

eHome2



BARRATT
DEVELOPMENTS PLC





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FOREWORD

In 2013 we began our work in partnership with the University of Salford at Energy House 1.0 with the aim of understanding, through robust testing, how a Victorian Terrace built within the Energy House 1.0 climate-controlled chamber would perform when retrofitted with a range of insulation technologies.

We're delighted to now be working with leading UK housebuilder, Barratt Developments, and a host of other innovative companies to build a new home - eHome2 - as part of a ground-breaking project in the University's new Energy House 2.0 climatic chamber.

Climate change is leading to more extreme climatic conditions, water shortages and pressures on natural resources - some of the most critical challenges of our time. The construction industry has a particularly important role to play in addressing some of these challenges as the built environment is responsible for close to 40% of the UK's carbon emissions, high levels of natural resource consumption and landfilled waste. In addition to the environmental impact buildings have in their construction, and particularly in their use, they also have a significant impact on our health and wellbeing.

At a time when the UK is facing long-standing housing shortages, pressures on the availability of skills needed to deliver high-quality homes and rising costs to keep homes warm, eHome2 will produce a new blueprint for building homes en masse that can operate at a net zero carbon level, consuming far less water and creating less waste. eHome2 is constructed using modern methods of construction (MMC). This means much of the home's structure and fabric was constructed off-site in controlled factory settings; creating sustainable, comfortable and efficient homes that will cost consumers far less to heat.

The eHome2 project is an embodiment of Saint-Gobain's vision to be the worldwide leader in light and sustainable construction and we look forward to sharing the results of the nine-month testing programme with Government and the wider industry.

Mike Chaldecott,
CEO of Saint-Gobain UK & Ireland



OUR PURPOSE:
Making the World a Better Home

OUR VISION
Be the worldwide leader in light and sustainable construction

RELATIONSHIP WITH THE UNIVERSITY OF SALFORD

Saint-Gobain has a long-standing relationship with the University of Salford.

At Saint-Gobain, we were heavily involved in the first Energy House: a Victorian Terrace in a climate-controlled chamber, which provided an accurate and rapid assessment of energy-efficient retrofit technologies.

The original Energy House is a traditional construction; solid brick walls, suspended timber floors and single-glazed windows with a conventional heating system and a gas boiler.

The University of Salford's latest addition to Energy House labs is Energy House 2.0, an innovative research centre helping to accelerate progress towards low carbon and Net Zero housing design at scale. The £16m research lab, part-funded by the European Regional Development Fund (ERDF), is the largest facility of its type in the world, offering world-leading research and academic expertise in Smart Living.



OUR PARTNERSHIP WITH BARRATT DEVELOPMENTS

Saint-Gobain and Barratt Developments, both leaders in their respective fields, are working together to create an operationally zero-carbon home that trials next generation technology. This project brings together Saint-Gobain's expertise in construction solutions, particularly those that are lightweight and sustainable, and Barratt's commitment to the creation of high-quality, energy efficient homes.



Within Energy House 2.0 there are two environmental chambers which can recreate a wide variety of weather conditions with temperatures ranging between -20°C to +40°C and, can simulate wind, rain, snow and solar radiation.

AIMS AND OBJECTIVES / CHALLENGES

Working in the new state-of-the-art facility at the University of Salford - Energy House 2.0 - Saint-Gobain and partners have constructed a three-bed detached house, designed to meet future performance and regulation requirements.

This project will provide an understanding of how to deliver zero carbon housing at scale using off-site lightweight construction solutions, and how these homes will meet the Future Homes Standard. One of the main objectives of eHome2 is to pilot next generation heating and ventilation technologies to reduce energy consumption and carbon emissions in the built environment. The project will also explore the use of smart technology to improve the efficiency of the homes and enhance quality of life for the occupants.

“eHome2 is a ground-breaking approach to the future of mass-built housing in the UK. The coupling of offsite construction, high fabric efficiency, low carbon heating systems and EV charging leads to a very complex system. The work carried out during this study will aim to quantify the building’s performance, deliver key metrics and provide feedback and improvements to the homes”.

Professor Richard Fitton

eHome2

Saint-Gobain is committed to finding innovative solutions to some of the most pressing issues facing the construction industry, including the need to reduce carbon emissions and increase the energy efficiency of buildings.



“Saint-Gobain is investing in our future through the creation of sustainable solutions, driven by customer-centric innovation, to address the needs of tomorrow, today”.

Tom Cox, Technical and Development Director, Saint-Gobain Off-site Solutions



FABRIC-FIRST APPROACH

The fabric-first approach ensures that the roof, walls, windows, floors and doors of a building are well insulated and airtight, which helps to create an efficient and low energy building. eHome2 brings together Scotframe’s high performing timber frame solution, sustainable glass mineral wool insulation from Isover, and glass with enhanced thermal insulation to reduce heat loss through the window. The solutions used for eHome2 have all been chosen for their ability to create a sustainable, efficient and comfortable home.

Almost two-thirds of the heat generated in a home is lost through the building fabric. And up to 35% can be lost through uninsulated walls.



eHome2



Building Management

Zmart Hohm provides the design, build, supply and commission of Loxone's home automation systems.



Building panels off-site guarantee quality control & the innovative design allows the electrical contractor to fully install the system without training, this maintains build schedules, minimises labour onsite & reduces wiring using Tree topology. Zmart Hohm provide the conductor to the orchestra of technology in the modern home.

The Loxone Building Management System maximises efficiencies of all technologies installed to make the building comfortable, efficient and more sustainable.



This system can turn off lights and put devices on standby when rooms are empty and even turn off the heating when a window is left open.

International Timber supplied sustainable timber for solutions within the build.



ISOVER's high-performing, sustainable glass mineral wool insulation products are installed at eHome2. This includes Acoustic Partition Roll, for internal partitions which delivers a measurable reduction in sound transmission. It also includes Timber Frame Roll 35 in the external walls and Spacesaver Plus in the loft which help to reduce heat loss within the building and decrease energy costs. They are manufactured in the UK with an electric furnace powered through a renewable energy tariff.



Saint-Gobain Glass' PLANITHERM ONE T low-e coated glass has enhanced thermal insulation optimised for both double and triple glazing. The UK manufactured glass reduces heat loss through the window, resulting in significant energy savings and has low solar gain, reducing overheating in the home. STADIP SILENCE acoustic laminated safety glass delivers enhanced security and safety, improved noise-control, and UV light protection to reduce furniture-fade.



Eurocell Modus frames can accommodate both double and triple glazing, providing leading thermal performance and tightness. Eurocell products are certified by the BSA (British Board of Agrément) for thermal performance, weathertightness, ventilation, resistance to intrusion, access and durability.



webernd MT render system, webersil TF decorative finish and weberwall brick effect were used to reduce time onsite through the speed of application and drying time.

weberwall brick can be installed over three times faster than traditional brick slips and can also significantly reduce site waste. These products from Saint-Gobain Weber provide lightweight, fast-track solutions in multiple colours and finishes.



The Vaillant aroTHERM plus air source heat pump combined with a 200litre UNISTOR cylinder provides heat and hot water. Using the natural refrigerant, R290, the aroTHERM plus is one of the most eco-friendly and efficient heat pumps on the market with an extremely low Global Warming Potential (GWP) of 3. With Sound power as low as 54 dB(A), the heat pump is suitable for use in densely built-up terraced housing estates.



Symphony's sustainable kitchen solution includes frontals made from 100% recycled board, cabinets made from a minimum of 50% recycled materials and cabinet legs from 100% recycled plastic. All timber-based products procured are FSC® certified. The fitted kitchen in Salford is - Hacienda Grey Driftwood.



Waterfall is the next stage in the evolution of water metering. It is an internet connected smart water metering solution designed to change behaviour. Waterfall accurately detects every water event in each property where it is installed. It records how much water is used, and what for. It uses this knowledge to remotely cut off the water supply when a serious leak is detected. Connecting with an APP, Waterfall helps influence user behaviour by providing insights on water use and water saving opportunities in the household.



Primary structural insulated closed floor panels. The panels improve build speed by up to 500%, offer a labour saving of up to 83%, provide U-values as low as 0.10 W/m2K, and leave no waste or packaging onsite, so are a highly efficient solution.



Automated blinds and curtain tracks integrated into the Loxone home control system to allow automatic operation for security, overheating mitigation and thermal benefits.



Cürv have supplied 30 integrated solar roof tiles which generates approx. 3,188kwh solar energy a year. Any excess energy is stored in the Cürv 8.4kwh Battery storage. This storage allows users to take full advantage of cheaper electricity rates during off-peak times. In the summer any excess power can be stored in the battery to consume during the night. During the winter months battery storage allows the person to buy electricity at the off peak rate.

The Cürv Air Source Cylinder provides hot water and the Cürv Infrared panel heating solution is used to heat the home. The Cürv Integrated App allows complete system control.



Posi-JoistTM floor cassettes allow for the integration of services, particularly Mechanical Ventilation & Heat Recovery systems (MVHR). Top hung joist detail reduces thermal bridging at wall-floor interfaces. Roof trusses were used to construct a thermally efficient attic space. Both the floor cassettes and trusses are constructed from sustainably-sourced timber.



Manthorpe's floor ventilators and loft hatch, manufactured in the UK help achieve compliance with Part L of the Building Regulations.



eHome2 has British Gypsum plaster on British Gypsum boards with ACTIVAIR® Technology plaster. ACTIVAIR® makes indoor air healthier by eliminating up to 70% of formaldehyde present in indoor air.

eHome2 also features light Gauge Steel (Ultrasteel) internal partitions and Magnetic plaster.



The Vent Axia Sentinel Kinetic Advance MVHR is an efficient heat recovery system that supplies filtered air to habitable rooms.

Vent Axia Multivent MVDC-MSH cMEV is a low energy mechanical extract ventilation system designed to extract humidity from wet areas and improve internal air quality.



The electric car sourced by VWFS | Fleet utilises the bi-directional charger, allowing car to house and house to car energy transfer. This will be a standard single direction charge for the launch with bi-directional later in the research.



ThermaSkirt, is a space saving and energy efficient skirting board radiant heating solution, ideal for high performing buildings with Air Source Heat Pumps.

Discrete Heat also manufacture ThermoCurve which is an infrared radiant coving, designed for use where there is limited wall space.



The Category 2 Closed Panel timber frame system includes insulation that is maintenance free and long-lasting. The system cuts energy bills, and innovative connections that reduce thermal bridging design and enhance airtightness. With the inclusion of critical vapour control membranes, service zones and externally fitted battens applied in the factory the system speeds up build time and ensures a high performing fabric achieving 0.13 W/m2K.



Saint-Gobain has partnered with Barratt Developments and a host of innovative companies to understand how sustainable housing can be delivered at scale using construction solutions manufactured off-site, in line with our vision to be the worldwide leader in light and sustainable construction.

OBJECTIVES

Understand how to deliver Net Zero carbon housing at scale using off-site, lightweight construction solutions

Monitor the performance of the house to inform future innovations

Research fabric and services efficiency, thermal comfort, usability and resilience to external climates



The Energy House 2.0 project is being part-funded by the European Regional Development Fund



COMFORT

An efficient home is important, but it must be a comfortable space for people to relax, work and socialise. 'Making the World a Better Home' is the common purpose of all Saint-Gobain brands, and this is reflected in the solutions we develop.

As pollution levels have risen, most of the attention has been given to the impact of outdoor air pollution on human health and the environment. In recent years there has been a larger focus on the how indoor air quality impacts people's health and wellbeing. eHome2 uses British Gypsum plaster with ACTIVair® Technology plaster; ACTIVair® makes indoor air healthier by eliminating up to 70% of formaldehyde present in indoor air.

In addition, two systems have been installed to improve air quality - Vent-Axia Multivent, a centralised ventilation system, and Vent-Axia Sentinel Kinetic Advance: a mechanical ventilation heat recovery system (MVHR), which supplies fresh air whilst extracting from wet areas.

70% ACTIVair® makes indoor air healthier by eliminating up to 70% of formaldehyde present in indoor air.

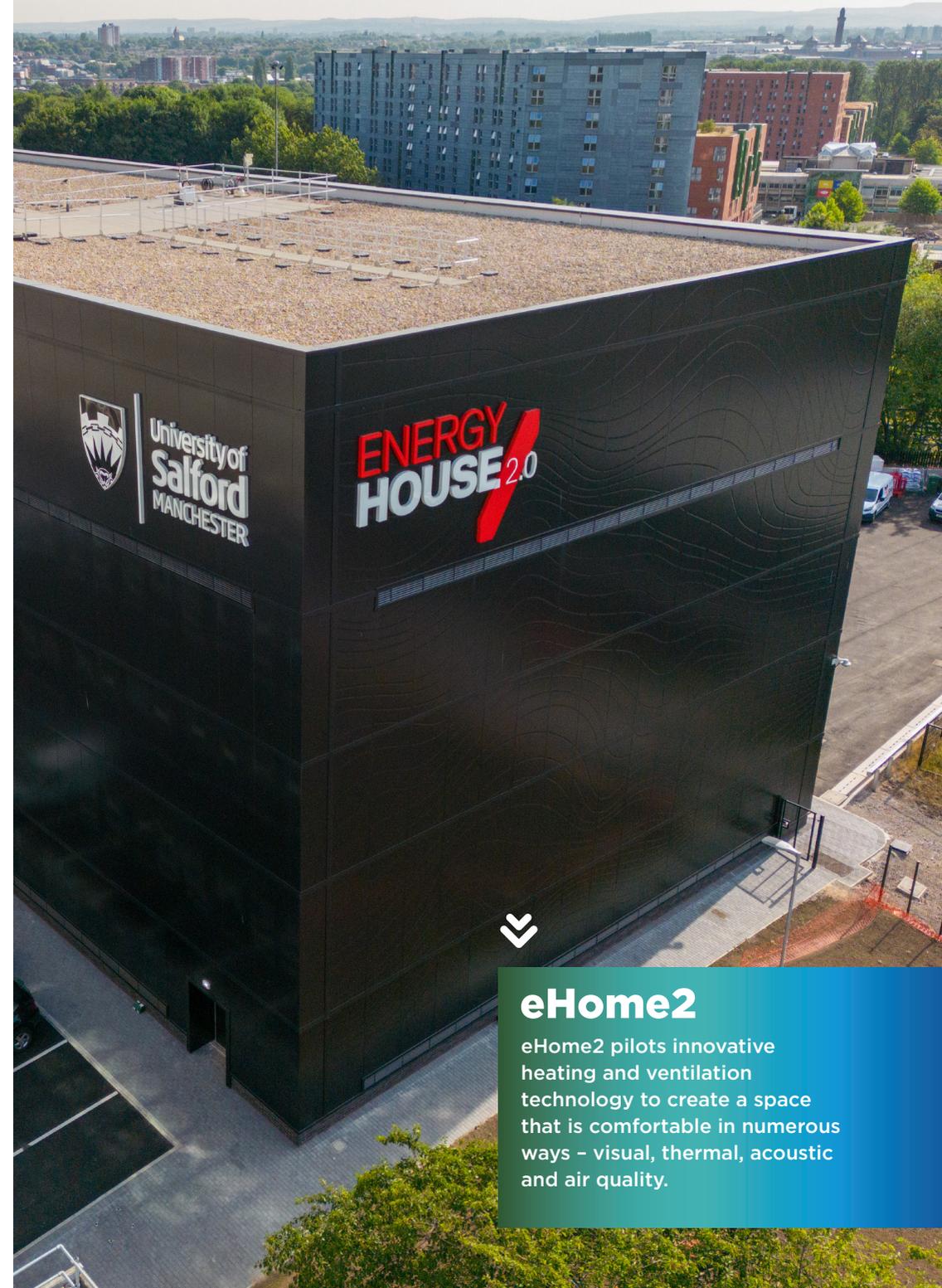
DID YOU KNOW?

Heating a room using the sun and other 'free' methods of climate control can help save up to 12.5% on your annual energy bill.

SMART TECHNOLOGY

eHome2's smart system controls everything from lighting and TVs to heating systems, electric vehicle charging points and window blinds. This system, provided by Loxone, can turn off lights and put devices on standby when rooms are empty - it can even turn off the heating when a window is left open. This can all be done with the click of a button or through voice command.

As extreme temperatures become more frequent, this system can help regulate the temperature in your home. In cooler weather, it can utilise solar gain by opening the blinds to passively heat rooms before activating the heat source. In hot weather, it can track the position of the sun to cool rooms automatically. The system can be controlled automatically through sensors, or manually through voice commands and smart home devices like Google Nest and Amazon Alexa.



eHome2

eHome2 pilots innovative heating and ventilation technology to create a space that is comfortable in numerous ways - visual, thermal, acoustic and air quality.

MODERN METHODS OF CONSTRUCTION

Modern Methods of Construction (MMC) is a process that focuses on off-site construction techniques. This includes mass production, timber frames and precast panels as alternatives to traditional building. eHome2 has been built using these methods and showcases how off-site lightweight solutions can play an important part in meeting the UK's first housing needs.

eHome2 includes:

Nuspan Flooring's structural insulated closed floor panels

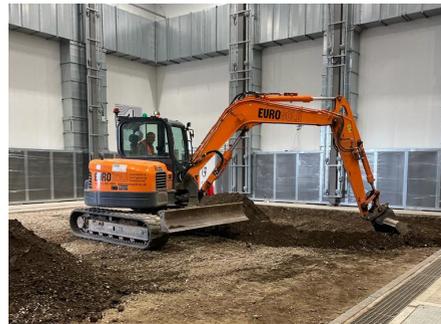
Scotframe's I-Stud timber frame system

Pasquill's Posi-Joist™ floor cassettes

Weber's weberwall brick



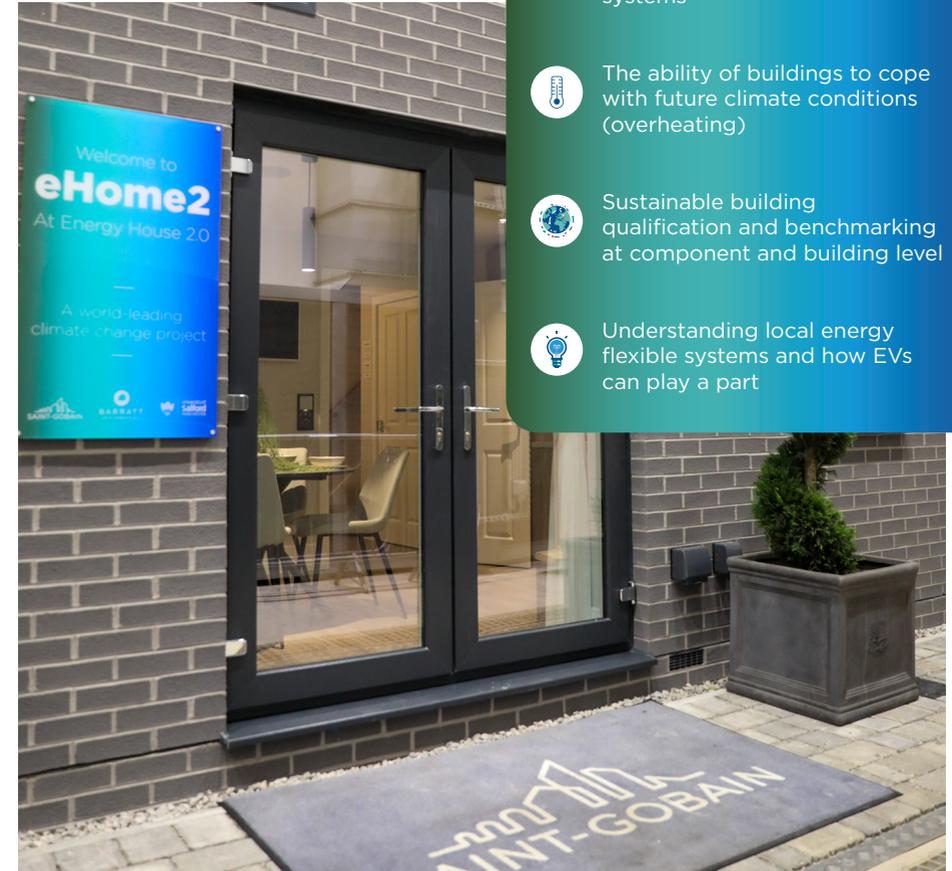
The off-site construction sector has long recognised the benefits of alternative brick systems compared to traditional brickwork. The embodied carbon of eHome2 has been significantly reduced through the use of a brick slip system from Weber, which has a fraction of the weight of traditional brick. The reduced thickness provided by the brick slip system means that weberwall brick can be installed over three times faster than traditional brick slips and can also significantly reduce site waste.



TESTING

The Energy House 2.0 facility has the capability to put buildings through a very wide range of climatic conditions. It is able to mimic the climate conditions of 95% of the world's populated areas, and will stress-test our building under extreme hot and cold climates, to provide data on energy efficiency and overheating in homes.

The nine-month testing period will encompass a range of tests. A large part of the research will focus on how different combinations of the technology, systems and fabric perform. The research team will examine all these variables under controlled conditions.



Tests for eHome2 will include:

-  Whole building performance testing and validation of future building concepts
-  Validation of building level thermal performance testing (QUB)
-  Running cost and comfort assessment of future electrified mechanical and electrical systems
-  The ability of buildings to cope with future climate conditions (overheating)
-  Sustainable building qualification and benchmarking at component and building level
-  Understanding local energy flexible systems and how EVs can play a part

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