



Replacement Dwelling at Crawford John, Upper Warren Avenue,
Caversham, RG4 7EB

Energy and Sustainability Statement
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17th August 2022

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Melin Consultants fully check all work prior to completion and a robust audit trail exists to demonstrate accountability.

All information within this document is based on evidence provided in the form of drawings and specifications.

CPD (Continual Professional Development) records are kept and all technical staff are required to complete a minimum 20 hours per year in training activities.

Low Carbon Consultants have the expertise and necessary qualifications to offer advice in a professional capacity on matters relating to Part L of the Building Regulations and sustainability within the construction sector.

This document contains the following information:

- Energy Statement, SAP Calculations

Project Ref: 303777 **Report Date:** 17/08/2022

Report author: Kyle Jones **Function:** Technical Consultant

Authorised by: Darren Baker **Function:** Senior Consultant

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1. Executive Summary

1.1 Overview

The Energy Statement provides a clear assessment of the proposed development's overall energy requirements and subsequent CO₂ emissions.

In formulating designed energy and carbon emissions FSAP2012 has been used to calculate the estimated CO₂ reductions.

The Sustainability Strategy provides information on proposed energy efficiency measures and other carbon reductions. It also provides a summary of proposed major fabric building materials, waste management and water management. It considers how the development maintains a balance of environmental, economic and social issues. Steps taken to promote an effective energy hierarchy are detailed.

1.2 Key Findings

The Energy Statement concludes that a minimum 19% reduction in carbon emissions can be provided from on-site renewable energy and energy efficient measures. To demonstrate this a system combining an air source heat pump (ASHP) with 2.8 kWp of photovoltaic (PV) solar panels will be required to meet the necessary requirements.

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Wed 17 Aug 2022 13:24:52

Project Information			
Assessed By	Kyle Jones	Building Type	House, Detached
OCDEA Registration	STRO037434	Assessment Date	2022-08-16

Dwelling Details			
Assessment Type	As designed	Total Floor Area	447 m ²
Site Reference	709352	Plot Reference	709352
Address	Crawford John, Upper Warren Avenue, Caversham, READING, RG4 7EB		

Client Details	
Name	John Otken
Company	Not Provided
Address	Crawford John, Upper Warren Avenue, Caversham, READING, RG4 7EB

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Electricity	
Target carbon dioxide emission rate	8.68 kgCO ₂ /m ²	
Dwelling carbon dioxide emission rate	4.53 kgCO ₂ /m ²	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	47.43 kWh _{pe} /m ²	
Dwelling primary energy	47.42 kWh _{pe} /m ²	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	49.2 kWh/m ²	
Dwelling fabric energy efficiency	48.9 kWh/m ²	OK

The baseline TER for the dwelling is 8.68 kg/m². With the inclusion of energy efficient measures, the DER of 4.53 kg/m² shows a greater than 47.81% reduction in CO₂ emissions.

1.3 DER/TER Comparison

	Result
TER (Target Emission Rate)	8.68
DER (Dwelling Emission Rate)	4.53
% Reduction	47.81

2. Introduction

2.1 Background

This Statement has been prepared by Melin Consultants considering *Reading Borough Council Sustainable Design and Construction Plan*.

It is intended to provide a clear and straightforward assessment of the proposed development's energy requirements and subsequent CO₂ emissions.

The *Reading Borough Council Sustainable Design and Construction Plan* requires developments to provide sufficient renewable energy generation and/or energy efficient measures to reduce the carbon emissions from the building by 19%.

This Statement assesses expected energy demand at the site, showing how carbon dioxide emissions will be reduced through designing for minimum energy use and installing on-site renewable energy.

2.2 Policy Requirements

In writing, this report the following policies and guidance have been adopted.

2.2.1 Reading Borough Council Sustainable Design and Construction Plan (December 2019)

Submission Requirements:

- a) Applicants need to demonstrate how they will comply with the relevant policies in the Local Plan. This section outlines what information is required to be submitted at the pre-application stage, at application stage, and what aspects might be considered later by condition.
- b) To comply with the relevant policies and standards on energy, a combination of measures including those for energy efficiency, energy conservation and inclusion of renewable or low carbon sources should be considered and factored in from the design stage onwards.
- c) Sustainability Statements typically require the developer to consider all aspects of development form which can contribute to securing high standards of sustainable development from the outset, including but not limited to:
 - Energy efficiency and carbon emissions of the building;
 - Water conservation;
 - Flood risk and drainage strategy;
 - Community impacts;

- Transport;
- Health and Wellbeing including day-lighting analysis and thermal comfort;
- Material usage, wastage, responsible sourcing and environmental impact, including embodied carbon;
- Pollution issues, low NOx, low global warming potential (GWP), reducing need for mechanical cooling;
- Ecological aspects to enhance the proposed developments for flora and fauna; and
- Best practice management of the site.

d) Energy Statements demonstrate how the energy related aspects of the proposed development actually meets the requirements of local planning policy and BREEAM energy and emissions standards. An energy statement would typically include the following information:

- Energy efficiency of the building;
- Baseline annual predicted energy demand of the development (regulated and unregulated);
- Baseline annual predicted carbon emissions of the development (regulated and unregulated), the Target Emission Rate (TER);
- The contribution of each proposed renewable energy technology;
- Cost information of technically feasible low or zero carbon renewable technologies, including additional insulation, low carbon decentralised energy, heat pumps etc;

- Feasibility of district or community heating;
- Summary of the benefits of various energy technologies;
- The total estimated reduction in the development's baseline carbon and/or energy emissions.

Required level of sustainability standard:

Table 1 – Required standard corresponding to development size.

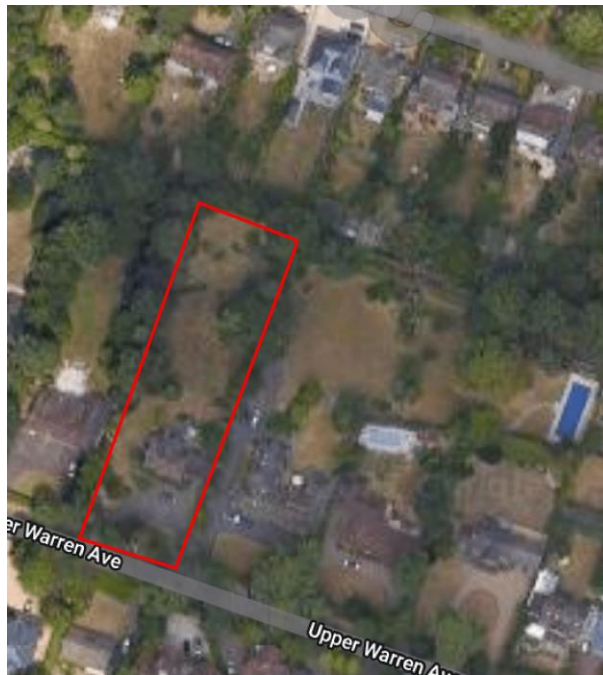
	Size of Development	Required Standard
New-build residential	Minor (fewer than 10 dwellings)	19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations
	Major (10 dwellings or more)	Zero Carbon (or if unachievable, a minimum 35% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations and planning contribution to offset remaining carbon emissions to zero)

3. Site Analysis

3.1 Location

The proposed development is located off Upper Warren Avenue, North of the River Thames. Figure 1 below highlights the area of the development.

Figure 1 - Map highlighting the location of the site and its surroundings



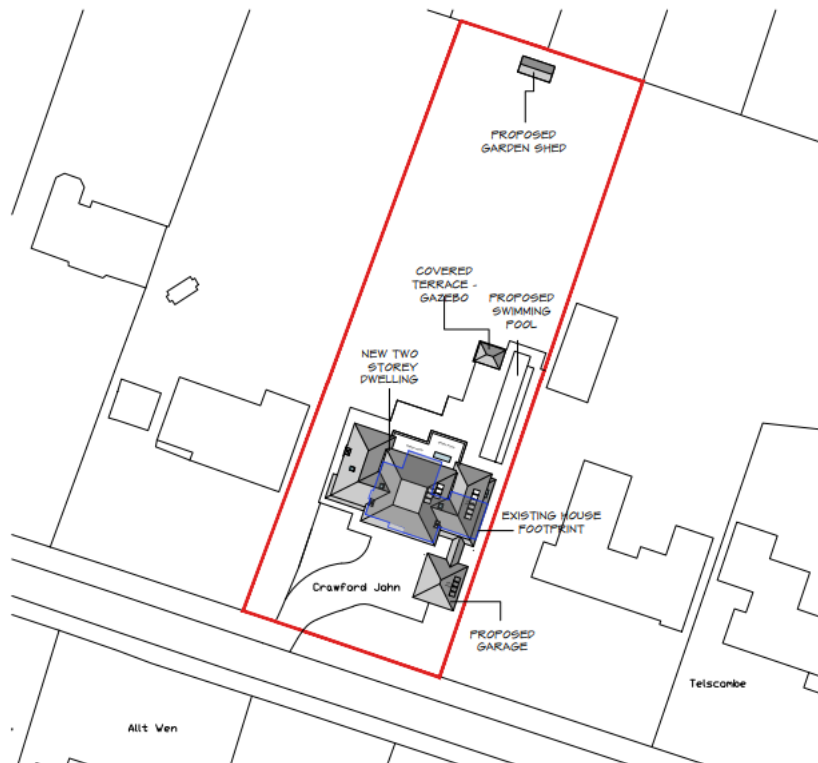
The closest train station is Reading on Station Road, which is approximately 1.9 miles from the development site by road. This provides services to London Paddington, London Waterloo, Newbury, Swansea, Manchester Piccadilly, Great Malvern, Redhill, Didcot Parkway and Bristol Temple Meads.

The nearest bus stop is on Highmoor Road Church, approximately 0.4 miles away which has the 146 buses on route. Additionally, there are a few more bus stops nearby such as Harrogate Road, approximately 0.6 miles away and St Peters Avenue, 0.8 miles away.

3.2 The Development

The proposed development will consist of the demolition of an existing dwelling and the subsequent construction of a new 2 story dwelling with a garden, garden shed, gazebo and swimming pool.

Figure 2 – Proposed site plan with existing house footprint.



4. Energy Efficient Design Measures

To supplement Reading Borough Council requirements for sustainable construction the design team have considered the three issues that contribute to the proposed developments overall sustainability. These are environmental, economic and social.

4.1 Solar/Daylighting

The proposed development will make good use of glazing to all elevations to help reduce internal lighting loads.

4.2 Lighting

It has been assumed within the calculations that all internal lighting will be low energy fittings. To be classified as a low energy light fitting under the Domestic Building Services Guide the fitting must have an efficacy of 45 lumens per circuit watt or higher.

In addition, all external security and safety lighting will be fitted with daylight and movement sensors.

4.3 Heating, cooling & DHW strategy

The proposed heating and domestic hot water strategy is likely to be from a highly efficient air source heat pump with an efficiency of at least 270%, and has therefore been used for the purposes of this report.

4.4 Ventilation strategy

A Mechanical Ventilation Heat Recovery (MVHR) system has been specified which will ventilate the proposed development.

4.5 Water use

In order to meet Building Regulations requirements, water usage must not exceed 110 Litres/person/day in line with Enhanced Building Regulations Part G criteria. To achieve this the following fittings will be required:

- WCs – dual flush 6 (full flush), 3 (part flush)
- Kitchen taps – 8 litres per minute
- Basin taps – 3 litres per minute
- Baths – 180 litre capacity
- Showers – 8 litres per minute

All development will be required to provide a Drainage Strategy. Development will be expected to incorporate Sustainable Drainage Systems and ensure that run-off rates are attenuated to greenfield run-off rates. Higher rates would need to be justified and the risks quantified. Development should strive to reduce run-off rates for existing developed sites).

4.6 Materials

Where possible, it is proposed that construction materials will be purchased from sources that minimise carbon emissions and/or come from sustainable sources. The environmental policy and sustainability policy for each manufacturer shall be carefully considered before orders are placed.

Where possible, timber should be sourced that has Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC) certification. This is to ensure that the timber is legally and sustainably sourced.

4.7 Energy Efficiency Measures

To reduce the energy demand within the dwelling, low U values, Accredited construction details and low air permeability figures have been used. The U values we have used are as follows:

- Floor – 0.11 W/m²K
- External Wall – 0.20 W/m²K
- Slope Roof – 0.13 W/m²K
- Flat Roof – 0.14 W/m²K
- Doors – 1.00 W/m²K
- Windows – 1.20 W/m²K
- Accredited Construction Details have been adopted
- MVHR unit – Vent Axia Kinetic Plus E used
- An air test figures of 4.3 m³/h/m² at 50Pa has been used
- ASHP – Viessmann Vitocal 200-A

4.8 Reducing surface water run-off

A formal strategy to reduce surface water run-off is not yet available. A detailed design for the management of surface water will be provided prior to the development commencing and approved in writing by the local planning authority.

4.9 Renewable technologies

Several low carbon and renewable technologies have been considered for the proposed scheme.

A summary of the suitability of each technology is listed in the following table.

Table 3 – Summary of renewable technology

Solar PV
Solar PV lends itself to the proposed development with minimal obstruction and a significant available installation area. The electricity demand of the proposed building is not going to be significant during period of occupation and a 19% reduction in carbon emissions is achievable by using this technology on its own, although this may require large areas of PV panels.
Solar thermal

The proposed development would have low to medium hot water demand which, if sized correctly, lends itself to solar thermal. It is unlikely that the full 19% reduction in carbon emissions could be achieved with this system alone as a large area of solar thermal panels would be required to achieve this.

Air source heat pumps

Air source technology is a potential technology that could be used on the proposed development. It would require wall or roof mounted plant which may present visual issues. It is unlikely that the full 19% reduction in carbon emissions could be achieved with this system alone

Biomass

Biomass is a potential technology for the site however, space for fuel storage won't be an issue within the development. Biomass boilers do not modulate as well as a conventional fuel boiler and would therefore require a constant heat demand to be sized correctly. It is unlikely that the full 19% reduction in carbon emissions could be achieved with this system alone

Ground source heat pumps

The energy demand of the proposed development would be suitable for ground source technology. Further investigation would be required into the area required for the external works and whether the Geology of the site is suitable. It is unlikely that the full 19% reduction in carbon emissions could be achieved with this system alone

Water source heat pump

The energy demand of the proposed development would be suitable for water source technology. Further investigation would be required into

the area required for the external works and whether the Geology of the site is suitable. It is unlikely that the full 19% reduction in carbon emissions could be achieved with this system alone

Wind

The estimated wind speed for the location and surrounding obstructions do not lend itself to this technology.

CHP

Low electricity demand makes CHP an unviable option for this development.

5. Baseline Energy Demand and CO₂ Emissions

5.1 Energy Benchmarks

Energy performance benchmarks for the proposed development are taken from 'Energy efficiency in buildings' CIBSE Guide F (2012) and where appropriate data from relevant design team members and thermal modelling calculations.

To demonstrate how the development has reduced carbon emissions by a prescribed amount, technical calculations (FSAP10) provide target CO₂ emissions (TER) for a building that is compliant with Part L1a 2022 followed by a final set of calculations that provide the dwelling CO₂ emissions (DER) for a building with renewables.

5.2 Reduction in energy usage through on-site renewable technology and energy efficient measures

In order to achieve the 19% reduction in carbon emissions, several renewable technologies have been considered for the proposed development (Solar Thermal, Solar PV, Wind, ASHP, GSHP, WSHP, CHP and Biomass). A system combining an air source heat pump (ASHP) with 2.8 kWp of photovoltaic (PV) solar panels has been determined to be the best way to meet the required reduction.

5.3 Regulated Energy

All our calculations have been based on regulated energy, which includes all energy used for space and water heating, electricity for lighting and all other fixed items such as pumps and fans. The regulated energy has been calculated using FSAP 10 software.

5.4 Unregulated Energy

To calculate the unregulated energy used by the dwelling, the formulas outlined in Section 16 of the Standard Assessment Procedure for Energy Rating of Dwellings (SAP) methodology have been used. Unregulated energy includes all energy used for cooking and appliances.

6. Energy Statement for the Chosen Technology

Based on the information provided in the above report, below is a summary of the savings:

	CO ₂ emissions (kg/m ² pa)
TER (Target Emission Rate)	8.68
DER (Dwelling Emission Rate)	4.53
Reduction in emissions from the use of renewable sources	4.15
Percentage reduction from the use of renewable sources	47.81%
Unregulated Energy (Emission Rate)	10.50

7. Energy Efficiency Measures included in Calculations per dwelling.

Element or System	Part L 2022	Proposed
Wall	0.26	0.20
Roof	0.16	0.14/0.13
Floor	0.18	0.11
Windows/Rooflights/Doors	1.40	1.20/1.00
Ventilation system		MVHR – Vent Axia Kinetic Plus E
Air Permeability	8.00	4.3
Heating System		Air Source Heat Pump (ASHP) – Viessmann Vitocal 200-A with 272.1% efficiency
Secondary Heating		Log burner
Energy efficient lighting	75%	100%

8. Conclusion

With the inclusion of energy efficient measures including a lower air test figure in addition to a highly efficient Viessmann Vitocal 200-A Air Source Heat Pump and 2.8 kWp of PV, the proposed development can demonstrate a potential to reduce carbon emissions by greater than 47.81% over a Building Regulations 2022 target emissions rate as outlined in the table above. This exceeds the requirement of 19% set out by Reading Borough Council for minor developments.

Appendix A:

Software Outputs

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Stroma SAP 10.2 SAP 10 program, 10.2

Date: Wed 17 Aug 2022 13:24:52

Project Information			
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OCDEA Registration	STRO037434	Assessment Date	2022-08-16

Dwelling Details			
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Client Details	
Name	John Otken
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This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	8.68 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	4.53 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	47.43 kWh _{PE} /m ²		
Dwelling primary energy	47.42 kWh _{PE} /m ²		OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	49.2 kWh/m ²		
Dwelling fabric energy efficiency	48.9 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.2	External walls (0.2)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.11	Not Provided (0.11)	OK
Roofs	0.16	0.13	Flat ceiling (0.14)	OK
Windows, doors, and roof windows	1.6	1.19	3 (1.2)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: External walls	285.29	0.2	
Ground floor: Not Provided	257.05	0.11	
Exposed roof: Sloped ceiling	208.85	0.13	
Exposed roof: Flat ceiling	55.33	0.14	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
1, Doors	2.63	South	0.7	1 (!)
2, Doors	2.14	East	0.7	1 (!)
3, Windows (1)	29.59	South	0.7	1.2
4, Windows (1)	6.06	East	0.7	1.2
5, Windows (1)	5.23	West	0.7	1.2
6, Windows (1)	52.31	North	0.7	1.2
7, Roof windows (1)	0.75	East	0.7	1.2
8, Roof windows (1)	1.44	North	0.7	1.2
9, Roof windows (1)	0.43	West	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.3	Not Provided
External wall	E3: Sill	Not government-approved scheme	0.04	Not Provided
External wall	E4: Jamb	Not government-approved scheme	0.05	Not Provided
External wall	E5: Ground floor (normal)	Not government-approved scheme	0.16	Not Provided
External wall	E6: Intermediate floor within a dwelling	Not government-approved scheme	0.07	Not Provided
External wall	E11: Eaves (insulation at rafter level)	Not government-approved scheme	0.04	Not Provided
External wall	E14: Flat roof	Not government-approved scheme	0.08	Not Provided
External wall	E16: Corner (normal)	Not government-approved scheme	0.09	Not Provided
External wall	E17: Corner (inverted - internal area greater than external area)	Not government-approved scheme	-0.09	Not Provided
Roof	R1: Head of roof window	Not government-approved scheme	0.08	Not Provided
Roof	R2: Sill of roof window	Not government-approved scheme	0.08	Not Provided
Roof	R3: Jamb of roof window	Not government-approved scheme	0.08	Not Provided
Roof	R6: Flat ceiling	Not government-approved scheme	0.06	Not Provided

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	4.3 m ³ /hm ² , Design value	OK
Air permeability test certificate reference	Not Provided	

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	226.7%	
Emitter type	Both radiators and underfloor	
Flow temperature	35°C	
System type		
Manufacturer		
Model		
Commissioning		
Secondary heating system: Closed room heater		
Fuel	Wood logs	
Efficiency	65.0%	
Commissioning		

5 Hot water

Cylinder/store - type: Cylinder		
Capacity	300 litres	
Declared heat loss	1.95 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.45 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	94%	OK
Manufacturer/Model		
Commissioning	Not Provided / Not Provided	
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	2.8 kWp	
Orientation	East	
Pitch	30°	
Overshading	None or very little	
Manufacturer	Not Provided	
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		