Cultivating **Heijplaat**

Nico's House and the Extra School

SSoA MArch Architecture 2011/12

ARC584 *Technology Report*

100235416 *Sam Brown*

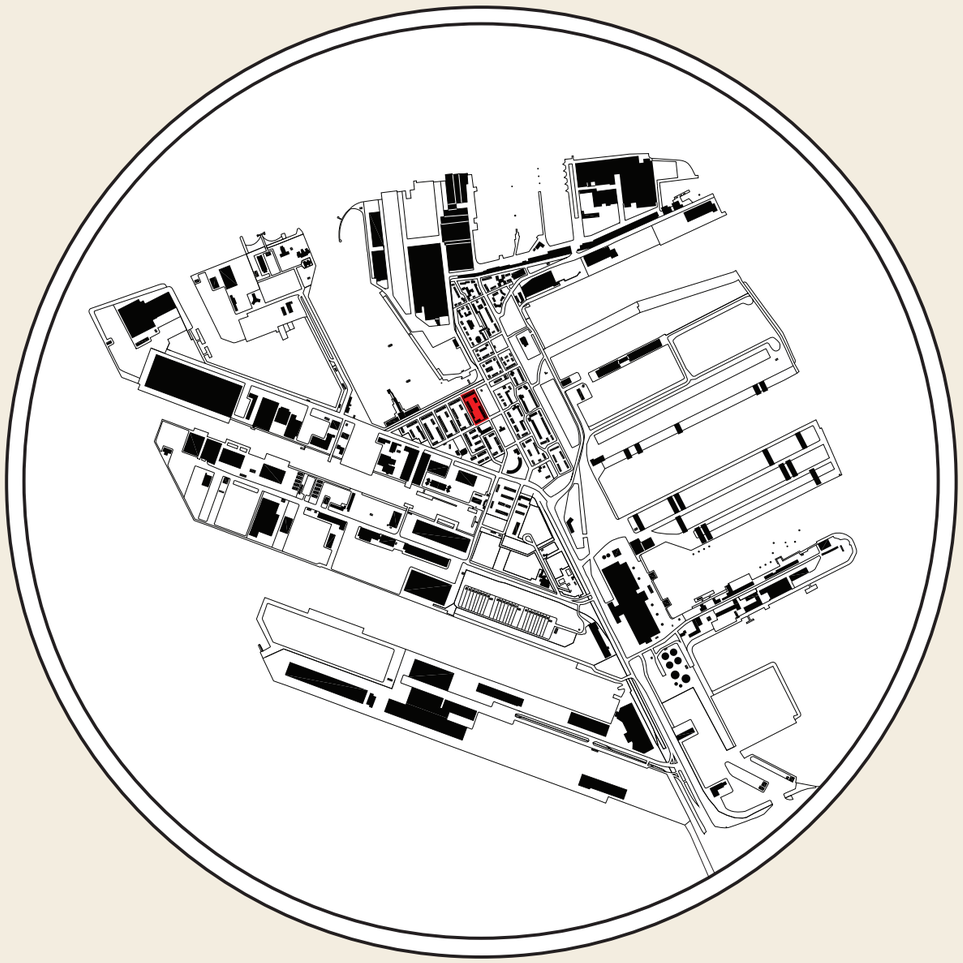


Fig. A /// *Reflections in Heijplaat.*

Preface: *The Story*

This Technology Report is associated with a Masters level architectural thesis project. Such projects exist ultimately as fiction, all-be-it with roots in observations of reality. Yet fiction has a capacity to effect change and we must therefore be careful with our fictions and the stories they tell.

Regeneration is inevitably flavoured by an attitude to stories both unfolding and spent. Those stories are sometimes a reason to do one thing and not another and thus are the seeds of future stories. To regenerate sustainably and responsibly, we can neither ignore stories themselves nor our role within them. In visiting Heijplaat and engaging with actors and agents that hold a stake there-in, I have already entangled myself in its story.

Nico Prins - the *Verhalenman* - took occupation of a condemned building in Heijplaat six years ago with the intention of collecting the stories of a place deeply connected with the evolution of Rotterdam as both city and port. Born in nearby Pernis, Nico spends his working days on 'native ground' in Heijplaat listening to its stories. In re-telling them, he hopes to ensure that Heijplaat's stories are given due regard as its future unfolds.

This report is the third in a series of three creative and strategic documents[1] that are intended to catalyse and encourage the development of particular aspects of the overall thesis project. As such, it is prepared at a later point in time to its predecessors and relates to a project that is itself more developed. It therefore serves as a snapshot of the overall design development of the project, as well as a specific description of its key technical concepts.

[1] Please refer to the accompanying documents: **BROWN, S.** (2012) *Cultivating Heijplaat - Design Report.* Sheffield: Sheffield School of Architecture; and **BROWN, S.** (2012) *Cultivating Heijplaat - Management Report.* Sheffield: Sheffield School of Architecture.

Personal Methodology: *Narrative*

Architecture is integral - yet at the same time peripheral - to everyday life. As a complex assembly of spatial, social, material, technological, and environmental systems, architecture frames stories of our encounters with our environment and with each other, mediating between us and our surroundings and existing as a stage upon which we act out our lives.

This report - on the integration of environment, material, structure and technology with the ongoing design of *Nico's House and the Extra School* - is developed through the story of one of its characters. In recounting their contact with the key technical concepts of the project, I hope to demonstrate the integration of technical and detail design thinking with the pursuit of architecture as the backdrop to everyday life.

CONTENTS

Fig. B /// *Wim de Jong*

Wim is 17. He's been at RDM a year now, training as a marine engineer, although he sometimes thinks about changing to navigation so he can help his father in the summer. Something about the former shipyard - recently reinvigorated by investment from universities and the *Stadshavens Rotterdam* initiative **(Technical Concepts Relating To Site, p.3)** - makes you think about making something of yourself.

Wim often walks out to Quarantine to think. The park is quiet and the former hospital buildings are peaceful. He likes living at *Nicos House*; he only studies a few days a week, and sometimes helps Nico with the hostel, filling the pellet hopper on the boiler, and changing the rainwater filters **(Site Environmental Strategy, p.9).** His knowledge of engineering helps him do this easily, and he must admit; its good to be able to ask Nico's advice about things when his father is away.

He wonders what it will be like when his mother and sister move into the new refurbishment. He wonders whether he'll be made to help with his sister's homework so that mum can concentrate on catching up with emails for her business. She'll like having the space now that she'll have a home office **(Technical Concepts Relating To Programme, p.5)**, and being so close to the school means she wont worry when Mika walks home on her own.

Some of the new pieces are being craned in tomorrow, and with any luck they can move in in a few months. The plans look great...and it'll be nice to sit with mum and Mika on the new balconies overlooking the gardens. **(Complex Material Assembly, pp.22-23)**. He has friends at RDM - on the building programmes - that say a long time was spent while they worked out what pieces of the old buildings they could - or should - take out

(Existing Buildings, p.10). They also say that similar things have been happening in Tilburg and Utrecht **(Technical Precedents, p.6)**, but that this is supposed to be the best around **(Zero-Carbon Agenda, p.8)**. He thinks its funny how no-one lives on the ground floor of the refurbished buildings, but remembers someone telling him that this was necessary these days and fully intended **(Flood Risk, p.8)**.

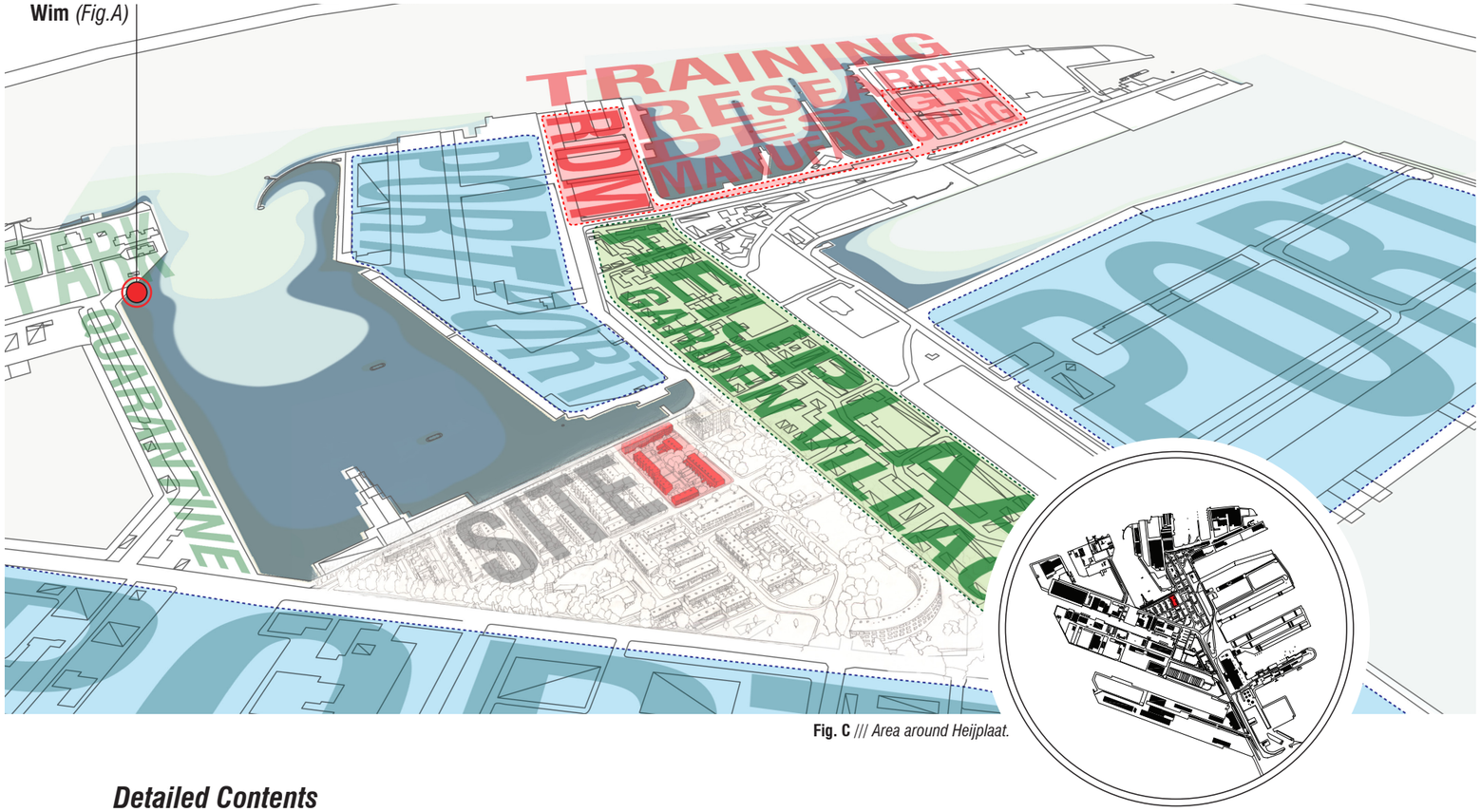


Fig. C /// *Area around Heijplaat.*

Detailed Contents

Introduction: *Nico's House and the Extra School*

Cultivating Heijplaat develops the informal function of Nico Prins as a community cultural activist into a formal architectural project. As with the condemned property he currently occupies, the new *Nico's House* is a hostel in the widest sense of the word. The building - comprising both a newly built facility and a set of refurbished dwellings - hosts a number of different people on different bases; from day-trippers and over-nighters who come to wonder at the spectacle of the port-machine surrounding Heijplaat, to mid-to-long-term residents of the *Stichting Hervormde Internaten voor Schippersjeugd* (SHIS) - an organisation that provides land based accommodation for parents and young people involved in the inland shipping industry [2].

The *Extra School* refers to both the educational reason behind the extended land-based residency of these latter, traditionally maritime-based actors, and to the role of Nico's House in the wider community. The paradigm of *community schooling* in the Netherlands envisages schools as truly civic buildings, extending their remit beyond the defined hours and content of the curriculum to encompass less formal definitions of - and relationships between - learners and educators. As a community building, Nico's House also provides extra spaces for use by Heijplaat's existing school, constrained spatially by enlistment as a national monument and struggling to meet the demands of the new paradigm for the provision of opportunities for learning centred on nutrition, culture and language. It also provides the opportunity for a typically transient community to engage with that paradigm.

In short, *Nico's House and the Extra School* addresses deficiencies on the educational offer available in Heijplaat and establishes a place of integration between an existing community with deep attachment to place and a new community necessary to the future revitalisation of that place. In doing so, it investigates the concepts of 'host' and 'guest' and carries this through to the level of technical and detailed design.

Studio Methodology: *Cultivating Heijplaat*

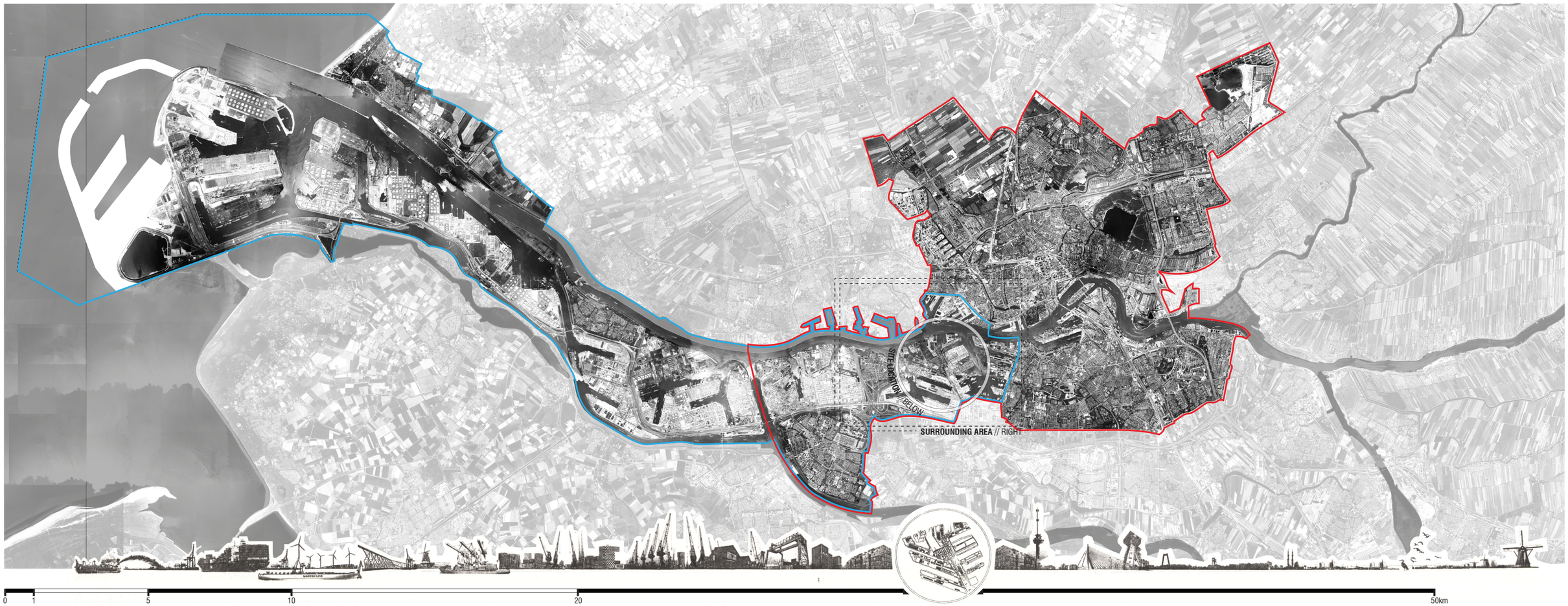
MArch Studio 7 (2011/12) has two points of departure; firstly, the act of *cultivation*, in any of its interpretations; and secondly, the city and port of Rotterdam in the Netherlands, as the gateway to Europe's food distribution network.

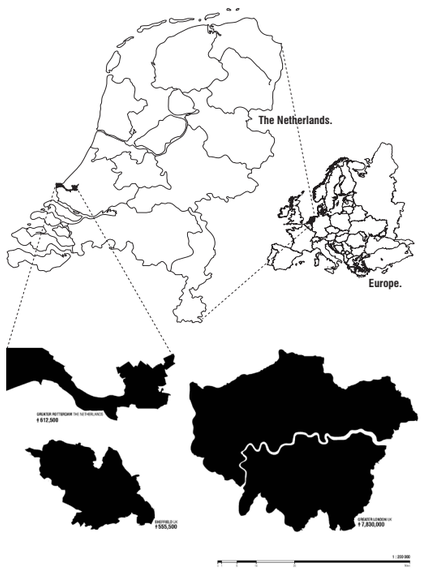
Cultivation can mean many things as both word and act. The most base of interpretations is perhaps *'the preparation of ground to promote growth'*, preceding even the obvious and usual connotations of agricultural food production. Considering cultivation as the *'planting, tending, improving and harvesting'* of *'ideas and relationships'* - rather than crops - can develop this concept and provide a useful metaphor for the values of sustainable regeneration.

Following early investigations into permaculture, Cultivating Heijplaat has developed a methodology that by default values what is there , before critically appraising the conditions to establish suitable parameters for intervention by design. In doing so, it seeks to enhance the well-being of the system as a whole, rather than merely produce new things. In doing so, it acknowledges ecology and accepts that edges - where tow systems meet - are often the healthiest part of any system; a vital and architecturally rich point of exchange and mediation [3].

[2] For more information about the SHIS please refer to the accompanying document: **BROWN, S.** (2012) *Cultivating Heijplaat - Design Report.* Sheffield: Sheffield School of Architecture, p.18.

[3] For a more detailed summary of design methodology please refer to **BROWN, S.** (2012) *Cultivating Heijplaat - Design Report.* Sheffield: Sheffield School of Architecture,





A Methodology For Selecting Site - Using Edges to Understand a Place

Rotterdam is a vast place. With a diameter roughly equivalent to Greater London and a population approximately equal to that of Sheffield, it is easy to lose people in the expanse of port facilities to which the city is enthral. The growth of the city has always followed that of the port., developing linearly along the heavily engineered banks of the Maas river. Rotterdam's harbours punctuate the shoreline along its entire length, from the traditional agricultural polder landscape of the east to the new Maasvlakte II currently under construction in the far west, where the Dutch area reclaiming more land from the sea in stereotypically bombastic style.

Whilst the infrastructure and logistical powerhouse of the Port has always led economic growth and spatial development, it has always needed people to operate it; to consume its throughput and demand its expansion. The City represents and services those people, and is embassy for the Port in the global market. The two are intertwined, fused by mutual dependency on the harbour's vicarious edge.

Following the edge is one way to deal with the scale of investigation at hand. Heijplaat sits at the confluence of Port and City. Lying wholly in neither it benefits from both; a leafy residential jewel amongst the industrial crane-scape of shipping facilities.

Fig. D (above) /// Map of *Greater Rotterdam showing to respective jurisdictions of City Of Rotterdam Municipality (red) and Port of Rotterdam Authority (blue), relative to a cross-section through the city from Maasvlakte II in the west, to the UNESCO World Heritage site of Kinderdijk in the east.*

Fig. E (left) /// Rotterdam's location within Europe and the Netherlands with comparative sizing to London and Sheffield.

Overview: *Technical Considerations Of Site*

Stadshavens Rotterdam

Heijplaat sits at the epicentre of the 1600-hectare *Stadshavens Rotterdam* regeneration masterplan, which represents the largest inner-city redevelopment in the Netherlands. Jointly commissioned by Rotterdam City Council and the Port of Rotterdam Authority and laying at the confluence of their respective jurisdictions, the regeneration is facilitated by the *Stadshavens Projectbureau* from its offices in the former shipyard of RDM Campus in Heijplaat. As such, Heijplaat plays host to the forces that ultimately shape its future.

In the simplest terms, the masterplan values sustainability and quality of life as integral to development and has the double objective of *'reinforcing the economic structure of City and Port'* and *'providing a high quality, sustainable living and working environment, which is climate proof and has a future-orientated energy supply'.* It seeks to deal with an area facing deterioration as industry moves west towards new harbour developments that can accommodate modern, deep-keeled vessels. As yet, only the RDM Campus - as the regeneration of a former industrial centre into one focussed on research and design - exists in built form. Heijplaat is next, and seen as a test ground for solutions that might be relevant to the wider area and to the country - and continent - as a whole.

The masterplan calls for three objectives to be met;

- Climate-proofing; particularly with regard to future rising sea levels.
- A future-orientated attitude towards energy; particularly with regard to the growing scarcity of fossil fuels and the importance of reducing CO_2 emissions.
- A net-zero carbon regeneration; aiming to make Stadshavens Rotterdam a world exemplar in terms of sustainable construction.

It does so without any detailed advice or guidelines on how to achieve such targets, cultivating ground rich for experimentation and innovation. Heijplaat is right at the centre of things with an opportunity to pursue exemplary sustainable development with relevance on a global scale.

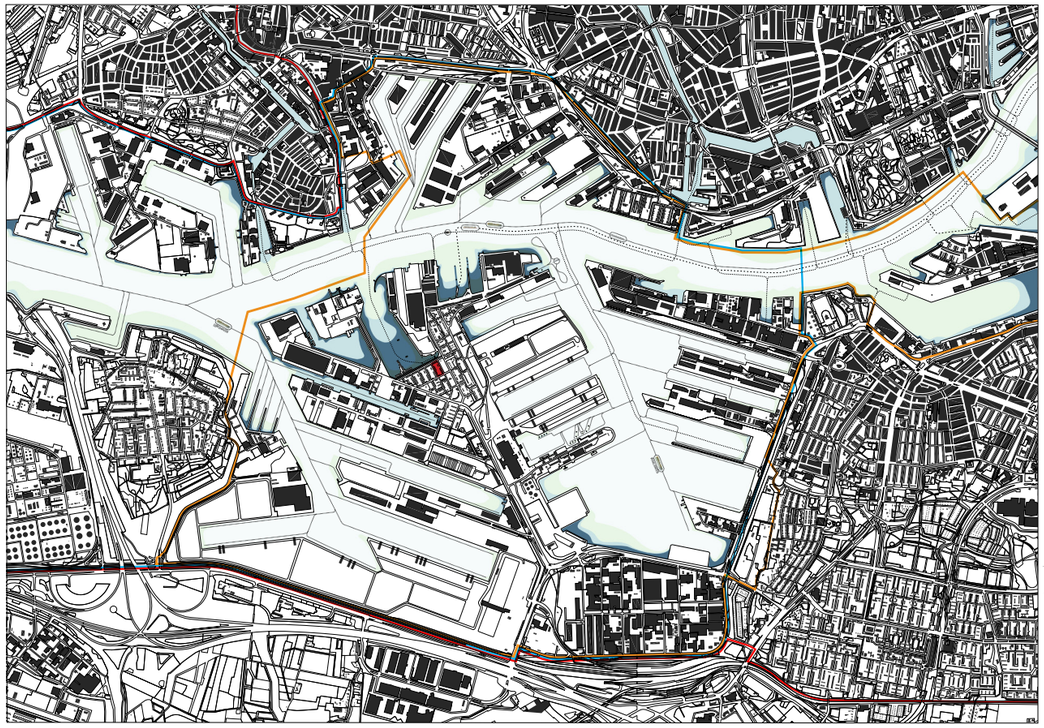


Fig.F /// *Heijplaat and its surroundings as figure ground. The site is marked in red, and the orange line represents the boundary of the Stadshavens Rotterdam 'Gebeidsplans', or masterplan.*

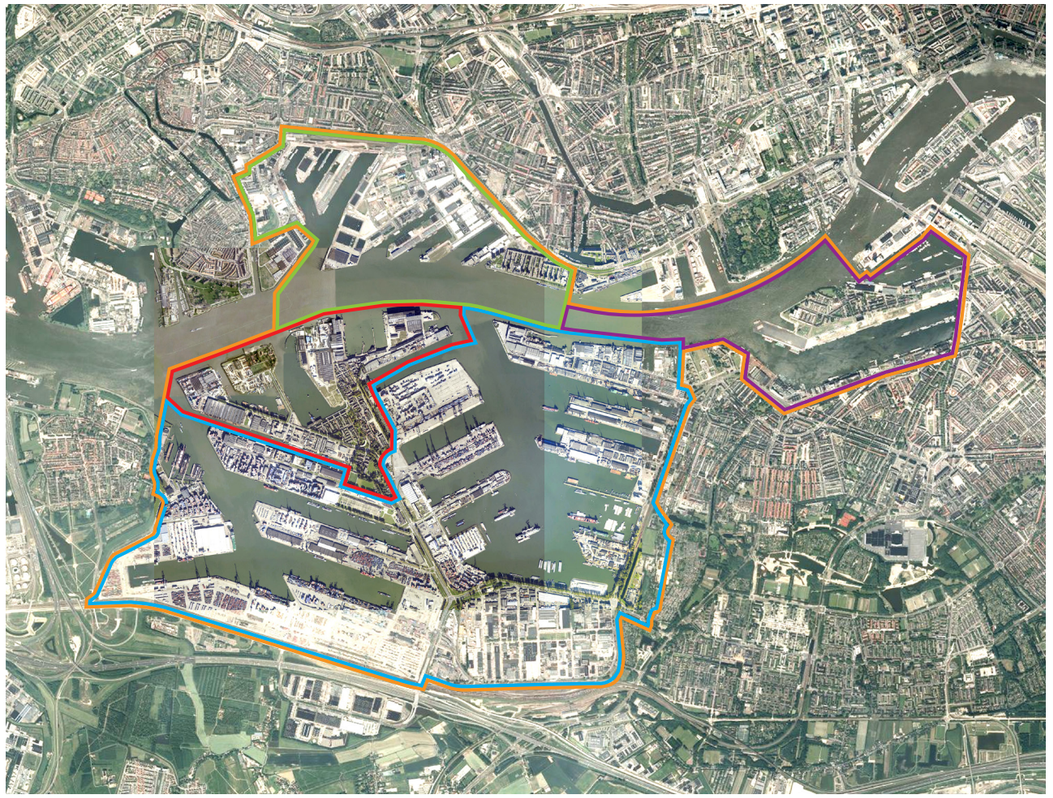


Fig.G /// *The Stadshavens Rotterdam masterplan introduces the inland shipping industry to Heijplaat and the surrounding area and sets out an aspiration for net-zero carbon, high quality residential and industrial development on former port land. The different coloured lines represent the different sub-areas within the overall masterplan. Heijplaat is bundled with the regeneration of the former shipyard at RDM, marked by the red line.*

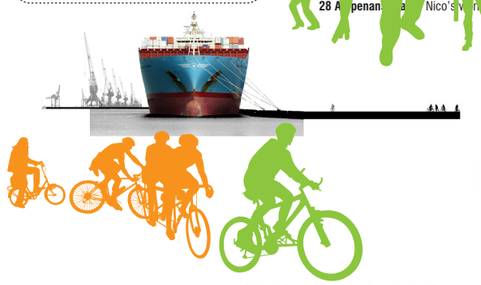
Fig.H /// *The striking contrast of industry and domesticity that characterises the inland shipping community. Richard and Liselle are interviewed by the BVB, a promotional organisation for the industry. Their lifestyle is perhaps surprisingly modern; Liselle runs a graphic design consultancy business using the vessels high speed internet connection, but occasionally needs to spend long periods of time in one place on land. Whilst the children are of pre-school age, the family can live comfortably aboard the vessel, but once compulsory school age is reached a choice must be made; either the children are sent to boarding school; or one parent lives ashore so that they can attend school. The SHIS facilitates accommodation in either situation.*

Fig.I (from top left) /// **A.** *Nico Prins - the host - has taken occupancy of a condemned terrace in Heijplaat, which he uses to host events for the local community focusing on storytelling and local cultural heritage. Nico's House becomes both the name of the project and the facilitating organisation* / **B.** *User Group 1: Tourists; daytrippers or overnighters who come for tours of teh port on a guided or independent basis, usually by bicycle.* / **C.** *User Group 2: Short-term Professionals; staying in Heijplaat for the purposes of short-term employment, consultancy or training.* / **D.** *16-18 year old young people in receipt of training; facilitated through the SHIS, a client of Nico's House.* / **E.** *SIngle-parent families associated with the inland shipping industry, in medium to long term shore-based residency facilitated through SHIS.* / **F.** *School Groups using Nico's House as an 'Extra SChool' for extra curricular teaching associated with nutrition, culture and language skills.*

Nico Prins /// Artist

Nico Prins is an artist working in Heijplaat. He has effectively assumed the role of unofficial community champion, using his practice to collect and tell the area's stories in a hope to influence the regeneration of the area. Born in neighbouring Pernis, Nico considers Heijplaat as 'native ground'; a place where he used to play as a child and where his father used to work as a bargeman. He has seen it change and will see it change again. Nico has a long term project to write a book about the area. His activity in Heijplaat is with that aim partially in mind.

I decided to return to Rotterdam to meet Nico after a long exchange of emails in which I learned a lot about the active community element of Heijplaat's population. Nico mentioned that he had rooms to rent after I contacted him through his *www.heijplaat.com* website, and so we set some dates. On my visit, I was able to attend a meeting of the resident's association as well as interview Nico and survey potential sites.



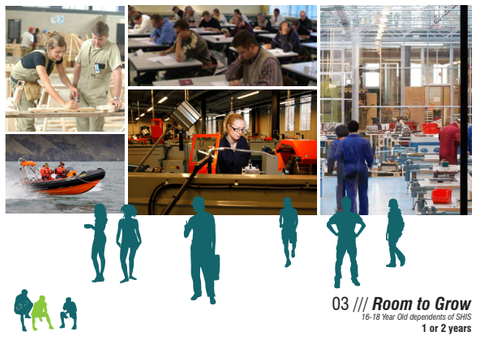
B.

01 /// ***The Spectacle of The Port***
Daytrippers / Overnight Guests
1 or 2 nights

C.

02 /// ***A Place To Stay***
'Troubleshooters' for Port-related businesses / 'Projetistas' (Creatives/Designers in Heijplaat for a project / SIAO Trainees (Industrial Dive School) / Exchange Students
1 week to 3 months

D.



03 /// ***Room to Grow***
16-18 Year Old dependents of SHIS
1 or 2 years

E.

04 /// ***A Home On Land***
Single-Parent Family with Young Children and Visiting Transient Partner
4 or 5 years

F.

01a /// ***The Extra School***
Small groups of children with teacher support / full class
A few hours to a **full day**

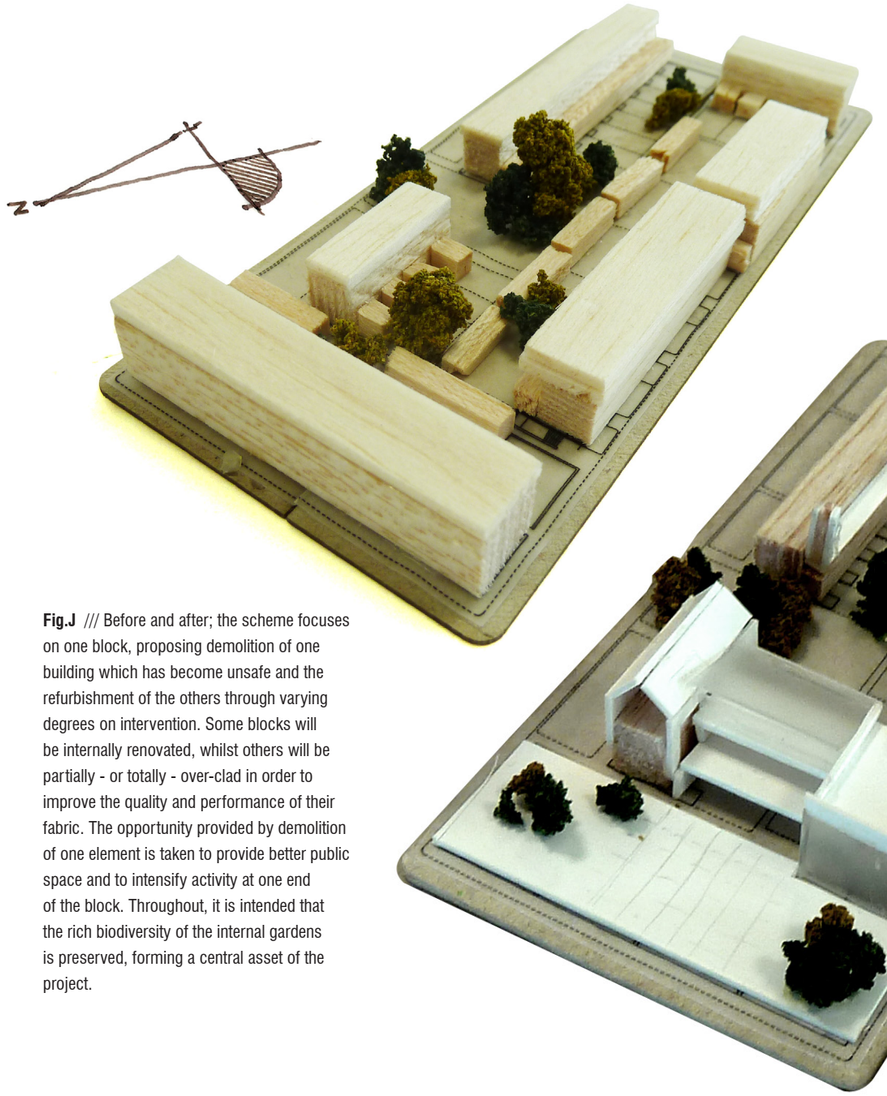


Fig.J /// Before and after; the scheme focuses on one block, proposing demolition of one building which has become unsafe and the refurbishment of the others through varying degrees on intervention. Some blocks will be internally renovated, whilst others will be partially - or totally - over-clad in order to improve the quality and performance of their fabric. The opportunity provided by demolition of one element is taken to provide better public space and to intensify activity at one end of the block. Throughout, it is intended that the rich biodiversity of the internal gardens is preserved, forming a central asset of the project.

Overview: *Technical Considerations Of Programme*

Nico's House hosts a number of different characters,on different bases, for different lengths of time. Its programme therefore has predominantly residential requirements which are subject to particular standards and guidance concerning their design. Essentially there are six programmatic functions that need to be considered;

1/ T**he Host (A.) -** The host need somewhere to live; and somewhere to work from that is private, in both a creative manner (library, studio, etc...) and an administrative role (building reception, administration offices, etc). They need good accessibility to the site and good views over it. They also require that the facility be designed to respect their guest's privacy. Issues of acoustic and visual separation will need to be considered in the design of the host's accommodation, and daylighting in the case of their creative workspace.

2/ **Guest B: Tourists -** The tourists need a place to meet; there needs to be a bike workshop and associated storage to provide them with transport; When they return, they need a place to est and maybe a place to wash. If they stay, then accommodation needs to be comfortable, secure and not too noisy. Essentially there are relatively few technical requirements from the point of view of the tourists as the building is merely a base for them. they are away most of the time.

3/ **Guest C: Short-Term Professional -** The needs of this group of guests are similar to Guest 1, although a greater sense of privacy and higher quality of finish is perhaps expected.

4/ **Guest D: 16-18 in Receipt of Training -** This group are at Nico's House in an arrangement of supported independent living. They are likely to have exuberant lifestyles and as such their attenuation with regard to the living environments of the other residents is a particular concern. there will be issues of acoustic and visual separation here, and also the design f other types of space for social activity, such as games rooms.

5/ **Guest E: Single-parent family -** This user group have both a high requirement for privacy and an occasional requirement of communality. They may have a close relationship with users in group 3.

6/ **Guest F: School Groups -** this user group have a technical requirement for robust spaces that are good learning and teaching environments. Equipment and facilities need to be to hand, and appropriately separated sanitary facilities need to be provided. Acoustics may be particularly important for group teaching spaces.

Approach to Detailed Design

The concept of 'guest' and 'host' is read from programme and on into an attitude to development in Heijplaat. The existing fabric of the area is viewed as the 'host', benefitting from a mutual relationship with its 'guests'; the new industry, a new community and new buildings. This attitude provides a point of departure for detailed and technical design, particularly with regard to the refurbishment of existing buildings. At every level, design moves should reinforce the idea of a mutually beneficial and reciprocal relationship between two or more elements, yet always imply future change. With regard to services design, for example, this could refer to the idea that systems and equipment are likely to be upgraded; design of facilities such as service channels and plant rooms must therefore account for this, perhaps allowing extra capacity for addition or extension, or allowing the possibility of disassembly and re-use. The idea of hosting can also be used to determine the location of certain programmatic elements based on assessment of function; for example, energy and services provision may be centrally located, controlled or accessed from the accommodation provided for the 'host' organisation of Nico's House. This literal alignment reflects the functional likelihood that the hosts will be responsible for performing maintenance checks and receiving supply deliveries.

Structurally the idea of 'guest' and 'host' is straightforward, although promises rich avenues of enquiry; 'guest' elements could sit on or hang from existing 'host' elements, providing support in return for shelter, services or urban vitality. At the level of detailed design, the concept of 'guest' and 'host' may simply be read in the way that materials are joined or - with particular reference to moveable elements such as doors and windows - in the way that they move apart.

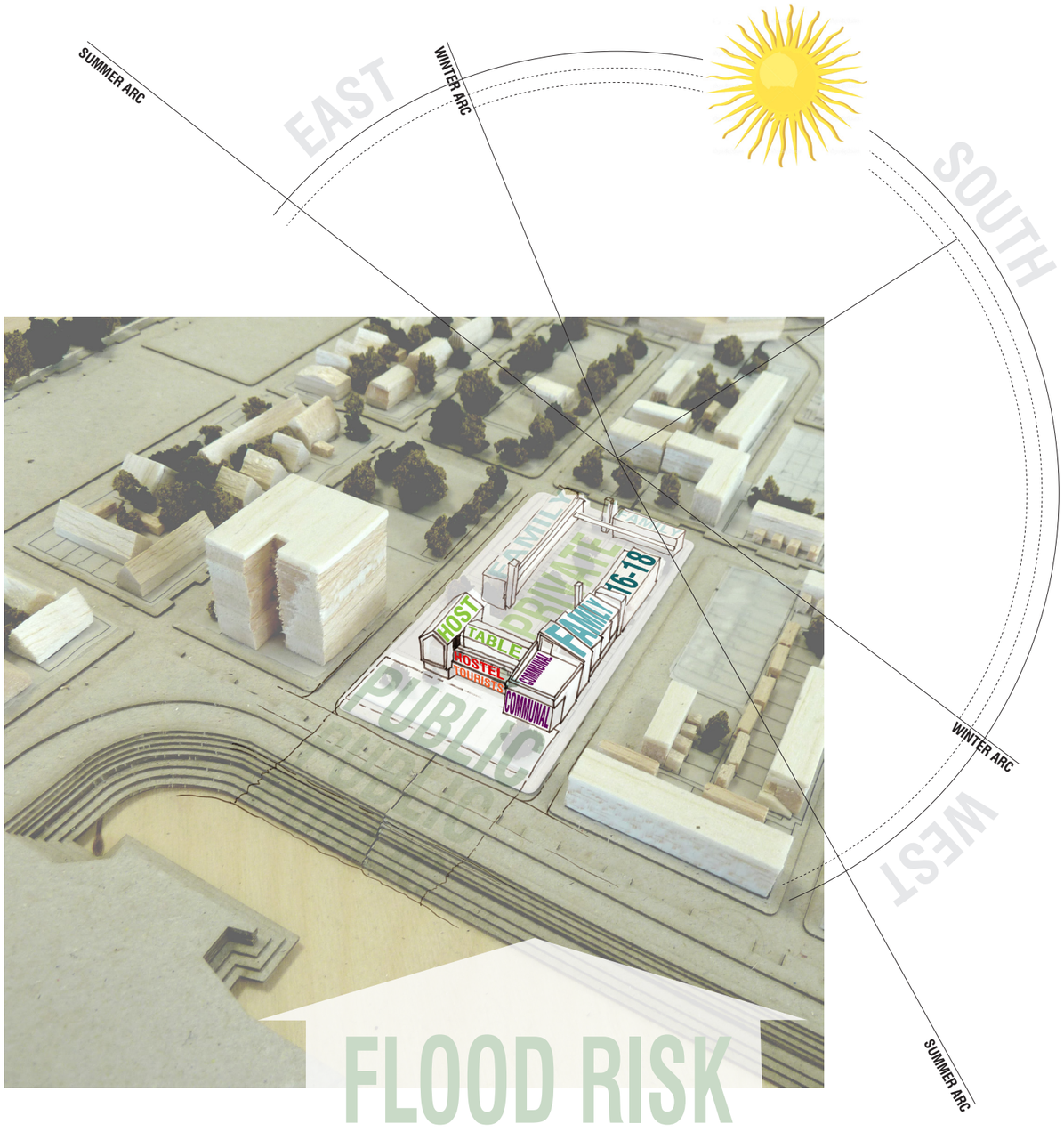
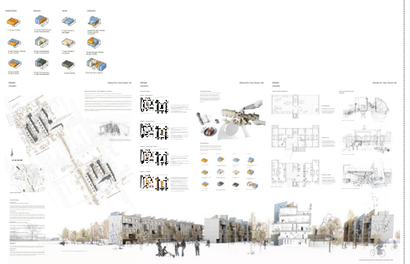


Fig.K /// Scheme in its context. The site is close to water and relatively low-lying, placing it at risk from flooding. It's long side is orientated roughly SE-NW, giving the internal gardens a good exposure to the sun. The site sits immediately adjacent to a new housing block, intended to provide transitional accommodation for local residents as the area is developed. To the east lies Tuindorp Heijplaat; the listed national monument and original garden suburb associated with the RDM shipyard. To the west lies the rest of Heijplaat 's post-war extension. The site is ideally placed to transgress a number of boundaries and 'edges'.

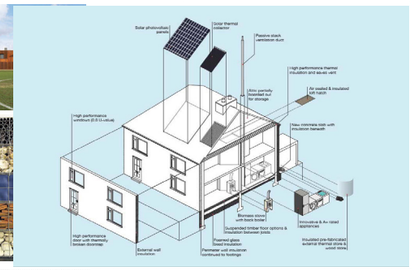
R01 /// **Wood For The Hood** Architect.// **Paul Bower / Urbed**



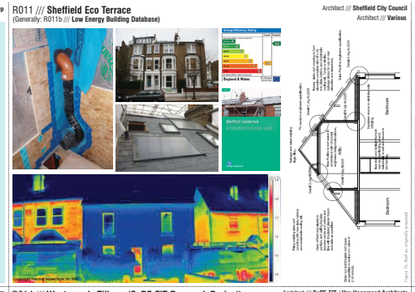
R02 /// **Retrofit For Living -** *61 Warwall, London* Architect.// **Penoyre & Prasad**

R03 /// **Hackney Marshes Centre**

R010 /// **Carbon Co-Op Free Retrofit Surveys** Architect.// **Carbon Co-Op**

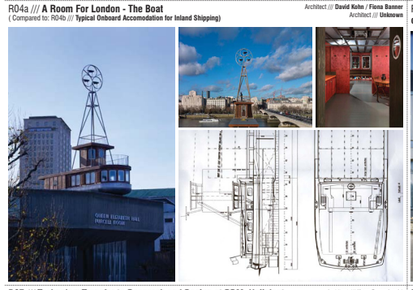


R011 /// **Sheffield Eco Terrace**
(Generally: R011b /// **Low Energy Building Database**) Architect.// **Sheffield City Council** Architect.// **Various**



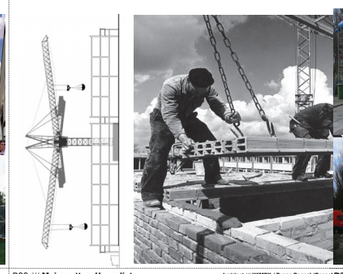
R012 /// **Retrofit For The Future, Rotherham** Architect.// **Urbed**

R04a /// **A Room For London - The Boat** Architect.// **David Kohn / Fiona Banner**
(Compared to: R04b /// **Typical Onboard Accomodation for Inland Shipping)** Architect.// **Unknown**



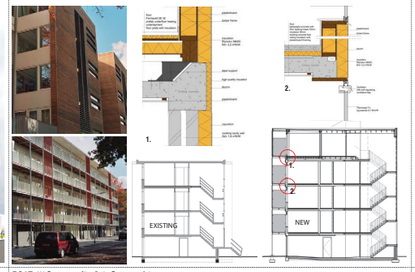
R05 /// **Ilot Schoettlé Housing, Mulhouse, France / Nantes School of Architecture, France / Latapie House, Floirac, France.** Architect.// **Anne Lacaton & Jean-Phillipe Vassal**

R06 /// **Original Construction, Post-War Housing, Heijplaat** Architect.// **Rotterdam Development Corporation**

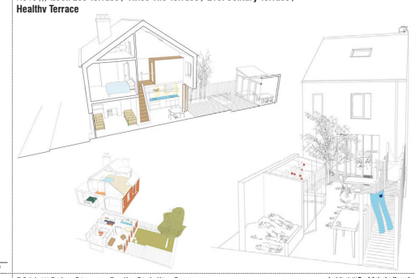


R013 /// **Prefabrication - Concept House Village, Heijplaat** Architect.// **Concept House Consortium**

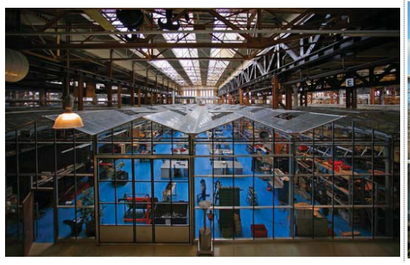
R014 /// **Westerpark, Tilburg (SuRE-FIT Research Project)** Architect.// **SuRE-FIT / Van Hoogmoed Architects**



R015 /// **£50k Eco Terrace / Twice The Terrace / 21st Century Terrace / Healthy Terrace** Architect.// **Ash Sakula**

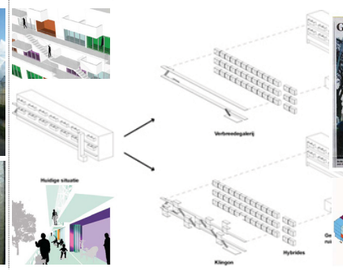


R07 /// **TechnologyTransfer to Research and Design at RDM, Heijplaat** Architect.// **Koen Barendrecht**



R08 /// **Industrial Greenhouse Construction at Naaldwijk** Architect.// **Unknown**

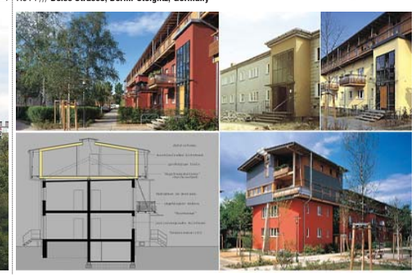
R09 /// **Maisonettes, Hoogvliet** Architect.// **WMBY / Duzan Doepel (Doepel Strijkers)**



R016 /// **Wallis Block, Pendrecht** Architect.// **Henk van Schagen / Hulshof Architecten**

R017 /// **Community Art, Overvecht** Architect.// **HK Designers / Local Actors / Local Authority**

R014 /// **Belss Strasse, Berlin-Steiglitz, Germany** Architect.// **Bauhäusische Kassel**



Technical Precedents: *Overview*

Refurbishment Soundings

The refurbishment of existing buildings is a very broad topic, covering everything from simple maintenance and conservation of existing fabric to radical re-imaging through almost total replacement of certain elements. In between sit instances of unusual technology transfer from industrial to domestic use and of participatory practices of inclusive design aimed at retaining social value in regeneration. In general, refurbishment aims to adapt existing buildings to current - and future - requirements in terms of social function, spatial possibility and particularly, energy use and carbon emissions.

To address the complexity of the field I have continued the methodology of 'soundings' - a process of collecting case-studies together as a body of research that can be easily referenced and retained as a product of this architectural thesis project [4]. The image above illustrates a selection of 'soundings' laid out as a sheet, whilst the image to the right illustrates their compilation as a more use-able research document.

The facing page critically assesses three selected precedent studies of particular relevance to the issue of refurbishing existing buildings of a post-war, residential nature.

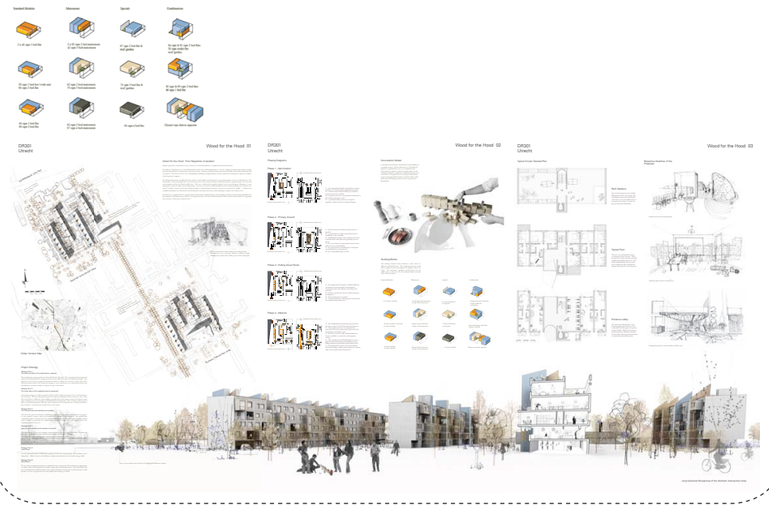
[4] For more information about 'soundings' please refer to the accompanying document: **BROWN, S.** (2012) *Cultivating Heijplaat - Design Report.* Sheffield: Sheffield School of Architecture, p.14.

Fig.L (above) /// 'Soundings' of refurbishment, possible technology transfer, existing structures and practices of community involvement.

Fig.M (right) /// Collated format of soundings; a useable resource in design studio.

R01 /// **Wood For The Hood**

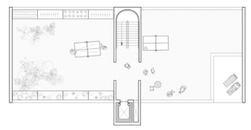
Architect /// **Paul Bower / Urbed**



Wood for the Hood - is a Europan10 entry (2010) by Paul Bower that addressed an area of post-war housing in Utrecht similar to that found in Heijplaat. The site is also similarly accessible by the Dutch inland waterways network and utilises this with regard to the delivery to site of construction elements and the sourcing of biomass fuel for energy generation.

The project demonstrates how the insertion of new structural lift-cores, constructed in cross-laminated timber, can provide a base for further additions to an existing structure, particularly where the capacity of the original structure to take extra loads in unknown. It also takes the opportunity generated by the new insertions to re-adjust the internal spatial layouts of the previously inflexible post-war dwellings, updating them to suit modern lifestyles and social units and to create opportunities for social encounter between residents. New lift-cores and additional elements of the floor-plan are expressed externally on the building's new elevation, celebrating the refurbishment architecturally.

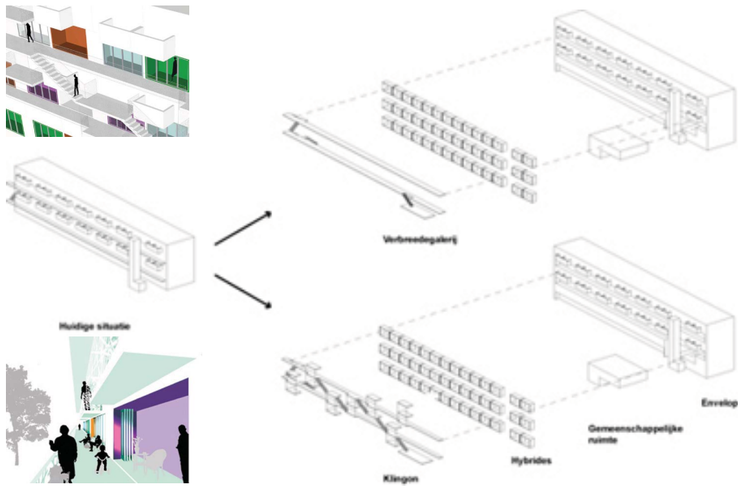
Perhaps most importantly, it treats the existing conditions as an 'eco-system', selecting technical design solutions such as prefabrication and over-cladding according to their constrained impact on that system. This is where it has the strongest resonance with design intentions in *Cultivating Heijplaat.*



[5] **BOWER, P** (2010) *Wood For The Hood - Europan10 Entry.* Rotterdam, Europan Nederland.

R09 /// **Maisonettes, Hoogvliet**

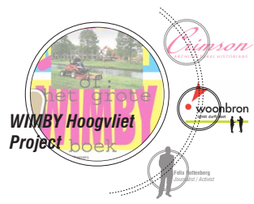
Architect /// **WiMBY / Duzan Doepel (Doepel Strijkers) / Krill Architecture**

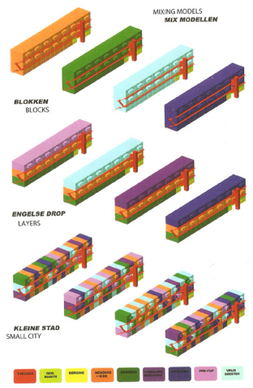


The WIMBY! Project - initiated by *Crimson Architectural Historians* in Heijplaat's neighbouring district of Hoogvliet and with the support of land-owning Housing Association Woonbron - set out to engage local residents in the regeneration of their neighbourhood. In doing so it discovered that often, small alterations to existing buildings were all that is needed to render them more liveable.

In the specific example of the Hoogvliet Maisonettes - inhabited largely by a mix of immigrant, single-parent families and elderly pensioners, both attracted by the low rents available for ageing post-war properties - the addition of a walkway and new lift-core externally greatly improved accessibility. The new walkways were oversized so as to also provide extra external space that could perform a social function, particularly addressing the cultural needs of immigrant families whilst also encouraging social contact between the elderly and the community of the block.

The technical solution to accessibility also allowed an updated configuration of internal spaces and dwelling-types to suit modern lifestyles and family-units. By moving circulation to the outside face of the building, more space was left inside the dwellings for living area. The technical solution is fully integrated with the spatial design proposals.

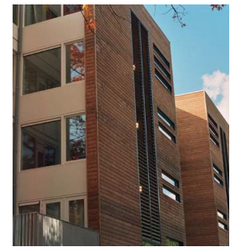


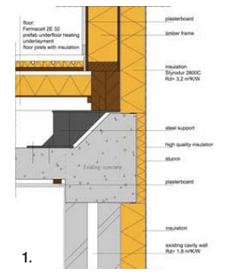


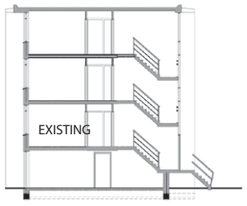
[6] **CRIMSON ARCHITECTURAL HISTORIANS** and **ROTTENBERG, F.** (2007) *WiMBY! Hoogvliet: Future, Past and Present of a New Town or: The Big WiMBY Book.* Rotterdam, NAi Publishers, p.398.

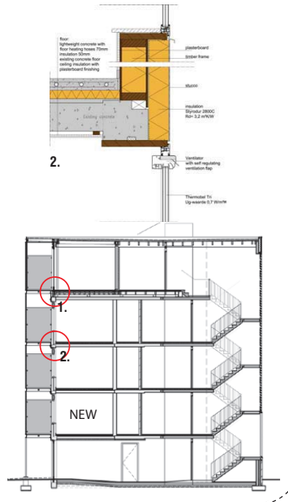
R014 /// **Westerpark, Tilburg (SuRE-FIT Research Project)**

Architect /// **SuRE-FIT / Van Hoogmoed Architects**





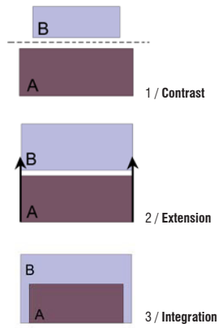




SuRE-FIT - is a European-wide research project into the energy-efficient refurbishment of existing buildings, funded by indirectly by the *European Community* (EC) via *Intelligent Energy Europe* and involving a wide variety of built environment professionals, including architects, alongside housing associations, 'money men', developers and local authorities. It aims to establish refurbishment as a financially viable option for sustainable development in Europe [7].

SuRE-FIT manifests itself as a report and web-based information portal. Architects, industrial designers, architectural engineers, local governments, universities and energy agencies from Germany, France, Denmark, Poland, the Netherlands, Italy, Sweden, the Czech republic and Slovakia took part in this research project, although UK-based participants are notably absent.

SuRE-FIT focuses generally on the concept of 'roof-topping' and uses three types to classify the technical and architectural strategies for refurbishment; 'contrast', in which the new element sits on top of the existing structure and reads as a separate form; 'extension', by which the new element is a visual continuation of the existing; and 'integration', by which an entirely new external envelope is added to the existing structure. The database is a useful resource as it feature technical details alongside statements of design intent for a number of projects across Europe. This report will refer to SuRE-FIT again in later sections.



[7] **SuRE-FIT** (2009) *SuRE-FIT Research Project - Build On Top: Duurzame revitalising Westerpark.* Brussels: Intelligent Energy Europe, p.5.

Standards: *Passivhaus* and the *Code for Sustainable Homes*

The *Stadshavens Rotterdam* initiative calls for net-zero-carbon development in Heijplaat. In a UK context, there there are two main standards to be aware of in reference to the quest for zero-carbon housing; *Passivhaus* and the *Code For Sustainable Homes*. Both are intended to reduce, minimise and conserve energy loss in the building, aiming to improve efficiency within the home, whilst reducing cost for the owner.

Each is characterised principally by a different focus; whereas the *Passivhaus* standard's aim is to dramatically reduce the requirement for space heating and cooling through an airtight building envelope with high levels of insulation, the Code for Sustainable Homes' primary aims are to reduce CO_2 emissions from a building, taking into account the whole life cycle of a building. The Code for Sustainable Homes actively encourages the use of renewable energy technologies, whereas *Passivhaus* is primarily values innovative design and use of materials [8] as well as quality workmanship and good orientation. *Passivhaus* is a voluntary building standard, although this does not mean it is any easier or cheaper to achieve than the legislated Code for Sustainable Homes. U-values - a measure of a building's fabric performance with regard to thermal transmission - as low as 0.15 W/m^2.K are required, which requires significant skill and expertise with attention to detail in order to remove draughts and air loss in making the building airtight. Homes assessed against the Code For Sustainable Homes can achieve a score of zero to six, whereas *Passivhaus* is more of a 'benchmark' that is either met or missed.

Both Passivhaus and the *Code for Sustainable Homes* are principally intended for new build homes. However, Passivhaus is accompanied by a refurbishment standard called "EnerPHit", which has a greater tolerance in terms of permissible U-values in acknowledgement of the increased complexities with retrofitting insulation and difficulties in modifying the existing orientation and design layout of existing buildings.

The *Code for Sustainable Homes* is a more recently developed evaluation tool operated by the Building Research Establishment (BRE) Global specifically for housing. BRE Global have also long operated and maintained BREEAM as a more general tool for evaluating, measuring and sharing knowledge on the built environment and the standard is now often required by clients in the UK, most notable government departments and public bodies. The BREEAM Domestic Refurbishment guidance scheme is the Code For Sustainable Homes' equivalent refurbishment-focused standard, although it too remains unlegislated. The scheme provides a methodology, software tool and certification for those responsible for delivery of sustainable domestic refurbishment projects [9], and BREEAM-NL is certified to operate in the Netherlands under franchise from BRE Global.

Both the Code for Sustainable Homes and Passivhaus have their various strengths and weaknesses, as the Passivhaus stipulates much higher requirements of thermal insulation, whereas does not require use of renewable energy sources. The Code meanwhile, encourages renewable energy sources, although these may be wasted if the building envelope is not adequately sealed enough. As such it is believed both can benefit from one another in taking a balanced approach to achieving our low carbon targets. Passivhaus is a low energy standard and if correctly followed, would achieve an approximate Code level 4. Achieving the higher Code levels 5 to 6 would require use of renewable energy technologies such as solar panels and wind turbines.

Achieving Code level 6 requires greater innovation and attention to design, as a Carbon Zero home would necessitate a net energy gain, through use of renewable energy, combined with improved thermal performance of the building fabric. As such, Cultivating Heijplaat will refer to both the Code for Sustainable Homes and to Passivhaus principals for guidance as it develops a strategy for developing a net-zero-carbon design. Resources to support design are available, including software tools, 'checklist' style design pointers and documented case studies.

[8] **ENERGY MEASURES** (2011) *Passivhaus vs Code For Sustainable Homes.* [WWW] Available from: http://www.energy-measures.com/passivhaus/passivhaus_code_sustainable_homes.php. [Accessed: 27/03/2012].

[9] **BRE GROUP** (2011) *BREEAM Domestic Refurbishment* [WWW] Available from: hhttp://www.breeam.org/filelibrary/BREEAM%20Refurb/KN4613_-_BREEAM_Domestic_Refurbishment.pdf [Accessed: 27/03/2012].

[10] **SuRE-FIT** (2009) *SuRE-FIT Research Project - Build On Top: Duurzame revitalisering Westerpark.* Brussels: Intelligent Energy Europe, p.52.

[11] Please refer to **RIBA** (2009) *Climate Change Toolkit 07: Designing for Flood Risk.* London: RIBA Publishing [also WWW] Available from: http://www.architecture.com/Files/RIBAHoldings/PolicyAndInternationalRelations/Policy/Environment/2Designing_for_floodrisk.pdf. [Accessed: 28/03/2012].

Local Standards: GPR in the Netherlands

The sustainability tool GPR® is being used in the Netherlands by municipalities and housing associations to set sustainable targets in their restructuring and renovation policies. Architects and project developers use it during the design process to achieve sustainable projects [10].

GPR® is a software tool, which quantifies the environmental impact and the design quality for new buildings as well as for the refurbishment of existing buildings. It is suitable as a decision making tool as it helps to find an optimum between the reduction of environmental load along with improvement of the quality of the building and takes into consideration the social impact of development as well as the net change in social value generated by it.

GPR uses 5 criteria; energy; environment; health; user quality and future value. For each module a score can be achieved on a scale of 1 to 10 for both the current quality of the building as well as the quality obtained after refurbishment. It is supposed to display in one glance the quality of a refurbished building, using a starting score of 5 that is then pegged up and down. GPR is based on Dutch legislation and European regulations such as the Energy Performance of Buildings Directive (EPBD) and European NEN-norms.

	social cultural aspects			environmental aspects			financial aspects			
scenario	maintaining urban structure	withstand impoverishment	preservation cultural heritage	CO2 emission	energie-performance	sustainability	rent /dwelling	energy cost	invested capital	total score
Maintenance	+	--	++	+	-	-	++	--	++	-2
Renovation	+	++	+	++	+	+	+	+	+	+11
Renovation Plus	+	++	+	+	++	++	-	++	-	+9
New building	-	++	--	-	++	++	--	++	-	+1

Fig.N /// A snapshot of GPR criteria used to compare strategies of 'maintenance', 'renovation', 'renovation plus' and 'new building' in the SuRE-FIT Westerpark case study in Tilburg, NL. For further information, please refer to: **SuRE-FIT** (2009) *SuRE-FIT Research Project - Build On Top: Duurzame revitalisering Westerpark.* Brussels: Intelligent Energy Europe, p.52.

Flood Risk: Resilient Strategies

Heijplaat lies outside Rotterdam's protective ring of dykes. District Authorities in the Netherlands hold detailed urban plans that address this issue at an urban scale; more often that not there is a simple architectural requirement for building design to elevate the ground floor by 72cm above the anticipated flood level and not to programme ground floor spaces with dormitory functions.

Additionally, it is best practice to use resilient and robust materials in construction at risk from flooding, especially with regard to ground floor structure and basic finishes. As raisin the ground floor level is unfeasible in *Cultivating Heijplaat* any alterations to the ground floor will follow this latter strategy, adopting pre-cast and in-situ concrete elements as material expression throughout the ground floor. The new insertions will feature a concrete base that is continued up to first floor level, conveniently providing a level threshold for the installation of cross-laminated timber panels. Advice on designing to mitigate flood risk, with particular reference to 'resilient' and 'resistant' strategies, is available from the RIBA [11].

Fig.O /// Programmatic and material strategies to facilitate flood resilient design.

Collective Energy Provision - Making refurbishment affordable

We know that we are technically capable of reducing energy consumption in buildings to net-zero, or near net-zero levels; yet it is the cost associated with doing so which remains prohibitive [12].

Combining rent and energy provision - in order to think and act in terms of whole living costs - is an essential regulatory and policy-level recommendation that could improve the attraction of refurbishment to housing associations and developers. Therefore it is important to take into consideration the use of collective energy systems like thermal energy storage, photovoltaic systems, solar panels, HR ventilation etc [13].

The average cost for renovating a dwelling is somewhere around 60,000 euros. Adding an additional storey to a post-war housing block raises this to around 119,000euros [14]. Purchasing land increases this further still. If no action is taken energy costs will exceed the costs for rent in 2016 [15]. Although rents will be higher due to renovation, energy costs will be lower. Bundling them together ensures that 'living costs' remain the same - or at least, don't rise.

Biomass CHP

Nico's House will utilise a Combined Heat and Power (CHP) system to provide electricity and hot water at the scale of the entire urban block. The *Stadshavens Rotterdam* masterplan demands net-zero carbon development in Heijplaat; this is unlikely to be possible without addressing energy provision at the scale of the neighbourhood as a whole, including the surrounding industry. Therefore, the plant room design for Nico's House should allow for the removal of installed equipment to facilitate its reuse elsewhere, whilst being appropriately position to facilitate connection to neighbourhood scale heating and power systems in the future.

Biomass is a reasonable assumption with regard to fuel source. The inland waterway network allows access to sources of fuel, most notably pellets manufactured from waste sawdust from timber processing facilities in the Rotterdam region. In theory, the waterways open up the site to much of Europe via a relatively low-carbon mode of freight transport. Therefore, the embodied energy of biomass used in Heijplaat will be comparably less than many places elsewhere. A precedent proposal of biomass CHP at the scale of an urban block and in the refurbishment of Dutch post-war housing can be found in the Wood for the Hood project by Paul Bower [16].

Solar Energy

It is almost unimaginable these days to not consider the micro-generation of energy by solar means in the design of a building. Heijplaat is surrounded by relatively low-lying land and the surrounding industry is spread out, meaning that access to the sun - when it is shining - is good. However, the blocks themselves are not particularly well orientated; nor are they so poorly orientated as to rule out passive solar design in new elements. The addition of an extra storey in refurbishment raises the opportunity to redesign the roofscape to best exploit the potential of solar energy generation. Energy generated by roof-mounted photovoltaic arrays can be collected and transferred through the service channels in the new insertions, whilst solar thermal collectors may be able to be used to top up the domestic heating system, which otherwise will rely solely on the output of the CHP system. The SuRE-FIT precedent refurbishment at Westerpark utilised 'energy roof' technology, which features pipes laid into roof finishes that can collect solar energy in a similar manner to a ground-source heat pump.

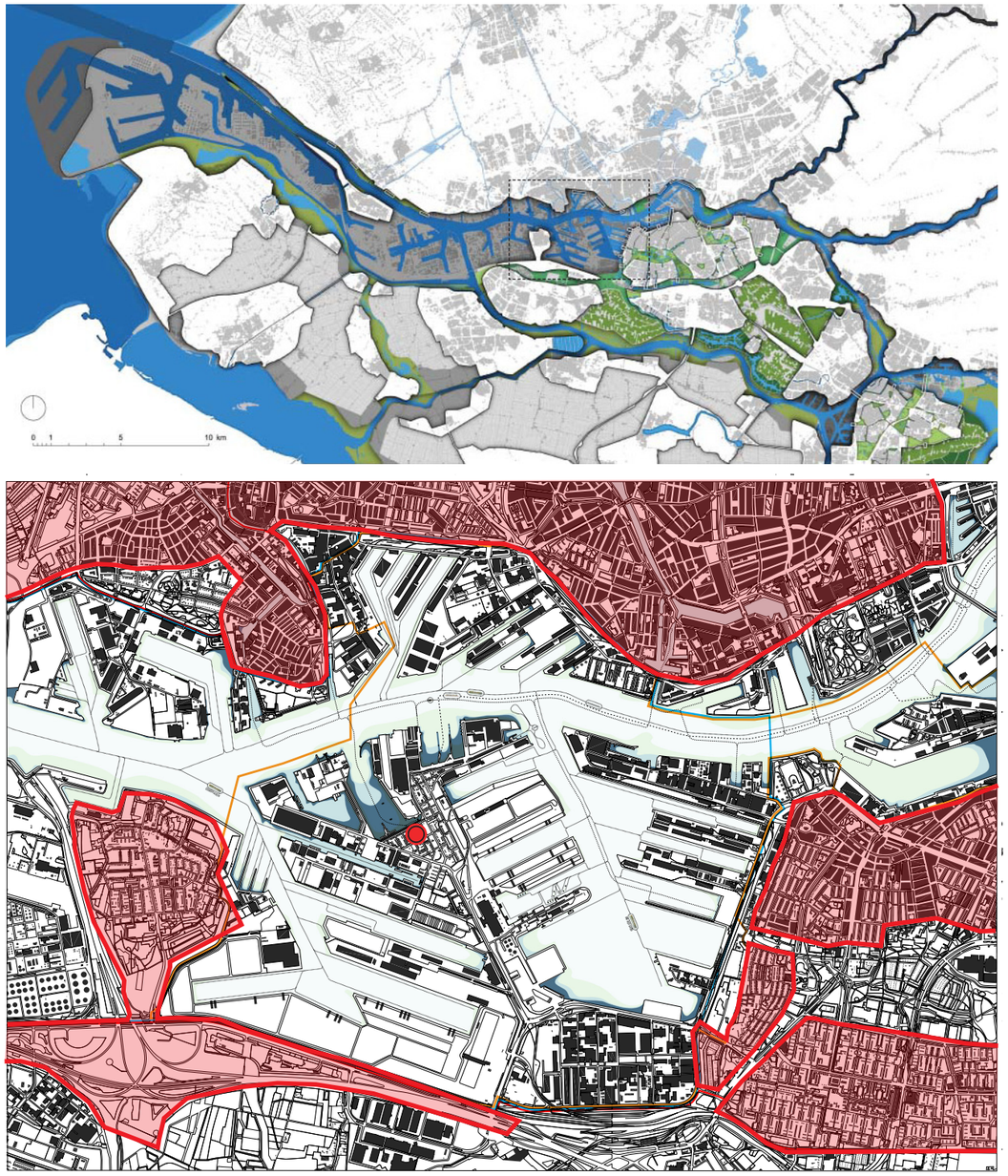


Fig.P /// *(top) Flood Protection Strategy for Greater Rotterdam; (bottom) Map illustrating location of site in relation to protective ring of dykes.*

[12] **SuRE-FIT** (2009) *SuRE-FIT Research Project - Build On Top: Duurzame revitalisering Westerpark.* Brussels: Intelligent Energy Europe, p.2.

[13] **Ibid.** p.2

[14] **Ibid.** p.12

[15] **Ibid.** p.42

[16] Please refer to **Technical Precedents**, p.6.

Existing Buildings: *On-going*

The Case for Refurbishment in Heijplaat

> *"The emerging importance of the reduction of CO_2 emission and energy-use is evident. Living is for $^1/_3$ responsible for the total emission of CO_2. Traffic and industry make up for the remaining $^2/_3$. In Europe there are over 200 million multi-family houses. The impact of these houses on CO_2 emission is huge. Research in name of the SuREFIT Research Project shows that of these 200 million houses, 7.3 million are potential rooftop candidates. Would these buildings be roof-topped, an annual reduction of CO_2 emission could be reached equal to the emission of 2.5 million cars per year. Rising energy prices tend to make the poor insulated dwellings unaffordable in the near future, with social problems as a result. The question arises how to revitalize this existing housing stock the best way. From a financial, environmental and social point of view."*
>
> **SuRE-FIT Research Project (2009), p.1**

A simple statement: It is important that we take retrofit and refurbishment seriously. EU targets for reductions in CO_2 emissions will simply not be met without it. In the UK we know we must reduce carbon dioxide (CO_2) emissions from our housing stock by at least 80% by 2050. We also know that this target can only be achieved by tackling the CO_2 emissions from our existing housing stock, which even by 2050 will still account for the largest portion of domestic emissions. By some estimates, this is around 17 million dwellings [18]. However, as illustrated in the introductory quote to this section, this is a *European* problem that manifests itself physically, economically and socially at a local level. In the Netherlands, the *SuRE-FIT Research Project* estimates that there are c.400,000 dwellings appropriate for economically viable refurbishment through strategic 'rooftopping' [19].

The *Stadshavens Rotterdam* masterplan proposes complete demolition of Heijplaat's post-war housing stock, ignorant of its inherent value in terms of embodied energy, 'locked-in' carbon and social heritage due to reasons of economic ease. Often it is not only architects and planners, but also residents that are increasingly positive about the qualities of post-war housing when compared to generic gentrification [20]. Existing buildings often have existing users; people who attach some value to them, whether informally through use of the wider neighbourhood or in more formalised relationships of residence, ownership and tenancy. Heijplaat in particular retains a rich story within its fabric, of residency and civic life tied closely to the operation of it's former shipyard and its historically important role within the wider city of Rotterdam. Relative to the working period of the shipyard, the post-war extension has now existed as part of Heijplaat's urban fabric for longer than it was absent, helping to frame and cultivate a rich social and cultural history.

The buildings themselves are worth preserving, not only for their embodied carbon, but also for the their embodied social capital. It is therefore important that existing residents are involved as much as possible in regeneration, encouraged to take a stake in it and allowed to benefit from the renewal. It is here that *Nico's House* - as an organisation - plays a key role in facilitating the engagement of Heijplaat's community in its regeneration [21].

Understanding What Is There - Methodology

Understanding the fabric of the existing buildings is crucial to refurbishment. Lacking the capacity to conduct a full survey, this thesis project is exploring the existing buildings remotely building on basic photographic and dimensional information gathered in an initial visit. This is an ongoing process utilising computer modelling and drawing alongside historical research (often in Dutch). As work-in-progress it is based largely upon 'likely' scenarios, rather than definitive known conclusions and will result in a set of 'best known condition' survey drawings of the existing structures illustrating a technical - as well as social - understanding of their fabric.

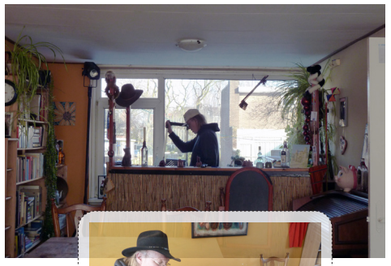
[17] **SuRE-FIT** (2009) *SuRE-FIT Research Project - Build On Top: Duurzame revitalising Westerpark.* Brussels: Intelligent Energy Europe, p.1.

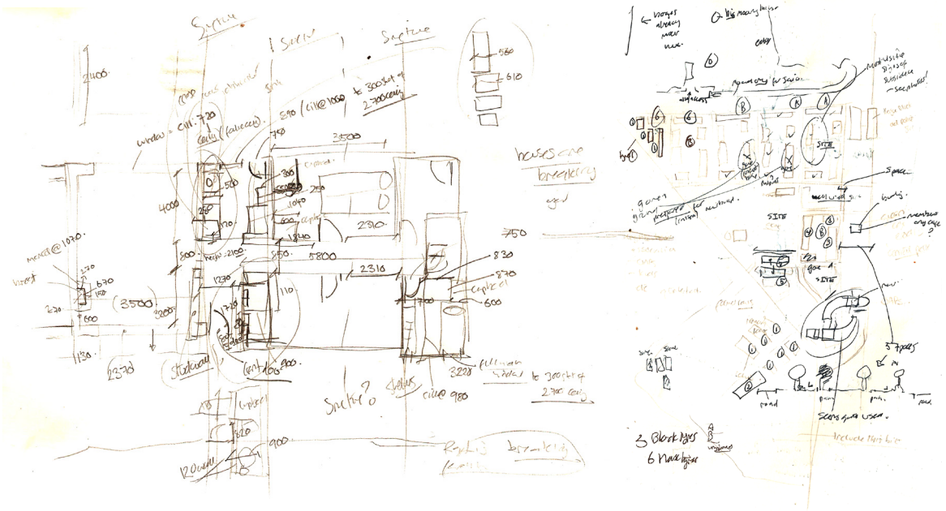
[18] **ENERGY SAVING TRUST** (2010) *Sheffield EcoTerrace: A Refurbishment Case Study.* London: Energy Saving Trust, p.1.

[19] **SuRE-FIT** (2009) *SuRE-FIT Research Project - Build On Top: Duurzame revitalisering Westerpark.* Brussels: Intelligent Energy Europe, p.12. Refer also to 'Technical Precedents, p.XX in this document).

[20] **ENERGY SAVING TRUST** (2010) *Sheffield EcoTerrace: A Refurbishment Case Study.* London: Energy Saving Trust, p.2..

[21] Please refer to the accompanying document: **BROWN, S.** (2012) *Cultivating Heijplaat - Management Report.* Sheffield: Sheffield School of Architecture, pp.8-9.





Nico Prins /// Artist

Nico Prins is an artist working in Heijplaat. He has effectively assumed the role of unofficial community champion, using his practice to collect and tell the area's stories in a hope to influence the regeneration of the area. Born in neighbouring Pernis, Nico considers Heijplaat as 'native ground'; a place where he used to play as a child and where his father used to work as a bargeman. He has seen it change and will see it change again. Nico has a long term project to write a book about the area. His activity in Heijplaat is with that aim partially in mind.

I decided to return to Rotterdam to meet Nico after a long exchange of emails in which I learned a lot about the active community element of Heijplaat's population. Nico mentioned that he had rooms to rent after I contacted him through his *www.heijplaat.com* website, and so we set some dates. On my visit, I was able to attend a meeting of the resident's association as well as interview Nico and survey potential sites.

Fig.0 /// Nico's House; an opportunity to visit the existing buildings. A measured survey was taken along with plenty of photographs. Although largely inflexible, internal arrangements often feature well day- lit spaces, especially in a spacious living room.

Fig.R (from top) /// **A.** *Architect of Heijplaat's post-war extension, JCW Boks. Boks was a known associate of the Dutch modernist delegation to CIAM and is likely to have used contemporary innovative building techniques, such as the Pronto building system.* / **B.** *Heijplaat's post-war housing extension. The Google image is slightly out of date, as approximately 15-20% of plots have been demolished due to structural deficiencies or new investment.* / **C., D. and E.** *The Pronto building system, designed to be 'quick and easy', utilised a hybrid of traditionary masonry construction and prefabricated concrete components, most notable floor slabs.* / **F.** *Heijplaat at the height of activity at the RDM shipyard. Note the proximity of the dwellings to ship construction.*

A.

B.

C.

D.

E.

F.

[22] **BLOM, A, BREGIT, J and VEN DER HEIDE, M.** (2004) *De Typologie van de vroeg-naoorlogse woonwijken.Published in: Zeist, April 2004 issue.*

[23] **SuRE-FIT** (2009) *SuRE-FIT Research Project - Build On Top: Duurzame revitalisering Westerpark.* Brussels: Intelligent Energy Europe, p.10.

[24] **ENERGY SAVING TRUST** (2010) *Sheffield EcoTerrace: A Refurbishment Case Study.* London: Energy Saving Trust, p.12.

[25] **SuRE-FIT** (2009) *SuRE-FIT Research Project - Build On Top: Duurzame revitalisering Westerpark.* Brussels: Intelligent Energy Europe, pp.20-21.

[26] **Ibid, p.21.**

Post-War Reconstruction

Post-War construction throughout Europe is characterised by the need to erect large quantity of housing in a relatively short space of time, using a largely inexperienced labour-force in a context of material scarcity. Dutch cities grew rapidly with the associated boom in the construction industry in the 1950s. The emphasis was on medium- and high-rise housing, on subsidized social housing and on austerity and uniformity [22]. These blocks, meant to cope with the rapid increase of the population, where affordable and of good quality. Nowadays these blocks are old and most of them are in a poor condition. The most common flaws of the existing dwellings consists of a bad energy performance, poor technical state, small and inflexible floor plans, small balconies and a limited variety in the population of the blocks [23].

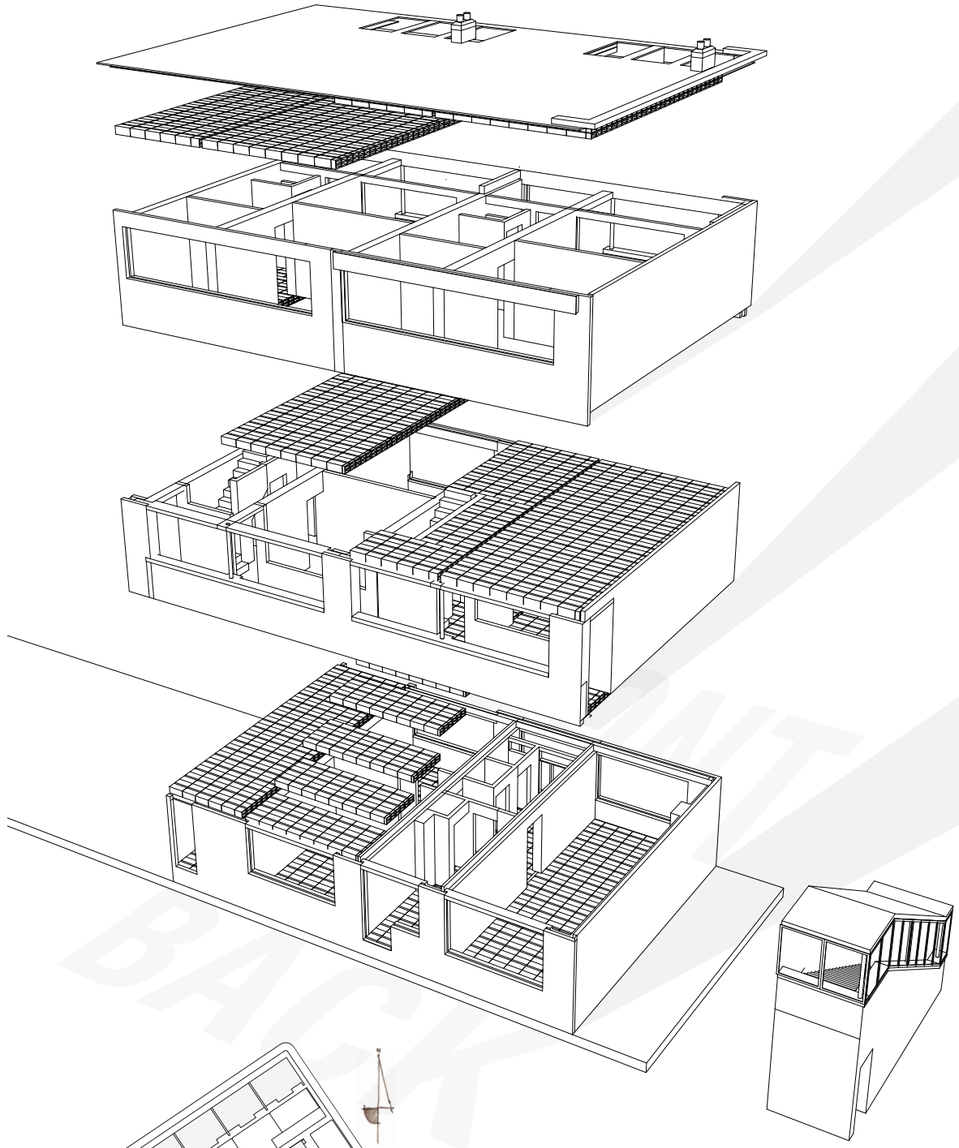
On the contrary, the urban plans are usually well laid out and set buildings within green surroundings. Blocks were planned on a 'neighbourhood' principal that placed civic buildings and amenities within walking distance and throughout Europe, postwar urban residential areas are located near the city centre with a good level of public transport [24]. The urban form is therefore the main reason why renovation or even expansion of these dwellings is absolutely worth considering.

This is particularly true of the Netherlands - which faces an acute lack of space for residential development and an increasing population - and for Heijplaat, which needs an increase in population in order to sustain itself as a neighbourhood.

Pronto Building System

The buildings in Heijplaat are likely to have been constructed using the Pronto building system. Details and plans are extremely hard to come by, although the nearby Rotterdam district of Pendrecht is featured as a case study at the 8th *Congrès International d'Architecture Moderne* (CIAM) in 1951 and describes Pronto as its structural component [25]. RDM are known to have employed JCW Boks to design its housing extension in 1952. Boks was a known associate of the regular Dutch delegation to CIAM and an active supporter of their aspirations for modernist building systems. Therefore, it is likely that he put a similar - if not the same - system to use at Heijplaat.

Pronto - developed in 1948 by *Van Vliet en van Dulst,* a small Rotterdam joiner's company - was one of a number of building systems developed during the postwar years to address the challenge of building a large amount of dwellings, quickly, with a scarcity of materials and relatively inexperienced labour force. By nature, these systems were supposed to be 'quick and easy' [26]. Pronto was a panel system of concrete, brick-clad components that were prefabricated in Van Vliet's own factory. Continuity with known building technology in particular was essential. The Pronto system was actually a hybrid form between traditional build and true system build. Pronto was used almost exclusively by some housing associations and selectively by others, as is the case in Heijplaat.



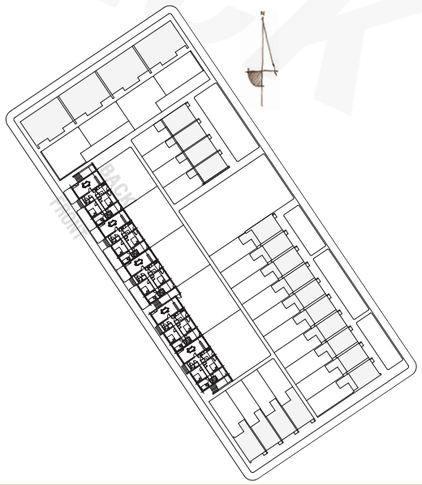
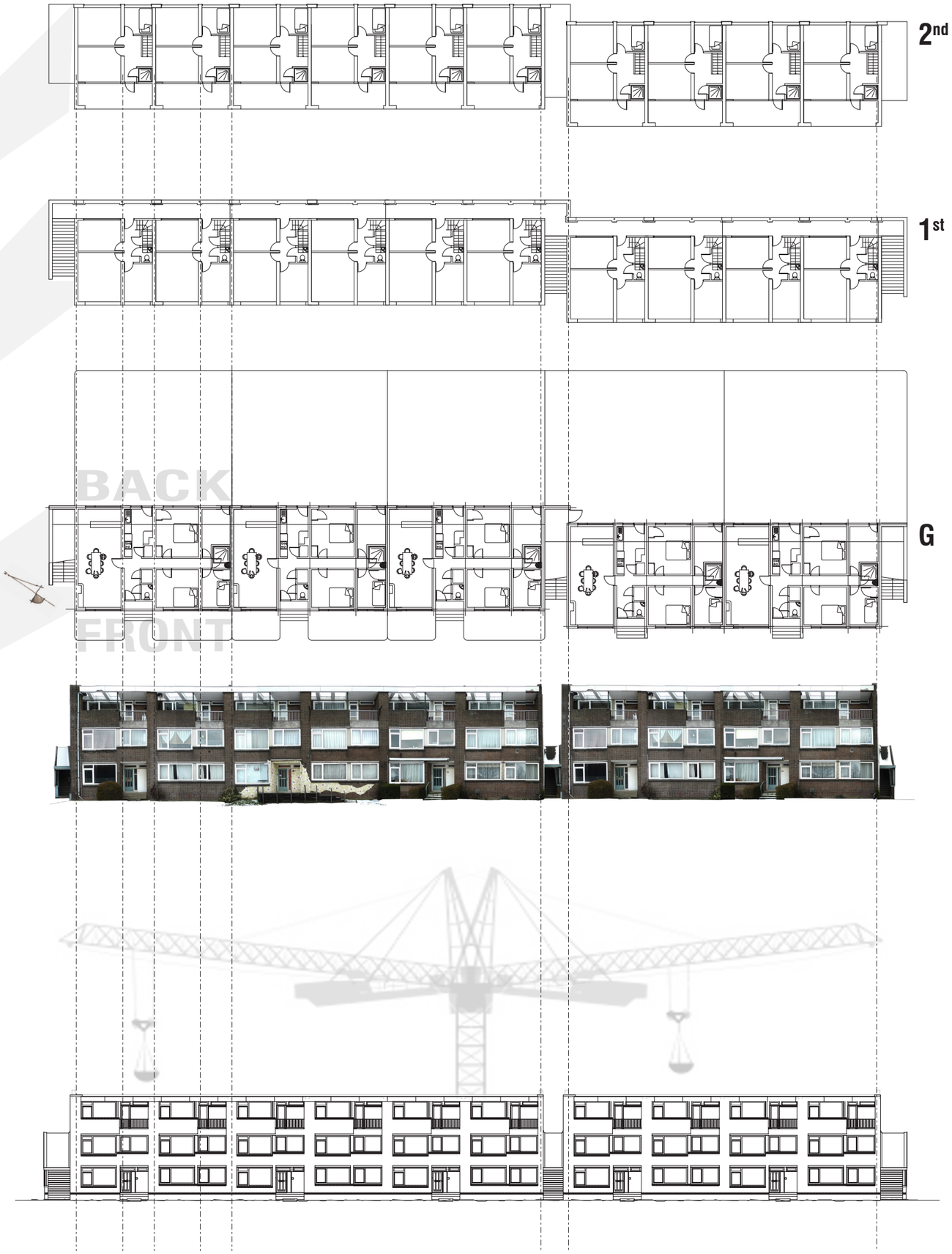


Fig.S (above) /// *Exploded construction of existing building showing two two-storey maisonettes above a single ground floor flat. Access to maisonettes is from a covered, elevated walkway above the ground floor flat, reachable by side stairs.*

Fig.T (right) /// *Photographic elevation related to drawn elevation, ground floor plan, first floor plan and second floor plan. Size of block was generally dictated by the reach of a single crane used in construction.*

Fig.U (left) /// *Block plan showing existing buildings; 4 x 2-storey units; 10 x 2-storey units; 4 x 2-storey units; 5 x single-storey ground floor flats with 10 x two-storey maisonettes above; 12 x single-storey flats in a three-storey bock.*



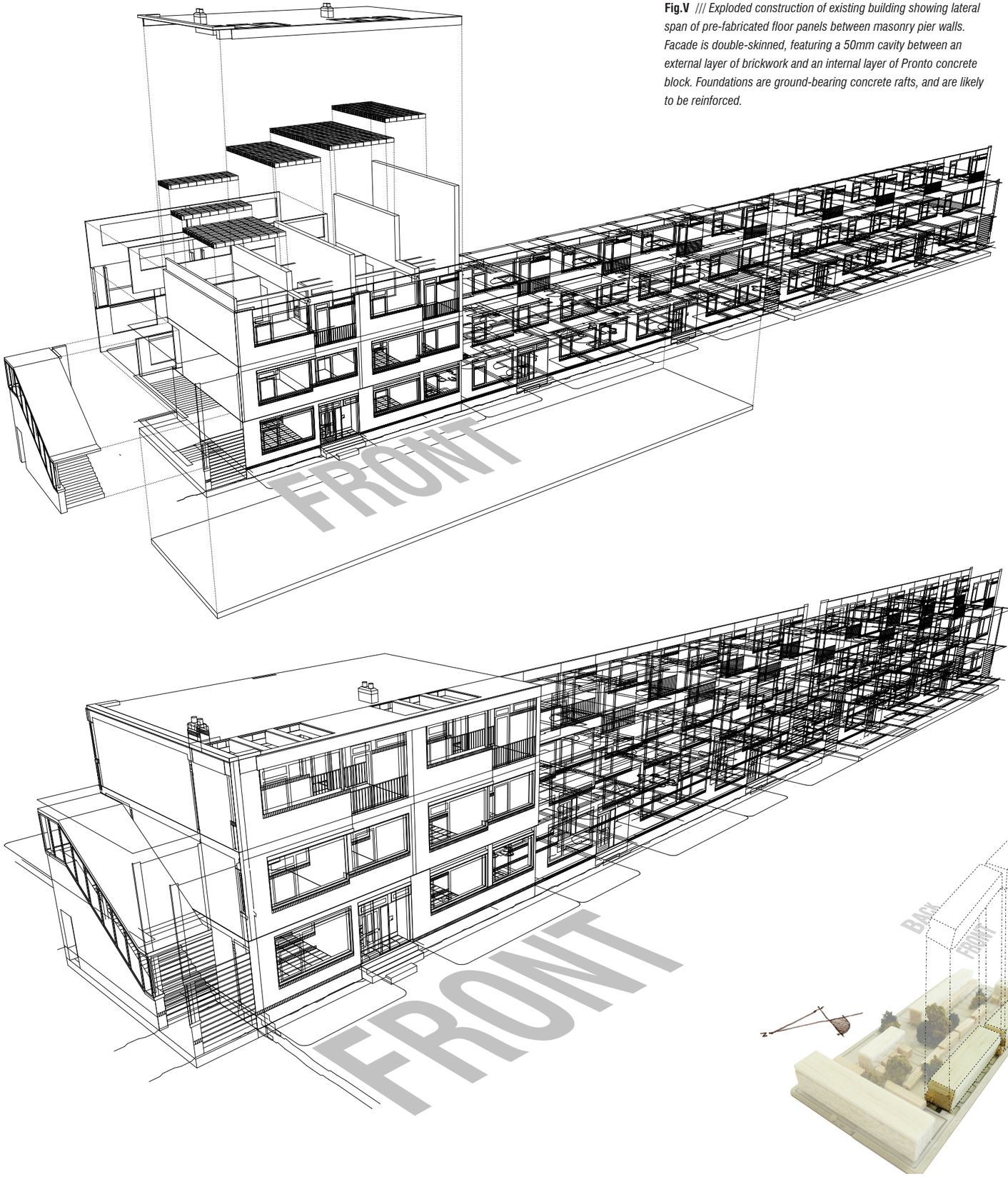


Fig.V */// Exploded construction of existing building showing lateral span of pre-fabricated floor panels between masonry pier walls. Facade is double-skinned, featuring a 50mm cavity between an external layer of brickwork and an internal layer of Pronto concrete block. Foundations are ground-bearing concrete rafts, and are likely to be reinforced.*

Permacultural Appraisal

A *tabula rasa* mentality - doing away with everything it encounters, from buildings to the underground infrastructure - may have been useful in the post-war reconstruction era, but is insufficient to meet the contemporary challenges of sustainability, reduction in energy use, CO_2 emissions, embodied energy and future-resilience. Building upon existing qualities helps to prevent a neighbourhood from becoming generic, something that could have developed anywhere and everywhere.

Cultivating Heijplaat adopts a permacultural attitude to place, assessing the good and bad qualities of the existing buildings before deciding what to keep, what to remove and what to adjust in order to cultivate the well-being and conviviality of the architectural system as a whole.

Positive Qualities

In it's urban lay-out, Heijplaat clearly reflected the ideals of the neighbourhood unit. It expressed one of the great ideals of the time: social equality. The social hierarchy of family, neighbours, the neighbourhood community and the urban society was mirrored by the physical hierarchy of the individual house, the street, a group of streets with a small shopping centre, the neighbourhood and the city at large. Post-war urbanism is often quite good, and embodies many of the 'sustainable' ideals we still value today, such as a green and pleasant environment and social cohesion supported by the architecture of buildings and their arrangement in a neighbourhood. All housing units were designed as parts of a balanced community comprising various types of houses. The architecture of the houses, schools, and shops was sober and homogenous. This functionalist feeling was greatly enhanced by the industrial building methods that were applied at the time. An abundance of open spaces and collective gardens compensated for the small houses; the transparency and openness of the public greenery represented a new, open urban society. Naturally, traffic was organized according to the latest ideas on efficiency. Cars, bicycles and pedestrians were provided with their own special lanes. These were combined to create wide traffic arteries provided with ample greenery. All components of the urban structure were endowed with the qualities of modernism and efficiency, simultaneously manifesting a idealistic social model.

Although the buildings are characterised in detail by the context of their post-war construction, they often prove to be surprisingly strong; over-engineering of structural components compensating for the lack of precision in execution by an inexperienced labour-force. They are likely to be able to accept the load of an additional, lightweight storey .

They also feature surprising good - if inflexible - space standards; the dwellings are relatively large and have good daylighting through large windows at front and back.

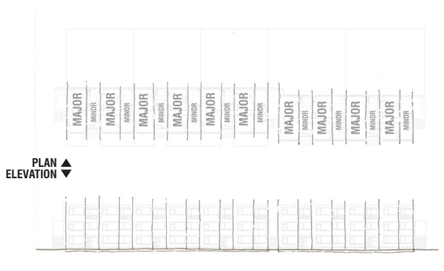
Negative Qualities

Like many post-war reconstructions, Heijplaat soon experienced serious difficulties. Instead of fostering social cohesion, the neighbourhood units promoted a feeling of contingency. In nearby Vlaardingen, sociologists discovered that inhabitants identified with their street and its immediate surroundings, but not with the social module of the neighbourhood. To add insult to injury, the size of the houses was seen as inflexible, lacking an extra room that could be used as a study or real opportunities for personalization.

The fabric of the buildings performs particularly poorly. There is absolutely no insulation anywhere in the buildings, other than that added adhoccly by residents themselves. Poor detailing carries through to waterproofing and many of the flat, single-ply felt roofs leak.

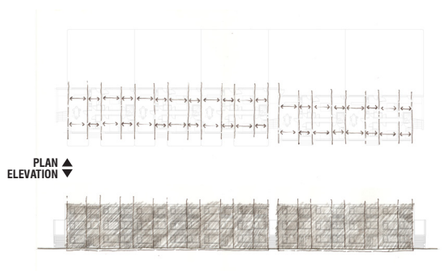
The 'monotony' of the buildings - designed for austerity and uniformity - is often cited as an undesirable characteristic.

Inserting Into Existing Buildings: *Strategic Approach*



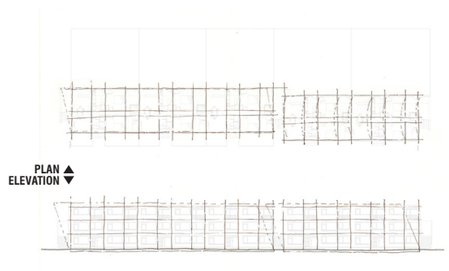
01 /// **Existing Primary Structural Grid**

Tartan grid of masonry pier walls form basis of platform-built existing structure. The grid is divided into major and minor structural bays; major bays span 3750mm and minor bays span 2580mm.



02 /// **Spans and Massing**

Existing structure comprises two separate buildings with separate foundations. Pre-fabricated concrete floor slabs span between masonry pier walls



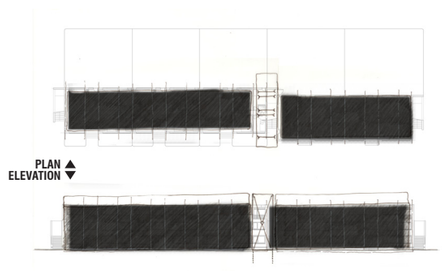
03 /// **Secondary Structure - Lateral Stability**

There are is also masonry infill between the piers of the platform. This does not seem to be load-bearing, but probably contributes to lateral stability of the overall structure by preventing wracking. The floor slabs themselves probably also contribute to overall stability by resisting bowing and twisting of the pier walls.

04 /// **Design Intent - 'Rooftopping' and Spatial Layout**

The primary design intent is to add a additional storey to the roof of the buildings, improving performance of the building fabric. Along with radical re-arrangement of internal spaces this facilitates the improvement of the 'spatial offer' and flexibility of the dwellings, i.e. there are more options for internal spatial layout. The ground floor is re-programmed with non-residential use to address the historical risk of flooding in the area.

The existing ground-bearing concrete raft is underpinned to enusre that the existing structure can take the additional load. This move is of course dependent on structural assessment.

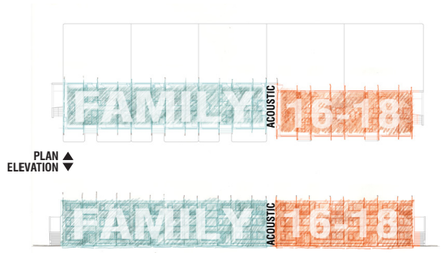


05 /// **Structural Compensation - 'Guest' and 'Host'**

As a result of spatial moves that address the fabric performance and internal flexibility, lateral stability of the overall structure might be compromised, i.e. internal masonry walls are likely to be removed resulting in reduced resistance to wracking. Additionally, the 'rooftopping' will potentially contribute to increased wind loading.

New 'guest' elements are added to the 'host' structure to improve lateral stability and further improve the spatial offer and flexibility by allowing for the provision of new services and better vertical access via stairwells and lift-cores.

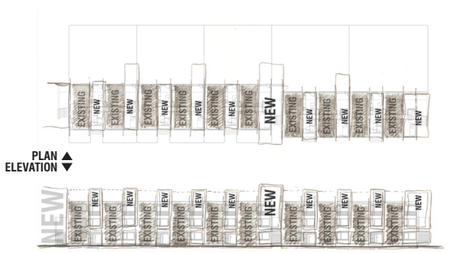
The concept of 'guest' and 'host' is articulated in the reciprocal relationship of new and old.



06 /// **User Groups**

Of the existing buildings, one is zoned for individual family dwellings, whilst the other is zoned as supported independent living for 16-18 year olds in training. Both user groups are 'clients' of SHIS; the pastoral organisation for the inland shipping industry and end-user for this element of the project.

This adjacency of user groups necessitates the consideration of clashes in lifestyle. Families - typically single-parent with young children - require peace, quiet and privacy, the 16-18 year old user group are likely to have more active (and louder!) social relationships with each other.



07 /// **Level of Intervention**

There is a ballance to be struck between new and old; how many 'guest' elements can co-exist with the host structure? What do the new elements bring to the existing?

Above - replacing every minor structural bay with a new insertion leaves very little existing fabric. The structural integrity of what remains may be compromised beyond a useful state and much social value derrived from existing aesthetics is lost. The regularity is almost akin to the lack of identity often cited as a problem with this kind of housing stock.

One major insertion signifies an entrance, shared by two user groups and might deal with acoustic separation between user groups.

Not every insertion needs to contain vertical circulation; and of those that do, not every one needs to contain a lift shaft.

08 /// **Retain Existing Entrances**

Whilst retaining the existing entrances makes sense in terms of the strategy of minimal intervention, it actually necessitates the insertion of quite a few new elements. Considered alongside junctions at either end of the block - and a shared central lobby - it also creates some awkwardly small spaces in plan and perpetutates the inflexibility of the existing dwellings.

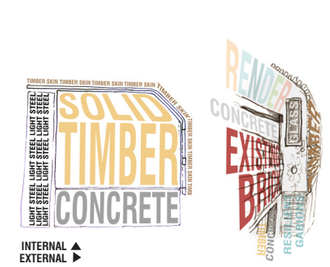
Shared element separating the two blocks will contain the lifts (two), whilst stairwells are still included in each of other insertions.

09 /// **Using Other Minor Structural Bay**

Rationalising the plan and facade by inserting the new element into the other available minor structural bay creates greater flexibility when considering internal layouts, especially when considered alongside the extra space offered by the additional storey.

New ellements 'take up the slack', collecting services, vertical circulation and new day rooms that augment the spatial possibilities of the existing dwellings.

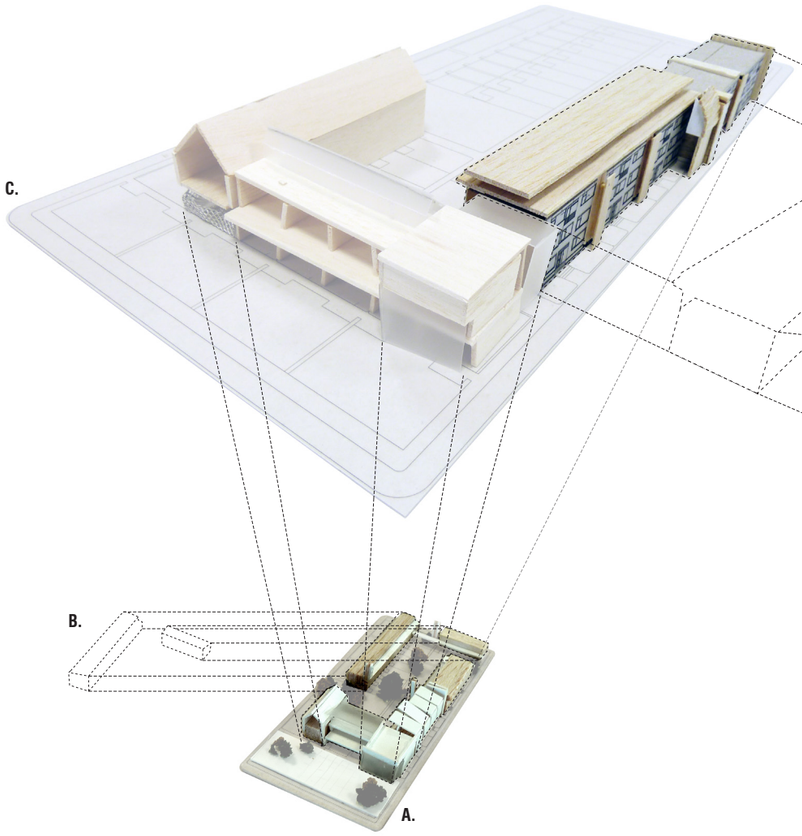
It is still possible to have a shared element separating the two blocks will contain the lifts (two), whilst stairwells are still included in each of other insertions.

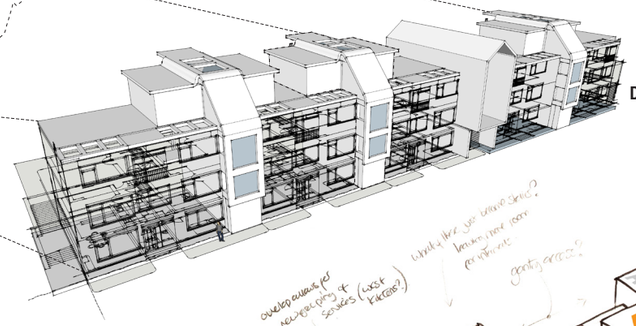


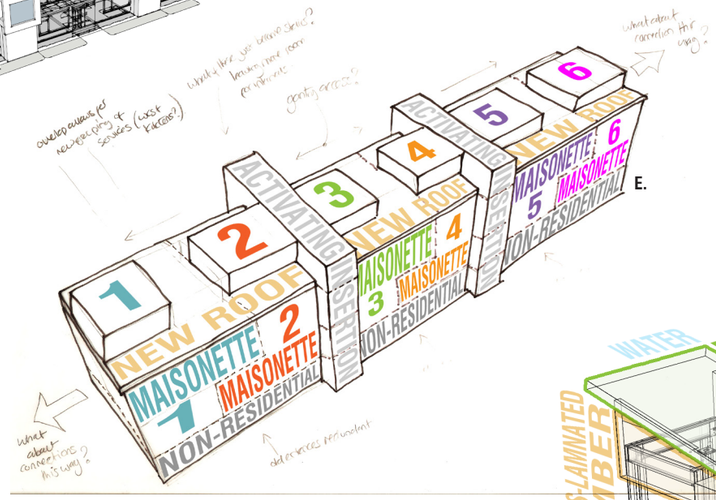
10 /// **Internal and External Materiality**

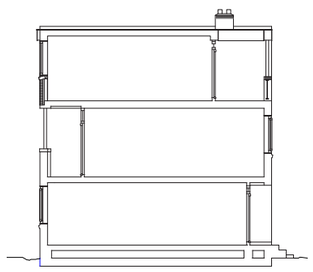
The new insertions are comprised of a number of materials in assembly. Some are read internaly and some are read externally.

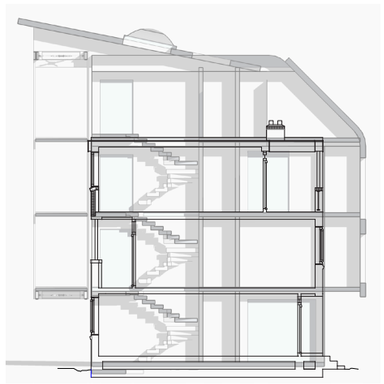
Concrete is expressed in the ground floor to indicate resilience to flood whilst the warm finish of the cross-laminated timber is exposed on the upper floors. The access walkways at the rear are expressed as lightly as possible whilst the external timber cladding is similarly fine. Thinner elements such as the steel access walkways and the timber skin cladding serve as counterpoint to the volumes of load-bearing structure that read as heavy mass.

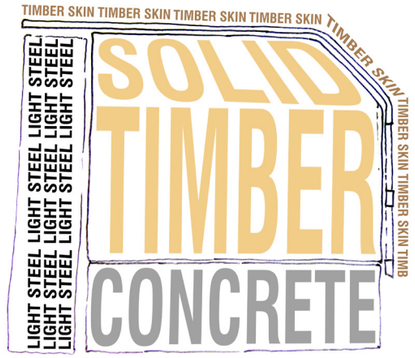












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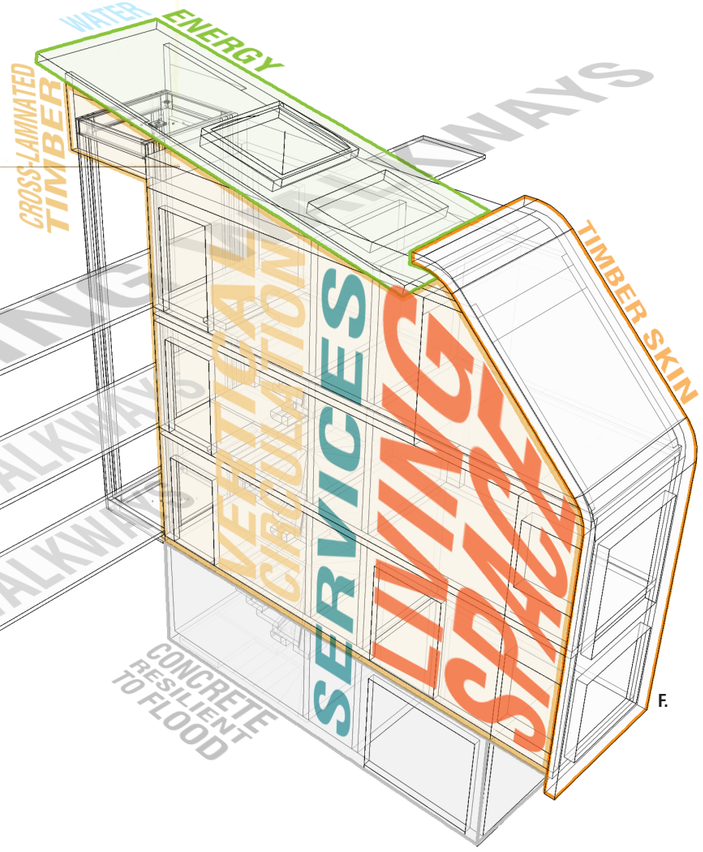
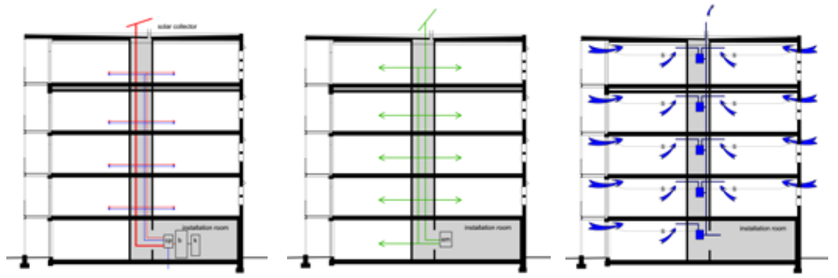


Fig.W (clockwise from top left) /// **A.** *Scheme for block at 1:1000 scale investigating urban form.* / **B.** *Elements of block discarded from project; these elements can be refurbished using identical strategies to those developed in the rest of the block.* / **C.** *1:200 model of scheme beginning to develop spatiality and architectural form.* / **D.** *Computer modelling investigation of architectural form of insertion into existing buildings.* / **E.** *Conceptual diagram of intentions for spatial rearrangement of dwellings and re-programming of other spaces.* / **F.** *Conceptual diagram for general spatial arrangement, function and materiality if insertion.*/ **G.** *Investigation of materiality and form of insertion in relation to the existing buidings.*

Fig.W (clockwise from right) /// **A.** *An investigation of how the suspended walkways might work in relation to the refurbished dwellings. The east-north-east edge of the building is a space to sit in the morning sun, to talk to your neighbour whilst picking herbs, and to watch birds roosting in the eaves. It is also a place from which fresh air is naturally drawn into the building through the stairwells and along which residents can travel laterally to access the lift core. It is a place where the private realm of the home can be completely opened up to the semi-public world of the gardens below. Continuing lines of protection against moisture ingress and transmission of thermal energy has proved the biggest challenge. Providing a winter-garden begins to address this issue by allowing waterproofing to be dealt with on the outside edge of the building, whilst thermal continuity is provided along the recessed glazing line.* / **B.** *Westerpark case study from the SuRE-FIT Research Project illustrating the process of assessing the load bearing capacity of existing foundations before 'rooftopping' the existing building by laying new beams along the structural grid.* / **C.** *Also from Westerpark; the new insertion, particularly with vertical service channel, can be used to collect and distribute service runs, both from a central energy source such as a CHP, or from distributed rooftop collection methods such as photovoltaic and solar thermal collectors. Ventilation can also be dealt with via the service void in the case of mechanical ventilation, or via the open stairwell in the case of natural ventilation.*



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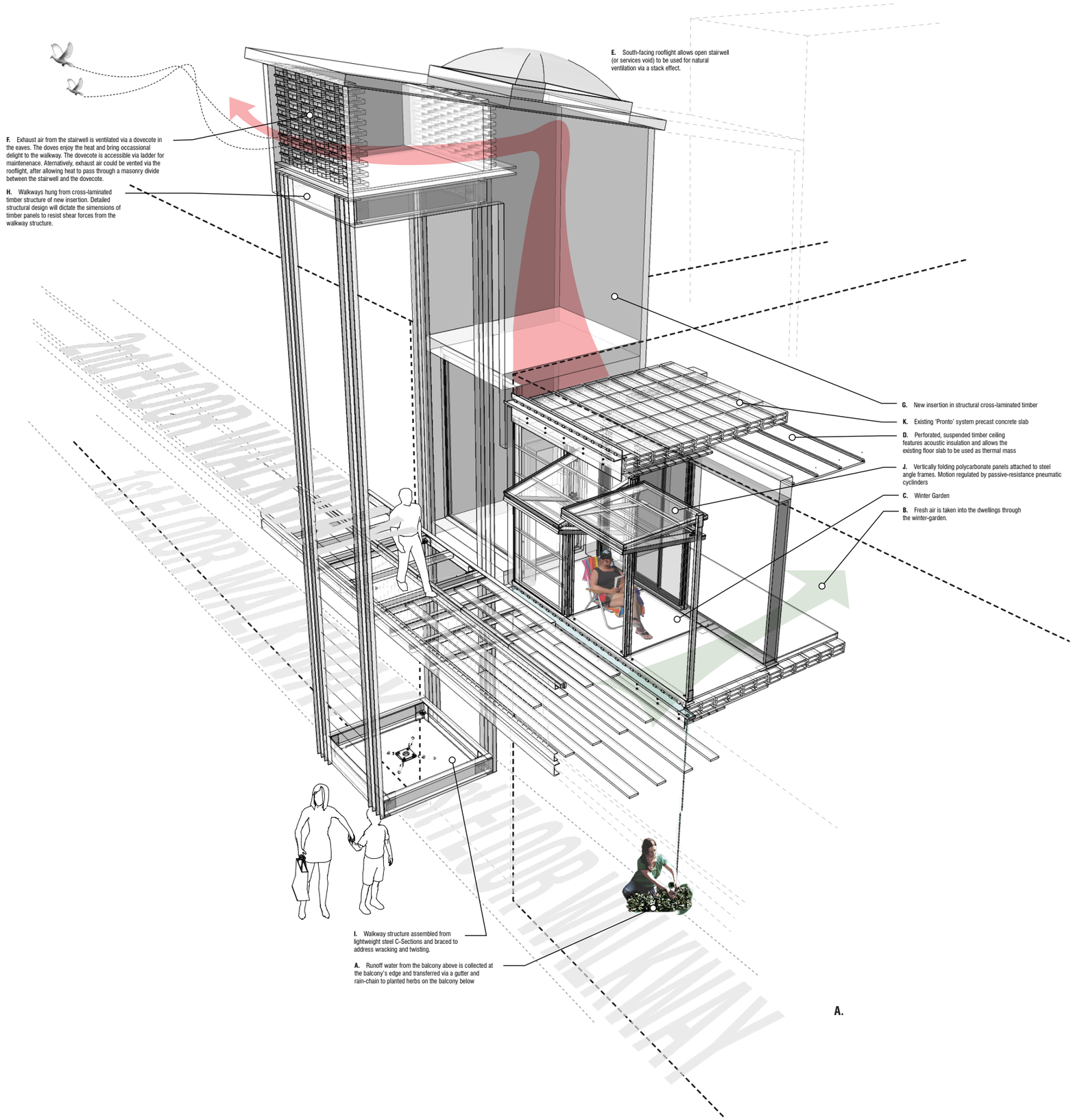

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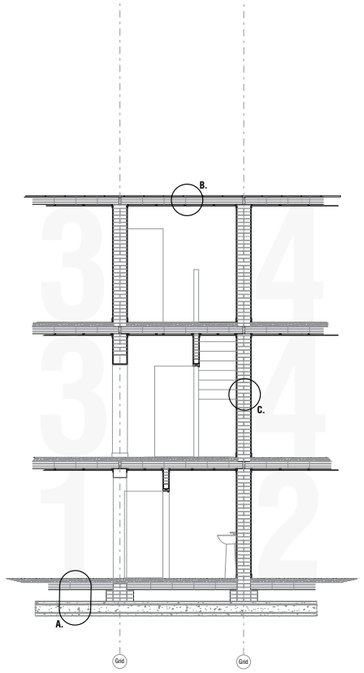
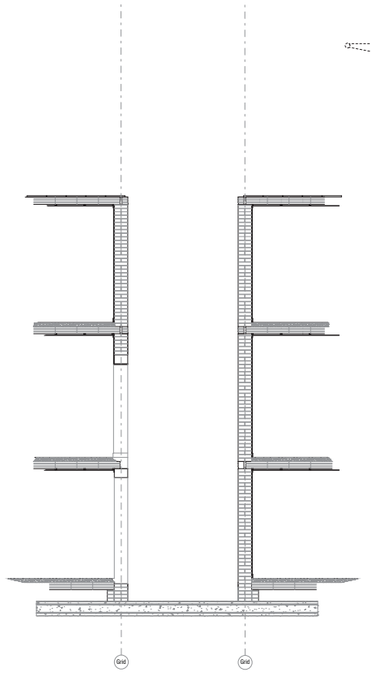
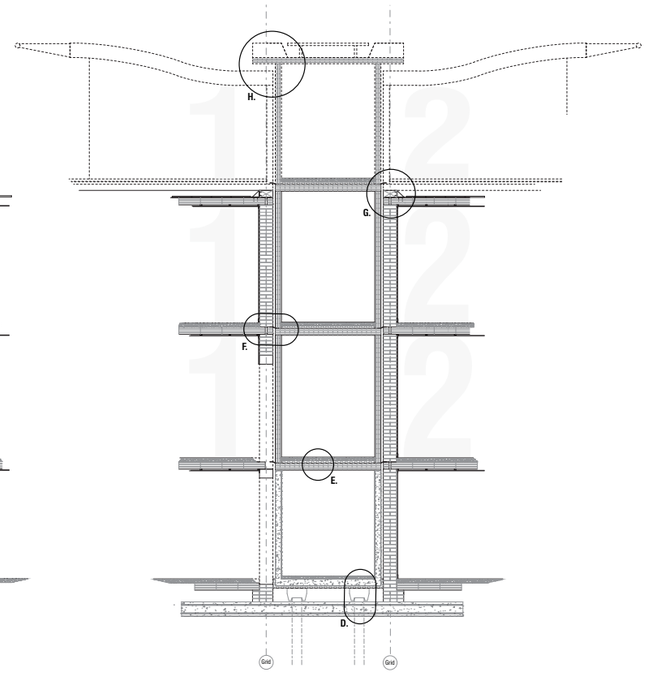






01 /// **Existing Construction**

A. Carpet; directly onto screed; laid onto suspended prefabricated concrete floor slab; supported on brick piers from in-situ ground-bearing raft foundation.

No thermal insulation.
Unlikely to be a vapour barrier in floor.
Raft foundation is likely to be reinforced.

B. Concrete tiles; onto single-ply felt waterproofing layer; onto prefabricated concrete panel; suspended plasterboard ceiling on battens attached directly to underside of concrete panel.

No thermal insulation.
Roof now very leaky.

C. Solid, loadbearing blockwork ('Pronto' system) between dwellings; plasterboard and plaster skim internal finish to each side.

No thermal insulation.
No acoustic insulation.

Assumptions based on observation and typical construction of the period. Buildings constructed 1952. Short section through junction of 4 dwellings; 2 ground floor flats and 2 first floor maisonettes.

02 /// **Removal**

Removal of material should be straightforward between structural grid-lines. Dilapidated bathrooms have been removed from both dwellings, as well as tight existing vertical circulation from the first floor mainsonettes.

Care must be taken to ensure load-bearing walls are propoerly braced whilst gap is surveyed and measured for fabrication of new conmponents, as the structure will be experiencing reduced lateral stability dut to the removal of some walls parallel to the section line taken above.

Waterproofing may also be compromised and must be temporarily addressed through the application of a waterproof covering to the exposed walls.

03 /// **Insertion**

Insertion comprises separate, prefabricated wall and floor pieces in cross-laminated timber. Assembly in storey-height sections allows for the new insertion to be tied into the existing masonry structure at floor junctions and fulfill its function of providing lateral stability to the existing structure.

A 50mm gap is allowed between the new structure and existing building. This can later be back-filled with inert, moisture-resistant insulation such as vermiculite and be sealed against moisture ingresss where it meets the external skin of the existing building facade.

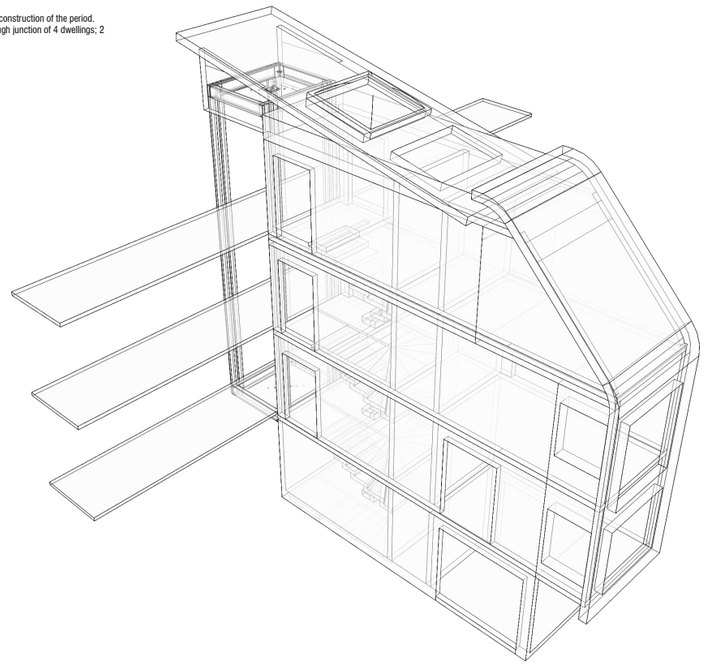
D. New mini-pile foundation; piles driven through holes made in existing raft foundation (removing large sections might compromise integrity of slab as a whole); Mini-piling rig can access up to 400mm from existing structural wall; In-situ concrete ground floor to provide floor-resilient finish and level threshold for installation of cross-laminated timber components; cast onto permanent polystyrene insulating formwork; polished screed internal floor finish.

E. Cross-laminated timber floor pieces left exposed as ceiling finish; acoustic insulation; waterproof membrane; floor screed; parquet floor internal finish.

F. Ties across cavity from top of cross-laminated timber floor panel to line of existing floor slab; 128mm, 5-ply cross-laminated timber wall panel provides 72minutes fire protection; 146mm, 5-ply cross-laminated timber floor panel provides sufficient load-bearing capacity across span and stiffens new element.

G. New laminated timber beams run along structural grid-lines on roof to take the load of additional storey; new roof including insulation and waterproofing layer to be laid directly over existing with a ventilated cavity.

H. Movement must be accomodated at the junction where the additional storey - bearing onto the existing structure - meets the new insertion, which bears onto its own foundation. Continuity of waterproofing layer, thermal insulation layer and level threshold must be maintained. Roof to be designed to collect rainwater for potable and sanitary use.



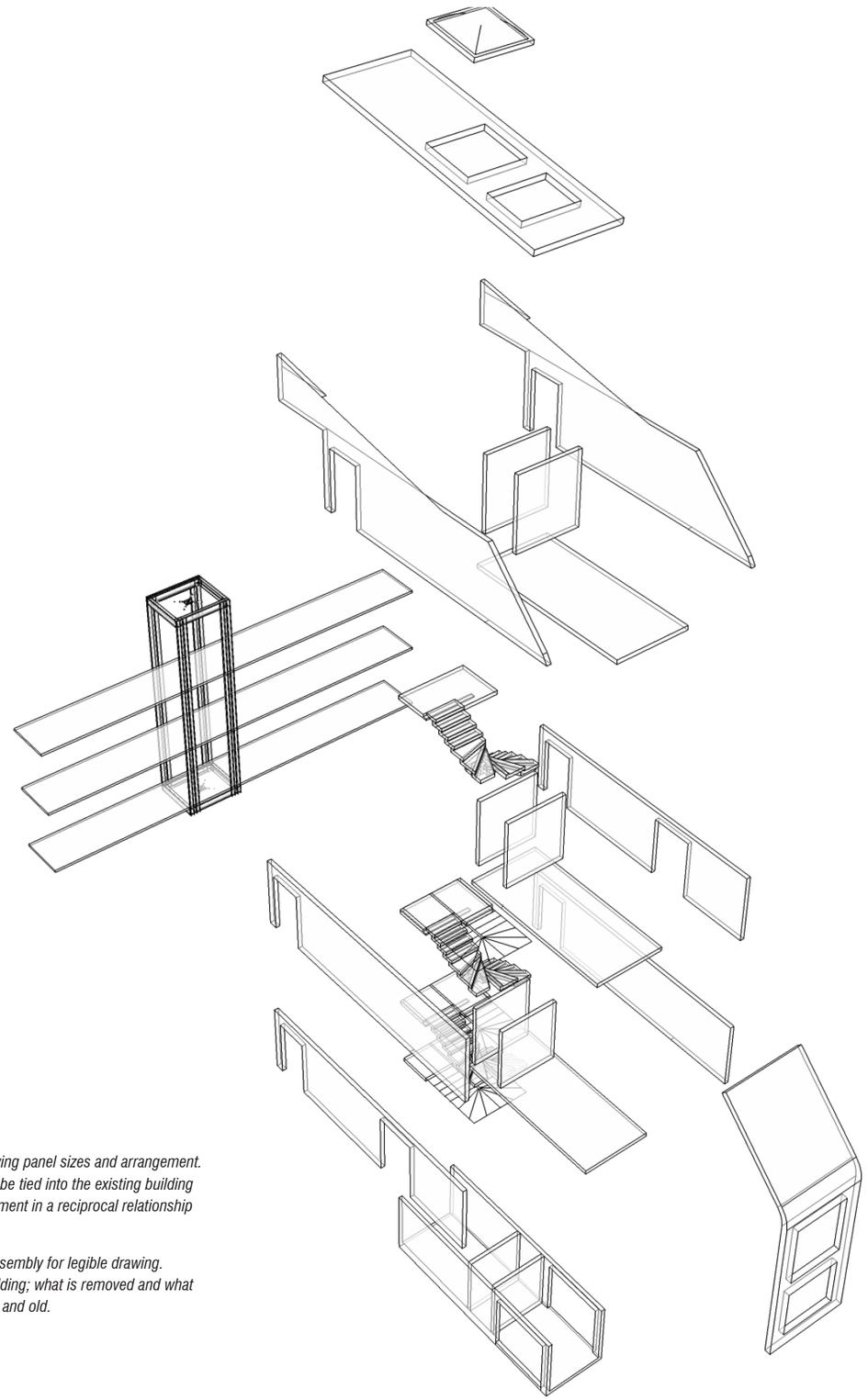


Fig.X (right) /// *Exploded view of new insertion showing panel sizes and arrangement. The new insertion is to be built in floors to allow it to be tied into the existing building and provide lateral stability in its role as a 'guest' element in a reciprocal relationship with its host.*

Fig.Y (above) /// *Please refer to Complex Material Assembly for legible drawing. Drawing shows process of insertion into existing building; what is removed and what stays, and where the structural ties are between new and old.*

Fig.Z (left) /// *Working computer model of insertion.*

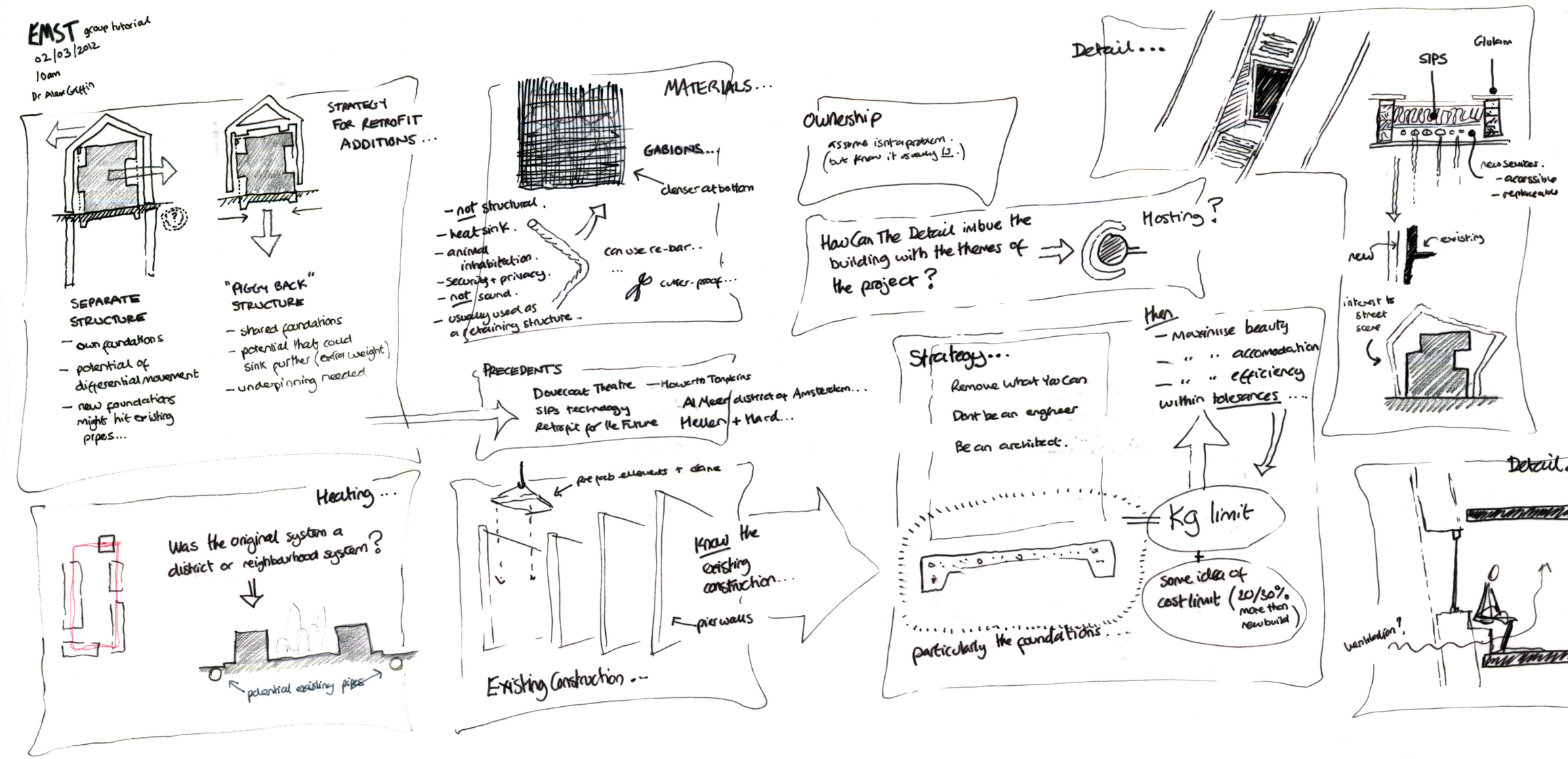
Cross-Laminated Timber and Prefabrication

Strategic detailed design tutorials have been developing the idea of prefabricating the new insertion in cross-laminated timber.

Cross-Laminated Timber (CLT) has very low net embodied energy due to the fact it sequesters carbon during growth which is then 'locked in' to a building in use. It is manufactured from thin sections of timber that would otherwise not be useful for structural purposes. therefore it is adding value to timber as a material. Other advantages are; it is easy to create openings; soft internal finish; can often be left exposed and still be fire resistant; speed - and visual impact - of installation; can cope with wet weather on site as it releases moisture readily when it dries; untreated, resulting in a healthy indoor environment, but relies on external envelope for weatherproofing; formaldehyde-free adhesive used; service runs can be pre-cut at the factory by CNC milling; zero-waste manufacture; biomass pellets produced from sawdust; high levels of precision possible due to the CNC process; min.60 year lifespan, as certified by BRE Global; solid timber contributes to thermal mass; and avoids cold bridging by being a poor conductor of heat;

This Page /// *Notes from detailed design tutorial 02/03/2012 with Dr Alex Griffin*

Facing Page /// *Materials research on Cross-Laminated Timber conducted as part of the 'Cultivating Materials' exercise with MArch Studio 7 'Cultivate', 2011/2012*



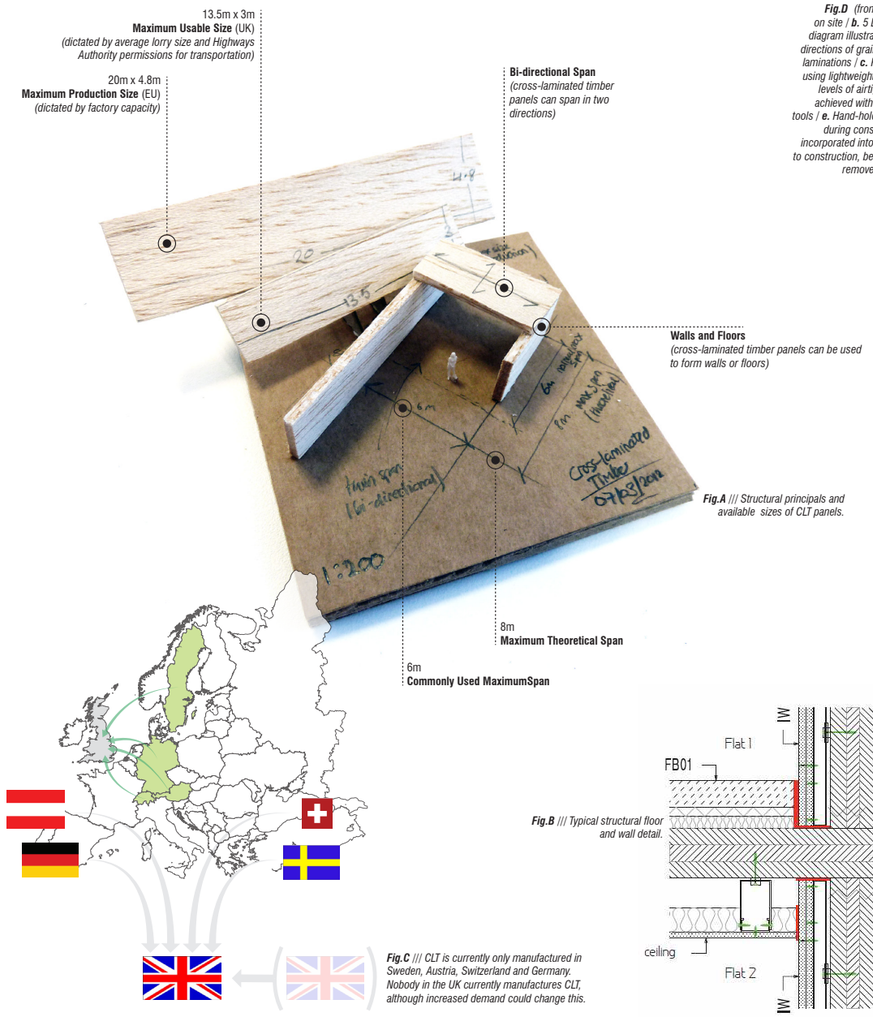


Fig.A */// Structural principals and available sizes of CLT panels.*

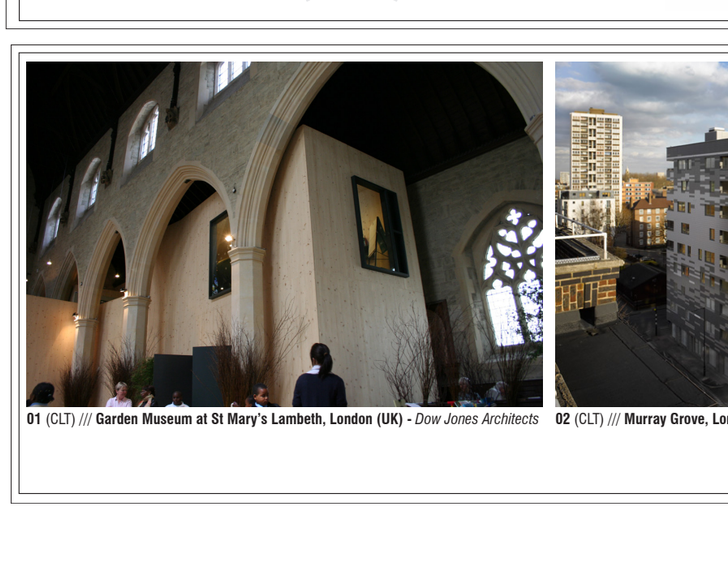


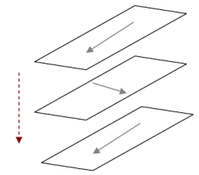
Fig.C */// CLT is currently only manufactured in Sweden, Austria, Switzerland and Germany. Nobody in the UK currently manufactures CLT, although increased demand could change this.*

Fig.B */// Typical structural floor and wall detail.*

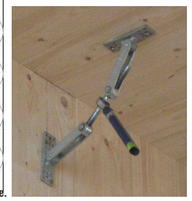
Fig.D *(from top) /// **a.** CLT on site / **b.** 5 Layer panel and diagram illustrating alternating directions of grain in successive laminations / **c.** Panels are fixed using lightweight tools / **d.** High levels of airtightness can be achieved with hand-operated tools / **e.** Hand-holds for guidance during construction can be incorporated into the panel prior to construction, before being later removed and plugged.*

a.

b.



c.



d. + e.

CROSS LAMINATED TIMBER

*Cultivating Materials **SB01a***

What is CLT? /// Cross Laminated Timber (CLT) panels can form a construction system that provides an alternative to more traditional structural frame methods such as steel, concrete and masonry. CLT is the main form of solid wood panel used in construction, although not all solid wood panels are cross-laminated (see below).

Advantages /// CLT frames offer a number of advantages including:

- Reduced programme durations;
- Waste minimisation;
- Safer working environments on site, and;
- Improved air tightness.

CLT buildings have a very low carbon footprint because the wood locks away the carbon absorbed during growth. Wood is easy to machine and the material itself is a good insulator. CLT panel construction can be competitive, even in tall and long span applications where conventional timber framing was hitherto unsuitable or uneconomic.

The possibility for prefabrication offers high build quality and quick assembly on site, whilst the light weight of the panels means that substructure can be minimised. This latter characteristic also suites CLT to projects involving the extension of existing buildings, particularly those that rely on existing structures for support.

Because these panels are strong in two directions, it is possible to cut large openings for doors and windows with no lintels.

Production /// Panels are produced from mechanically dried spruce boards which are stacked together at right angles and glued over the entirety of their surface. Each CLT panel is produced is between three and seven boards thick depending on the amount of structural loading required. Gluing at high pressure reduces the timbers expansion and shrinkage potential to a negligible level. The result is a rigid structural timber member that can be used both vertically and horizontally to construct a buildings frame.

BRETTSTAPEL

*Cultivating Materials **SB01b***

Brettstapel is a system of German origin, similar to CLT but constructed without the use of glue. Instead, large section softwood members are joined with hardwood (usually Beech) dowels to produce load bearing solid timber wall, floor and roof panels. The hardwood dowels are kiln-dried to a moisture content lower than that of softwood posts. Following assembly, the dowels expand over time to achieve moisture equilibrium, thus 'locking' the posts together and creating a structural load-bearing system. Brettstapel is therefore one of a few construction methods that can be entirely fabricated from timber. Avoiding glues particularly means that a healthier indoor air quality can be achieved.

The Brettstapel system allows low grade wood (predominantly spruce or fir) to be used for higher grade (structural) purposes. By ensuring natural defects, such as knots in the wooden posts are not adjacent to each other, poor quality timber can be utilised which makes for a highly economical way of using a fast growing, under-used resource of which the UK and Scotland in particular, has an abundance.

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TRADA (2009) *Wood Information Sheet (WIS-2/3-62) - Cross Laminated Timber: Structural Principals*
TRADA (2009) *Worked Example: 12-storey building of cross-laminated timber (Eurocode 5)*

Above TRADA series available via Construction Information Service (CIS).

WILLMOTT DIXON (2012) *Briefing Note 13: Cross Laminated Timber Frames* [PDF Slideshow] Available from: *http://www.willmottdixongroup.co.uk/sustainability/responsible-business/technical-library* [Accessed 08/03/2012].

(Good Case Studies that include design decisions and detailing / comprehensive survey of UK suppliers and European producers / construction details and specifiers guide)

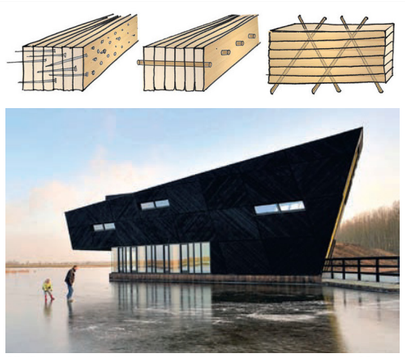
PRECEDENTS /// CLT CONSTRUCTION

01 (CLT) /// **Garden Museum at St Mary's Lambeth, London (UK) -** *Dow Jones Architects*

02 (CLT) /// **Murray Grove, London (UK) -** *Waugh Thistleton*

03 (CLT) /// **St Agnes Primary School, Manchester (UK) -** *Eurban Ltd.*

04 (Brettstapel) /// **Acharacle Primary School, Argyle (UK) -** *Gaia Architects*



05 (Brettstapel) /// Dowel detail in Brettstapel construction. + **06** (CLT) /// **Oostvaarders Education Centre (Netherlands) -** *Drost & van Veen Architects*

Structures Tutorial

Amy Boulton 2:15pm

22/03/2012

We learned about...

- Underpinning
- tieing back to existing structure
- new foundations in and around existing buildings...

Look @ 'Part B' for stairs, and use precedents properly (ie. annotate + present details...).

① Nicos House (completely overclad existing building)

need to tie back to existing structure here, or include a new floor....

minipiles

2-3m

obstacle dictated by accessibility of piling rig.

allows seperate spaces to be read as such...

or

just façade improvement.

Remember!

- not adding huge loads, so should be ok.
- there is a possibility you might not have to do anything extra to existing structure at all! pending full detailed structural survey
- google "minipiles"... ...you can get rigs that fit through doors.

② Buildability of timber insertion...

minor grid removed

EXISTING SLAB

Dont remove existing slab... it may have been designed with re-inforcement mesh and removal may compromise overall integrity...

Threshold opportunity... "thickness" + different materials"

you can control how close the new structure can get...

WALL

EXISTING SLAB

2nd pile as close as you can get...

new cantilevered foundation

1 pile as close as you can get...

or:...

new foundation bridges.

EXISTING SLAB

2nd pile perpendicular existing slab

1st pile as close as you can get

200mm

work on skin friction, rather than end bearing...

EXISTING SLAB

mini piles in a row

new concrete = level threshold

pre-fabricated CLT unit

ties at top of each floor to existing.

50mm cavity...

elements don't have to be vertically continuous to act as if they were/are...

EXISTING SLAB

minipiles Ø 200mm dia.

③ Underpinning

occasionally necessary... Must fill in gaps...

This Page /// *Notes from structural design tutorial 22/03/2012 with Amy Boulton.*

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Many things are relevant to the study of architecture. Here I have tried to keep track of my evolving bibliography:

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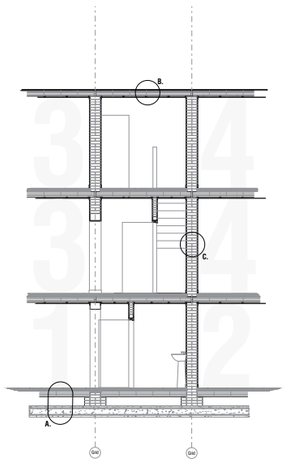


01 /// **Existing Construction**

A. Carpet; directly onto screed; laid onto suspended prefabricated concrete floor slab; supported on brick piers from in-situ ground-bearing raft foundation.

No thermal insulation.
Unlikely to be a vapour barrier in floor.
Raft foundation is likely to be reinforced.

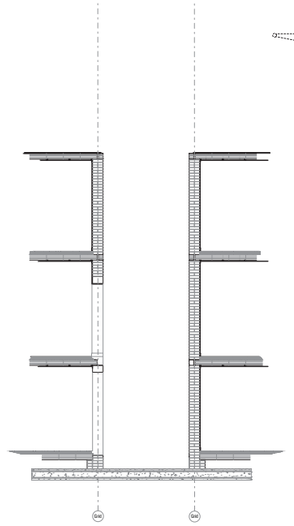
B. Concrete tiles; onto single-ply felt waterproofing layer; onto prefabricated concrete panel; suspended plasterboard ceiling on battens attached directly to underside of concrete panel.

No thermal insulation.
Roof now very leaky.

C. Solid, loadbearing blockwork ('Pronto' system) between dwellings; plasterboard and plaster skim internal finish to each side.

No thermal insulation.
No acoustic insulation.

Assumptions based on observation and typical construction of the period. Buildings constructed 1952. Short section through junction of 4 dwellings; 2 ground floor flats and 2 first floor maisonettes.

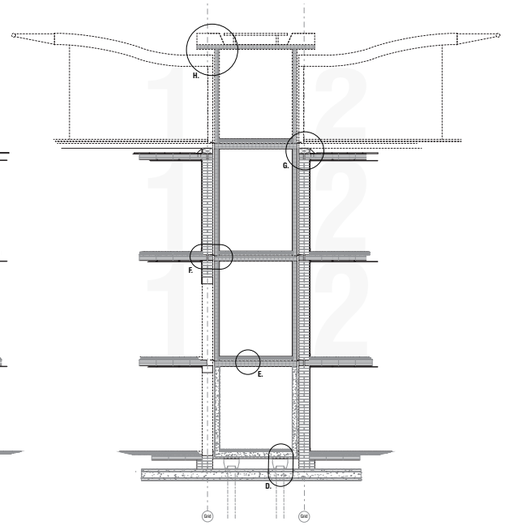


02 /// **Removal**

Removal of material should be straightforward between structural grid-lines. Dilapidated bathrooms have been removed from both dwellings, as well as tight existing vertical circulation from the first floor mainsonettes.

Care must be taken to ensure load-bearing walls are properly braced whilst gap is surveyed and measured for fabrication of new components, as the structure will be experiencing reduced lateral stability dut to the removal of some walls parallel to the section line taken above.

Waterproofing may also be compromised and must be temporarily addressed through the application of a waterproof covering to the exposed walls.



03 /// **Insertion**

Insertion comprises separate, prefabricated wall and floor pieces in cross-laminated timber. Assembly in storey-height sections allows for the new insertion to be tied into the existing masonry structure at floor junctions and fulfill its function of providing lateral stability to the existing structure.

A 50mm gap is allowed between the new structure and existing building. This can later be back-filled with inert, moisture-resistant insulation such as vermiculite and be sealed against moisture ingress where it meets the external skin of the existing building facade.

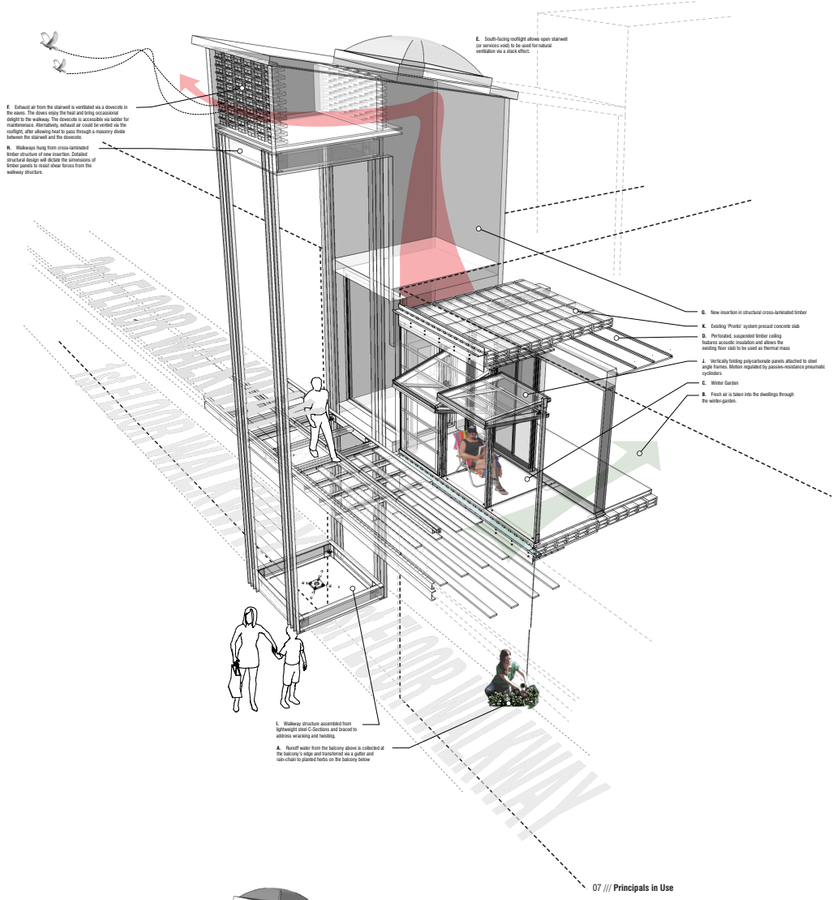
D. New mini-pile foundation; piles driven through holes made in existing raft foundation (removing large sections might compromise integrity of slab as a whole); Mini-piling rig can access up to 400mm from existing structural wall; In-situ concrete ground floor to provide floor-resilient finish and level threshold for installation of cross-laminated timber components; cast onto permanent polystyrene insulating formwork; polished screed internal floor finish.

E. Cross-laminated timber floor pieces left exposed as ceiling finish; acoustic insulation; waterproof membrane; floor screed; parquet floor internal finish.

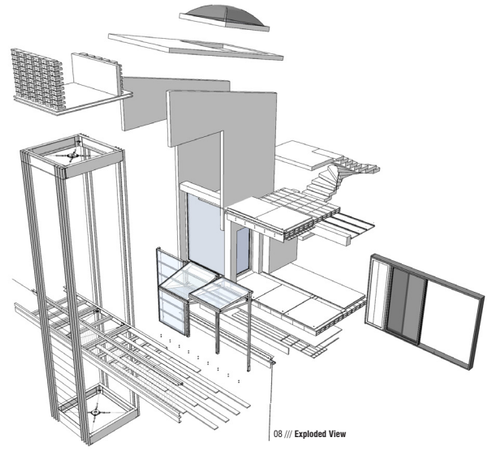
F. Ties across cavity from top of cross-laminated timber floor panel to line of existing floor slab; 128mm, 5-ply cross-laminated timber wall panel provides 72minutes fire protection; 146mm, 5-ply cross-laminated timber floor panel provides sufficient load-bearing capacity across span and stiffens new element.

G. New laminated timber beams run along structural grid-lines on roof to take the load of additional storey; new roof including insulation and waterproofing layer to be laid directly over existing with a ventilated cavity.

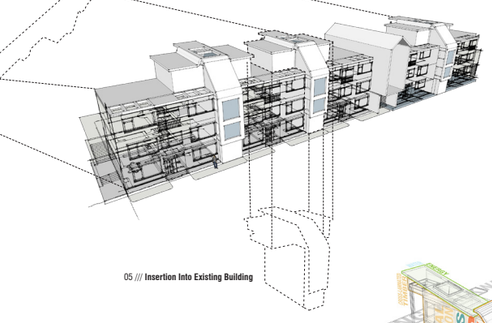
H. Movement must be accomodated at the junction where the additional storey - bearing onto the existing structure - meets the new insertion, which bears onto its own foundation. Continuity of waterproofing layer, thermal insulation layer and level threshold must be maintained. Roof to be designed to collect rainwater for potable and sanitary use.



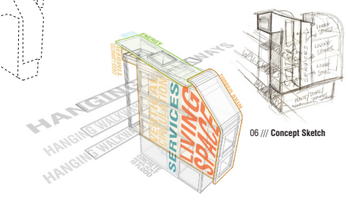
07 /// **Principals in Use**



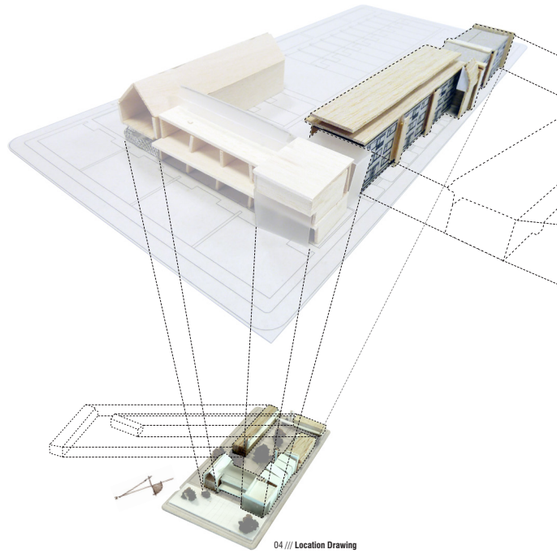
08 /// **Exploded View**



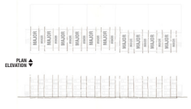
05 /// **Insertion Into Existing Building**



06 /// **Concept Sketch**

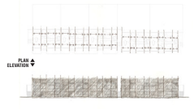


04 /// **Location Drawing**



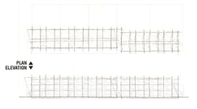
01 /// **Existing Primary Structural Grid**

Tartan grid of masonry pier walls form basis of platform-built existing structure. The grid is divided into major and minor structural bays; major bays span 3750mm and minor bays span 2580mm.



02 /// **Spans and Massing**

Existing structure comprises two separate buildings with separate foundations. Pre-fabricated concrete floor slabs span between masonry pier walls



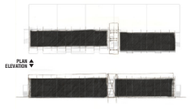
03 /// **Secondary Structure - Lateral Stability**

There are is also masonry infill between the piers of the platform. This does not seem to be load-bearing, but probably contributes to lateral stability of the overall structure by preventing wracking. The floor slabs themselves probably also contribute to overall stability by resisting bowing and twisting of the pier walls.

04 /// **Design Intent - 'Rooftopping' and Spatial Layout**

The primary design intent is to add a additional storey to the roof of the buildings, improving performance of the building fabric. Along with radical re-arrangement of internal spaces this facilitates the improvement of the 'spatial offer' and flexibility of the dwellings, i.e. there are more options for internal spatial layout. The ground floor is re-programmed with non-residential use to address the historical risk of flooding in the area.

The existing ground-bearing concrete raft is underpinned to ensure that the existing structure can take the additional load. This move is of course dependent on structural assessment.

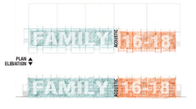


05 /// **Structural Compensation - 'Guest' and 'Host'**

As a result of spatial moves that address the fabric performance and internal flexibility, lateral stability of the overall structure might be compromised, i.e. internal masonry walls are likely to be removed resulting in reduced resistance to wracking. Additionally, the 'rooftopping' will potentially contribute to increased wind loading.

New 'guest' elements are added to the 'host' structure to improve lateral stability and further improve the spatial offer and flexibility by allowing for the provision of new services and better vertical access via stairwells and lift-cores.

The concept of 'guest' and 'host' is articulated in the reciprocal relationship of new and old.



06 /// **User Groups**

Of the existing buildings, one is zoned for individual family dwellings, whilst the other is zoned as supported independent living for 16-18 year olds in training. Both user groups are 'clients' of SHS, the pastoral organisation for the inland shipping industry and end-user for this element of the project.

This adjacency of user groups necessitates the consideration of clashes in lifestyle. Families - typically single-parent with young children - require peace, quiet and privacy, the 16-18 year old user group are likely to have more active (and louder!) social relationships with each other.

07 /// **Level of Intervention**

There is a ballance to be struck between new and old; how many 'guest' elements can co-exist with the host structure? What do the new elements bring to the existing?

Above - replacing every minor structural bay with a new insertion leaves very little existing fabric. The structural integrity of what remains may be compromised beyond a useful state and much social value derived from existing aesthetics is lost. The regularity is almost akin to the lack of identity often cited as a problem with this kind of housing stock.

One major insertion signifies an entrance, shared by two user groups and might deal with acoustic separation between user groups.

Not every insertion needs to contain vertical circulation; and of those that do, not every one needs to contain a lift shaft.

08 /// **Retain Existing Entrances**

Whilst retaining the existing entrances makes sense in terms of the strategy of minimal intervention, it actually necessitates the insertion of quite a few new elements. Considered alongside junctions at either end of the block - and a shared central lobby - it also creates some awkwardly small spaces in plan and perpetuates the inflexibility of the existing dwellings.

Shared element separating the two blocks will contain the lifts (two), whilst stairwells are still included in each of other insertions.

09 /// **Using Other Minor Structural Bay**

Rationalising the plan and facade by inserting the new element into the other available minor structural bay creates greater flexibility when considering internal layouts, especially when considered alongside the extra space offered by the additional storey.

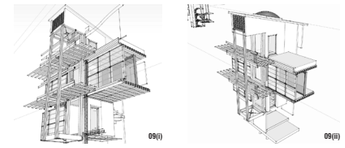
New elements 'take up the slack', collecting services, vertical circulation and new day rooms that augment the spatial possibilities of the existing dwellings.

It is still possible to have a shared element separating the two blocks will contain the lifts (two), whilst stairwells are still included in each of other insertions.

10 /// **Internal and External Materiality**

The new insertions are comprised of a number of materials in assembly. Some are read internaly and some are read externally.

Concrete is expressed in the ground floor to indicate resilience to flood whilst the warm finish of the cross-laminated timber is exposed on the upper floors. The access walkways at the rear are expressed as lightly as possible whilst the external timber cladding is similarly fine. Thinner elements such as the steel access walkways and the timber skin cladding serve as counterpoint to the volumes of load-bearing structure that read as heavy mass.



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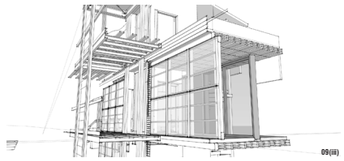

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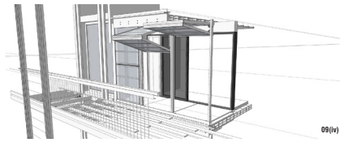

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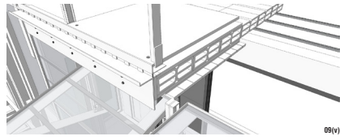

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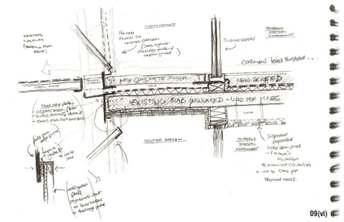

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COMPLEX MATERIAL ASSEMBLY /// AN EDGE...

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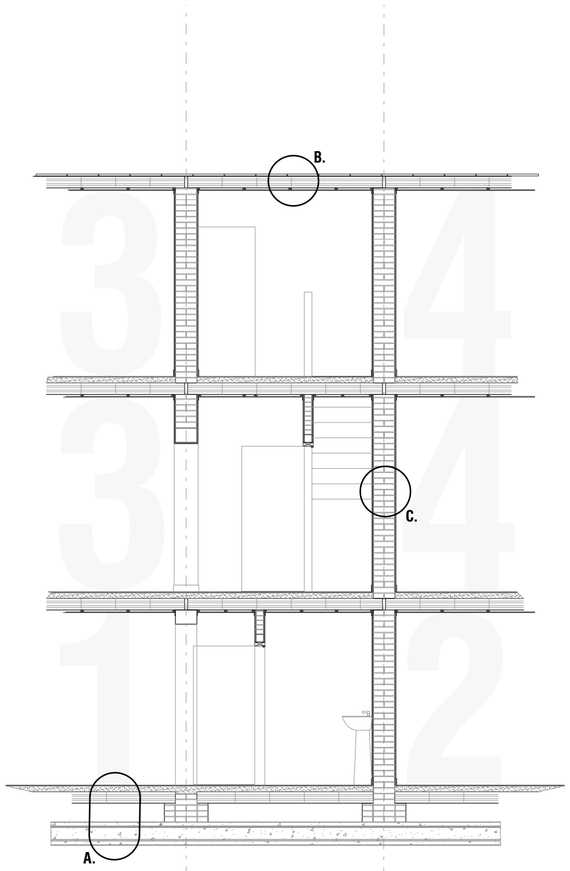
The east-north-east edge of the building is a space to sit in the morning sun, to talk to your neighbour whilst picking herbs, and to watch birds roosting in the eaves. It is also a place from which fresh air is naturally drawn into the building through the stairwells and along which residents can travel laterally to access the lift core. It is a place where the private realm of the home can be completely opened up to the semi-public world of the gardens below.

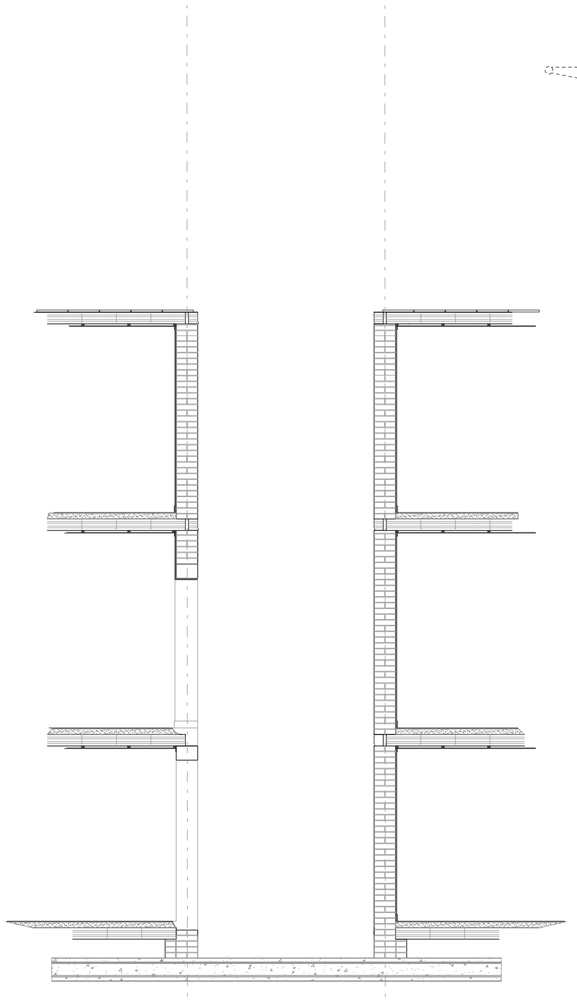
Continuing lines of protection against moisture ingress and transmission of thermal energy has proved the biggest challenge. Providing a winter-garden begins to address this issue by allowing waterproofing to be dealt with on the outside edge of the building, whilst thermal continuity is provided along the recessed glazing line.

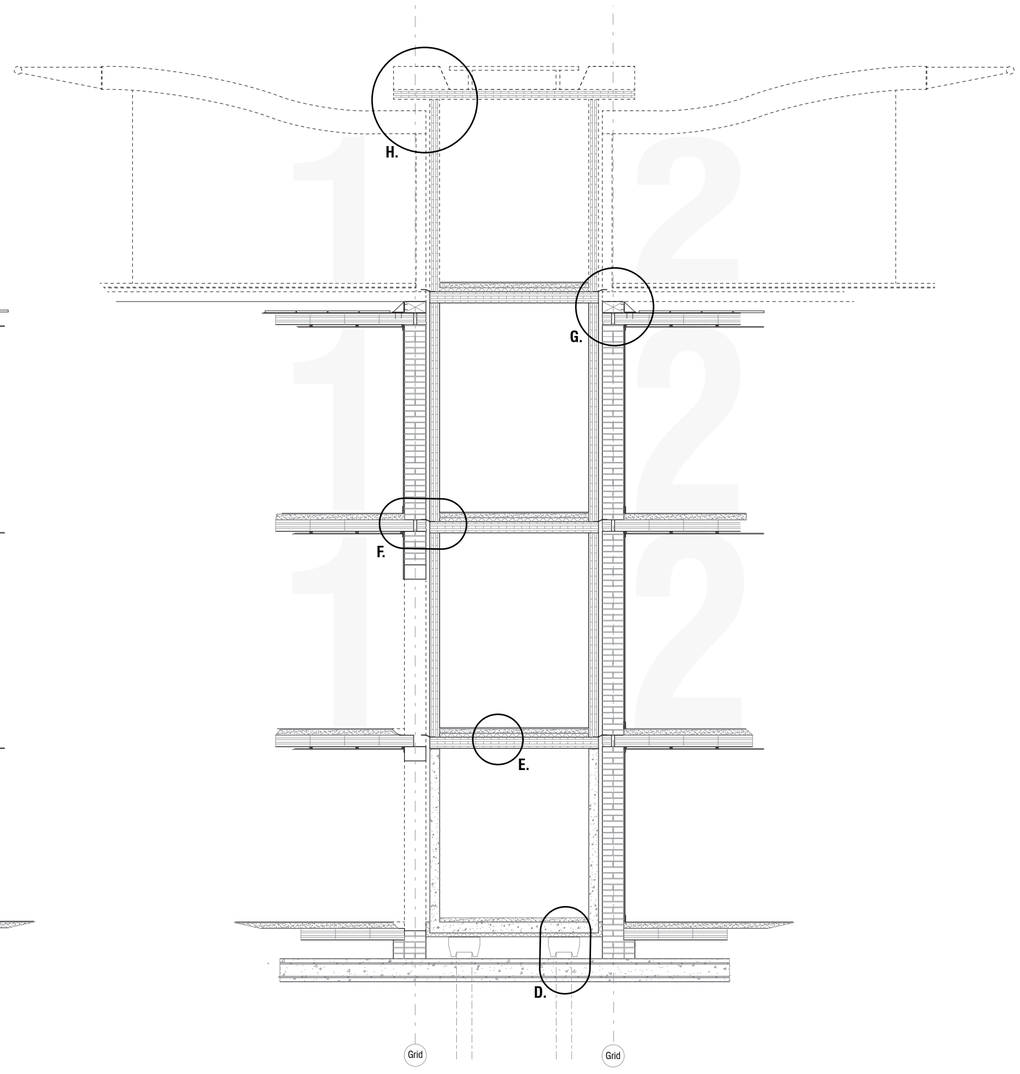
Cultivating Heijplaat /// An Edge

Nico's House and the Extra School

SSoA MArch Architecture 2011/12
ARC584 *Complex Material Assembly*
100235416 *Sam Brown*







01 /// **Existing Construction**

A. Carpet; directly onto screed; laid onto suspended prefabricated concrete floor slab; supported on brick piers from in-situ ground-bearing raft foundation.

No thermal insulation.
Unlikely to be a vapour barrier in floor.
Raft foundation is likely to be reinforced.

B. Concrete tiles; onto single-ply felt waterproofing layer; onto prefabricated concrete panel; suspended plasterboard ceiling on battens attached directly to underside of concrete panel.

No thermal insulation.
Roof now very leaky.

C. Solid, loadbearing blockwork ('Pronto' system) between dwellings; plasterboard and plaster skim internal finish to each side.

No thermal insulation.
No acoustic insulation.

Assumptions based on observation and typical construction of the period. Buildings constructed 1952. Short section through junction of 4 dwellings; 2 ground floor flats and 2 first floor maisonettes.

02 /// **Removal**

Removal of material should be straightforward between structural grid-lines. Dilapidated bathrooms have been removed from both dwellings, as well as tight existing vertical circulation from the first floor mainsonettes.

Care must be taken to ensure load-bearing walls are propoerly braced whilst gap is surveyed and measured for fabrication of new conmponents, as the structure will be experiencing reduced lateral stability dut to the removal of some walls parallel to the section line taken above.

Waterproofing may also be compromised and must be temporarily addressed through the application of a waterproof covering to the exposed walls.

03 /// **Insertion**

Insertion comprises separate, prefabricated wall and floor pieces in cross-laminated timber. Assembly in storey-height sections allows for the new insertion to be tied into the existing masonry structure at floor junctions and fulfill its function of providing lateral stability to the existing structure.

A 50mm gap is allowed between the new structure and existing building. This can later be back-filled with inert, moisture-resistant insulation such as vermiculite and be sealed against moisture ingresss where it meets the external skin of the existing building facade.

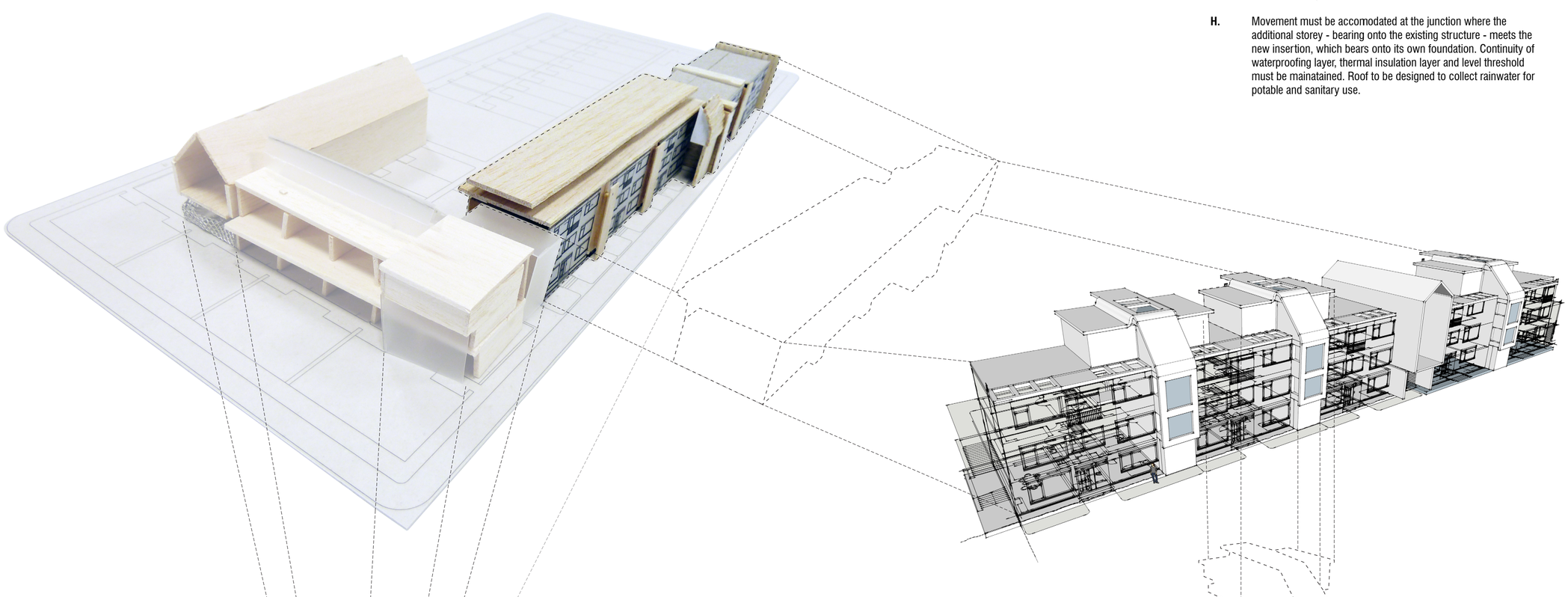
D. New mini-pile foundation; piles driven through holes made in existing raft foundation (removing large sections might compromise integrity of slab as a whole); Mini-piling rig can access up to 400mm from existing structural wall; In-situ concrete ground floor to provide floor-resilient finish and level threshold for installation of cross-laminated timber components; cast onto permanent polystyrene insulating formwork; polished screed internal floor finish.

E. Cross-laminated timber floor pieces left exposed as ceiling finish; acoustic insulation; waterproof membrane; floor screed; parquet floor internal finish.

F. Ties across cavity from top of cross-laminated timber floor panel to line of existing floor slab; 128mm, 5-ply cross-laminated timber wall panel provides 72minutes fire protection; 146mm, 5-ply cross-laminated timber floor panel provides sufficient load-bearing capacity across span and stiffens new element.

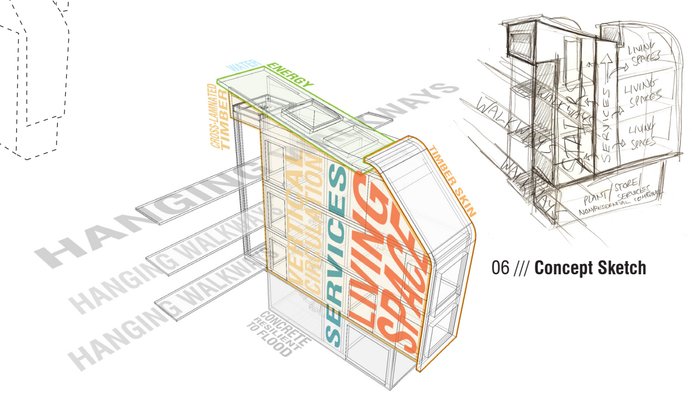
G. New laminated timber beams run along structural grid-lines on roof to take the load of additional storey; new roof including insulation and waterproofing layer to be laid directly over existing with a ventilated cavity.

H. Movement must be accomodated at the junction where the additional storey - bearing onto the existing structure - meets the new insertion, which bears onto its own foundation. Continuity of waterproofing layer, thermal insulation layer and level threshold must be mainatained. Roof to be designed to collect rainwater for potable and sanitary use.

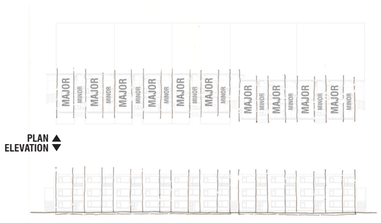


04 /// **Location Drawing**

05 /// **Insertion Into Existing Building**

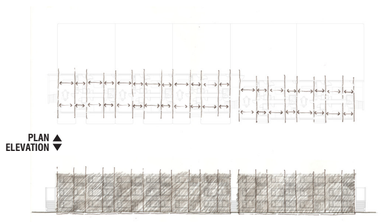


06 /// **Concept Sketch**



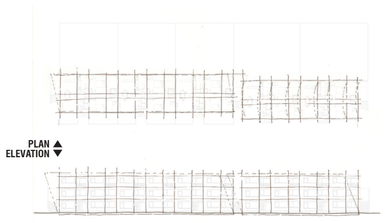
01 /// **Existing Primary Structural Grid**

Tartan grid of masonry pier walls form basis of platform-built existing structure. The grid is divided into major and minor structural bays; major bays span 3750mm and minor bays span 2580mm.



02 /// **Spans and Massing**

Existing structure comprises two separate buildings with separate foundations. Pre-fabricated concrete floor slabs span between masonry pier walls



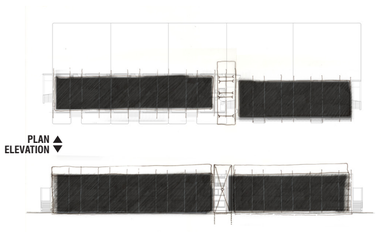
03 /// **Secondary Structure - Lateral Stability**

There are is also masonry infill between the piers of the platform. This does not seem to be load-bearing, but probably contributes to lateral stability of the overall structure by preventing wracking. The floor slabs themselves probably also contribute to overall stability by resisting bowing and twisting of the pier walls.

04 /// **Design Intent - 'Rooftopping' and Spatial Layout**

The primary design intent is to add a additional storey to the roof of the buildings, improving performance of the building fabric. Along with radical re-arrangement of internal spaces this facilitates the improvement of the 'spatial offer' and flexibility of the dwellings, i.e. there are more options for internal spatial layout. The ground floor is re-programmed with non-residential use to address the historical risk of flooding in the area.

The existing ground-bearing concrete raft is underpinned to enusre that the existing structure can take the additional load. This move is of course dependent on structural assessment.

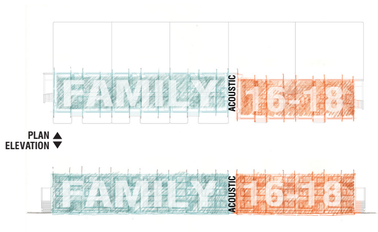


05 /// **Structural Compensation - 'Guest' and 'Host'**

As a result of spatial moves that address the fabric performance and internal flexibility, lateral stability of the overall structure might be compromised, i.e. internal masonry walls are likely to be removed resulting in reduced resistance to wracking. Additionally, the 'rooftopping' will potentially contribute to increased wind loading.

New 'guest' elements are added to the 'host' structure to improve lateral stability and further improve the spatial offer and flexibility by allowing for the provision of new services and better vertical access via stairwells and lift-cores.

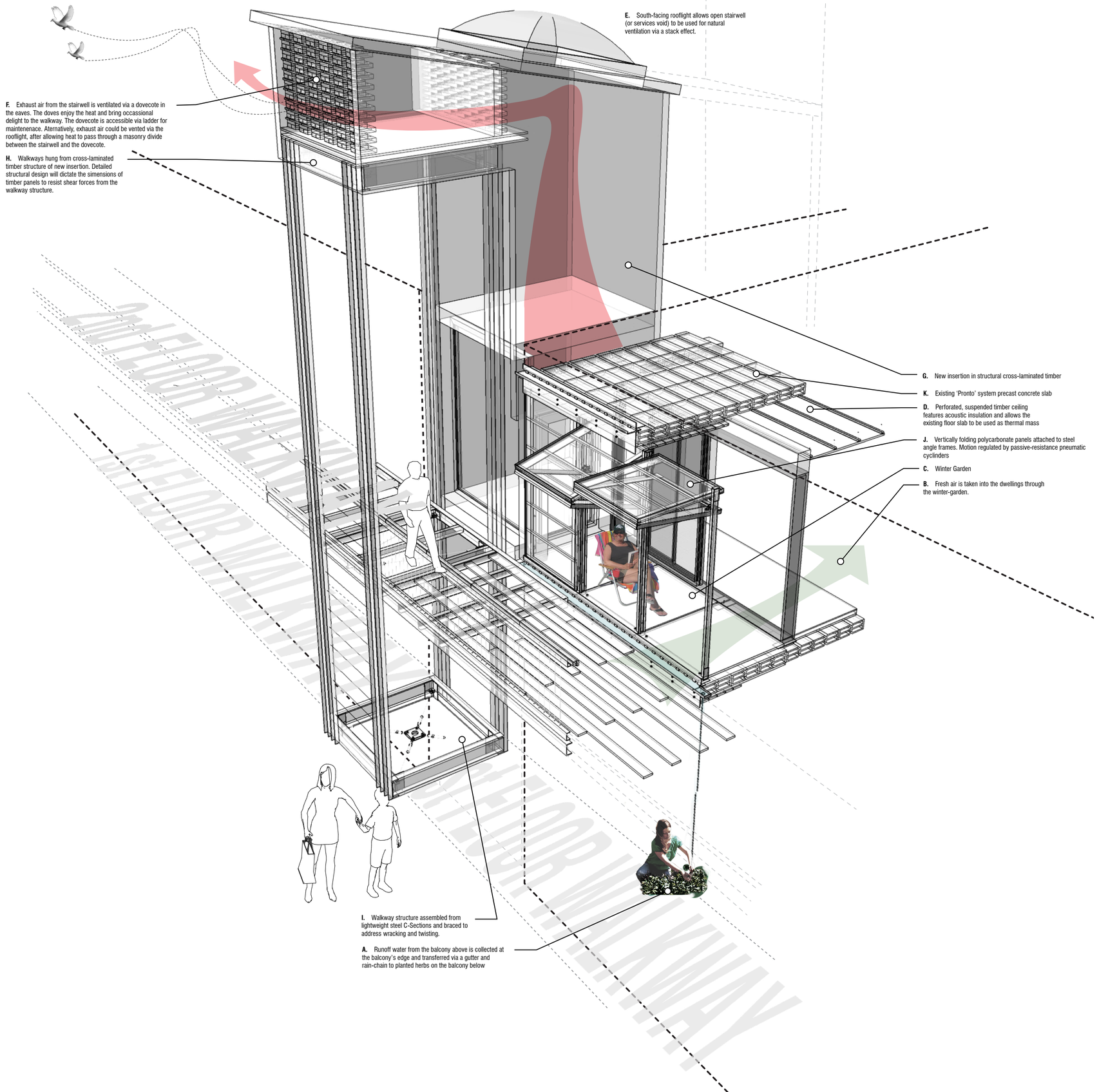
The concept of 'guest' and 'host' is articulated in the reciprocal relationship of new and old.



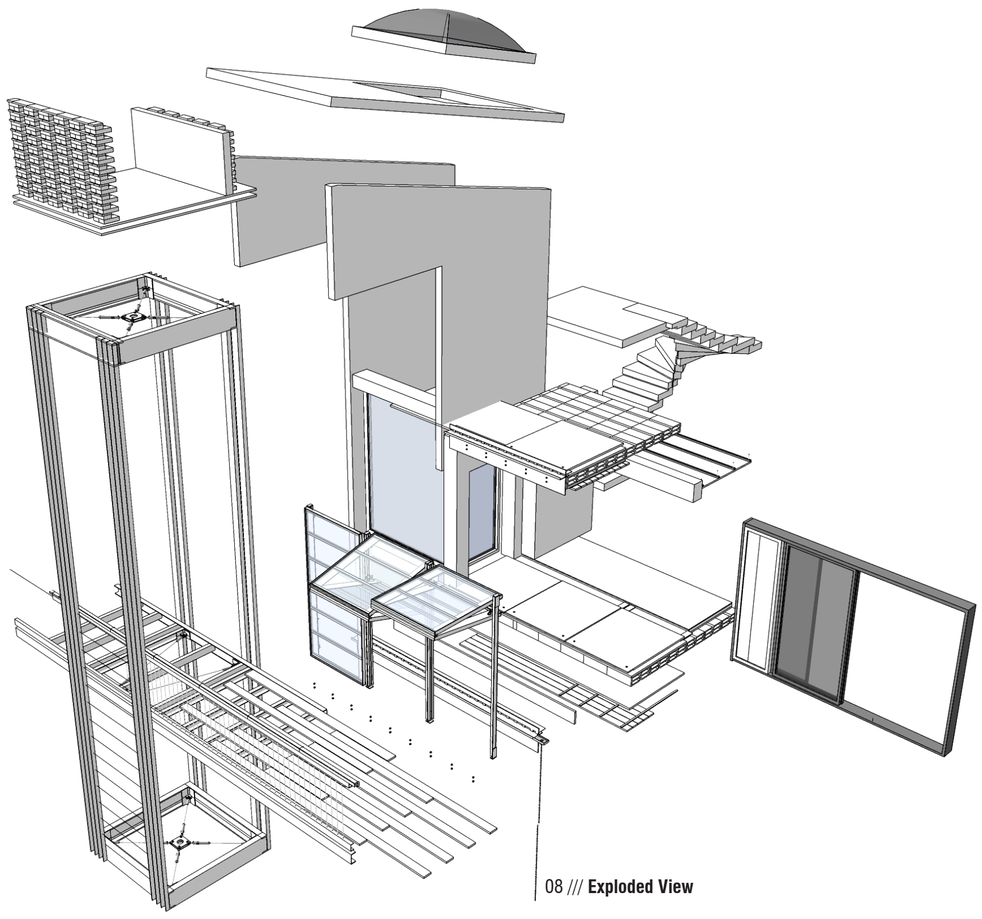
06 /// **User Groups**

Of the existing buildings, one is zoned for individual family dwellings, whilst the other is zoned as supported independent living for 16-18 year olds in training. Both user groups are 'clients' of SHIS; the pastoral organisation for the inland shipping industry and end-user for this element of the project.

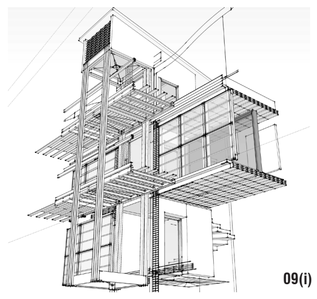
This adjacency of user groups necessitates the consideration of clashes in lifestyle. Families - typically single-parent with young children - require peace, quiet and privacy, the 16-18 year old user group are likely to have more active (and louder!) social relationships with each other.



07 /// **Principals in Use**



08 /// **Exploded View**



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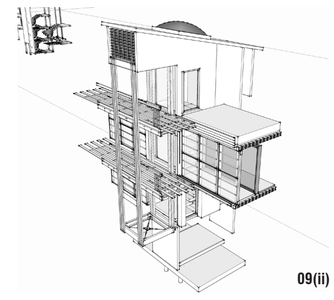

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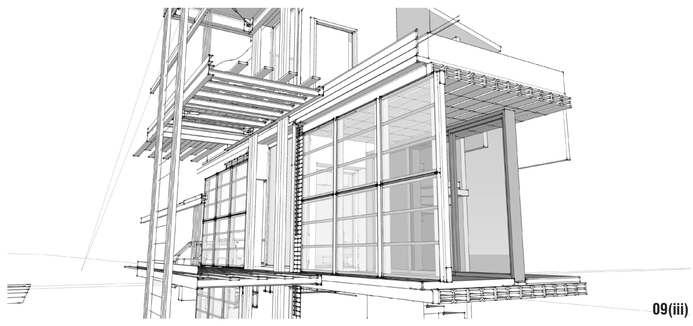

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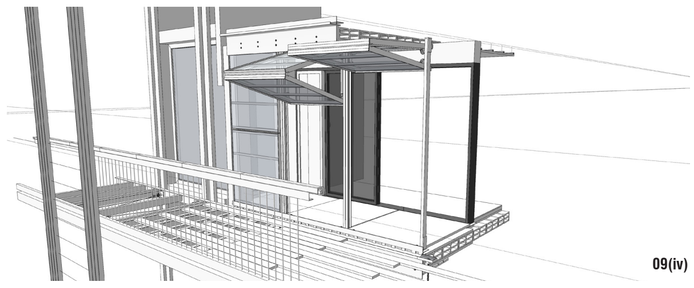

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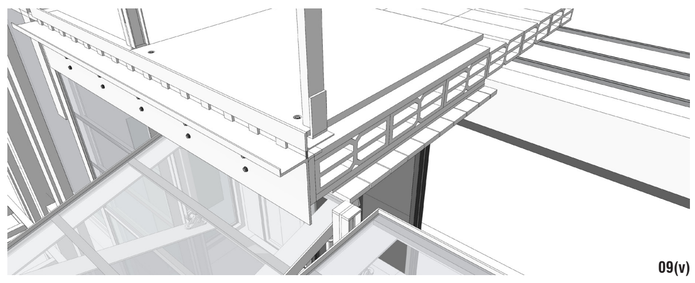

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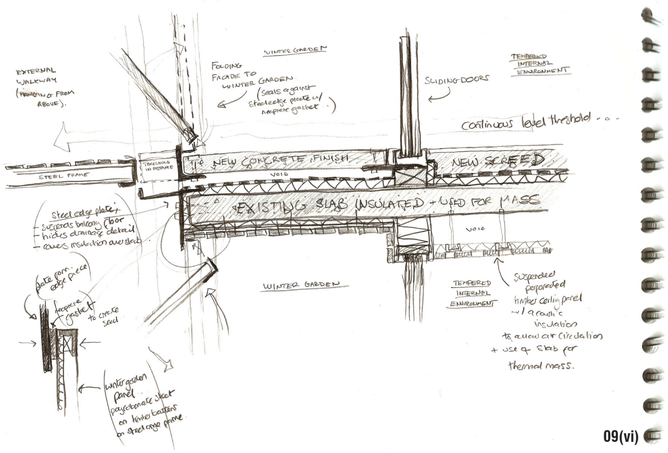

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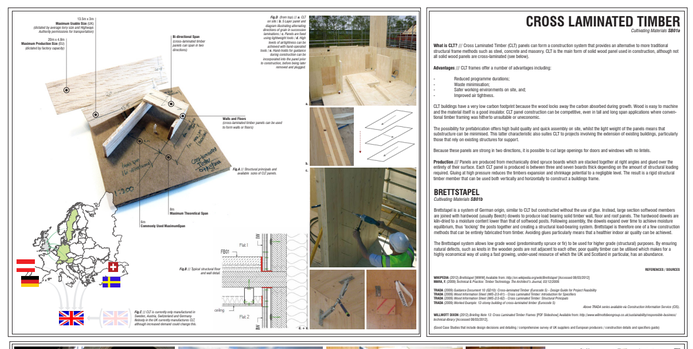

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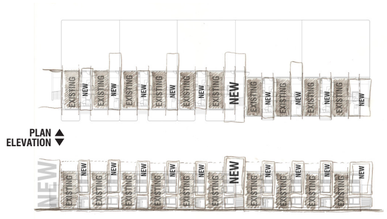
SSoA MArch Architecture 2011/12

***ARC584** Complex Material Assembly*

***100235416** Sam Brown*



07 /// **Level of Intervention**

There is a ballance to be struck between new and old; how many 'guest' elements can co-exist with the host structure? What do the new elements bring to the existing?

Above - replacing every minor structural bay with a new insertion leaves very little existing fabric. The structural integrity of what remains may be compromised beyond a useful state and much social value derrived from existing aesthetics is lost. The regularity is almost akin to the lack of identity often cited as a problem with this kind of housing stock.

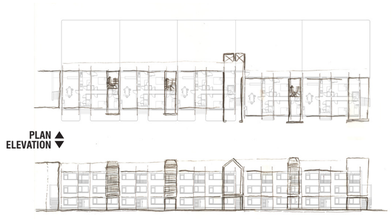
One major insertion signifies an entrance, shared by two user groups and might deal with acoustic separation between user groups.

Not every insertion needs to contain vertical circulation; and of those that do, not every one needs to contain a lift shaft.

08 /// **Retain Existing Entrances**

Whilst retaining the existing entrances makes sense in terms of the strategy of minimal intervention, it actually necessitates the insertion of quite a few new elements. Considered alongside junctions at either end of the block - and a shared central lobby - it also creates some awkwardly small spaces in plan and perpetutates the inflexibility of the existing dwellings.

Shared element separating the two blocks will contain the lifts (two), whilst stairwells are still included in each of other insertions.

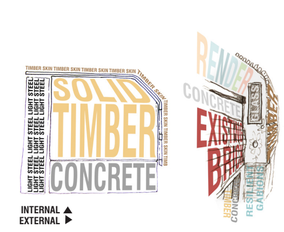


09 /// **Using Other Minor Structural Bay**

Rationalising the plan and facade by inserting the new element into the other available minor structural bay creates greater flexibility when considering internal layouts, especially when considered alongside the extra space offered by the additional storey.

New elements 'take up the slack', collecting services, vertical circulation and new day rooms that augment the spatial possibilities of the existing dwellings.

It is still possible to have a shared element separating the two blocks will contain the lifts (two), whilst stairwells are still included in each of other insertions.



10 /// **Internal and External Materiality**

The new insertions are comprised of a number of materials in assembly. Some are read internaly and some are read externally.

Concrete is expressed in the ground floor to indicate resilience to flood whilst the warm finish of the cross-laminated timber is exposed on the upper floors. The access walkways at the rear are expressed as lightly as possible whilst the external timber cladding is similarly fine. Thinner elements such as the steel access walkways and the timber skin cladding serve as counterpoint to the volumes of load-bearing structure that read as heavy mass.