The University of Nottingham

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Creative Energy Homes

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David Wilson Eco House

Nottingham H.O.U.S.E

E.ON House

Tarmac Masonry Homes

The BASF House

Mark Group Research House

The Department of Architecture and Built Environment, University of Nottingham, has partnered with industry to showcase state-of-the-art energy efficient technologies and house designs. The multi award winning project, Creative Energy Homes, is at the forefront of the UK's low carbon housing research and education and promotes innovative design ideas and construction methods.

The seven inhabited homes built under the project title, at Green Close on the university campus, work as live laboratories for the investigation of the relationship between the occupants and building performance. The research undertaken relates to most aspects of sustainability, and particularly energy use. Through post occupancy evaluation the project also aims to explore the feasibility of demand-side management, energy storage and smart-grid technologies. This unique facility is designed to encourage knowledge transfer with industry and to outreach academia and the general public.

ROGER BULLIVANT

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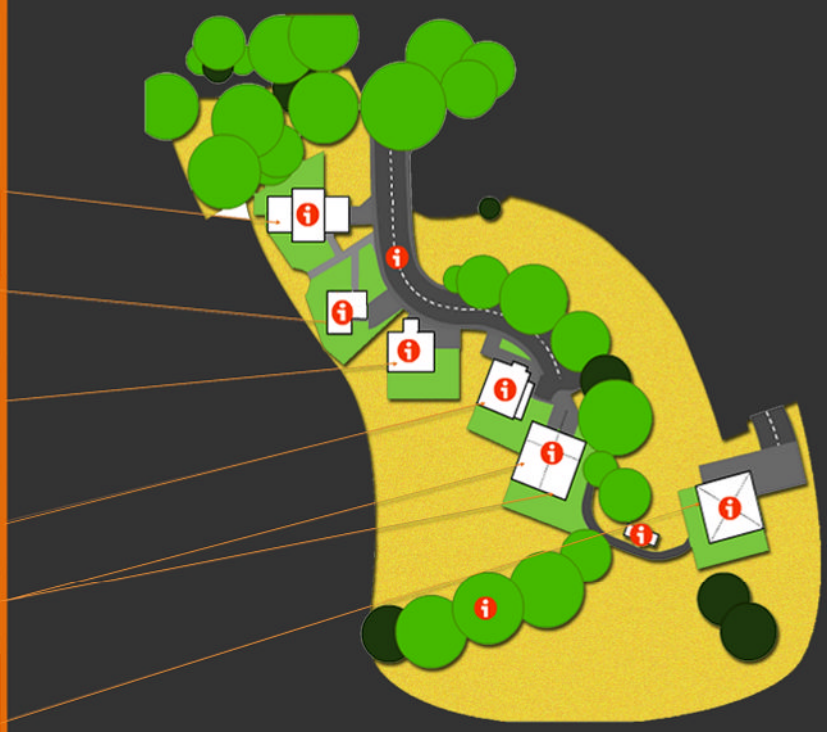


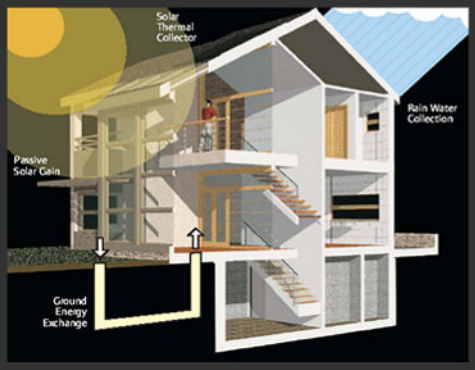
The UK government has set ambitious targets to reduce carbon emissions by 80% by 2050 and to have every new home zero carbon from 2016 onwards. The 'Creative Energy Homes' has been helping to inform the path to achieve those targets and has been recognised as an exemplar project by the Zero Carbon Hub for being successful, verifiably low and zero carbon housing solutions .

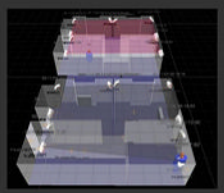
The project exhibits world class research in the fields of innovative building fabrics; energy conservation and generation through renewable resources and optimized power utilisation. It is also a medium to explore various building codes, user comfort and satisfaction, and building energy performance ratings.

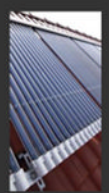
Engagement of occupiers in the post occupancy evaluation of the homes is an essential element of this experimental project. Hence each of the Creative Energy Homes is occupied and fully instrumented to provide valuable data on performance and use of the building. Data sets include occupancy, weather data, environmental conditions (temperature, humidity, indoor air quality) energy consumption and use (gas, electricity, biomass etc), water consumption (including rainwater and grey water use), building fabric performance and renewable energy contributions (PV, solar thermal, GSHP, ASHP, micro-CHP, micro-wind, Biomass).

The data is analysed and results are disseminated by project investigators who work closely with the industrial partners in research and development projects.

Students are encouraged to engage themselves in experiential learning through their involvement in various aspects of the project.







For more information visit

www.creative-energy-homes.co.uk

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The BASF house offers affordability as well as an energy efficient housing solution. It uses carefully selected materials and technologies to balance the cost of building a code level 4 home, against the requirements to make the house affordable, based on whole life operational costs and energy use.

The key criteria for designing the house was to have a compact floor area and utilise passive solar design strategies as well as natural ventilation. The north, east and west walls are highly insulated, whilst facing south has a fully glazed, double height sunspace. The sun warms the air in this sunspace which acts as the primary heating source for the house. Furthermore, the heating demand is supplemented by the ground air heat exchanger system and an air source heat pump. To achieve a high thermal capacity, the ground floor construction is in Insulated Concrete Form (ICF) and the structure above it in lighter Structural Insulated Panels (SIP's). Phase Change Materials (PCM) have also been used for temperature buffering. A web based smart home control system provides interactive building management and constantly monitors the performance of the house.

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Where quality lives
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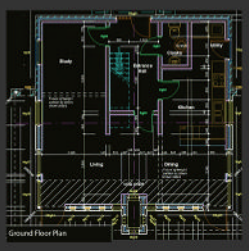

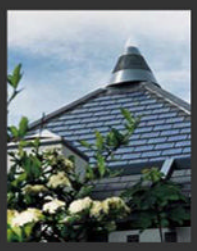

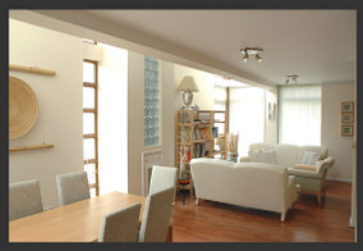

The history of the Creative Energy Homes project can be traced back to the Millennium Eco-house which was constructed by David Wilson Homes at the turn of the millennium. This is a four-bedroomed detached property which uses brick and block construction. Its original purpose was to support research of domestic-sized renewable energy systems such as micro-CHP, solar thermal, micro-wind and natural ventilation devices. The house employs PV roof slates on the south side and two micro-wind turbine technologies to meet electricity demands. A solar chimney constructed on the south façade provides passive solar heating as well as ventilation. The house has been designed to have maximum natural light through light pipes. Each technology makes a strategic contribution in reducing the conventional energy consumption of the house.

The House is now also used as a space for research staff offices. It is fully instrumented to allow the on-going monitoring of its energy performance. The house also serves as a live laboratory for testing smart-grid energy technologies to meet the next generation of smart grid and smart home control systems.

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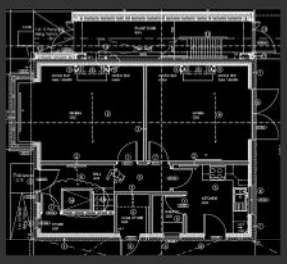

Three million of them were built, they stimulated a boom in employment and turned a nation of shop keepers into a nation of home owners. The 1930's semi is an icon of its age but 80 years on it is undergoing a green revolution.

The University of Nottingham together with the energy company E.ON were granted special planning permission to build an original 1930's semi-detached reidential property to find out what modifications to thousands of existing homes would be needed to meet the government's targets for reducing carbon emissions associated with the existing housing stock. Twenty one million houses in England (86% of the current stock) will still be in use by 2050. It is therefore vitally important that we identify and research technologies aimed at reducing the energy consumption associated with existing homes. The replica 1930's semi has and will be upgraded in several stages over several years to determine the impact and efficiency of different retrofit measures. This house has been built as a three phase research project.

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The Mark Group house is a four-bedroom detached property with three floors including a basement/garage. It was designed by interdisciplinary members of the teaching staff and a construction workforce of undergraduate students studying architecture and building technology gained valuable experience of construction practices by working on aspects of the build. PhD and research staff has undertaken a number of research studies associated with the construction of the home.

The house uses innovative modern methods of construction in the form of a lightweight steel frame and insulated concrete form (ICF). The construction above ground level is in prefabricated steel frame cladded with 200mm polystyrene foam board while the basement is in Insulated concrete formwork. Whilst the focus of the house is on energy efficiency by employing a 'fabric first' approach to design, the house also includes technologies and design aspects to maximise solar utilisation (active and passive), natural ventilation, minimise potable water use and maximise natural light. The house employs a ground source heat pump and an earth air heat exchanger system to help meet the space heating demand.

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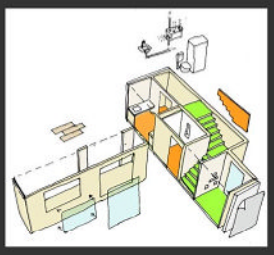

The Nottingham H.O.U.S.E (a family Home Optimising the Use of Solar Energy) is the result of academics, researchers and students from the various disciplines in the Department of Architecture and Built Environment collaborating with a select group of industrial sponsors and specialist consultants. This full-scale home was designed to the world's most stringent design codes – The German Passivhaus Institute, UK Code for Sustainable Homes Level 6 (Zero-carbon), Lifetime Homes compliant & Secured by Design compliant. This is the first time all these codes have been combined within a house of this type - this in itself was a massive challenge despite the fact that students designed and built this as part of their teaching and learning experience at Nottingham. It is a fully functioning home, compliant with all UK building regulations.

The house was designed as a starter home for a family of two adults and one child. The design explores the concept of the family home, while also considering its role in the wider urban fabric. A comfortable interior is provided by the design throughout the different seasons of the year.

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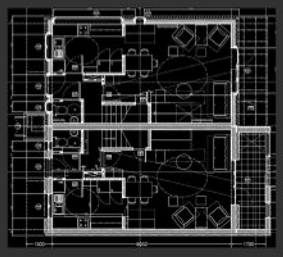

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Tarmac Masonry Homes are two semi-detached properties sponsored by Tarmac to demonstrate that even the highest level of Sustainability codes are achievable by traditional and readily available masonry products and techniques. Other objectives were to provide practical answers to some of the questions which surround the viability of Code for Sustainable Homes and appraise them for user comfort and energy performance.

The homes have been designed by architect Bill Dunster's Zed factory Ltd and were constructed by Lovell. One property has been built to comply with Code for Sustainable Homes level 4 and the other to level 6. The design team intended to build homes that are both affordable and easy to maintain. Both properties incorporate sustainable technologies including flat plate solar water heating panels, high efficiency appliances, rainwater harvesting, sun pipes and building envelopes with a high degree of insulation and minimal air leakage.