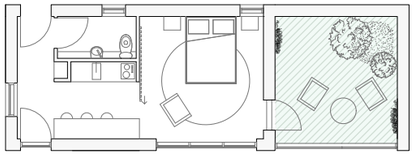
SINGLE BED - 2 PERSON - WOR



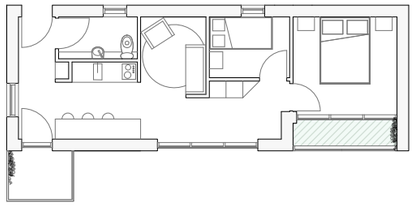
48 sqm SPACE (3 SQUA



SINGLE BED - 1 PERSON



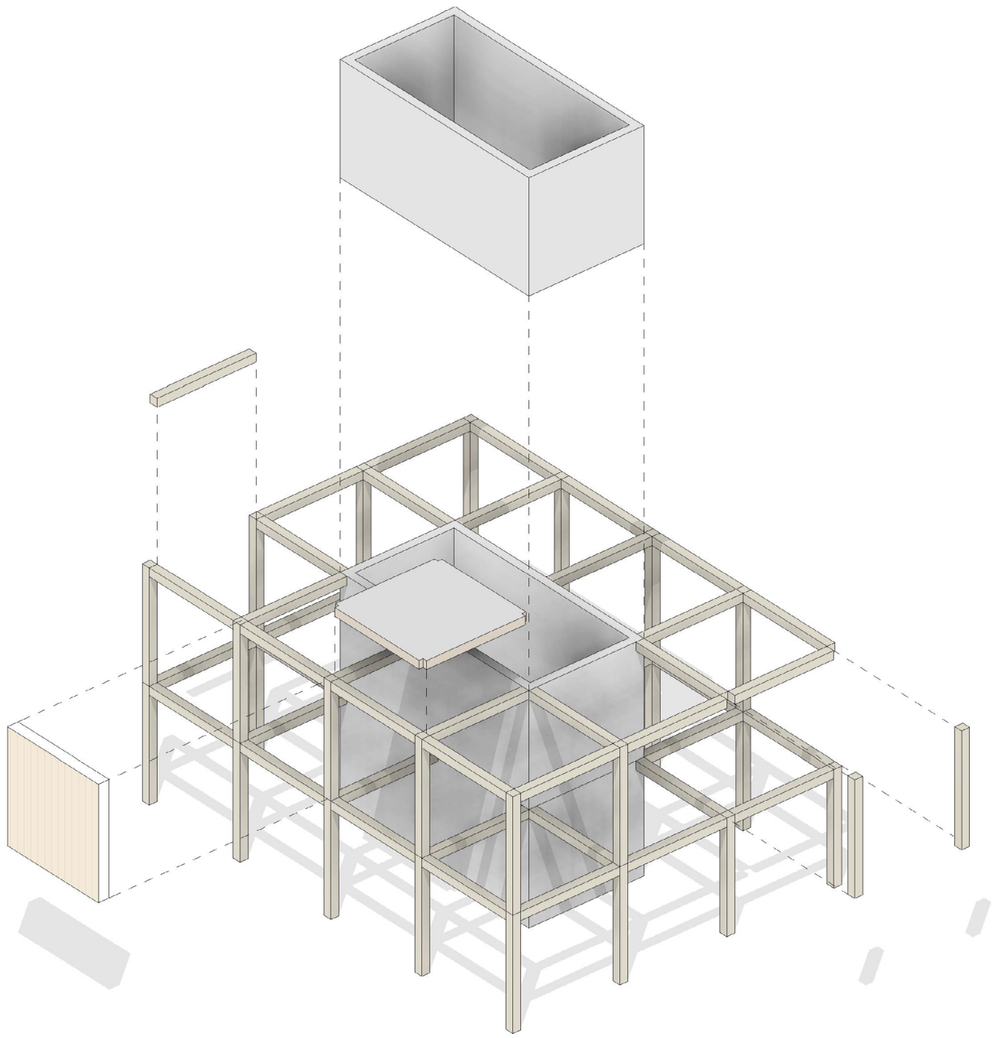
SINGLE BED - 2 PERSON



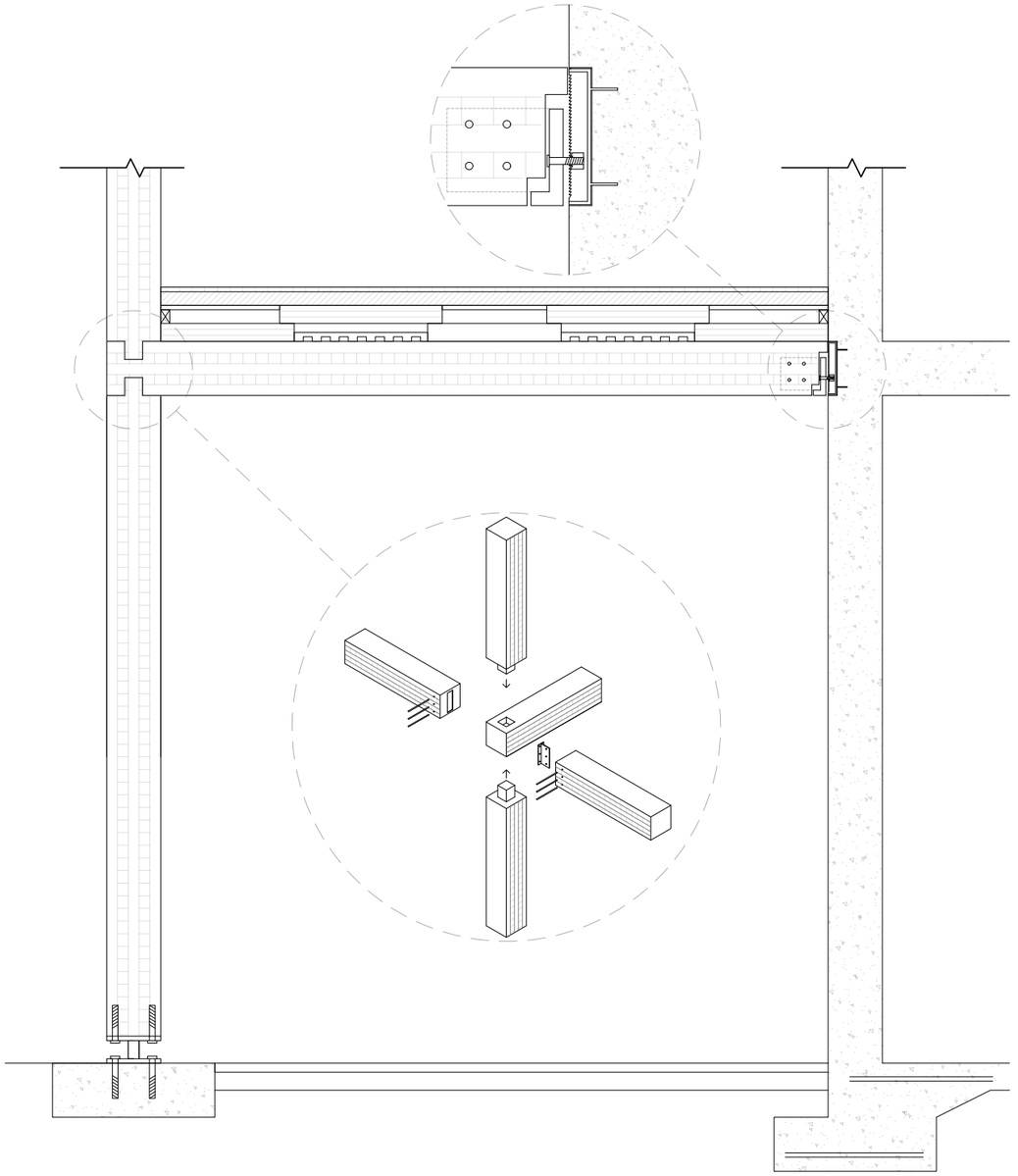
DOUBLE BED - 3 PERSO

4 X 4 X 4 Grid - Structure

The structure consists of a concrete core which brings lateral stability to the system. A Glulam frame is then assembled around the core to support the Modular panels. The use of a stump mortos joint at the connections reduces the need for steel in the system. A toothed anchor plate which is casted into the core allows for adjustability of the beams for maximum precision of the frame.
The floor and ceiling build up uses CLT panels that over lap leaving a service cavity at floor and ceiling level



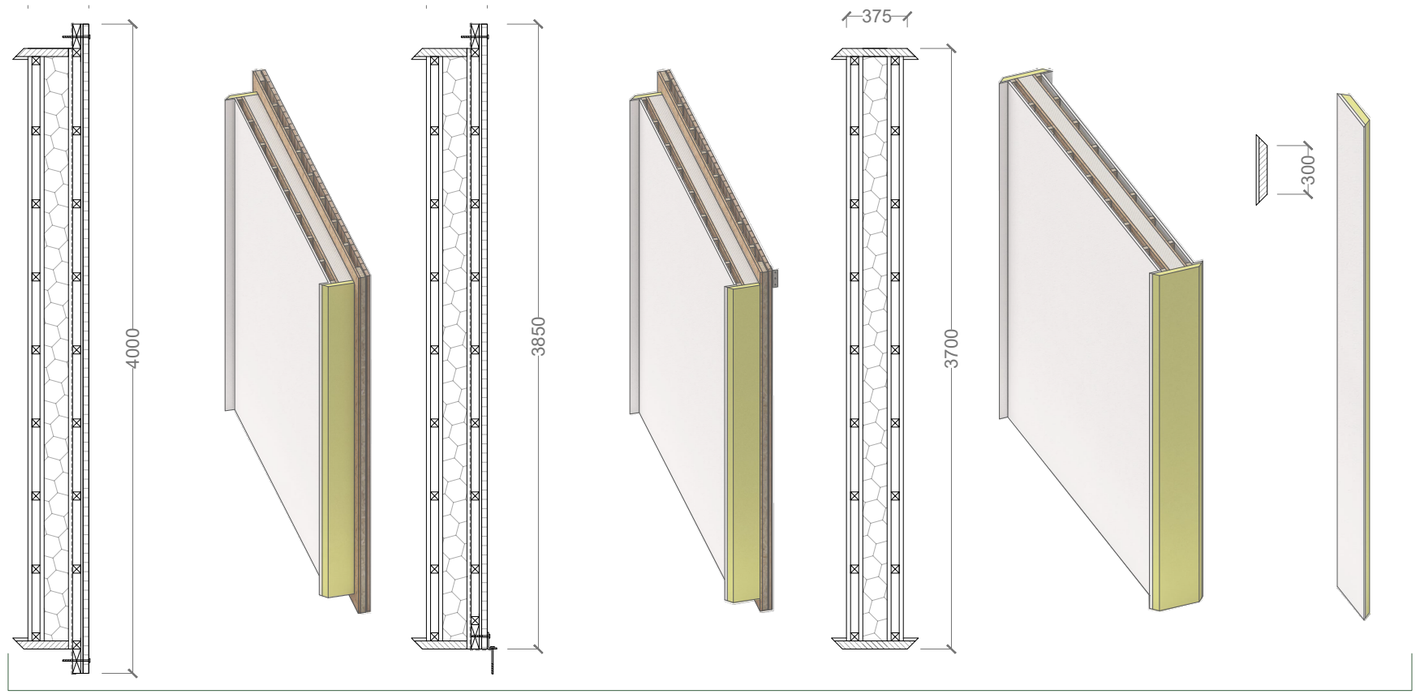
- PRIMARY STRUCTURE -



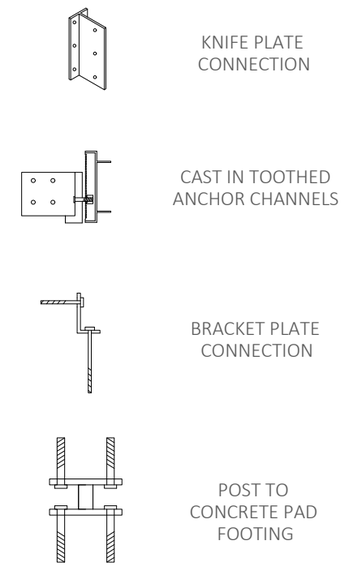
- GLULAM FRAME-

Component Catalogue

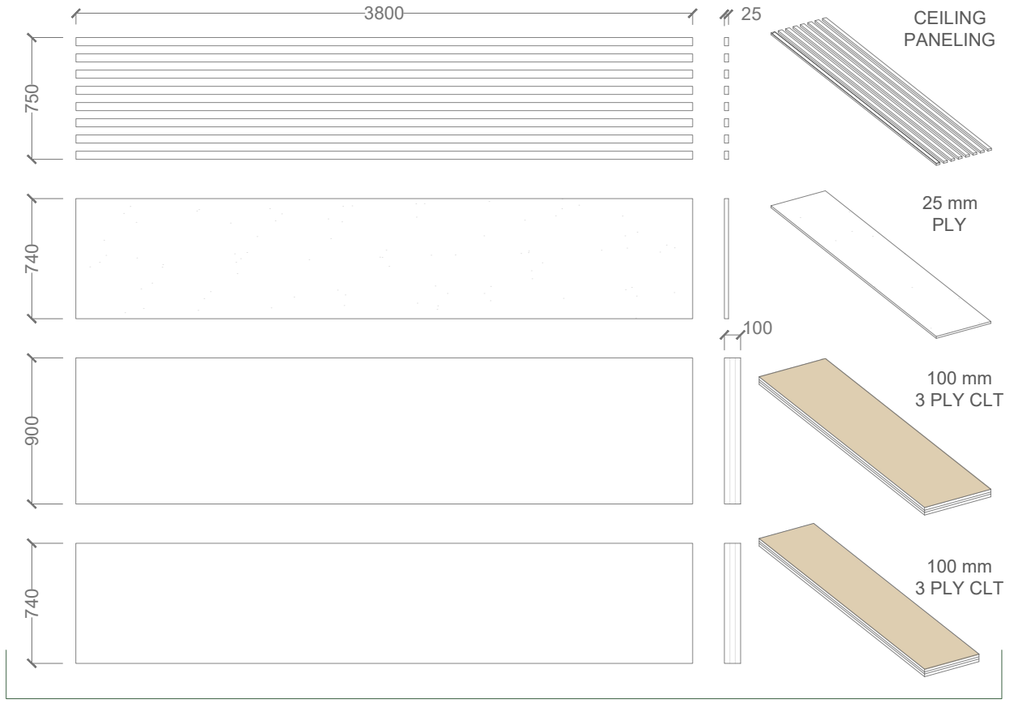
The system always considers efficiency. The catalogue of components, that work within the grid, sharing interlocking system, make up the buildings and can be assembled off site in a controlled environment. They're then brought to site and put in place in a short amount of time.
- Reducing the need for on site workers, lay down areas and allowing for fast on site assembly .



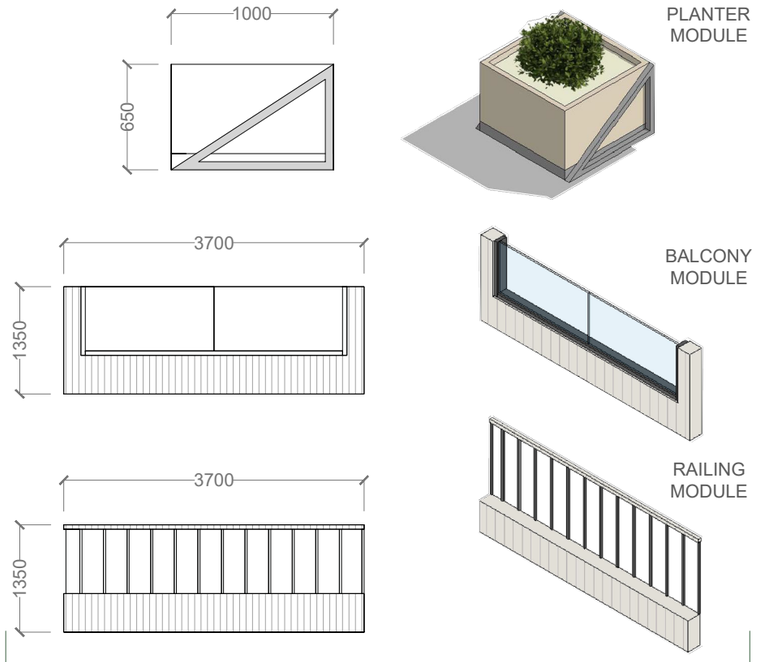
- WALL COMPONENTS-



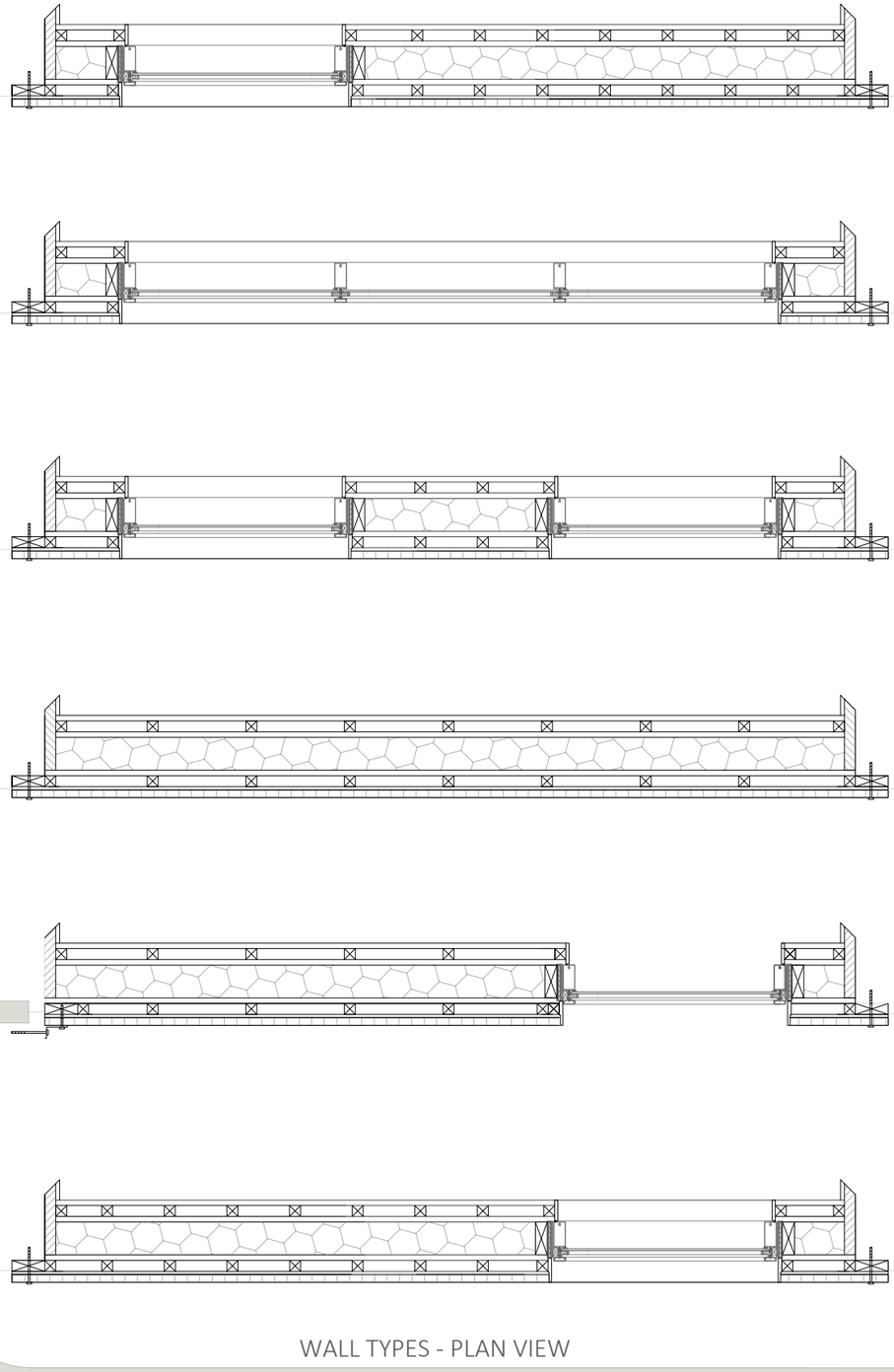
- CONNECTIONS-



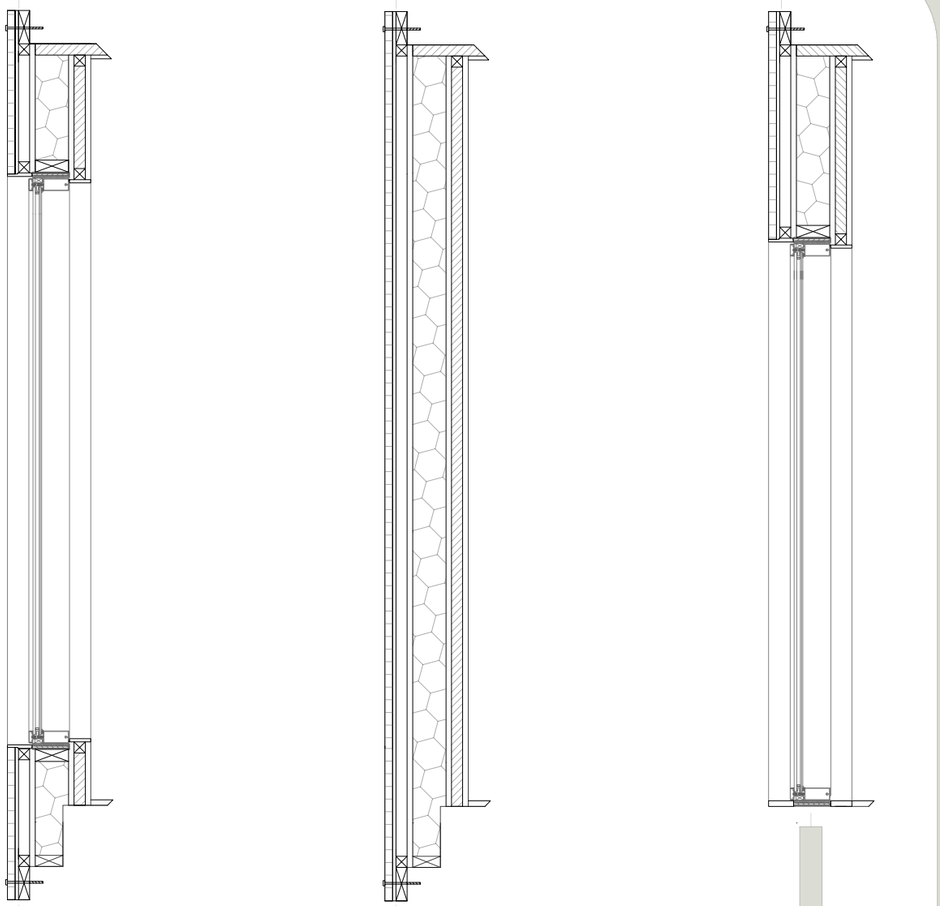
- FLOOR COMPONENTS-



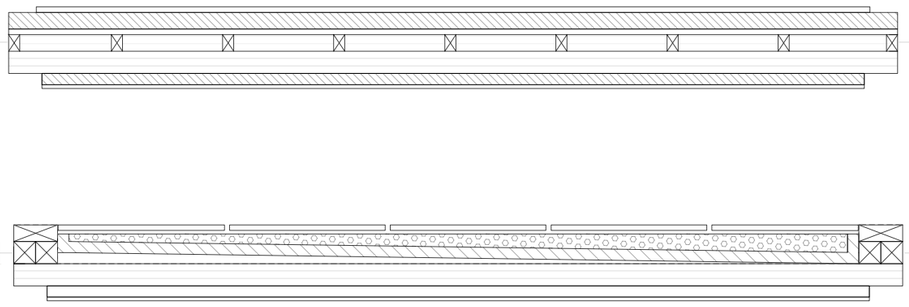
- SERVANT COMPONENTS-



WALL TYPES - PLAN VIEW



WALL IN SECTION



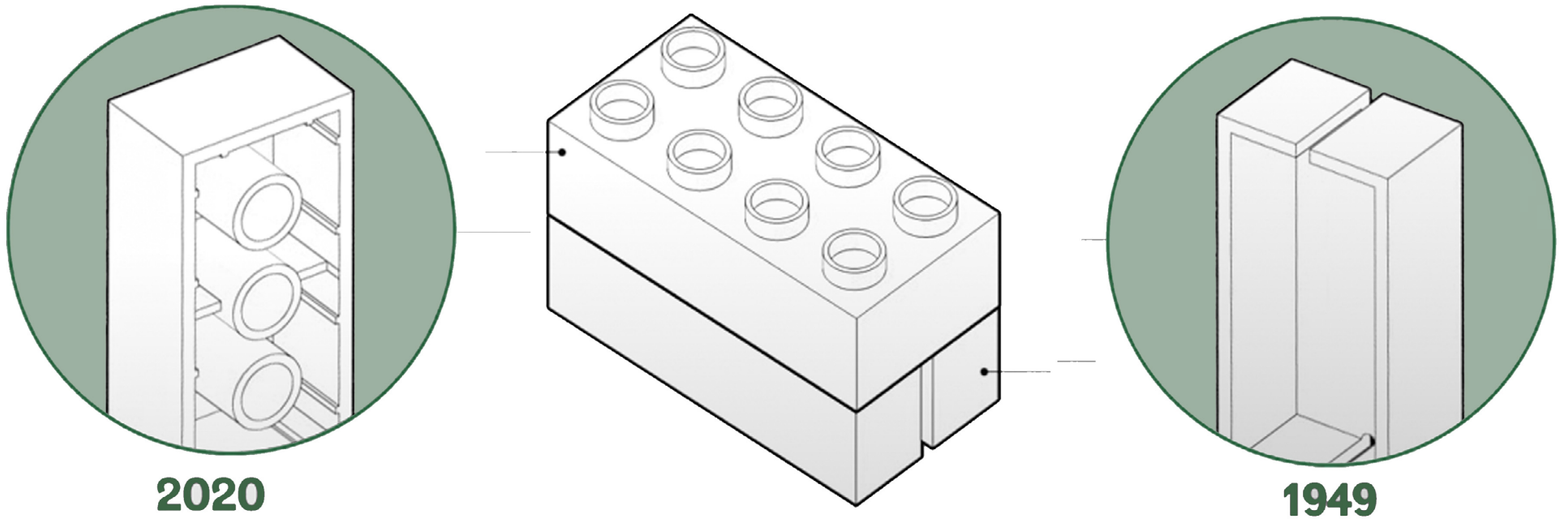
FLOOR TYPES IN SECTION

Assemble a Kit of Parts

Off Site Component Assembly

Components Transported to Site

Components Dropped Into Place

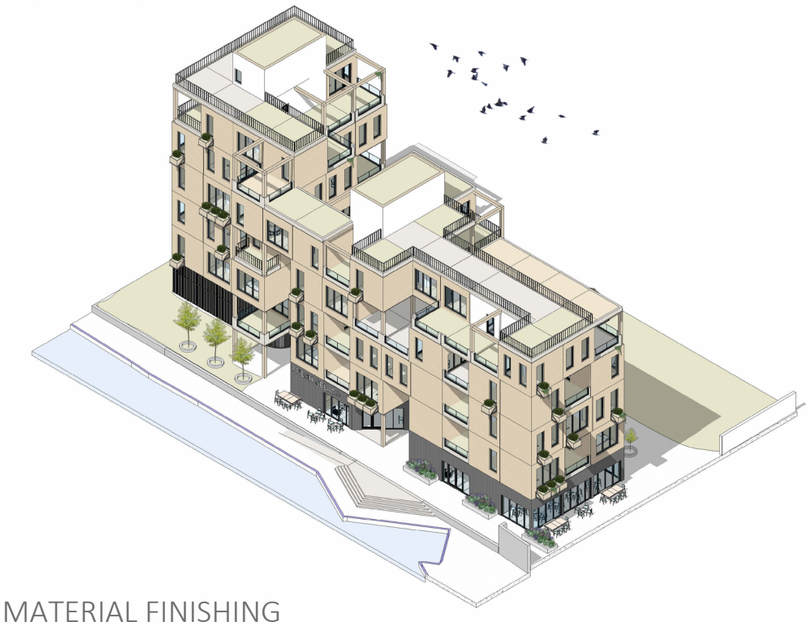


LEGO

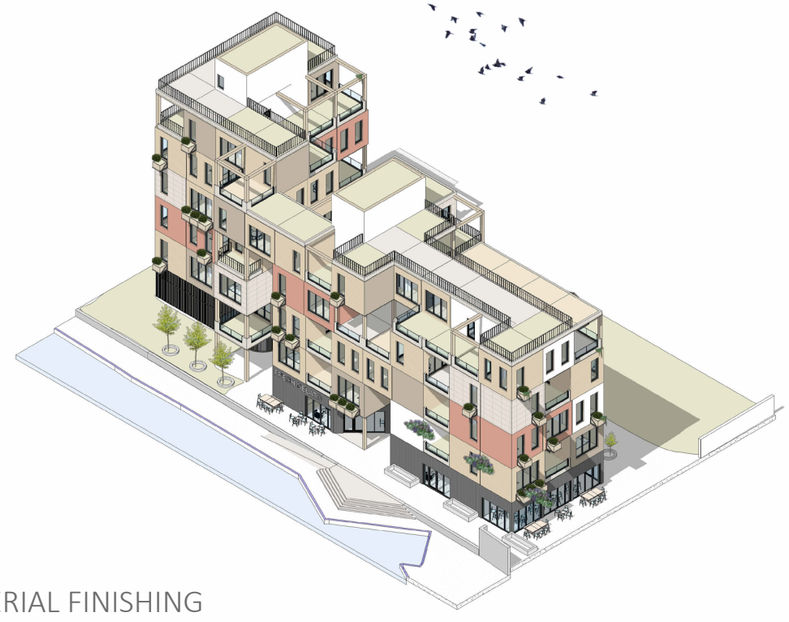
The first Lego block ‘molded in 1949’ still fits fine with anyone molded today. This is made possible due to consistencies in ‘grids and interlocking systems’ (Lego History Group). Even as technology improves and materials that the panels are built up from become more refined, the system can still be used once connection and grid remains constant .

Component materials

The system considers location and Panel finishes are designed for the building to fit in at a variety of locations. Furthermore a material finish option list can allow the user to decide for themselves how there home will look, giving the building a diverse and organic feel. The Materials Finishes were carefully considered in order to compliment each other and their surrounding context. Wood Paneling, Red Brick, Clay Brick, Render & Reconstructed Stone are all commonly used around the greater Dublin area.



CONSISTENT MATERIAL FINISHING



DIVERSE MATERIAL FINISHING

PANEL TYPES - MATERIAL VARIETY

Testing The System

This project is located in the old Bakery site in the heart of Phobsborough on the Royal Canal bank at Cross Guns bridge. The proposal is to reimagine the site that sits at the edge of a long linear park (The Royal Canal) as an open square at the ground level with housing above. Considering a ‘City first’ approach it’s necessary to get a close look at the site and its context to understand how the scheme can be beneficial to the area and provide an improved atmosphere and sense of place. The stretch of the Royal Canal Between Lock House 6 and 7 is an area that interests me as a loose space.

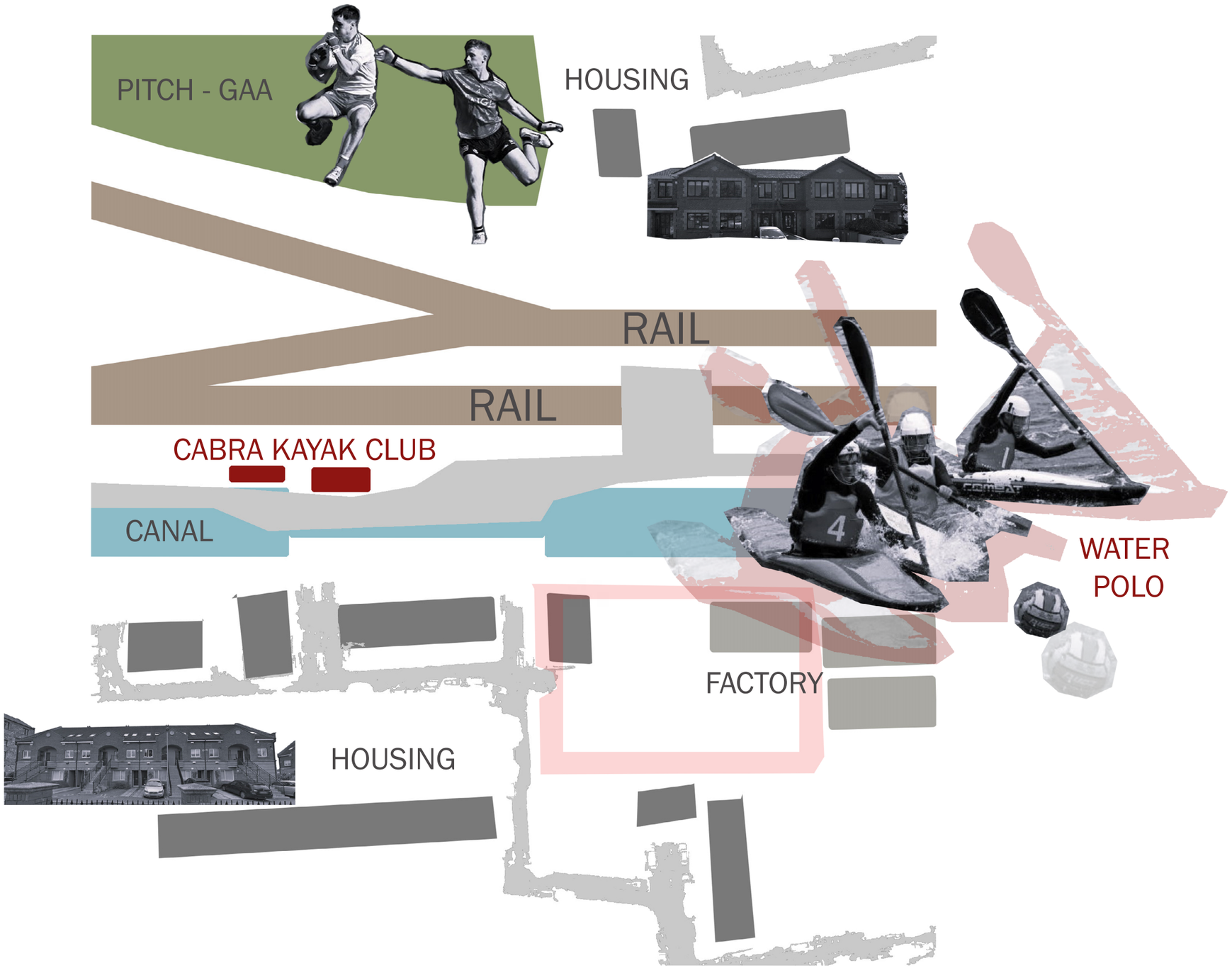
SITE LOCATION

Vacant storage sheds at Lock House 6 along the Royal Canal
- Where Housing & Industry meet

SITE LOCATION

The site lies within an interesting urban knot with lots of activity taking place around the area

- An attractive space to reimagine

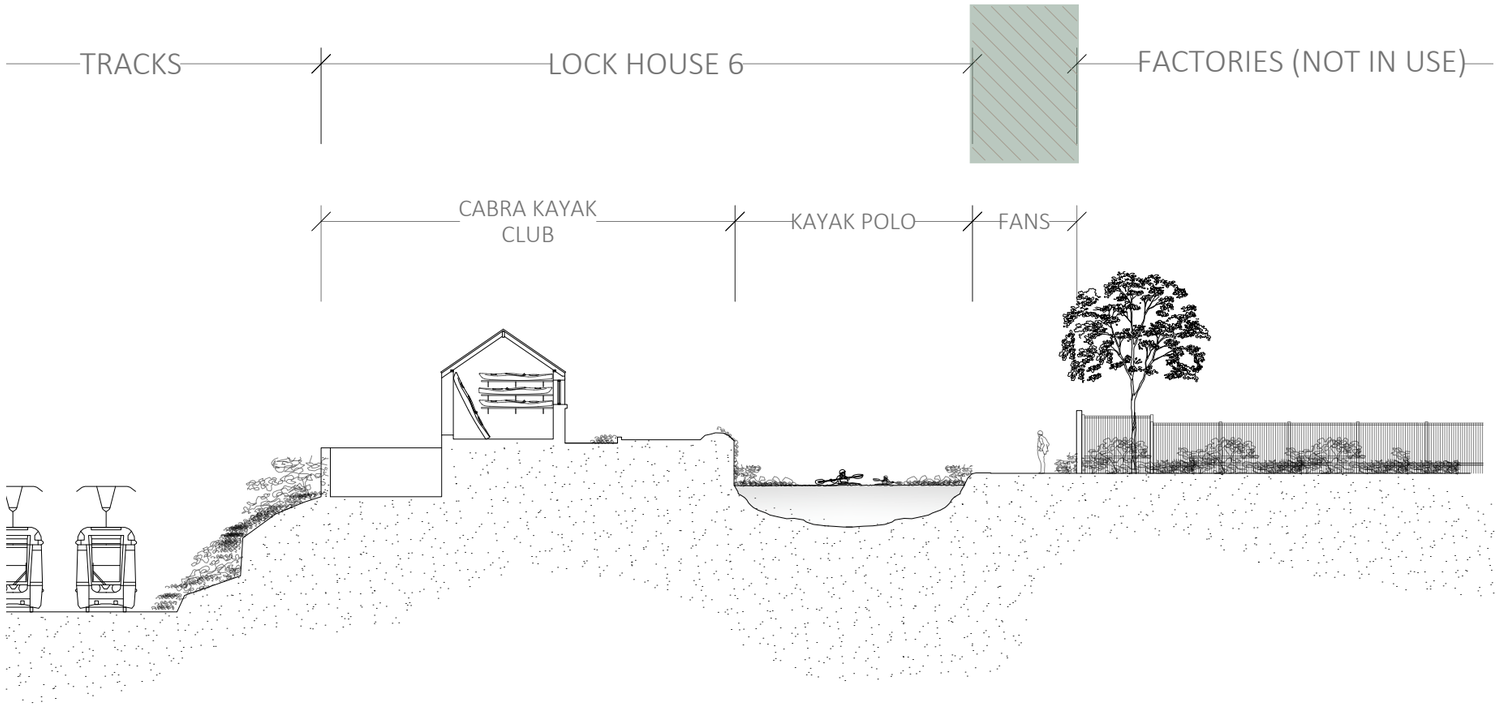


SITE LOCATION

The unexpected use at this location is the reuse of The Grand Canal Lock House 6 as a clubhouse for the Cabra Kayak Club. The stretch of Canal between lock house 6 & 7 is used for water polo game weekly.

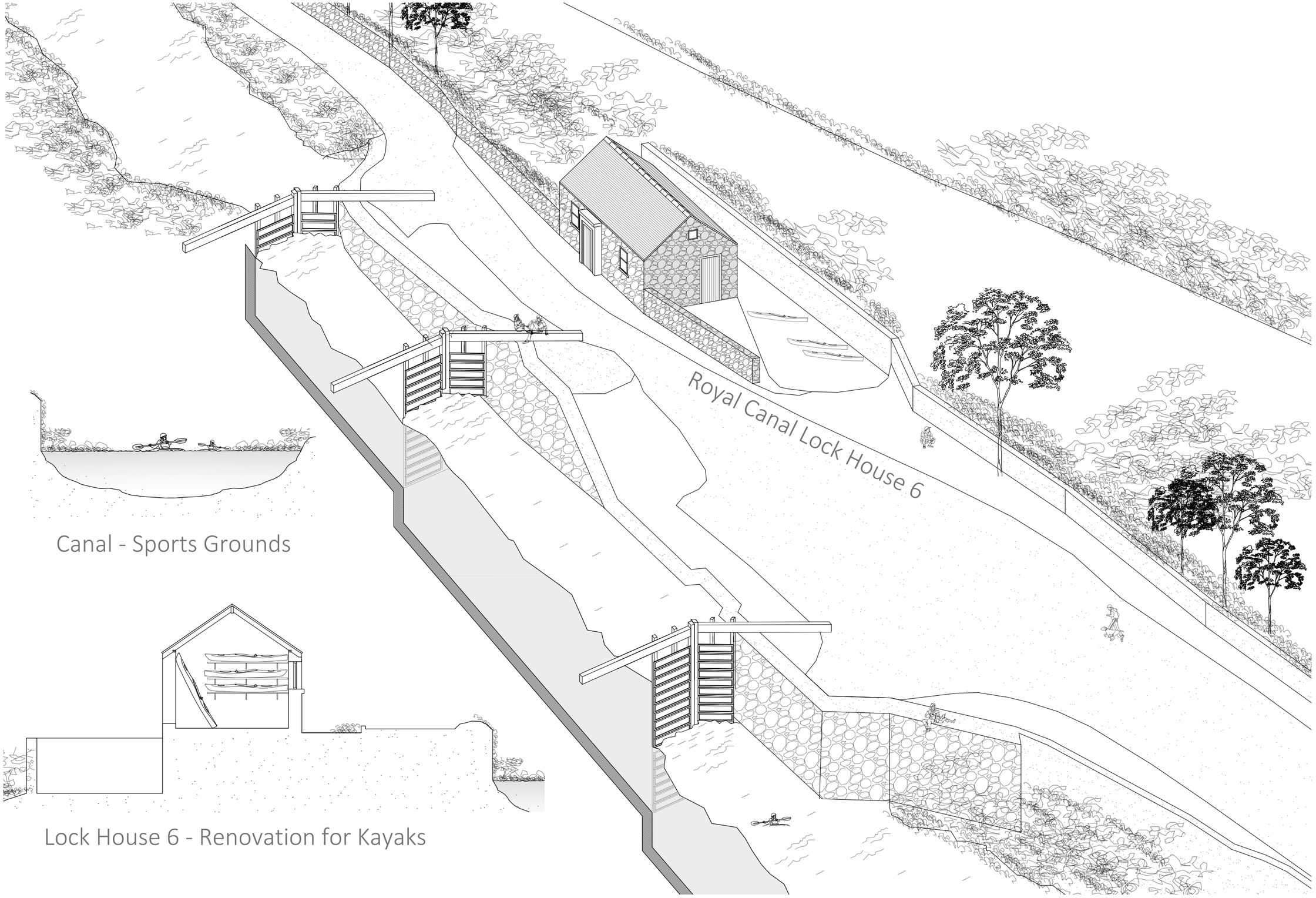
A small patch inbetween factories, train tracks and GAA playing grounds provides an amenity I didn't expect to find in this part of the city. Luckily, when walking the area I was able to talk to one of the members and I asked him about it.

He said, "Cabra Kayak Club is a Kayak Club based in on the Royal Canal and on Dublins East Coast. We are a club set up to service the local community but we also welcome members from other areas. We run training and trips on canals, lakes, rivers and the sea. There is a recreational aspect to the club as well as a competitive sports element. We are still finishing work on rebuilding a Lock House on Lock 6"
- Giving a really sense of strong community spirit



SITE LOCATION

Cabra Kayak Club



Canal - Sports Grounds

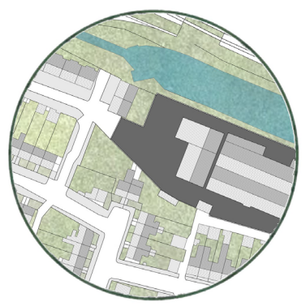
Lock House 6 - Renovation for Kayaks

SITE ANALYSIS

Defensive Boundary

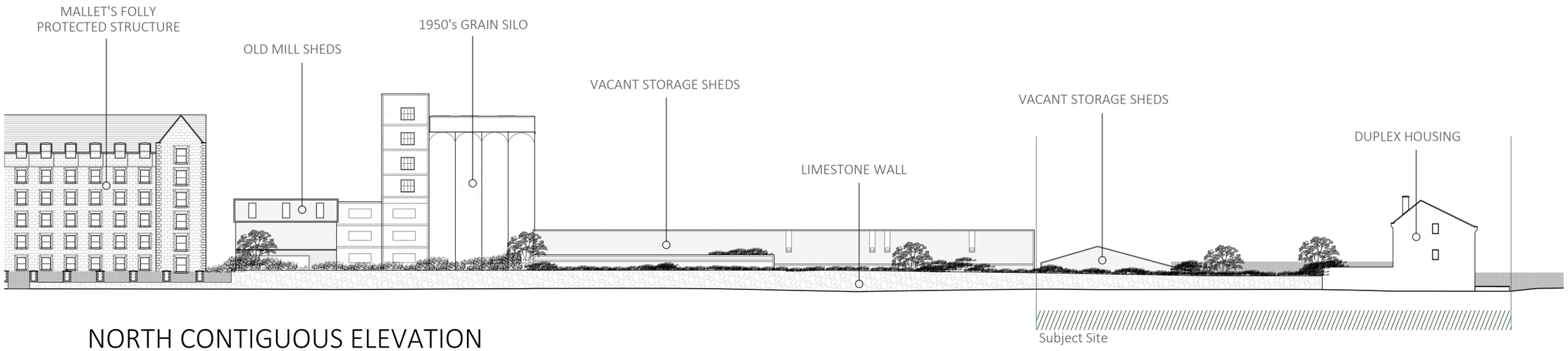
No Pedestrian Access
from Canal or Street

Under Utilized
Access Points

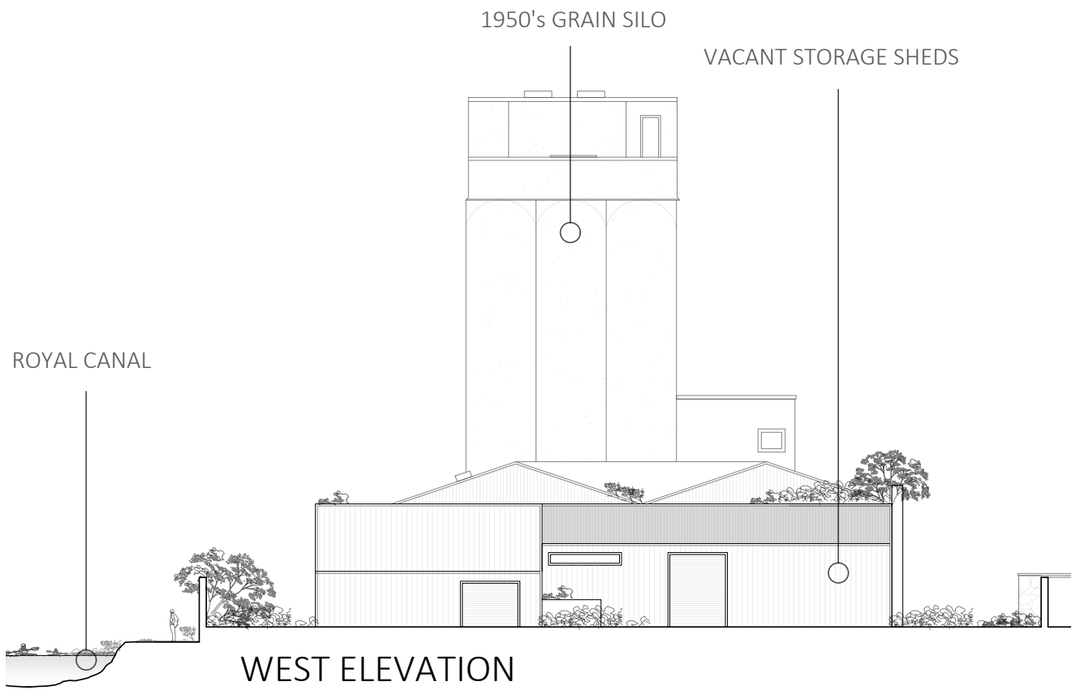


Hard Surfacing
- Concrete-

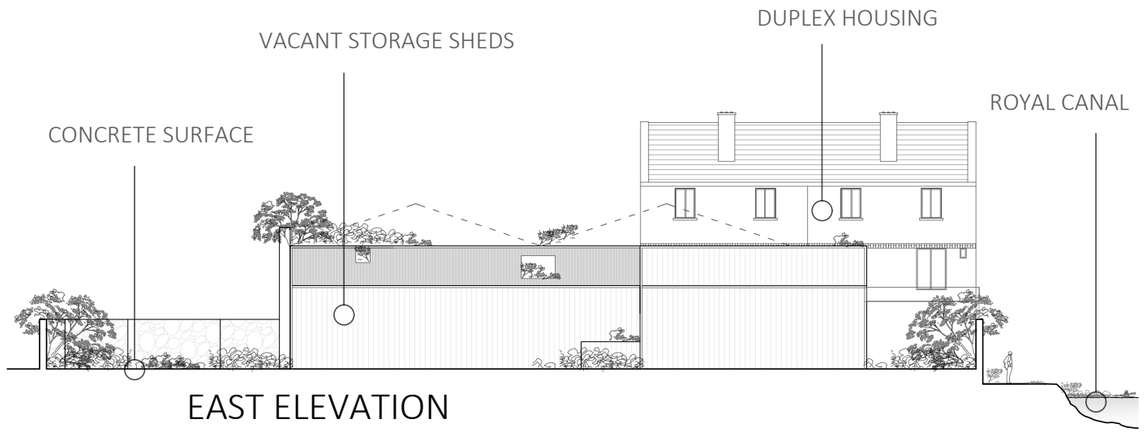
VACANT STORAGE SHEDS AT THE ROYAL CANAL



NORTH CONTIGUOUS ELEVATION



WEST ELEVATION

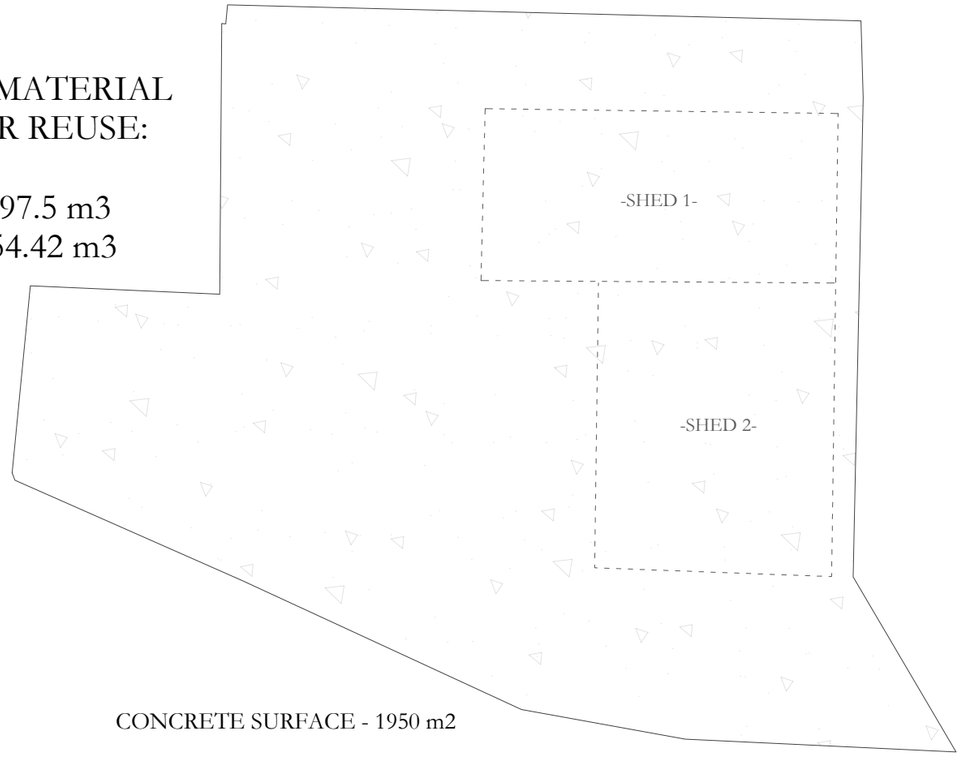


EAST ELEVATION

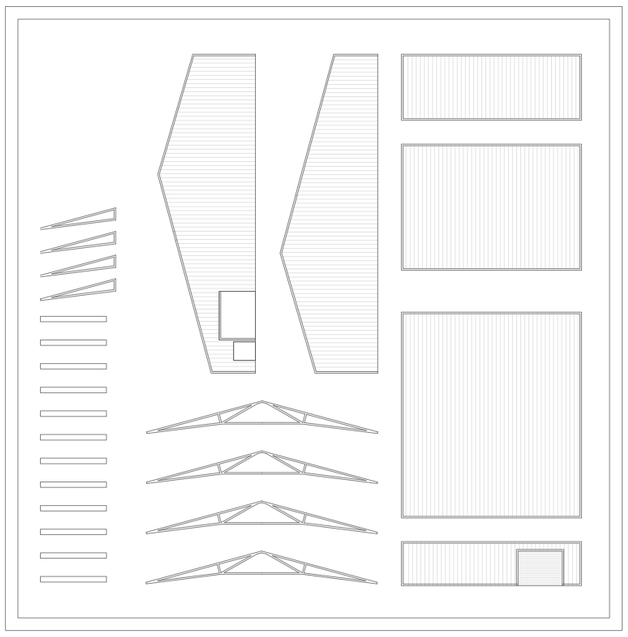
SITE ANALYSIS

TOTAL ON SITE MATERIAL
AVAILABLE FOR REUSE:

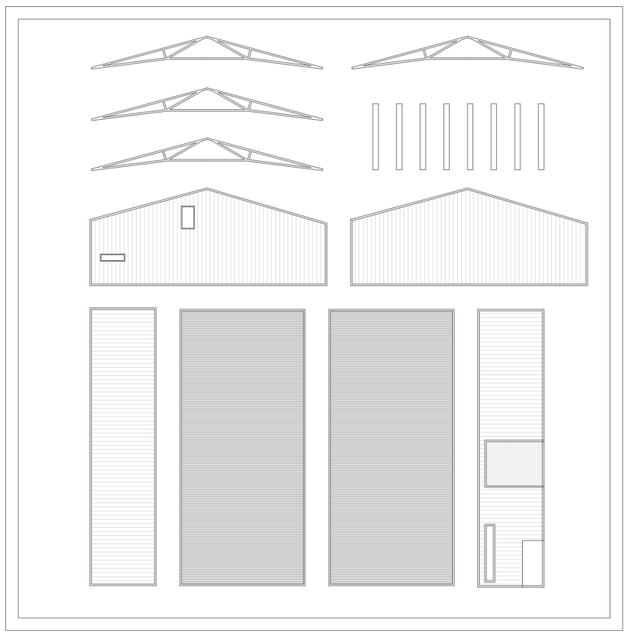
CONCRETE - 97.5 m3
STEEL - 54.42 m3



CONCRETE SURFACE - 1950 m2

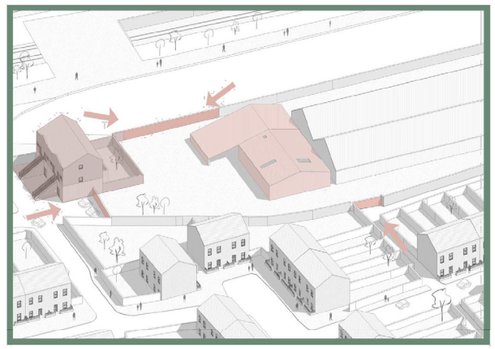


SHED 1 - COMPONENT DECONSTRUCTION

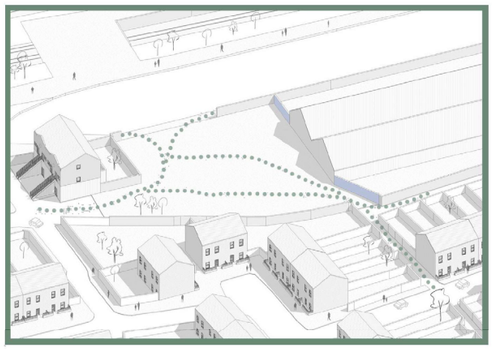


SHED 2 - COMPONENT DECONSTRUCTION

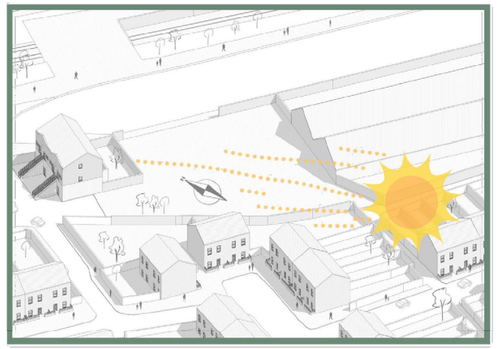
SITE APPROACH



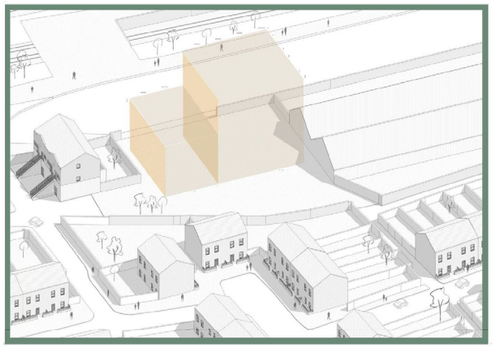
Defensive Boundaries are opened
for Improved Pedestrian Access



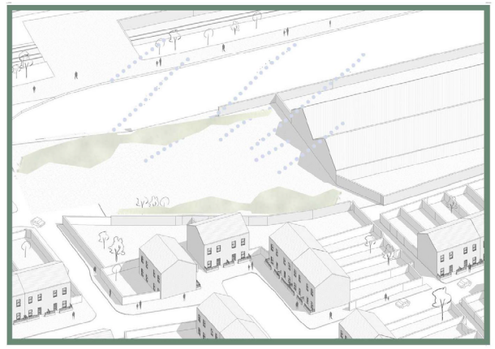
Site Boundaries adhered to but not
followed - 3 New Points of Access



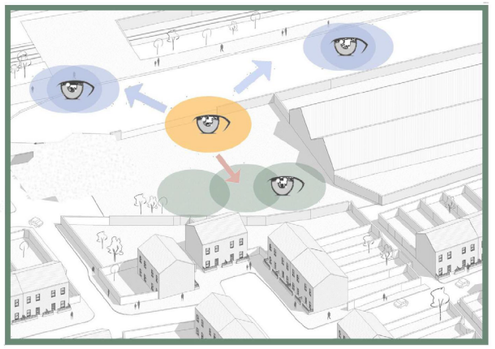
Orientation and Angle of Sun PV



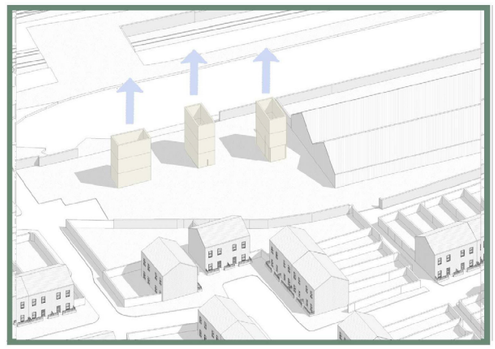
Massing addresses context
- Possibility to Adapt & Readdress new context



Soft Landscaping to Increase Water
Retention on Site



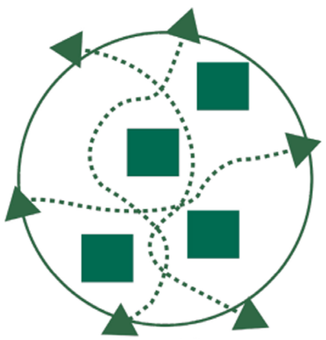
Visual connection North to Royal Canal



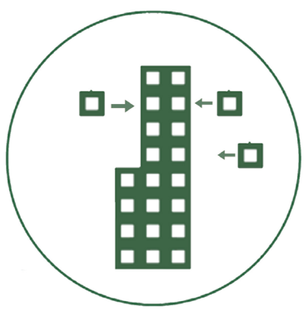
Erect Stair Cores

Assemble Glulam Frame

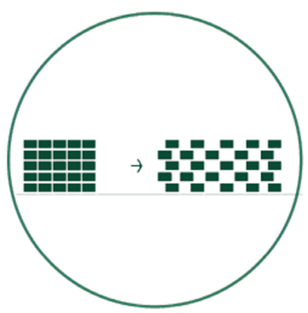
- SITE APPROACH-



Permeable Site



Adaptable Design



Creating Terraces

Providing Open
Space

Diverse Occupants

Bringing People
Together

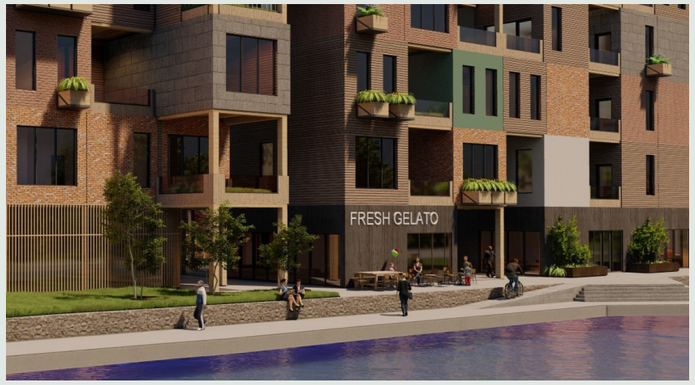
Meta Square

Site Plan

Meta Square - Ground Floor Plan

The ground floor ties into ‘Fior Studios’ proposed ‘market place’ within the grounds of the old bakery. I see the proposal being a primary route for cyclist and pedestrians navigating through the area as the permeability connects the housing estates straight out on the canal, with Broombridge Station west of the site being a heavily used Luas stop.

The addition of a bike and Kayak Storage, a Cafe, Gelato shop, an outdoor event space, a green area with a football net and many areas to congregate in, the site is well equipped to attract people of all interests



Meta Square - Second Floor Plan

SITE AREA: 2500 sqm

PLOT RATIO: 0.23

UNITS: 28 ------- (112 Per Hectare)

The finished scheme achieves a high density of 112 units per hectare. Although this could be pushed to a greater density it was decided that this scale and massing is most appropriate at this time when considering the surrounding context.

The scheme has shared and social spaces within the plan. Providing 2 laundry rooms so that residents don't need bulky utilities in there homes, A gym to encourage physical and mental wellbeing, work / study space where quiet is needed for concentration, a shared lounge to host friends and family on occasions and shared outdoor terraces that can be used for a bundle of activities

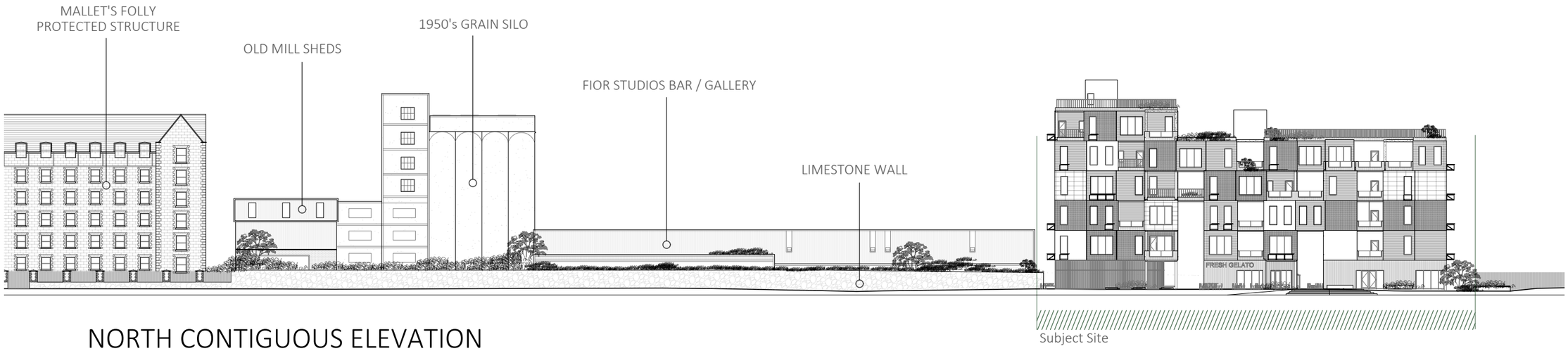
Refer to page 41

Refer to page 40

Meta Square
Section A-A

Meta Square

Context Elevations



NORTH CONTIGUOUS ELEVATION

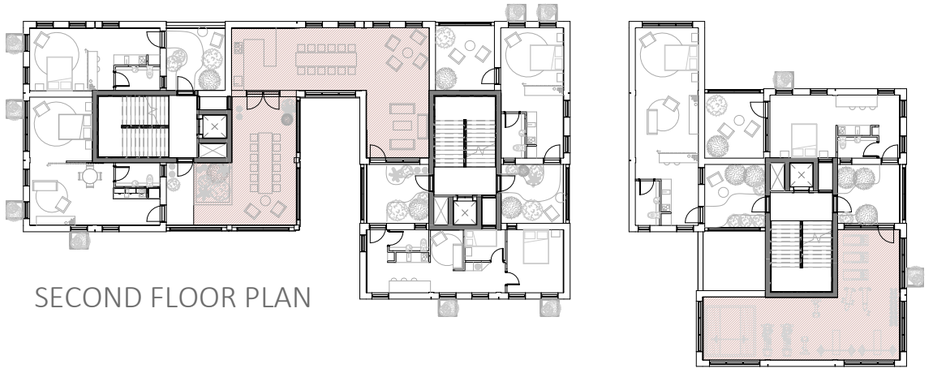
WEST ELEVATION

EAST ELEVATION

Meta Square

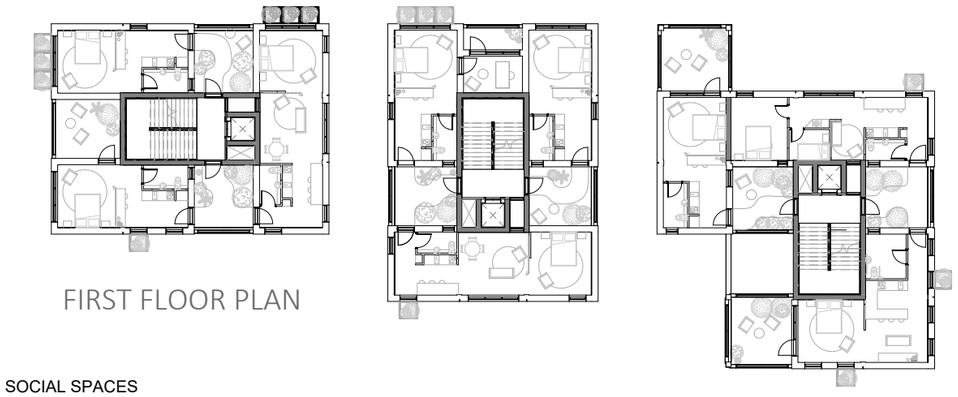
Floor Plans-

The cores are all shared as you can pass between towers at different points, always opening out on to an outdoor terrace for maximum fire safety. The cores have service cavity's that bring there services to the kitchen and bathrooms withing the scheme which locations wont change to allow for simpler adaptations

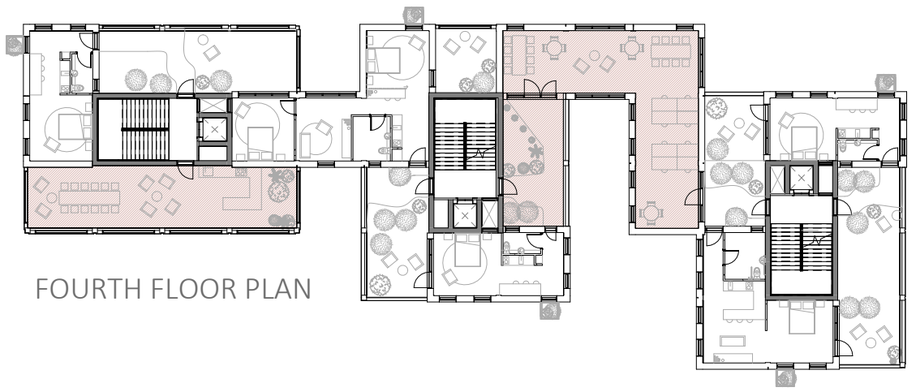


SECOND FLOOR PLAN

FIFTH FLOOR PLAN



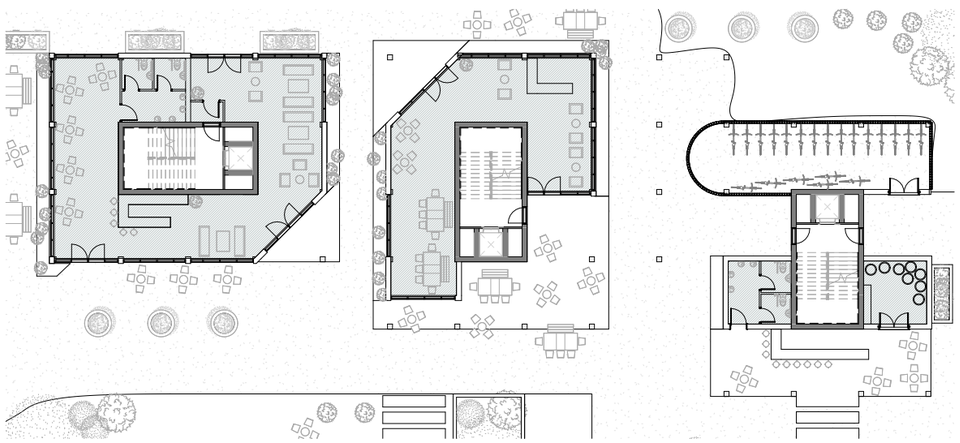
FIRST FLOOR PLAN



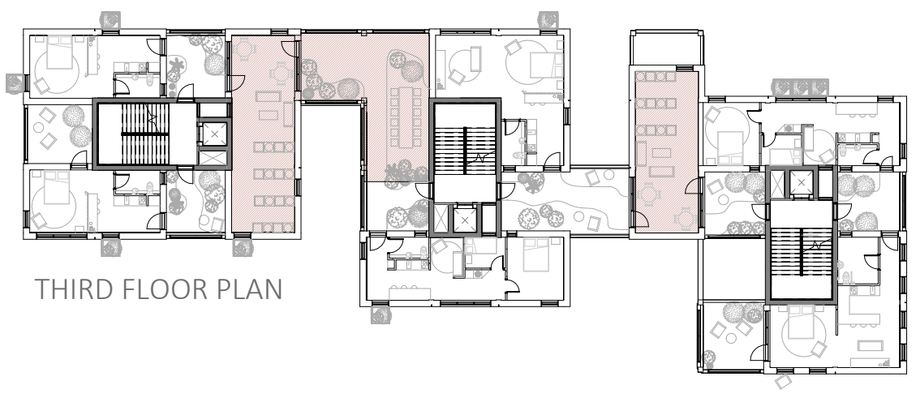
FOURTH FLOOR PLAN

SOCIAL SPACES

COMMERCIAL SPACE



GROUND FLOOR PLAN



THIRD FLOOR PLAN

Resident Led Material Finishing

As mention previously the component based design system has a material pallet that makes it more adaptable to different sites. When considering the hugely diverse materials found around the context on the old bakery site I decided to go for a ‘resident let finish’ with each home having a different material from the options list. I believe that this is the best outcome of the system where the users can put there own touch on there home and express themselves. This adds to the character of the proposal giving it that important organic feel as the facade shifts over time.

Meta Square

Canal View

Meta Square

Evening Time

Open space - South Facing

Meta Square within Contexts

Interior

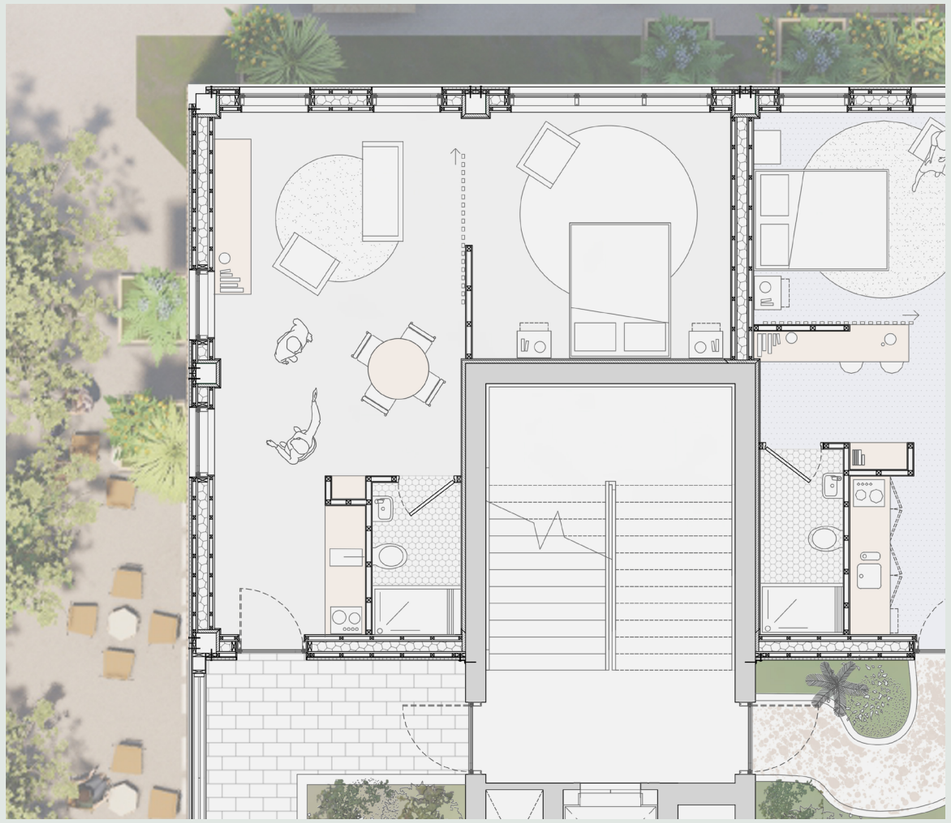
To understand the reputation that modular homes have as being poorly built temporary structures, I wanted to talk to somebody who has lived in one themselves:

Interview: After the Uk's post war push people continued to use prefab homes around England Ireland Scotland and Wales. I managed to interview Noel Farrell, a block layer by trade with 60 years of experience, building with traditional building methods all over Dublin. He once lived in a prefabricated home for a period of 4 years between 1970 and 1974. When asked why he bought the prefab he said, "I couldn't afford a house, it was just temporary," he went on to say how his prefab was timber frame with cladding and sat on blocks. There was no toilet in the prefab just a dry toilet outside and for water and he would have to walk "up the road" and bring it back. There was also "no heating". The "prefab was about 25 ft x 25 ft", a little over 15 sqm. The floor plan consisted of one main bedroom which "wasn't that big, now," and another "small little" bedroom, a sitting room, and a "small" kitchen. He recalled rats starting to come up through the floors and a feeling of dampness and cold inside the home.

"Aw, they were freezing sure."

When asked why he thought the technology did not become standard practice to be used as an alternative to traditionally built homes, he responded saying they were just "too cold." My final question for Mr Farrell was "if he thinks people would consider prefabricated homes again if properly serviced and insulated?" He had a quick and positive reply, "Yeah, there wouldn't be a bother on them." The interview gave great insight into the stigma that was associated with the prefab homes of the time. Although they were a success in getting a lot of people into homes fast, the prefab homes biggest downfall was in there build qualities. Similar issue of discomfort were a common complaint in the Ballymun scheme with users being to warm not being able to turn off the heating. (Modern Housing Ireland, 1969)

The proposed design gives , at a minimum, dual aspect homes with front gardens even at the upper floors. Every home has room to move fluidly within a well serviced space. With large glazing panels the interior is a light filled space while providing passive surveillance of the public realm below. The addition a sliding screen that can be pulled across to close off the bedroom area allows for light to still pass through. The vast expanse of large glass windows brings nature indoors so you can have a deeper connection with your surroundings. Floor-to-ceiling windows become the main focal point of a room, allowing you to capitalize on the views of the City. The Planter Modules give a sense of being within nature even on the upper floors.



Meta Square Conclusion

I believe the proposed scheme would bring a high quality of life to those living in the new modular home and those in the surrounding area.
The difficulties with a system like this with an evolving facade is planning. When asked during my review how I think planning could control this scheme i wanted to try push the point of the current planning system needing to be pushed and reimagined to allow for new solutions to combat the housing crisis. Its stated in ‘Chapter 5: Quality Housing and Sustainable Neighborhoods’ a key point relates to Policy: QHSN22,

“Adaptable and Flexible Housing- To ensure that all new housing is designed in a way that is adaptable and flexible to the changing needs of the homeowner as set out in the Lifetime Homes Guidance contained in Section 5.2 of the Department of Environment, Heritage and Local Government’s ‘Quality Housing for Sustainable Communities - Best practice Guidelines for Delivering Homes Sustaining communities’ (2007) and Universal Design Guidelines for Homes in Ireland 2015.”

The planning process requires a set of final design drawings representing the finished building. In this case a final height and size when the scheme is fully fitted out would be used allowing for freedom that is controlled within a set of rules.

I hope for this thesis to question our current approach to providing homes and broaden the minds of Ireland decision makers when it comes to delivering quality affordable housing, while highlighting the potential to push modular construction further.

Meta Square Presentation

Scan the QR code below for a digital view my final presentation board

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7. Image 1. Phoenix Type temporary bungalows in Hemel Hempstead, Hertfordshire. Historic England Archive P/H00099/003. Accessed on 05/10/22

Image 2. Uni-Seco prefabricated houses in Brixton, London. One of the most numerous prefabs of the post-war era. Historic England Archive P/H00049/005. Accessed on 05/10/22

Image 3. An AIROH House being assembled on the grounds of the Tate Gallery, London. Historic England Archive P/H00042/003. Accessed on 05/10/22
Image 3A. An AIROH House Exploded Axonometric View. Historic England Archive P/H00042/003. Accessed on 05/10/22

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8. Image 4. Ballymun. Flats 1972

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15. Image 5. Dortheavej Copenhagen, designed by, BIG Architects. Site Plan

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16. Image 6. Dortheavej Copenhagen, designed by, BIG Architects.

17. Image 7. Nakagin Capsule Tower, designed by Kisho Kurokawa. Precedents of Metabolism Architecture

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21. Image 8. Nakagin Capsule Tower, designed by Kisho Kurokawa. 9 sqm Capsule (Online) Available at: https://www.youtube.com/watch?v=6SwvtBxxp2w&t=406s&ab_channel=AbroadinJapan

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