Applied Research in the Marketplace: Architectural Design Research

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July 2020

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Project Details

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Title: *Applied Research in the Marketplace: Architectural Design Research*

Output Type: Design projects

Locations: *(London)* Upton Gardens, Green Street, London E13 9AX, UK

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Timescale: Project work began in early-January 2019 and was completed by July 2020

Funder: EU Erasmus+ networking grant – this is a work package that forms part of the larger project titled 'Strengthening Architecture and Built Environment Research (SABRE)'

Consultants: *(London)* Architects for Social Housing, Greater London Authority's Housing Team, HTA Architects, Macreanor Lavington Architects, Peter Barber Architects, Peynore & Prasad Architects, Public Practice, Unboxed Homes, University of Bath's Centre for Innovative Construction Materials, White Arkitekter (London office).

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Summary of Research Content and Process

The fundamental purpose of this design research portfolio is to offer a best-practice model for how one can encourage, articulate and disseminate the kinds of innovative investigations that are taking place extensively in European architectural practices, but which as yet are not being fully recognised and appreciated.

In order to do so, the portfolio adopts the existing model of the *Bartlett Design Research Folios* published by University College London's Bartlett School of Architecture – represented within this project by the Centre for London Urban Design (CLOUD) – and then enhances this model through a wider transnational collaboration with the Centre for Housing Architecture at Chalmers University of Technology in Gothenburg, Sweden. As such it harnesses the strength of architectural design research in these two leading European universities in order to demonstrate how architectural practice can become more academically informed. The proposition is that architects today need to be more explicitly involved in research/knowledge creation if they intend to forge productive connections between the different forms of 'languages' they use in their work – e.g. sketch designs, drawings, visualisations, texts, models, prototypes, buildings, etc.

In terms of content, this design research portfolio examines the need for higher quality and more sustainable social housing in European cities. How indeed might we better integrate research into the present-day field of dwelling design? For its case-studies, the portfolio interweaves two examples of applied design research that lead to new housing proposals on respective sites in London (UK) and Gothenburg (Sweden). A notable feature of this design research process is the degree of collaboration between the subject experts based in universities and those working in SMEs and other external stakeholders within the UK and Sweden. This close link between academia and practice, plus the fruitful cross-cultural comparisons that are made possible by pulling together design researchers from two different European countries, means that the portfolio not only contains innovative approaches to social housing design but also showcases the benefits to architectural firms if they can reconceive their projects as fertile vehicles for design research. Additionally, the new form of online publication represented by this design portfolio offers a direct demonstration of how architects might communicate their innovative research more effectively on a global stage.

As a part of BauHow5's wider initiative titled 'Strengthening Architecture and Built Environment Research (SABRE)', the responsibility for producing this research portfolio was allocated specifically to the UCL Bartlett and Chalmers for two reasons: firstly, because both schools are among the best-known centres internationally for architectural design research; and secondly, because of the existence of urban housing research units within each institution. These units are the Centre for London Urban Design (CLOUD) at the UCL Bartlett, co-led by Professor Murray Fraser, and the Centre for Housing Architecture (CHA) at Chalmers, whose staff include Professor Fredrik Nilsson and Dr Anna Braide. Both of these research centres were also already working closely with local and national stakeholders that were then incorporated successfully into this project. To carry out the design research process, the two research teams in London and Gothenburg met at regular intervals to exchange, review, critique, and publicise their proposals at different stages – thereby sharing and allowing for the cross-fertilisation of ideas, values, standards and design solutions along the way.

To inject greater dynamism into the research process, each of the UK and Swedish teams selected their own sites for social housing projects in their respective cities, plus they also deliberately tackled the issue through differing lenses. The UCL Bartlett team created a speculative design research project as a counter-proposal to a major development now being erected in East London, viewing their approach as one framed in academia but reaching out to external practices/stakeholders – whereas the design research project undertaken by the Chalmers team is part of an actual scheme currently being implemented in Gothenburg by Malmström Edström Architects & Engineers, and as such they envisaged their approach more along the model of external practices/stakeholders who bring their research work into academia. Thus, the Bartlett scheme is more speculative and anticipatory in its nature, while the Chalmers scheme is more embedded into current Swedish housing practices. The contrasts and tensions between these two distinctive approaches however undoubtedly helped to energise and enrich the eventual proposals by both teams for these two cities.

As an outcome of this fertile transnational and cross-cultural exchange between the UK and Swedish project teams, a range of new models and formats for architectural design research were developed by the two academic partners, as will be discussed in the main portfolio that follows. The project’s results have in due turn been disseminated via organised events and online platforms in different applied contexts so as to increase the transferability of the research findings to other academic and industrial stakeholders across Europe and beyond.

Design Research Portfolio

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Chapter 1

Introduction

This design research portfolio consists at its core of a best-practice model for how to encourage, articulate and disseminate the kinds of innovative work that are taking place extensively in European architectural practices, but which as yet are not being fully recognised and appreciated.

In order to do so, the portfolio adopts the existing model of the *Bartlett Design Research Folios* published by University College London's Bartlett School of Architecture – represented within this project by the Centre for London Urban Design (CLOUD) – and then enhances this model through a wider transnational collaboration with the Centre for Housing Architecture at Chalmers University of Technology in Gothenburg, Sweden. As such it harnesses the strength of architectural design research in these two leading European universities in order to demonstrate how architectural practice might become more academically informed. The proposition is that architects today need to be more explicitly involved in research/knowledge creation if they intend to forge productive connections between the different forms of 'languages' that they use in their work – e.g. sketch designs, drawings, visualisations, texts, models, prototypes, buildings, etc.

Working closely in collaboration with external SME architectural practices and other relevant stakeholders in London and Gothenburg, the two interweaving yet distinct parts of this design research project – carried out respectively by the UCL Bartlett and Chalmers teams – relied upon an extremely wide diversity of different methodological approaches. These included theoretical analysis, historical research, critical literature reviews, fieldwork research, workshops, interviews, design-led research, sketch proposals, drawing, modelling, prototyping, testing of sustainable technologies, financial costing, and so on. Two separate experts' groups were set up in the UK and Sweden to give advice upon specialist topics such as environmental performance, ecology, economics, planning regulations, innovative materials, digital fabrication, etc. The combined design research project, consisting as it does of its two distinctive but interweaving strands, has in turn been widely disseminated through lectures, seminars, workshops and various online platforms.

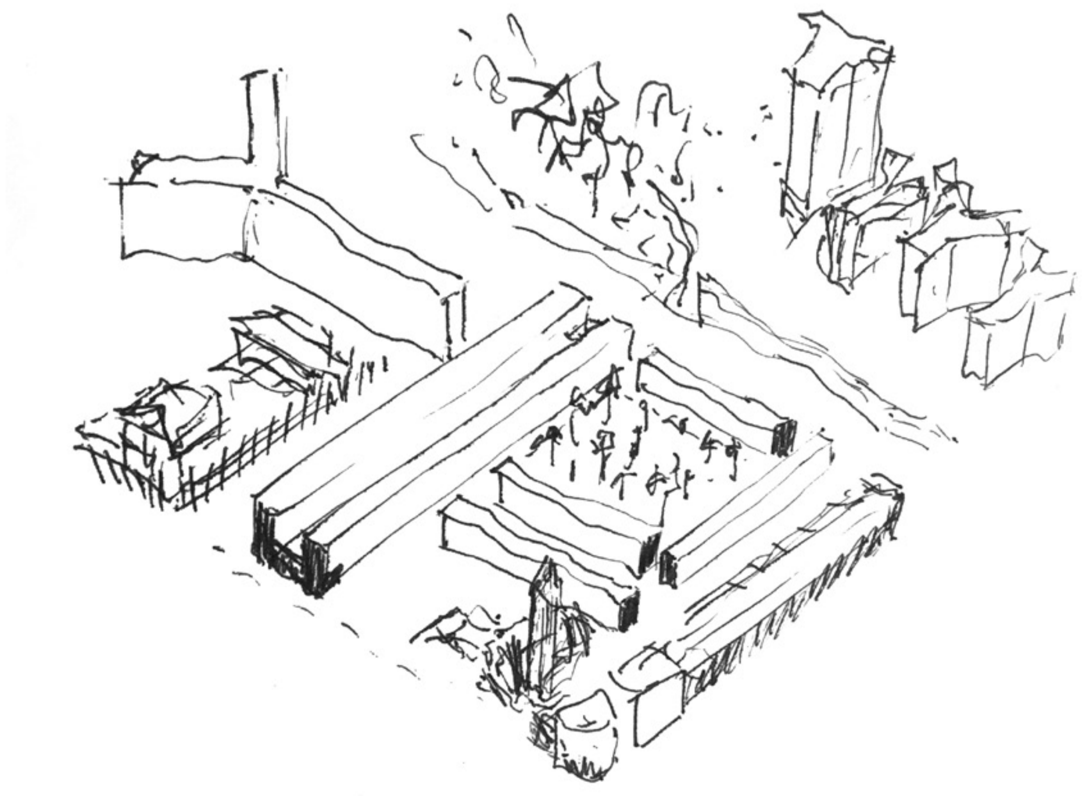

Fig.
Initial site development sketch by the UCL Bartlett team.

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Chapter 2

Research Aims and Objectives

The central aim of this portfolio is to make proposals for better quality and more sustainable social housing in European cities by running a design research process that spans from initial concepts through to the creation of realisable projects. How indeed might we better integrate research into the present-day field of dwelling design? An important objective of this research study was thus to develop and spread knowledge about the kinds of creative process that are able to combine relevant research and design practice in a productive and iterative manner, leading in this case to higher quality housing schemes. In doing so, a further clear objective was to help bridge the current gap between design practice (which is usually seen as taking place within architectural practices) and design research (which is most commonly promoted within academic circles). To this effect, the project deliberately selected London and Gothenburg as two otherwise separate realms that are able to be united here to creative effect.

To create the required case-study projects, this portfolio consists of two intertwined examples of applied design research that offer proposals for sustainable housing developments on respective sites in London (UK) and Gothenburg (Sweden). The fruitful cross-cultural comparisons made possible by pulling together design researchers

Fig (opposite).
Initial clay development model by the UCL Bartlett team.

from two different European countries means that the portfolio not only contains innovative approaches to social housing design, but also showcases the benefits to architectural firms if they can reconceive their projects as fertile vehicles for design research. And on a wider scale, the design research process highlights the strong connections that exist between the built environment and the socio-economic regeneration of our cities, not least in regard to questions of environmental and social sustainability.

A yet further aim of the project is to provide an example of how architectural design research can be written up and disseminated more effectively. The model of the Bartlett Design Research Folios is a successful one to explore, and hence the elaboration of that precedent within this portfolio is intended to help make this model of research/knowledge production even more academic in its form and content. Widely acclaimed, the Bartlett Folios contribute to developing a common format that enables more intersubjective communication and dissemination of knowledge, insights and solutions created during the architectural design process. This not only strengthens the academic aspects of design research but also supports more explicit and precise communication within the architectural profession, as well as with other professions in the built environment. In this sense, the new form of online publication that is represented by this design portfolio likewise offers a direct demonstration of how architects might communicate their innovative research more effectively on a global stage.

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Chapter 3

Research Questions

There is of course a broad spectrum of issues raised by the two design strands within this research project, yet the overarching research questions can be summarised as follows:

1. What are the most effective ways in which one can carry out and then disseminate architectural design research?

2. How can architectural design research create a process of cross-fertilisation between academia and practice that serves to enhance mutual knowledge building about sustainable social housing design?

3. How can two deliberately distinct approaches be used in the respective schemes (academia-informing-practice in London; practice-informing-academia in Gothenburg) in order to create a more dynamic and symbiotic model of design research?

4. How might contemporary conditions of everyday domestic life in European cities be integrated into design research for sustainable social housing projects?

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Chapter 4

Research Context

4.1 Wider project context

The underlying impetus for this design research portfolio comes from the BauHow5 research alliance of five leading European research-intensive faculties of Architecture and the Built Environment. These BauHow5 partners comprise the Bartlett Faculty of the Built Environment at University College London, UK; School of Architecture at Chalmers University in Gothenburg, Sweden; Department of Architecture at the Swiss Federal Institute of Technology in Zurich (ETHZ), Switzerland; Department of Architecture at the Technical University of Munich, Germany; and BK Bouwkunde at Delft University of Technology, Netherlands. The alliance's aim is to push the boundaries of current knowledge/skills in pedagogy, research and practice in this field, thereby raising awareness about the value of research and innovation for the greater benefit of European societies, economies and ways of cultural life.

BauHow5's first-ever initiative was the EU Erasmus+ project titled 'Strengthening Architecture and Built Environment Research (SABRE)', which ran from 2017–20. The SABRE project sought to strengthen transnational research partnerships among European higher education institutions, industry, practice, and local/regional authorities, and in order to achieve this goal it identified some current real-world challenges that could be used to exemplify the increased potential for research, innovation and entrepreneurship in the subject area. Its wider intention was also to prove that research ought to be playing a larger and more important role within Europe's creative/construction industries, thereby as consequence also better serving the needs of public policy-makers, professional bodies and research funding bodies.

With all of these goals in mind, the SABRE project consisted of four separate work packages: 'European PhD Core Curriculum for Architecture and the Built Environment'; 'Architectural Entrepreneurship'; 'Making the Knowledge Triangle Work'; and 'Applied Research in the Marketplace – Architectural Design Research'. This current portfolio is hence the output from this last work-stream.

Given that the portfolio hopes to influence how architectural research/knowledge is produced, and to demonstrate how it could be more consciously articulated, disseminated and managed by European architectural practices and construction firms, it is therefore vital that it can have a potential impact on both industry and academia. Within the academic context, the methods that are employed for research/knowledge production in design practices need to be adapted and strengthened to offer legitimate methods for the more speculative, 'blue-sky' research projects carried out by universities. Within the industry context, design research can help practicing architects in Europe develop improved design tools, making them more entrepreneurial and more successful nationally/internationally. This explains the emphasis within this project on setting up the two experts' groups from external stakeholders in the UK and Sweden. These outside consultants included, in the case of the UCL Bartlett's project, representatives from some leading local housing practices (HTA Architects, Macreanor Lavington Architects, Peter Barber

Architects, Peynore & Prasad Architects, White Arkitekter), local authorities (Greater London Authority's Housing Team, Public Practice), developers (Unboxed Homes), and environmental researchers (University of Bath's Centre for Innovative Construction Materials). In the case of the Chalmers team in Gothenburg, their consultants initially included a municipal company for urban development (Älvstranden Utveckling AB) and Sweden's largest architectural firm (White Arkitekter), and the final project was developed together with one of the nationally leading large housing developers (HSB Gothenburg), and one of the leading local architectural practices (Malmström Edström Architects and Engineers).

4.2 Brief historical context for British housing

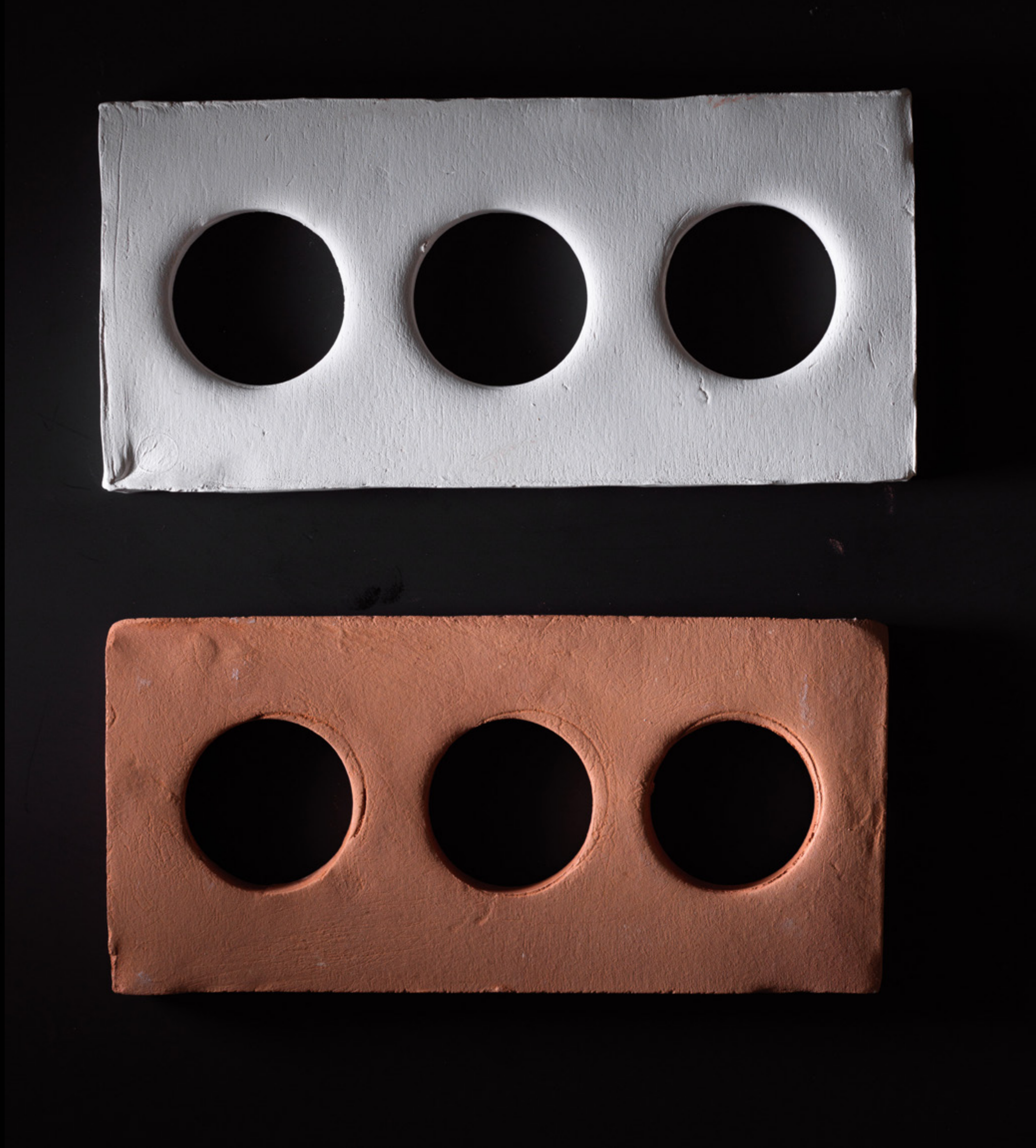
After millennia of slowly changing vernacular building practices, housebuilding in Britain from the late-17th century started to become another speculative commodity within the capitalist socio-economic system. In London, and then the rest of England, following the path set by ingenious speculators like Nicholas Barbon, land for housing was typically leased from wealthy ground landlords; developers then made their profits by building and renting leasehold properties that took the form of multi-storey, single-family brick terraced houses in continuous rows along both sides of a street.[1] Different classes of terraced houses were provided for all ranks of income/social status, with the situation slowly changing into one where householders could purchase their property with a perpetual freehold. The model of single-family terraced houses predominated in England, Wales and Ireland. The only real variant was in Scotland, where major cities like Glasgow and Edinburgh followed the Continental European tradition of single-floor apartments, with these blocks of flats usually arranged into continuous rows called 'tenements'.

Private enterprise hence created nearly all housebuilding in Britain throughout the Industrial Revolution. However, growing concern about the threats posed by urban poverty, overcrowding and disease showed that Frederick Engels was correct in *The Housing Question* (1872–73) when pointing out the inherent contradiction in the capitalist system which meant that housebuilding for the poorest citizens could never be adequately profitable.[2] In other words, the bare wages paid to industrial labourers to ensure that capitalists could extract 'surplus value' were not high enough to pay the rents required by commercial housebuilders to make their profits. To tackle this problem, from the 1850s onwards firstly a swathe of semi-philanthropic housing companies like the Peabody Trust – which sought 'only' to make a nominal 5% profit so that their dwellings, designed as multi-storey apartment blocks, were affordable to the skilled working classes – and secondly local municipalities began increasingly to erect cheaper-rent housing.[3]

A more ambitious and far-reaching paradigm was soon to emerge. As part of efforts to defuse Nationalist rebellion in the southern provinces of Ireland – then part of the United Kingdom and in effect a colony – the British government from the mid-1880s devised the first-ever policy to provide working-class dwellings subsidised by the national exchequer in order to keep rent levels very low.[4] Built using standardised housing typologies, initially these dwellings were in rural areas, then in Irish towns and cities. The Irish Free State won independence in 1922, yet before then the innovative policy of state-subsidised working-class housing was transferred to Britain via the 1919 Addison Housing Act – largely driven by a fear of USSR-style 'Bolshevism' erupting.[5] Subsidy came from taxes levied by the British government, yet the actual dwellings were built by local municipalities, leading to them being referred to as 'council housing'. Most units were clustered in nodes popularly known as 'council estates'. While the vast majority of new dwellings in the inter-war era

continued to be erected by private developers, typically as Neo-Vernacular or Neo-Georgian semi-detached or detached houses in suburban areas, the state policy of subsidising working-class dwellings flickered intermittently, with apartment blocks becoming increasingly preferred to low-rise houses. Council housing in Britain reached its zenith after the Second World War. Countless estates were built in existing cities or in post-war New Towns, whether as low-rise houses or taller apartment blocks. By the early-1970s around 30% of those in England and Wales and over 50% of the population in Scotland and Northern Ireland were living in state-subsidised council housing.[6] The generally high standard of dwellings built for working-class tenants, plus private housing as well, was predicated through the celebrated 1961 Parker Morris Report which stipulated decent-sized rooms, plentiful daylighting and other requirements as mandatory provisions. The nadir for post-war council housing came in the shape of system-built prefabricated tower blocks, with the fatal collapse of Ronan Point in May 1968 hastening the switch away from that type of construction; meanwhile the most acclaimed were the medium-rise Modernist estates built in the late-1960s and early-70s by the London Borough of Camden to Neave Brown's designs, combining flats with two-storey maisonettes.[7]

The gradual collapse of the British Welfare State from the mid-1970s was intensified by the policies of the 1980s Thatcher government. Council housebuilding all but stopped and a great many dwellings owned by local authorities were purchased by tenants under a generous 'Right to Buy' scheme. What this has meant is that over the past three decades the private market has again become the near-exclusive provider of new dwellings in Britain: responsibility for providing low-rent homes has tended to fall onto housing associations, which have made only a modest contribution. While the 1981 Census reported that the proportion of those in England living in owner-

Figs.
Initial clay development models by the UCL Bartlett team.

occupied or privately-rented housing was c.67%, with the remaining c.33% in council housing or housing association stock, the 2011 Census revealed that now 84% are homeowners or rent privately and only 16% live in 'socially-rented' homes (split almost equally between local authority and housing association dwellings).[8] London however has a slightly higher proportion of people in 'socially-rented' dwellings, at c.23% of its population.[9] Furthermore, because of high land prices and planning restrictions, plus the deliberate withholding of projects by speculative developers to keep property prices high, new housebuilding in Britain has fallen to only c.160,000 per year.[10] This is far below the current required level, estimated at around 300,000 new dwellings a year.

Furthermore, as a recent report by the Place Alliance observes, the design and spatial quality of new private housing estates in Britain is generally 'mediocre'.[11] This is despite them mostly being (once again) Neo-Vernacular or Neo-Georgian semi-detached and detached dwellings targeted at middle-class business executives, on decent enough peripheral sites. Mandatory space standards such as were set by the Parker Morris Report are all but forgotten, replaced in some areas by less effective documents like the Greater London Authority's *London Housing Design Guide* (2010). It means that Britain has now the lowest housing space standards of any European nation.[12] The final straw is the relative absence of new housing that might be remotely affordable to those on lower incomes or to younger citizens. Householders in the UK typically spend about 20% of their income on housing – this percentage is even higher in London, where the average house price is now c.£670,000 compared to just £230,000 nationally, and average rents are c.£1,675 per month compared to £975 nationally.[13]

4.3 Brief historical context of housing in Sweden

Housebuilding in Sweden today is internationally considered to be of high quality. The prevailing kitchen and bathroom standards, storage facilities, and the critical question of accessibility for disabled people are all well implemented through housing norms and regulations.[14] However, there are also issues concerning housebuilding that point in quite another direction. Housing production is now ruled by market forces which act within a situation characterized by shortage of offerings. The current extensive demand for housing in Swedish towns and cities appears to reduce the desired focus on providing long-term sustainable dwellings. The resulting decrease in housing quality means that Sweden in the long run might miss out on supplying a good standard of dwellings for all people. The current housing shortage has meant an increase in the rental price for dwellings and a situation in which many people cannot afford to buy an apartment.

This present-day situation was preceded by quite a different story. Sweden experienced a long phase of development in which the achievement of high-quality housing norms was used as the condition for receiving state-subsidised construction loans – this being regarded as the most effective way to ensure sufficiently high dwelling standards for all. Looking back at Swedish housing history, the mass provision of dwellings was initially largely formed during the years of the 'People's Homes *(Folkhemmet)* policy. This was a socio-political movement spanning from the early-1930s through the mid-70s that considered housing to be a major social welfare issue. It was the Social Democratic government that introduced the People's Homes movement as a political tool to address the 1930s housing crisis.[15] At that time, when the Social Democrat party took over, Sweden was seen to have one of the worst housing standards in Europe.[16] Thus the People's Homes initiative created an alliance between state finance and private capital to provide decent quality housing for all citizens. Also, from the 1930s the qualitative properties of housing designs were developed through extensive government-financed research.[17] Gradually through this process Sweden's basic housing norms were established. State loans were conditional on implementing the state-directed regulations. During this period, municipal non-profit housing companies were also formed as a way to offer good dwellings. All these factors contributed to the establishment of a high-quality, standardized approach to housebuilding throughout Sweden.

From 1945 onwards, the Swedish government's major goal was to end the housing shortage. However, in the 1950s this goal had appeared to fail, and so parliament decided to build 100,000 new units of housing a year over a period of ten years. The project came to be known as the 'Million Programme' *(Miljonprogrammet)*, still the most famous Swedish housing initiative to date.[18] This decision duly resulted in a housing construction boom during the 1960s. Large-scale industrialised construction was now developed to reach the goal of providing the million dwellings that were needed. By the mid-1970s, however, important demographic changes – with there being fewer young people and less immigration into Sweden – caused a dramatic reduction in housing demand. Due to this change, the previous housing shortage was now replaced by an over-production surplus. It was thus confidently and publicly declared that Sweden's housing shortage and overcrowding problem had been finally solved.[19] Indeed, for some years to come the demand for dwellings remained low and so the level of housebuilding was limited. This situation lasted for a considerable period, and indeed in the 1990s there came a further significant turn in what had been Sweden's housebuilding policy for many decades. Now the economy became increasingly deregulated and so government-driven housing development was replaced by market-

driven development. This marked a shift away from the ambition to provide high-quality housing for all citizens, leading to many notable changes.

Today a new housing shortage has occurred because there has been such limited housebuilding for so many years. Sweden's National Board of Housing, Building and Planning (*Boverket*) has estimated a need for approximately 710,000 new housing units to be built over the next ten years.[20] This is not far off the number of dwellings provided by the 'Million Program' in the 1960s and 70s.[21] But the situation is quite different from when the 'People's Homes' policy created a symbiotic alliance between public and private capital: now there is a situation in which economically powerful groups control the demands and conditions for housing quality.

One consequence of the new market-driven approach is that housing has become more a question of lifestyle realization rather than of common welfare.[22] This means that crucial aspects tend to be neglected. A recent research study that examined owner-occupied apartments from the 2000s showed that residents feel the need to remodel and renovate their homes to a far greater extent than expected, with these spatial interventions addressing what the occupants perceive as qualitative shortcomings in the design of their apartments, especially by changing the layout and the number of rooms.[23] Another consequence of privatised housing development is that the market's response to the housing shortage and the high costs of construction is to reduce apartment sizes.[24] While the intention to create better affordability for residents may be good, this tendency to address short-term market conditions may well be undermining the long-term spatial functionality of Sweden's housing stock.

But there have also been strong reactions to the present situation of Swedish housebuilding in response to decreasing quality and increasing shortages. In recent years, the housing situation has again become a salient question both in state and municipal forums as to how better to provide affordable housing and also raise supply. For instance, the fact that municipal housing companies have been compelled to become market-focused is now being questioned. During the last few years housing research has also been given increased levels of funding. Within academia a dedicated centre for housing research and innovation has been initiated as the Centre for Housing Architecture (*Centrum för bostadens arkitektur, CBA*) at Chalmers University of Technology. Its aim is to become a national centre for identifying, researching and communicating housing issues, and ultimately to represent the interests of residents within a market-driven situation: hence its involvement in this design research portfolio.

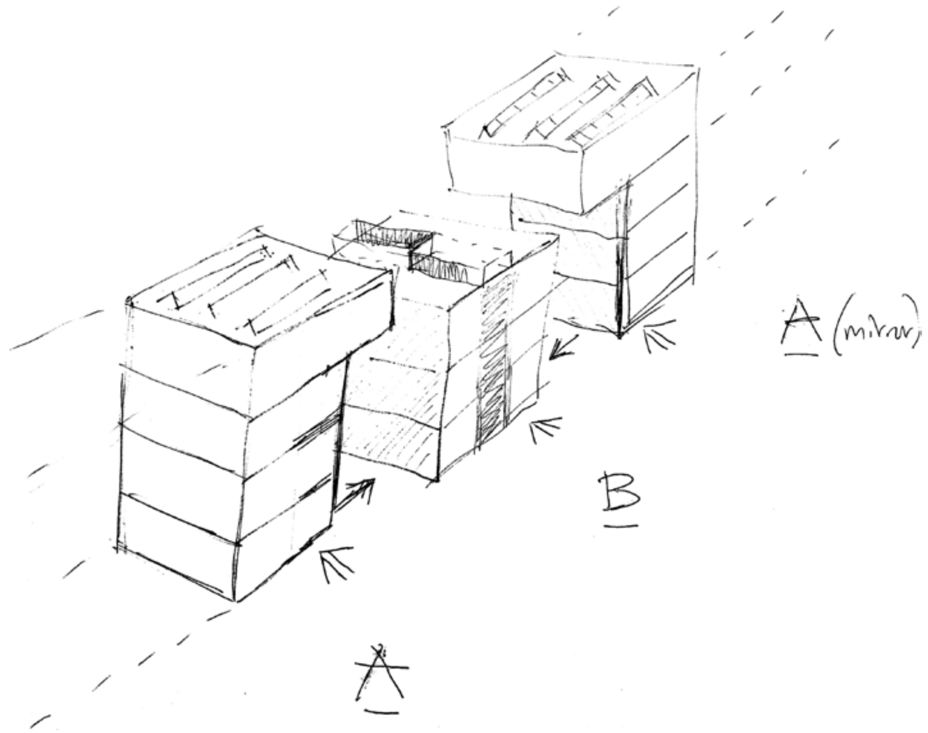


Fig.
Initial sketch illustrating terrace typology concept by the UCL Bartlett team.

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Chapter 5

Research Methods and Outcomes

5.1 General methodology

The project's research methods encompassed many techniques for both the London and Gothenburg schemes, albeit with the actual application varying to differing degrees:

1. Analysis of the history of social housing provision;
2. Sociological analysis of concepts such as flexibility and adaptability in housing design;
3. Search for alternative, more sustainable building methods in housing production;
4. Investigations into alternative models of housing tenancy/ownership/management;
5. Close analysis of the selected urban sites using photography, social mapping, etc;
6. Design development via sketches, drawings, physical models, digital models, etc;
7. Daylight and energy usage modelling software to decide wall thickness, room size, window size, etc;
8. Experimental testing and prototyping of alternative sustainable construction, such as clay bricks/tiles.

To carry out the design research process, the two research teams in London and Gothenburg met at regular intervals to exchange, review, critique, and

Fig (opposite).
Impromptu protest sign pinned to a tree on 20th July 2020 in Pemberton Gardens, London N19.

publicise their proposals at different stages – thereby sharing and allowing for the cross-fertilisation of ideas, values, standards and design solutions along the way.

To inject greater dynamism into the research process, each of the UK and Swedish teams selected their own sites for social housing projects in their respective cities, plus they also deliberately tackled the issue through differing lenses. The UCL Bartlett team created a speculative design research project as a counter-proposal to a major development now being erected in East London, viewing their approach as one framed in academia but reaching out to external practices/stakeholders – whereas the design research project undertaken by the Chalmers team is part of an actual scheme currently being implemented in Gothenburg by Malmström Edström Architects and Engineers, who envisaged their approach more along the model of external practices/ stakeholders that bring their research work into academia. As will be seen in this section, the Bartlett scheme is more speculative and anticipatory in its nature, while the Chalmers scheme is more embedded into current Swedish housing practices. The contrasts and tensions between these two distinctive approaches however undoubtedly helped to energise and enrich the eventual proposals arrived at by both teams. It is therefore now worth elaborating upon the two approaches in more detail, before then discussing how the interchange between the London and Gothenburg teams affected the final proposals for these two cities.

Fig. 1: Aerial computer-generated marketing view of Barratt London's Upton Gardens development (opposite) Although Barratt London's Upton Gardens project remains under construction, this aerial image illustrates the scale of the buildings that will ultimately be realized on the site of the former West Ham United football ground. While the scheme appears closer in scale to the high-rise flats to its east on Priory Road (visible at the rear of this image), it is clearly of a very different scale and urban grain to the predominantly two and three storey terraced houses (visible in the image foreground) that make up the bulk of the building stock in this area.

[Courtesy of Barratt London]

5.2 From academia to practice – the London scheme

Two factors above all are crippling new housebuilding in London, making it extremely hard to provide dwellings for lower-income residents. The first factor is the city's excessively high land prices[25], at around 15% of average earnings, which in turn greatly hampers housing supply[26] and also encourages developers to overpack any available sites with ever-higher dwelling blocks which are destroying the city's street-based urban grain. The second factor is a lack of state regulation, due to the UK being the most avid European follower of US-style neoliberal economics, which enables developers not merely to manipulate the planning control system to squeeze in more dwellings but also to provide almost solely dwellings to buy or rent. This has led to a dearth of truly affordable social housing in London given that local authorities have ceased building and the contribution by housing associations is modest.[27]

With this situation in mind, the Bartlett's CLOUD research team embarked on a design project that tackled these two problems head on. Since it was a housing proposal devised in academia to take out into practice, in order to show that a social-rent scheme was achievable, it was decided to choose a current housing development in London for the site in order that CLOUD's counter-proposal could then be compared directly with what is actually being built. It was agreed that this site needed to be in a poor borough in East London as that area is in greatest need of new social housing. After analysing six potential sites, the one selected for the test-case was Upton Gardens in East Ham: it is the location of what previously was the football stadium used by one of England's best-known clubs, West Ham United. A comprehensive survey of the provision of local services, identifying also the gaps in provision, was then researched on site and then mapped out (see Appendix A). In addition, two meetings of the London housing experts' group (17th May 2019;

Fig. 2: Upton Gardens site looking south along Green Street
Construction work has not yet reached Upton Gardens' western site boundary with Green Street, though the potential impact of the development at street level can start to be understood from the scale of the completed blocks visible in the distance. The development will create a largely unbroken 7-storey frontage to Green Street once complete, overshadowing St. Edwards School at its northern boundary and the terraced houses that sit opposite.
[Courtesy of Professor Murray Fraser]

Fig. 3: Upton Gardens site looking north along Priory Road
Construction work is largely complete to the Upton Gardens' eastern site boundary along Priory Road. While the scheme is closer in height to the Boleyn Road flats that it faces, another clue to its scale exists in the continuous brick wall at their border. Originally erected to ensure crowds from the football matches at Upton Park did not spill into the grounds of the Boleyn Road flats opposite it is a reminder of the stadium that used to occupy this site. The sectional profile of the former stadium was used by Barratt London as justification for the height of the blocks of flats that replaced it.
[Courtesy of Professor Murray Fraser]

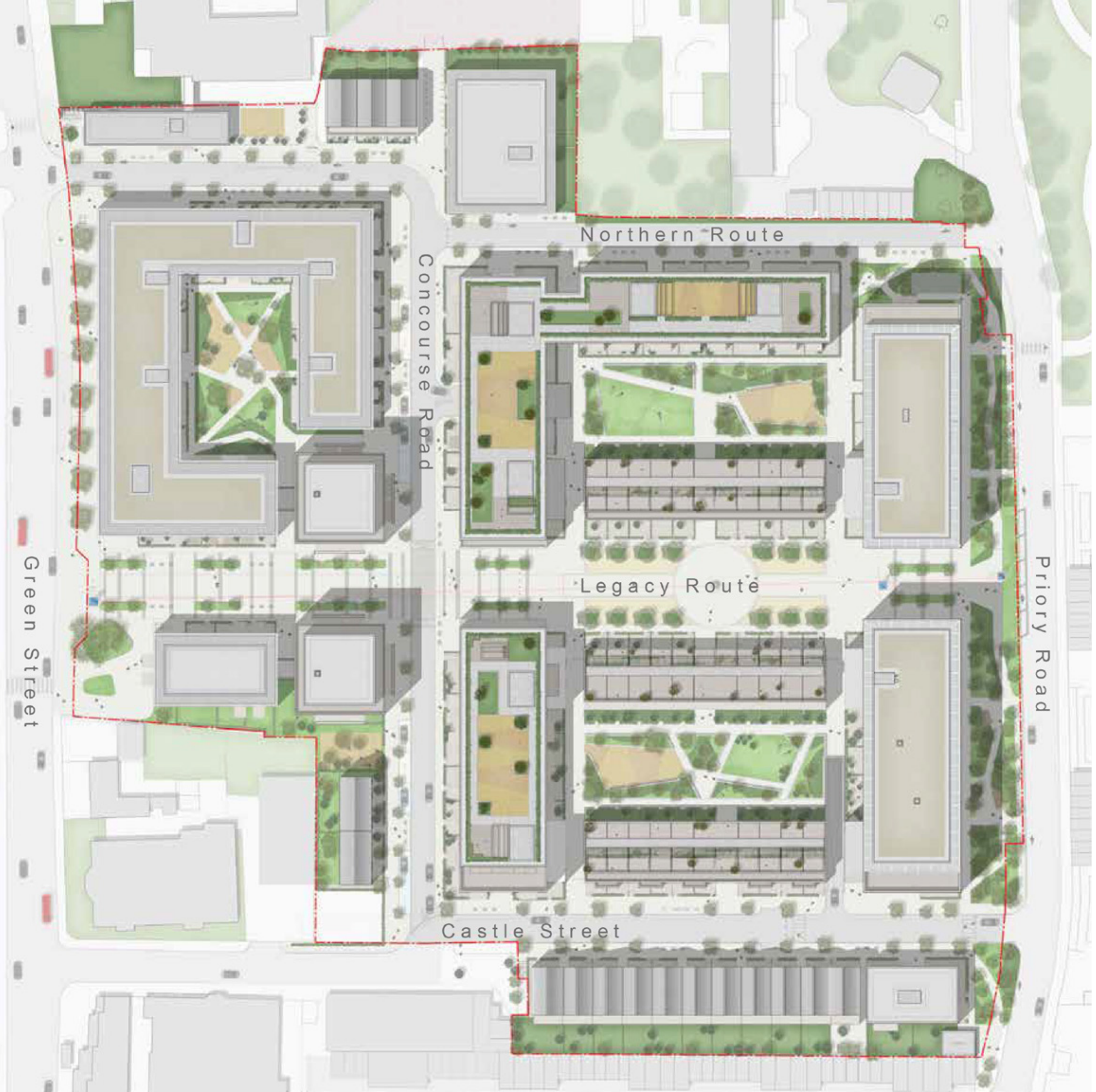


Fig. 4: Site plan of Barratt London's Upton Gardens development (opposite)
A number of key urban moves are visible in the site plan for Barratt London's Upton Gardens development. A linear park has been created along the Priory Road boundary though, as is visible in Fig.3, a lack of non-residential activities that might otherwise animate this edge means that the park is principally used to create defensible space for the ground floor flats. The central legacy route through the development, that supposedly crosses the centre circle of the historic Upton Park football stadium, is a token nod to the site's past though what is most evident is the lack of open public space within the development. Each green space instead forms the interior of a rectangular housing block that can easily be sealed off from the general public.
[Courtesy of BUJ Architects/Newham Planning Portal]

21st October 2019) were used specifically to frame and sharpen the scope and direction of the design research investigations (see Appendix B).

The initial stage of this project for East London hence involved detailed analysis of the current scheme being erected Upton Gardens by one of the UK's largest housebuilders, Barratt Homes, and as designed by BUJ Architects (Figs. 1–4). The publications on this development were forensically analysed in regard to financial costs, urban impact and architectural form. An accompanying table sets out the findings from this analysis, with the main conclusion being that – although the scheme is just within the permitted amount of dwellings permitted under the Greater London Authority's 'London Plan' – it is in truth an over-development of the site by a factor of 2 (see Appendix C). In other words, the Barratt Homes project has an average height of 8 storeys whereas to achieve a more socially and environmentally balanced design that fits into what is a predominantly low-rise urban area, there ought to be on average of 4-storey blocks. This overdevelopment in the Barratt Homes scheme leads to two deleterious effects: firstly, there is almost no public space provided for residents, and the apartments' interiors are highly contorted in plan and provide poor views and low levels of daylight. The current design for Upton Gardens can hence be seen as a typical example of 'greedy development' whereby profits are pursued at the expense of creating decent housing or decent urban environments. Indeed, the Place Alliance recently produced a damning report about the 'mediocre' quality of new UK housing design, with London among the worst affected cities.[28] By tackling the viability assessment – the key means by which housebuilders demonstrate the economic viability of their proposals and often negotiate a relaxation of the affordable housing targets mandated within the planning framework – it was possible for the CLOUD team to demonstrate that this lower level of development was not only feasible but

Fig. 5: Mecklenburgh Square, London (left); Fig. 6: Mountjoy Square, Dublin (middle); Fig. 7: Mercers Road, London (right)

To inform the development of our own designs it was important to look closely at historic relationships between housing provision and urban morphology within British cities to determine the scale, grain and connectivity of our proposals while addressing the particularities of our chosen site. Mecklenburg Square (1804-1825) is a 200-metre, four storey terraced block facing central gardens; Mercers Road (1884) is a 260-metre, four storey terraced block facing an opposite block of comparable length; Mountjoy Square (1790-1818) is a 140-metre, four storey terraced block facing central gardens. The comparable scale of each of these blocks indicated a historic urban pattern of terraced housing in Britain at a scale to be assimilated for the Upton Gardens site.

[Courtesy of Professor Murray Fraser/Google Earth]

Fig. 8: Aerial view of proposed scheme (opposite)
The proposed scheme is predominantly four storeys in height and uses long, linear runs of terrace to reinforce and create new linkages within the wider urban schema. At its heart a public park occupies the footprint of the historic Upton Park football ground, putting accessibility and connectivity at the core of the proposals. At the eastern boundary of the site, addressing Green Street, a local public library and a series of workshops surround a 12-storey residential tower that references the neighbouring Boleyn tower. The site's northern boundary is occupied by a four-storey workshop and education facility, ensuring that a diversity of uses is available throughout the proposed counter-proposal.

could also exceed the GLA's affordable housing targets.

Hence in devising the counter-proposal for what could be built instead on the Upton Gardens site, there were 3 clear objectives:

1/ To create clearer and stronger urban forms that could enhance liveability for all residents in that impoverished part of London;
2/ To design dwellings with larger and more spatially coherent interior rooms so as to improve the quality of domestic life for occupants;
3/ To push the issue of environmental sustainability, which is usually only paid lip-service, by adopting the super-insulated standards of the Passivhaus system.

The next task was to decide how to achieve these urban and environmental targets in the counter-proposal scheme. From the outset, two crucial design strands were highlighted:

1/ A rethinking of London's tradition of terraced/row housing in a manner that could create 4-storey blocks comprising single-storey apartments rather than multi-level houses;
2/ A rethinking of clay as London's quintessential building material, pushing it beyond its typical uses for brick walls and roof tiles by making it more environmentally sustainable.

The design research process was centred upon these two themes.
In terms of the former, an exacting historical investigation was undertaken into the long history of terraced housing in London (Figs. 5–7).[29] It is fascinating to note that although usually built as rows of single-family multi-level houses, in many instances these houses were instantly subdivided into single-storey apartments – with this now being a very common arrangement in today's London because of the astronomical cost of housing. The interrelationship between the physical form, aesthetic appearance and urban layout of terraced apartments was modelled via

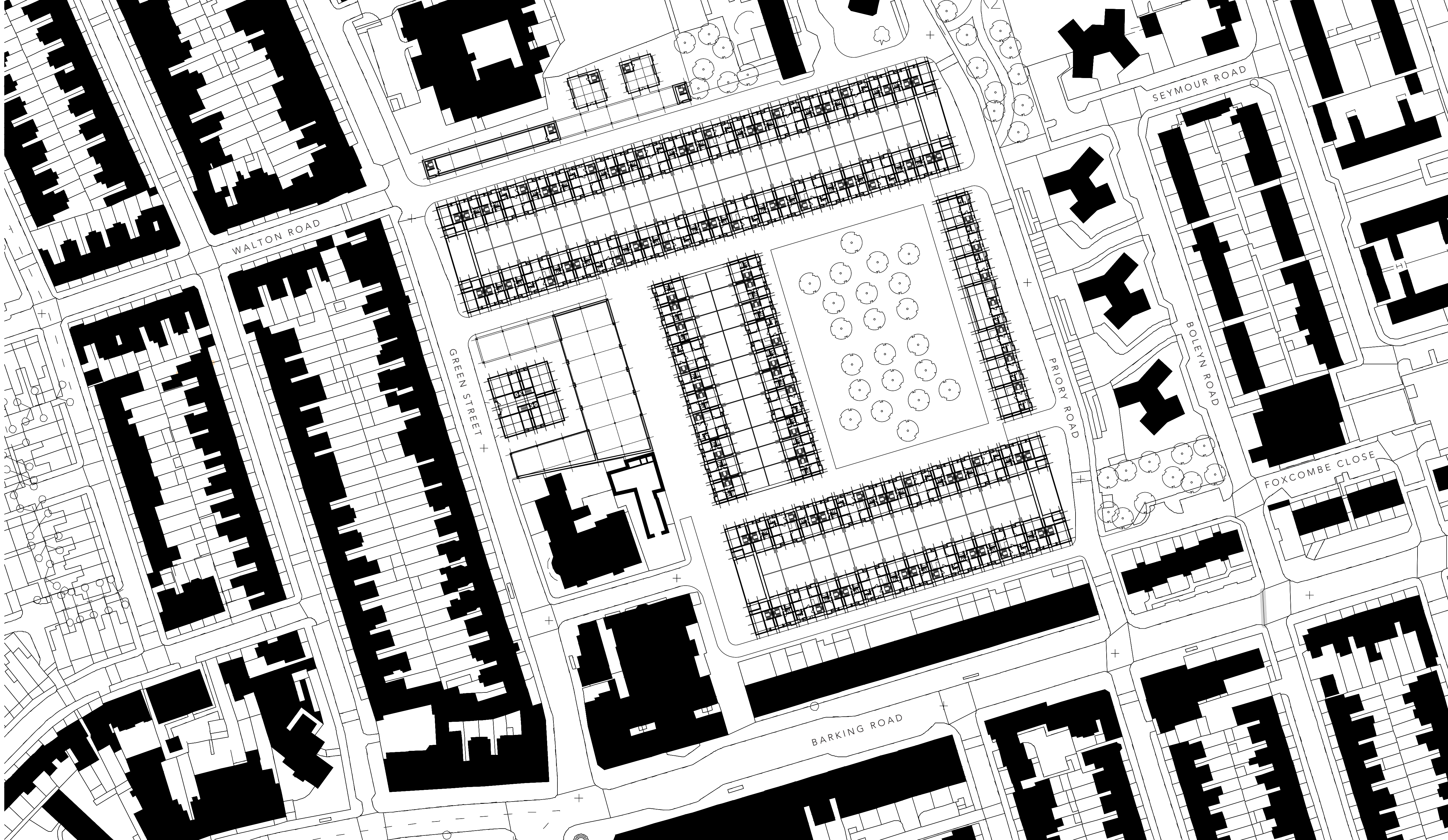


Fig. 9: Site plan
Each of the proposed terraces is created from repeating, modular plan types that deliver a total of 404 homes (60 no. 3 bed 6 person; 112 no. 2 bed 4 person; 232 no. 1 bed 2 person). This delivers 115 homes per hectare, as opposed to 255 homes per hectare in the Barratt London scheme. While the overall density of the proposed scheme is clearly lower, it has a comparable efficiency to the Barratt London scheme when considered on a floor-by-floor basis meaning that the difference in numbers can largely be accounted for by the fact that the counter-proposal is less than half the height of the Barratt London development.

Fig. 10: Roof plan
The site plan creates new connections between Priory Road and Walton Road, Green Street and Barking Road, significantly improving urban legibility. A new connection is also made through the continuous wall bounding the Boleyn Road flats with the intention of increasing pedestrian traffic and creating active urban space within a formerly under-utilized area. Active edges, green spaces and linkage with nearby facilities become a means of promoting a healthy, well-used publicly accessible environment.

Fig. 11: Site Section
Barratt London's proposals used the former section profile of West Ham United's Upton Park football stadium as a means to justify a scale and density of development that is the maximum achievable on this site within the parameters set out by the London Plan. When the scale of the surrounding, primarily residential context is taken into consideration, however, this appears to be a significant overdevelopment of the site. The proposed counter-development takes the opportunity to consider a more appropriate scale that is derived from an understanding of the surrounding urban schema and historic terrace types. This generally limits its height to 4-storeys (with the exception of a single 12-storey tower), while achieving a density of development that meets London Plan targets.

a series of design iterations to find the optimal organisation (Figs. 8–17). A huge benefit of the counter-proposal over the Barratt Homes scheme was that it is also possible to create a public park literally in the same position as the 100-metre by 64-metre pitch in the old Boleyn Ground where West Ham United played for decades. Likewise, the scheme manages to incorporate a range of employment and social facilities such as rentable workshops, corner-shop units, a nursery and a local community centre.

In terms of achieving higher sustainability criteria than the Barratt Homes scheme, the counter-proposal adopts the Passivhaus standards of insulation and airflow control. An accompanying diagram shows the thick

Fig. 12: Terrace corner
A key aspect of the terrace design was consideration of how the ends of each block could avoid awkward, blank end walls and instead be used to animate the masterplan with a varied range of uses. Each corner is occupied by a shop or workshop whose rent is subsidised to encourage local business, while a central, single-storey link topped with a roof garden provides space for a convenience store or office. Generous glazed corners to the flats above enable a degree of natural surveillance intended to ensure that the urban links facilitated by the overall block forms are enlivened and made safe by everyday human activity.

Fig. 13: View north along Priory Road
Bringing activity back to Priory Road is essential to ensuring that the urban plan put forward for Upton Gardens, and its impact on the wider area, is successful. Animated, glazed corners will meet both the existing junction with Priory Park and Seymour Road to the North of the site and the proposed connection to Foxcombe Close (and Barking Road) at the Southern edge of the site. It is intended that these active edges will promote interaction with and draw activity from busier neighbouring roads and routes, in turn animating the urban connections passing through the site.

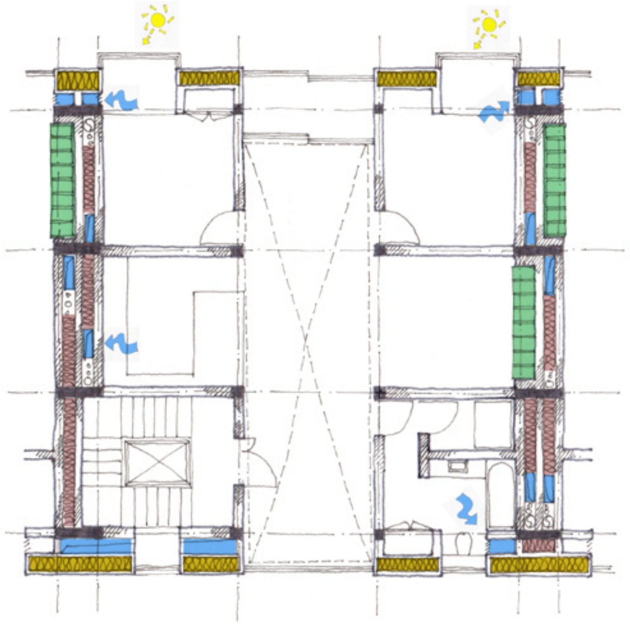
Fig. 14: Ground floor plan modules
The core planning module of this proposal is a 3.4 metre square grid which is used to ensure that all key living spaces meet and/or exceed London Plan requirements. The plan then alternates between 1 and 2-bedroom flats along the length of the terrace, with each division between flats separated by a deep double wall housing services (a construction element followed through to the building's deep external walls), passive ventilation and in-built storage. A stair and lift serve each flat subdivision with direct access to each flat off of each stairwell. All ground floor flats are dual aspect and have access to a private garden.

Fig. 16: Upper floor plan modules
The plan area occupied on the below floors by the 1-bedroom, 2-bedroom, 1-bedroom plan configuration is given over to 2 no. 3-bedroom flats, each served by a generous roof terrace. Each living space and its connected terrace is fully private. As with the floors below all corridor space is eliminated and the repeating planning module ensures equality in the level of spatial provision throughout all flat types.

Fig. 15: Typical floor plan modules (opposite)
The planning principles from the ground floor are largely replicated, with the removal of the ground floor entrance lobbies creating space in plan for generous winter-gardens that are accessible from the living area of each flat. A cruciform plan arrangement within the 2-bedroom flats defines different territories within the main open plan living space, while an L-shaped plan works on a similar principle within the 1-bedroom flats. Projecting oriel windows create in-built seating within the bedrooms. As with the ground floor plan all corridor space has been eliminated to ensure that the full extent of the plan area is useful.

Fig. 17: External Spaces
Together with the generous provision of open, publicly accessible space within the proposed Upton Gardens masterplan, each flat will have a dedicated, private external space that exceeds London Plan requirements. All ground floor flats will benefit from an 8.5-metre-deep garden that extends to the full plan width of the flat. 1st and 2nd floor flats will have a winter garden that will facilitate year-round use. Each top floor flat will have a generously proportioned terrace directly accessible from the main living space.

Fig. 18: Construction Plan
The building plan form is articulated by deep dividing and external walls, that allow a continuous 400mm insulation zone and separate zones for airflow control to meet Passivhaus standards. A pre-cast concrete frame, employing cement replacement technologies to minimise carbon impact, is clad with fired clay bricks externally, while unfired clay surfaces are used internally to facilitate carbon capture. In adopting this approach it is hoped to drastically reduce the energy consumption and overall carbon impact of the scheme.

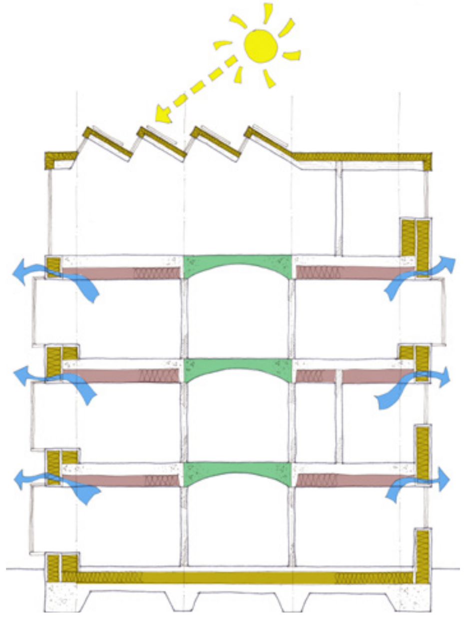


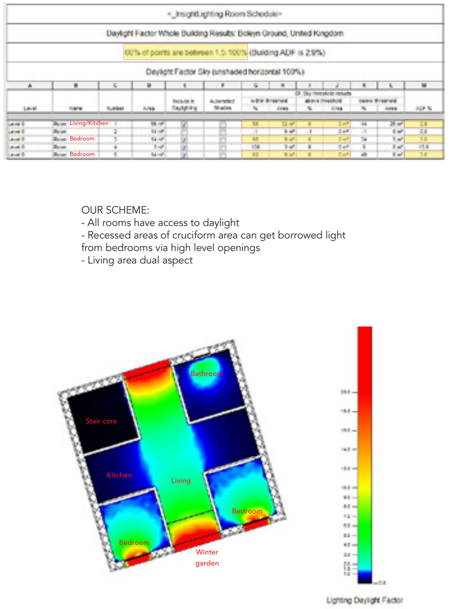
walls and floors and the complex passive ventilation systems within the housing blocks (Figs. 18–19). Care was taken to ensure that there would be sufficient daylight in all interior rooms so that for the maximum amount of time they do not require artificial lighting (Fig. 20). This combination of super-insulation and reduced mechanical heating/lighting means that the running energy costs of the apartments in the project would be extremely low, indeed almost nil, for residents. The impact of this strategy in reducing the project's carbon footprint would be immense.

The desire was also to experiment with how clay might be used in a more sustainable manner. As such, as sequence of test pieces were

Fig. 19: Construction Section (left)
The building plan form is The lower floors of the building are created from a pre-cast concrete frame and slab, employing cement replacement technologies to minimise carbon impact. A central arched slab defines the main cruciform living spaces and is clad in unfired clay tiles to facilitate carbon capture. Deep external walls are super insulated and contain separate zones for airflow control to meet Passivhaus standards. The deep dividing walls between the flats facilitate stack ventilation. The top storey of the building is roofed with a CLT (Cross-Laminated-Timber) sawtooth structure topped with a green roof and PV panels.

Fig. 20: Daylighting Analysis (right)
A comparison of daylighting within a typical two bedroom flat from the Barratt London development with the 2-bed cruciform flat arrangement designed as part of the counter-proposal. Although there are dark areas within areas of the cruciform these are alleviated by clerestory lighting. The comparable kitchen and bathroom areas within the Barratt London development, together with circulation areas, receive no natural light at all. This, combined with the dual aspect design of the main living area, ensures that a higher percentage of the plan in the counter proposal is served by natural daylight, further reducing the energy consumption of the scheme.





fabricated to explore the tactile and aesthetic qualities of clay bricks and tiles, incorporating new digital fabrication technologies (Figs. 21–23). The breakthrough came after discussing with the internationally renowned BRE Centre in Innovative Construction Materials at the University of Bath, headed by Professor Pete Walker. Their extensive research demonstrates that unfired clay surfaces can be used as a passive method to absorb surplus heat/moisture/volatile organic compounds in interior environments, making the home healthier for occupants (see Appendix D). These excess elements can then be realised safely at other times of the day. The counter-proposal thus selects the principle of using fired clay bricks externally and unfired clay

Fig. 21: Collected clay test models (top left)
A key aspect of our research was to explore how London clay could be used in a more sustainable manner, while referencing the materiality of historic London terraces. A variety of clay models were initially created to test components and tactility at different scales. Similarly, different casting techniques were explored together with the properties of fired and unfired clay. These initial experiments took place in parallel with the design of the counter-proposal, allowing the macro to inform the micro and vice-versa.

Figs. 22 (bottom left) and 23 (opposite): Developing a modular fired clay cladding component
As the design of the counter-proposal developed, we explored, in parallel, the nature of a bespoke, clay rainscreen whose tactile qualities would enrich the visual and experiential qualities of the scheme together with its technical performance. To retain structural integrity within British weather conditions it is essential that clay is fired, so a number of bespoke, test components were fabricated with the aim of creating out own modular brick component.

Fig, 24: Fired clay brick (left)
A textured, perforate fired brick was developed as a repeating element in the counter-proposal. The patterned texture to its solid faces abstracts the design of the counterproposal in miniature while the perforate face of the brick allows it to be used on edge for ventilation inlets and outlets in the main building facades or to reduce the solidity of external garden walls. By using a single repeating clay component in different configurations to define the solid elements of the scheme costs can be significantly reduced while creating a unique, tactile architectural quality that defines the development.

Fig. 25: Unfired clay shelf (right)
On the basis that unfired clay can retain its structural integrity in stable environmental conditions and, in turn, be used as a passive method to absorb surplus heat/moisture/volatile organic compounds in interior environments, making the home healthier for occupants, we explored how, in addition to cladding our soffits with unfired clay tiles, we could use unfired clay to create built-in storage. This image illustrates a shelf module based in the dimensions of IKEA's Kallax shelving, creating an in-built modular shelving system that can practically house an occupants posessions.

tiles/shelving units internally to improve the environmental credentials (Figs. 24–26). Clay ceilings in the living room will also create an attractive visual effect reminiscent of Le Corbusier's famous 1950s design for the Maisons Jaoul in suburban Paris (Fig. 27).

The design research carried out to produce the final counter-proposal always had in mind the ultimate aim of getting the project fully costed by an independent quantity surveyor (see Appendix E). Their figures show that the Bartlett team's counter-proposal could be built for about 5% less than the cost per square metre of the unsatisfactory Barratt Homes scheme now being

Fig. 26: Flat interior (left)
The open-plan flat interior avoids applied finishes and freestanding furniture, instead using a central barrel vault clad in unfired clay tiles and generous in-built shelving to create a durable interior that passively absorbs surplus heat/moisture/volatile organic compounds in interior environments, making the home healthier for occupants. Clerestory lights ensure that daylight is available in all areas while dual aspect floor-to-ceiling windows ensure a strong connection between interior and exterior.

Fig. 27: Maisons Jaoul (right)
Le Corbusier's famous 1950s design for the Maisons Jaoul in suburban Paris employs a similar ceiling arrangement to our counterproposal, creating an attractive visual effect within its principle living spaces.

erected at Upton Gardens. What the design research therefore reveals is that is possible to build higher quality and more environmentally sustainable housing at no more outlay, and even to make a slight saving – thus as well as providing larger and better dwellings, there would also be the net benefit of a new public park and various community facilities. The intention is now, armed with this useful data and information, to approach London developers to present the case for following this alternative design vision instead.

Fig. 28: 'Multi-Purpose Room' design tool (opposite, top left)
A multi-purpose room is a room that by its size and form can be used for different dwelling needs and thus accommodate or adapt to different functions. In an apartment with several multi-purpose rooms the different domestic functions such as bedroom, living room and study room can be composed and combined more freely than in an apartment with functionally defined rooms. There is no agreed optimal size for a multi-purpose room: however, 3.6 metres x 3.6 metres (13 square metres) is considered the smallest size to be used for this kind of space. The form of the room should be rectangular or else close to rectangular.

Fig. 29: 'Flexible Interplay of Rooms' design tool (opposite, top middle)
An apartment layout that allows a flexible interplay of rooms will enable the residents to make their own choices as to the spatial relationships and how to combine the set-up of rooms. The configuration of the apartment's rooms (room structure), and the way in which doorways connect these rooms, operationalizes how the rooms can interplay. A room that can be reached through different doorways hence enables occupants to decide how this room can link to other rooms. Doorways can easily be blocked off and then reopened as needed.

5.3 From practice to academia – the Gothenburg scheme

The alternative strategy of this 'real-world' project involves the design of multi-family residential buildings in Tuve, a north-western suburb of Gothenburg. As such it focusses upon the analysis and design of floor plan layouts to create more sustainable and flexible domestic solutions. In this sense, its specific topic of design research involves rethinking how to design adaptable apartment spaces. The research was supplemented and informed by a series of interviews with the lead architectural firm for the Tuve project (Malmström Edström Architects & Engineers) and also the housing developer/client (HSB Gothenburg Cooperative Housing Organisation). Of particular importance for this research project is the development of design tools that are able to enhance the spatial qualities of housing floor plans to provide better sustainability, as part of a wider knowledge-building process within the Swedish architectural profession.

The specific point of departure for this design research project were four design tools for adaptable apartments which were then implemented as the controlling parameters for the creation of apartment floor plans for the Tuve scheme. These design tools have been produced as a result of previous research by the Centre of Housing Architecture at Chalmers University[30], through a range of methodologies that included practice-based design, theoretical writing about adaptable dwellings, investigations of existing projects that contain adaptable dwelling space, and empirical studies about the lifestyles of Swedish householders (see Appendix F). The four design tools are named respectively '*Multi-Purpose Room*' (Fig. 28), '*Flexible Interplay of Rooms*' (Fig. 29), '*Parallel Use of Rooms*' (Fig. 30) and '*Number of Rooms*' (Fig. 31). The project for housing at Tuve was hence used as an opportunity to further develop these design tools. This was done by examining how they were used by a professional architecture practice with two end results: firstly, the testing

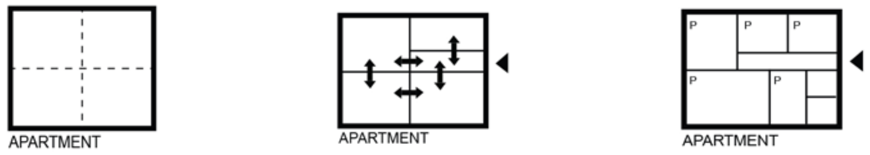


Fig. 30: 'Parallel Use of Rooms' design tool (top right)
Rooms that do not channel occupants into other rooms are able to be used in parallel. These types of rooms often have a high usage capacity as they can be used as private rooms as well as for social gatherings. Consequently, the situation where a room is the only route to get to another room is less useful in accommodating diverse or multiple dwelling needs. An apartment with a central living room that form the only link to the bedroom(s) exemplifies this problem.

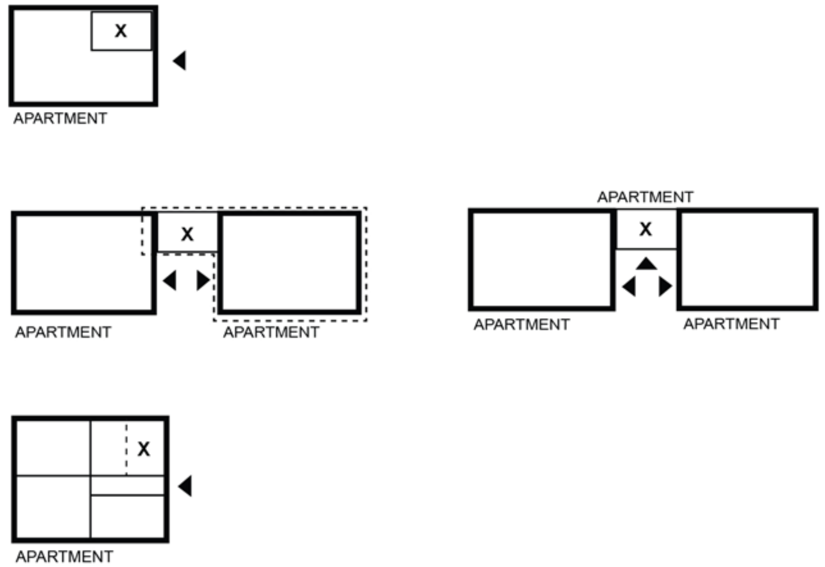
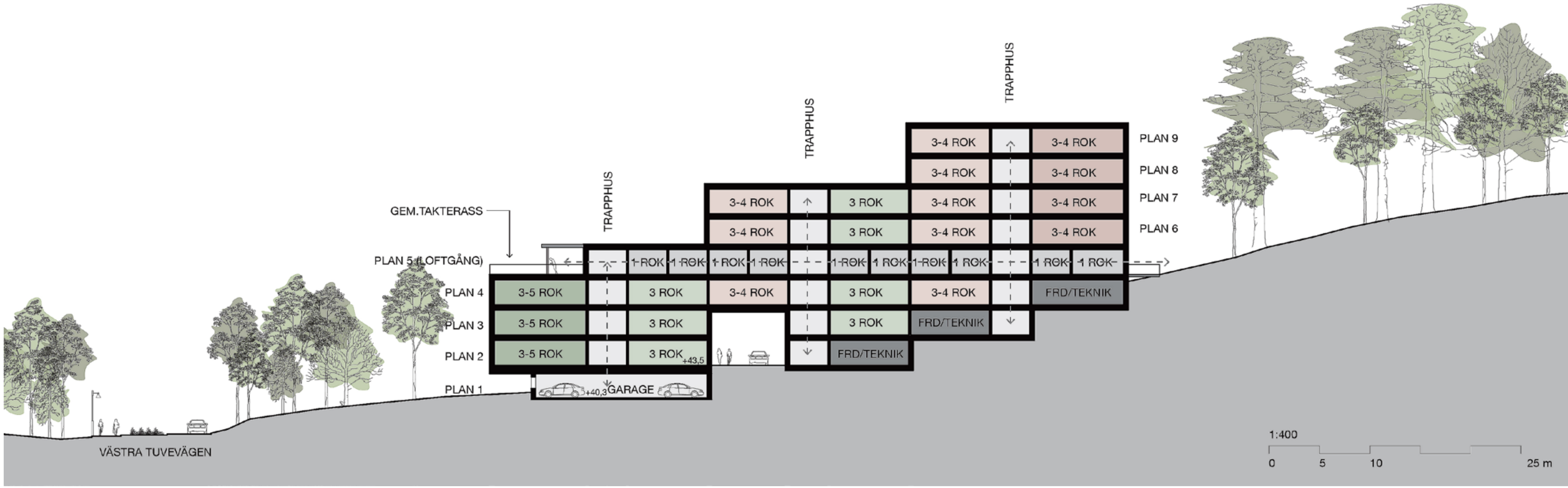


Fig. 31: 'Number of Rooms' design tool (bottom)
An apartment that allows occupants to vary the number of rooms, or that have one room more separately located that can function independently, are able to adapt to changing household needs such as a growing family requiring an additional bed room or else a single parent deciding to rent out a room to reduce their expenses. In such case, three strategies can be defined for the 'Number of Rooms' design tool in terms of 'the independent room' (top), 'the elastic room' (middle) and 'the flexible room' (bottom).

Fig. 32: Aerial photograph of the Tuve housing site
This photo shows well the suburban nature of the site for the new housing development and also the situation of the four new blocks in the heavily wooded, sloping topography on this north-western edge of Gothenburg. The new scheme is located adjacent to a number of previous housing projects and also some outdoor sports facilities.

Fig. 33: Site layout plan for the Tuve housing scheme
The four linear blocks are carefully laid out in a splayed arrangement by Malmström Edström Architects & Engineers to maximise daylight inside the dwellings and also prevent direct overlooking. The longer block on the left-hand side of the drawing follows the contour lines while the other three blocks are placed at right-angles to the contours, and thus they step down the main slope on the site. The access road runs underneath these blocks to reach the far block.

Fig. 34: Site section for the Tuve housing scheme
This section is through one of the three shorter housing blocks that are placed at right-angles to the contour lines, showing how these blocks step down the main slope and also indicating the access road running underneath them. The communal garage is located in the basement of the lowest part of each block. The drawing also shows how the flats are to be surrounded by the existing mature trees on the site, giving good views for residents.



of the capacity of the design tools to facilitate closer interaction between the key actors in the design process; and secondly, to find out how architectural practice can inform academic research through the former's use of the tools to create an actual housing proposal.

In terms of its location, the allocated plot in Tuve borders onto rural areas and is characterized by sloping forested land with many fine broad-leaved trees. The aim of the housing project is to provide the kinds of dwellings that are currently missing in Tuve, namely mid-sized and large-sized apartments. In total there will be four residential buildings erected upon the site (Figs. 32 + 33), and they will contain 150 apartments of varying sizes (Figs. 34 + 35). The earliest stage of the design process consisted of the lead architects producing some general sketches/drawings for how they saw the proposed housing at Tuve (see Appendix G). The sketch work was followed up by interviews. During these interview sessions it became clear that some critical adaptable design alternatives could be further developed in the actual floor plan layouts. Thus from the initial plan drawings (Fig. 36) and the interview sessions, the Chalmers team took the design of adaptable space further by analyzing and developing a more detailed design scheme (Figs. 37 + 38). These three apartment designs included the following types: 100-square-metre, 2-to-4-bedroom dwelling ('Apartment 1'); 70-square-metre, 2-bedroom dwelling

Fig. 35: Typical apartment plan layouts for the Tuve housing scheme (opposite)
This drawing shows the general arrangement used for the housing block, with each staircase feeding two dwellings per floor, as well as the ingeniously tight planning involved in fitting the accommodation into flats based on a 4-metre module. There is a mix of apartment sizes throughout, as shown in the uppermost plan. On some floor, this usual layout is reconfigured to provide a lot of narrow loft-type dwellings fed by a communal access balcony on one side, as seen in the plan just below it. Other features of the internal adaptability of rooms are indicated in the lower two plans.

('Apartment 2'); 88-square-metre, 2-to-3-bedroom dwelling ('Apartment 3'). All have a similar room configuration, with a central hallway that connects the bedrooms, living room, kitchen and bathroom to the entrance. In each case the more public rooms such as the living room and kitchen are combined into a single large open space on one side of the hallway, while the private bedrooms are placed on the opposite side. The two larger apartment-types also have the option of adding one or two additional bedrooms at the expense of reducing the size of flexible living room/kitchen space.

During the interview sessions, the two key stakeholders – i.e. the architects and housing developer – explicitly stated they were pleased with the floor plans suggested by the Centre for Housing Architecture. They made it clear that they were already familiar with the sorts of qualities the Chalmers design tools aim to provide, albeit not with quite such a strong focus on creating adaptable space within dwellings. As a whole they saw the flexible space strategy as a useful method by which to evaluate the relative benefits of different plan alternatives. Yet they also emphasized the point that aims such as providing flexible space might possibly result in larger dwelling sizes, thereby making apartments more expensive to build and buy/rent, if the design tools were used without a good understanding of the current practices and conditions for housing production in Sweden.

Among their comments on the design tools, the housing developer especially emphasized that the *'Multi-Purpose Room'* tool was interesting because it could allow diverse spatial uses for those rooms in question. Both of these stakeholders also saw the *'Flexible Interplay between Rooms'* tool as being important for generating a sense of domesticity, albeit also warning of their experience that it could result in less alternatives for arranging furniture. The lead architects argued that the *'Parallel Use of Rooms'* tool, whereby the room functions are all separated and the

bedrooms can be separately accessed, could lead to expensive dwellings as it might well mean a larger dwelling size – whereas the developer stressed that this hallway-based arrangement had been a crucial quality in earlier Swedish housing norms. The use of the *'Number of Rooms'* tool, which would allow occupants to create additional bedrooms within their apartment if desired, was supported by the architects as a strategy they themselves had used before.

To summarize the findings about the three floor plans devised by the Chalmers team, the incorporation of some adaptable spaces appears to come at the elimination of a separate kitchen and a reduction in the number of bedrooms. Apartment 1 can be expanded from two to four bedrooms, and Apartment 3 can likewise offer two or either three bedrooms, yet Apartment 2 only has the capacity to be a two-bedroom dwelling. However, all of the apartment layouts also possess other, less articulated strategies for adaptable space, which was appreciated by the lead architects.

Especially strong potential for achieving adaptable spaces come from the 'Flexible Interplay of Rooms' tool. The central hallway in the three proposed floor plan layouts allows for varying sizes and number of rooms on both of its sides, constituting a precondition for flexible room design. The flexible wall positions that enable occupants to vary the size and number of rooms is hence very carefully designed (Fig. 37). Thus, the spatial capacity of these apartments can be tested through design speculations as to various lifestyles and furnishing options (Fig. 38). There are three different possibilities for households, each with different needs: single parent with a tenant (Apartment 1); collective household (Apartment 2); nuclear family (Apartment 3). This shows that the request for private space will be far more accentuated for a collective household and for the renting-out single parent, but not for the nuclear family. Hence the needs and requests

Fig. 36: Diagram to show the adaptable apartment plan layouts
This drawing shows the ways in which the layouts of two dwelling types, Apartment 1 and Apartment 3, are able to be adapted to provide two more or one more bedroom respectively. It is not possible to adapt the other type, Apartment 3, in this way.

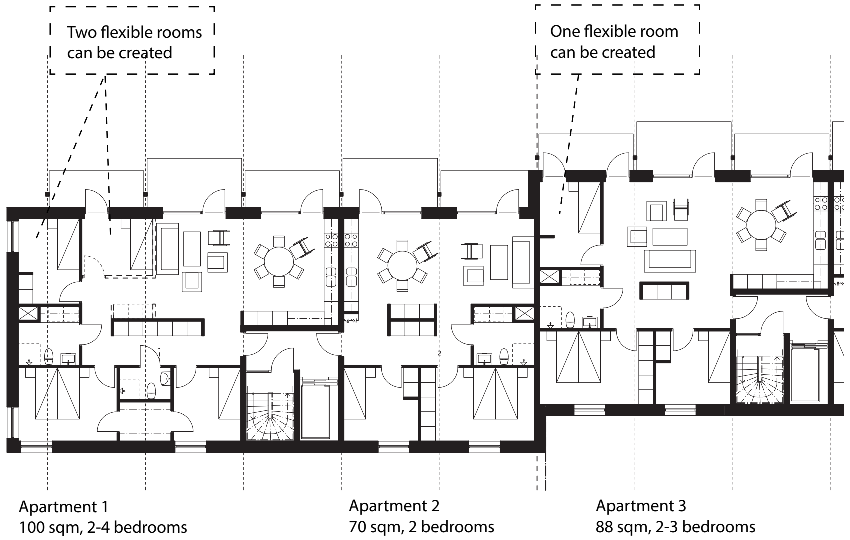


Fig. 37: Diagram to show the flexible wall arrangements within the apartments
This drawing shows how walls can be removed or reinstated within the three apartment types in relation to the fixed window positions in each type. It thus explains why it is not possible to adjust the internal walls in one of the types, Apartment 2, because of the window positioning, and hence this type is not nearly as adaptable as the other two types of dwelling.

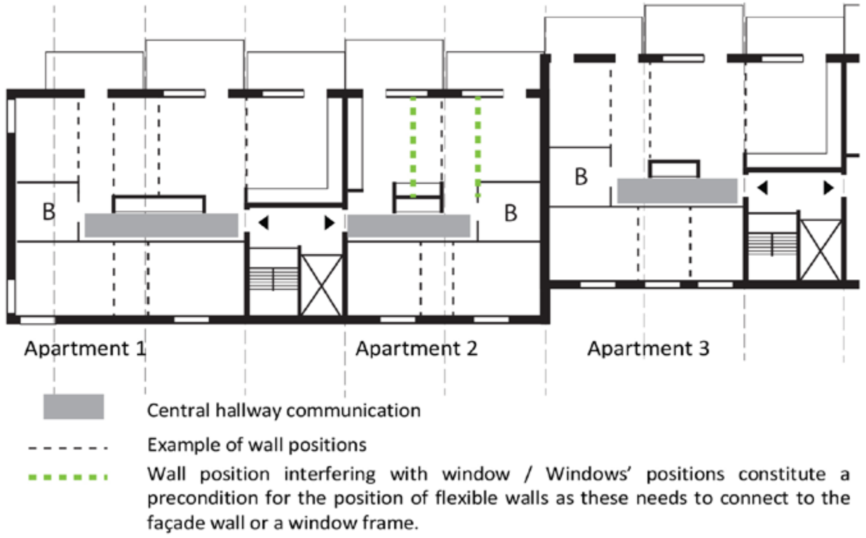


Fig. 38: Diagram indicating the potential furniture arrangements in the apartments (opposite)
This drawing shows how the furniture could be configured in the three types of apartments to allow for three rather different household situations: i.e. a single occupant who has decided to let out a bedroom, a collective of young adults sharing a dwelling, and a typical nuclear family. The generous balconies on the far side help to give extra spaces for residents to spill out onto so as to enjoy the fresh air and woodland views.

in regard to the size of rooms, and their spatial relationships, can be different in each case. Equal-sized bedrooms may for example be of importance for the collective household, whereas a small bedroom can suffice for a young child within a nuclear family. The results from these speculative design investigations show that the proposed apartment layouts best enable spatial solutions for diverse household types through the 'Parallel Use of Rooms' and the 'Flexible Interplay of Rooms' tools. The central hallway enables for rooms to be used separately and privately, increasing the apartment's spatial capacity to function well for the single-parent-with-tenant as well as for the collective household.

To sum up, the proposed apartment layouts that were communicated and developed during the interview sessions using the Chalmers design tools became richer and more articulated in terms of those properties that were not otherwise fully present in the verbal discussions of the reading of the drawings. The capacity for adaptable space in the apartments therefore increased from the initial design proposals by the lead architects, even if was inherently embedded in the scheme from the beginning. Speculative design investigations meant that the three apartment solutions offered the varied use of dwelling spaces that could function for diverse living situations. However, it also has to be noted that the strategy for providing flexible rooms has its weak points. It implies that residents will need to build a wall or hire a carpenter to make the spatial alterations they desire. This building work can be a costly and complicated task for occupants, meaning that the inherent adaptable design solutions remain unused. Yet when considering the limited interest of current architects in designing adaptable space, the spatial capacity of the three apartment designs proposed by the Centre for Housing Architecture constitute a considerable advance in the search for more diverse and sustainable dwelling solutions. It is also clear that the input of the Chalmers team helped to enrich the overall design by Malmström Edström Architects & Engineers (Fig. 39; see also Appendix G).

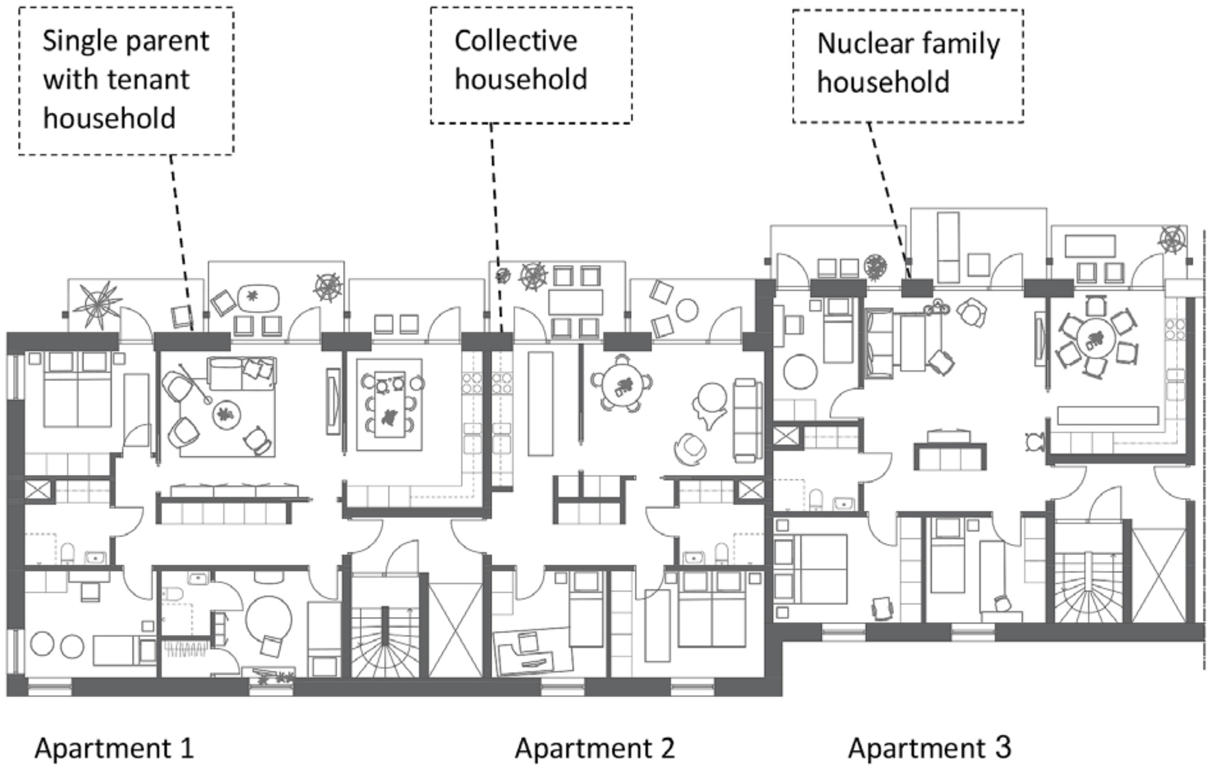


Fig. 39: Initial block modelling of the Tuve project in emulation of recent Scandinavian precedents
Malmström Edström Architects & Engineers are keen to ensure that the stepped housing blocks are well integrate well in terms of the sloping terrain of the Tuve site, and also that the existing trees and other natural features are retained as much as possible. The key precedents for the design are some celebrated recent suburban estates like ‘Living in Nature’ in Turku, Finland by Schauman Nordgren Architects or the scheme at Hestra Parkstad in Borås, Sweden by Vandkunsten Architects, both of which are also depicted here.

6

Chapter 6 (Conclusion)

Coming together to find sustainable housing design for European cities

The two projects in this design research folio are clearly very different in form and approach. The Bartlett team's contribution is essentially one of design speculation carried out via a series of parallel experimental tests which look at how to reconfigure domestic space and introduce sustainable clay construction into what is a deprived inner-city site. This scheme is intended as a provocation, a sign to citizens and authorities in London that there indeed a better alternative to the profit-driven over-development that is currently stifling housing creativity in the city. In contrast, the project involving the Chalmers team aims to blend more into existing housing practice by convincing the lead architects and the housing developer for a 'real-world' project in a leafy suburban location about the importance of embedding adaptability into the design, based upon their prior research into flexible apartment layouts. The Bartlett proposal is an example of housing research being devised in academia and then taken out into the profession, whereas the Chalmers proposal brings existing professional know-how into academic research. The former scheme is thereby more spatially and materially creative, with the latter scheme being more precise in attention to making apartment plans more adaptable so they can respond more easily to the changing needs of occupants.

There are of course strengths and benefits in both these models of design research for housing, and significantly, the two different approaches are rooted in the respective housing histories and current housebuilding realities of Britain and Sweden. In Britain today, a few narrowly focused private developers determine almost all new housebuilding, and in doing so they resist any advice from academics and indeed all but refuse to test out any innovative solutions in their schemes. The aim of these British housing developers is primarily to build executive-style detached and semi-detached dwellings in suburban districts, and hence they only have a cursory interest in designing apartment blocks for inner-city areas. In Sweden, in contrast, there is a more consensual and collaborative approach to housebuilding, with actors such as housing developers, municipal authorities, architects and academics working far closer together. Living in apartments is ubiquitous in Swedish towns and cities, and thus the abovementioned actors are more likeminded in their desire to improve the existing design models such as by, in this instance, providing greater adaptability of use.

It is crucial to acknowledge and accept these diversities, since what emerges the strongest from this design research folio is the importance of cultural specificity in housing design as opposed to trying to devise generalized 'one-size-fits-all' solutions. The folio shows the need to respect the differing socio-economic and cultural conditions in countries like Britain and Sweden, while also noting that there are naturally certain factors – domestic habits, construction economies, environmental sustainability, recyclability, etc – which are common issues. But even if such issues are common, the manner of thinking about and dealing with them will be distinct, and this indeed needs to be seen as a positive attribute.

At the same time, this design research folio has also showed the benefits of

dialogue and interchange between the Bartlett team in London and the Chalmers team in Gothenburg. Sharing knowledge, offering criticisms, and holding open discussions certainly helped to shape each other's project considerably for the better. In terms of the cross-influences on the London scheme resulting from the input of the Chalmers team, a number of aspects can be cited:

- The Bartlett team felt compelled to look even more closely at different governance and management models for its counter-proposal project, as well as at the impact the scheme would have on the surrounding urban area and nearby housing schemes (see Appendix A);
- Initially the two housing blocks onto the new public park were going to have their back gardens facing onto this open area, but the Chalmers team argued that there should be greater privacy and security for these dwellings and so the orientation of those blocks was turned around;
- The Chalmers team stressed the strong need to cater for all generations, and hence one of the blocks next to the new park was redesigned so as to be specifically suitable for senior citizens;
- In general, there grew the realization that the London scheme had to allow for greater flexibility and change inside the apartments, since this is one of the main principles urged by the Chalmers team;
- It was likewise realized that the London project ought to offer some apartments as self-build blocks in which the dwellings can be offered at lower price in a 'shell-and-core' arrangement.

Likewise, the thinking of the Bartlett team came to influence the work of the Chalmers team for their Gothenburg project in some ways too:

- The Chalmers team chose to test out even more speculative and innovative design proposals for the apartment layouts, drawing upon the more academically experimental and creative approach and spatial solutions of the Bartlett team;
- Even though the focus of the Gothenburg project was very much focused on the best design for apartment floor plans, the integration by the Bartlett team of innovative testing and in using traditional materials like clay in new sustainable ways was taken up in the discussions between Chalmers and the lead architecture in the subsequent design phase for the Tuve scheme;
- The strong integration of future-oriented speculative design research to provoke public debate with perspectives of architectural and building history and theoretical analysis that characterises the Bartlett team undoubtedly enriched and helped to contextualise the Swedish approach, which is typically more pragmatic and embedded in contemporary architectural/building practice;
- The Chalmers team was also influenced by the conscious way in which the Bartlett team set up an arena for open and often critical discussion and debate between different experts, organisations, consultants, academics and various stakeholders in the built environment so as to give more direct input for the London design proposal. This method differs from how such arenas are normally formed in the Swedish context, where – being generally founded in a collaborative culture – they are

more closed and consensus-based, remaing close to the needs of the actual project, whereas the more critical and open discussions tend to be held at a more generalised level.

Both of the teams thus found the cross-cultural design research process to be extremely useful and rewarding. Cross-fertilization of design research in this manner can clearly contribute greatly to creating more sustainable dwellings, living arrangements and communities. It also serves to build up mutual knowledge – in this case relating to housing design – as well as suggesting the need for further collaborative exchange beyond this two-way research project between London and Gothenburg. What this design research folio demonstrates above all else is the way in which architectural thinking and practice is able to benefit when carried out and disseminated as a research-led activity, encouraging also creativity and innovation to flourish.

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Chapter 7

Research Dissemination

The dissemination of the transnational, cross-cultural exchanges between the UK and Swedish project teams, and of the design proposals that emerged and of the new model for architectural design research developed by the two academic partners, formed a crucial part in initially conceiving and then in implementing the projects. The outcomes have duly been disseminated via a series of organised events along the way:

1/ Initial meeting of the London housing experts' group, University College London (17th May 2019);

2/ Multiplier Event consisting of a workshop of the London housing experts' group at University College London (21st October 2019);

3/ Multiplier Event consisting of a workshop of the Gothenburg housing experts' group at the Centre for Housing Architecture, Chalmers Technical University (17th February 2020);

4/ Multiplier event consisting of an open online symposium entitled "Applied Research in the Market Place: Architectural Design Research" with invited international keynote talks and presentations of the design research projects (15th September 2020). [https://www.chalmers.se/en/departments/ace/calendar/Pages/Applied-Research-in-the-Market-Place-Architectural-Design-Research.aspx]

Furthermore, the creation of this design research portfolio was linked to online platforms in different applied contexts in order to increase the transferability of the research findings to other academic and industrial stakeholders across Europe and beyond. The specific case studies of the exemplar housing projects in London and Gothenburg were thus presented as examples for the production and dissemination of research/knowledge about urgent societal issues via the use of design research methods. The two case studies thereby offer insights into how to set up collaborative models and formats for exchanging experiences in architectural research/knowledge, and of how to develop other innovative projects that would likewise be transferable to European academic and practice contexts. To reach this required level of dissemination, the key online platforms that were used were:

- BauHow5 'SABRE' website, TU Munich [http://www.bauhow5.eu]
- Centre for London Urban Design pages on the UCL Bartlett School of Architecture's website [https://www.ucl.ac.uk/bartlett/architecture/research/centre-london-urban-design-cloud]
- Centre for Housing Architecture webpages on the Chalmers Technical University's website [https://www.chalmers.se/en/centres/cba/Pages/default.aspx]

Finally, as part of the aim to highlight, produce, articulate and disseminate new formats such as extended design research folios like this one, making them better known to architectural/built environment firms and universities generally, a number of public lectures and essay/book publications have been used by members of both the London and Gothenburg teams. The most relevant examples of this public dissemination were:

- Halina Dunin-Woyseth & Fredrik Nilsson, 'Developments towards Field-specific Research in Architecture and Design: On Doctoral Studies in Scandinavia since the 1970s'. In *The Production of Knowledge in Architecture by PhD Research in the Nordic Countries*. Aalborg: The Nordic Association of Architectural Research, 2018.
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- Murray Fraser (ed.), *Design Research in Architecture*. Farnham, Surrey/Burlington, VT: Ashgate, 2013.
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- Fredrik Nilsson, invited keynote lecture on 'Designing Fusion Points – Connecting communities of practice and research', at the international symposium on The Changing Shape of Architectural Practices, Aarhus School of Architecture, Aarhus, Denmark, 12th September 2017.

- Fredrik Nilsson, invited keynote lecture on 'Fusion Point Gothenburg' at the international symposium on Urban Quest 2017 – Future of the Nordic Model, Museum of Finnish Architecture, Helsinki, Finland, 28th September 2017.

- Fredrik Nilsson, invited keynote on 'Opening up design research', at the international symposium on Against Method? Architectural Design in Academia, at ETH Zürich, Switzerland, 13th December 2017.

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Chapter 8

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9

Chapter 9

Appendices

This section contains five supporting appendices for the counter-proposal designed by the Bartlett team for Upton Gardens in East London, and a further two appendices relating to the Chalmers team for the new housing development at Tuve, Gothenburg.

A

Appendix A

Spatial mapping of social provision in East Ham, London

In re-developing a site of the scale and significance of Upton Gardens there is a need to ensure that the end result meaningfully integrates itself into the physical and socio-economic fabric of its surroundings. Developments such as Barratt London's proposals for Upton Gardens are all-too-often seen as agents of gentrification, speculatively driving up land and property values to levels that are unaffordable to existing residents and ultimately changing the demographic profile of an area entirely. Sadly, Barratt London's marketing material does little to create the impression that this development will do anything different. In establishing a counter-proposal we felt it was essential that we understood the socio-economic make-up of Upton Gardens and the surrounding area to ensure that we designed housing which could truly meet its needs. Similarly, a site of this scale presents the opportunity not only to deliver volume housing, but also to add additional activities that will enrich the social fabric of the site and surrounding area. The following analysis illustrates existing use patterns and facilities around Upton Gardens together with the demographic make-up of the area. This analysis has been used to inform the counter-proposal both in terms of who housing on this site should be for and how much of it should be delivered, and also a range of on-site activities that either complement surrounding use patterns or address their absence in the wider urban schema.

Project: Upton Park / Boleyn Ward
Title: Area plan_***Uses***
Scale: 1:2500 / A3

1


2

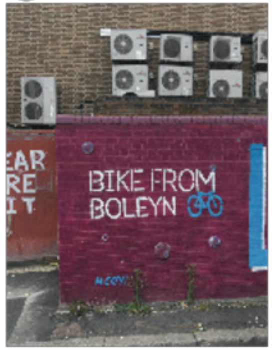

3


Legend

- Car park
- Allotment gardens
- Parks / Green spaces
- Market
- Pubs
- Community & social clubs
- Light industrial
- Religious institutions
- Schools & educational facilities
- Offices
- Shops / Flats above shops
- TFL
- Housing

N

4


5


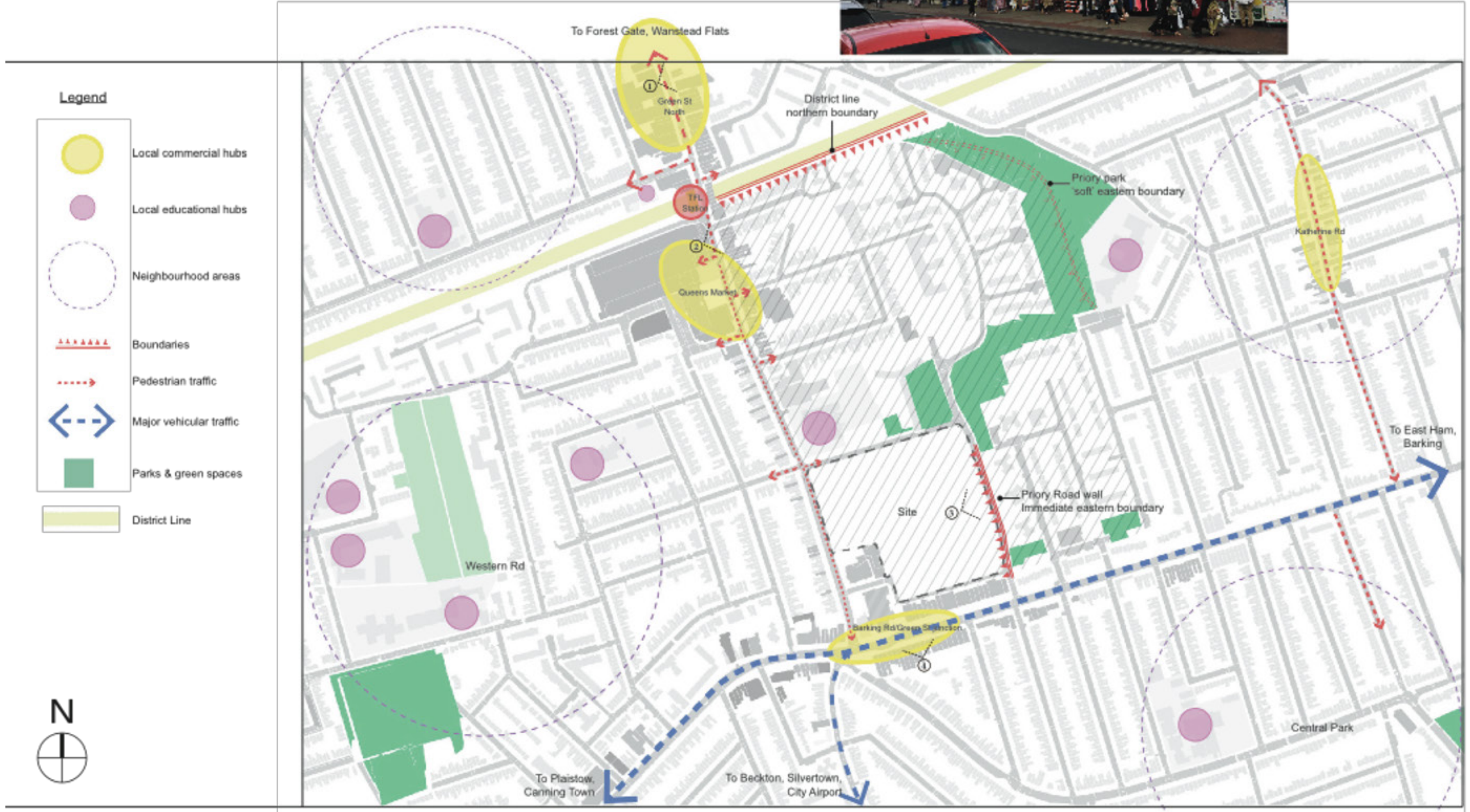
6


7


8


Project: Upton Park / Boleyn Ward
Title: Area plan_***Neighbourhood structure***
Scale: 1:2500 / A3

1



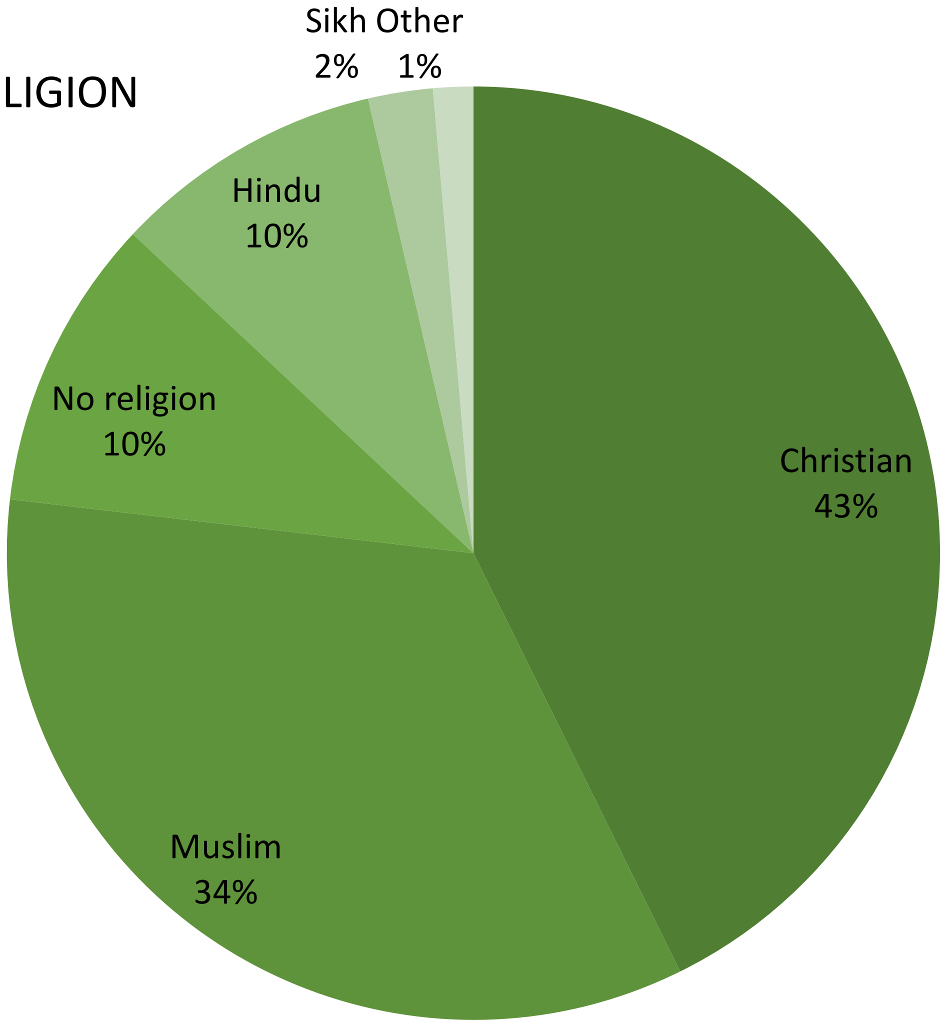
3

2

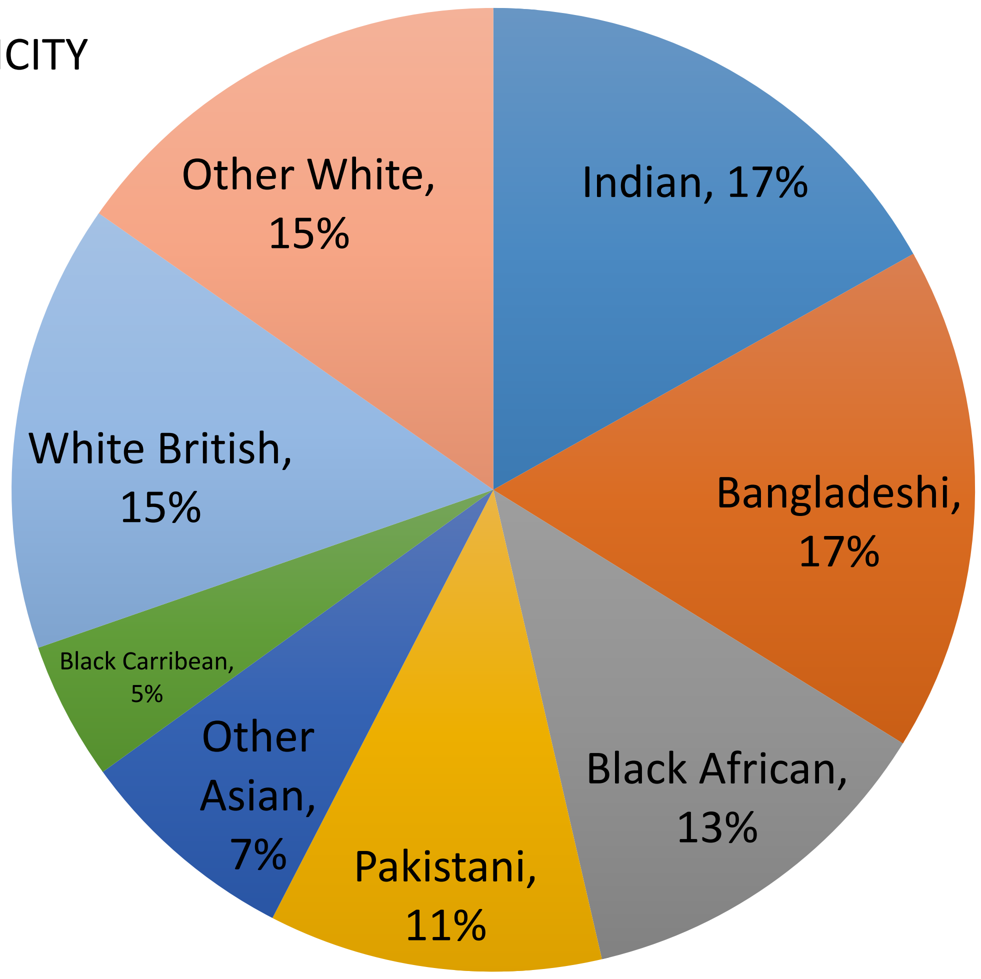
4

DEMOGRAPHICS
Population: 360,000 (3rd most populated London borough)
Median age 31.9 y.o. / 20-39 y.o.: 40% / 65+ y.o.: 13.3%

RELIGION



ETHNICITY



EMPLOYMENT

Employment rate: **69.8%** (London 74.2%)
Unemployment rate: **5.1%** (London 5%)
Median annual pay (all workers): **£24,923** (London £30,311)
36% borough residents are low-paid

DEPRIVATION
Newham has **highest homeless rate in UK**: 1 in 25 residents in T.A. or sleeping rough (Shelter, 2017)
Highest rate of child poverty in London (with Tower Hamlets)
43% of Newham children live in poverty
19% households experience fuel poverty

94% of Newham falls within the 40% poorest areas in UK (IMD - Index of Multiple Deprivation)

HOUSE PRICES

Flat/maisonette (51% of Newham housing stock): **£415,000**
Terraced house (45% of Newham housing stock): **£405,000**

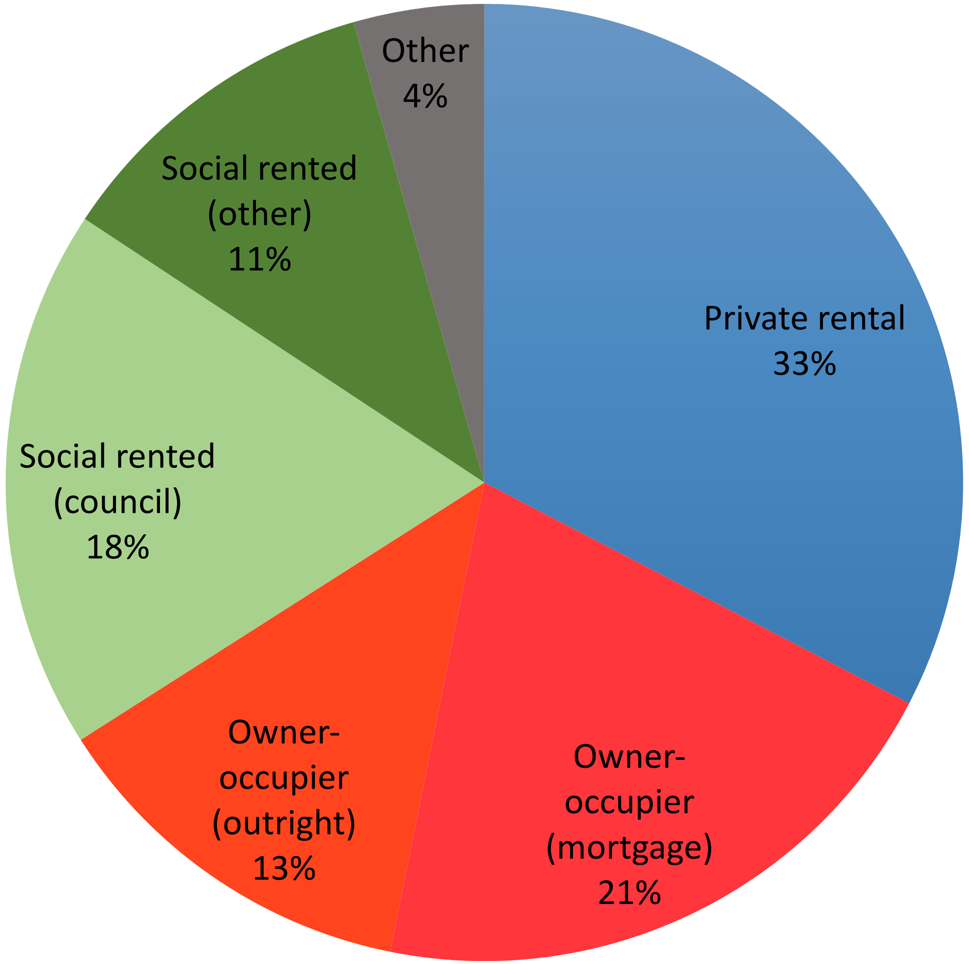
RENTS

Median 2-bed **£1400pcm** (London £1495)
Median 3-bed **£1690pcm** (London £1750)

HOUSEHOLDS

2-parent families (with or w/o children): **26%**
Single parent families: **15%**
One-person households: **26%** (mostly 18-64 y.o.)

TENURES



B

Appendix B

Key points from meetings of London housing experts' group

i. SUMMARY OF DISCUSSIONS AT 1st HOUSING EXPERTS' GROUP MEETING

Clarke Hall, Institute of Education, UCL

17th May 2019

Present:

Bartlett: Prof Peter Bishop, Prof Murray Fraser, Dr Nicholas Jewell

Visiting experts: Pooja Agrawal (Greater London Authority/Public Practice), Simon Elmer (Architects for Social Housing), Gillian Horn (Peynore and Prasad Architects), Kevin Logan (Macreanor Lavington Architects), Jo McCafferty (Levitt Bernstein Architects), Riette Oosthuizen (HTA Architects), Linda Thiel (White Arkitekter), Gus Zogolovitch

1. LAND

- Do we need to build more housing at all in London? Would it merely fuel the process of speculative land investment in a situation whereby land is now almost totally commodified?
- How is land value established? There is a real need to diversify the quality indicators for land use such that it is not only about economics. What are the wider community benefits of a new housing scheme, and how might it benefit social sustainability over the longer term?
- Does the way that housing land is procured influence, or even determine, what is then designed on that site?
- What is required is a new model that treats housing as something that is not an object of speculation. In 2011 around 50% of all new housing in London was built by only four developers, and this figure has crept up since. A more balanced provision is essential.
- Housing costs have remained stable for a long time and hence it is increases in land value that push up the cost of new homes; in turn this is making design/construction a more residual issue.
- It would be better to use smaller London sites to help diversity the kinds of companies and organisations who build new housing.
- One possibility would be to build on council-owned land or perhaps TFL-or NHS-owned owned land, albeit carefully, such that up to 50% extra densification is achievable. However the crucial issues will then be who owns (tenure model) and who runs (management model) the resulting housing stock.
- Britain needs a stronger planning system to stop rampant speculation and to obtain real benefits from publicly owned land. In the Netherlands, for example, all development is pre-modelled so that the framework for a site is already agreed, thus reducing conflicts, planning appeals, etc

2. FINANCE

- What is required is stable longer-term certainty of planning policy to reduce speculation and provide a better quality for new housing in London.
- While the level of privately built housing has remained fairly constant since 1945, the collapse of state housing in the early-1980s has created a monoculture of private builders/developers. Instead, the state should adopt a more active role via planning policy and housebuilding.
- The difficulty of borrowing money at a decent rate in the British private marketplace is so great that it is hard to build good quality housing. Thus the government should provide stable funds at lower interest rates to enable smaller builders/developers/organisations to compete.
- Housing is a good financial product and a sound source of investment, so the challenge is to leverage this longer-term value. Too often it is the case that builders/developers seek short-term profits at the expense of wider social issues. Interestingly, Manchester Council has combined its health and social housing budgets due to the recognition that good design can save on health costs if viewed over the longer term.
- The current situation in which companies make money from land value uplift without even having to build anything is creating a housing crisis. Inflated land costs in turn reduce the quality of new housing because it soaks up far too much of the available finance.

- British governmental pressure on local authorities and other public organisations to obtain the maximum price for land regardless of other social factors likewise reduces the quality of new housing. This situation is entirely ideological, since many other European countries run contrary policies. In Germany local authorities negotiate with landowners to decide what is built, with the uplift in land value going to the municipalities. In Sweden land is sold not on price, but on the quality of the proposed development.
- Do local authorities and other public organisations possess the ability to value land correctly? It is a complex issue and hence they generally lack requisite knowledge and skills. To help, a research project or campaigning group could provide a clear summary of the current housing market in London to show precisely how it is used in practice as a commodity, while also describing the roles that architects and others play in enabling this form of property speculation to happen.
- Are there other cooperative models of housing finance or mortgages, perhaps in other European countries, which could be used to advantage in London? This would then likely impact on other issues such as the need for better rent protection laws, different pension systems, etc.

3. DESIGN

- It is helpful to remember that 99.5% of London's housing is existing second-hand stock, with only c. 40,000 new houses being built in the city each year; therefore one cannot just consider new-build strategies.
- Architects must look also at the longer-term finance and management and service costs, not only the initial building costs.
- A broader vision of sustainability, both social and economic, would suggest that no net loss of community/industrial/landscape provision should arise from any new housing scheme in London.
- Indeed, London's socioeconomic realities suggest a need for diversity in opportunity, meaning that mixed development is both economically and socially safer. One example is the prediction that with the current rate of reusing former industrial sites, by around 2040 there will be no industrial land left in London. It is thus necessary to think of the daily lifecycle of any new housing scheme, including employment.
- It is vital to re-establish overtly street-based housing designs, as the reaction against perceived problems of Modernist estates has led to a predominance of schemes with internally focused private courtyards that only serve to segregate communities.
- It is hence essential to consider the design of the accompanying urban landscape as part of the housing scheme, not least in how it links to existing communal spaces, transport links, etc.
- Could one borrow from the 'uplift' assessment techniques of property firms like Savilles to predict how new housing will negatively affect local residents through gentrification forces, and then find ways to compensate them accordingly via new facilities?
- How might we share the caring of properties with those who are living in or running a housing scheme?
- There is a real question in housing design about what level of flexibility is achievable or desirable. How so we know what people are likely to want in future? Who in fact we are we designing for in terms of ethnicity, gender, age, religious belief, sexual orientation, etc?

- Building regulations will need to be rethought if we genuinely wish to facilitate change and longevity in housing design.
- Issues of health and wellbeing are other essential factors in housing design. For instance, British dwellings tend to have smaller windows and thus less daylight inside, which can cause mental health issues. Less interior space also diminishes children's educational attainment. These and other associated factors can then lead to family breakdown.
- Health and wellbeing issues also extend to the provision of communal spaces. The latter should serve both residents and those in the local area, as a form of social contract, which could be achieved by a more effective use of Section 106 powers (as a York University study has shown).
- Could there be a neuroscience study of housing? This might help to widen the usual considerations beyond the current tick-box system for assessing aspects of domestic health and wellbeing.

4. <u>CONSTRUCTION</u>

- Britain has the smallest housing space standards in Europe – for instance only c. 66 square metres for a 3-bed dwelling – and these sizes are getting smaller. London is especially affected because of its high land costs.
- There is a need to devise a clearer method to calculate housing costs, not just based on crude calculations of square metres, etc. The main construction cost for a house is in its external volume, and so the use of simpler plans and less exterior folds/creases makes it cheaper.
- There are obvious benefits from prefabrication over traditional construction systems, especially in saving time, but skills training would need to be factored in. There is also the issue of just how customized can these prefabrication systems become?
- In Britain the supply chain is controlled by the volume housebuilders, and so there is relatively little off-the-shelf construction. This is in contract to Sweden where c. 90% of dwellings are built off-site, to a high quality.
- Flexibility is also desirable but can the changes to dwellings over time be achieved without waste, thus achieving zero-waste circularity?
- Housing construction standards are too low, making it easy to reach levels of compliance. Instead there need to be far tougher standards especially in term of sustainability, with the ideal goals being negative carbon and total circularity.
- However, where should the relevant sustainability standards come from? It could possibly be from the German Passivhaus or else a similarly integrated system.
- With the British energy supply now being decarbonized, techniques such as combined-heat-and-power (CHP) are no longer relevant. More important is to avoid extremities in conditions by providing thermal mass and robustness and solidity, such as by using a concrete frame with modular components.
- Photovoltaics work fairly well in Britain; it is however crucial to dispense with a gas supply in any new dwelling.
- What is the relevance of cultural attitudes towards materials? Old brick seems more popular with the British public than new brick, for example, but is this due to a cultural prejudice in favour of older dwellings?

ii. SUMMARY OF DISCUSSIONS AT 2nd MEETING / SABRE HOUSING MULTIPLIER EVENT

Bartlett School of Architecture, UCL

Room 502, 22 Gordon Street, London WC1H 0QB

21st October 2019

Present:

Bartlett: Kirti Durelle, Prof Murray Fraser, Millicent Green, Dr Nicholas Jewell, Professor Peg Rawes

Visiting experts/partners: Peter Barber (Peter Barber Architects), Dr Anna Braide (Chalmers University), Geraldine Dening (Architects for Social Housing), Simon Elmer (Architects for Social Housing), Prof Anna-Johanna Klasander (White Arkitekter/ Chalmers University), Hanna Morichetto (Chalmers University), Clare Murray (Levitt Bernstein Architects), Prof Fredrik Nilsson (Chalmers University), Riette Oosthuizen (HTA Architects), Linda Thiel (White Arkitekter)

1. POSITION TALK:
Pete Barber (Peter Barber Architects)

- *Under Tory Government policies there is an ongoing process for the commodification of housing, especially severe in London, with many attempts to clear away and redevelop/privatise post-war estates*
- *Altogether around 2 million social housing units have been lost in Britain through the 'Right-to-Buy' legislation, initially for council houses and now also for housing associations*
- *This is all happening at a term of chronic housing shortage in London/Britain: there are c. 7,000 street homeless people, many households are being evicted every day from their homes, etc*
- *We need a revolution in housing provision, and academia can help by bringing in careful, logical analysis of the cloud-cuckoo 'real world' of commodified housing provision in Britain*
- *There is a need to bring life back to housing and to introduce new senses of agency, such as by questioning what is a home today, and investigating what other forms of design/development are possible*
- *He is pursuing this in numerous schemes for social housing in London and also via more polemical projects such as '100-Mile City'*

2. BACKGROUND TO LONDON HOUSING PROJECT:
Dr Nicholas Jewell (Bartlett CLOUD)

- The background thinking for the London project at Upton Gardens was presented, beginning with a critique of the current Barratts's scheme for c. 840 dwellings of which only 25% are 'affordable'.

The calculation is that this figure is based on erroneous accounting, and it could easily rise to 56% or even marginally higher, not least if the profit level is capped.

- There was also criticism made of the design of the Barratt's development for being over-developed, using blocks that are too high for the neighbourhood, solely providing private courtyards and no communal recreational space, etc
- The proposal is that a number of smaller developers/ contractors take on the building of various elements, including an element of self-build for some of the dwellings
- In response, it was suggested that our financial analysis be shared with the London Borough of Newham to ask if they agree with the amended figures.
- It was also suggested that the best model to use might be a Community Land Trust since that would also be able to cover (i.e. protect) the adjacent post-war estate from being privatized, and that under the CLT a system of cooperative social housing could be implemented
- A good example of a CLT to investigate is Community Assets for Society and Housing (CASH), which is active in several London schemes; there are also other good models to be found in Germany, Austria, etc

3. DESIGN OF LONDON HOUSING PROJECT: Prof Murray Fraser (Bartlett CLOUD)

- The draft design scheme as a counter-proposal for the Upton Gardens site was presented as it stands at the moment
- The first main point made was the wish to reinforce the tradition of the London terraced dwelling, which is the most common model in the city and also typical of the East Ham area. Using this housing model instead of the Barratt's high-rise blocks would help to introduce a intelligible clarity to the site plan and connect better to the existing streets around
- However whereas London's terraced houses were generally conceived as single-family dwellings (even if in practice this was often not the case in practice), today it is very common for people to live in terraced houses that have been subdivided into flats on different floors. Could therefore the design make use of this fact to imagine a new terrace arrangement of single floor units?
- The second main principle is that of creating clarity in the spatial arrangement inside the flats, so that residents on entering their dwelling can see immediately the relationship between all of the rooms. This is intended as a specific critique of the Barratt's scheme (and many other contemporary housing developments), in which there are long unnecessary corridors and a general lack of interest in internal spatial design.
- In essence the approach is thus to adapt the model of the loft-living unit, where one enters directly into the main free-flowing living space, and thereby can get rid of all internal corridors altogether.
- The third principle is to rethink the most common London building material, clay, in terms of its environmental sustainability.
- This was pursued by discussions with a research team at Bath University led by Prof Pete Walker, whose ideas of using unfired clay surfaces internally as modulators of heat/moisture/volatile organic compounds. It is unlikely that clay cold be used for continuous carbon capture,

however, nor that unfired clay blocks could be used externally, but unfired clay inside the flats could have great benefits

- To this effect, a range of test blocks/tiles have been made that will then be turned into a few full-scale prototype elements. These are to be sued alongside other environmentally conscious elements in the scheme such as Passivhaus-level insulation, ventilation systems, clay plaster, clay polymer concrete and so on
- In reply, the following questions were asked:
    - What is the build cost of the dwellings, as they need to be delivered for the same as Barratt's scheme (i.e. £1700 per square metre)?
    - Although they have now been removed, could the proposal envisage re-using components from the old stadium?
    - Will stack ventilation work within the flats?
    - Does the depth of the plan affect daylight levels?
    - How much carbon would be used in creating the scheme's clay components?
    - Is clay furniture, rather than say timber, more sustainable?
    - Would cleaning the clay ceiling/furniture be an issue?
    - How would we get building insurance/ BBA certification for clay components?
    - How will residents cook their daily meals in the flats?
    - How will they wash and dry their clothes?
    - Is there in fact a viable communal heating system as an alternative to CHP, which has been rejected here for environmental reasons?
    - Could the blocks around the public green park space be handed, so that it does not face onto rear gardens?
    - Could community facilities be related to the scheme's park space?
    - Might there be specific provision to house elderly people as well?

4. POSITION TALK:
Geraldine Dening + Simon Elmer
(Architects for Social Housing)

- *They calculate that there are currently 237 post-war housing estates in London at risk of redevelopment/privatizing, of which one of the most urgent cases is the St Raphael's Estate in Brent*
- *False claims of criminality on this estate and the supposed end of its houses' lifespan are being manipulated as reasons to demolish the current dwellings that date from the 1950s–60s*
- *In truth the figures show that crime is actually lower on the estate than in surrounding areas!*
- *The financial arguments in favour of demolition/new-build are likewise fictitious, and do not for instance include the compensation sums needed to pay residents to move out*
- *Closer examination shows that reusing the buildings is financially more sensible, and doesn't involve relocating residents*
- *Furthermore, when one adds in the environmental benefit of not demolishing the current blocks, and then incurring the carbon footprint of having to build entirely new dwellings, there is no contest*

- *Hence there is now an opportunity to design a counter-proposal for the St Raphael's Estate that refurbishes the existing homes, adds in some roof extensions and new infill blocks, built by small-scale local developers, and to show that the 'Refurb + Infill' strategy would work better*

5. BACKGROUND TO SWEDISH HOUSING PROVISION/DESIGN: Prof Anna-Johanna Klasander (White Arkitekter/Chalmers University)

- Sweden, including cities such as Gothenburg, have long-term regional plans and also development gain controls on urban sites, thus providing greater certainty and less profiteering than in Britain
- However, the political climate from the 1980s in Sweden has been against providing social housing, and so the Welfare State system of subsidizing the building of low-rent dwellings has collapsed
- Instead, citizens who are on lower incomes are given targeted subsidies via the wider social benefits system, which hence incorporates an allowance to enable lower-paid citizens to afford rents in private housing schemes built by developers
- There is thus no 'social housing' as such any longer in Sweden, but instead 'socially mixed housing'
- What this means however is that there is little incentive for developers to build for those wanting to pay lower rents, and indeed there is now a chronic shortage of those dwellings in Sweden
- It also makes it very hard for younger citizens to afford to move out their parental homes, and so general worries about personal debt/interest rate rises are a disincentive to renting one's own place
- Design-wise, it is common to find moderately high housing blocks in cities like Gothenburg with private courtyards that are shared (and indeed heavily used) by residents
- Increasingly important is the provision of multigenerational housing to cover all ages, set within a generally ageing population.
- Sweden's major building company, Skanska, is mostly committed to heavy materials such as concrete and steel, and is therefore not so involved in using Cross-Laminated Timber (CLT), etc
- Instead it is SODRA, the Swedish forestry and timber association, which is most active in pushing forward CLT construction.
- In response, it was asked how long is the expected lifespan of CLT and whether it is environmentally sustainable given its reliance on glue; however, there are now CLT systems without glue, and generally it is regarded as sufficiently long-lasting for use in housing

6. ADAPTABLE APARTMENTS AS A NEW SWEDISH HOUSING MODEL: Dr Anna Braide (Chalmers University Centre for Housing Architecture)

- Following the switch to market-driven housing provision in Sweden since the 1990s there has been a clear drop in quality and quantity
- Solutions to the problem are however generally only conceived in terms of increasing the quantity of new house-building, even among bodies like the Swedish National Housing and Planning Board

- It is thus the emphasis of the Centre for Housing Architecture, set up at Chalmers University in 2017, to look instead at the design quality of new housing and at the lifestyle of inhabitants of these dwellings
- One of the key investigations is in the idea of adaptable apartments that cab extend the lifespan for how long people will live in a dwelling, by enabling it to adapt over time to suit their changing needs
- It is also a different approach to most in Sweden as the focus is on the design and use of interior spaces as opposed to questions of mass delivery, technological systems, and so on
- This is being tested out as a design research exercise, partly done by thinking of new design strategies and tools, but also partly through applied test projects such as the VIVA collective apartment block in Gothenburg near to the Chalmers campus
- In reply to a question about who is carrying out follow-up studies of housing in use after completion, this is precisely what is being done in the VIVA project
- In reply to a question of whether it is better to reuse older Swedish housing blocks or build anew, the problem was raised of whether one can get a loan to buy an older property, which may be a disincentive there

7. POSITION TALK: Clare Murray (Levitt Bernstein Architects)

- *There is a climate crisis alongside the housing crisis in Britain*
- *In many cases in new British housing projects, especially in London, there is currently a trade-off between the amount of 'affordable dwellings' and what environmentally sustainable features are included, but this is the wrong way to tackle the problem*
- *The target set by the Greater London Authority (GLA) is for all new building, including housing, to achieve 35% less carbon emissions than is stipulated in the 2013 Building Regulations, with the longer-term aim of becoming totally neutral in terms of carbon emissions ('a Zero Carbon London') by 2050*
- *Key is connectivity between the design of new housing, which needs to be of Passivhaus standards, with sufficient surrounding greenery and play spaces and other amenities to ensure well-being and comfort of residents*
- *With 'operational carbon' now being reduced by changes to energy supplies, it is becoming more crucial to look at 'embodied carbon'. Off-setting is one way to help, but the aim should be to achieve zero carbon in new building*
- *Hence the two aspects must be looked at in conjunction, and Denmark for instance has a policy to reverse-calculate the operational carbon allowance along with the embodied carbon allowance for new projects*
- *All of this also compels us to look more at constructional materials, and into codes such as that in Britain which limits the use of timber structures to a maximum height of 11 metres (i.e. effectively 3 storeys)*

C

Appendix C

Critique of Barratt Homes development for Upton Gardens, East Ham

To inform the architectural development of our counter-proposal it was necessary to establish a set of rigorous parameters that would form the basis of an exemplar approach to large scale housing development that would address the shortcomings present in many housing schemes under construction in London today. As such one of our initial activities was a thorough technical analysis of the architectural and urban characteristics within the Barratt London scheme, together with its compliance with key aspects of the London Plan and its approach to social and environmental sustainability. The following key points of critique were noted:

- Scheme is out of scale with surroundings.
- Expensive basement excavations to accommodate a large number of car parking spaces and plant.
- Complicated block forms and many balcony recesses.
- Only 75% of dwellings are dual aspect.
- Poorly proportioned bedrooms and living spaces.
- 25-30% of plan devoted to circulation.
- No built-in storage.
- Scheme is predicated on private courtyards with little communal open space.

- Through routes do not connect meaningfully with wider urban schema.
- Token relationship with site history.
- Energy strategy largely dependent on CHP, passive measures appear to only go as far as meeting statute.
- Affordable housing provision below London Plan targets and skewed by viability assessment.

This, in turn, informed the guiding principles for the counter-proposal which are set out in the following table.

Some guiding principles for the Bartlett team's counter-proposal
Spetember 2019

	Design principle	**Our proposal**	**Barratt's scheme**
1	Block heights must not be overly tall	We are at 4 storeys, with just one higher tower for visual effect	Minimum 8-storey high blocks, and some towers up to 13 storeys
2	Housing density should be high although not excessively so	115 dwellings per hectare	257 dwellings per hectare overall (yet only 126 dwellings p.h. if one takes just their lower 4 storeys)
3	Car-free design with a reliance on cycle and pedestrian use	No extra car parking, collective bike storage at street level at the ends of each housing terrace	Large basement for 322 cars and 1010 bikes
4	No expensive excavations or groundworks	No basements anywhere in the project	Large basement for cars and bikes
5	Simple plan forms and smooth external envelope to reduce construction costs	Only straight terraces and very few folds or indentations	Complicated block forms and many balcony recesses
6	Minimal circulation areas inside and outside dwellings to save space and money	No internal corridors within flats, and with only direct access to flats off staircases	Flats have extensive, convoluted, inefficient circulation both in the flats and in the staircases
7	Good size and proportion for all internal rooms	100% of flats are proportioned on a clear square module and meet London Plan minimum room sizes	Many flats have long, thin, poorly proportioned bedrooms and living spaces
8	Narrow blocks and double-aspect layouts to provide sufficient daylight and cross-ventilation	100% of dwellings are double-aspect, terraces no more than 12m deep	Only 75% of dwellings are double-aspect, blocks up to 20m deep
9	No private courtyards to avoid segregating people	No private courtyards at all	Whole scheme is predicated on private courtyards
10	Clear through-routes that join up coherently with the existing street layout	All through-routes link to surrounding streets and provide visual links to them	Most through-routes do not connect in any meaningful way to the streets around
11	Each dwellings must have its own external space in some form	All the ground-floor flats have private gardens, and all upper flats have either winter-garden balconies or roof gardens	Many of the flats have no external spaces at all
12	Plenty of well-designed landscaping as communal open space	Large public park on the exact site and dimensions of West Ham United's old football pitch	No landscaped communal open space, only private courtyards
13	Needs other mixed uses so that the scheme is not only housing	Light industrial workshops, 16 corner retail units, library, crèche, plus a dedicated healthcare/training centre	Crèche, teacher training facility, potentially a library
14	Solid and robust construction must be used for longevity, thermal mass and soundproofing	Solid concrete floors and ultra-thick clay-block walls between all dwellings	Uncertain, planning documents only mention exterior facing bricks
15	Prefabrication to be used where possible to speed up construction	All the concrete columns and floor panels, plus all the CLT roofs, will be prefabricated	Uncertain, but no prefabrication methods are mentioned
16	Needs plenty of built-in storage	Ultra-thick external walls for bedroom cupboards plus ultra-thick crosswalls to incorporate built-in clay shelving	Relatively little built-in storage of any kind
17	Carbon-negative design with Passivhaus standards of almost-zero heat loss, coupled with on-site energy production	Ultra-thick insulated walls, photovoltaics on roofs, use of materials for carbon capture – but, contrary to London Plan, we are not proposing a CHP system	Unclear, mentions only a 35% reduction on 2013 Building Regulations as asked for in London Plan, which is not good – plus uses a CHP system housed in basement

D

Appendix D

Bath University research into sustainable clay construction

The Bartlett team's counter-proposal for Upton Gardens relies heavily upon sustainable clay construction methods to meet its environmental, ecological and aesthetic goals. Hence the decision was taken to use thick unfired clay blocks and tiles for ceilings, floorings and storage units in the apartment interiors, given unfired clay's ability to modulate internal temperatures and moisture levels, and also to use thicker hollow clay blocks to build the exterior facades. In order to provide the necessary expertise on these sustainable materials, the Bartlett team consulted with the special research group led by Professor Pete Walker in the Centre for Innovative Construction Materials at the University of Bath, UK.

A list of initial questions was prepared for Professor Walker and his team at a meeting at Bath University held on 9^{th} September 2019:

a/ Is it feasible to use clay blocks and tiles as a means also to capture CO^2 emissions in the atmosphere – and if indeed it is, does this only apply to unfired clay used internally?

b/ You mention in an essay the use in Germany of unfired clay bricks externally, but have there been problems with using them in this way?

c/ Might also fired exterior clay blocks and tiles be used for carbon capture, even if they are not so efficient at doing so?

d/ If one does use unfired clay blocks and tiles internally, what are the key criteria to make them as useful as possible for environmental modification and yet also protect against wear-and-tear?
e/ Are there particular types of clay or types of additives (e.g. lime/metakaolin) or mortars (e.g. sodium silicate) that we ought to be looking to use?
f/ Are there also other kinds of biologically-based materials (e.g. earthen elements, straw bales, hemp plasterboard) or alternative concretes (e.g. lime-pozzolan concrete mix, clay-based geopolymers) that we should be incorporating into a relatively large 400-unit urban housing scheme?
g/ What would you recommend as the best texts in explaining the potential of these more environmentally appropriate construction materials/methods?

From the responses to these and subsequent questions, the environmental design strategy for the Bartlett team's counter-proposal was developed, as summarized in the table at the end of Appendix C and as described in the design scheme/image captions within the main folio itself.

Here is also a very useful general summary of the benefits of unfired clay construction for housing written by one of the members of the Bath University research team, Dr Andrew Heath, based on their longstanding scientific research into the topic:

Greenspec website, http://www.greenspec.co.uk/building-design/unfired-clay-bricks/

Unfired clay bricks

Unfired clay bricks offer a cost-effective form of construction of very low environmental impact. **Dr Andew Heath** of the University of Bath provides an overview of the technology and application.

Introduction

Also known as earth masonry, unfired clay brickwork is constructed using earth materials (possibly with some additives). Earth masonry is not 'fired' like conventional bricks, but the masonry units are air dried after manufacture to reduce shrinkage and improve strength. In some traditional forms of earth construction (e.g. cob or rammed earth), monolithic (solid) walls are constructed, but unfired clay bricks are similar to other masonry systems where there the units ('bricks') are bonded together with mortar and possibly covered with a finishing system (paint or render).

Traditional forms of unfired clay bricks (cob blocks, adobe and mudbricks) are generally made by hand and as a result, have variable dimensions and other properties. Traditional earth masonry has thick walls (often over 300mm thick) as the mortar provides low bond strength and the thick walls have sufficient mass to keep themselves stable against lateral loads in dwellings.

Because of the environmental and financial cost of using materials in construction, it is preferable to reduce the wall thickness to approximately 100mm for internal partitions (the standard thickness for fired clay bricks and concrete blockwork). Thinner walls also reduce the structural loading and increase available space inside buildings.

Modern unfired clay brickwork uses units manufactured to accurate tolerances using a commercial extrusion or pressing system to provide a consistent, high quality product. This enables rapid, cost effective, 100mm thick walls with low environmental impact to be constructed. In most cases, modern unfired clay bricks are produced in commercial fired brick manufacturing plants using similar materials to fired bricks, but without putting the bricks through the firing process. This significantly reduces the energy used in manufacture and previous research has indicated unfired bricks have 14% of the embodied energy of fired bricks and 25% of the embodied energy of concrete blocks. In Germany, some fired brick plants have moved to making only modern earth masonry and associated products.

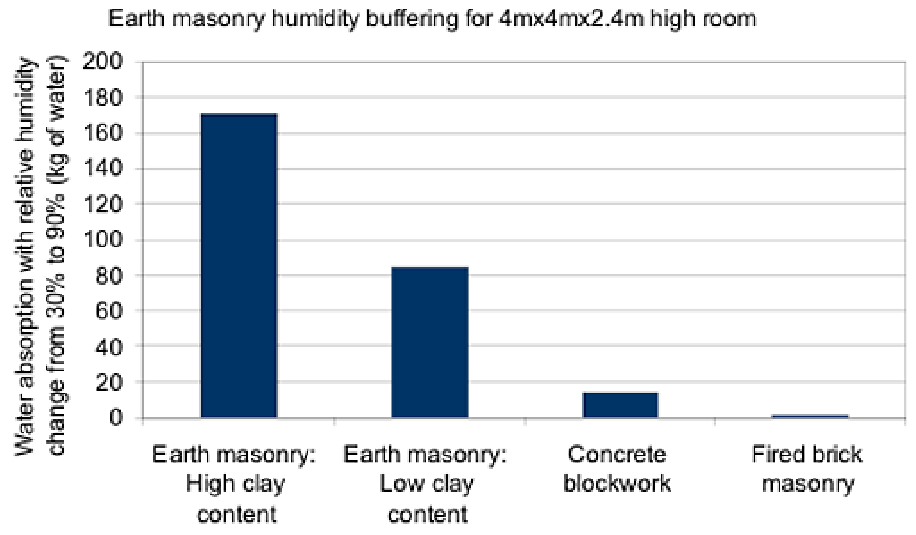
Control of internal environment

Unfired clay brickwork has been shown to provide passive environmental control in buildings through buffering of the temperature in the building (through the provision of thermal mass), and through buffering relative humidity by absorbing moisture from the air at high humidity, and then releasing it at low humidity. Buffering of temperature and humidity will normally reduce the energy required to operate buildings. To enable buffering of relative humidity, a specialist vapour-permeable render and paint are required. Gypsum plasterboard and non-permeable paints should not be used with unfired brickwork as they could lead to premature failure through build-up of water in the masonry.

The amount of moisture that will be absorbed by the walls in a 4 x 4 x2.4m high room with a 100mm wall thickness is illustrated in the figure below. As shown, the unfired brickwork can absorb significantly more moisture from the air than either concrete blockwork or fired brick masonry.

Empirical evidence has showed that unfired clay brickwork can buffer humidity to medium humidity levels (40-65% relative humidity), but further research is required to confirm and model this effect. If this is confirmed, it could have positive implications for

Fig.
Moisture buffering capacity of earth masonry



occupant health: 'The incidence of absenteeism or respiratory infections was found to be lower among people working or living in environments with mid-range versus low or high relative humidities.' (Arundel et. al. *Indirect health effects of relative humidity in indoor environments*. Environ Health Perspect. March; 65 pp 351-361 (1986)).

Strength of unfired clay brickwork

The compressive strength of unfired clay brickwork is much more complicated than for blockwork or fired clay bricks and no single strength value can be assigned. The strength of unfired brickwork is dependent on the material properties, the dimensions of the wall and the water content. The material property that influences the masonry strength more than any other is the clay content in the masonry units.

As the water content in the masonry units is increased, the strength decreases and it is therefore important to keep the masonry dry once constructed through appropriate detailing, such as provision of a fired masonry or blockwork plinth to prevent accidental wetting from spills. Further information on detailing is available in the books listed at the end of this factsheet. The water content will normally be highest during construction (from application of wet mortar and render) and will then stabilise to a lower level (stronger masonry) during use.

After construction and in the absence of any accidental wetting (through appropriate detailing), the water content will be controlled by the relative humidity in the air, resulting in the relationship in the figure below. It is worth noting that the humidity must be maintained at the level for a considerable period of time (a number of weeks) before the water content will stabilise throughout the masonry. Boiling a kettle or having a shower will have negligible effect on the strength of the masonry.

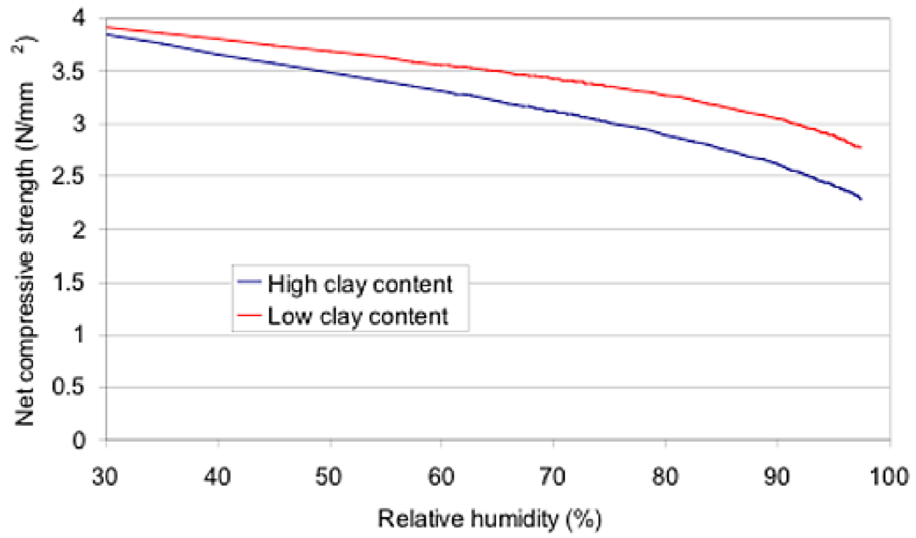
As shown in the figure, even in the extreme range likely to be experienced (30% to 97.5% relative humidity), there is only a small change in strength. Long-term monitoring of a house constructed with unfired clay brickwork in Dalguise, Scotland showed that the relative humidity in the house remained between 40% and 65% throughout the year, even in the bathroom where a shower was used. Under this change in relative humidity the strength will change by approximately 12% for the earth masonry with high clay content, and only 8% for the low clay content.

The strength of unfired brickwork is normally lower than fired clay bricks or concrete blockwork, and 100mm thick unfired clay brick walls are currently not recommended for high load structural applications. Increasing the wall thickness will open the possibility for structural use of unfired brickwork.

Mortars for unfired clay brickwork

As the wall thickness decreases, the mortar must bond more to the masonry units to provide sufficient structural

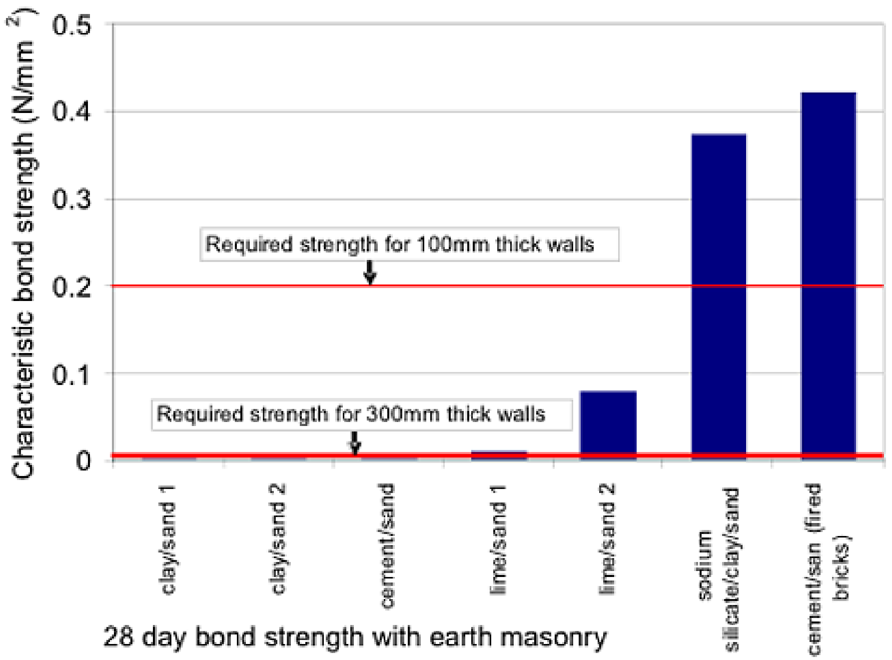
Fig.
Effect of relative humidity on strength



strength against lateral loads (pushing horizontally against the wall). The effect of wall thickness on required bond strength can be determined by a structural engineer, but it can be calculated that a 300mm thick wall with almost no bond strength (traditional earth masonry) can support the same load as a 100mm thick wall with a bond strength of approximately 0.2N/mm2. The bond strength of different mortars with modern earth masonry is shown in the figure below. This figure includes clay/sand and lime mortars used for traditional earth masonry and a cement/sand mortar used with fired bricks.

As shown, the mortars used for traditional earth masonry do not provide the bond strength required to construct 100mm thin walls using modern earth masonry. The use of a preformulated sodium silicate/clay/sand mix does, however, provide the required strength

Fig.
Bond strength with different mortars



and provides a bond strength similar to cement mortars with fired bricks. The preformulated sodium silicate mortar has less than 10% of the embodied CO2 than typical cement-based mortars but does not perform as well at high water contents. These high water contents can be avoided through appropriate detailing.

An alternative to a sodium silicate-based mortars is to tie 100mm thick modern earth masonry to a timber or other frame to provide the required lateral load capacity. This will provide the environmental benefits of earth masonry (thermal mass and humidity buffering) to a timber framed building.

Bricks, blockwork or unfired clay bricks - which is best?

There is no simple answer to which is best as the different materials are suited to different applications. Some points to consider are:

- ↑ Unfired brickwork generally has lower embodied energy and is easier to recycle and dispose of at end of use than blockwork or fired clay masonry
- ↑ Unfired brickwork has the ability to absorb more moisture from the air than blockwork or fired brick masonry, and therefore provides better passive humidity control
- ↓ Unfired brickwork does not have the same moisture resistance as blockwork or fired clay masonry, and detailing should ensure it is kept dry during and after construction
- ↓ Unfired brickwork generally has a lower strength than blockwork or fired clay masonry, and it is currently not recommended to use thin-walled earth masonry in high-load structural applications. It will also not support as high a load from fixings as fired

Further information

Earth masonry: Design and construction guidelines. - Morton, Tom. ISBN 9781860819780, BRE Press (2008).

Building with Earth: Design and Technology of a Sustainable Architecture. Minke, Gernot. Birkhauser, Basel, Germany (2006).

- UK Earth Building Association (www.arc-architects.com/research/EBUK.htm)
- German Earth Building Association (www.dachverband-lehm.de/index_gb.html)
- UK Brick Development Association (www.brick.org.uk)

E

Appendix E

Cost breakdown of Bartlett's team counter-proposal for Upton Gardens

In order to give legitimacy to the counter-proposal for Upton Gardens it was important that the scheme was independently costed. There were two principle reasons for doing this. Firstly, the counter proposal employs a number of sustainable technologies that are, rightly or wrongly, perceived as costly additions to the process of construction. We were keen to understand the budget premium, if any, of making these technologies a core part of volume house building. Secondly, a core part of the viability assessments prepared to justify the level of affordable housing that will be delivered in developments of this nature, is determined by the cost of building the project. This cost, together with fees, is offset against the projected project value as a saleable asset in order to understand the level of affordable housing that a developer can afford to deliver. Viability assessments have frequently been the subject of controversy as a result of accusations that developers frequently inflate projected construction costs, often as a means of accounting for a means of accounting for excessively high costs in speculative land acquisition, while underplaying profit in order to reduce their obligation to deliver affordable housing whose levels frequently fall below London Plan targets. Projects of the scale of Upton Gardens should be an ideal opportunity to deliver much needed affordable housing in greater numbers. We were keen to use our costed scheme as a basis to challenge the viability assessment prepared by Barratt London for Upton Gardens and understand whether the targets stated within the London Plan are achievable for projects of this scale.

We approached the cost consultant Pierce Hill in January 2020 who prepared a high-level cost assessment on the basis of our counter-proposal.

Broadly speaking, the development cost of the counter-proposal breaks down to £2161.78 per square metre or £200 per square foot.

In order to compare this to the Barratt London we have had to make some adjustments to account for inflation. Based on Barratt London's 2015 viability assessment and supporting documentation their scheme broke down to a cost of £2034.40 per square metre or £189 per square foot. Inflation between 2015 and 2020 accounts for an 11.59% increase. Adjusted to 2020 the cost of Barratt London's development would therefore come to £2270.19 per square metre or £210.91 per square foot. It should be noted that Barratt London's development meets statutory requirements only and does not incorporate more advanced sustainable technologies such as Passivhaus.

In terms of stated costs within Barratt London's viability assessment it would appear that the counter proposal is in fact more economic, equating to a cost of £1937.52 per square metre or £180 per square foot in 2015 prices. This indicates two things:

1) Sustainable technologies such as Passivhaus, homes that meet or exceed London plan space standards, dual aspect planning, generous external space and good levels of natural daylight – key areas in which the counter-proposal improves upon the current development – are achievable and should be mandated as standard at the cost levels

PIERCEHILL

Upton Park Passivhaus
INITIAL COST ESTIMATE Rev -

5 BREAKDOWN OF PROJECT COSTS

Elemental Summary	Block A	£ / m2	Block B	£ / m2	Block C	£ / m2	Block D	£ / m2	Tower	£ / m2
Sub-structure										
Foundations and ground floor slab	£ 1,605,400.00	£ 90.50	£ 741,600.00	£ 81.93	£ 318,300.00	£ 75.86	£ 1,101,500.00	£ 89.85	£ 976,400.00	£ 147.40
Superstructure										
Frame	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	£ 554,300.00	£ 83.68
Upper floors	£ 2,884,600.00	£ 162.60	£ 1,259,500.00	£ 139.14	£ 1,383,800.00	£ 329.79	£ 1,911,500.00	£ 155.91	£ 954,800.00	£ 144.14
Roof	£ 3,768,300.00	£ 212.42	£ 1,481,200.00	£ 163.63	£ 663,900.00	£ 158.22	£ 2,456,200.00	£ 200.34	£ 363,600.00	£ 54.89
Staircases	£ 1,654,700.00	£ 93.28	£ 764,400.00	£ 84.45	£ 267,500.00	£ 63.75	£ 941,300.00	£ 76.78	£ 280,300.00	£ 42.32
External Walls	£ 5,560,000.00	£ 313.42	£ 2,832,100.00	£ 312.87	£ 1,059,900.00	£ 252.60	£ 3,670,800.00	£ 299.41	£ 1,395,200.00	£ 210.63
Windows, glazed facades, external doors	£ 6,015,600.00	£ 339.10	£ 2,904,500.00	£ 320.87	£ 1,194,700.00	£ 284.72	£ 4,062,500.00	£ 331.36	£ 1,767,200.00	£ 266.79
Internal Walls and Partitions	£ 6,664,200.00	£ 375.66	£ 3,188,600.00	£ 352.25	£ 1,447,800.00	£ 345.04	£ 4,262,000.00	£ 347.63	£ 1,328,000.00	£ 200.48
Internal Doors	£ 820,400.00	£ 46.25	£ 247,800.00	£ 27.38	£ 155,000.00	£ 36.94	£ 630,000.00	£ 51.39	£ 193,200.00	£ 29.17
Finishes										
Wall finishes	£ 161,300.00	£ 9.09	£ 68,600.00	£ 7.58	£ 36,800.00	£ 8.77	£ 132,300.00	£ 10.79	£ 20,200.00	£ 3.05
Floor finishes	£ 999,000.00	£ 56.31	£ 450,000.00	£ 49.71	£ 180,200.00	£ 42.95	£ 683,700.00	£ 55.77	£ 622,400.00	£ 93.96
Ceiling finishes	£ 1,195,300.00	£ 67.38	£ 580,800.00	£ 64.16	£ 373,000.00	£ 88.89	£ 807,900.00	£ 65.90	£ 385,500.00	£ 58.20
Fixtures, fittings & equipment										
Bookcases and cupboards	£ 782,200.00	£ 44.09	£ 391,500.00	£ 43.25	£ 122,600.00	£ 29.22	£ 565,400.00	£ 46.12	£ 164,700.00	£ 24.86
Kitchens	£ 1,456,500.00	£ 82.10	£ 660,000.00	£ 72.91	£ 171,000.00	£ 40.75	£ 996,000.00	£ 81.24	£ 270,000.00	£ 40.76
Bike stands	£ 43,100.00	£ 2.43	£ 21,300.00	£ 2.35	£ 5,000.00	£ 1.19	£ 29,100.00	£ 2.37	£ 10,000.00	£ 1.51
Bathroom accessories and vanity units	£ 213,700.00	£ 12.05	£ 104,100.00	£ 11.50	£ 90,400.00	£ 21.54	£ 142,500.00	£ 11.62	£ 49,300.00	£ 7.44
Post boxes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	£ 14,400.00	£ 2.17
Services installations										
Sanitaryware	£ 619,200.00	£ 34.90	£ 289,200.00	£ 31.95	£ 240,300.00	£ 57.27	£ 412,800.00	£ 33.67	£ 124,200.00	£ 18.75
Mechanical services	£ 2,913,500.00	£ 164.23	£ 1,431,700.00	£ 158.16	£ 531,800.00	£ 126.74	£ 1,966,700.00	£ 160.42	£ 1,120,000.00	£ 169.08
Electrical services (power & lighting)	£ 2,081,100.00	£ 117.31	£ 1,014,500.00	£ 112.07	£ 453,100.00	£ 107.98	£ 1,534,600.00	£ 125.17	£ 568,700.00	£ 85.85
Lifts	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	£ 160,000.00	£ 24.15
Mains services	£ 322,000.00	£ 18.15	£ 190,000.00	£ 20.99	£ 88,500.00	£ 21.09	£ 160,000.00	£ 13.05	£ 195,000.00	£ 29.44
Builders Work in connection with installations	£ 178,100.00	£ 10.04	£ 87,800.00	£ 9.70	£ 39,400.00	£ 9.39	£ 122,200.00	£ 9.97	£ 65,000.00	£ 9.81
Below ground drainage	£ 476,000.00	£ 26.83	£ 238,000.00	£ 26.29	£ 119,000.00	£ 28.36	£ 309,400.00	£ 25.24	£ 119,000.00	£ 17.96
Services prelims	£ 330,000.00	£ 18.60	£ 162,500.00	£ 17.95	£ 73,600.00	£ 17.54	£ 225,300.00	£ 18.38	£ 117,600.00	£ 17.75
SUB-TOTAL	**£ 40,744,200.00**	**£ 2,296.74**	**£ 19,109,700.00**	**£ 2,111.10**	**£ 9,015,600.00**	**£ 2,148.62**	**£ 27,123,700.00**	**£ 2,212.37**	**£ 11,819,000.00**	**£ 1,784.27**
RESIDENTIAL BUILDING TOTAL									**£ 107,812,200.00**	**£ 2,161.78**
Other Works										
Community buildings									£ 12,087,900.00	
External Works									£ 2,789,100.00	
Main contractor preliminaries (based on 80 weeks)									£ 12,762,600.00	
Main contractor's overheads & profit									£ 8,940,200.00	
Contingency									£ 13,545,900.00	
TOTAL									**£ 157,937,900.00**	

Fig.
Pierce Hill cost plan for counter-proposal

indicated by Barratt London within their viability assessment.

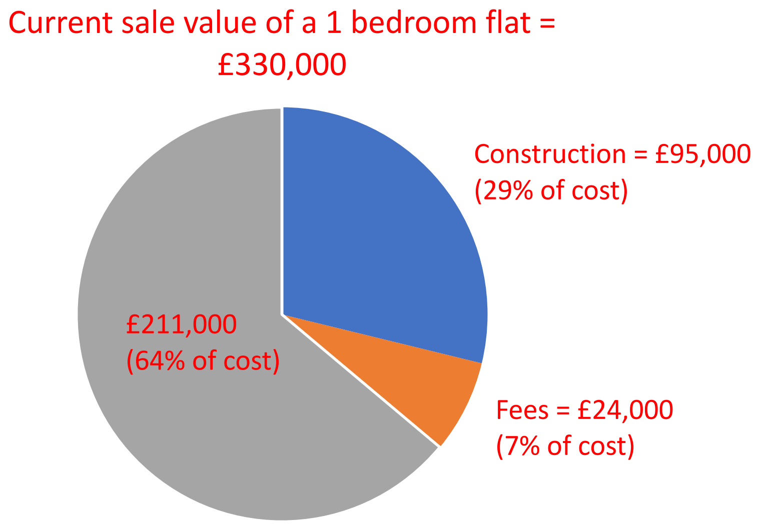
2) On the basis that Barratt London's development does not incorporate these characteristics, the development costs stated within its viability assessment appear to be inflated.

The question now was on what basis we could challenge the viability assessment. Barratt London initially offered 6% affordable housing which was challenged by Newham Council who stated that 35% could be achieved. Planning was granted on the basis of a viability assessment that demonstrated delivery of 25% affordable housing was the maximum possible (with offsite contributions should sale values exceed £700 per square foot), split 60-40 between affordable rent and shared ownership. This was well below the London Plan target that 50% of all new homes should be affordable housing.

Looking at the current sale value of a one bedroom flat within the Barratt London development, it is clear that there is a substantial gap between this and the capital investment on the part of the developer. The key to increased affordable housing provision clearly resides in exploring the means with which to narrow this gap.

To work further into the viability assessment it was necessary to reverse engineer Barratt London's development costs. For a single home the premium for Passivhaus is generally thought to be 10-15%. On the basis that there were likely to be economies of scale and to account for a degree of cost associated with land acquisition in the Barratt scheme we worked on the basis of a 6% reduction from the 2015 adjusted figure for our counter-proposal to give a value to the Barratt scheme of £1829.88 per square metre or £170 per square foot. We also looked at a number of the fees and rates associated with the development where excessive profit percentages had been indicated. We also adjusted the sale values upwards to account for the current sale prices within the development and for future phases

Fig.
Apportionment of value in re-sale value of Barratt London flats at Upton Gardens



a realistic rate of inflation. Based on these assumptions we believe that 56% of the scheme can in fact be delivered as affordable housing while still maintaining an adequate return for the developer. If the costs associated with speculative land acquisition are decoupled from the development process, we believe this figure could be pushed to 60%.

In order for this approach to be viable an alternative approach to that offered by a commercial developer needed to be considered. Our research led us towards an LHC (Local Housing Company) model, whose key advantages are:

- LHCs are independent, arms-length commercial organisations wholly or partly owned by councils. They are intended to act commercially for a social purpose, primarily to supply new local housing, as required by local market under-provision.

- Attractive model because it avoids usual limitations faced by council:
  - stock loss via Right-to-Buy (RTB).
  - limits on recyclability of capital receipts from future RTB sales.
  - controls over borrowing.
- Newham's LHC "Red Door" (new build intermediate rent).

There are also some negatives to be considered in this scenario:

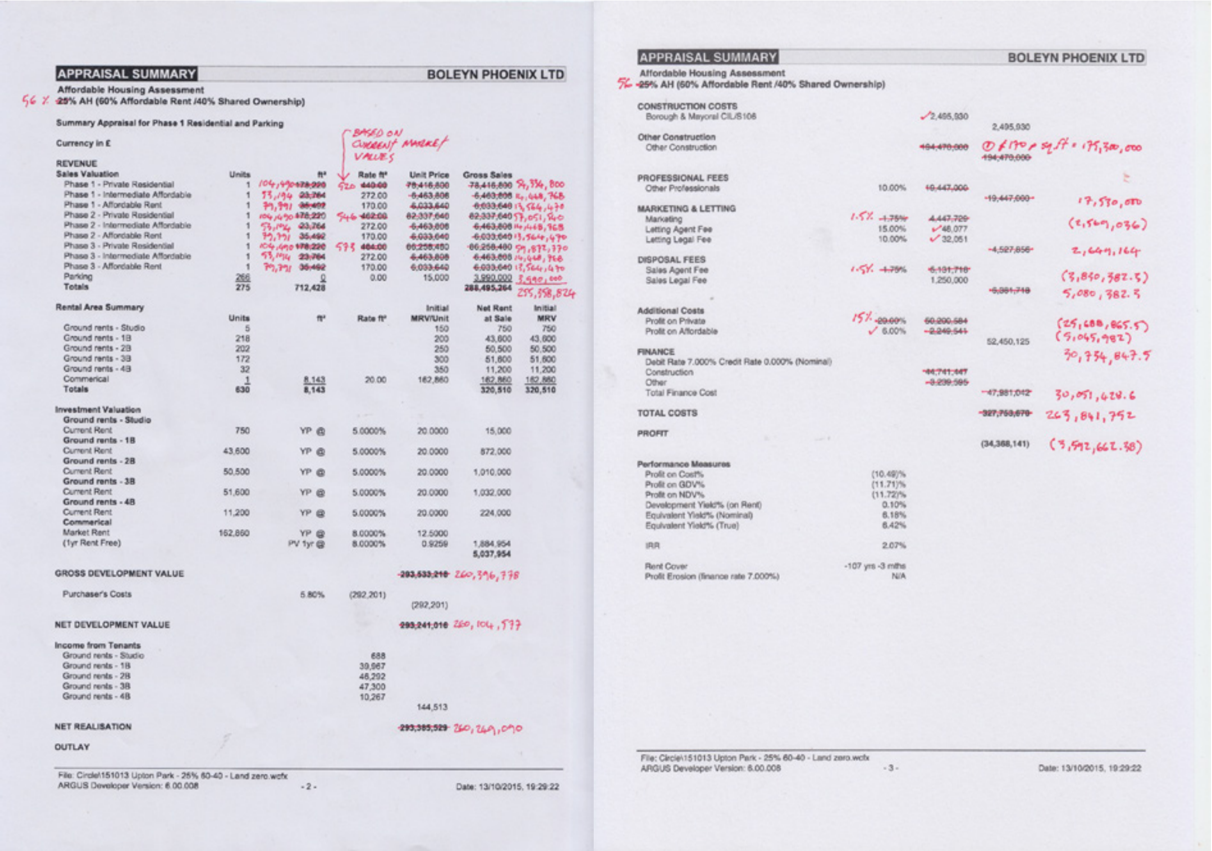
- Cross-subsidy of 'affordable' housing by recycling receipts from market sale & revenue from intermediate/market rents.
- Only 10% of new LHC supply will be for social rent. Even more problematic for development on council land.
- Chartered Institute of Housing recommends 33% of new supply needs to be social rent.

As such, the challenge was now to propose a delivery and tenure model that could capitalise on these advantages and overcome the drawbacks associated with current LHC's.

Boleyn Ground Development Scenario

The following acquisition, development and tenure model is thus proposed:

- The unique nature of West Ham's move from site creates a unique test case whereby the council can take a controlling interest in the land, removing the cost of speculative land acquisition from the equation
- Newham/GLA acquires the land in exchange for the Olympic Stadium (West Ham's new home).



APPRAISAL SUMMARY BOLEYN PHOENIX LTD

Affordable Housing Assessment
~~25%~~ 56% AH (60% Affordable Rent /40% Shared Ownership)

Summary Appraisal for Phase 1 Residential and Parking

Currency in £

REVENUE

Sales Valuation	Units	ft²	Rate ft²	Unit Price	Gross Sales
Phase 1 - Private Residential	1	~~178,220~~ 104,490	~~440.00~~ 520	~~78,416,800~~	~~78,416,800~~ 54,334,800
Phase 1 - Intermediate Affordable	1	~~23,764~~ 53,194	272.00	~~6,463,808~~	~~6,463,808~~ 14,468,768
Phase 1 - Affordable Rent	1	~~35,492~~ 79,791	170.00	~~6,033,640~~	~~6,033,640~~ 13,564,470
Phase 2 - Private Residential	1	~~178,220~~ 104,490	~~462.00~~ 546	~~82,337,640~~	~~82,337,640~~ 57,051,540
Phase 2 - Intermediate Affordable	1	~~23,764~~ 53,194	272.00	~~6,463,808~~	~~6,463,808~~ 14,468,768
Phase 2 - Affordable Rent	1	~~35,492~~ 79,791	170.00	~~6,033,640~~	~~6,033,640~~ 13,564,470
Phase 3 - Private Residential	1	~~178,220~~ 104,490	~~484.00~~ 573	~~86,258,480~~	~~86,258,480~~ 59,872,770
Phase 3 - Intermediate Affordable	1	~~23,764~~ 53,194	272.00	~~6,463,808~~	~~6,463,808~~ 14,468,768
Phase 3 - Affordable Rent	1	~~35,492~~ 79,791	170.00	~~6,033,640~~	~~6,033,640~~ 13,564,470
Parking	266	0	0.00	15,000	3,990,000 3,990,000
Totals	275	712,428			288,495,264 255,358,824

BASED ON CURRENT MARKET VALUES

Rental Area Summary	Units	ft²	Rate ft²	Initial MRV/Unit	Net Rent at Sale	Initial MRV
Ground rents - Studio	5			150	750	750
Ground rents - 1B	218			200	43,600	43,600
Ground rents - 2B	202			250	50,500	50,500
Ground rents - 3B	172			300	51,600	51,600
Ground rents - 4B	32			350	11,200	11,200
Commerical	1	8,143	20.00	162,860	162,860	162,860
Totals	630	8,143			320,510	320,510

Investment Valuation					
Ground rents - Studio					
Current Rent	750	YP @	5.0000%	20.0000	15,000
Ground rents - 1B					
Current Rent	43,600	YP @	5.0000%	20.0000	872,000
Ground rents - 2B					
Current Rent	50,500	YP @	5.0000%	20.0000	1,010,000
Ground rents - 3B					
Current Rent	51,600	YP @	5.0000%	20.0000	1,032,000
Ground rents - 4B					
Current Rent	11,200	YP @	5.0000%	20.0000	224,000
Commerical					
Market Rent	162,860	YP @	8.0000%	12.5000	
(1yr Rent Free)		PV 1yr @	8.0000%	0.9259	1,884,954
					5,037,954

GROSS DEVELOPMENT VALUE ~~293,533,218~~ 260,396,778

Purchaser's Costs 5.80% (292,201) (292,201)

NET DEVELOPMENT VALUE ~~293,241,016~~ 260,104,577

Income from Tenants		
Ground rents - Studio	688	
Ground rents - 1B	39,967	
Ground rents - 2B	46,292	
Ground rents - 3B	47,300	
Ground rents - 4B	10,267	
		144,513

NET REALISATION ~~293,385,529~~ 260,249,090

OUTLAY

File: Circle\151013 Upton Park - 25% 60-40 - Land zero.wcfx
ARGUS Developer Version: 6.00.008 - 2 - Date: 13/10/2015, 19:29:22

APPRAISAL SUMMARY BOLEYN PHOENIX LTD

Affordable Housing Assessment
~~25%~~ 56% AH (60% Affordable Rent /40% Shared Ownership)

CONSTRUCTION COSTS				
Borough & Mayoral CIL/S106		2,495,930		
			2,495,930	
Other Construction				
Other Construction		~~194,470,000~~	~~194,470,000~~	① £170 / sq.ft = 175,300,000
PROFESSIONAL FEES				
Other Professionals	10.00%	~~19,447,000~~		
			~~19,447,000~~	17,530,000
MARKETING & LETTING				
Marketing	~~1.75%~~ 1.5%	~~4,447,729~~		(2,569,036)
Letting Agent Fee	15.00%	48,077		
Letting Legal Fee	10.00%	32,051		
			~~4,527,856~~	2,644,164
DISPOSAL FEES				
Sales Agent Fee	~~1.75%~~ 1.5%	~~5,131,718~~		(3,830,382.5)
Sales Legal Fee		1,250,000		
			~~6,381,718~~	5,080,382.5
Additional Costs				
Profit on Private	~~20.00%~~ 15%	~~50,200,584~~		(25,688,865.5)
Profit on Affordable	6.00%	~~2,249,541~~		(5,045,982)
			52,450,125	30,734,847.5
FINANCE				
Debit Rate 7.000% Credit Rate 0.000% (Nominal)				
Construction		~~44,741,447~~		
Other		~~3,239,595~~		
Total Finance Cost			~~47,981,042~~	30,051,428.6
TOTAL COSTS			~~327,753,670~~	263,841,752
PROFIT				
			(34,368,141)	(3,592,662.38)

Performance Measures	
Profit on Cost%	(10.49)%
Profit on GDV%	(11.71)%
Profit on NDV%	(11.72)%
Development Yield% (on Rent)	0.10%
Equivalent Yield% (Nominal)	6.18%
Equivalent Yield% (True)	6.42%
IRR	2.07%
Rent Cover	-107 yrs -3 mths
Profit Erosion (finance rate 7.000%)	N/A

File: Circle\151013 Upton Park - 25% 60-40 - Land zero.wcfx
ARGUS Developer Version: 6.00.008 - 3 - Date: 13/10/2015, 19:29:22

Fig.
Alternate viability assessment prepared by the Bartlett team

- Newham/GLA defines the housing tenure mix based on London plan, local needs and planning policy: 40% owner occupier, 35% social rent, 25% affordable purchase.
- Outline planning is sought based on this tenure mix.
- Newham/GLA joins forces with community-led housing (CLH) development partners through an OJEU process which prioritises proposals for their affordability and approach to community involvement. Together they divide the land into plots, for future sale or lease the CLH partners at below-market cost.

- Plot A (*small*): Community-led housing group A
- Plot B (*large*): Community-led housing group B
- Plot C (*tower*): Red Door development
- Plot D (*medium*): Community-led housing group D
- Plot E (*small*): Elderly co-housing group E
- Plot F (*small*): Community-led housing group F
- Plot G (*medium*): Community-led housing group G
- Plot H (*library, workshops, 'Housing+'*): Boleyn CLT
- Plot X (*open space/common*): Boleyn CLT

- Together, all small-scale builders form a non-profit company: **Boleyn Ground Community Builders [BGCB]**, to purchase the plots and take the development forward. Funds are sought from the Mayor of London's London Community Housing Fund (£38M pot currently available).
- They appoint a design team to develop a coherent design for the whole site.

- The architectural proposal:
  - uses regular form, repetitive layouts and simple construction details to generate savings on the build for all groups (economies of scale);
  - corresponds to the prescribed unit mix set at Outline Planning stage.

- Planning permission is sought by BGCB and granted by Newham Council.
- The project is tendered competitively as a single contract, again to generate overall savings on the construction cost. Separate contractor 'delivery teams' would work on the various block/plots, to increase the speed of delivery.
- The basic shell of all but the social rent units are built to a secure, watertight and habitable and mortgage compliant standard. Provided are the kitchen sink, a basic bathroom, heating and functional electrics and lighting, but no other finishes, fittings or partitions. This allows for a cheaper initial capital investment and allows people to create and adapt their own home over time, either doing the work themselves or paying builders.
- Social rent units are fully fitted out, as social tenants may not be able to invest initially into the development of their apartment.
- Where possible/appropriate, prospective buyers (for owner-occupiers and elderly co-housing) pay a 10% deposit to de-risk the development, allowing some of the homes to be pre-sold or pre-let ahead of construction.
- Once built, the developments are sold on by the BGCB to the fully mutual CLH groups, where only residents are members.

- Each CLH group incorporates a low profit housing association (LPHA) to provide guaranteed cost-based rents in perpetuity, ensuring that socially rented housing stock is not lost via right-to-buy.
- The Boleyn Ground Housing Cooperative (BGHC) is formed as a Registered Provider of social housing/a charitable Housing Association. It is an overarching organisation whose members are already part of individual CLH groups (perhaps even including resident groups from Estates next door), and which manages the Social Rented homes across the whole site. These homes, the non-residential site uses (library and workshops), the green space/ common, and other communal/ Housing+ uses and activities are all under CLT (Community Land Trust) ownership of the BGHC.

F

Appendix F

Chalmers University research into adaptable housing design

1. Background

The gap between research and design practice in architecture is a recurring issue both in academia and the profession. Many believe that it obstructs the development of inclusive high-quality solutions to complex and urgent societal challenges in the built environment, as well as hampering the future development of the profession.[1] This research study therefore investigates a way to cross-fertilize professional practice with current academic research at Chalmers University to foster sustainable design solutions for housing. Here the specific applied design research focuses on design of adaptable apartment space floor plans.

Today there is comprehensive knowledge about adaptable dwellings, as accumulated by various research projects. For example, the design of spatially adaptable dwellings has been emphasized as one way to increase the quality of housing design generally.[2] One crucial characteristic is the capacity of adaptable dwellings cope with unforeseen demographic transformations.[3] Furthermore, the increased spatial capacity provided by adaptable dwellings allows for more diverse uses and a better quality of domestic life – as well as in turn contributing to a more socially resilient housing stock over the longer term.

However, contemporary architects – at least in Sweden – do not have the design of adaptable dwelling spaces in mind.[4] Rather, the current state of practice in housing design is set by specified norms and standards that both frame and restrict qualities such as adaptable space.[5] Functionally specific rooms allow for certain uses but militate against others, in the same way that the emphasis on the nuclear family situation with parents' bedroom and children's rooms as the preconceived model for room sizes and floor plan arrangements is also restrictive. The spatial capacity to host other types of households and lifestyles is thus narrowed down, even if adaptable apartments are clearly better at supporting social multiplicity/inclusivity and offer far more sustainable housing from a technological-ecological perspective. In current Swedish architecture there are still only fragmentary efforts and no well-developed model for how design research might contribute to greater social/environmental sustainability.

The research by the Centre for Housing Architecture therefore offers a method by which architectural practice can inform the thinking of academics seeking to create more sustainable solutions for new Swedish apartments. These design research studies are hence focused upon early intervention into the design process for actual schemes involving a professional architectural firm and a client. The point of departure for the design research involves four design tools for adaptable apartment space designed by the Chalmers team to be implemented as the design parameters for apartment floor plans. These design tools have been developed through previous research, using practice-based research approaches but also through theoretical studies of research on adaptable dwellings, realized dwelling projects with adaptable dwelling space, and empirical studies of households' living situations. The design tools are named *'Multi-Purpose Room', 'Flexible Interplay of Rooms', 'Parallel Use of Rooms'* and *'Number of Rooms'.*

1.1 Methodology of design research

This section outlines the general research approach, the nature of the design research involved, the specific methods applied, the process of data collection, and the subsequent analysis of these findings.

1.1.1 Using a practice-informing-research procedure

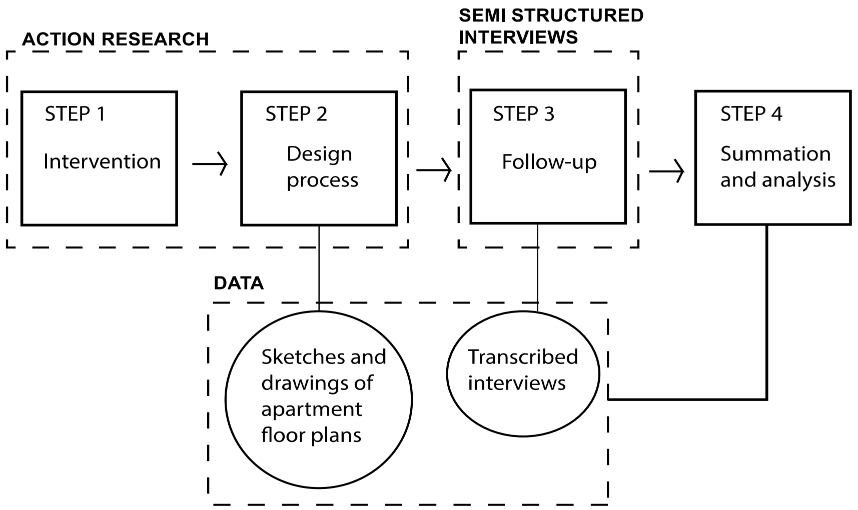
The research carried out by the Centre for Housing Architecture is that of a practice-informing-research procedure, as an attempt to foster cross-fertilisation that will contribute to mutual knowledge-building and to sustainable, realizable design solutions.

To investigate the practice-informing-research procedure more closely within a 'real-world' situation, the typical design research study involves an actual housing project with the developer as client and a commissioned architectural firm running the design process. During a project's initial design phase, the four design tools are introduced to the architect and developer so that they can be tested as the controlling design parameters for creating the apartment floor plans. Besides tracking and interacting in the early design process, the research is followed up with interviews with the architect and developer. The collected research data thus includes design sketches, models, drawings of apartment floor plans, presentational texts, reflections on the use of the design tool, transcribed interviews and so on.

1.1.2 Research design and methods

This kind of design research, which aims to reveal the strength and weakness of design tools in a 'real-world' situation, is best described as a kind of 'action research' that intervenes in and influences a course of decisions. This is also done through semi -structured interviews to find out the stakeholders' experiences and insights from the process. As such, the typical housing research study by the Centre for Housing Architecture involves four steps that can be generalized here into a simplified model (Fig.1).

Fig. 1



The first step, 'Intervention', involves a workshop to exchange information between municipal stakeholders, researchers, architects and developer. In this workshop the architect and developer present their housing project brief and the site, while the researchers introduce the design tools for creating adaptable space. The second step, 'Design Process', is when the architects develop the apartment floor plans by applying the design tools. The third step, 'Follow-Up', involves semi-structured interviews and design review sessions in which the architect and developer, in separate sittings, evaluate the success or failure of the practice-informing-research procedure in producing the final apartment designs, as analysed through drawings of the floor plans. The focus for this evaluation is thus on the spatial qualities enabled by the design tools and the ways they have added to knowledge for the architect and developer. The fourth step, 'Summation and Analysis', consists

of a detail scrutiny of the data collected during the design research study.

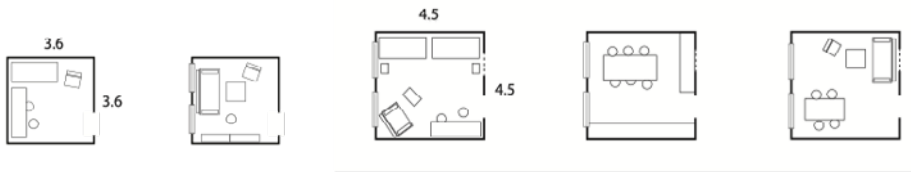
1.1.3 Analysis of data

The data comes from Step 2 and Step 3 and includes design sketches, conceptual visualizations and drawings of apartment floor plans alongside the transcriptions of the interview sessions.

The outcome of the applied design tools, primarily in terms of sketches and drawings, are analyzed by applying a conventional method used by architects when designing floor plans, albeit seldom articulated or made explicit. It can be described as 'figurative empirics', referring to the trained capacity to analyze and understand the use of apartments by reading the floor plans to understand a dwelling's projected physical and spatial qualities.[6] This kind of analysis of domestic space is vital in creating novel solutions for adaptable dwelling spaces that can cater for diverse households and dwelling needs. In this manner, the contribution of the four design tools devised by the Centre of Housing Architecture can be estimated in terms of how much they add to sustainable design.

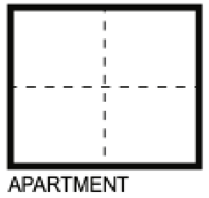
In order to investigate the cross-fertilisation of knowledge in the practice-informing-research procedure, a range of materials including participant observations, semi-structured interviews and sketches/ drawings of apartment floor plans are all analyzed in parallel. Directed content analysis is thus employed.[7] The apartment floor plans serve to demonstrate what qualities have been productive from the Chalmers research input, especially in terms of the design tools – and thus which are attractive and helpful for architectural practitioners, and what qualities are less applicable.

Fig. 2



2. DESIGN TOOLS

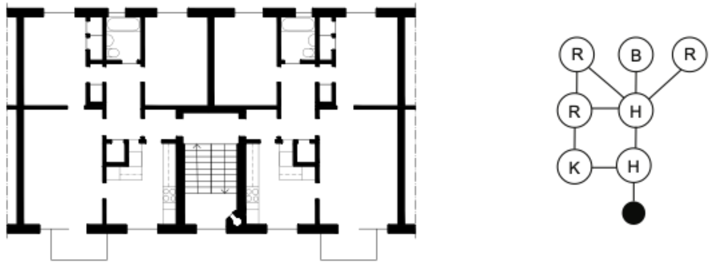
This section presents in turn the four design tools called *'Multi-Purpose Room'*, *'Flexible Interplay of Rooms'*, *'Parallel Use of Rooms'* and *'Number of Rooms'*.

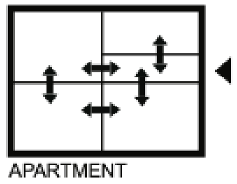


2.1 *Multi-Purpose Room*

A multi-purpose room is a room that by its size and form can be used for different dwelling needs and thus accommodate or adapt to different functions. In an apartment with several multi-purpose rooms the different domestic functions such as bedroom, living room and study room can be composed and combined more freely than in an apartment with functionally defined rooms. There is no agreed optimal size for a multi-purpose room: some recommendations are for an area between 12–15 square metres[8], while also slightly larger spaces such as a 4-metre by 4-metre room are also proposed.[9] However, a room of 3.6 metres x 3.6 metres (i.e. approximately 13 square metres) is considered the smallest size to be used for this kind of space. The form of the room should be rectangular or close to rectangular (Fig. 2).

Fig. 3
Example of a 65-square-metre, 3-room apartment in a multi-family residential building in Stureby, Stockholm (1953).

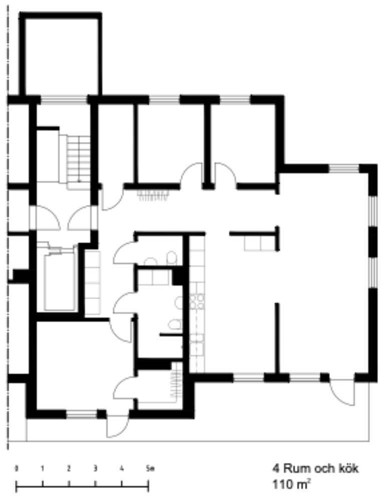


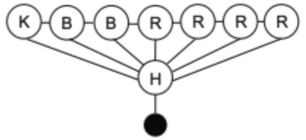


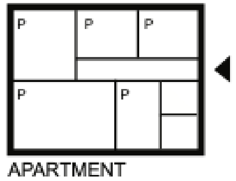
2.2 *Flexible Interplay of Rooms*

An apartment layout that allows a flexible interplay of rooms will enable the residents to make their own choices as to the spatial relationships and how to combine the set-up of rooms. The configuration of the apartment's rooms (room structure), and the way in which doorways connect these rooms, operationalizes how the rooms can interplay. A room that can be reached through different doorways hence enables occupants to decide how this room can link to other rooms. A doorway that is not needed can be closed off and instead become part of the wall. With a change in dwelling needs (for example a different occupant with other preferences or needs), the closed-off doorway can easily be reopened. One disadvantage with this method of creating flexible space is that having several doorways into one room can reduce the range of alternatives for where to place furniture.

Fig. 4
Example of a 110-square-metre, 4-room apartment in a multi-family residential building designed by KUB Architects in Kungsbacka (2002).







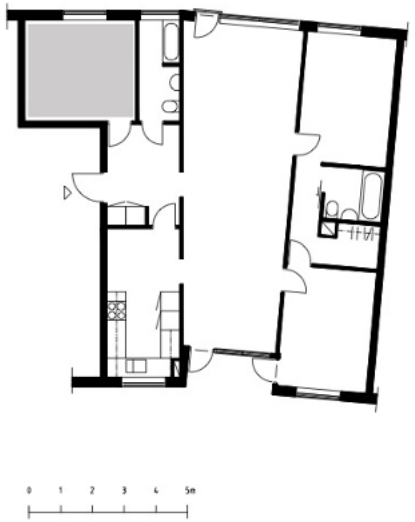
2.3 <u>*Parallel Use of Rooms*</u>

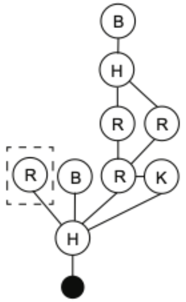
Rooms that do not channel occupants into other rooms are able to be used in parallel. These types of rooms often have a high usage capacity as they can be used as private rooms as well as for social gatherings. Consequently, the situation where a room is the only route to get to another room is less useful in accommodating diverse or multiple dwelling needs. An apartment with a central living room that form the only link to the bedroom(s) exemplifies this problem. The room's central location makes it a hub that offers support for social gatherings, yet for those who don't want to be disturbed, it is a poor solution. Thus, an apartment layout with a hallway connecting all the room is optimal for making the rooms useful for diverse dwelling needs as it allows all rooms to be used in parallel. This type of apartment layout has a large spatial capacity and can work well both for nuclear families and collective

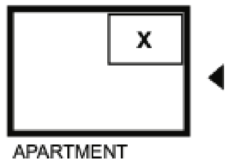
households. For a collective household it is also be valuable not to have to pass through the living room to go to the bathroom, kitchen or apartment entrance.

2.4 <u>*'Number of Rooms'*</u>
An apartment that allows occupants to vary the number of rooms, or that have one room more separately located that can function independently, are able to adapt to changing household needs such as a growing family requiring an additional bed room or else a single parent deciding to rent out a room to reduce their expenses. In such case, three strategies can be defined for the *'Number of Rooms'* design tool in terms of 'the independent room', 'the elastic room' and 'the flexible room'.

Fig. 5
Example of a 104-square-metre, 4-to-5-room apartment in a multi-family residential building in Guldheden, Göteborg, designed by Snis Architects (1949).



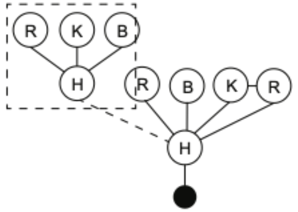




2.4.1 <u>The independent room</u>

The independent room is a room in an apartment that is located close to the entrance and with direct contact to the entrance hallway, bathroom and kitchen. This room can thus be rented out, or be used for multi-generational living, or else it can be a teenager's or young adult's bedroom.

Fig. 6
Multi-family residential block at Råslätt, Jönköping, as designed by L. Stalin (1969).



2.4.2 The elastic room

The elastic room is one that can belong to one or another of two separate apartments, and potentially (if large enough) also the possibility to become an entirely distinct apartment accessed from the common stairwell.

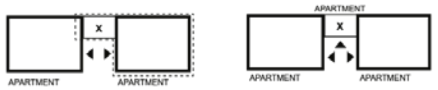
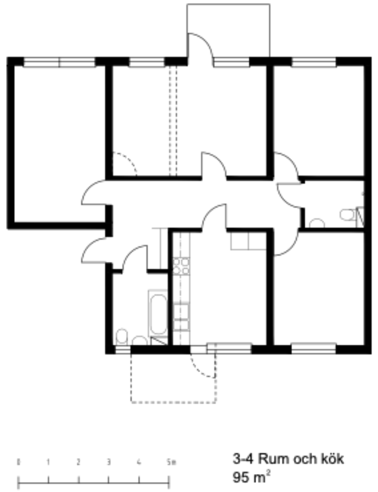
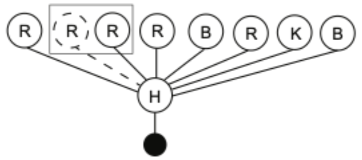
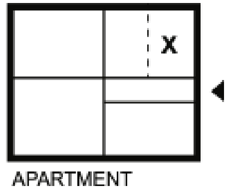


Fig. 7
Example of a 95-square-metre, 3-to-4-room apartment from God Bostad [Good Housing] (1976).







2.4.3 The flexible room

The flexible room is a room that can be created by adding a new wall with an apartment. The household can therefore adjust the number of rooms they have by mounting or dismounting this wall, which can be built on site or else be prefabricated.

Endnotes:
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2. Krokfors, Karin (2017). *Time for Space: Typologically flexible and resilient buildings and the emergence of the creative dweller.* PhD Thesis: Aalto University, Helsinki, Finland; Manum, Bendik (2006). *Apartment Layouts and Domestic Life: The interior space and its usability – A study of Norwegian apartments built in the period 1930–2005.* PhD Thesis: Oslo School of Architecture, Norway; Tarpio, Jyrki (2016). *Joustavan asunnon tilalliset logiikat [The Spatial Logic of the Flexible Home].* PhD thesis: Tampere University of Technology, Tampere, Finland); Wiktorin, Marianne (1975). *Anpassbara bostäder: tillämpningar och konsekvenser [Customised Housing: Applications and Results].* Stockholm: Svensk Byggtjänst.

3. Braide, Anna (2019). *Dwelling in Time: Studies on life course spatial adaptability.* PhD Thesis: Chalmers University of Technology, Gothenburg, Sweden; Leupen, Bernard (2006a). *The Frame and The Generic Space: A study into the changeable dwelling proceeding from the permanent.* Rotterdam: 010 Publishers; Leupen, Bernard (2006b). 'Polyvalence, a concept for the sustainable dwelling'. *Nordic Journal of Architectural Research,* 9/3, 23-31; Schneider, Tatjana & Jeremy Till (2007). *Flexible Housing.* London: Architectural Press; Yunitsyna, Anna (2016). 'Universality in Contemporary Czech Housing Architecture'. Available at: https://www.academia.edu/30575199/Universality_in_Contemporary_Czech_Housing_Architecture

4. Braide, Anna (2019). *Dwelling in Time*: 4–7.

5. Werner, Inga Britt (2008). *Bostadskvalitet idag: en utvärdering av nybyggda bostäder ur kundens synvinkel [Housing Quality: An evaluation of newly built housing from the customer's point of view].* Stockholm: Skolan för arkitektur och samhällsbyggnad, Kungliga Tekniska högskolan: 62.

6. Braide, Anna (2019). *Dwelling in Time*: 63.

7. Hsieh, Hsiu-Fang & Sarah E. Shannon (2005). 'Three approaches to qualitative content analysis'. *Qualitative Health Research,* 15/9: 1277–88.

8. Manum, Bendik (2006). *Apartment Layouts and Domestic Life*: 46.

9. Nylander, Ola (2007). 'Bostadens typologi [Housing types]'. In *Bostaden och kunskapen [Housing and Knowledge],* edited by Tommy Berger. Stockholm: Arkus: 86–88.

G

Appendix G

Design information about the new housing scheme for Tuve

The Tuve housing project that forms part of this design research study is still very much in its initial design phase. The first move by the lead architects, Malmström Edström Architects & Engineers, was to present to the client a selection of sketches and a project description summary, written in Swedish. Their sketches illustrated the project's disposition of the site, a section through the building in the landscape, the proposed apartment floor plans, plus some illustrations that showed the overall building volumes. The written description, which is translated below, gave a more detailed overview of the scheme, discussing aspects such as its orientation in the landscape, the overall design concept, the local traffic links, parking plan, apartment floor plans and sizes, focus on adaptable space, some reference projects, and how to address noise issues.

'Orientation

Through this design investigation [by Malmström Edström Architects & Engineers], *the client HSB Gothenburg wants to investigate the possibilities to build housing on the Tuve 11: 5 property. The site is today a mainly undeveloped forest slope to the south along the street called Västra Tuvevägen. In direct connection to the proposed development are the housing estates Brf Vitsippan and Brf Blåsippan, which HSB Gothenburg developed about ten years ago. In addition, the* *company also manages about 50 rental apartments in the same area. The property at Tuve 11: 5 is now owned by HSB Gothenburg and thus can be seen as a natural continuation of the residential development north of Västra Tuvevägen. The proposal includes an addition of about 150 homes.*

Concept

The site concept for the proposal is to place lamella-like (gill-shaped) buildings in the sloping direction, with these blocks at varying heights of 3-4 floors closest to Västra Tuvevägen and rising to 5-6 floors higher up the slope. The location of the buildings creates opportunities for bright homes with great visual contact with the beautiful natural surroundings. The use of the lamella form provides conditions to provide noise-absorbing facades towards the east.

Traffic and street connections

The scheme is proposed to be connected via a new local street that connects to Glöstorps Röseväg. This means that no new exit onto Västra Tuvevägen needs to be made, which gives a safer traffic solution. Instead, the new local street can be built along contours that allow a slope of less than 1:20. The new local street will thus run through the entire area on a relatively flat trajectory with access parking and parking for the disabled next to each building. The street is accessible for rescue service vehicles as well as for recycling lorries.

Parking

Two larger parking garages will meet the need for car and bicycle parking for all apartments. Along the local street within the scheme are also parking bays for visitors and for the disabled. The parking garage is located in a basement with covered courtyard floors and facades above ground looking to the south. The design provides bright, safe and flexible space that can be adapted to changing needs over time.

Housing floor plans

The residential buildings are made up of modules with stairwells in the middle. Depending on which apartment sizes are being combined, modules with either a width of 16 meters or of 20 meters can be mixed together. The homes are mainly oriented with their open living area looking to the west, consisting of a kitchen, living room and balcony, while the bedrooms are mainly located to the east.

Entrance gallery

The fifth-floor level (as calculated from the lowest floor on site) is to be designed as an entrance gallery and communication path. The gallery has a private zone closest to the apartments that serves as a balcony, and the gallery always faces south or west.

Area and apartment distribution

The proposal is for about 150 apartments, for example being distributed as follows:

- *1 bedroom plus kitchen: 20%*
- *2 bedrooms plus kitchen: 15%*
- *3 bedrooms plus kitchen: 40%*
- *3-4 bedrooms plus kitchen: 10%*
- *3-5 bedrooms plus kitchen: 15%*

The proposal contains about 13,400 m2 gross area. The key figure of BOA: BTA (Housing area: Gross area) is approximately 0.74.

Adaptable floor plans
Through a research collaboration with the Department of Architecture and Civil Engineering at Chalmers University of Technology, special emphasis is to be placed on investigating and developing housing plan solutions that are adaptable and flexible to use according to changing needs over time. The proposal is part of a study, within a larger research context, that has as one of its aims to produce design tools for adaptable housing in the early stages. Creating flexible, usable and adaptable housing is an important part of tomorrow's sustainable society.

Architecture and materials
The proposal is further based on the idea of getting buildings, topography and vegetation to work together, an idea that is already present in the nearby residential buildings in Brf Vitsippan and Brf Blåsippan. The idea is to dramatize the sloping land by letting the houses follow the variations in level and to keep the natural features and larger trees between the houses.

The buildings consist partly of a main volume of solid character and partly of a lighter wooden column/beam structure that forms the balconies and attic corridors to the south and west. The structure will have a strong material feel that highlights the warm and soft character of the wood. The main volume is to have more pragmatic appearance, being built using the most beneficial method of construction and with a facade of sheet material along with plaster or concrete.

Inspiration and references
The proposal has taken inspiration from Nordic contemporary architecture, and we are happy to highlight two important role models. The scheme titled 'Living in Nature' in Turku, Finland by Schauman Nordgren Architects consists of relatively large-scale buildings with a light character, simple geometry and effective detailing. The adaptation of this scheme to the existing vegetation is exemplary. The scheme at Hestra Parkstad in Borås, Sweden by Vandkunsten Architects is a role model when it comes to how buildings can emphasize and benefit from the topography, and how simple and sustainable facade materials can be used in a character-creating way. Both of these reference projects also offers examples of exciting and spatially enriching openings punched into the building volumes.

Noise
The proposal is designed according to conditions that follow from the noise investigation (R20117111A) carried out by Gärdhagen Akustik, dated 1 April 2020. The noise investigation takes into account the traffic noise from Västra Tuvevägen as well as industrial noise from Volvo's factory property located west of Tuve 11: 5. The proposal shows that the National Board of Housing, Building and Planning's requirements regarding noise levels in a residential environment can be met in the case of this scheme.'

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