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Energy Statement

Land to rear of 91 Station Road

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Contents

1 Introduction

This report has been prepared by FES on behalf of *Garland Cornelius Architects* to accompany the planning application for proposed development at the rear of 91 Station Road, Hampton. This report in particular includes the following;

- A calculation of the baseline carbon emissions of the development.
- An assessment of the potential of the most viable renewable and low carbon technologies

The following documents were considered when formulating the report.

Planning Policy Statement 1 (2007) – PPS 1 strengthens the emphasis on sustainable development, and requires new developments to "secure the highest viable resource and energy efficiency and reduction in emissions."

Planning Policy Statement 22 (2007) – PPS 22 calls for local authorities to actively encourage renewable energy development through local planning policy.

Building Regulations 2010 – Approved Document L1A *Conservation of Fuel and Power* sets minimum energy efficiency and fabric efficiency standards for new build properties.

CP1 of Richmond's Core Strategy – The London Borough of Richmond upon Thames requires the development to "conform to the Sustainable Construction checklist, including the requirement to meet CSH Level 3..."

CP2 of Richmond's Core Strategy – The London Borough of Richmond upon Thames requires the development to "achieve a reduction in carbon dioxide emissions of 20% from on-site renewable energy unless it can be demonstrated that such provision is not feasible."

London Plan 2011 – Policy 5.2 of the London Plan requires developments to achieve carbon dioxide emissions reductions expressed as a 25% reduction over Part L of the Building Regulations. Policy 5.4 details the presumption that renewable technologies will be included in designs to reduce CO_2 emissions by 20% where feasible.

2 Energy Strategy

2.1 The Context

The proposed works fall within the scope of Approved Document L1A 2010. The AD sets minimum fabric efficiency standards and a minimum emissions rate for new build properties. The table below summarises the key requirements

Table 1 – Minimum Fabric Efficiency Standards

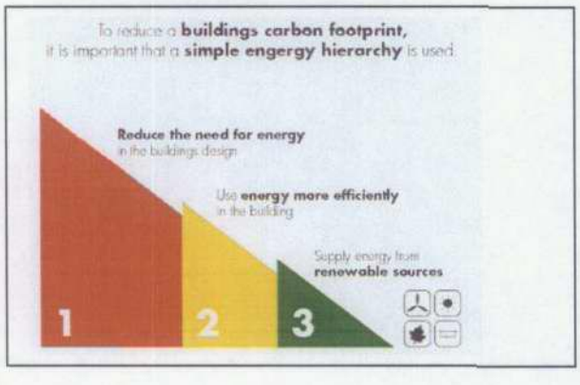
Thermal Element	Part L1A 2010 Minimum Standard
Wall	0.30W/m^2K
Roof	0.20W/m^2K
Floor	0.25W/m^2K
Glazing & Doors	2.20W/m^2K

2.2 Proposed Strategy

In line with best practice the proposed energy strategy for the development at 91 Station Road will adhere to the principles of the Energy Hierarchy;

- **Be Lean** – reduce the need for energy.
- **Be Clean** – supply and use energy in the most efficient manner.
- **Be Green** – supply energy from renewable sources.

The Energy Hierarchy



Adhering to the principles of the Energy Hierarchy has a number of benefits:

- By reducing the energy requirement of the dwelling the renewable requirement shrinks in proportion. This has obvious cost benefits.
- The sustainable credentials of the dwelling are enhanced and are not validated by simply bolting on expensive renewable equipment. By focusing on fabric

performance and the provision of efficient heating systems the dwelling is intrinsically "green".

The **lean** and **clean** measures are those measures which cumulatively reduce the energy requirement of the development through the provision of efficient building services and the construction of a thermally efficient building envelop. The measures included below constitute the lean and clean efforts.

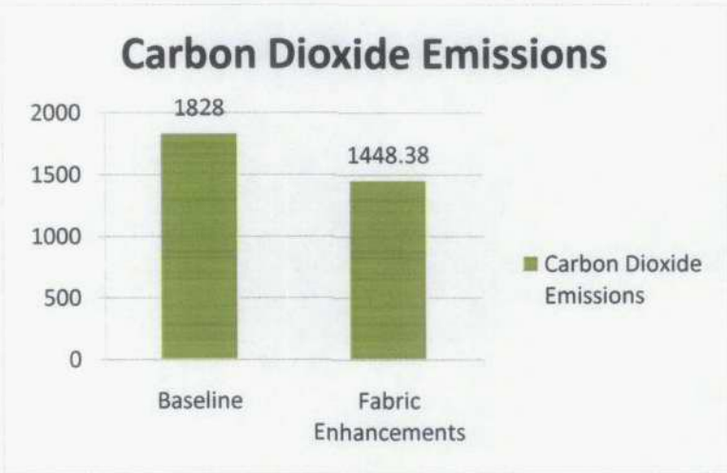
Table 2 – Specification

Element	Minimum Standard	Specification
Wall	0.30W/m^2K	0.22W/m^2K
Floor	0.25W/m^2K	0.18W/m^2K
Flat Roof	0.20W/m^2K	0.16W/m^2K
Pitched Roof	0.20W/m^2k	0.10W/m^2k
Glazing	2.00W/m^2k	1.40W/m^2K
Low E lighting	75%	100%

- Water consumption is included in the calculation of a property's energy requirement. Consequently the property will achieve a maximum internal water consumption of 105 litres per person per day.
- Efficient heating controls will be included in the heating design.
- Successive studies have shown that energy consumption decreases when occupants are made aware of their true energy consumption. Hence an energy display device will be installed in the property.

The property was modelled in SAP 2009 assuming an 88% gas boiler, in line with the *Standard Case* identified in ENE 7 of the Code for Sustainable Homes, to quantify the net carbon benefit of the fabric specification. The graph overleaf provides a comparison with the baseline emission rate (those associated with a dwelling constructed to the minimum standards).

Table 3 – CO_2 Emissions



3 Renewable & Low Carbon Technologies

The following technologies have been assessed:

- Solar Thermal
- Photovoltaic Panels
- Heat Pumps

3.1 Solar Thermal Panels

Solar thermal panels use radiant solar energy to heat water for domestic consumption. The system works successfully across the UK as they can work in diffuse weather conditions. In comparison to other technologies it is considered a reliable and proven technology. The system works most efficiently when the panel or evacuated tube is mounted on a 10-60° pitch facing due south, though other combinations do work successfully. During late spring to early autumn months, the system can be expected to meet some 70-90% of a dwellings domestic hot water needs.

Due to the relatively small size of the proposed property we judge that the *Alpha* solar thermal package to be the most appropriate for consideration. Unlike other solar thermal packages the system works with a combination boiler. Calculations confirm that this package has the potential to reduce emissions by a further **223.2kg/year** and achieve a **12%** reduction over Part L (assuming gas is the primary fuel).

The anticipated cost of such an installation will be roughly £5000 (a panel will be required to the front and rear of the property) with an anticipated payback period of 30+ years. Whilst the property does achieve the minimum ENE 1 requirements of the Code for Sustainable Homes Level 3, it does not achieve the London Plan target of a 25% reduction over the TER and would not achieve a financial payback. Thus we do not judge its inclusion appropriate.

3.2 Photovoltaic (PV)

Photovoltaic panels convert sunlight into electricity for use within a dwelling. PV panels use cells to convert light into electricity. A PV cell usually consists of 1 or 2 layers of a semi-conducting material such as silicon. The greater the intensity of sunlight, the more electricity is generated. PV systems can come in different forms. The most aesthetically pleasing are PV tiles which resemble roof tiles. However, the most popular are modules which can either sit on the roof or be integrated into it. The technology is most efficient when oriented due south. However, panels orientated south of east or west are suitable. Generally panels orientated away from due south require a greater surface area to generate a set amount of energy.

To achieve the London Plan target a PV array must be capable of offsetting some **397.2kg/year** of CO_2. This equates to a 1.05kWp PV array, as calculated by SAP Appendix M. Such a PV array will be roughly 7-8m^2 in panel size and will be split between the front and rear elevations.

Due to the orientation of the property we do not judge this technology worthy of further consideration. Panels orientated east/west have lower efficiencies, increased visual impact, and a much longer payback period.

3.3 Heat Pumps

Air Source Heat Pumps (ASHP) use the refrigeration cycle to take low grade heat from the external air and deliver it at a higher grade heat in a building. Heating is achieved through the routing of refrigerant between indoor and outdoor heat absorption and rejection equipment. The heat which is liberated in the indoor component is then used to heat water in a conventional low temperature hot water heating system. The heat generated is considered low grade heat (normally 45-55 degrees C) and as such is not suitable for conventional radiator systems.

Heat pumps are not a renewable technology as they use electricity. However they are recognised as a low carbon technology because they utilise a heat source which is naturally renewed in our environment. Furthermore the technology was eligible for funding under the Low Carbon Buildings Programme and will be eligible for funding under the Renewable Heat Incentive.

The full potential of this technology has been assessed and is detailed overleaf.

Heat pumps have CoPs in the range of 250%-350%. In other words they have the potential to produce 2.5kWs for every 1kw consumed and thus they greatly reduce a property's energy requirement. The table below details the proposed property's heating requirement, as calculated by SAP 2009.

Table 4 – Energy Requirement

	Energy (kWh/year)
Space Heating	3,235.62
Hot Water	2,093.02
Lighting	278.85
Pumps & Fans	175.00
Total	5,782.49

Should an ASHP be installed SAP 2009 calculates that the heat pump will consume some 2121.42kWh/year to meet the property's space heating and hot water requirement. Thus the heat pump will generate some **3,207.22kWh/year** or **55.4%** of the property's entire energy requirement.

There are numerous heat pumps in the market place, many of which have been tested and listed on SAP Appendix Q. Market leaders include *Mitsubishi, NIBE, Kingspan, Daikin* and *Bosche*. For the purposes of this report the *Kingspan Aeromax* has been assumed. The table below details the calculated emission rates.

Table 5 – Calculated Emission Rate

TER	42.66
DER	22.05
Improvement	48.30%

The addition of this heat pump reduces emissions by a further **217.99kg/year** when compared against the *Standard Case* (see page 5) and achieves a 48.3% reduction of Part L, thus adhering to the requirements of the London Plan.

4 Conclusion

FES was instructed by *Garland Cornelius* to review the proposed energy strategy for the development at the rear of 91 Station Road, Hampton and assess the most viable low carbon technology. Following a review we can confirm the following;

- The proposed fabric specification exceeds the requirements of Part L1A 2010 and adheres to the principles of the Energy Hierarchy.
- The betterments over AD L 2010 achieve a carbon reduction of **379.62kg/year** over the minimum standards required by Building Regulations.
- An investigation of the most suitable renewable and low carbon technologies has shown that the addition of an Air Source Heat Pump achieves further reductions in carbon emissions and will as a minimum achieve a 25% reduction over Building Regulations, thus satisfying the London Plan.

In conclusion we would recommend the adoption of the proposed fabric specification and the inclusion of an air source heat pump.

Disclaimer
This report is based on the information provided by the client. Should this prove to be inaccurate the findings and conclusions of this report will be invalidated.