

Imagine that your new home expressed the way that you felt about the world - understanding the environmental challenges of the new century, but also offering solutions to some of them ?

Imagine it was designed like a yacht to sail through the seasons, requiring so little energy input that it could run on the sun and wind with a good captain.

Imagine it was draughtproofed and had so much insulation that no real heating system was required to be comfortable for all but a few of the very coldest days in winter.

Imagine that it was built with WWF Forest Stewardship Council sustainable laminated timber much like an old post and beam medieval barn, but made strong enough to support thermally massive floors and walls that help keep the rooms cool in summer.

Imagine it caught the rooftop wind and breathed in fresh air at the same time as recovering heat from stale or moist air without using whining and power intensive fans.

Imagine you could order a double height passive solar conservatory to bask in winter sunlight, grow interseasonal vegetables and fruit, and be able to pick citrus fruits from your Sunday afternoon balcony recliner.

Imagine you could have free solar hot water all summer, only turning on a small automated woodpellet boiler to provide back up hot water in the winter months. You need so little biomass each year that you can easily stay within your fair share of the limited stocks of the annually replenishable national biomass quota.

Imagine you could harvest your total annual electricity needs from solar electric panels mounted on the south facing roof surface. In many European countries, this would mean no electricity bill each year. These are grid connected as standard, but optional battery storage can be included for those that wish to go offgrid.

Photos on this page show a completed house in Grande Synthe, near Dunkirk in northern France





Imagine you could choose the internal surface finishes from plaster to stone to polished eco concrete or even terracotta.

Imagine your kitchen could be made from predominantly reclaimed materials and still be low maintenance and look great.

Imagine you can choose from a variety of different housetypes and cladding options, with the option to use local materials if you wish. It is now possible working with a community group to plan your own street of Code 6 detached, semi detached or terraced homes working with our three dimensional CAD modelling techniques. You can even splice the new homes into an existing townscape.

Imagine you could order a new home as simply as you could choose a new car - understanding the cost and performance of the kit system before you buy.

RuralZED is a range of zero carbon housetypes designed to make it really simple to plan a low carbon lifestyle. Work out a strategy for eating local organic food, cycling to school / work and market, and maximising public transport and a step change reduction in personal carbon footprint becomes possible. It is even possible to charge a small electric car or bike from your roof. ZEDfactory offer help on planning applications and building control - and the kits are now being supplied with frame erection and foundation service included in the cost from your local builders merchant. They are delivered in two secure shipping containers containing carefully designed racking and assembly instructions, leaving you the option of completing the home yourself - or asking your local builder to finish the job. Certification of build quality, and training courses will be available as optional services.

Are you ready to start the voyage of a lifetime ?

Photos on this page show a completed house in Grande Synthe, near Dunkirk in northern France



Upton Project - The first as-built Code 6 buildings in the UK

Designed by ZEDfactory Architects for Metropolitan Housing Partnership, in association with Arups and Mansells.

The first terrace of RuralZED zero carbon homes to achieve the coveted BRE Code 6 'as built' certification have been built for the Metropolitan Housing Trust at Upton near Northampton. The terrace includes a mixture of three bed social housing units for rent and private sale. Achieving around 50 homes per ha, they demonstrate the viability of achieving the highest level of the government's Code for Sustainable Homes at a residential density representing 70 % of all homes in the UK.

The homes use ZEDfactory's well proven technique of reducing energy demand using state of the art energy efficient construction - allowing the total annual energy demand to be generated on site using well proven renewable energy sources. The Arup engineered zero heating specification homes use a mixture of winter sunlight and passive heat recovery ventilation needing only a tiny amount of wood pellet in winter to take off the chill and provide domestic hot water, and have evacuated tube solar hot water panels almost eliminating summer biomass consumption. The total annual biomass consumed is well within the quota available per UK resident without using agricultural land. Fit and forget solar electric panels on the south facing roof slopes provide enough electricity to meet total annual electric demand, with some homes having the possibility to generate a little surplus using roof mounted turbines as part of a future upgrade path on exposed sites. The same suite of building integrated renewable energy technologies can be used to upgrade existing buildings, showing how decentralised energy supplies can be achieved without expensive large scale infrastructure investments, that will never be funded in a recession.

The dry assembly ruralZED house kits structured by Mark Lovell are unusual in that they use heavy traditional laminated timber frames with thermally massive walls, floors and ceilings wrapped in draught proofed superinsulation and durable brick, timber or rendered elevations. This avoids both the summer

overheating often found in lightweight timber frames and the massive embodied CO2 often found in metal and masonry construction.

A range of different housetypes is now available from the ZEDfactory, and on larger projects an on site prefabrication factory will both create local jobs and deliver code 6 housing for both public and private sector from around £1,850-00 m2 gross internal. This is 'the Town that built itself', and a perfect way to use public investment in social housing to create new jobs, stimulate investment in low carbon industry, and kickstart the process of removing our national addiction to fossil fuel without going nuclear.

In ten years time with an 8 % annual fuel price escalator [most years are far higher] a household living in a three bed ruralZED home is likely to save around £150-00 / month on fuel bills. If this cash normally allocated to utility payments was paid into the slightly larger mortgage needed to meet the capital cost of the Code 6 home, most households would hardly notice the difference to their monthly outgoings, and could see their home increase in value with its A++ home energy rating. Currently it is mandatory that all new homes will be Code 6 by 2016, making it essential that the home buying public and local authorities resist the developer's' lobby to dumb down the Code standards to increase their land bank value. If a slightly backward industry restructured to meet the Codes requirements, meeting this high standard will become second nature and the UK will become one of the world leaders in low carbon construction.

The low energy features and how each works:

The RuralZED units at Upton have been designed as zero fossil energy buildings. They use a low embodied energy timber frame to support thermally massive walls and floors. A sunspace is used as a thermal buffer zone, allowing



ruralZED™

the buildings to capture warmth from the sun in the winter months, as well as providing additional amenity space.

They have a well-insulated envelope. Typical U-values 0.15 for walls, 0.12 for floor and 0.1 for roof. Dwelling emission rate of $-15.04\text{kg CO}_2/\text{m}^2/\text{a}$.

Airtight construction and insulation combine to give an HLP of 0.62 for mid-terrace units and 0.8 for end of terrace units. Passive heat recovery ventilation is employed to provide constant fresh air with no electrical consumption. Evacuated tube solar thermal panels pre-heat water in the winter and provide all the hot water required in the summer. A communal wood pellet boiler system provides a small amount of additional hot water in the winter.

Electrical consumption has been minimised; large windows provide plenty of natural light. The 21 internal light fittings are all low energy CFLs. A drying rack has been provided in the sunspace to avoid the need for a tumble dryer. All white goods are rated A and above. Induction hobs are specified, which use 25% less electricity than traditional electric hobs.

A 3.2kW array of photovoltaic solar panels provide enough electricity to exceed the entire electrical load of each building over a year.

Energy consumption compared with a building regs building:

In order to meet code 6 of the Code for Sustainable Homes, these buildings are a 100% improvement on a building built to current regulations. The Target Emission rate is $22.24\text{kg CO}_2/\text{m}^2/\text{a}$ and the Dwelling Emission rate is $-15.04\text{kg CO}_2/\text{m}^2/\text{a}$. The microgeneration incorporated in the buildings balance out all energy consumption.

Photos on this page show completed houses in Upton, Northamptonshire, UK



Annual energy cost compared to a normal building:

The microgeneration on the units should create a net profit in electricity for the householders, whilst it should cost about £120 in wood pellets for additional water heating in winter.

The capital costs of the energy saving features and how long it will take to recoup this investment:

These units cost about £26,000 more than a standard home. The final price for these units has not been decided yet, but they will be exempt from stamp duty tax, making a potential saving of around £2,000. Whilst we don't have figures for the whole buildings, the payback for various features of the buildings has been calculated; using 300mm of insulation instead of 100mm will pay back in 8 years; the photovoltaics will pay back in 12 years. When taking into account an 8% fuel price escalator the initial investment will pay for itself relatively quickly.

Since the houses were originally designed for Upton, a refined version of the RuralZED kit house has been launched in France, which has brought the cost down by around £10,000 to £1,800/m².

Embodied energy of materials:

The RuralZED units were designed to have as low embodied energy as possible. This is why timber is used for the frame. Concrete with GGBS cement-replacement was used to provide the thermal mass, whilst still having a relatively low embodied energy level. The thermal mass is critical to the thermal performance of the building, storing heat in the winter and cooling in the summer.

The carbon payback of the photovoltaic solar panels has been calculated as around 3.5 years, including manufacture and shipping.

With careful use these homes should use less electricity than they generate, enabling the embodied energy to be offset over time.

Images on this page show a typical masterplan



RuralZED at Upton - Achieving Code 6 - Breakdown of Code for Sustainable Homes scores					
Category	Feature	Performance	Credits Achieved	Max Score	Comments
1 Energy And CO2 Emissions					
Ene1	Dwelling Emission Rate	For end -13.86, for mid -13.44	15	15	HLP 0.8 for terrace end unit 0.62 for terrace mid unit
Ene2	Building Fabric	Typical U values: roof 0.1, floor 0.12, walls 0.15, windows 1.24	2	2	
Ene3	Internal Lighting	21 light fittings - all CFL	2	2	
Ene4	Drying Space	Drying rack in Sunspace	1	1	First floor level - in all units.
Ene5	Energy labelled white goods	All white goods A and above	1	2	figure for rental units - ' for sale ' units achieved 2 pts
Ene6	External Lighting	Space lighting CFL. Security 150W	2	2	
Ene7	Low/Zero Carbon	3.6 kWp of PV panels, 2 solar thermal panels & biomass boiler	2	2	
Ene8	Cycle storage	Provision for at least 2 bikes in secure sunspace	2	2	
Ene9	Home Office	Switches, phone & broadband supplied in single bedroom	1	1	
2 Water					
Wat1	Internal	4.5 litre toilets & low flow fittings give 77.56 litres/person/day	5	5	Centralised rainwater harvesting system for toilets
Wat2	External	200 litre water butts collect rainwater. Overflow goes into RWH	1	1	
3 Materials					
Mat1	Environmental Impact	At least 3 of the five key elements achieve a Green Guide rating of A+ to D	12	15	
Mat2	Responsible Sourcing - basic	All timber elements are legally sourced	6	6	
Mat3	Responsible Sourcing - Finishing materials	All timber elements are legally sourced	3	3	
4 Surface Water Run Off					
Sur1	Surface Water Run Off	Drainage scheme includes swales and permeable paving with attenuation	2	2	
Sur2	Flood Risk	Scheme outside flood risk zone	2	2	
5 Waste					
Was1	Household	Waste and recycling storage designed in. Local council collections for each	4	4	50 litres recycling
Was2	Construction	Waste management plan by contractor + external contractor for recycling	2	2	
Was3	Composting	220 litre compost bins in gardens	1	1	
6 Pollution					
	Global Warming Potential	All envelope materials inc. sealants use products with GWP under 5	1	1	
	NOx Emissions	Biomass boiler emissions exceed 100mg NOx/ kWh	0	3	
7 Health and Wellbeing					
	Daylighting	Daylight factor for living room, dining room and single bedroom/ office are 1.5% or higher, kitchen exceeds 2%. All the habitable rooms in the house achieve a view of the sky higher than 80%.	3	3	
	Sound	Party wall airborne sound insulation values are at least 8dB higher, and impact sound insulation values that are at least 8dB lower than part E requirements.	4	4	
	Private Space	Private garden is in excess of 4.5m ² minimum area for a 3 bed house, accessible by wheelchair users	1	1	
	Lifetime Homes	Designed to Lifetime Homes standards e.g. thresholds, door widths, lift area	4	4	
8 Management					
	Home User Guide	Home user guide provided	3	3	
	Considerate Constructors	Project was been signed up to Considerate Constructors scheme with regular audits Main contractor put a management plan in place to reduce the impacts to the site as a consequence of development.	2	2	
	Construction Site Impacts		2	2	
	Security	Scheme designed to Secure By Design standards. Local police consultation	2	2	
9 Ecology					
	Value	Site previously farmland. No credit sought	0	1	
	Enhancement	Planting schedule, bird & bat boxes, sedum roof species to ecologists report recommendations	1	1	
	Protection	Farmland had no ecological features to protect	1	1	
	Change in value	New scheme including 28 species on green roof was a minor enhancement to area	3	4	
	Footprint	2 storey buildings, so do not qualify for credit (must be over 2 storey)	0	2	
Total:			93	104	
Weighted total (gives score out of 100)			91	100	

THE CODE FOR SUSTAINABLE HOMES



FINAL CERTIFICATE

(Issued at the Post Construction Stage)

ISSUED TO:

**19 Mill Pond Drive,
Upton,
Northampton,
Northants NN5 4EW**

The sustainability of this home has been independently assessed at the Post Construction Stage and has achieved a Code Rating of 6 out of 6 stars under the April 2007 version



Above
Regulatory
Standards

Current
Best
Practice

Highly
Sustainable
and Zero Carbon

The next page sets out how this home achieved its rating in the nine categories.

Licensed Assessor
Simon Roberts

Assessor Organisation
ARUP

Client
Mansell Construction Services Limited

Developer
Metropolitan Housing Partnership

Architect
Bill Dunster Architects ZEDFactory Ltd

Certificate Number
BRE-A-CSH-SR05-1-0002

Date
14th May 2009

Signed for and on behalf of BRE Global Ltd



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FINAL CERTIFICATE

(Issued at the Post Construction Stage)

Certificate Number: BRE-A-CSH-SR05-1-0002

Score: 91

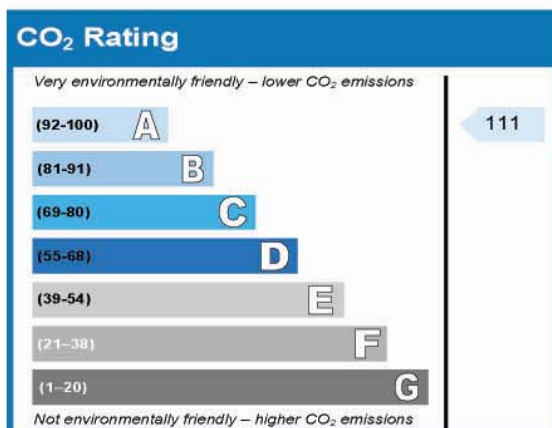
What Your Code Star Rating Means

Combined Score	36-47	48-56	57-67	68-83	84-89	90-100
Stars	1	2	3	4	5	6

The Code for Sustainable Homes considers the effects on the environment caused by the development and occupation of a home. To achieve a star rating a home must perform better than a new home built to minimum legal standards, and much better than an average existing home.

How this home scored			What is covered in the category									
Category	Percentage of Category Score attained											
	0	10	20	30	40	50	60	70	80	90	100	
Energy	100	[100% bar]										Energy efficiency and CO ₂ saving measures
Water	100	[100% bar]										Internal and external water saving measures
Materials	87	[87% bar]										The sourcing and environmental impact of materials used to build the home
Surface Water Run-off	100	[100% bar]										Measures to reduce the risk of flooding and surface water run-off, which can pollute rivers
Waste	100	[100% bar]										Storage for recyclable waste and compost, and care taken to reduce, reuse and recycle construction materials
Pollution	25	[25% bar]										The use of insulation materials and heating systems that do not add to global warming
Health & Wellbeing	100	[100% bar]										Provision of good daylight quality, sound insulation, private space, accessibility and adaptability
Management	100	[100% bar]										A Home User Guide, designing in security, and reducing the impact of construction
Ecology	55	[55% bar]										Protection and enhancement of the ecology of the area and efficient use of building land

Further detailed information regarding The Code for Sustainable Homes can be found at www.communities.gov.uk/thecode



The CO₂ rating is a measure of a home's Carbon Dioxide (CO₂) emissions. This rating is shown on your Energy Performance Certificate as the Environmental Impact Rating. This Certificate is available from the seller, and also includes information on how you can improve the home's performance.

The Code measures the sustainability of a home as a complete package, and takes into account other aspects of energy use as well as wider sustainability issues, such as water and waste.

The CO₂/Environmental Impact Rating is shown here for information only and does not form part of The Code for Sustainable Homes. Neither BRE Global nor the assessment organisation is responsible for the accuracy of this number.

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