ndhomes

Building For The Future

Carlisle Racecourse Housing Development

Energy Statement

THE CODE FOR SUSTAINABLE HOMES

Document (ix)

Racecourse Housing – Energy Statement

Energy Statement

Index

Racecourse Housing – Energy Statement

Introduction

Here at **ndhomes** we have set our standards high – all houses have been designed to achieve Level 4 of the Code for Sustainable Homes much sooner than Target. Level 4 has a minimum 44% reduction of carbon emissions over Building Regs 2006. Government Target is for all new homes to achieve Level 4 by 2013 we are 4 years ahead of Target.

ndhomes have met the BRE at Watford to review this Development, Oliver .M. Novakovic, Director of Futures Housing described the scheme as "an exciting and challenging project". A design stage assessment against the Code has been completed and registered with STROMA.

This will be the first Residential Development built to this high standard in Cumbria and the North West of England. Furthermore the BRE & STROMA have confirmed that this is the first housing development to be registered which is to built entirely to Level 4 in the UK.

We at **ndhomes** are pioneering these new Standards, which results in an exciting Market Leading Development of local, regional and national interest. Delivering efficiencies and reduced carbon emissions providing **ndhome** owners with greatly reduced annual running costs at a time when the cost of natural resources globally are rocketing and directly affecting day to day utility costs for us all.

Racecourse Housing – Energy Statement

Energy efficiency of the buildings

We have adopted the simple Design principle of decreasing thermal conductivity with modern insulative materials whilst maintaining good thermal mass within construction to reduce significant temperature fluctuations and alleviate the need for Summer cooling, this combined with the latest and most efficient methods of harnessing natural resources result in very efficient **ndhomes** :-

Simple summary : -

- Ground floor construction of concrete slab with 100mm PUR insulation with a screed over for under floor heating achieving a U-value of 0.16W/m^2K.
- New Build Walls - traditional masonry construction with 200mm of full cavity fill insulation to the walls of the dwellings achieving a U value of 0.15W/m^2K.
- Conversion Walls - using 150mm insulation to the inside of the existing walls achieving a U value of 0.20W/m^2K.
- New Build Intermediate floors - concrete beam and block with screed for under floor heating
- Conversion Intermediate floors – posi timber joists with 100mm of insulation between and 22mm V313 weyroc finish.
- Roof construction of 200mm PUR insulation between/under rafters achieving a U value of 0.14W/m^2K.
- Softwood, triple glazed low E coating windows with aluminium external sill achieving a U value of 1.00W/m^2K.
- Composite External door construction achieving a U value of 0.70W/m^2K.

The Code sets out clearly minimum daylight factors required for Sustainable Homes to provide sufficient daylight to each room reducing the use of artificial lights, making the home a healthier natural environment. We are providing 2% daylight factor to kitchens, 1.5% daylight factor to living, dining & study rooms. We have wherever practical Designed window areas on South elevations to maximize solar gain in the winter months thus reducing heating requirements.

An integral part of the energy efficiency of the building is ensuring air tightness. We have designed the building to achieve an air tightness of 3m^3/hr@50PA which greatly exceeds the current standard set out in Building Regs 2006.

By providing mechanical ventilation heat recovery units with a 90%+ efficiency rating we are ensuring the necessary controlled air changes within each dwelling are achieved whilst delivering healthy fresh supplies of pre-heated air avoiding heat being wasted by traditional extraction methods.

In considering renewable resources a balance has to be found between Capital cost and effective payback time/lifetime running costs. We have explored all currently available renewable technologies for this project.

Summary and The Energy Efficiency of the Buildings cont…

Once methods of construction were selected we began considering the most efficient method of providing heating and hot water for the dwellings. Considering all factors including though not limited to location / maintenance / aesthetics and of course life time running costs we investigated all available forms and technologies and have combined ultra efficient Air Source Heat pumps (up to 450% efficiency) with South facing Solar Thermal roof panels to provide very low running costs and significant carbon savings contributing significantly toward the 44% reduction required to achieve Level 4.

With Smart Controls integrated the systems are managed efficiently and automatically determine which system needs to make a contribution, when both systems are required and when indeed both can be closed down, this Smart Control is linked directly to the multi coil cylinder ensuring direct communication between point of source and demand. Output will be provided around 35-40 degrees C for under floor heating and 55-60 degrees C for hot water; under floor heating will have individual room temperature controls reducing wasted heat.

Low flow click taps, aerated showers, reduced capacity baths and cisterns all combine to further ensure efficient use of water; this is significantly further enhanced by Designing in a combination of Rain water and Grey water harvesting systems across the Development reducing total water demand by this New Residential scheme significantly.

Use of low energy lighting across the scheme further enhances the carbon efficiency of this Development.

Racecourse Housing – Energy Statement

Renewable resources considered

Ground source heat pumps

Due to the nature of the development there is insufficient garden space to install trenches for the "slinky's" which would mean boreholes would be required. The cost for undertaking the boreholes is significant; with the new generation of air source heat pumps which are very close to the co-efficiencies of ground source, the significant additional cost for the borehole installation would mean much more expensive properties, with long paybacks on the additional expenditure which would not be in the owner's interest.

Photovoltaic cells

There is the opportunity to install photovoltaic cells due to the orientation of the buildings with south east – south west facing roofs. However, the cost of installation of a 1KWP system is approximately £7000, the unit would only produce 750KWhrs per year which equates to a saving of approximately £75.00/yr giving a 90year+ payback period which would not be in the owner's interest.

Communal/individual Combined Heat & Power

Combined Heat and Power systems produce roughly twice as much waste heat as they generate electricity. To be viable economically they require a large and constant year round demand for heat. This makes their application to energy efficient new housing problematic and impractical.

The developments high insulation standards mean the requirement for space heating is very low and demand is present for only part of the year. The only constant source of heat demand is for domestic hot water and in terms of reducing Carbon emissions this is not enough in this instance to make an installation economically viable.

Wind

There is sufficient wind speed in the area to make turbines a viable option, however, the flow of the wind is obstructed by other buildings and trees making the flow mixed. Small scale wind turbines to each property would not produce enough power to be a viable option and would require additional lateral/vibration support to the building to cope with the load of a small turbine, there would potentially be planning issues with 34+ wind turbines in this location.

A large wind turbine would be a more viable option as it would get above the mixed wind flow, this could feed into a communal system, however, the operation/control of this would be difficult and there would potentially be planning issues with a large wind turbine in this location.

Passive stack ventilation

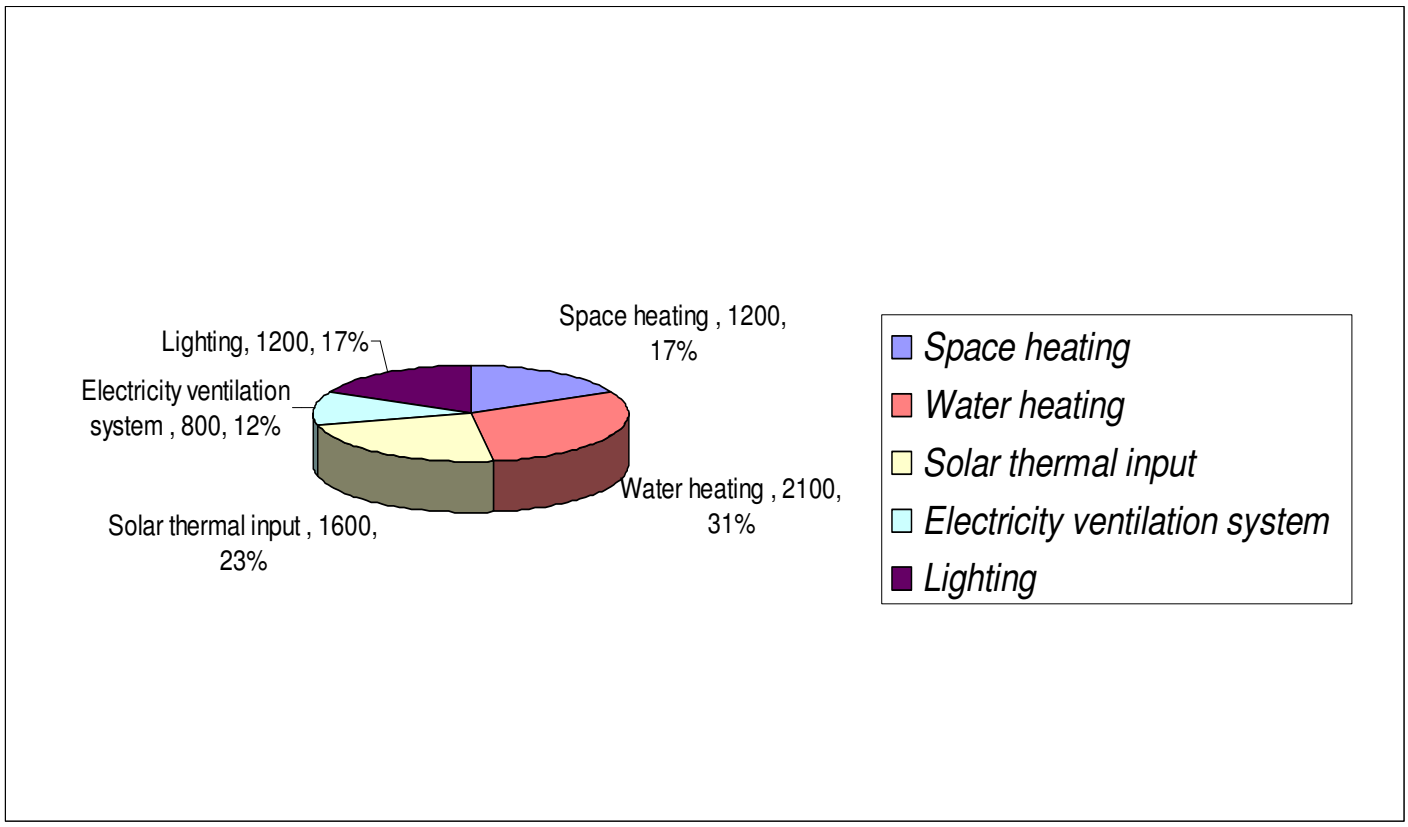
The design of these airtight buildings are more suited to a controlled ventilation strategy both for the movement of the right amount of air and to optimise energy efficiency. It is estimated that uncontrolled passive stack ventilation could, at best, waste up to 30% more heat than controlled heat recovery ventilation which has ruled this method out.

Biomass

The design of the buildings mean there is insufficient space for biomass storage. Although a stove would provide sufficient heat for the property, the distribution would not be efficient in four story dwelling, even taking account of the MVHR distributing the heat. The Biomass could not be used for hot water as potentially on a cloudy but warm day there could be insufficient sunlight to provide adequate hot water needs from the solar thermal, this would mean that an additional system would be required as well as the biomass which would further rule this out.

Racecourse Housing – Energy Statement

Example anticipated energy requirement for a typical 250m2 townhouse



250m2 Typical mid terrace house*

Total space heating requirement	1200kwhr's	£120/year	490kg CO2/year
Total water heating requirement	2100kwhr's	£210/year	900kg CO2/year
Total solar thermal input (free energy)	1600kwhr's	£160/year saving	675kg CO2/year saving
Total ventilation & pumps requirement	800kwhr's	£ 80/year	335kg CO2/year
Total lighting requirement	1200kwhr's	£120/year	505kg CO2/year
Total purchased energy/running cost	**5300kwhrs**	**£530/year**	**2230kg CO2/year**

* typical use example

Conclusion

Using the principals set out in the Summary and the energy efficiency of the buildings we have designed 42 dwellings which produce at least 44% less carbon than Building Regs 2006.

The method of construction we have chosen will provide the end user with a property which far exceeds standard building practice both in terms of efficiency and thermal comfort.

Due to the properties being extremely air tight with high levels of insulation and coupled to a 450% efficient heating system linked to solar thermal technology the running costs of the properties will be extremely low which is a priority in a time of spiraling fuel costs.

Mechanical ventilation heat recovery systems will save energy loss from passive systems whilst providing controlled fresh air to the required rate to make the building a healthy living environment.

We have strived to achieve this level of excellence without the use of add on technologies such as solar photovoltaic which provide the end user very little benefit but significantly affect the house prices.

Here at **ndhomes** we believe we have succeeded in all our design requirements, to provide a first for Carlisle, Cumbria the North West and the UK, pioneering to set the standards 5 years ahead of Government Targets **ndhomes** will deliver to its Clients a Sustainable Development of modern, efficient homes for the Future.