
Edinburgh Home Demonstrator

*Introduction to
briefing and design*

EHD

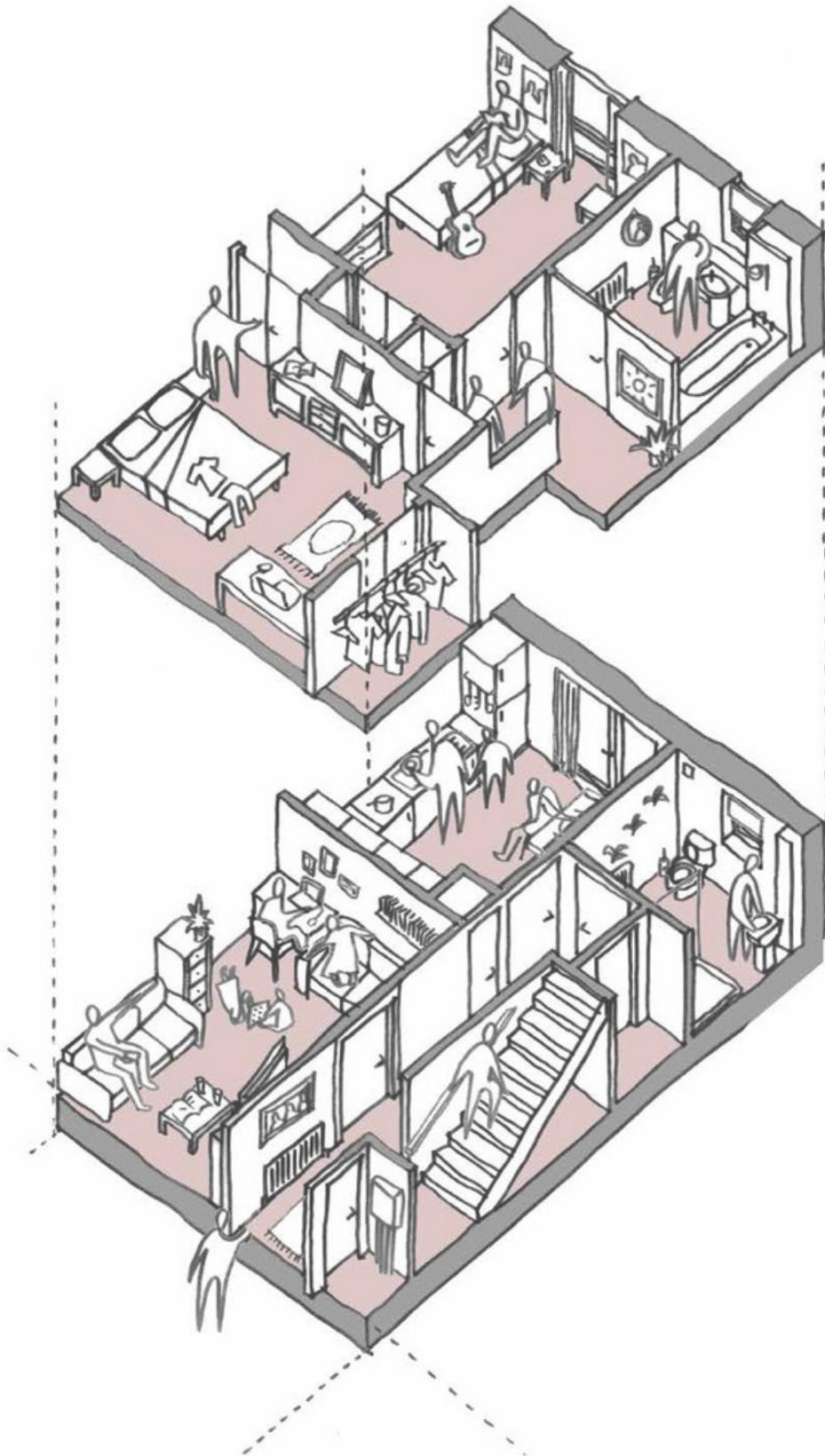


Image credit: Anderson Bell + Christie

Executive summary

The Edinburgh Home Demonstrator (EHD) programme will deliver a new approach to briefing, design, procurement and construction to realise the ambition of the Edinburgh & South East Scotland City Region Deal housing programme. This will be achieved using net zero carbon design and offsite manufacturing.

Collaboration with the City Region Deal partners, offsite manufacturers and design professionals has allowed the EHD programme to develop a suite of house and flat typologies that are all aligned with offsite manufacturing processes. These typologies are also net zero carbon ready providing reassurance that the housing will be capable of achieving net zero carbon.

Balancing the rationalisation of the housing layouts with the need for mass customisation to respond to context was also a key consideration of the EHD programme. To ensure that the housing can be customised it is only the elements that are manufactured offsite, such as the superstructure, that have been rationalised allowing the appearance of the homes to respond to their context.

Mass customisation of the homes coupled with a design-led approach to place-making ensures that the EHD business model will positively contribute to the affordable housing delivery within the South East Region.

Monitoring the performance of the homes is key to ensuring that the business model is delivering the anticipated benefits to the client and the user of the homes. To do so the first pilot project will be monitored during its construction to evaluate the quality, speed and cost of construction, the completed building will provide live data for the energy performance and the place-making response will be evaluated. All the monitoring will be used to inform the future development of the business model and this regional knowledge sharing approach reinforces the collaborative approach to housing delivery at scale across the South East Region.

Contents

What do I get?.....	5
How we achieve this.....	7
A unified approach: working together.....	8
User orientated: best value.....	10
Designed for manufacture.....	11
High pre-manufactured value.....	12
Community engagement.....	13
Place-making response.....	14
Place-making response: lifestyle.....	15
Our homes.....	16
Design-led approach.....	17
Customisation.....	18
The types: flats.....	19
The types: houses.....	22
The types: cottage flats.....	24
Attributes explored: flexible working.....	26
Attributes explored: extra storage.....	27
Attributes explored: kitchen and dining space.....	28
Attributes explored: future proof energy strategy.....	29
Attributes explored: future-proofed ground floor spaces.....	30
Proving performance at a pilot site: Granton D1.....	31
Granton D1: responding to place.....	32
Drivers	33

What do I get?

- High quality product
- Zero emissions heating
- Lower residents' energy use
- Future proofed solutions
- Best value design
- Better assurance of project delivery times



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How we achieve this

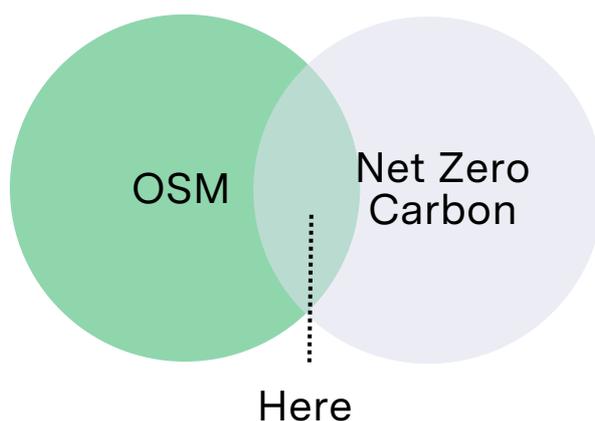
The Scottish Government have set a new vision for housing in Scotland through the Housing to 2040 national strategy. This includes an ambition to build 110,000 new affordable homes by 2032.

There is a clear need to build homes in large quantities at pace. In Scotland, we are fortunate to have pioneered offsite manufacturing (OSM) timber construction techniques, through collaboration between academia, industry and delivery partners. OSM brings the benefit of assembly line production to the affordable housing sector. This allows the superstructure of homes to be produced faster and to a higher quality standard in comparison to carrying out all works on site, as well as significantly increasing pre-manufactured value (PMV).

The route map in Housing to 2040 also aims to significantly reduce the carbon emissions of homes and those associated with the construction of housing. A pivotal part of this strategy is to phase out gas boilers in homes from 2024, with a backstop of net zero carbon by 2045. It is therefore clear that a net zero-carbon strategy for housing must be developed now.

The Edinburgh Home Demonstrator (EHD) will establish a scalable delivery model for higher-performing affordable homes, utilising OSM and PMV enhancements coupled with an outline net zero carbon strategy as part of the Pilot Projects that:

- Eliminates fossil fuel use with opportunities for renewable heat in a communal format.
- Utilises a common sense approach to capital expenditure, ensuring all energy generated on-site is used on site.
- Mitigates capital cost uplift, by optimising fabric performance with mainstream products and OSM systems.
- Adopts a Fabric First Approach to reduce the energy demand required for heating / hot water generation.
- Reduces tenant's energy bills beyond the current performance requirement of Aspect Silver Levels 2 & 3 in Section 7 of the SBSA Domestic Technical Handbook.



A unified approach: working together

The EHD understands that affordable housing benefits society far beyond the delivery of unit numbers to meet policy requirement. It changes lives; it creates and enhances communities.

Our sense of community has been profoundly affected by the global pandemic, as has the way we work and the way we socialise. There is a deeper appreciation of place, especially greenspace. The model of living and working has changed profoundly for many of us. Our priorities have shifted and it is important that affordable housing provides the flexibility to adapt to these changes.

The EHD looks beyond the core delivery criteria of OSM and net zero. It facilitates change in Place-making, Changing Lifestyles and Client Aspirations.

The EHD consulted local authority partners to determine what measures are important for the future and how they could best be realised.

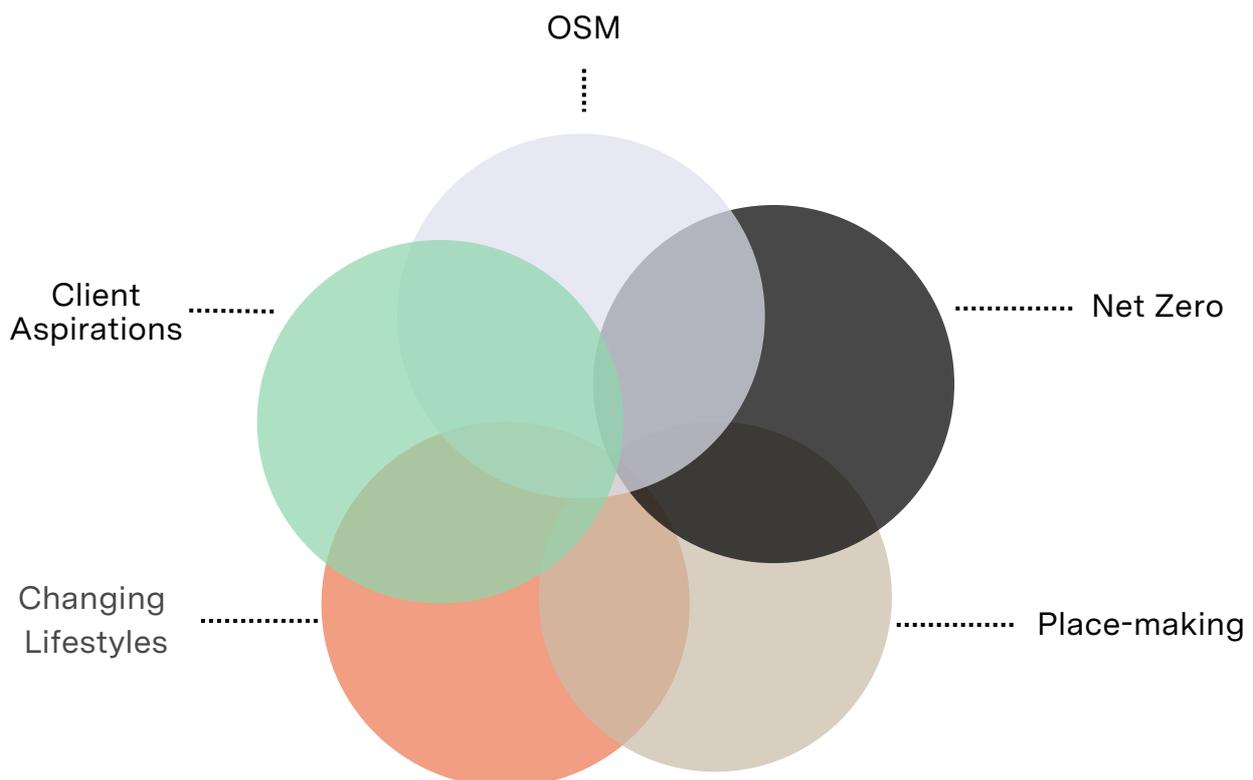


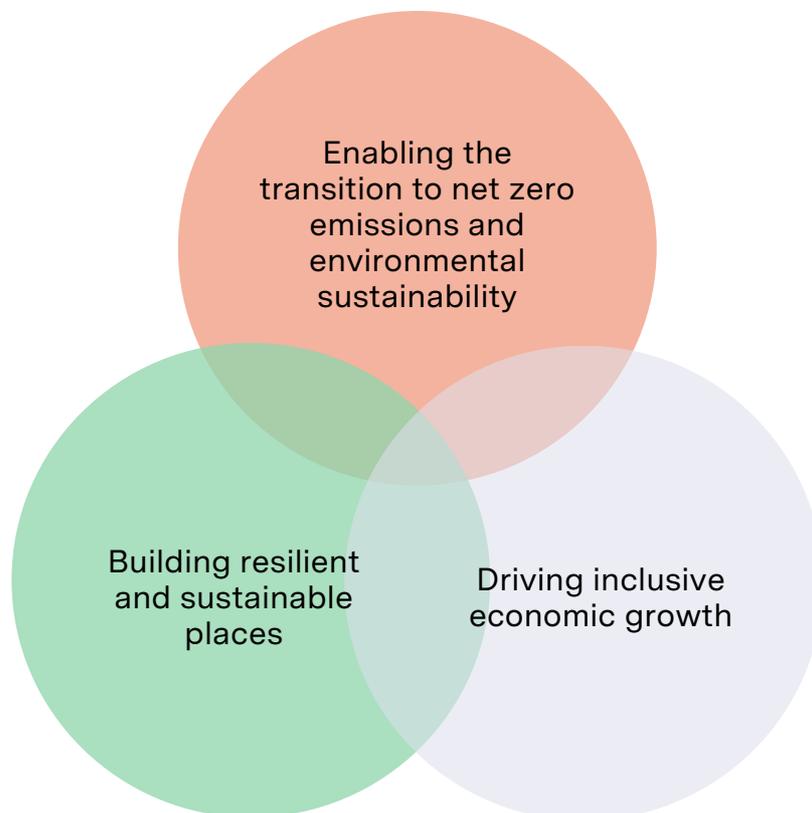


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User orientated best value

The EHD programme applies performance criteria that have been tested to demonstrate the best value for housing providers and their clients.

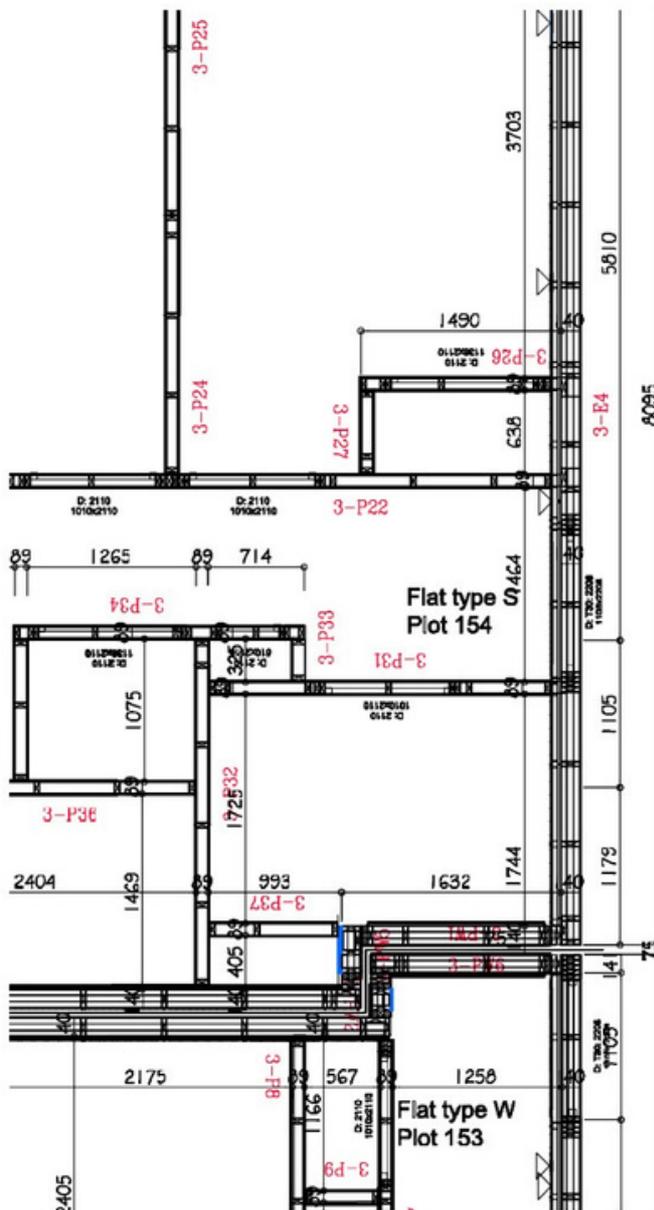
- Capital cost – there will be a capital cost uplift to achieve net zero, however, this has been mitigated by using mainstream materials that are fully compatible with OSM processes.
- Revenue cost – the product will be of a higher quality, built to factory standards. Active systems are easy to access and maintain, thus reducing revenue costs.
- Energy demand – the thermal performance is improved significantly, which will reduce occupant energy demand. The performance criteria for any new delivery model will consider performance in relation to inclusive growth and sustainable place.



Extract from Local Impact Infrastructure Investment Plan

Design for manufacture

The types were developed in dialogue with Offsite Solutions Scotland, a consortia of OSM companies utilising timber technology. All aspects of the designs were reviewed to ensure deliverability in all factory situations.



Anderson Bell + Christie carried out an investigation of current Design for Manufacture and Assembly (DfMA) practices of Offsite Solutions Scotland Group member organisations. Detailed consultations were undertaken to understand their current approach to offsite manufacturing processes with an aim to produce standardised types for designers to use on future EHD new build development projects. It outlines to designers the project performance targets which require to be achieved and provides an agreed approach on how to deliver this through coordinated building components and layouts.

These are aligned with current manufacturing processes and, therefore provide designers with standardised types which have been developed through consultation with the OSS organisations to deliver newbuild housing through the EHD project.

Extract from OSM timber kit design

Image credit: Anderson Bell + Christie

High pre-manufacture value

The aim of the EHD is to explore solutions in order to mainstream the use of off-site manufacturing in affordable house building in Scotland. Defined Modern Methods of Construction (MMC) are already commonplace in affordable housing delivery.

Therefore, it was important to consider the Pre-Manufacture Value (PMV) and how this could be incorporated into the standardised types.

There are multiple routes to increase the PMV of a project. PMV evaluates the proportion of a project made up of onsite labour, plant and temporary works. Increasing off-site manufacturing and reducing site labour can both be maximised to improve PMV.

When evaluating the suitability of each MMC category, we took cognisance of the current working relationship with Offsite Solutions Scotland (OSS). More than 80% of new homes in Scotland are built using components which are

constructed offsite, typically involving a combination of closed and open panel timber frame construction.

Panelised Timber Frame construction is a systemised approach using flat panels used for basic floor, wall and roof structures which are produced in a factory environment. The level of complexity in the panels can vary across the industry.

Therefore, it was considered most appropriate to aim for maximising PMV through focusing on offsite manufacture of primary components and reviewing how further components within the build process could be standardised in addition to this in the future.

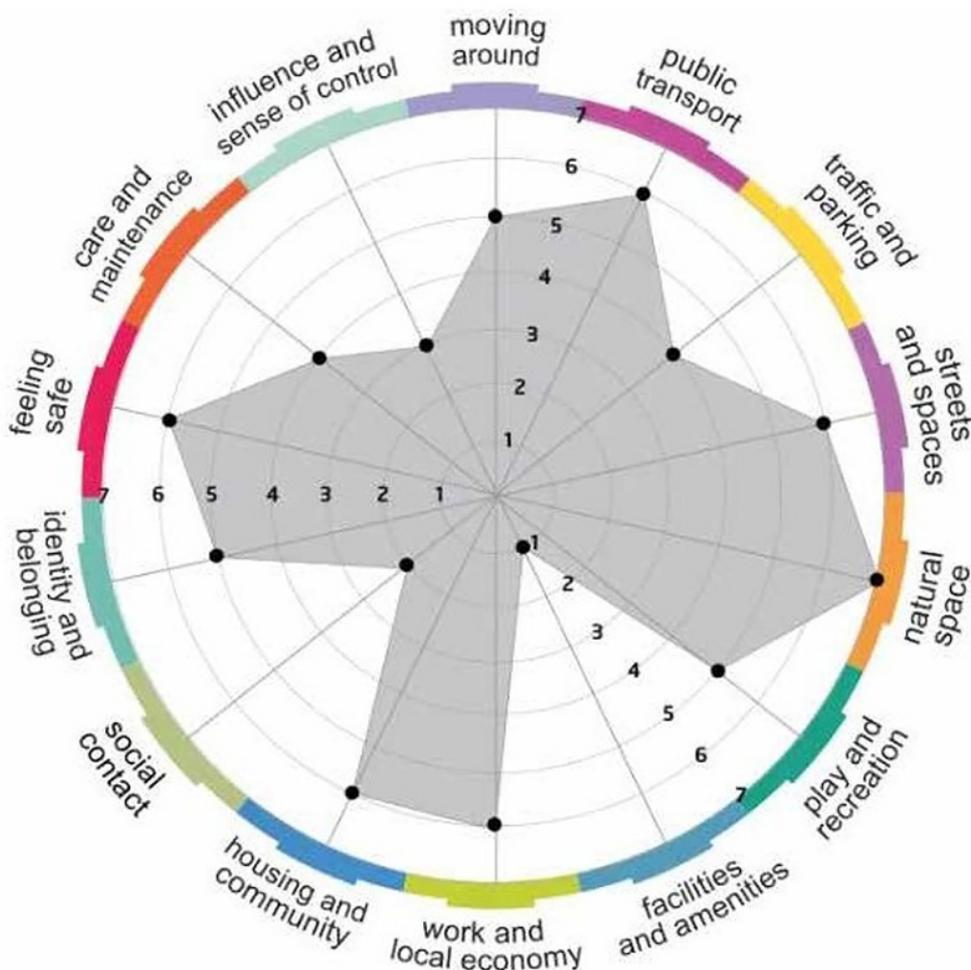


Community engagement

The EHD follows a place-based approach, with community engagement as a key design driver. The process facilitates early community engagement utilising the Scottish Government Place Standard.

This process helps all parties to understand what really matters to a local community and how your project can enhance the area.

This process feeds into the specific design briefing which helps to shape the masterplan development and the customisation of the design.



Place making response

Early design development and master planning will strive to create a strong place-making response. This will help to ensure that the design respects the local vernacular and provides people first public space.

New communities will have their own sense of identity. They must feel safe, both in terms of physical protection and passive observation.

There must be useable greenspace that can be maintained and well used. There must be opportunities for play and for families. They must provide equality of access. They must be suitable for an ageing population and deliver lifetime neighbourhoods.

These aspects will be considered and built in to the design process from inception.

Image credit: TRACE for Granton D1

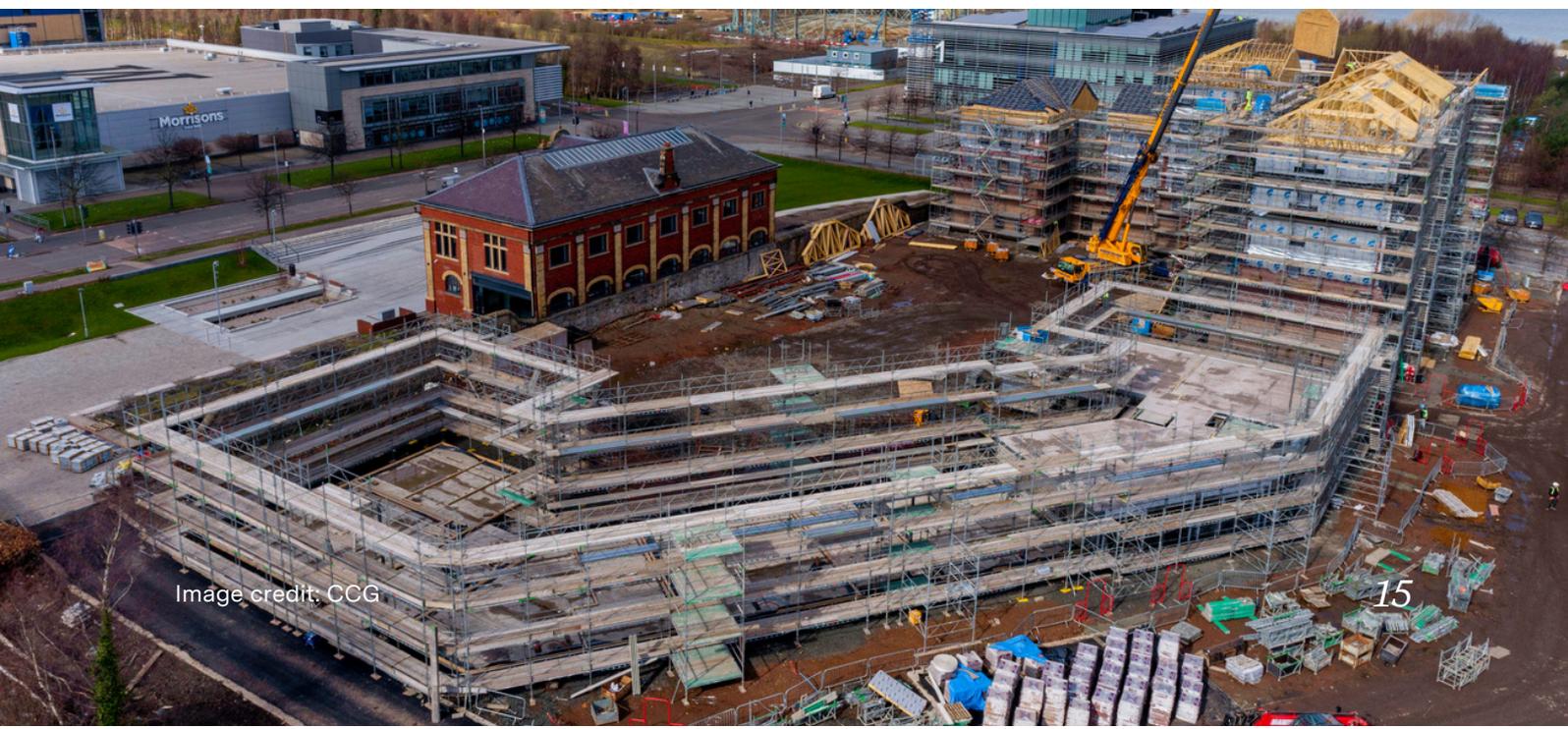


Place making response: lifestyle

The choices we make have a significant impact on the environment. Housing providers may not be able to guarantee change, but they can make it a natural choice for the residents. The EHD encourages a positive approach that facilitates lower-carbon living.

This approach requires looking beyond the site's physical boundary and exploring interfaces into the wider landscape. The EHD promotes the link between low-carbon lifestyle choices and wellbeing:

- Making active travel easier than taking the car.
- Enhancing public transport.
- Linking cycle and walking routes.
- Providing greenspace with lots of different use opportunities.
- Providing opportunities for play.
- Providing opportunities to rest along a route.
- Maximising existing environmental features, such as mature trees or topography.
- Promoting tree planting, including urban orchards.
- Provision of community growing spaces.



Our homes

The EHD utilises house and flat types that can be assembled on top of one another and repeated to provide maximum efficiency and value benefit. These types have set plan layouts, however, they can be customised in elevation to suit place-making requirements.

At present, there are 10 layouts that represent the most common typologies of the Local Authority partners. It is anticipated that variations of these types may be needed to suit particular site conditions, for example, a prominent corner that terminates a vista.

The layouts represent an enhancement of the typical approach, accommodating a variety of additional features that reflect the changing way we live and client aspirations. These are explored in detail in the following pages.

These changes have been implemented with a negligible impact on the internal floor area, which has been cost-evaluated to ensure that any cost impact is nominal.

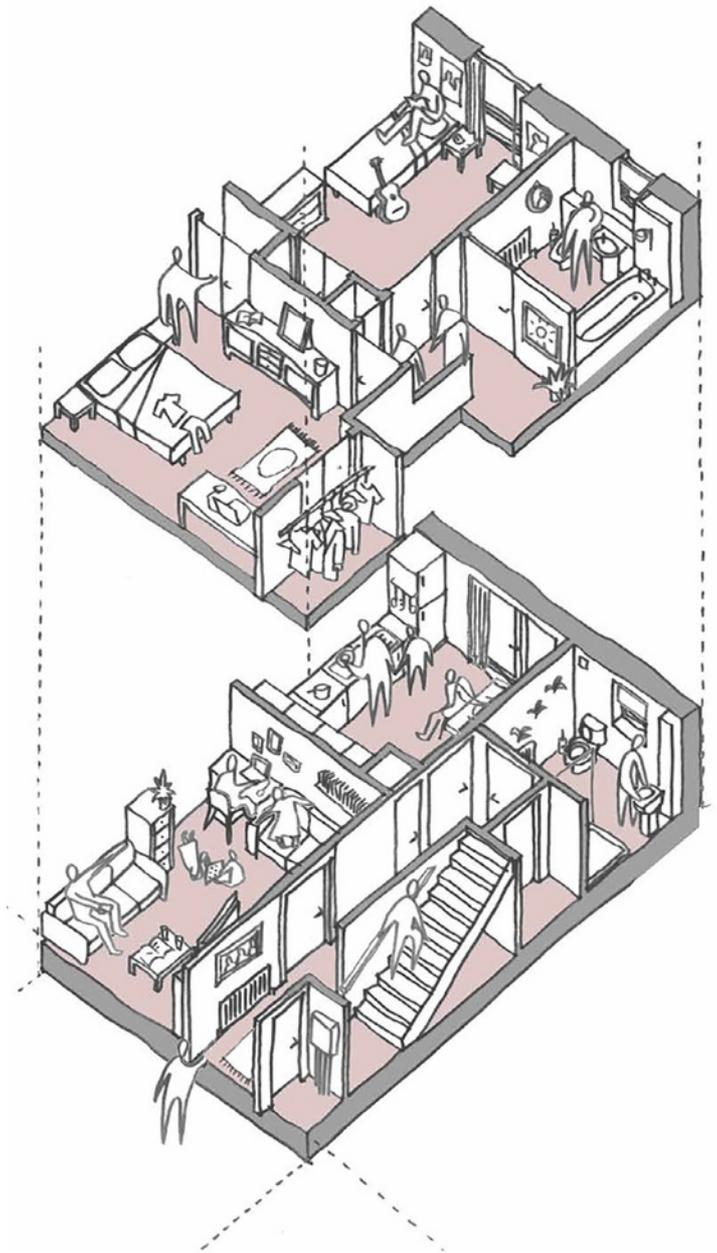


Image credit: Anderson Bell + Christie

Design led approach

Working with a set floor layout does not mean the external fabric of the building needs to stay the same. Working with these plans gives us time to consider a contextually appropriate response to a particular site, looking at fenestration, materiality, and roovescape to name a few.

This generates a completely customisable approach, ensuring a high-quality attitude to place-making and enhancing the existing surroundings.



Buff brick + dual-pitched roof



More urban response - mono-pitch and balconies



Changing roovescape and pitch - using colour

Customisation

Using the building fabric to create a site-specific, design-led approach. Informed by place and context.



Using alternative robust materials where contextually



Additional brick detailing + monopitch



Buff brick + traditional slate

Image credit: Anderson Bell + Christie



Image credit: TRACE for Granton D1

The types: flats

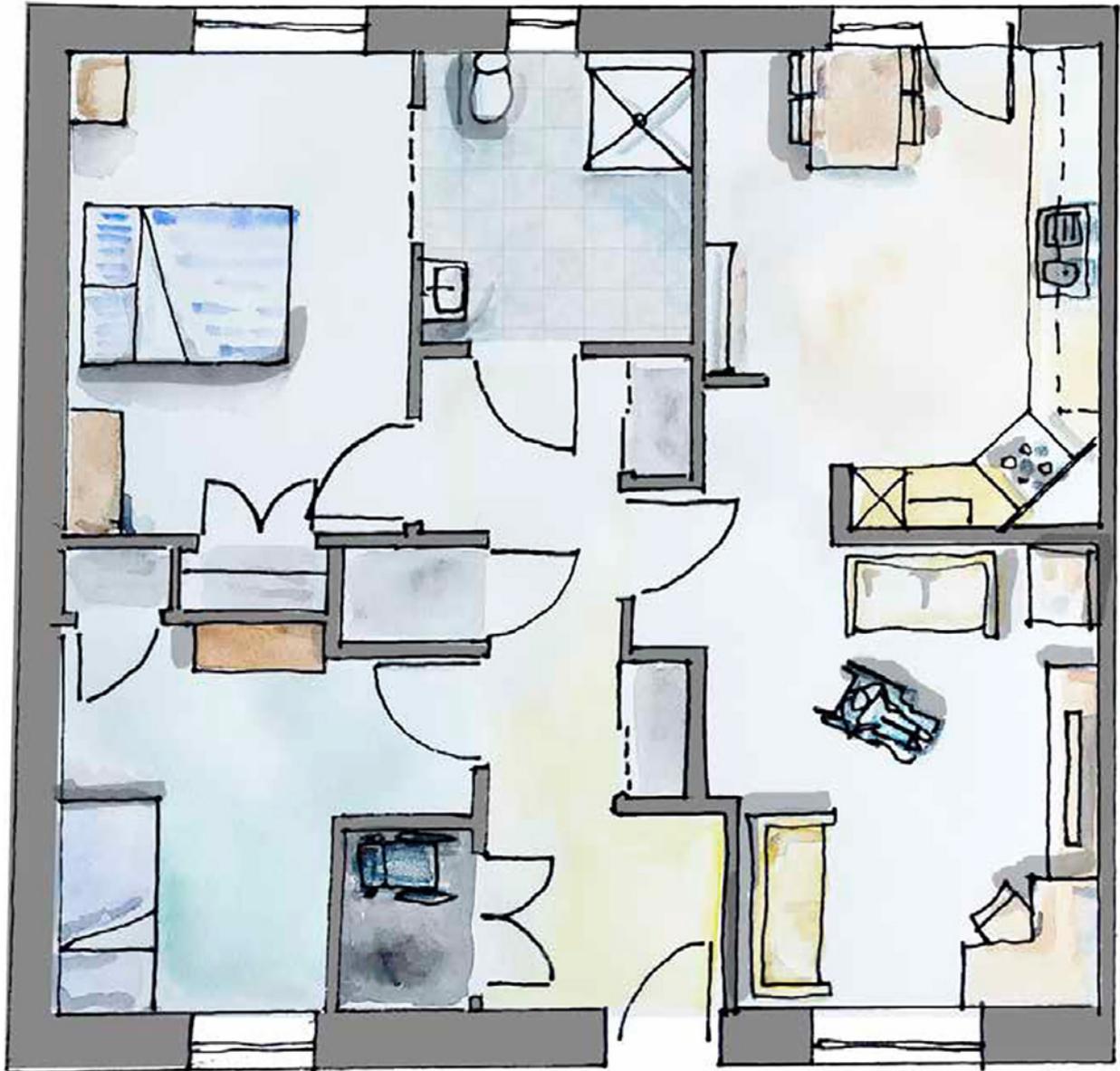
Instead of an open plan arrangement, it was preferred that flats have a closed configuration. Where noise from washing machines could be an issue, these would be located in a designated drying cupboard with its own extract.



1b2p Flat



1b2p Accessible Flat



2b3p Accessible Flat

All types are compliant with Housing for Varying Needs guidance and checklist completed as part of a funding application.



2b4p Flat



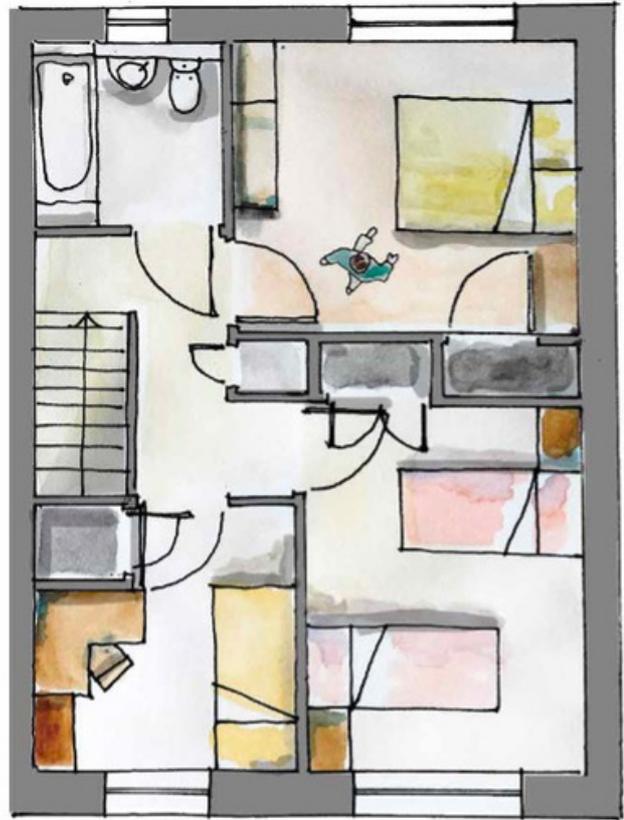
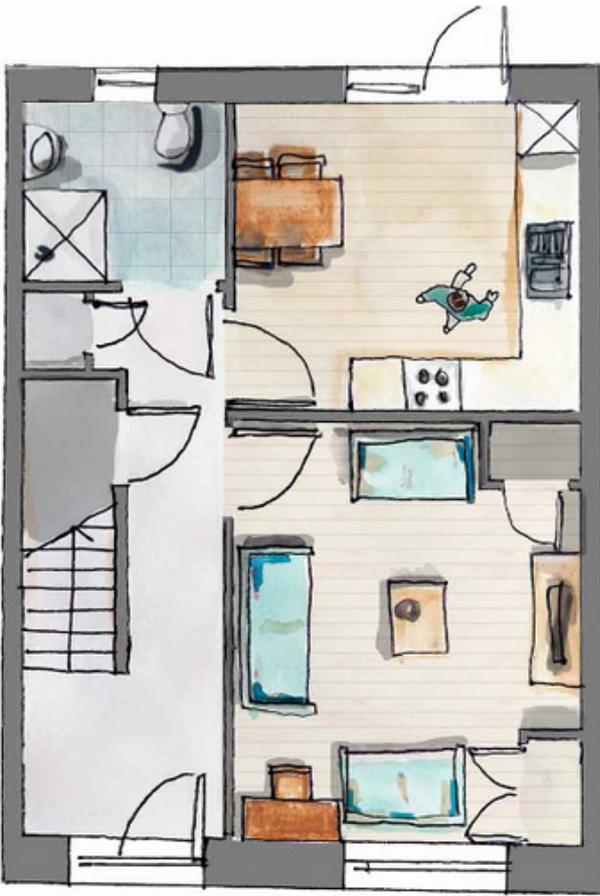
3b5p Flat

The types: houses

As described in the later section, Attributes Explored, ensuring tenants can stay in their homes for longer with minor adaptations (i.e. downstairs bedroom) would be beneficial to both well-being of tenants and reduce the strain on accessible homes.



2b4p House



3b5p House



4b6p House

The types: cottage flats

The cottage flats benefit from lots of storage space and bedrooms positioned away from kitchens to assist with noise attenuation.



1b2p GF Upper Flat



1b2p GF Cottage Flat



2b4p Upper Flat



2b4p GF Cottage Flat

Attributes explored: flexible working

Post-pandemic and in the face of Scotland's changing attitude to flexible working - a suitable place to work from home is more important than ever.

We have allocated 2 working from home spaces in houses and in different rooms to give families greater flexibility.



2nd home working space

Attributes explored: extra storage

Our study showed that many properties are not meeting the targeted storage volumes, in particular family and wheelchair properties. The feedback was that you can never have too much storage so a balance was needed to be found. Types were amended to accommodate a minimum amount of storage per person.

This can also be turned into a designated drying area, dependent on the client, with its own duct for ventilation.



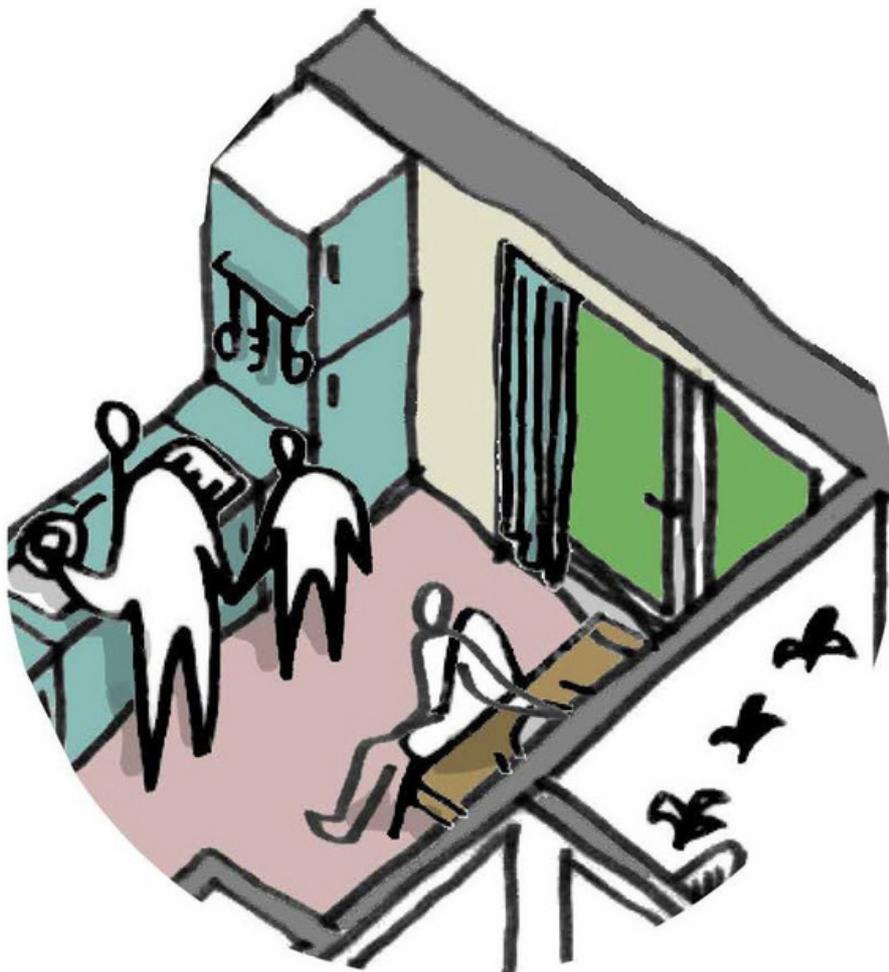
*Designated drying
space or room for
extra storage*

Attributes explored: kitchen & dining space

Similarly, kitchen storage was noted to not be sufficient in many properties. A minimum target was agreed upon for different properties and accommodated in the floor plan.

A small dining space was also considered necessary in the kitchen, even if there is a larger dining table in the living space.

The kitchen also has a connection to the garden in most family properties.

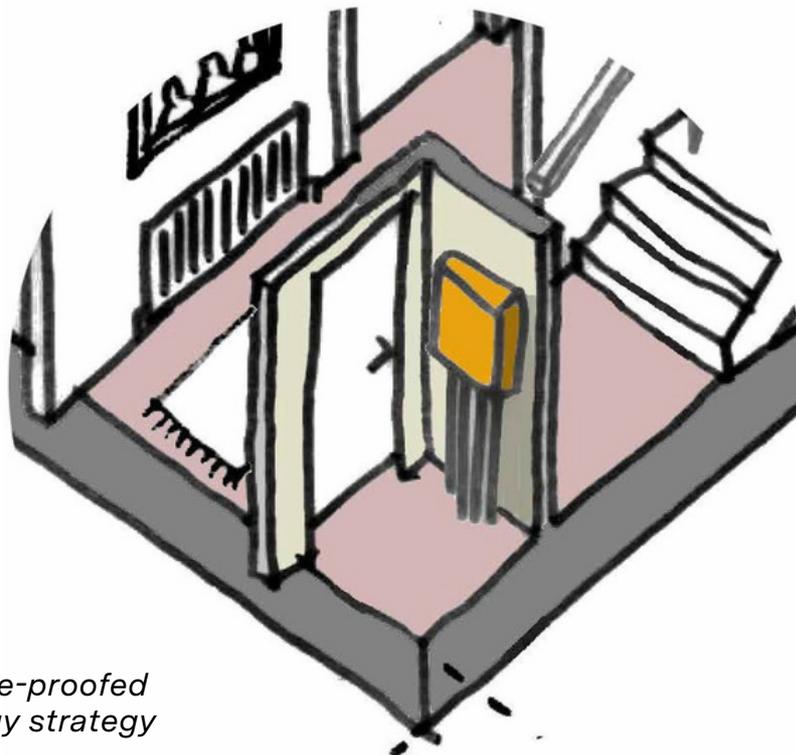


Attributes explored: future proof energy strategy

It is important that properties take into consideration an energy strategy that is going to last for the lifespan of the building and modifications should hopefully not be required.

It is also important to ensure low maintenance and low bills for both client and tenant. The Energy Strategy is based on a communal solution which allows for maintenance to be carried outside of properties and a designated HIU (Heat Interface Unit) space is included in properties, usually near the front door for ease of service connections and access. Heat interface units act as a bridge between a communal heat source and the heating and hot water systems of the individual apartments.

Centralised systems may not always be the right fit for different sites, but enough space is allocated in the types to allow for various solutions.

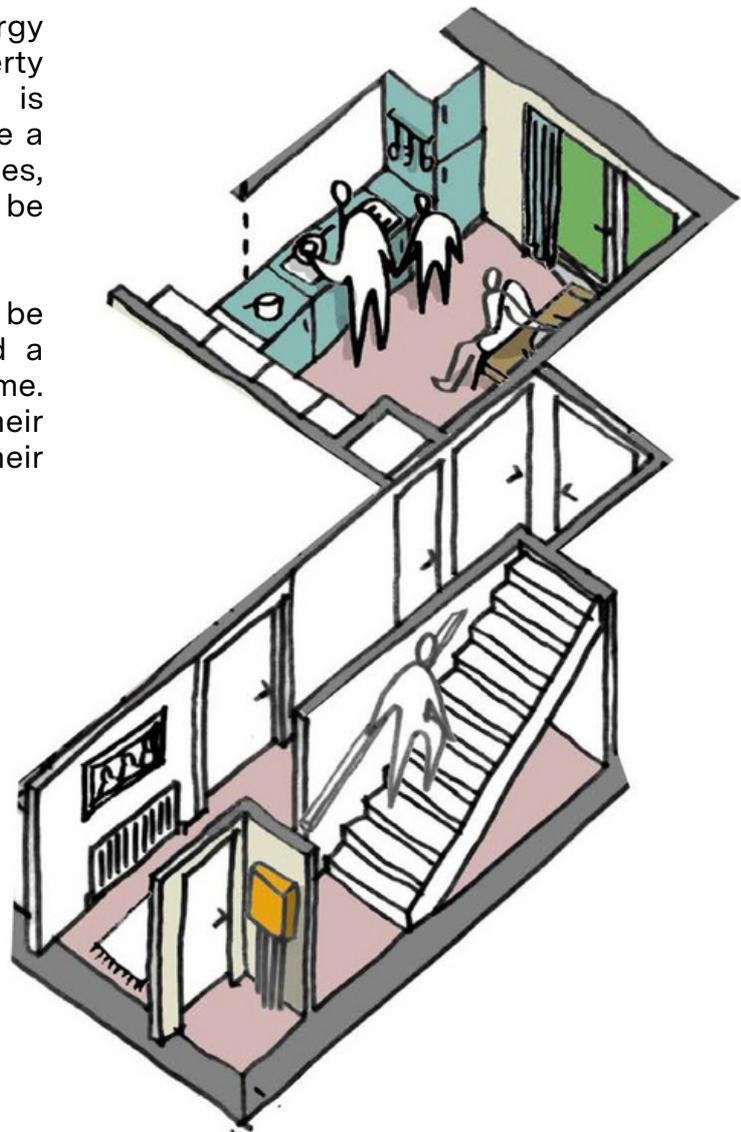


*Future-proofed
energy strategy*

Attributes explored: future proofed ground floor spaces

As well as future-proofing an energy strategy, the form of the property needs to be considered. It is preferable to most clients to have a 'front to back' hallway in houses, which allows the living space to be separately accessed.

This allows the living room to be modified into a bedroom should a tenant's ability change over time. This allows people to stay in their homes for longer, and to retain their independence.



*Front-to-back hallway to allow
for living room modifications*

Proving performance at a pilot site: Granton D1

Edinburgh Napier University will monitor and evaluate Granton D1, a pilot of the EHD process, using a digital twin. This process will create a digital replica of the building that logs real-world performance and compares it to the design energy models.

This project is comprised of 75 affordable homes with commercial units. Construction commences in Spring 2022 and the monitoring will continue for 1 year post completion. Post-occupancy feedback from the pilot will be reported and used to enhance future projects.



Granton D1: responding to place

Although off-site construction forms the basis of efficiently constructed and low-energy homes, there is still the freedom to form a bespoke approach to place. Volume, form and materiality can inform contextually appropriate developments with place-making critical to this - the Granton D1 pilot project is a test bed.

Exterior elements of the design can be tailored to suit the needs of the Client, tenants and statutory consultees, and the focus can be on:

- Community focused regeneration
- Delivery of new high high-quality, contemporary
- affordable homes
- Promote active travel and public transport
- Achieve Net Zero Carbon sustainable design
- Provide renewable heating
- Creating a strong sense of place



Drivers

Offsite construction can also help address the challenges facing the supply of new affordable homes. Challenges such as:

- decarbonisation
- labour shortages
- attracting a more diverse workforce
- material shortages
- efficiency of delivery
- reducing waste
- construction quality
- increasing costs

It will be a prime catalyst for construction industry transformation and make a significant contribution towards achieving net zero.





Net zero homes built *for people to thrive.*



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