PROPOSED RESIDENTIAL DEVELOPMENT
Hill Street, Elsecar

CARBON REDUCTION REPORT

December 2017

8 Princes Square, Harrogate, HG1 1LX
Tel: 01423 506070/ 07779224474
Vat No: 861943012, Company Registration Number: 5404229

Introduction

This report has been prepared by Award Energy Consultants on behalf of the design team of the proposed development of 13 new build dwellings and the conversion and refurbishment of the Ticket Master's Office at Hill Street, Elsecar. This report considers and evaluates the measures incorporated into the design of the development to reduce the predicted carbon emissions of the site by 20% as per Barnsley Metropolitan Borough Council's planning requirements.

Policy Context

The following documents were considered:

Building Regulations 2013: for new build dwellings, Part L1A is of particular note; Part L1A sets minimum standards for fabric and energy efficiency for new build dwellings. The equivalent standard document for conversions is Part L1B to which the conversion of the Ticket Master's Office will conform

National Planning Policy Framework 2012: strengthens the emphasis on sustainable development, and requires new developments to secure the highest viable resource and energy efficiency and reduction in emissions by considering Governments and other national standards.

Barnsley Metropolitan Borough Council's Policy CSP 5: requires that all development incorporate decentralised, renewable or low carbon energy sources and other appropriate design measures sufficient to reduce the development's carbon dioxide emissions by at least 20%, subject to such measures being practicable and not unacceptably prejudicing the viability of the development.

Proposed Development

The proposed site is for 13 new build residential properties and 1 conversion, as detailed in the site layout plan below.

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Carbon Reduction Method (New Builds)

The carbon emissions from each new build property from space and water heating, ventilation, and lighting were calculated using SAP 2012 software. Data was entered in line with the design team's construction specification and drawings. The specification was amended where required to pass the minimum requirements of part L1A of the 2013 Building Regulations. The resulting SAP 2012 assessments were then used to calculate the total predicted carbon emissions from the site.

SAP 2012 software was then used to calculate the amount of photovoltaic (PV) power required to reduce the site's carbon emissions by 20%.

Table 1

Element	U-Value required By 2013 regulations*	Enhanced Specification
Walls (w/m^2k)	0.30	0.26
Roof (w/m^2k)	0.20	0.10
Floors (w/m^2k)	0.25	0.17
Windows (w/m^2k)	2.0	1.4
Doors (w/m^2k)	2.0	1.4
Design air pressure test ($m^3/h/m^2$)	10	5
Thermal bridging	-	ACD

* For U-values: See Approved Document L1a 2013 Building regulations

Results of Carbon Reduction Calculations (New Builds)

Table 2 below shows the predicted carbon emissions for each property type, along with the amount of photovoltaic panels required to meet the 20% carbon reduction requirement.

Table 2

Property Type	Carbon Emissions Baseline ($KgCO_2/m^2/Year$)	PV Applied (kWp)	Carbon Emissions with Photovoltaics ($KgCO_2/m^2/Year$)	% reduction in Carbon Emissions
Detached	14.24	1.31	11.39	20.00%
Semi-detached	18.59	0.67	14.80	20.41%
Bungalow	22.96	0.55	18.32	20.11%
Apartment (GF)	21.92	0.63	17.50	20.16%

Results of Carbon Reduction Calculations (New Builds) cont.

The weighted average baseline carbon emissions for the site are 17.94 Kg/m^2/year. The application of 12.27 kWp of photovoltaic panels results in weighted average carbon emissions of 12.27 Kg/m2/year. This represents a site-wide reduction in carbon emissions of 20.34%, as shown in Table 3.

Table 3

Property Type	No	Carbon Emissions Baseline ($KgCO_2/m^2$/Year) Weighted Average	PV Applied (kWp)	Carbon Emissions with Photovoltaics ($KgCO_2/m^2$/Year) Weighted Average
Detached	6	14.24	1.31	11.39
Semi-detached	2	18.59	0.67	14.80
Bungalow	1	22.96	0.55	18.32
Apartment (GF)	4	21.92	0.63	17.50
TOTAL	13*	17.94	12.27	14.29
Site-wide Carbon Reduction = 20.34%				

* Plot 14 is the proposed conversion of the Ticket Master's Office and the carbon emissions associated are detailed in on Page 6

Carbon Reduction Measures (New Builds)

The following summarises the proposed carbon reduction strategies that will be incorporated into the Part L1a 2013 designed dwellings.

- Highly efficient space and hot water heating systems. These will be accompanied, where feasible, by thermostatic controls, zoned heating and override facilities to ensure that heating is optimally controlled to use the least amount of energy
- High levels of insulation across all thermal elements within the build
- Lightweight thermal blocks will be used on this development as they are made of a sustainable material which has a high recycled content and excellent insulation and acoustic absorption properties
- High levels of air tightness to be achieved within the construction of the dwelling to reduce unnecessary heat loss
- Addressing Thermal Bridging limits heat loss across junctions; the design team have looked at the standard details for thermal bridging and, in consultation with the Aircrete Products Association, the Concrete Block Association and the Energy Savings Trust, have modelled and proven enhancements from ACD standard details.
- 100% dedicated low energy lighting

Carbon Reduction Measures (New Builds) cont.

- Windows and doors will be 30% more efficient than minimum standards with the Building Regulations
- All external light fittings will be provided with energy efficient light bulbs with appropriate control systems for efficient usage
- Natural ventilation is the most energy efficient form of ventilating a space. To this end, the dwellings will be naturally ventilated via open-able windows and trickle vents
- Sufficient glazing will be provided to the principal living rooms of each dwelling to ensure sufficient natural lighting, thus reducing the energy consumed in artificially lighting the room. In addition, it is well known that developments which are orientated to ensure that the principal glazed elevations are within 30 degrees of due south are most effective at utilising solar gain, thus reducing energy consumption. Where practicable and feasible this has been incorporated into the site design

Carbon Reduction Method (Conversion)

Due to the lack of carbon targets within Part L1b, Award Energy compared the CO_2 emissions in tonnes per year resulting from a specification meeting the minimum requirements within Part L1b and also the proposed enhanced specification, shown in Table 4

Table 4

Element	Baseline 2013 regulations*	Proposed Specification
Walls (w/m^{2}k)	0.30	0.21
Roof – slope (w/m^{2}k)	0.18	0.18
Roof – plane (w/m^{2}k)	0.18	0.14
Floors (w/m^{2}k)	0.25	0.21
Windows (w/m^{2}k)	1.6	1.6
Doors (w/m^{2}k)	1.8	1.8

* For U-values: See Approved Document L1b 2013 Building regulations

As can be seen in Table 5 below, the proposed specification for the conversion of the Ticket Master's Office results in a reduction in carbon emissions of **25.23%** though fabric improvements alone.

Table 5

Property Type	Carbon Emissions Baseline (t/Year)	Carbon Emissions Proposed Specification (t/Year)	% reduction in Carbon Emissions
Ticket Master's Office	3.25	2.43	25.23%

Conclusion

This report demonstrates that site-wide carbon emissions for the new build dwellings can be reduced by **20.34%** through the application of 12.27 kWp of photovoltaic panels, with the proposed carbon emissions of the Ticket Master's Office, when converted, reducing by **25.23%**. The development at Hill Street, Elsecar exceeding the 20% carbon reduction requirement of Barnsley Metropolitan Borough Council's planning policy CSP5.

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