The Green House Project

Huntingdonshire DISTRICT COUNCIL

working in partnership with

bre

Background and project details

The UK's housing stock is currently responsible for producing more than 40% of all carbon emissions. Whereas progress has been made on improving the energy performance of new build properties through the Code for Sustainable Homes, we must face the challenge of improving our existing housing stock if we are to meet the Government's target of reducing carbon emissions by 80% by 2050. The UK has the oldest existing housing stock in Europe, making up for over 90% of our homes. The majority of these properties will still be standing and occupied by 2050. It is essential that such existing properties are sustainably refurbished to help meet the challenges of climate change and rising energy costs.

In Huntingdonshire approximately 67,000 homes are privately owned. There is huge potential to improve the energy and water efficiency of these properties, which will help to reduce the district's carbon footprint and bring homes up to a higher level of environmental performance. It is now widely recognised as a priority to look at a 'whole house' approach to sustainable refurbishment. This not only addresses improving the building fabric, it also looks at other ways of reducing the carbon emissions such as efficient heating systems, renewable energy technologies, ventilation systems and water efficiency measures. If we are to tackle climate change effectively, we need to actively encourage this whole house approach and clearly demonstrate to the public how and why this must be done. Sustainable refurbishment not only benefits the environment, it also has financial benefits and encourages well being and healthy living for householders.

To maximise influence, Huntingdonshire District Council has acquired two properties, which will be sustainably refurbished and used as demonstration homes. Both properties are typically representative of the housing stock across the district in their age, construction and design. A key objective of the project is to demonstrate cost effective refurbishment, using local suppliers and affordable, efficient products, materials and appliances. HDC are working in partnership with the Building Research Establishment on this project, as part of their 'Rethinking Refurbishment' campaign, which will encourage a positive change in the UK housing agenda, highlighting the contribution that refurbishment has to play in reducing carbon emissions and encouraging best practice.

The BRE will be carrying out extensive 'before and after' tests on both of the properties to monitor the thermal performance, air tightness and acoustic levels. SAP assessments have been taken to show the existing energy use. Based on this data, the BRE have provided specifications for refurbishment measures, which will improve the energy rating, lower carbon emissions and reduce the environmental impact of the properties.

Different rationale will be taken for each property. One will represent what might be typically possible for a relatively low financial outlay, whilst still achieving a reasonable energy performance rating. The other, larger property will represent what can be achieved with more finance available for the work and will include a wider range of micro-generation renewable technology.

St Audreys Lane, St Ives

Manor Farm Road, St Neots

The UK housing stock currently emits approximately 150million tonnes of carbon dioxide each year... a large amount of this comes from older inefficient housing.

Green House Project

Sustainable Refurbishment Demonstration Properties

St Audreys Lane, St Ives

A detached, 2 bedroom house, built in the mid 1960's. This property currently has a single storey extension to the rear, which needs to be removed due to poor construction. This will be replaced by a two storey extension to the side and new single storey to the rear, stretching across the width of the house to provide extra living space.

This property will be used as the main exemplar, showcasing how emissions can be reduced through a number of different affordable measures.

Existing SAP rating:

Following the BRE tests and assessments, this property has achieved a SAP score of 48, with an Environmental Impact of 42 and a SAP rating of E.

Improved SAP rating:

By implementing the measures recommended by the BRE, the SAP rating can be increased to a B, with a SAP score of 85 and an Environmental Impact score of 88. This has been calculated to reduce CO2 emissions for heating and lighting the house and hot water production by approximately 4350kg.

Specifications for improvements:

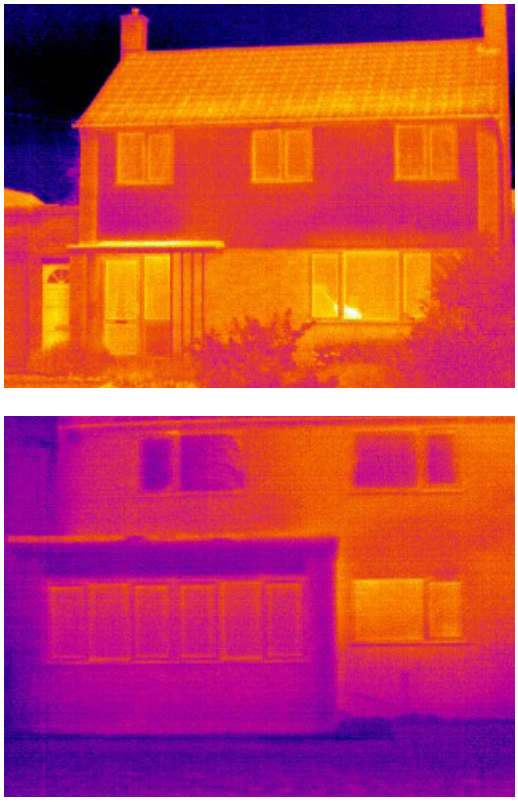
- Replacement of existing windows with timber framed, double glazed units acheiving a U-value of no less than 1.9.
- Windows to be set back in line with cavity to reduce opportunity for thermal bridging.
- Remove existing cavity fill in the existing external walls and replace with new foam material. Use a combination of brick and blockwork, fitted internally with 30mm Spacetherm, faced with 10mm Fermacell on the north wall at first floor level and east wall. The south wall will be fitted with 80mm of external insulation with a proprietary render finish. The extension will be constructed using the traditional brick and blockwork method, however it will have an enlarged cavity space to increase its thermal qualities. Target U-value for all external walls is 0.2.
- Replace the existing loft insulation with 250mm mineral fibre, giving a u-value of 0.16, with eaves and raft ventilators, allowing free flow of air circulation.
- Replace loft hatch with a sealed, insulated fitting, which can be clipped down.
- Additional insulation to be fitted to sloping roofs in bedrooms and bathroom. Eliminate cold bridging with Spacetherm for ease of installation, 20mm on Fermacell fixed directly to slope.
- Underfloor heating to be laid under new areas in the kitchen and dining room. This will have 70mm of insulation with 70mm concrete screed, allowing for heating pipes to be laid in.
- Dual flush toilets. Water saving taps, shower fitments. Bath to have 155 litres (capacity to overflow). Water efficient appliances.
- Fit rainwater hogs for rainwater harvesting, with a PV pump to move the water to a holding tank in the loft space, which will mains feed the WC's. Back-up mains will be installed for when there is lack of rainwater.

CO2 emissions before:	
Space Heating	4307kg
Water Heating	1049kg
Lighting	288kg

Projected CO2 emission after:	
Space Heating	990kg
Water Heating	600kg
Lighting	208kg

According to government figures, energy efficiency alone could reduce carbon emissions from our homes by 40%.

- All lighting will be low energy. Philips LED lighting range for significant savings on energy use and extended lamp life is recommended.
- Space heating will be provided by an air-source heat pump, with underfloor heating incorporated into the new kitchen and dining room areas. The lounge and bedrooms will have oversized radiators with the system designed to heat the lounge area to 21 degrees and the rest of the house to 19 degrees.
- Heating Save will provide a domestic building management system to be incorporated to the property, which will adjust the heat output and hot water use and generation, providing optimum use of the heating system and solar thermal hot water.
- Flat panel solar thermal hot water system to be fitted onto south facing roof, with a cylinder store, of which 129 litres will be provided by the solar thermal.
- Solar photovoltaic panels on the available south facing roof space for power generation. Over 1 meter sq in size will raise the SAP rating to 89 with an Environmental Impact of 93.
- Water attenuation green roof to be fitted onto single storey extension.
- Installation of a smart meter for long term data on the energy consumption of the property
- The driveway will be replaced with a Sustainable Urban Drainage system using permeable paving to allow surface water to pass between the blocks.



Thermal images clearly showing heat loss

Green House Project

Sustainable Refurbishment Demonstration Properties

Manor Farm Road, St Neots

A semi-detached 3 bedroom house, built in the early 1970's. This property will be used as a refurbishment exemplar demonstrating how a house from this era can have it's emissions reduced through a more limited number of affordable improvements.

Existing SAP rating:

Following the BRE tests and assessments, this property has achieved a SAP score of between 47 - 53, with a SAP rating of E.

Improved SAP rating:

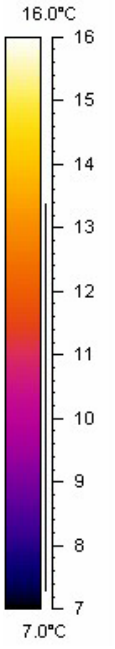
By implementing the measures recommended by the BRE, the SAP rating can be increased to a B, with a SAP score of 82 and an Environmental Impact score of 81. This has been calculated to reduce CO2 emissions for heating and lighting the house and hot water production by approximately 3450kg.

Specifications for improvements:

- Retain existing windows where possible and reseal. Full length window on the front elevation will be replaced with a low level wall and a new double glazed window to match. Windows need to achieve a u-value of 0.23. Replacement window will be double glazed, PVC-U with low emissivity hard finish.
- Remove the existing cavity fill in external walls and replace with new foam material.
- Internal insulation to be 30mm Spacetherm and Fermacell boarding.
- Throughout the inside surface of the external walls, Fermamcell is to be fitted using tape and joint boards. Total thickness will be 311mm approx. This should result in a u-value of 0.23.
- The new low level wall will be of the same construction as the existing wall so the internal finishes match. The U-value will be therefore be 0.23.
- Replace the existing loft insulation with 250mm mineral fibre, giving a u-value of 0.16, with eaves and raft ventilators, allowing free flow of air circulation.
- Replace loft hatch with a sealed, insulated fitting, which can be clipped down.
- All lighting to be low energy.
- Space heating will be provided by a high efficiency heat only boiler (91.3/5% efficient), with a room-sealed flue and fanned. This will be accompanied by full heating controls including a programmer, room thermostats and TRV's. The property has been connected to the mains gas network.
- For water heating there will be an evacuated tube solar thermal panel located on the south facing roof. A water cylinder will be fitted as a thermal store.
- This property is within 1 in 100 flood risk and measures will be put in place to mitigate this. Measures will include raising the level of the electric sockets to 1m above floor level and replacing the full length window on the front elevation with the low level wall and window.
- The front driveway will be fitted with a sustainable drainage system.

CO2 emissions before:	
Space Heating	3943kg
Water Heating	1344kg
Lighting	254kg

Projected CO2 emission after:	
Space Heating	1184kg
Water Heating	311kg
Lighting	127kg



Thermal images clearly showing heat loss

The UK government is committed to acheiving a target of 80% reduction in carbon emissions by 2020. Energy efficient housing plays a major part in this.

Green House Project

Sustainable Garden Design

Working with the Wildlife Trust, Cambridgeshire Biodiversity Partnership

The gardens at both of the properties will be designed in a 'widlife friendly' way to inspire visitors and help influence and educate on biodiversity. Each garden will contain a variety of features to satisfy both the needs of the residents and wildlife.

Potential Wildlife Garden features:

Flowers and herbs for nectar and pollen
Herb spiral with lavendar, thyme, rosemay and fennel
Native plants that flower across seasons

Grass area

The lawn areas are important for drainage. These will be laid as long lawns with wildflowers and short lawns for frequent use.
Wildflowers to be suitable for the area/soil type according to local wildlife areas.

Water Feature

Ideally a pond but alternatively a bird bath if space is limited
Provide a ground level water source for mammals.
Potential to incorporate a 'boggy area'.

Climbing Plants

To be aesthetically pleasing whilst providing cover for invertebrates over winter
Climbers provide ground cover quickly

Hedge/bushes

These will provide nesting sites for birds. Must be native species and preferably provide food for animals.

Refugia

Logpile - using native hardwood which will rot better.
Rockery with gaps in the rocks for amphibians and invertebrates to take cover.
Compost heap with timber frame.

Fruit and vegetables

Small local variety of apple and/or pear tree.
Currant bushes.
Vegetable patch with a selection of spring and winter produce.
Potatoes in planters where space is limited.
Herbs which are easy to access from the house.

Hard Structures

Fencing with holes at the bottom for mammal passage.
Water butt fitted to guttering.
Garden bench
Bird box, bat box and bug homes. Bird feeders.
Pots made out of recycled items, ie wellies, jugs, food tins, etc

Low cost sustainable materials will be used where possible. Local schools will be invited to become involved for the purpose of education and community engagement. Display boards with information on the features incorporated in the gardens will be designed and made by local community groups/school children using materials such as hand-made terracotta and plywood boards which can then be recycled.