BakerBrown

Information to comply with planning condition n22

Project
Replacement Dwelling.

Project Number
1512

Document Reference
1512_BB_RP_4002

Site Location
Badan Lodge,
Cuilfail,
Lewes,
BN7 2BE

bakerbrown.studio +44 (0)1273 400 319 info@bakerbrown.studio

Contents

The purpose of this document is to satisfy the requirements of Planning Condition n22, stating:

Prior to the commencement of the development hereby permitted, detailed information in a Design Stage Sustainable Construction Report in the form of:
a) Design-stage SAP 10 assessment for the dwelling
b) Design-stage plan and specification for 1 no. electric vehicle (EV) charge points.
c) Design-stage BRE water calculator.
d) Product specification for EV, ASHP, PV, waste facilities, and materials; and
e) Grown in Britain or FSC certificates.
f) Sustainable materials and building design details.

Demonstrating that the development will:
a) Reduce predicted CO_2 emissions by at least 19% due to energy efficiency measures and onsite renewable energy, compared with the maximum allowed by Part L1 2013
b) Provide 1no. electric vehicle (EV) charge points, in a suitable location to ensure simultaneous charging, with a minimum power rating output of 7kW and a universal socket.
c) Have predicted water consumption of no more than 110 litres per person per day.
d) Have separate internal bin collection for recyclables matching local waste collection service; and
e) Have a private compost bin.
f) The building and landscaping are designed to adapt to climate change including overheating risk.
And providing evidence demonstrating a selection of sustainable materials shall be submitted to, and approved in writing by, the Local Planning Authority. The development shall be built in accordance with these agreed details.

Reason: To ensure the development demonstrates a high level of sustainable performance to address mitigation of, and adaptation to, predicted climate change.

1.0 Required Information

1.1

Design-stage SAP 10 assessment for the dwelling (point a)

— The following pages inlcude the completed SAP Design Stage 10 report prepared by Dynamic Energy, which demonstrates compliance and that the dwelling will reduce predicted CO2 emissions by at least 19% due to energy efficiency measures and onsite renewable energy, compared with the maximum allowed by Part L1 2013

1.1

Design-stage SAP 10 assessment for the dwelling (point a)

Building Regulations England Part L (BREL) Compliance Report

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

Date: Tue 27 Feb 2024 15:42:46

Project Information			
Assessed By	Derek White	Building Type	House, Detached
OCDEA Registration	EES/004958	Assessment Date	2024-02-27

Dwelling Details			
Assessment Type	As designed	Total Floor Area	275 m^2
Site Reference	Badan Lodge Cuilfail BN7 2BE	Plot Reference	001
Address			

Client Details	
Name	Baker Brown Studio
Company	Baker Brown Studio
Address	Cookbridge Station Road, Cookbridge, BN8 4SW

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	*8.18 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	1.16 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*45.8 kWh_{PE}/m^2*	
Dwelling primary energy	14.64 kWh_{PE}/m^2	OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency		
Target fabric energy efficiency	*53.1 kWh/m^2*	
Dwelling fabric energy efficiency	50.4 kWh/m^2	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.26*	0.12	Walls (1) (0.12)	OK
Party walls	*0.2*	N/A	N/A	**N/A**
Curtain walls	*1.6*	N/A	N/A	**N/A**
Floors	*0.18*	0.12	FT1 - Retained (0.16)	OK
Roofs	*0.16*	0.1	Roof (1) (0.1)	OK
Windows, doors, and roof windows	*1.6*	0.89	H-ER.101 (1.3)	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^2K]**
Exposed wall: Walls (1)	4.96215	0.12 **(!)**
Exposed wall: Walls (2)	9.986	0.12 **(!)**
Exposed wall: Walls (3)	50.04345	0.12 **(!)**
Exposed wall: Walls (4)	95.29	0.12 **(!)**
Exposed wall: Walls (5)	37.19	0.12 **(!)**
Ground floor: FT1 - Retained, FT1 - Retained	96.13999938964844	0.16
Ground floor: FT2 - New slab, FT2 - New slab	85.4000015258789	0.1 **(!)**
Ground floor: FT3 - new block, FT3 - new block	47.2599983215332	0.09 **(!)**
Ground floor: FT4 - new timber, FT4 - new timber	34.34000015258789	0.13
Exposed roof: Roof (1)	96.827201831055	0.1 **(!)**
Exposed roof: Roof (2)	150.3075	0.1 **(!)**

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
SE-ED.008, SE-ED.008	2.1483	South East	0.7	0.83 **(!)**

1.1

Design-stage SAP 10 assessment for the dwelling (point a)

Name	Area [m²]	Orientation	Frame factor	U-Value [W/m²K]
SW-ED.001, SE-ED.008	5.7939	South West	0.7	0.83 (!)
NE-EW.012, SE-ED.008	1.6695	North East	0.7	0.83 (!)
NE-ED.007, NE-ED.007	6.531	North East	0.7	1.04 (!)
SE-ED.006, NE-ED.007	6.5394	South East	0.7	1.04 (!)
NE-EW.011, NE-EW.011	1.2285	North East	0.7	0.81 (!)
NE-EW.010, NE-EW.011	1.2285	North East	0.7	0.81 (!)
NE-EW.009, SE-ED.008	1.02375	North East	0.7	0.83 (!)
NE-EW.008, SE-ED.008	1.02375	North East	0.7	0.83 (!)
SW-ED.005, SW-ED.005	2.016	South West	0.7	0.8 (!)
NW-EW.007, SW-ED.005	1.5057	North West	0.7	0.8 (!)
SW-EW.006, SW-EW.006	3.2907	South West	0.7	0.71 (!)
NW-ED.004, SW-ED.005	2.016	North West	0.7	0.8 (!)
NW-EW.005, NW-EW.005	2.73	North West	0.7	0.74 (!)
NW-EW.004, NW-EW.005	1.362	North West	0.7	0.74 (!)
NW-ED.003, NW-ED.003	5.65065	North West	0.7	1.08 (!)
SW-EW.003, SW-EW.003	2.4435	South West	0.7	0.79 (!)
SW-ED.002, SW-ED.002	13.10655	South West	0.7	0.78 (!)
SE-EW.002, SE-EW.002	1.767	South East	0.7	0.75 (!)
SE-EW.001, SE-EW.002	1.767	South East	0.7	0.75 (!)
SW-ED.101, SW-ED.101	5.3751	South West	0.7	0.82 (!)
SW-EW.101, NE-EW.011	2.172	South West	0.7	0.81 (!)
NW-EW.103, NW-EW.103	1.362	North West	0.7	0.88 (!)
NW-EW.102, NW-EW.102	1.4376	North West	0.7	0.86 (!)
H-ER.101, H-ER.101	2.55	Horizontal	0.8	1.3
NE-ER.102, NE-ER.102	0.93	North East	0.8	1.2
NE-ER.102, NE-ER.102	0.93	North East	0.8	1.2
H-ER.104, H-ER.101	0.8925	Horizontal	0.8	1.3
NE-ER.105, NE-ER.102	0.8928	North East	0.8	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)	Calculated by person with suitable expertise	0.05000000074505806	
External wall	E3: Sill	Calculated by person with suitable expertise	0.05000000074505806	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.05000000074505806	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.1599999964237213	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 (!)	
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.03999999910593033 (!)	
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.07999999821186066	
External wall	E15: Flat roof with parapet	Calculated by person with suitable expertise	0.5600000023841858	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.09000000357627869	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.09000000357627869	
Roof	R1: Head of roof window	SAP table default	0.24	
Roof	R2: Sill of roof window	SAP table default	0.24	
Roof	R3: Jamb of roof window	SAP table default	0.24	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m³/hm²*	
Dwelling air permeability at 50Pa	3 m³/hm², Design value (!)	OK
Air permeability test certificate reference		

1.1

Design-stage SAP 10 assessment for the dwelling (point a)

4 Space heating		
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	388.9%	
Emitter type	Both radiators and underfloor	
Flow temperature	35°C	
System type	Heat Pump	
Manufacturer	Master Therm CZ s.r.o.	
Model	AquaMaster Inverter	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		
5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	400 litres	
Declared heat loss	2.5 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	80 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	1.21 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	86%	OK
Manufacturer/Model	MRXBOXAB-ECO2, MRXBOXAB-ECO2C	
Commissioning		
9 Local generation		
Technology type: **Photovoltaic system (1)**		
Peak power	5.119999885559082 kWp	
Orientation	South West	
Pitch	30°	
Overshading	None or very little	
Manufacturer		
MCS certificate		

1.1

Design-stage SAP 10 assessment for the dwelling (point a)

Technology type: **Photovoltaic system (2)**	
Peak power	2.559999942779541 kWp
Orientation	North East
Pitch	30°
Overshading	None or very little
Manufacturer	
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			

1.2

Design-stage plan 1 no. electric vehicle (EV) charge points (point b), compost bin (point e) and recycling (point d)

The EV charging point and compost bin are marked up on the plan below.

The EV charging point is located near the car parking area. A Myenergy Zappi charger, with a 7kW output universal socket is specified

The compost bin is located externally, near the kitchen for easy access.

Separate refuse, recycling and food composting bins will be located under the kitchen sink. There is an external covered bin storage area near the utility room door that will be sized to accommodate the local authority supplied wheelie bins for refuse and recycling.

These bins will be wheeled out to the front gates on collection days.

1.3

Design-stage BRE water calculator (point c)

The below image represents the summary of design stage water consumption calculations. These have been achieved by using the online calculator available at: http://thewatercalculator.org.uk/calculator2.asp

The water consumption has been identified to be 98.92l per person per day, which is below the required 110l per person per day.

the water calculator

http://www.thewatercalculator.org.uk/

BADAN LODGE

Congratulations

You are within your maximum consumption of potable water: 110 litres / person / day.

Total potable water consumption as per your calculation: 98.92 litres / person / day.

This calculator is intended to inform design choices by demonstrating the likely impact of specification changes on total water consumption. Results can only be used to demonstrate compliance with the Code for Sustainable Homes when the calculations have been verified by a suitably qualified Code for Sustainable Homes assessor.

Calculation summary

Installation Type	μ Value	× Usage	+ Fixed	= Total
Single Flush Toilets	0	4.42	0	14.94
Dual Flush Toilets	3.38			
Washrooms Taps	5.7	1.58	1.58	10.59
Baths Only	219.5	0.11	0	24.14
Showers Only	7	4.37	0	30.59
Kitchen/Utility Taps	10.1	0.44	10.36	14.8
Washing Machine	8.17	2.1	0	17.16
Dishwasher	1.25	3.6	0	4.5
Waste Disposal	☐	3.08	0	0
Water Softener	☐	1	0	0
Grey Water Contribution	0	1	0	0
Rain Water Contribution	8.02	1	0	8.02
Total litres / person / day, including a normalisation factor of 0.91:				98.92

1.4

Product specification for EV, ASHP, PV, waste facilities and materials (point d)

Below is an extract from the Mechanical and Electrical Engineers specification relating to the PV and EV charging. Details of the PV system designed by GM Monk are outlined on the following pages.

Stand-alone photovoltaic systems

Systems

1. Ss_70_10_70_85 Stand-alone photovoltaic systems

1. Generally :

   The Contractor shall supply, deliver, store on site, distribute on site, erect, install, test and commission a complete photovoltaic and generation power system.

   All specifications are to be read in conjunction with preliminaries/general conditions, relevant drawings, and schedules of equipment.

   All services shall be installed in accordance with the product manufacturer's guidelines.

2. PV Specialist.

   A specialist PV Installer shall design, supply, install, test and commission the complete PV system and Electrical Vehicle Charging. The complete installation shall be provided and installed by a My Energi approved specialist to provide integrated PV and electrical vehicle charging.

   Proposed specialist:-

   DPS Sussex Ltd

   6 Newlands Close, Hassocks, England, BN6 8BG

   Contact Simon Hodges, *simonhodges@dpssussex.co.uk* Tel 07717682342

3. Description:

   The contractor shall allow for the photovoltaics to be installed onto the sloping roof areas as follows:-

   1. East roof: 6 panels = 1.92 kWp
   2. East roof: 3 panels = 0.96 kWp
   3. West roof: 8 panels = 2.56 kWp
   4. West roof: 8 panels = 2.56 kWp

   Total = 8 kWp

   The above minimum output is based upon a notional panel rating of 320W monocrystalline panels.

   Verify final kW rating with SAP assessor.

   Provide inverter, batteries, PV panels, roof support systems, input metering and all ancillaries to provide a fully MSC compliant installation. It should be noted that the power supply to the property is 3 phase. The PV will feed into one of the phases.

   Liaise with structural engineer and architect to confirm roof support and fixing arrangements

4. Planning Requirement on Appearance:-

   The PV panels shall satisfy the following requirement on appearance that the planning consent has imposed. *"The front glasses of the solar panels shall contain anti-reflection coating and should be in dark colours. The installed solar panels shall accord with the approved plans and thereafter be retained as such."*

5. Battery Storage:- Provide battery storage of 5kWh capacity, comprising My Energi "Libbi" Lithium Ion battery storage units. The battery units shall be stackable to facilitate future storage expansion.

6. Electrical Vehicle Charging:-

   The battery and PV system shall operate in unison to provide intelligent electrical vehicle charging, drawing power from the photovoltaic system in preference to drawing power from the grid.

   The battery and intelligent control shall be from the My Energi range comprising "Libbi" battery storage units and domestic single phase "Zappi" electrical vehicle charging unit. The complete installation shall be provided and installed by a My Energi approved specialist.

1.4

Product specification for PV (point d)

4. Electrical Vehicle Charging

Please refer back to Photovoltaic Systems for reference to the integrated PV / EVC systems.

The battery and PV system shall operate in unison to provide intelligent electrical vehicle charging, drawing power from the photovoltaic system in preference to drawing power from the grid.

The battery and intelligent control shall be from the My Energi range comprising “Libbi” battery storage units and domestic single phase “Zappi” electrical vehicle charging unit. The complete installation shall be provided and installed by a My Energi approved specialist.

1.4

Product specification for PV (point d)

System Overview

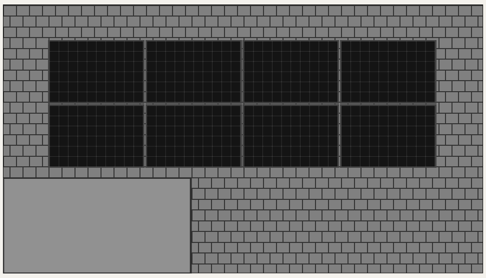
Your system comprises **25 Anglo Solar 410W Mono Black solar panels** to collect sunlight and turn it into DC electricity.

The panels will be connected to **1 SolaX X3 G4 10.0kW hybrid inverter**, which converts the DC electricity into mains (AC) electricity.

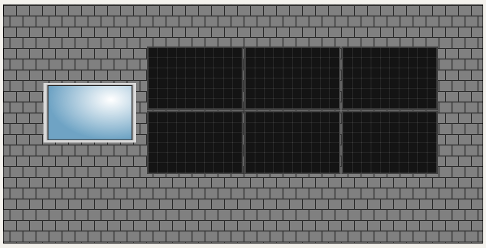
A SolaX Triple 5.8kWh LFP Battery battery storage system will allow you to store excess energy from sunny days, so that you can use your generated electricity at night too.

We include all the isolators, wiring and meters needed to connect the system safely to your electrical system. Your system will be installed and certified by our trained installation team.

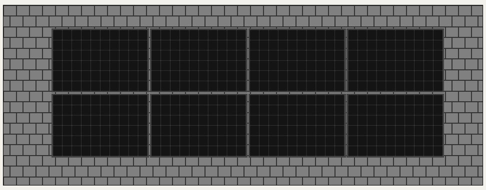
Roof 1



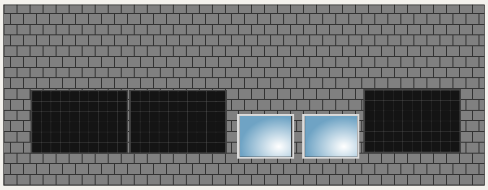
Roof 2



Roof 3



Roof 4



1.4

Product specification for EV (point d)

System components

Solar Panels: Anglo Solar 410W Mono Black x 25

410W Mono Black Half Cut

Model	AS-S108-M10H
Power	410 watts
Dimensions	1134 x 1724mm

Inverter: SolaX X3 G4 10.0kW hybrid

The SolaX G4 has several communication options, can be controlled remotely and has an emergency power system to function through power outages.

AC Power	11000 watts
Trackers	2

Battery: SolaX Triple 5.8kWh LFP Battery x 2

With a 10-year warranty and 90% depth of discharge, the new Triple Power battery is a flexible, practical, high-performance energy storage.

Capacity	5.800 kWh
Quantity	2

Mounting: Schletter pitched roof mounting system

Schletter is a German engineered PV roof mounting system. It is extremely versatile and compatible with the most popular roof coverings used in the UK.

Designed for	All roof types
Colour	Not specified

1.4

Product specification for PV (point d)

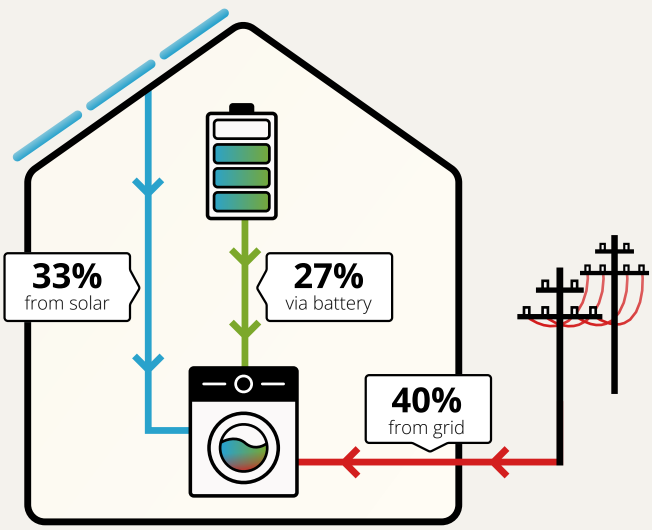
Battery Storage

We have included a 11.6 kWh battery storage unit in this proposal. On sunny days, when your PV array is producing more electricity than you are using in the property, you will be able to store the spare energy and use it at night.

Battery storage systems increase the proportion of electricity generated by a solar PV array that is consumed in the property rather than exported to the grid. Excess solar energy that is not needed during the day can be stored and subsequently used overnight

This leads to financial savings, as you replace expensive imported electricity (at 25p per kWh) with free electricity generated by your solar panels.

Where will your power come from?



Annual Power Requirement: 8066 kWh

How battery storage reduces your grid dependence

Including battery storage will reduce your grid dependence by an extra 27% compared with a PV-only system. You should only need to buy around 40% of your power from the grid.

60%
total reduction of grid dependence with battery

Estimated PV self-consumption – PV only

Assumed occupancy archetype	in half the day
Assumed annual domestic electricity consumption	8000 kWh
Expected solar PV self-consumption (PV Only)	2618 kWh
Grid electricity independence / Self-sufficiency (PV Only)	33%

Estimated PV self-consumption – with EESS

Assumed usable capacity of electrical energy storage device, which is used for self-consumption	10.44 kWh
Expected solar PV self-consumption (with EESS)	4771 kWh
Grid electricity independence / Self-sufficiency (with EESS)	60%

We have assumed that your annual electricity consumption is 8000 kWh.

The energy performance and benefits of EESS is impossible to predict with certainty due to the numerous functions a system can be programmed to perform. This estimate is given as guidance only. It should not be considered as a guarantee of performance.

1.4

Product specification for PV (point d)

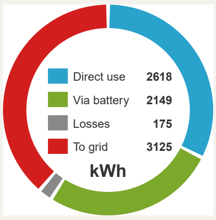
Your energy explained

In addition to the MCS calculation of system output we have run a more detailed model of your system to estimate how much of the electricity generated by the system you are likely to use yourself and how much will go to the grid.

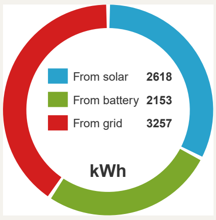
Smart Export Guarantee (SEG) information

The Smart Export Guarantee(SEG) enables Generators to receive payments from electricity suppliers for the electricity they export back to the National Grid, providing specific criteria are met. Your installation will be MCS accredited, which means that you should be able to apply for SEG payments from your electricity supplier. Further details on the SEG and its eligibility requirements, including how to apply, can be found online at ofgem.gov.uk

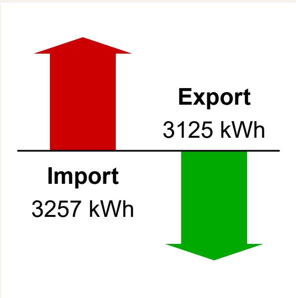
Annual Generation



Annual Consumption

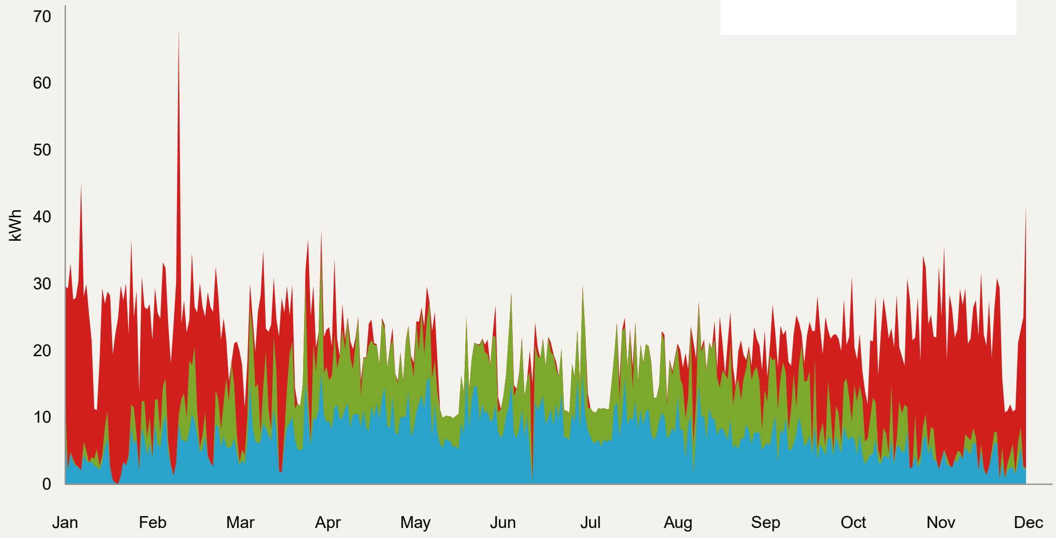


Annual Import/Export



Where your electricity will come from in a typical year

Based on an electricity usage of 8,000 kWh per year, the graph below shows how much electricity used in the property is expected to come directly from the solar panels (blue) , how much is expected to come from battery storage (green), and how much is expected to be imported from the grid (red).



1.4

Product specification for PV (point d)

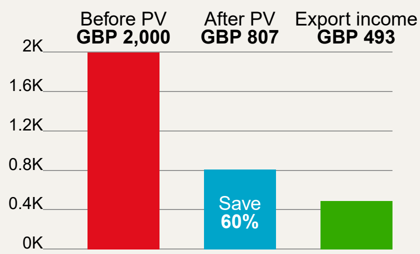
Financial Benefits

Based on our model we expect you to self consume 4,771 kWh of the 8,066 kWh of electricity the system should generate - providing 60% of the annual electricity consumption of 8,000 kWh in the property.

At an electricity tariff of £0.25/kWh, that's a saving of **£1,193** on your electricity bill - down from £2,000 at present! Your new bill could be **just £807 per year.**

3,287 kWh of excess solar energy will be exported to the grid. If you are paid by your supplier at £0.15 per kWh, **you will receive an additional £493 in income from them.**

Overall, your savings and benefits are expected to be around £1,686 in the first year after the system is installed.



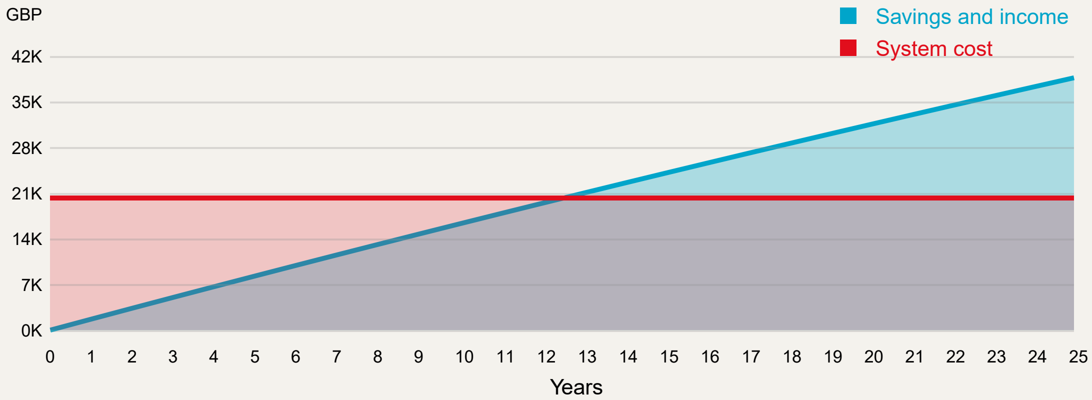
Payback

Using a more detailed model that also takes account of longer term factors such as inflation, gradual degradation in panel output over time and financial discount rates[1], **we expect the system to pay for itself in 12 years.**

Over a projected 25 year lifetime, we expect the system to have a **Net Present Value of £18,767.** A positive net present value is a good indication that an investment is financially worthwhile.

Disclaimer: Nothing in life is certain. Cloudy periods, growing trees, and even pigeon droppings can affect the output of your array. No-one really knows how electricity tariffs will change in the future, or what inflation will be in 10 years time. We have based our calculations on an inflation rate of 3.95%, electricity price that rises with inflation, a discount rate[1] of 4%, an import electricity tariff of 25p/kWh, and export payments of 15p/kWh. Returns are not guaranteed.

[1] Financial discounting is a method used to calculate the worth of future money in today's terms.



1.4

Product specification for PV (point d)

Environmental Benefits

Your new PV system will supply your property with clean, green electricity - and in sunny periods some will also be exported back to the grid.

Overall you'll be making a big contribution to reducing CO_2 not just by lowering the carbon intensity of your own electricity, but by putting low-carbon electricity back in the grid for others to use too.

Your current electricity supply produces

1,699 kg CO_2 each year

53% will be supplied by solar, saving

902 kg CO_2 each year

3,816 kWh will be exported, saving

810 kg CO_2 each year

Total savings

1,713 kg CO_2 each year

Your yearly CO_2 reduction of 1,713 kg is equal to...

a car ride of 6,117 miles

CO_2 absorbed by 79 trees

Disclaimer: We calculate and compare the likely annual CO_2 emissions for your home based on your generation and usage with the solar PV system detailed in this document versus estimates for a property like yours using energy from the grid. Your actual CO_2 emissions will depend on lots of factors, like how much energy your solar panels generate, how much of this energy you use directly and how much energy you continue to use from the grid. To calculate what these savings equate to in miles driven, we base this on the CO_2 emissions of an average sized diesel car as outlined in the UK government's 'Greenhouse gas reporting: conversion factors 2022' (https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022). To calculate what these savings equate to as the average amount of CO_2 absorbed by trees, we base this on a rate of 25kg per tree per year. Trees absorbs anywhere between 10 and 40kg of CO_2 per year on average, depending on a whole host of factors including the species, location, planting density, and age.

1.4

Product specification for GSHP (point d)

Outlined below is the Mechanical and Electrical Engineers specification for the Ground Source Heat Pump

Ground source heat pump systems

Systems

91. Ss_60_40_36_35 Ground source heat pump systems

1. Generally:

The Contractor shall supply, deliver, store on site, distribute on site, install, set to work, test and commission all plant, materials and accessories necessary to provide the Client with a complete Ground Source Heat Pump Installation, as described below and in compliance with the design as indicated on the drawings.

All specifications are to be read in conjunction with preliminaries/general conditions, relevant drawings and schedules of equipment.
The contractor shall ensure the installation complies with the relevant European and British Standards.

2. Description of the works:

The contractor shall submit installation drawings, technical information and equipment selections/manufacturers literature for approval by the client/design team prior to procurement.

The ground collector array shall be installed with vertical bore holes. The contractor shall establish the required number and depth of bore holes based upon heat extraction requirement and soil type, and then coordinate the position of these with other external services, building foundations, tree RPA's, features and obstructions. External services plans shall be updated as part of this.

The Contractor shall be responsible for the design, performance testing and commissioning of the GSHP borehole provision and associated buried pipework to ensure that the GSHP can be served with suitable energy delivery to meet performance requirements throughout the year for space heating and hot water service generation in accordance with the MCS Standard, MIS 3005-D current issue.

Ensure that the design of the closed loop bore hole heat exchanger achieves equilibrium at a temperature of greater than 0°C and that the temperature of the heat transfer fluid at the end of each heating season is the same as at the end of the previous year. The ground temperature shall be able to fully recover each year.

The heat transfer fluid shall be provided with antifreeze and the effect of the antifreeze shall be accommodated in consideration of system and equipment pressure drops, and heat exchanger efficiencies.

The contractor shall provide all design information as set out in Table 4 of MIS 3005-D for comment prior to procurement of equipment, for client comment. This comment shall not relieve the contractor of the design responsibility.

Notwithstanding the general requirements for O&M information, records, commissioning records, and user guides etc, before handover provide full MCS certificates, and documentation as required in MIS 3005-D for the completed installation.

1.4

Product specification for GSHP (point d)

Please see below specification defined by Corindale, mechanical engineers.

The design, installation and commissioning shall be performed, where applicable, in accordance with the following standards and recommendations: -

- NHBC Technical Guidance 8.2/01 Jan 2023. Heat pump design and specification.
- Microgeneration Installation Standard MIS3005, Latest Issue.
- BS EN 15450: Heating Systems in Buildings. Design of heat pump systems.
- BS EN 14511 Air Conditioners, Liquid Chilling packages and heat pumps for space heating.
- BSRIA BG 4/2011. Underfloor Heating and Cooling
- The Ground Source Heat Pump Association GSHGPG - Good Practice Guide For Ground Source Heating And Cooling
- Environment Agency guidelines.
- CIBSE Domestic heating compliance guide

The GSHP shall serve an LTHW circuit generally operating at 35°C Flow and 29°C return when serving the space heating system.

HWS shall be generated by an indirect calorifier fed with LTHW from the GSHP. Please refer to Part L report for HWS generation efficiency requirements. When generating HWS the primary water flow from the GSHP shall be automatically diverted to the HWS primary and the flow temperature automatically be raised to an adjustable level initially set to 55°C, until the HWS demand is satisfied.

Circulation pumps and controls shall be selected, installed and commissioned to ensure the flow and static pressure requirements of the secondary circuits are met.

The GSHP specialist shall be responsible for liaising with the UFH specialist and controls specialist to provide a coordinated, fully operational heating and hot water service system.

An access chamber shall be provided for the collector array manifold by the contractor. Surface finish for the cover shall be agreed with the architect.

All LTHW pipework, valves, vessels and ancillaries shall be thermally insulated in plant spaces, and all pipework in concealed service zones, ceiling voids and wall voids etc. Thermal insulation shall be class 0 fire rated, thickness in accordance with the requirements of the building regulations and provided with service identification labelling.

Valves and ancillaries in plant spaces shall be provided with Velcro fastened flexible thermal insulation valve covers.

1.5

Grown in Britain or FSC certificates (point e)

Timber is used for structural components as well as cladding elements.

The structural components are specified to be sourced from sustained well managed plantations approved by the Forest Stewardship Council (FSC).

The cladding timber is Sweet Chestnut from InWood Developments or similar approved and it is described within condition 3 supplementary information.

InWood Developments states that: " *All our finger-jointed Sweet Chestnut products can be supplied with chain of custody certification in FSC, PEFC for proof of sustainable harvesting and peach of mind.*"

The contractor will provide certificates upon purchase of materials.

1.5

Sustainable materials and building design details (point f)

The choice of a new build for the property was primarily defined to create a dwelling with improved structural and thermal efficiency and air tightness, as well as being able to incorporate larger areas of natural materials to ensure that it creates a highly sustainable home.

The new build is a lightweight timber frame construction, with localised elements of steel to support the bigger spans.

Structural timber is a regenerative and less carbon intensive option to a standard masonry construction, saving, of up to 5 t CO_{2e} *(for a standard 4 bedroom house) (*source: the Construction Index).

We have outlined the sustainable design ethos in the sustainability statement submitted at planning. This is also outlined in the next pages.

In addition, we have added information regarding the external materials within the document prepared to comply with condition 3 materials

1.5

Sustainability Strategy Introduction

Introduction

BakerBrown is a practice of architects that have been committed to responding to the Climate & Ecological Emergency since they were founded in Lewes in 1993. They have practiced, taught, and researched around issues of sustainable low carbon design and associated closed loop systems for over 25 years delivering many award-winning projects including a new country house in Hadlow Down, The Greenwich Millennium Village, and The Brighton Waste House.

The practice studies projects at design, construction, operation and demolition stages, considering the whole life of a building.

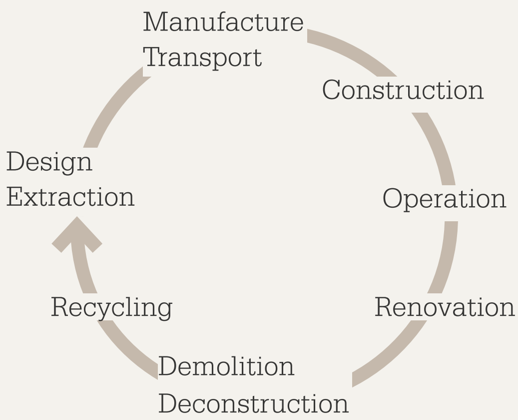
In addition to designing buildings to low carbon standards, BB employ a ‘Resource Mapping’ exercise to locate a pallet of local materials for each project. This can even include materials normally demolished and sent to landfill or incineration. For example fire damaged bricks from a site at Streat Hill will be recycled to create ‘new’ tiles formed on site for the replacement dwelling. The SDNP Planning team appreciated our Resource Mapping technique as it will radically reduce the ‘carbon footprint’ of developments by reducing the amount of material arriving from across the world, whilst simultaneously reducing waste from the construction sites and utilising materials from the South Downs and Weald. This will help create a sense of place and of course support local jobs.

Principles applied to Badan Lodge

The proposal for the replacement dwelling at Badan Lodge is in line with BakerBrown's ethos and intends to follow and exceed local and national benchmark sustainability standards, taking into consideration standards such as PassivHaus for principles such as optimization of operational energy and well insulated buildings, Life Cycle and embodied carbon assessments to quantify the environmental impact of the development and the RIBA (Royal Institute of British Architects) 2030 Climate Challenge, a professional voluntary standard for good practice.

This report outlines BB's typical approach to design and to this specific project. The practice and the client will strive to ensure the strategies noted in this document are realised if the project is approved.

RIBA 2030
Climate Challenge



1.5

Embodied Carbon Reduction

We have listed below some core guiding principles for our approach to each project. The careful assessment and reuse of existing stock (which makes up the majority of what we will be inhabiting in 30 years) is a vital part of this process, essentially helping turn the linear approach into the circular approach.

The strategy is:

— Ensure that where possible we are 'Mining the Anthropocene' (existing human-made products and materials) and protecting natural resources by using reused materials, materials with high recycled content

— Ensure that the supply chain of materials and components have Environmental Product Declarations (EPD's), where possible, and are locally supplied from sustainable, ethical, non-toxic sources.

— Limit use of materials with high embodied carbon (Concrete, Bricks)

— Specify that high embodied carbon materials are easily removed, when and if the dwellings are demolished, so that these can be reused

— Use low carbon, organic and carbon sequestering materials such as timber, cork, earth.

— Maximise structural efficiency to reduce the quantity of materials used.

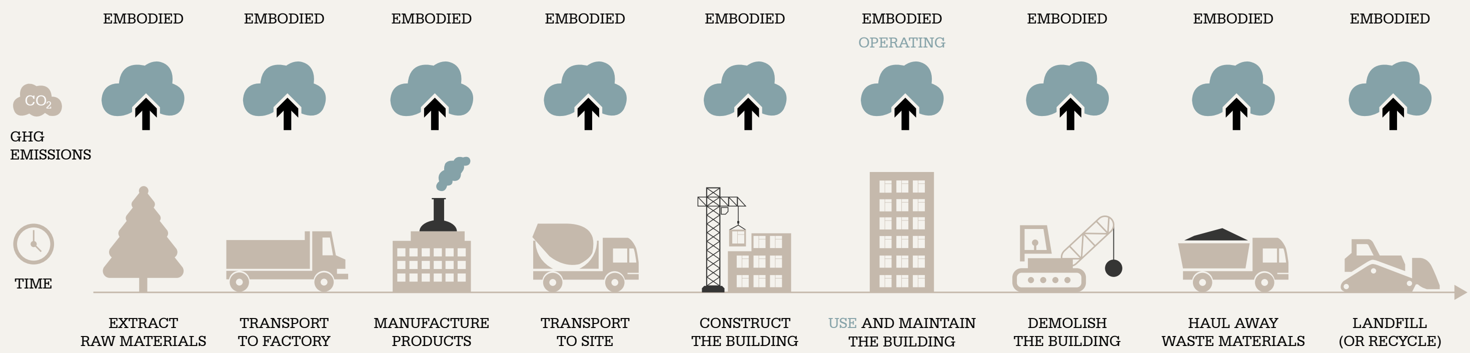
— Undertake a Resource Mapping exercise at the beginning of the project in order to ascertain the local availability of second-hand or new material, components, technologies, services, labour, etc.

— Ensure the buildings uses/supports other Closed-Loop Systems such a rainwater harvesting, renewable energy, locally-grown zero waste food production.

— Put into action strategies to Design Out Waste ti minimise waste on site and throughout the supply chain.

— Ensure that the Circular Economy principles are adhered to throughout the Design, Construction, Occupation, Maintenance, Adaptation and ultimate De-Construction of the Project, i.e RIBA Stages 1-8.

Why is embodied carbon so important?
A building's carbon impact is divided into embodied and operational carbon. Embodied carbon relates to the energy before and after a building is in use. Operational carbon relates to the energy required to operate the building. Embodied carbon is not yet covered in the building regulations, even if it constitute a very large part of a building's footprint.
BakerBrown considers embodied carbon as standard practice, and limits projects' impact by carefully selecting materials and construction methods.



1.5

Operation Carbon Reduction
Passive House Principles

When considering Operational Carbon, we are applying 'PassivHaus' low energy benchmarks which propose a 'fabric first'approach to reducing energy use.

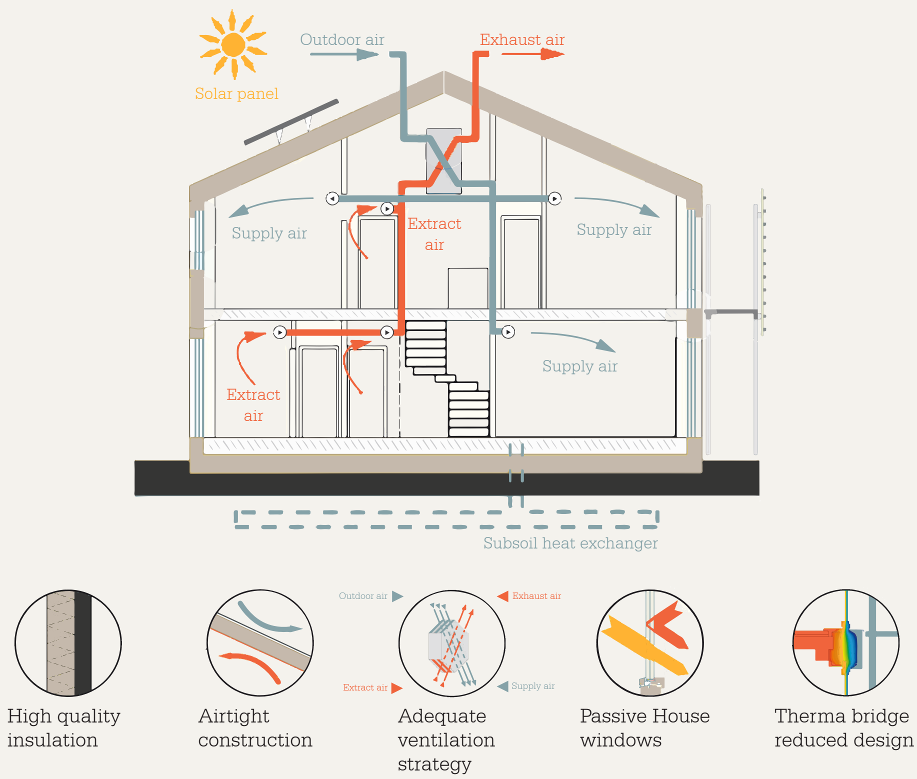
The heating and cooling of rooms and water are the primary reasons for high energy use. The strategies here aim to reduce this while providing comfortable internal spaces.
CO_2 Emissions of the dwellings in use will be controlled by installing adequate and high performance, well insulating materials, fixings and heating systems.
The strategy will not only reduce operational emissions, but also cut costs and minimise heating and cooling requirements of the residents, increasing wellbeing and limiting the necessity of increasing dramatically the energy needs of the area.

Below is a diagram of a PassivHaus system, from which the practice takes principles. Many of these are simple solutions for long term wellbeing.

As a norm we (BB) design new residential buildings to the low energy (in use) standards demanded by 'Passivhaus' principles with regards to airtightness, energy for heating demand, and thermal efficiency.
The five key Passive House principles are:

— Thermal insulation
— Passive House windows
— Adequate ventilation strategy
— Airtightness
— Thermal bridge reduced design

The exact specification will be determined when preparing for the Building Regulations Application. However we have determined our energy benchmarks specific to the project in the following pages.



1.5

Circular Design

BakerBrown's role doesn't stop at architects. As a Bcorp we take the circular economy and sustainability seriously and we aim to advise on the opportunities and challenges that an authentic Circular Economy presents, ensuring sustainability, closed-loop systems and the circular economy are integral to briefs and project development.

The words ‘Circular Economy’ have become very popular, and it is currently a concept that many institutions, city bureaucrats, politicians, clients, financiers, consultants etc, are very happy to use. However, as with many all-encompassing concepts there is a danger that its real meaning becomes diluted, and much like the term ‘sustainability’ before it, becomes meaningless.

The implementation of the circular economy in construction has been explored by many and the Architect's Climate Action Network (ACAN) launched a campain in 2021 to encourage the RIBA to implement stage 8 - deconstruction within the RIBA Plan of Work. The stage is envisaged to consider a building's deconstruction and reuse, as opposed to demolition. This stage often happens both at the end and at the beginning of projects.

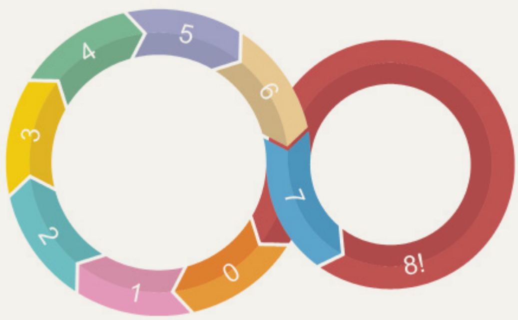
When we are considering a Circular Economy; we are looking at ways of designing out waste and avoiding materials, products, buildings, systems and whole cities even, that don’t have an end-of-life strategy. We design things that can eventually :

— be organic compost (food) for the natural 'Bio-sphere' and/or

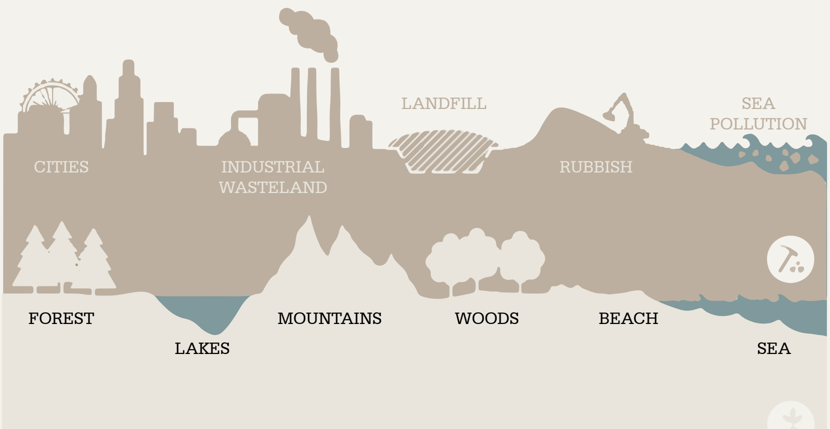
— technical nutrients for the human-made 'Tech-sphere'.

To use a phrase we referred to when we built the Waste House, we believe that

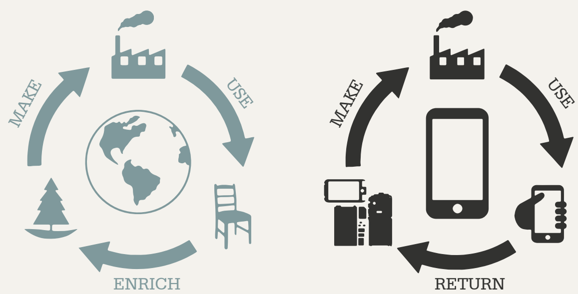
“there’s no such thing as waste, just stuff in the wrong place.”



ACAN stage 8 campaign



Mine the anthropocene, nurture natural resources diagram



Tech and Bio Spheres

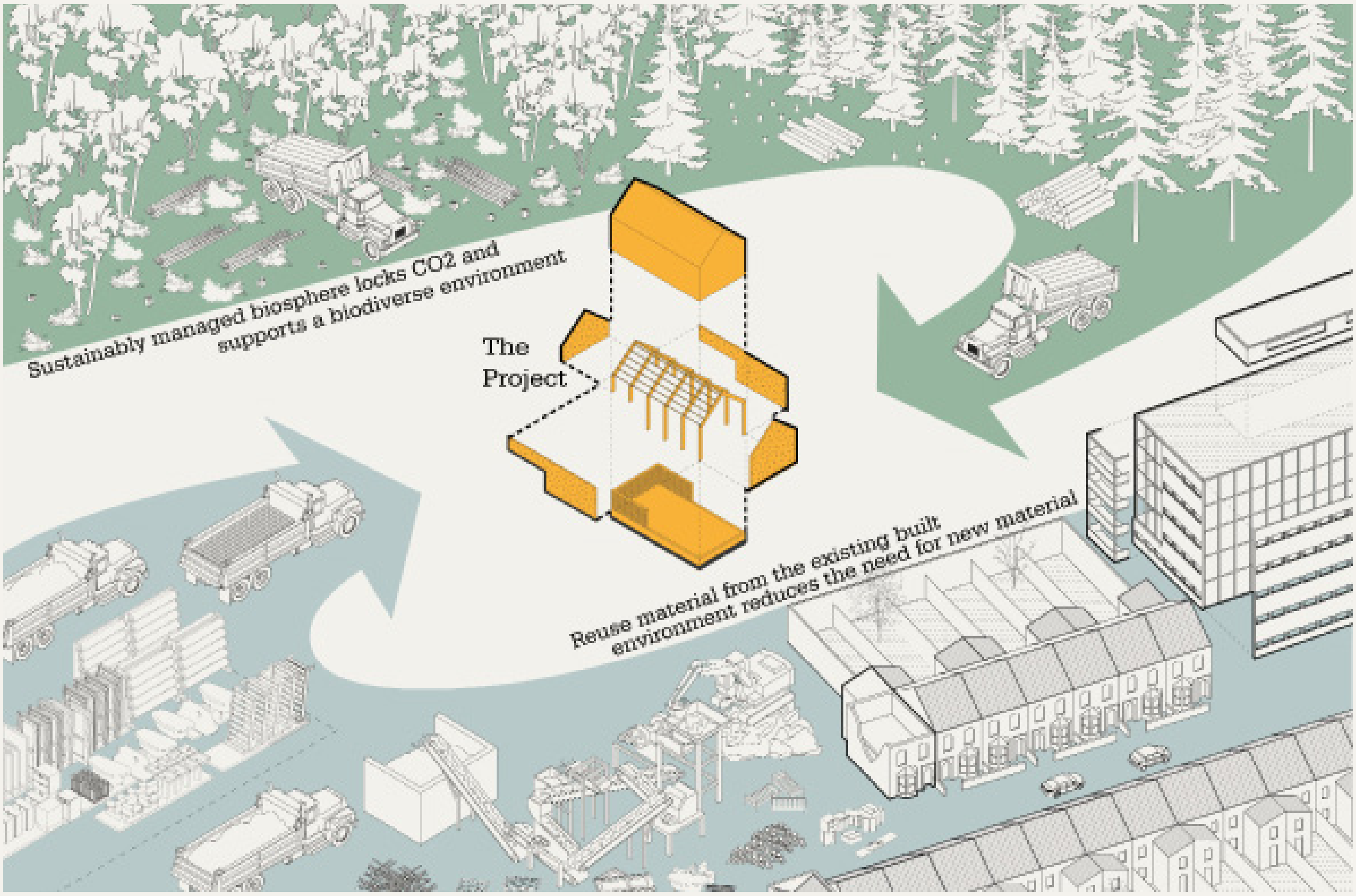
1.5

Circular Design

In 2020 founder Duncan Baker-Brown published the second edition of a book with RIBA. Entitled 'The Re-Use Atlas; a designer's guide towards a circular economy' . With the second edition due to be published soon, Baker-Brown explored ideas around ways to radically reduce our reliance on the harvesting of raw materials (that currently have such a devastating effect on natural ecosystems) via a collection of inspiring built projects from across Europe and beyond. Case study projects are divided into chapters dealing with Recycling, Re-Use, Reduce and finally a chapter considering projects that perform as genuine closed loop 'circular' systems, just like the natural world.

The practice is renowned for its careful and intelligent interventions in sensitive urban and rural contexts around the South Downs National Park and areas of outstanding natural beauty such as the Sussex High Weald.

Part of this philosophy is our resource mapping, a study of resources available on and near the site.



1.5

Resource Mapping

Baker Brown is committed to the use of local materials. Throughout the years, we have developed a resource map of materials local to the sussex area which we try to incorporate into our projects whenever possible. A summary of which is detailed as follows:

1) Ash Die Back
Sourced locally within Sussex, ash die back can be used for structural elements, external cladding or for internal finishes and joinery.

2) Site Surplus
It is possible to reuse surplus and waste material from local/ regional sites. Specifically, as material for renders, aggregate and other finishes.

3) Local Works Studio
Located in nearby Barcombe, Local Works Studio can be utilised for forming new materials from on-site waste.

4) Waste Chalk
Can be used for internal plaster and external renders.

5) Chailey Brick Yard
Over-fired, under-fired and normal bricks can be sourced from nearby Ibstock Chailey Brickyard.

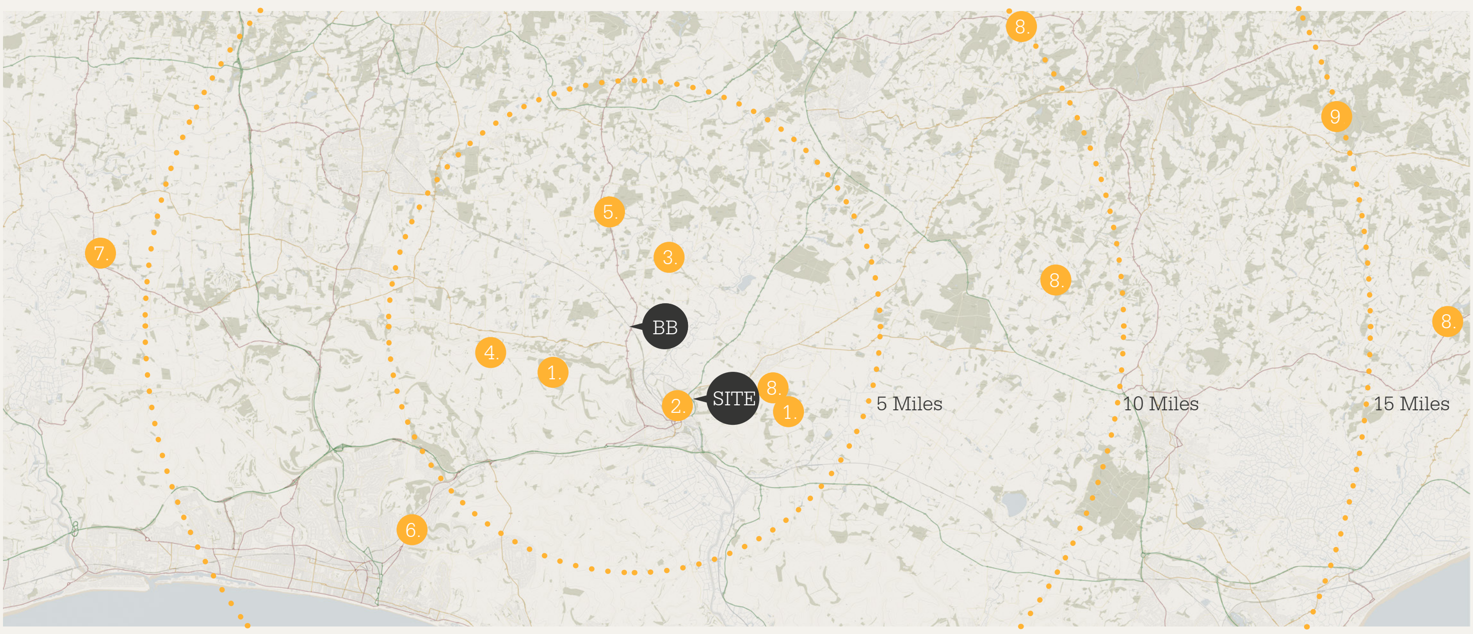
6) Surplus Site Material
Large development sites in and around East Sussex can be used as a source for 'waste' and surplus material.

7. Reclaimed Clay Tiles
Reclaimed clay tiles sourced from multiple suppliers.

8) Sweet Chestnut
A fast growing sustainable hard wood, Sweet Chestnut provides an abundant local source of timber.

9) Low Grade Pine
A low grade 'waste' material that can be used for a glue-free CLT system called Brettstapel.

1.Ash Dieback Sussex | 2.Surplus Site Material | 3.Local Works Studio - Lewes | 4. Waste Chalk Sussex | 5.Chailey BrickYard Ibstock | 4.Other Sites Material | 7.Clay tiles JJ Reclamation | 8.Sweet Chesnut Sussex | 9.Low-grade Pine Sussex



1.5

Existing Building and Site Elements

The existing dwelling is to be demolished to ensure that the new dwelling has improved structural and thermal efficiency and air tightness, as well as being able to incorporate larger areas of natural materials to ensure that it creates a highly sustainable home. The previous proposal to extend and alter already required large areas of substandard construction to be removed and it is therefore only the original masonry and tile hung elements that form additional demolition with the proposal for a replacement dwelling.

The core aim of the project is to save as many existing elements as possible. BakerBrown has undertaken a preliminary audit and intends to undertake a more detailed audit post planning, undertaking a concise analysis of the existing building(s), the materials with approximate quantities and the primary potential reuse opportunities.

The aims for this project regarding existing building elements being demolished are:

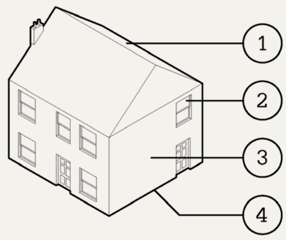
— All existing foundations and floor slabs to be retained and reused minimising requirement for additional concrete.
The details will be developed collaboratively with the Structural Engineer.
This measure will drastically reduce the requirement for additional concrete and cement based materials.

— Reusing the large roof trusses to the single storey pitched roof.
The details will be developed collaboratively with the Structural Engineer.
The aim is to reduce the requirement for new structural roof components.

— Minimal waste to be taken off site

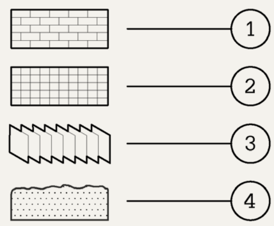
— All rubble crushed and used for backfill to raised paths, below beam and block floors.

— All existing UPVC windows, internal doors, ironmongery, parquet floor, kitchen, sanitaryware to be stored for reuse by family member building own home.



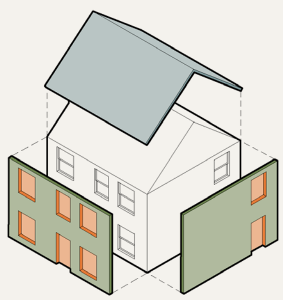
Material Types

Initial assessment of the materials available



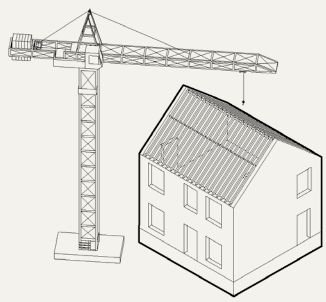
Material Quantities

Approximate quantities of the primary materials/ components



Reuse potential

What is the likelihood of reuse based on materials and construction type



Facilitate Deconstruction / Reuse

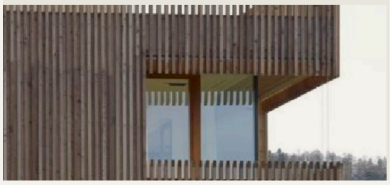
Establish the relevant contacts within the industry to facilitate the optimal form(s) of deconstruction and reuse either on site or elsewhere

1.5

New Building Elements

New building elements will be selected consciously and considering the resource map.
The aims for the project regarding new building elements are:

- Timber frame construction, with nominal amounts of concrete blockwork.
  The new build is envisaged to be built mostly in timber, with nominal amounts of blockwork and concrete,
- Locally sourced sweet chestnut cladding, to wrap around the first floor and large parts of the ground floor.
- Chalk Down Lime render to exterior sourced locally, from Robertsbridge.
- Wood fibre insulation, an eco-friendly choice to save energy, reduce carbon and improve indoor comfort.
- Wood fibre render boards rather than gypsum plasterboard.
- Locally sourced flint. Walls to be installed by local craftperson.
- Natural slate tiles.
- Efficient aluminium composite windows.



1.5

Performance, Ecological design and Renewable Energy

The aims for the project regarding performance, ecological design and renewable energy are:

Performance

— Well insulated design with notional u-values aiming at:

Walls	0.14
New Floor slabs	0.10
Exg upgraded floor slabs	0.17
Pitched Roofs	0.10
Flat roofs	0.11
Windows (triple glazed composite)	0.8*
Doors	1.08

Units: W/(m²K)
*Average

— Achieve and promote natural cross ventilation to main living space

— Rooflights to increase ventilation

— Deep overhangs and brise soleil to south west facing elevation to minimise overheating and future proof the dwelling in the climate crisis.

Ecological Design

— Rainwater capture, the rainwater is collected and discharged into an on site natural swimming pond.

— Enhanced ecology around natural swimming pond, wildflower meadow, and use of native planting in the general landscaping strategy.

— Green roofs to majority of flat roof areas. The flat roofs to the single storey ground floor elements will be finished with a Swiss lightweight Meadow finish or biodiverse blanket. This will provide increased biodiversity upon the site, creating additional habitats for a variety of wildlife species. This type of roof is also very low maintenance and uses species indigenous to the South Downs.

— Permeable surface to driveway, to reduce hard surfaces and surface water flooding.

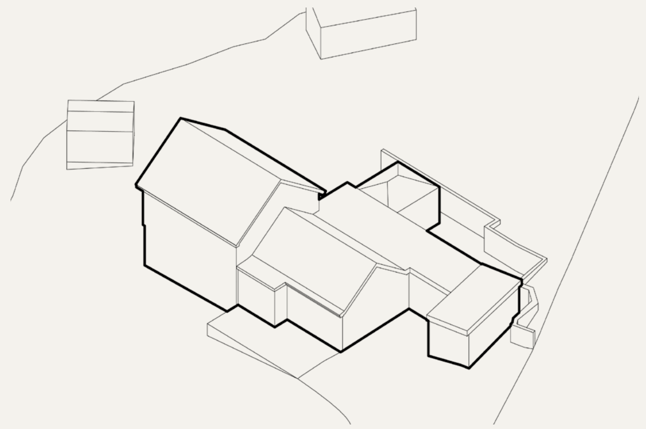
Renewable Energy

— Ground source heat pump as primary source of energy.

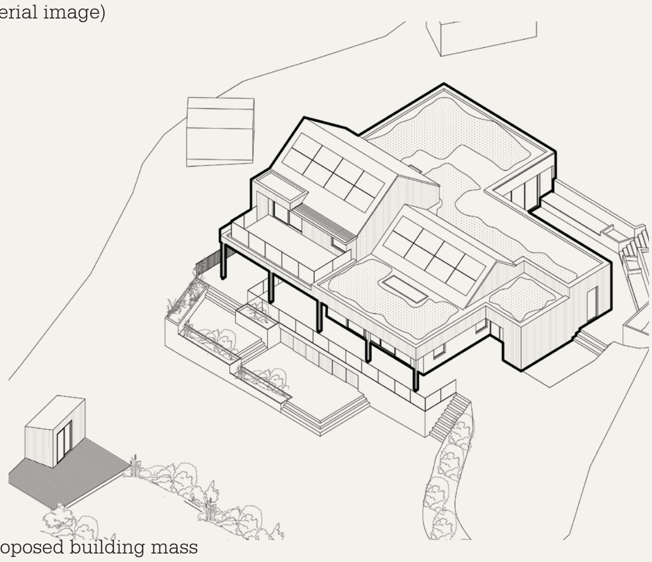
— 10kW Solar array with battery storage.

— MVHR system to ensure great air quality within the new dwelling.

— Electric car charging



Existing building mass
(aerial image)



Proposed building mass
(aerial image)

1.5

Compliance with SDNP Local Plan

The South Downs National Park Local Plan sets out the requirements for all new developments to incorporate sustainable construction measures. These are set within:

— SD2 Ecosystem Services.

— SD22 Parking Provision; and

— SD48 Climate Change and Sustainable Use of Resources.

Within SD48, the key applicable minimum standards to residential developments are:

i. Energy efficiency: 19% carbon dioxide reduction improvement against Part L (2013) through the energy efficiency of the building and;

ii. Water: Total mains consumption of no more than 110 litres per person per day.

We have clarified below the project strategies to meet the SDNP local plan requirements. Please note that alongside this document, it has been incorporated a sustainability checklist for minor developments.

Energy Efficiency

The Project has been subject to a Passive House Planning Package assessment, that has defined the base model for the dwelling's energy efficiency measures. At design stage SAP assessment is being carried out to determine the dwelling's emission rate.

As defined in previous pages, the remodelling will also include the installation of a ground source heatpump, an MVHR unit, a photovoltaic array with battery, and fabric element u-values in excess of building regulation compliance.

Electrical Vehicle Charging

The provision of 1x electric vehicle charging point near the parking area is included in the scheme.

Water Consumption

Internal potable consumption will be limited to no more than 110 l per person per day.
All internal taps will be equipped with aerators, and toilets equipped with low water consuming units, flushing using 4.5 litres per day instead of 6 litres per full flush. Calculations will be provided at later stage.

Waste

The scheme will include dedicated areas and bins for recycling and food composting. These will be stored near to the site entrance.

Materials

As defined in the previous pages, the project aims to use local, natural and reclaimed materials as much as possible.

Adaptation to climate change

As defined in the previous pages, the project uses various measures to mitigate the impact climate change can have on the site and the area surrounding it. It in fact includes green roofs, local planting, a natural pool enhancing local biodiversity, and drainage systems such as permeable paving.

The new building will also be constructed prioritising fuel conservation measures, including highly insulated building elements that, together with shading devices will minimise overheating risk.

Contact

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1.4

Product specification for EV, ASHP, PV, waste facilities and materials (point d)

Photovoltaic System (continued)

array junction boxes; Pr_60_70_06_67 Photovoltaic (PV) generator junction boxes; Pr_60_70_48_47 Low-voltage switch-disconnectors

12. Cable type: Pr_65_70_48_90 Thermosetting-insulated and thermoplastic-sheathed (LSHF) armoured cables

13. Concealed installation: Required

14. System accessories: Pr_80_51_51_22 Digital metering equipment

15. Execution: Ss_70_10_70/630 Installing PV module arrays; Ss_70_10_70/660 Installing d.c. isolation switches; Ss_70_10_70/670 Installing PV array junction boxes; Ss_70_10_70/680 Installing PV generator junction boxes; Ss_70_10_70/690 Installing a.c. isolation switches; Ss_70_10_70/730 Installing energy meters; Ss_70_10_70/760 Connection to lightning protection system; Ss_70_10_70/750 Earthing and equipotential bonding; Ss_70_10_70/770 Labelling

16. System completion: Ss_70_10_70/810 Testing and commissioning photovoltaic systems; Ss_70_10_70/815 PV array performance tests; Ss_70_10_70/820 Documentation; Ss_70_10_70/840

Maintenance

yield using the method prescribed in the BRE publication Standard Assessment Procedure for energy rating of dwellings, Appendix M.

5. Approvals: Obtain planning approval from the relevant authorities. Obtain written approval of the Distribution Network Operator.

3. Ss_70_10_70/220 Structural and weatherproofing considerations

1. Supports and fixings

1.1. Requirement: No impairment to the thermal and weatherproofing performance of the building

fabric.

1.2. Arrangement of fixings or proposed supporting structure: Submit proposals.

4. Ss_70_10_70/230 Photovoltaic arrays

1. Nominal output

1.1. Peak power: 8.0kW minimum.

1.2. Number of strings: Submit proposals

1.3. String voltage (maximum): Submit proposals

1.4

Product specification for EV, ASHP, PV, waste facilities and materials (point d)

Photovoltaic System (continued)

7. Current rating: Submit proposals

8. Ingress protection (minimum): To BS EN 60529, IP44.

6. Pr_60_70_06_67 Photovoltaic (PV) generator junction boxes

1. Manufacturer: Submit proposals

2. Standards: To BS EN 61439-1 and BS EN 61439-2.

3. Enclosure

3.1. Ingress protection (minimum): To BS EN 60529, IP 65.

3.2. Impact protection (minimum): To BS EN 62262, IK10.

3.3. Material: Submit proposals

3.4. Degree of protection: To BS EN 61140, Class II.

7. Pr_60_70_48_47 Low-voltage switch-disconnectors

1. Standards: To BS EN 60947-1 and BS EN 60947-3.

2. Third-party certification: ASTA Type test certification.

3. Rated operational voltage (Ue): 415 V.

4. Rated operational current (In): 100 A.

IK08.

10.3. Material: Sheet steel.

10.4. Finish: Powder-coated.

10.5. Colour: Manufacturers standard

10.6. Gland plates: Fully removable to top and bottom faces.

11. Execution: Pr_60_70_22/665 Installing switchgear generally

8. Pr_60_70_48_62 Photovoltaic array junction boxes

1. Manufacturer: Submit proposals

2. Standard: To BS EN 61439-2.

3. Enclosure

3.1. Material: Polycarbonate.

3.2. Degree of protection: To BS EN 61140, Class II.

3.3. Ingress protection (minimum): To BS EN 60529, IP 65.

3.4. Impact protection (minimum): To BS EN 62262, IK10.

1.4

Product specification for EV, ASHP, PV, waste facilities and materials (point d)

Photovoltaic System (continued)

2. Standards: To BS EN IEC 61730-1 and BS EN IEC 61730-2.

3. Third-party certification: Submit proposals

4. Application class: Submit proposals

5. Cell type: Submit proposals

6. Format: Welded frame modules.

7. Framework

7.1. Material: Anodized aluminium.

8. Module interconnections

8.1. Standard: To BS EN 62852.

8.2. Module connectors: Polarized and suitably rated for the applicable d.c. voltage and current.

8.3. Ingress protection (minimum): To BS EN 60529, IP65.

9. Nominal output of module

9.1. Peak power: Submit proposals

9.2. Power output tolerance: 0/3%.

10. By-pass diodes: Submit proposals

11. Output warranty: Minimum of 90% power output