



© Zero Bills Home Limited

The Zero Bills Home

An Innovation Affordable Zero Carbon Housing System

* Photo by Duan Fu

The Zero Bills Home

Exceptional Performance. Enhanced quality of life

The Zero Bills Home is the ground breaking low cost zero carbon building that offsets energy bills and enhances internal living standards. Don't take our word for it visit the show home at the BRE in Watford for proof.

The show home at BRE Innovation Park represents the first house type for our upcoming 89 home development in Barking and Dagenham and 100 home development in Essex. We are also building bespoke designs with a number of smaller clients, demonstrating the buildings viability at all scales of construction volume.

Exceeding Building Standards

ZBHC houses are designed to be modern and contemporary, built from traditional materials in a sustainable construction system. The system combines an energy efficient modular frame structure with an integrated solar PV panel roof. The electricity generated from the PV roof panels earns revenues from the Feed in Tariff scheme which, when combined with the free use of the electricity stored in the batteries, leads to incomes and savings exceeding the residual cost of electricity - a Zero energy bills home. This will protect households against ever rising energy bills and help to reduce fuel poverty.

Exceptional low Carbon Credentials

We have maximised the use of UK sourced materials to minimise the carbon footprint. The Timber studs, OSB and Steel are all UK sourced. We maximise the use of natural building materials and eliminate urethane foams, materials with high off gassing and materials with short life cycles. This makes the building one of the lowest embodied carbon buildings possible. Combined with our BIPV solar roof, battery storage and zero fossil fuel energy systems, the home starts paying back its embodied carbon by generating more electricity than it needs over a typical year.

Design Flexibility

The system uses simple and adaptable plans which create convenient internal layouts for any plot orientation. The open structural system increases flexibility for self-build and site specific variations. We have developed this further to create a range of standard house types for detached, semi and terraced typologies. 'Design code' planning kits allow new communities on larger sites to design themselves whilst recognising the importance of the placemaking agenda.

Excellent Value

The system build costs for a completed building or for simply the shell and core compare favourably with current costs of meeting building regulations. The Shell and core which comprises of the structural weatherproof envelope, windows and doors, renewables package, heating and ventilation system, can be delivered at a fixed price. The package represents approximately 75% of the build costs and enables the owner occupier to reduce labour rates and overheads for finishing elements. These value adding features enables the zero bills home company to offer a cost effective and sustainable alternative to traditional builder offerings.



The Zero Bills Home

Brief Specification

- Superinsulated concrete foundation slab with optional piles to match ground conditions
- Laser cut galv steelpowder coated structural ring beam with timber studs and structural boards.
- Superinsulated cladding with heat recovery ventilation and triple glazing reduces heat demand with small heat pump for comfort and hot water.
- ZEDfactory designed BIPV solar roofing system provides durable roof with electric generation and optional solar loft conservatory.
- Good daylight, water saving appliances and LED lighting reduces electric demand allowing surplus solar electricity to power an electric car.
- A smart LIPO4 Fitcraft battery system stores solar electricity, minimising grid imports and impact on existing mains grid infrastructure.

Simple Construction

The build system has been simplified to benefit both small and large builders. It brings the benefits of offsite construction on site without the additional overheads or lead in times of factory production. The system promotes the use of local labour trained using the technical manual and the ZBHC house kit ordering process, creating a fully scalable system from single homes to thousands of homes annually through a chain of national builders merchants.

Exceptional Sustainability Credentials

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Prefabricated steel sections



OSB3 Racking Strength



Studs & Joists



Superinsulated Concrete Foundation



Factory laser cut steel structural ring beam



Factory cut steel easily combined with timber studs sourced through local builders merchants



Self-adhesive airtightness and weather proof membrane bonded to OSB board and then fixed to timber studs



OSB fixed to floor joists



Breathable external insulation skin removes thermal bridges

The ZED zero bill concept

:: Step one ::

Buiding Fabric

The properties are designed with a low fabric heat loss of around 2.5kW due to high levels of insulation, triple glazing, high levels of airtightness, thermal mass and maximise passive solar gain. This means that additional winter space heating and hot water can be met by the internal gains and a small integrated MVHR based heat pump. All technologies incorporated are fit and forget, easy to use and low maintenance.

:: Step two ::

Renewable Energy Technologies

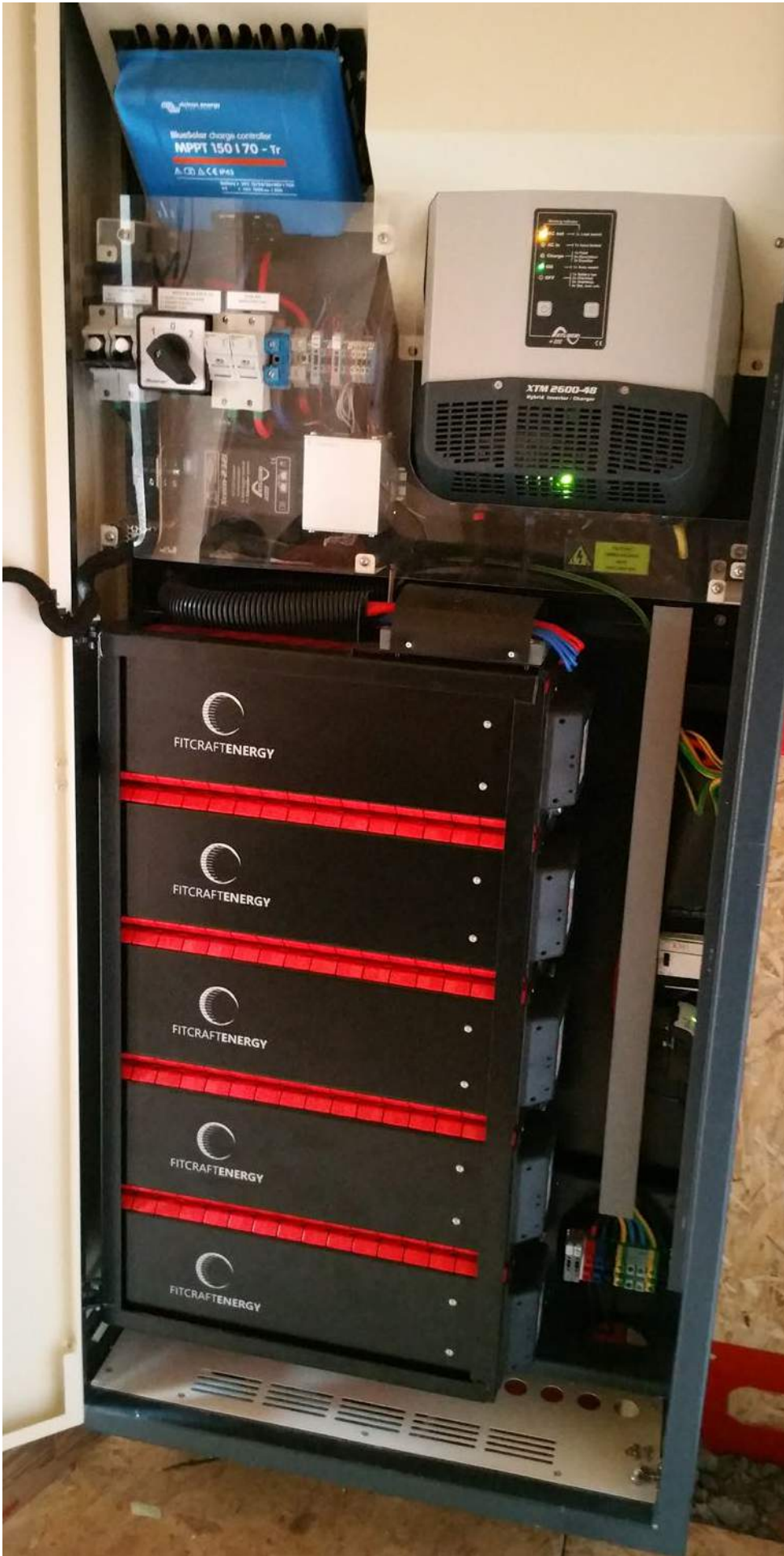
All properties are designed with mono-crystalline solar electric panels on the south facing roof surface. By using the HiminZED energy roof system the design reduces the initial build costs by incorporating the solar electric panels into the roofing material. The size of this system has been carefully matched to meet the annual demand and storage capacity and still supply a little excess power to the grid during peak production. Export is limited to below 3kW to enable single phase connection. The roof is also eligible for the FITS tariff. The size of the system and storage capacity means that annually, electricity bills will be eliminated.

:: Step three ::

Zero Energy Bills

If you calculate the annual net cash flows, which we have done for many simulations, the cost benefit is positive. This means that not only is the property net zero bills, but it also generates a surplus per annum. When we incorporate avoided costs, bills that you would have to spend if you did not have a zero bills home, the net gain is even greater.

- ▼ ZED Roof power station 7.5 kW peak
- The BRE house has achieved an airtightness of 1.3 ach @50 pascals test pressure on first test without walls plastered. Building Regulations requires 10 ach @50 pa.
- The Zero Bills Home 7.5 KWh Battery inverter



The zero bill system provides:

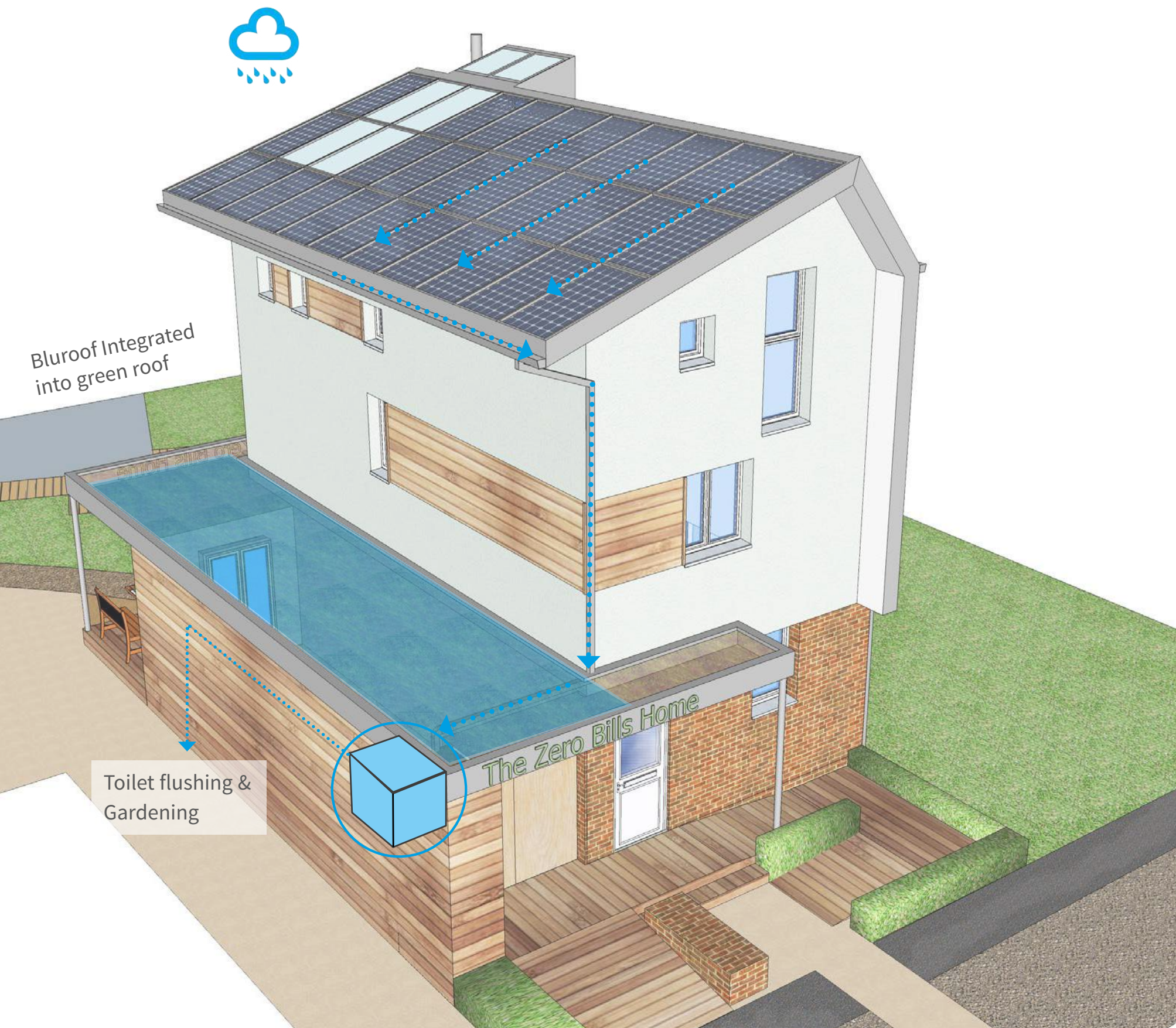
-  Affordable
-  Custom-Built
-  Clean Renewable Energy
-  Communities



▲ 7.5kW peak HiminZED BIPV roof at BRE Innovation Park



▲ Inside the solar loft



Filter



Rain water tank



Toilet flushing & gardening



Energy Performance Strategy

Summary

The building typology will be designed and constructed to meet or exceed the energy standard, Ene 1 of the Code for Sustainable Homes, Code level 6.

The buildings aim to achieve the energy performance criteria through high fabric efficiency and offsetting the regulated carbon emissions with photovoltaic glass roof panels that form the waterproof finish on the south facing roof of each property.

The energy strategy uses a combination of solar photovoltaic panels, heating using an MVHR based air source heat pump and heat exchanger, super insulation, Airtightness better than 1.5 ACH, Thermal mass.

No off-site or carbon offsetting solutions is used to create the zero carbon home.

The PV provides enough electricity to power the small air source heat pump integrated into each home's hot water cylinder.

High efficiency LED lighting, induction hobs and water saving appliances minimise both thermal and electric demand, maximising the energy efficiency of the homes.

Dwellings are capable of being upgraded to meet the BRE's HQM standard which replaces Code 6 of the Code for Sustainable Homes.

The solar PV roof will be Microgeneration Certification Scheme (MCS) accredited, fitted by MCS approved personnel and be designed and constructed to a standard to ensure that the local power company accept these for connection to the grid and export tariff. Life of the inverter: to be guaranteed for 5 years (extendable to 10, 15, or 20 years). A battery integrated inverter is available as an option

The integrated PV roof panels will be supplied by HiminZED (HGT-250)

The specification of the solar PV panels are designed for the location

Solar lofts to be designed to prevent condensation and provide a secondary waterproof line with an expected lifetime in excess of 25 years.

Space heating is provided via ducted warm air heating.

Dwellings are designed to be capable of taking wood burning stove.

Fabric Thermal Performance

The dwellings fabric performance standards are:

U-values

- 0.13 W/m²K for walls
- 0.1 W/m²K for floor and roof
- 0.9 W/m²K for windows and external doors.
- Targeted 1.5 ACH air tightness at 50 Pa pressure. This based on our innovative airtightness techniques which enables us to simplify the details which commonly cause problems and develop a far more robust detailing strategy which is unaffected by occupants actions inside the building.

Fabric

The design of the external wall insulation system complies with the relevant ETAG or BBA certificate for installation without a cavity. The composite wall build up is breathable. The design prevents internal humidity build up and interstitial condensation without the use of plastic membranes or easily damaged VCL's. This is confirmed by relevant calculations.

The exterior and interior finishes are sufficiently robust to avoid chipping of the internal/external fabric. The external fabric has been third party tested to verify performance against water ingress and taped and sealed joints to OSB, linings and window reveals will be installed in accordance to the relevant manufactures guidelines.

Impact resistance and robustness of external finishes have been third party verified. External finishes are verified to be sufficiently robust to resist chipping/minor vandalism.

A plinth of brick slip or other client approved material to be provided below render/external cladding will ensure the thermal performance of the building is not compromised whilst meeting minimal heights for building materials above ground level.

Thermal Bridging

The design detailing will ensure that the insulation forms a continuous unbroken layer between Insulation around the roof, walls and floor of the fabric.

Designs will incorporate a thermal break in between walls and slab with uninterrupted insulation layer to reduce thermal bridges.

Ventilation

- Ventilation is to be achieved with Mechanical Ventilation with Heat Recovery (MVHR) ensuring that adequate levels of ventilation can still be achieved with all the doors and windows closed. A highly efficient MVHR system that's also contributes to space heating and hot water demand is used
- The units will have sufficient acoustic attenuation within the intake and distribution ductwork to provide good levels of sound insulation.
- Ventilation distribution pipe work is smooth bore flexible duct. All duct work and pipe runs facilitate ease of access for maintenance. Ventilation to solar lofts is provided by openable windows / Velux roof lights

Acoustics

The homes will meet:

- 30 dbLAeq for bedrooms
- Internal sound insulation will be designed so that
 - (i) Airborne sound insulation values are at least 3dB higher than Building Regulations.
 - (ii) Impact sound insulation values are at least 3dB lower than Building Regulations.

Power and Lighting

Lighting will be provided by LED lights throughout the property. Switches and power points will be installed in accordance with Building Regulations.

Day lighting

Kitchens must achieve a minimum Average Daylight Factor of at least 2%. All living rooms, dining rooms and studies (including any room designated as a home office under Ene 9 - Home Office) must achieve a minimum Average Daylight Factor of at least 1.5%

Water Saving

- Low flow taps will be specified (Hansgrohe)
- Lower flow showers will be installed
- The design will accommodate an option for rainwater harvesting

Mechanical and Electrical

- 7.75 - 8.25 kWp Roof integrated PV array. Size is adjustable for daylight requirements into solar loft (See Specification Sheet)
- Heating and Ventilation - MVHR based heat pump
- Solar Assisted heat Pump Auxiliary heat pump
- Renewables 7.75 kWp of Solar PV (See Specification Sheet)
- Lighting LED/ CF

The Zero Bills Home

Section view





Hastings Zero Bills Home Development

Project Information

Client: Neil Brown
Project Date: 2014–now

Site Location: Castle Hill Road Hastings, UK
Project Status: Construction Finished

Hastings Zero Bills Home Development

Five custom build homes for self-build community group beside Hastings Castle

This development of five zero carbon homes is located on one of the best plots in Hastings - just a stones throw from Hastings castle, with panoramic views to both the East, the West and the Castle. Perched high up between Hastings Old Town and the Town Centre, it sits in a residential setting within the Old Town Conservation Area.

The ambition of the client is to create a high quality and highly efficient terrace of homes for the 21st century, and to demonstrate that zero carbon dwellings can be commercially viable. ZEDfactory have worked up a design which both delivers in design quality and environmental performance, providing an opportunity to transform this derelict site into a historically important project for the city to coincide with the 950th anniversary celebrations of 1066.

Design

The design is of a staggered terrace of 5, running perpendicular to Castle Hill Rd, optimising the panoramic views from each home. A shared ramped access from Castle Hill Rd leads to a sheltered entrance on the East of the properties. A vehicle access at the SW of the site leads to a garage undercroft for each home, with gardens located above. The internal layout is arranged with the living, dining and kitchens on the ground floor - as one open plan space that can spill out to the terrace and garden through a folding / sliding screen. Upstairs are 3 bedrooms and the main bathroom, with the master bedroom benefiting from fantastic views through large windows and a Juliette balcony. The top floor of each home is a flexible open plan space intended for a range of activities depending on the occupants lifestyles. This could be a studio, office, living room, games room or workshop for example. This floor also benefits from a glass screen opening onto balcony with arguably the best views in town.



Specification

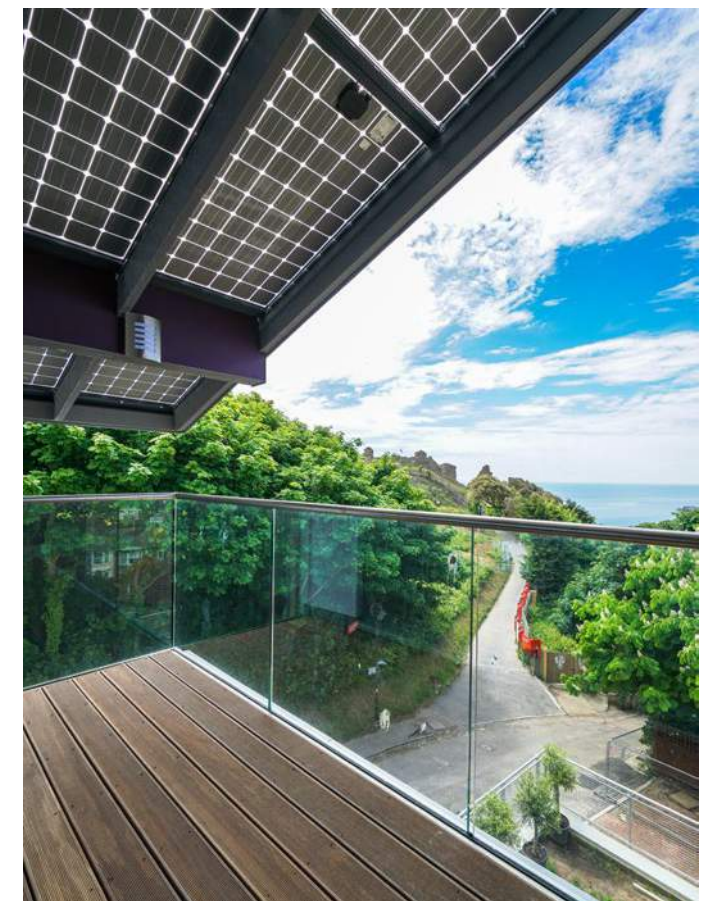
The construction is a heavyweight timber frame, allowing for abundant insulation and a good level of thermal mass in the form of screeded floors to each story. The external walls are externally insulated with a highly sustainable natural Wood Fibre product, to achieve an overall U-value of 0.14.

Windows are all extremely high performance timber frame aluminium clad triple glazed units manufactured by Velfac, and the folding sliding doors on the ground floor by Sunflex.

The South roof is entirely made up of the ZEDroof solar panel roofing system, and the North is a standing seam Zinc. Gutters are all metal, and timber cladding from locally grown sweet chestnut.

The performance of the building should comfortably achieve a zero carbon benchmark, with excess electricity from the PV panels being fed back into the national grid.

Heating and ventilation are provided by a highly efficient combined system, incorporating an air source heat pump and MVHR unit. Heating is distributed by underfloor heating coils embedded in the floor screed.



The Zero Bills Home Eco-villages

Overall masterplan & Site design



The site is located on the south western edge of Newport village, comprising 4.6 hectares of arable sown land, managed by a local farmer under a yearly renewable lease. The scheme includes 95 residential units and allows for extra retailing and a local market to be allocated.

The layout is enriched by a variety of green areas ranging from private gardens to semiprivate courtyard areas to communal village greens. In addition to the substantial soft landscape to site boundaries and within the site, the scheme includes dedicated children's play spaces on the southern boundary, within a substantially planted woodland environment. The landscape proposal will include provision for a pond within the village green with substantial tree and shrub planting to the pond perimeter.

The proposal includes for the provision 0.8 hectares of land for Newport Primary School as part of the Education Contribution. Within which it is proposed to include an additional 24 car parking spaces together with the option to provide vehicular access from the residential development through to the bridal path and Frambury Lane, which currently provide access to the school and village recreational facilities.

In addition to the parking facilities the additional the School Board intend to create an ecological park with substantial tree planting forming a buffer zone between the school and the new development and through which the extended pedestrian pathway will provide safe access for local schoolchildren walking to school from Newport.

“

The Trustees wish to apply for planning permission for a comprehensive mixed residential zero carbon sustainable development appropriate to Newport village.

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Newport Eco-village

New Code 5 development in Newport Essex

Project Information	
Client: Empeendimentas	Project Date: June 2012
Site Location: Newport, UK	Project Status: Planning Application

House types

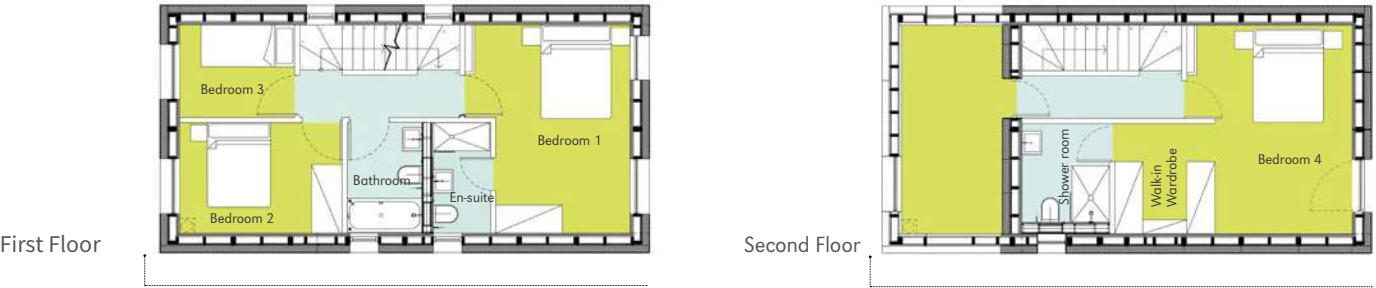
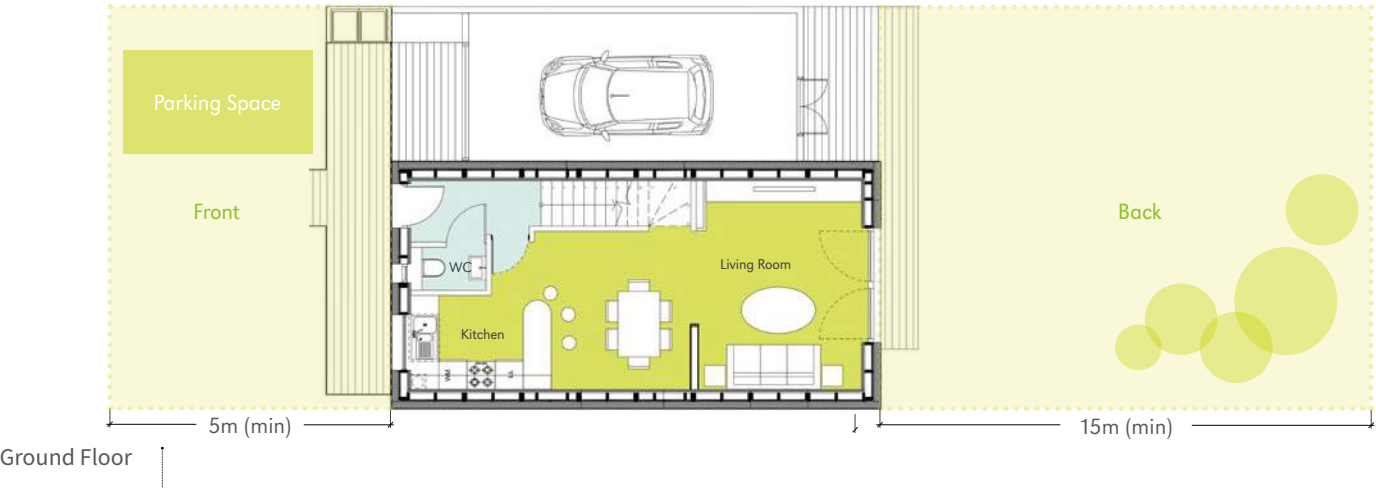
East west Three Story

House Information
Orientation: East / West
TOT Floor Area: 116 m²
Bedrooms: 4

Areas
Ground Floor Area: 42.5 m²
First Floor Area: 42.5 m²
Second Floor Area: 31 m²



• Demonstration House at BRE Innovation Park

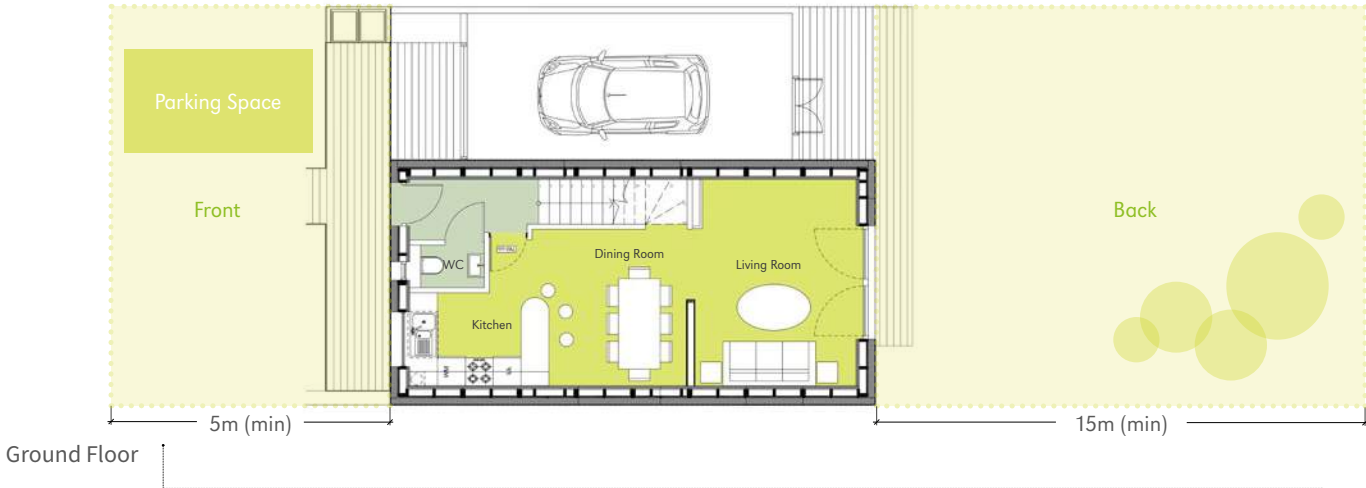


South facing three story



House Information
Orientation: North / South
TOT Floor Area: 111.5 m²
Bedrooms: 3

Areas
Ground Floor Area: 42.5 m²
First Floor Area: 42.5 m²
Second Floor Area: 26.5 m²



House types

South facing two story



House Information

Orientation: North / South

TOT Floor Area: 96.3 m²

Bedrooms: 3

Areas

Ground Floor Area: 36.8 m²

First Floor Area: 36.8 m²

Second Floor Area: 22.7 m²

South facing terraced house



East west two story



House information

Orientation: East / West

TOT Floor Area: 85 m²

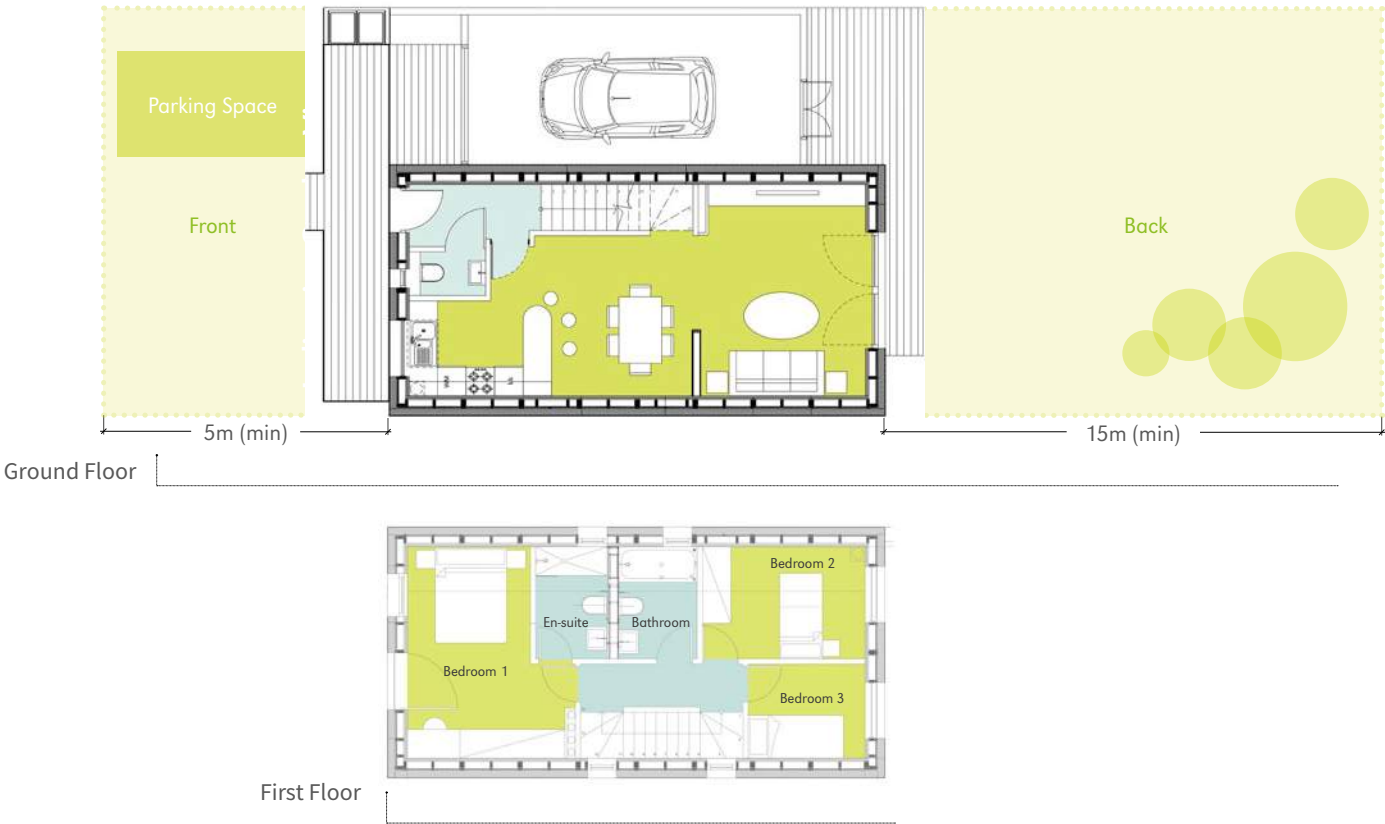
Bedrooms: 3

Areas

Ground Floor Area: 42.5 m²

First Floor Area: 42.5 m²

East west terraced house



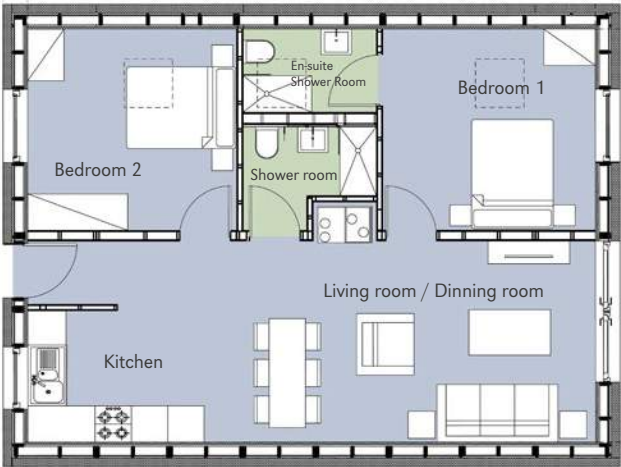
House types

East west bungalow

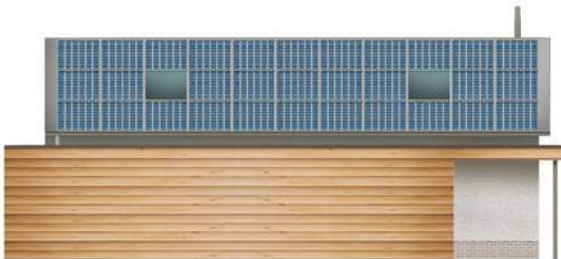


House information
 Orientation: East / West
 TOT Floor Area: 70.1 m²
 Bedrooms: 2

Areas
 Ground Floor Area: 70.1 m²



West Elevation



South Elevation



East Elevation



North Elevation





Ecogrove Eco-village

A flagship Code 6 development

Project Information

Client: Ecogrove Homes Ltd.

Site Location: London borough of Barking and Dagenham, UK

Project Date: 2009–now

Project Status: Planning Application

Ecogrove Eco-village

Site plan



Residential area Proposed site boundary

Ecogrove will be a flagship eco-village. As well as being super-energy efficient and built to last at least 100 years, the development also provides people with a desirable lifestyle. Homes are well-specified and modern, and are designed to be healthy, easy to run, light and well ventilated. Homes are air-tight and super-insulated. The building fabric is thermally massive, and ventilation is wind-driven and incorporates heat exchangers to reduce heat loss. Together, these measures reduce the heating requirement and make it cost effective to use renewable energy sources. Micro-generation technologies, including solar panels to generate electricity will be fitted to individual homes. Each home will also be provided with a back-up wood pellet boiler for provision of hot water in the Winter and space heating if required. Wood-pellet storage facilities will be integrated on site. A strong sense of community integration is to be encouraged by the design, the inclusion of the community farm as part of the wider masterplan will be key to this.

Longevity

Sustainable buildings should last. ZEDfactory projects are designed to last for five generations. Whether using traditional masonry or the timber-frame kit, ZEDfactory structural components are detailed and installed to be durable. Shorter-life components, such as window seals, kitchens and cladding materials, are designed so they can be replaced without affecting the overall integrity of the building. The design also allows for flexibility in room layout, using non load-bearing internal walls with post and beam structures.



Ecogrove Eco-village

Shows how to leads a zero carbon lifestyle at the same time as increasing overall quality of life

Ecogrove offers the following :

- New homes with an overall annual carbon footprint of zero. Enough renewable energy has been integrated into the project to meet its overall annual energy demand.
- Electric powered personal mobility powered by renewable energy. Although cars will be present in the development, their annual electric demands can be met by solar powered car ports and canopies.
- A positive encouragement for bike use: with the masterplan encouraging a new cycle route linking community centres away from Collier Row. Convenient secure bike storage, and E-bike technology sold with the homes.
- An integrated local food farm shop and integrated grow your own Garden Organic courses.
- Winter gardens located in every home in the solarium loft spaces.
- The remediation of a large area of degraded brown field land set in beautiful countryside.
- A showcase zero carbon environmental project beside the Redbridge Cycling Centre accessible to visitors.
- The first zero carbon Code 6 homes in this part of London, delivered by an experienced team.



Restoring the site to an area of high quality green belt

As is painfully clear at the moment the quality of the site is a long way from what it should be as green belt land. In addition to promoting an extremely low carbon footprint for the new residents the planning of the scheme has been strategically designed to make the layout as verdant as possible. The basic premise is to have sensitively designed, unobtrusive houses built of natural materials that are crafted into the landscape, not just placed into it. A large children's play area of 1500sqm will also be included as part of the green zone.



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Bickleigh Down Eco-village

New Code 5 development at Bickleigh Down

Project Information	
Client: Zero C	Project Date: 2009–now
Site Location: Bickleigh Down, UK	Project Status: Planning Application

Bickleigh Down Eco-village

Site plan

Bickleigh Down will be a new zero energy village and exemplar sustainable community which will act as a pilot project showing best practice for the future growth of the South West.

It forms the initial stage of a wider masterplan which covers 8 hectares. The proposal creates an exemplar sustainable development of up to 91 homes built to the zero carbon specification, together with a Plymouth ZED Assembly facility, to deliver the zero energy bill housing and low energy commercial and live-work units.

The proposal is distinctive in that:

- All houses have the potential to produce more energy than they consume over the course of a year, unlike the latest revision of the Code for Sustainable Homes' Code 6 benchmark¹. These potentially energy positive houses add value by offering buyers an upgrade option from Code 6 to a Zero Bills Specification.
 - Central to the proposal is the project's potential to stimulate the growth of local 'green economy' based around the assembly of ZBHC timber house kit and use of solar technologies.
 - The development is formed around a new communal green, with kitchen gardens, retention of biodiversity, and promotion of green lifestyles.
 - The prominent location at the 'gateway' to Plymouth provides a shop window to 'showcase' low carbon retrofit and enterprise in Plymouth.
 - Finally, the new village will be a great place to live and work - with a community green open space, a community café / bar and a covered market area.
- The new village has been designed to offer the highest possible quality of life for new residents, including a share of communal woodland carefully integrated with safe public open spaces, decent gardens and traffic calmed, car safe streets.



Private for sale properties Affordable units Block C – café, with affordable units above Assembly shed

Bickleigh Down Eco-village

Custom build

The houses will be built using the same set of prefabricated parts, built on site in controlled factory conditions and erected on pre prepared plots to each customers detailed specification.

By allowing people to customise their own homes, a greater sense of ownership and community can be created, with residents able to engage in the design process whilst maintaining a harmonious overall masterplan. The architect becomes the design facilitator rather than design dictator, holding workshops with each customer to ensure their house meets their needs.

Residents would typically be offered the following choices of external envelope, design features, internal arrangements, and specification items:

Choose housetype and plot number:

There are a range of housetype options stemming from 3 basic footprints. This ranges from 2 story 3 bed terraced houses, up to 5 bedroom detached family homes, depending on location on the site.

Customers are only offered housetypes that fit on the approved masterplan layout and meet the approved design code principles set out in this document.

Choose internal layout:

Each housetype has a limited range of internal layout options, which can be chosen without altering the structural design, external window location, or service distribution. For example, a 4 bedroom unit might have an option to become a 3 bedroom unit with a very large master bedroom, if required. Or there could be the option to have an open plan living / kitchen arrangement or for them to be separated by a wall or sliding screen. Most housetypes also have the option to construct a 'room in the roof', which requires a staircase, some additional services, and an extension to the insulated envelope. All internal layout options would be designed to comply with building regulations and not effect the external appearance of the houses.

Choice of external materials:

Residents can choose from a limited selection of window colour, render colour, front door colour, soffit colour and arrangement of timber weatherboarding.

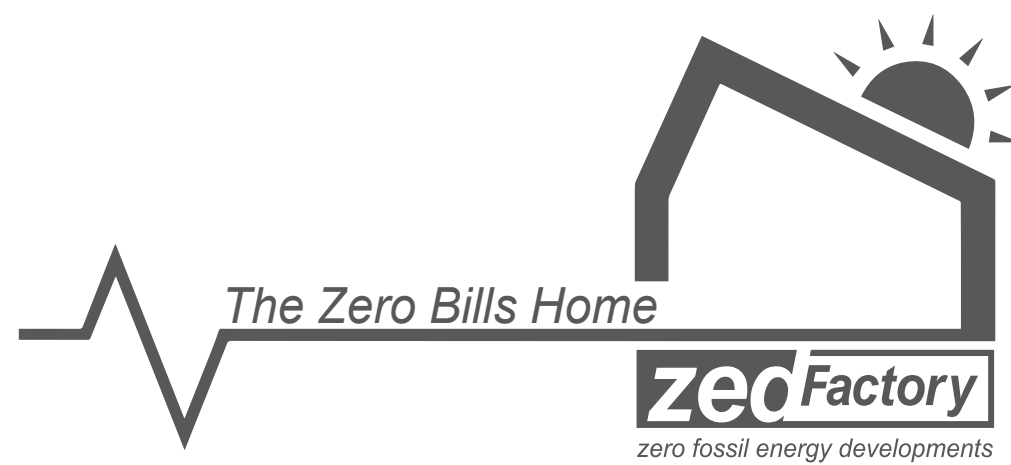
These colours and materials would be agreed as a reserved detail under the planning conditions, and PCC will be asked to approve a selection of colours / materials which can then be chosen by residents without going back to PCC for each individual home.


Optional extras:


Residents will also be offered a selection of optional extras such as a wood burner in living room or pellet range in kitchen, balcony to master bedroom, electric bike, home energy monitoring system, underground rainwater storage, garden terrace, pond and raised beds.

The only option that has aesthetic planning implications would be the bedroom balcony and wood pellet burner. The stainless steel flue is shown on all elevations provided.





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