ENERGY & SUSTAINABILITY ASSESSMENT

THE GARAGES

PROPERTY ADDRESS

FERRYMORE
ST RICHARD'S COURT
HAM
TW10 7NS

DATE

March 22

PREPARED BY

EAL Consult

Contents

1. EXECUTIVE SUMMARY

This Sustainability statement has been prepared to support the planning application for the the demolition of the garages and the construction of two 3 storey townhouses with parking and gardens in Ham, west of London and south of Richmond but north of Kingston upon Thames. The strategy highlights how the proposed development will promote sustainability throught both design and operation and summarises the relevant regulatory and planning policies applicable and how the relevant policy targets will be addressed and achieved.

The strategy reponds to the UK Planning and regulatory framework, the National Planning Policy Framework 2021, the New London Plan 2021 and the Borough of Richmond Upon Thames Local Plan (2018).

In accordance with the Energy Hierarchy detailed within The New London Plan 2021, this statement outlines an overall commitment to reducing energy consumption under occupancy through the adoption of a 'Fabric First' principle, which will seek enhanced insulation standards and improved heating and lighting efficiencies in comparison to the standard requirements of Approved Document Part L1A 2013. Further carbon emission reduction can be achieved by using renewables (Air Source Heat Pumps).

Energy Effcicency & Carbon Reduction:

- Passive design principles including a high level of insulation and reduced air permeabilty to deliver Part L1A 2013 compliant Building in absence of renewable technologies. It will achieve **3.7%** reduction in carbon emissions over Part L1A baseline.

- Air Source Heat Pumps / Photovoltaic panels have been proposed for the specific scheme and will deliver a further **36.3%** reduction in regulated carbon emissions over Part L1A baseline when utilising the proposed carbon factor changes to building Regulations Part L.

Material and waste management:

- Minimising the use of virgin materials during construction by recycling and reusing where feasible.
- Low waste benchmark levels will be targeted during construction with requirements identifying that the diversion of waste from landfill is to be achieved by the contractor.

Recommendation and Results:

This report demonstrates that the proposed development by incorporating the measures above can achieve an average carbon emission reduction of **40.1% with the use of:**

- **Air Source Heat Pumps.**

The following tables demonstrate the carbon emissions and savings.

Table 1. Carbon Dioxide emissions after each stage of the Energy Hierarchy

	Regulated Carbon dioxide emissions (Tonnes CO2 per annum)	
	Regulated	Total
Building Regs Notional Development	4.36	5.23
After Energy demand Reduction	1.2	5.04
After Renewables	2.61	3.14

Table 2. Carbon Dioxide Savings from each stage of the Energy Hierarchy

	Regulated Carbon dioxide savings (Tonnes CO_2)	% Reduction
Savings from energy efficiency measures	0.16	**3.7%**
Savings from Renewables	1.58	**36.3%**
Total savings	1.75	**40.1%**

2. INTRODUCTION

Site description

The site is located in Ham, west of London and south of Richmond but north of Kingston upon Thames. The block of garages stand independently from the retail units and duplexes of St. Richards Court in a housing estate probably built in the 1960's and 70's and are currently unused. The proposed development comprises the demolition of the garages and the construction of two 3 storey townhouses with parking and gardens.

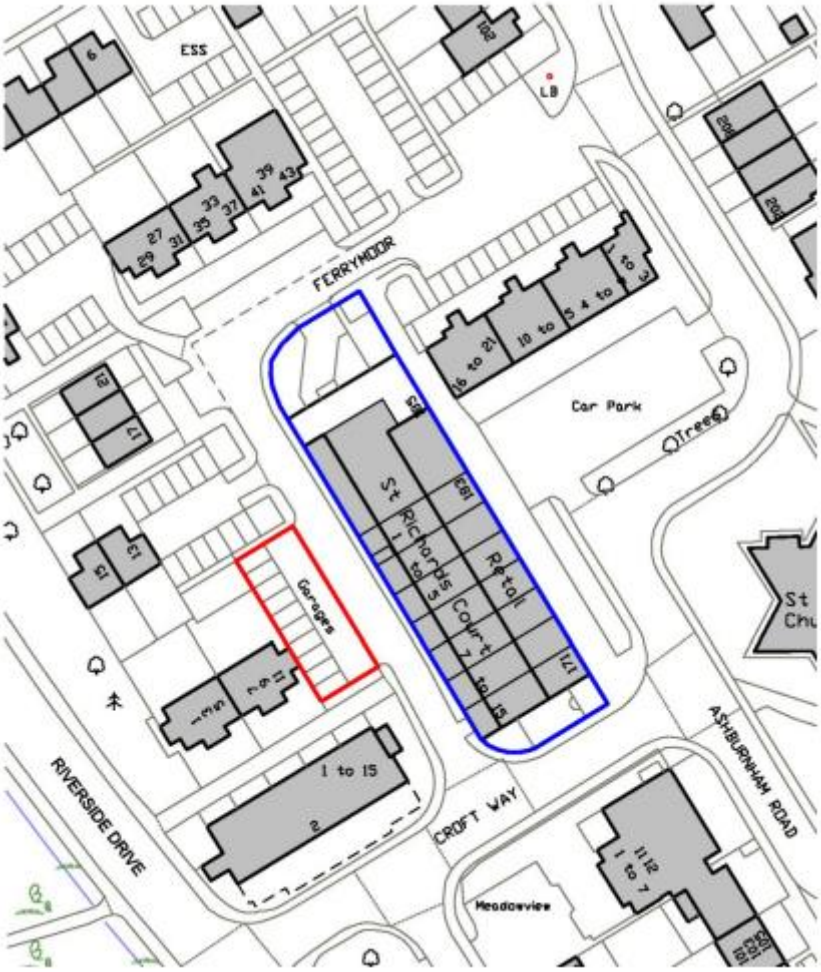


Figure 1. Site Location

Methodology

This energy assessment outlines the energy demand from the development together with the associated CO_2 emissions, using the present Building Regulations Part L as a baseline. It demonstrates how the emissions from energy use in the development will be reduced through energy efficiency measures.

The proposed scheme is required to achieve carbon emission reduction principles in accordance with the UK Planning and regulatory framework,

The methodology employed to determine the potential CO_2 savings is in accordance with the three-step Energy Hierarchy.

- **Be Lean -** Improve the energy efficiency of the scheme;
- **Be Clean -** Supply as much of the remaining energy requirement with low carbon; technologies such as district heating if available or combined heat and power (CHP); and
- **Be Green -** Offset a proportion of the remaining carbon dioxide emissions by using renewable technologies.

The government approved Standard Assessment Procedure (SAP) methodology software (2013) has been used to determine the CO_2 emissions and energy requirements. It compares CO_2 emissions from regulated energy use (DER) with those of an equivalent dwelling built to Part L1A 2013 (TER), a notional dwelling of the same size and shape. These calculations do not include emissions from cooking or appliances.

Opportunities for incorporating features into the development that contribute to the objectives of sustainable development were explored during the design process, to ensure that where possible, the proposals achieve best practice.

3. PLANNING POLICY CONTEXT

National Planning Policy Framework 2021 – emphasised the concept of sustainable development by encouraging local authorities to adopt proactive strategies to mitigate and adapt to climate change. It recommends the move to a low carbon future by:

- Avoiding increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- Contributing to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.
- To help increase the use and supply of renewable and low carbon energy and heat, plans should:
    - provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
    - consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
    - identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for colocating potential heat customers and suppliers.

The London Plan 2021 provides the strategic framework for an integrated socio-economic, transportation and environmental development plan across the capital to 2050. The Plan seeks to ensure new developments are designed to enable the efficient use of energy and support the development of sustainable energy infrastructure to produce energy more efficiently. It sets out a range of policies that apply to new developments.

Policy SI 2 Minimising Greenhouse Gas Emissions:

A. Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy: a) Be lean: use less energy and manage demand during operation, b) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly, c) Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.

B. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C. A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either: 1) through a cash in lieu contribution to the borough's carbon offset fund, or 2) off-site provided that an alternative proposal is identified, and delivery is certain.

D. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E. Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.
F. Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

9.2.1 The Mayor is committed to London becoming a zero-carbon city. This will require reduction of all greenhouse gases, of which carbon dioxide is the most prominent. London's homes and workplaces are responsible for producing approximately 78 per cent of its greenhouse gas emissions. If London is to achieve its objective of becoming a zero-carbon city by 2050, new development needs to meet the requirements of this policy. Development involving major refurbishment should also aim to meet this policy.

9.2.2 The energy hierarchy should inform the design, construction, and operation of new buildings. The priority is to minimise energy demand, and then address how energy will be supplied and renewable technologies incorporated. An important aspect of managing demand will be to reduce peak energy loadings.

London Borough of Richmond Upon Thames – Local Plan 2018.

Policy LP 20 B1.
Minimise internal heat generation through energy efficient design

Policy LP 22
Developments will be required to achieve the highest standards of sustainable design and construction to mitigate the likely effects of climate change. Applicants will be required to complete the following:

1. Development of 1 dwelling unit or more, or 100sqm or more of non-residential floor space (including extensions) will be required to complete the Sustainable Construction Checklist SPD. A completed Checklist has to be submitted as part of the planning application.
2. Development that results in a new residential dwelling, including conversions, change of use, and extensions that result in a new dwelling unit, will be required to incorporate water conservation measures to achieve maximum water consumption of 110 litres per person per day for homes (including an allowance of 5 litres or less per person per day for external water consumption).
3. New non-residential buildings over 100sqm will be required to meet BREEAM 'Excellent' standard.
4. Proposals for change of use to residential will be required to meet BREEAM Domestic Refurbishment 'Excellent' standard (where feasible).

Reducing Carbon Dioxide Emissions
Developers are required to incorporate measures to improve energy conservation and efficiency as well as contributions to renewable and low carbon energy generation. Proposed developments are required to meet the following minimum reductions in carbon dioxide emissions:

1. All new major residential developments (10 units or more) should achieve zero carbon standards in line with London Plan policy.
2. All other new residential buildings should achieve a 35% reduction.

3. All non-residential buildings over 100sqm should achieve a 35% reduction. From 2019 all major non residential buildings should achieve zero carbon standards in line with London Plan policy.

Targets are expressed as a percentage improvement over the target emission rate (TER) based on Part L of the 2013 Building Regulations. This should be achieved by following the Energy Hierarchy: 1. Be lean: use less energy 2. Be clean: supply energy efficiently 3. Be green: use renewable energy

4. ENERGY STRATEGY

The Energy strategy for the proposed housing is based on the Building Regulations Part L1A; it adopts a set of principles to guide design and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. It seeks to incorporate energy efficiency through the approach detailed below.

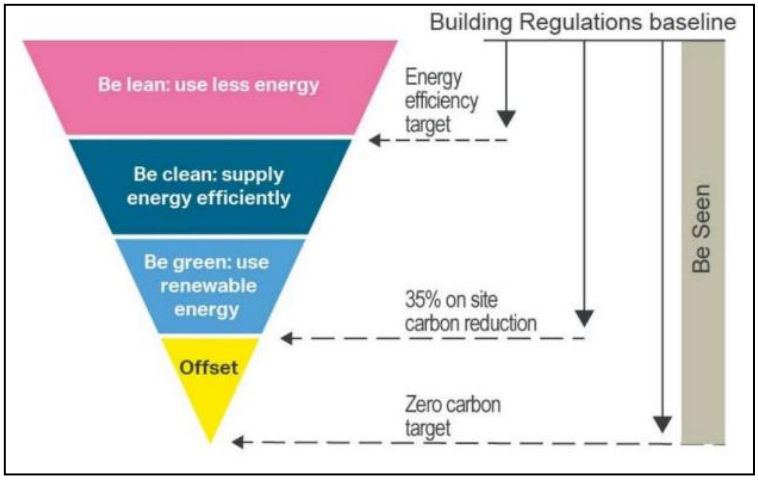


Figure 2. Energy Hierarchy

Be 'Lean' - Demand Reduction

The building fabric performance and engineering systems have been optimised in order to use less energy prior to the inclusion or consideration of Low and Zero Carbon (LZC) Technology.

Through passive design measures, efficient building fabric and engineering systems the building is estimated to achieve **3.7%** reduction in annual regulated CO_2 emissions over Part L1A benchmark, therefore demonstrating compliance with Building Regulations Through passive means alone without the utilisation of renewable technologies.

Passive Design Measures:

Fabric Performance - The fabric performance values aim to reduce unwanted heat loss and heat gains, whilst maintaining a comfortable internal environment.

Table 3. Fabric energy Efficiency Standard

Thermal element	Part L1A Minimum Standard
Wall	0.30W/m^2k
Roof	0.20 W/m^2k
Floor	0.25 W/m^2k
Glazing	1.2 W/m^2k
Doors	1.2 W/m^2k

The heat loss of different building elements is dependent upon their U –value. A building with low U values provides better levels of insulation and reduced heating demand.

The development will incorporate high levels of insulation and efficient glazing; thereby reduce demand for space heating. The table below shows the U values for the development and the associated improvements over Building Regulations.

Table 4. Energy Efficient design Specification

Element	Standard	Specification
Wall	0.30 W/m²k	0.14W/m²k
Floor	0.25W/ m²k	0.13W/m²k
Roof	0.2 W/ m²k	0.11 W/ m²k
Glazing	1.4 W/ m²k	1.1 W/ m²k

Space Heating & Cooling - Space heating could be provided by underfloor heating for each dwelling;

Efficient Lighting and Controls - Throughout the development natural lighting will be optimised. The development will also incorporate low energy light fittings throughout. All light fittings will be specified as low energy lighting and will accommodate compact fluorescent (CFLs) or fluorescent luminaries only.

Ventilation - The use of natural ventilation is proposed for dwelling.

Domestic hot water (DHW) system – domestic hot water is supplied for dwelling via the air source heat pump and cylinder.

Be 'Clean' – Supply Energy Efficiently

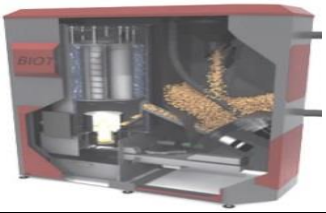
The Be Clean step of the energy hierarchy refers to the use of 'Clean energy supply'. This includes, but is not limited to, the use of Combined Heat and Power (CHP) and District Heat Networks. Policy TP1 seeks for new development to promote the use of CHP and district heating.

In light of the small scale nature of the proposed development, it is apparent that the use of CHP is also technically and financially unviable in this instance.

Be 'Green' - Renewable Energy

Once energy demand reduction measures have been applied, methods for generating low and zero carbon energy can be assessed. The following renewable technologies can be considered for the project: Biomass, Water source heat pump, air source heat pump, Wind energy and solar photovoltaic panels.

Table 5. Renewable Technologies Feasibility Table

Technology	Pros	Cons
Biomass Heating A biomass system designed for wood pellets, which have a high-energy content, would fuel this development. 	• Less volume of storage • Less maintenance and produce considerably less ash residue	• Nox Emissions which may impacts • High Costs • Not suitable for the project
Ground Source Heat Pump It circulates a mixture of water and antifreeze around a loop of pipe, called a ground loop, which is buried in the garden. Heat from the ground is absorbed into the fluid and passes through a heat exchanger into the heat pump 	• Use all through the year	• High Costs • Not suitable for this project
Air Source Heat Pump They are an efficient and environmentally-friendly way of heating using air drawn freely from the atmosphere. They operate rather like a refrigerator in reverse, absorbing heat from the air into a working fluid which is passed into a compressor where its temperature is increased before it is transferred into the heating and hot water circuits of the building	• Can generate less CO_2 than conventional heating systems. • Cheaper • Provides heating and hot water • Less maintenance • Can be used as air-conditioning in the summer	• Needs electricity • Can be noisy
Wind Turbines Wind turbines are available in various sizes from large rotors able to supply whole communities to small roof or wall-mounted units for individual dwellings. 	• Cheaper • Less CO_2	• Local wind speeds in the area is likely to be below the level generally required for investment in large wind turbines. • Noise and signal interference. • Detrimental aesthetic impact

Solar Photovoltaic Panels (PV) Photovoltaic panels extract the energy of the sun to generate electricity. They operate most efficiently when oriented to the south and are inclined to about 35 degrees. 	• Cheaper • Less CO_2 • No input power in order to generate electricity.	• Not enough space

Renewable Technologies Feasibility Review Conclusion

The renewable energy sources that have been reviewed for this project are Biomass Heating, Ground Source Heat Pump, Air Source Heat Pump, Domestic Wind Turbine and Solar Photovoltaic Panels (PV).

On review of the above technologies, it has been concluded that the use of an air source heat pump is to be incorporated in the design because it achieves a CO2 percentage reduction of **36.3%** contributing to an overall reduction **of 40.1%** in carbon emissions.

Be Seen: Post-Construction Monitoring

To truly achieve net zero-carbon buildings we need to have a better understanding of their actual operational energy performance. To reduce the 'performance gap' the fourth stage, 'be seen', is a critical element in minimising greenhouse gas emissions and keeping running costs low.
Quality assurance mechanisms and commitments that will be considered as part of the energy strategy are:

- Gaining quality assurance accreditation (e.g. Heat Trust)
- Following quality standards (e.g. CIBSE Code of Practice)
- Transparent billing, including separation of the ongoing maintenance and capital replacement aspects of the standing charge
- Aftercare support (e.g. BREEAM Man 05 Aftercare)
- Heat tariffs options given to occupants
- Consumer choice for metering arrangements at no extra cost (e.g. Prepayment Meters (PPM)
- Thermal storage linked to pricing signals and renewable generation

5. SUSTAINABLE DESIGN

The proposed project incorporates sustainable design and construction measures capable of mitigating and adapting to climate change to meet future needs. This section details site-specific initiatives which demonstrate how the conversion helps to meet the sustainability objectives set out in the National Planning Framework 2021.

Energy Use and Pollution
The design of the development has taken into consideration day lighting to habitable spaces to improve the wellbeing of occupants. Good levels of daylight will offer occupants a pleasant and highly valued connection to the outdoors and plenty of natural light. It will also reduce the use of artificial lighting and therefore energy use. All light fittings will be specified as low energy lighting.
No external lighting is required. The location and orientation of windows help to create a design that avoids overheating in the summer.

Pollution: Air, Noise and Light
The layout of the development can provide good internal air quality for habitable areas but not too much so as to waste heat. The use of openable windows will create horizontal airflow. By achieving a good naturally ventilated building the energy demand for air conditioning and mechanical ventilation will thereby be eliminated within the development.

The development will not increase the air pollution of the area by reducing as a start, its energy consumption, which in turn will reduce emissions that lead to air pollution.
Other measures will include:

a. Use of eco-friendly building materials
b. Non-toxic paints
c. Installation of energy efficient appliances and devices
d. Use of renewable technologies

Light pollution can best be described as artificial light that is allowed to illuminate or intrude upon areas not intended to be lit. Light in the wrong place at the wrong time can be intrusive.
Intrusive light is over bright or poorly directed lights shining onto neighbouring property which affect the neighbours' right to enjoy their property. Therefore, the proposal will incorporate lighting measures in order to avoid causing a nuisance.

Water: Water Efficiency
In domestic and non-domestic buildings, the demand for water can be reduced as much as 50% using a variety of simple and innovative strategies that are integrated into the plumbing and mechanical systems. In order to reduce water consumption the proposed development will include efficient fixtures with low flow rates. Total internal water consumption will not exceed 105 litres/person/day.

Table 6. Water Fittings Standards

Schedule Appliance Water Consumption		
Appliance	**Flow rate or Capacity**	**Total Litres**
WC	Dual flush WC 4/2.6 litre	14.72
Basin	1.7 litres/min	5.98
Shower	8 litres/minute flow	24.00
Bath	160 litres	25.60
Sink	4 litres/min	14.13
W/machine	Default used	16.66
Dish Washer	Default used	3.90
		104.99

Pollution

All contractors would be required to sign up to the nationally recognised Considerate Constructors Scheme which requires, amongst other things that dust emissions, potential noise pollution, impacts on water quality and the potential for ground contamination are minimised during demolition and construction. The Contractor would also be obliged to adhere to a site specific Code of Construction Practice to reduce potential nuisance effects.

Waste

A bin store has been included by the entrance for the residents exclusive use. Composting is also recommended to reduce the overall household.

Flood Risk

The development site is located in a Low Flood Risk Area on the Environment Agency Flood Risk Map.

Biodiversity

The proposed development will incorporate measures to support and enhance the environment through consideration of the existing site, including measures to mitigate the impact of the development and enhance site biodiversity.

6. Circular economy

Materials efficiency

Materials can have a significant impact on environmental performance, both in construction but also ongoing use. Materials used for the building will have lower environmental impacts over their lifecycle. This applies to the materials used in the external walls, roof and glazing. This extends to elements of the materials category such as the basic building materials (internal walls) and the finishing elements (fascia, skirting, and furniture).

It is expected that all timber used in the development will come from a legal Source (FSC Scheme). At least 80% of the building materials will be responsibly sourced and will use suppliers who can provide an EMS certificate or equivalent. Materials rated with an A or B in the BRE Green Guide to Specification will be preferred.

Other measures will be implemented:

- The reuse of existing materials from the demolition of existing buildings
- At least 20% of the total value of materials used should derive from recycled and reused content in the products and materials selected;
- Steel will have a high recycled content;
- Concrete will have a Ground Granulated Blast Furnace Slag (GGBS) value of 50%.

Resource efficiency

- Pre-demolition audit to be carried out and target benchmark of ≤ 11.1 tonnes of construction waste per 100m2;

Diversion of waste from landfill

- Where possible, segregation of recyclable and non-recyclable material will be employed for all waste generated throughout the construction process. Furthermore, material will be re-used on-site where feasible;
- Pre-fabrication of materials/elements such as bathroom pods, pipework and riser materials will be considered;
- Reusable packing solutions with key product manufacturers will be explored at the earliest opportunity. Solutions may include flat pallets, bulk bags, steel stillages and returnable cable drums;
- Construction waste – minimum 80% diversion from landfill rate;
- Demolition waste – minimum 90% diversion from landfill rate;
- Operational waste – Target diversion from landfill rate to be set.

7. CONCLUSION

The development has been designed to exceed Part L1A building regulations requirements. In line with the national and local policies, regulated CO_2 emissions from the development will be reduced by **40.1%** from the notional emissions once energy efficiency measures and lean measures are taken into account.

In order to achieve the required carbon emissions reduction, the report concludes and proposes the use of energy efficient measures outlined in the section 4 of this report.

An appraisal of the proposed development has been undertaken against key sustainability objectives identified from relevant policy guidance. The framework for the appraisal was guided by the National Plan. This process has ensured that the development responds to the sustainable development objectives that are relevant to the area. Key sustainability initiatives in ecology, waste management, water, health and wellbeing, materials, pollution and Surface water management have been incorporated in the design of the proposed Development.

8. APPENDIX

I. SAP Calculations

Project Information

Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 1
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	49.29	2.50	123.22	(3a)
First floor	43.20	2.80	120.96	(3b)
Second floor	43.20	2.80	120.96	(3c)
	135.69			**(4)**
			365.14	**(5)**

2. Ventilation rate

			m³ per hour	
	main + seondary + other heating			
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	5	x 10	50.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
		0.14	**(8)**
Pressure test, result q50	4.00		(17)
Air permeability		0.34	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.29	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18

13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.37	0.36	0.35	0.32	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34

3.76 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT			**7.120**	**1.05 (1.10)**	7.50			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East) SIDE			**4.640**	**1.05 (1.10)**	4.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**6.720**	**1.05 (1.10)**	7.08			(27)
Solid door FRONT			**2.270**	**1.10**	2.50			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**7.510**	**1.10**	8.26			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**2.170**	**1.05 (1.10)**	2.29			(27)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**1.320**	**1.05 (1.10)**	1.39			(27)
Walls EXTERNAL #WINDOWS & DOORS			125.64	0.14	17.59	70.00	8794.80	(29)
Ground floors UNDERGROUND			49.29	0.13	6.41	110.00	5421.90	(28)
Flat roofs GF REAR #ROOFLIGHTS			3.92	0.11	0.43	9.00	35.28	(30)
Flat roofs MAIN ROOF #ROOFLIGHTS			41.88	0.11	4.61	9.00	376.92	(30)
Party wall SOLID			80.15	0.00	0.00	180.00	14427.00	
Internal floor FF			43.20	0.00	0.00	18.00	777.60	
Internal floor SF			43.20	0.00	0.00	18.00	777.60	
Internal ceiling FF			43.20	0.00	0.00	9.00	388.80	
Internal ceiling GF			43.20	0.00	0.00	9.00	388.80	

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.91 (42)

Annual average hot water usage in litres per day Vd,average 108.71 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
119.58	115.23	110.88	106.54	102.19	97.84	97.84	102.19	106.54	110.88	115.23	119.58	(44)
Energy content of hot water used												
177.33	155.10	160.05	139.53	133.89	115.53	107.06	122.85	124.32	144.88	158.15	171.74	

Energy content (annual) 1710.43 (45)

Distribution loss												
26.60	23.26	24.01	20.93	20.08	17.33	16.06	18.43	18.65	21.73	23.72	25.76	(46)

Cylinder volume, l 300.00 (47)

Manufacturer's declared cylinder loss factor (kWh/day) 2.14 (48)

Temperature Factor 0.5400 (49)

Energy lost from hot water cylinder (kWh/day) 1.16 (55)

Total storage loss												
35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82	(56)
Net storage loss												
35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82	(57)
Primary loss												
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(62)
Output from water heater for each month, kWh/month												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(64)

2406.12 (64)

Heat gains from water heating, kWh/month												
106.23	94.26	100.48	92.14	91.79	84.16	82.87	88.12	87.08	95.44	98.33	104.37	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	(66)
Lighting gains												
68.70	61.02	49.63	37.57	28.08	23.71	25.62	33.30	44.70	56.75	66.24	70.61	(67)
Appliances gains												
454.41	459.13	447.24	421.95	390.02	360.00	339.95	335.24	347.12	372.42	404.35	434.36	(68)
Cooking gains												
55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	(71)
Water heating gains												
142.79	140.27	135.06	127.97	123.37	116.89	111.38	118.44	120.94	128.28	136.57	140.29	(72)
Total internal gains												
782.43	776.95	748.46	704.02	657.99	617.13	593.48	603.50	629.29	673.98	723.68	761.79	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South)	0.9 x 7.120	46.75	0.63 x 0.80	0.77	116.2638	
FRONT						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East)	0.9 x 4.640	19.64	0.63 x 0.80	0.77	31.8294	
SIDE						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 6.720	10.63	0.63 x 0.80	0.77	24.9577	
REAR						
Solid door	0.9 x 2.270	0.00	0.00 x 0.70	0.77	0.0000	
FRONT						
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 7.510	10.63	0.63 x 0.80	0.77	27.8917	
REAR						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 2.170	26.00	0.63 x 0.80	1.00	25.5921	
ROOF						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 1.320	26.00	0.63 x 0.80	1.00	15.5676	
ROOF						
Total solar gains, January					242.10	(83-1)

Solar gains												
242.10	439.16	668.69	936.81	1144.24	1176.68	1117.58	957.29	761.03	503.97	294.94	203.94	(83)
Total gains												
1024.53	1216.11	1417.14	1640.83	1802.23	1793.81	1711.06	1560.79	1390.32	1177.94	1018.62	965.73	(84)

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau											
57.58	57.70	57.82	58.37	58.48	58.97	58.97	59.06	58.78	58.48	58.27	58.04
alpha											
4.84	4.85	4.85	4.89	4.90	4.93	4.93	4.94	4.92	4.90	4.88	4.87
Utilisation factor for gains for living area											
0.99	0.98	0.95	0.87	0.71	0.52	0.38	0.43	0.68	0.92	0.98	0.99 (86)
Mean internal temperature in living area T1											
20.10	20.26	20.48	20.73	20.88	20.93	20.94	20.94	20.90	20.69	20.34	20.07 (87)
Temperature during heating periods in rest of dwelling Th2											
19.99	19.99	19.99	20.00	20.00	20.01	20.01	20.01	20.01	20.00	20.00	20.00 (88)
Utilisation factor for gains for rest of dwelling											
0.99	0.98	0.94	0.83	0.65	0.44	0.29	0.34	0.60	0.89	0.98	0.99 (89)
Mean internal temperature in the rest of dwelling T2											
18.80	19.02	19.34	19.68	19.86	19.92	19.93	19.93	19.90	19.64	19.16	18.76 (90)

Living area fraction (38.72 / 135.69) 0.29 (91)

Mean internal temperature (for the whole dwelling)

19.17	19.37	19.66	19.98	20.15	20.21	20.22	20.22	20.18	19.94	19.50	19.14 (92)

Apply adjustment to the mean internal temperature, where appropriate

19.17	19.37	19.66	19.98	20.15	20.21	20.22	20.22	20.18	19.94	19.50	19.14 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains											
0.99	0.97	0.94	0.83	0.66	0.46	0.31	0.36	0.62	0.89	0.98	0.99 (94)
Useful gains											
1012.04	1183.65	1325.45	1368.29	1185.74	819.51	533.69	561.22	861.51	1050.32	993.29	956.59 (95)
Monthly average external temperature											
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20 (96)
Heat loss rate for mean internal temperature											
2251.9	2186.9	1985.21	1655.37	1260.60	829.55	534.88	563.58	902.48	1391.94	1854.88	2243.6 (97)
Fraction of month for heating											
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00
Space heating requirement for each month, kWh/month											
922.43	674.20	490.86	206.69	55.70	-	-	-	-	254.16	620.34	957.53

Total space heating requirement per year (kWh/year) (October to May) 4181.92 (98)

Space heating requirement per m² (kWh/m²/year) 30.82 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	90.90%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
922.43	674.20	490.86	206.69	55.70	-	-	-	-	254.16	620.34	957.53	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
1014.77	741.69	540.00	227.39	61.28	-	-	-	-	279.61	682.45	1053.38	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(64)
Efficiency of water heater												80.20 (216)
88.49	88.12	87.30	85.35	82.37	80.20	80.20	80.20	80.20	85.80	87.88	88.60	(217)
Water heating fuel												
267.17	236.56	251.00	230.48	234.27	215.35	207.16	226.85	226.31	237.71	245.03	260.51	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4600.57	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2838.41	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00	(231)
Electricity for lighting (100.00% fixed LEL)	485.33	(232)
Energy saving/generation technologies		
PVs 0.80 x 2.000 x 950.616 x 1.000	1520.986	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
	1520.986	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	6478.33	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4600.569	3.480	160.10	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating cost	2838.41	3.480	98.78	(247)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	75.000	13.190	9.89	(249)
Energy for lighting	485.335	13.190	64.02	(250)
Additional standing charges			120.00	(251)
Electricity generated - PVs	1520.986	13.190	-200.62	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			252.17	(255)

11a. SAP rating

	0.42	**(256)**
	0.59	**(257)**
SAP value	91.82	
	92	(258)
SAP band	**A**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4600.57	0.216	993.72	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2838.41	0.216	613.10	(264)
Space and water heating			1606.82	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	485.33	0.519	251.89	(268)
Electricity generated - PVs	-1520.99	0.519	-789.39	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1108.24	(272)

	kg/m²/year	
CO2 emissions per m²	**8.17**	(273)
EI value	91.78	(273a)
EI rating	**92**	(274)
EI band	**A**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(3.48 / 0.9090) x (1 + (0.29 x 0.25)) = 4.1059, stars = 4
Main heating environmental impact	(0.2160 / 0.9090) x (1 + (0.29 x 0.25)) = 0.2549, stars = 4
Water heating energy efficiency	3.48 / 0.8456 = 4.1154, stars = 4
Water heating environmental impact	0.2160 / 0.8456 = 0.2554, stars = 4

Project Information
Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 1
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.05.054, printed on 07/03/2022 at 09:08:47

New dwelling as designed

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1 TER and DER
Fuel for main heating system: Gas (mains) (fuel factor = 1.00)

Target Carbon Dioxide Emission Rate	TER = 16.07	
Dwelling Carbon Dioxide Emission Rate	DER = 9.65	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 54.8	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 42.3	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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2b Fabric U-values

Element	Average	Highest	
Wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	4.00	OK
Maximum :	10.00	

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4 Heating efficiency
Main heating system:
Boiler and underfloor heating, mains gas
Vaillant ecoFIT pure 630
Source of efficiency: from boiler database
Vaillant ecoFIT pure 630 VU 306/6-3 (H-GB)
Efficiency: 89.9% SEDBUK2009
Minimum: 88.0% OK
Secondary heating system:
None -

5 Cylinder insulation

Hot water storage

	Manufacturer's declared cylinder loss factor (kWh/day)	2.14	
	Permitted by DBSCG	2.86	OK
Primary pipework insulated	Yes		OK

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	Time and temperature zone control	OK
	Cylinderstat - Yes	OK
	Independent timer for DHW - Yes	OK
Boiler Interlock	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100.0%

Minimum: 75.0% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): OK

Not significant OK

Based on:

Thermal mass parameter : 231.33

Overshading : Average or unknown (20-60 % sky blocked)

Orientation : South

Ventilation rate : 8.00

Blinds/curtains :

None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Double-glazed, argon filled, low-E, En=0.1, soft coat U-value 1.10 W/m²K

Flat roofs U-value 0.11 W/m²K

Solid door U-value 1.10 W/m²K

Walls U-value 0.14 W/m²K

Photovoltaic array

Project Information

Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 1
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	49.29	2.50	123.22	(3a)
First floor	43.20	2.80	120.96	(3b)
Second floor	43.20	2.80	120.96	(3c)
	135.69			**(4)**
			365.14	**(5)**

2. Ventilation rate

			m³ per hour	
	main + seondary + other heating			
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	5	x 10	50.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
		0.14	**(8)**
Pressure test, result q50	4.00		(17)
Air permeability		0.34	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.29	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18

13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.37	0.36	0.35	0.32	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34

3.76 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**6.720**	**1.05 (1.10)**	7.08			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East) SIDE			**4.640**	**1.05 (1.10)**	4.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT			**7.120**	**1.05 (1.10)**	7.50			(27)
Solid door FRONT			**2.270**	**1.10**	2.50			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**7.510**	**1.10**	8.26			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**2.170**	**1.05 (1.10)**	2.29			(27)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**1.320**	**1.05 (1.10)**	1.39			(27)
Walls EXTERNAL #WINDOWS & DOORS			125.64	0.14	17.59	70.00	8794.80	(29)
Ground floors UNDERGROUND			49.29	0.13	6.41	110.00	5421.90	(28)
Flat roofs GF REAR #ROOFLIGHTS			3.92	0.11	0.43	9.00	35.28	(30)
Flat roofs MAIN ROOF #ROOFLIGHTS			41.88	0.11	4.61	9.00	376.92	(30)
Party wall SOLID			80.15	0.00	0.00	180.00	14427.00	
Internal floor FF			43.20	0.00	0.00	18.00	777.60	
Internal floor SF			43.20	0.00	0.00	18.00	777.60	
Internal ceiling FF			43.20	0.00	0.00	9.00	388.80	
Internal ceiling GF			43.20	0.00	0.00	9.00	388.80	

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.91 (42)

Annual average hot water usage in litres per day Vd,average 108.71 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
119.58	115.23	110.88	106.54	102.19	97.84	97.84	102.19	106.54	110.88	115.23	119.58	(44)
Energy content of hot water used												
177.33	155.10	160.05	139.53	133.89	115.53	107.06	122.85	124.32	144.88	158.15	171.74	

Energy content (annual) 1710.43 (45)

Distribution loss												
26.60	23.26	24.01	20.93	20.08	17.33	16.06	18.43	18.65	21.73	23.72	25.76	(46)

Cylinder volume, l 300.00 (47)

Manufacturer's declared cylinder loss factor (kWh/day) 2.14 (48)

Temperature Factor 0.5400 (49)

Energy lost from hot water cylinder (kWh/day) 1.16 (55)

Total storage loss												
35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82	(56)
Net storage loss												
35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82	(57)
Primary loss												
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(62)
Output from water heater for each month, kWh/month												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(64)

2406.12 (64)

Heat gains from water heating, kWh/month												
106.23	94.26	100.48	92.14	91.79	84.16	82.87	88.12	87.08	95.44	98.33	104.37	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	(66)
Lighting gains												
68.70	61.02	49.63	37.57	28.08	23.71	25.62	33.30	44.70	56.75	66.24	70.61	(67)
Appliances gains												
454.41	459.13	447.24	421.95	390.02	360.00	339.95	335.24	347.12	372.42	404.35	434.36	(68)
Cooking gains												
55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	(71)
Water heating gains												
142.79	140.27	135.06	127.97	123.37	116.89	111.38	118.44	120.94	128.28	136.57	140.29	(72)
Total internal gains												
782.43	776.95	748.46	704.02	657.99	617.13	593.48	603.50	629.29	673.98	723.68	761.79	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 6.720	10.63	0.63 x 0.80	0.77	24.9577	
REAR						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East)	0.9 x 4.640	19.64	0.63 x 0.80	0.77	31.8294	
SIDE						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South)	0.9 x 7.120	46.75	0.63 x 0.80	0.77	116.2638	
FRONT						
Solid door	0.9 x 2.270	0.00	0.00 x 0.70	0.77	0.0000	
FRONT						
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 7.510	10.63	0.63 x 0.80	0.77	27.8917	
REAR						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 2.170	26.00	0.63 x 0.80	1.00	25.5921	
ROOF						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 1.320	26.00	0.63 x 0.80	1.00	15.5676	
ROOF						
Total solar gains, January					242.10	(83-1)

Solar gains												
242.10	439.16	668.69	936.81	1144.24	1176.68	1117.58	957.29	761.03	503.97	294.94	203.94	(83)
Total gains												
1024.53	1216.11	1417.14	1640.83	1802.23	1793.81	1711.06	1560.79	1390.32	1177.94	1018.62	965.73	(84)

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau											
57.58	57.70	57.82	58.37	58.48	58.97	58.97	59.06	58.78	58.48	58.27	58.04
alpha											
4.84	4.85	4.85	4.89	4.90	4.93	4.93	4.94	4.92	4.90	4.88	4.87
Utilisation factor for gains for living area											
0.99	0.98	0.95	0.87	0.71	0.52	0.38	0.43	0.68	0.92	0.98	0.99 (86)
Mean internal temperature in living area T1											
20.10	20.26	20.48	20.73	20.88	20.93	20.94	20.94	20.90	20.69	20.34	20.07 (87)
Temperature during heating periods in rest of dwelling Th2											
19.99	19.99	19.99	20.00	20.00	20.01	20.01	20.01	20.01	20.00	20.00	20.00 (88)
Utilisation factor for gains for rest of dwelling											
0.99	0.98	0.94	0.83	0.65	0.44	0.29	0.34	0.60	0.89	0.98	0.99 (89)
Mean internal temperature in the rest of dwelling T2											
18.80	19.02	19.34	19.68	19.86	19.92	19.93	19.93	19.90	19.64	19.16	18.76 (90)

Living area fraction (38.72 / 135.69) 0.29 (91)

Mean internal temperature (for the whole dwelling)

19.17	19.37	19.66	19.98	20.15	20.21	20.22	20.22	20.18	19.94	19.50	19.14 (92)

Apply adjustment to the mean internal temperature, where appropriate

19.17	19.37	19.66	19.98	20.15	20.21	20.22	20.22	20.18	19.94	19.50	19.14 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains											
0.99	0.97	0.94	0.83	0.66	0.46	0.31	0.36	0.62	0.89	0.98	0.99 (94)
Useful gains											
1012.04	1183.65	1325.45	1368.29	1185.74	819.51	533.69	561.22	861.51	1050.32	993.29	956.59 (95)
Monthly average external temperature											
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20 (96)
Heat loss rate for mean internal temperature											
2251.9	2186.9	1985.21	1655.37	1260.60	829.55	534.88	563.58	902.48	1391.94	1854.88	2243.6 (97)
Fraction of month for heating											
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00
Space heating requirement for each month, kWh/month											
922.43	674.20	490.86	206.69	55.70	-	-	-	-	254.16	620.34	957.53

Total space heating requirement per year (kWh/year) (October to May) 4181.92 (98)

Space heating requirement per m² (kWh/m²/year) 30.82 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	90.90%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
922.43	674.20	490.86	206.69	55.70	-	-	-	-	254.16	620.34	957.53	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
1014.77	741.69	540.00	227.39	61.28	-	-	-	-	279.61	682.45	1053.38	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(64)
Efficiency of water heater												80.20 (216)
88.49	88.12	87.30	85.35	82.37	80.20	80.20	80.20	80.20	85.80	87.88	88.60	(217)
Water heating fuel												
267.17	236.56	251.00	230.48	234.27	215.35	207.16	226.85	226.31	237.71	245.03	260.51	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4600.57	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2838.41	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00	(231)
Electricity for lighting (100.00% fixed LEL)	485.33	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7999.32	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4600.569	3.480	160.10	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating cost	2838.41	3.480	98.78	(247)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	75.000	13.190	9.89	(249)
Energy for lighting	485.335	13.190	64.02	(250)
Additional standing charges			120.00	(251)
Electricity generated - PVs	0.000	0.000	0.00	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			452.78	(255)

11a. SAP rating

	0.42	**(256)**
	1.05	**(257)**
SAP value	85.32	
	85	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4600.57	0.216	993.72	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2838.41	0.216	613.10	(264)
Space and water heating			1606.82	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	485.33	0.519	251.89	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1897.63	(272)

	kg/m²/year	
CO2 emissions per m²	**13.99**	(273)
EI value	85.93	(273a)
EI rating	**86**	(274)
EI band	**B**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(3.48 / 0.9090) x (1 + (0.29 x 0.25)) = 4.1059, stars = 4
Main heating environmental impact	(0.2160 / 0.9090) x (1 + (0.29 x 0.25)) = 0.2549, stars = 4
Water heating energy efficiency	3.48 / 0.8456 = 4.1154, stars = 4
Water heating environmental impact	0.2160 / 0.8456 = 0.2554, stars = 4

Project Information
Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 1
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.05.054, printed on 07/03/2022 at 09:08:48

New dwelling as designed

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1 TER and DER
Fuel for main heating system: Gas (mains) (fuel factor = 1.00)

Target Carbon Dioxide Emission Rate	TER = 16.07	
Dwelling Carbon Dioxide Emission Rate	DER = 15.46	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 54.8	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 42.3	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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2b Fabric U-values

Element	Average	Highest	
Wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	4.00	OK
Maximum :	10.00	

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4 Heating efficiency
Main heating system:
Boiler and underfloor heating, mains gas
Vaillant ecoFIT pure 630
Source of efficiency: from boiler database
Vaillant ecoFIT pure 630 VU 306/6-3 (H-GB)
Efficiency: 89.9% SEDBUK2009
Minimum: 88.0% OK
Secondary heating system:
None -

5 Cylinder insulation

Hot water storage

	Manufacturer's declared cylinder loss factor (kWh/day)	2.14	
	Permitted by DBSCG	2.86	OK
Primary pipework insulated	Yes		OK

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	Time and temperature zone control	OK
	Cylinderstat - Yes	OK
	Independent timer for DHW - Yes	OK
Boiler Interlock	Yes	OK

7 Low energy lights

	Percentage of fixed lights with low-energy fittings: 100.0%	
	Minimum: 75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley):		OK
	Not significant	OK

Based on:

Thermal mass parameter :	231.33
Overshading :	Average or unknown (20-60 % sky blocked)

Orientation : South

Ventilation rate :	8.00

Blinds/curtains :

None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Double-glazed, argon filled, low-E, En=0.1, soft coat U-value 1.10 W/m²K
Flat roofs U-value 0.11 W/m²K
Solid door U-value 1.10 W/m²K
Walls U-value 0.14 W/m²K

Project Information

Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 1
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	49.29	2.50	123.22	(3a)
First floor	43.20	2.80	120.96	(3b)
Second floor	43.20	2.80	120.96	(3c)
	135.69			**(4)**
			365.14	**(5)**

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	5	x 10	50.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
		0.14	**(8)**
Pressure test, result q50	4.00		(17)
Air permeability		0.34	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.29	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18

13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.37	0.36	0.35	0.32	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34

3.76 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT			**7.120**	**1.05 (1.10)**	7.50			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East) SIDE			**4.640**	**1.05 (1.10)**	4.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**6.720**	**1.05 (1.10)**	7.08			(27)
Solid door FRONT			**2.270**	**1.10**	2.50			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**7.510**	**1.10**	8.26			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**2.170**	**1.05 (1.10)**	2.29			(27)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**1.320**	**1.05 (1.10)**	1.39			(27)
Walls EXTERNAL #WINDOWS & DOORS			125.64	0.14	17.59	70.00	8794.80	(29)
Ground floors UNDERGROUND			49.29	0.13	6.41	110.00	5421.90	(28)
Flat roofs GF REAR #ROOFLIGHTS			3.92	0.11	0.43	9.00	35.28	(30)
Flat roofs MAIN ROOF #ROOFLIGHTS			41.88	0.11	4.61	9.00	376.92	(30)
Party wall SOLID			80.15	0.00	0.00	180.00	14427.00	
Internal floor FF			43.20	0.00	0.00	18.00	777.60	
Internal floor SF			43.20	0.00	0.00	18.00	777.60	
Internal ceiling FF			43.20	0.00	0.00	9.00	388.80	
Internal ceiling GF			43.20	0.00	0.00	9.00	388.80	

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.91 (42)

Annual average hot water usage in litres per day Vd,average 108.71 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
119.58	115.23	110.88	106.54	102.19	97.84	97.84	102.19	106.54	110.88	115.23	119.58	(44)
Energy content of hot water used												
177.33	155.10	160.05	139.53	133.89	115.53	107.06	122.85	124.32	144.88	158.15	171.74	

Energy content (annual) 1710.43 (45)

Distribution loss												
26.60	23.26	24.01	20.93	20.08	17.33	16.06	18.43	18.65	21.73	23.72	25.76	(46)

Cylinder volume, l 150.00 (47)

Manufacturer's declared cylinder loss factor (kWh/day) 1.60 (48)

Temperature Factor 0.5400 (49)

Energy lost from hot water cylinder (kWh/day) 0.86 (55)

Total storage loss												
26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78	(56)
Net storage loss												
26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78	(57)
Primary loss												
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month												
227.38	200.30	210.09	187.97	183.93	163.96	157.10	172.90	172.75	194.93	206.58	221.79	(62)
Output from water heater for each month, kWh/month												
227.38	200.30	210.09	187.97	183.93	163.96	157.10	172.90	172.75	194.93	206.58	221.79	(64)

2299.68 (64)

Heat gains from water heating, kWh/month												
99.00	87.73	93.25	85.14	84.55	77.16	75.63	80.89	80.08	88.21	91.33	97.14	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	(66)
Lighting gains												
68.70	61.02	49.63	37.57	28.08	23.71	25.62	33.30	44.70	56.75	66.24	70.61	(67)
Appliances gains												
454.41	459.13	447.24	421.95	390.02	360.00	339.95	335.24	347.12	372.42	404.35	434.36	(68)
Cooking gains												
55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	(69)
Pumps and fans gains												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (negative values)												
-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	(71)
Water heating gains												
133.07	130.55	125.34	118.25	113.65	107.17	101.66	108.72	111.22	118.56	126.85	130.57	(72)
Total internal gains												
769.71	764.23	735.74	691.30	645.27	604.41	580.76	590.78	616.57	661.26	710.96	749.07	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South)	0.9 x 7.120	46.75	0.63 x 0.80	0.77	116.2638	
FRONT						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East)	0.9 x 4.640	19.64	0.63 x 0.80	0.77	31.8294	
SIDE						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 6.720	10.63	0.63 x 0.80	0.77	24.9577	
REAR						
Solid door	0.9 x 2.270	0.00	0.00 x 0.70	0.77	0.0000	
FRONT						
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 7.510	10.63	0.63 x 0.80	0.77	27.8917	
REAR						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 2.170	26.00	0.63 x 0.80	1.00	25.5921	
ROOF						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 1.320	26.00	0.63 x 0.80	1.00	15.5676	
ROOF						
Total solar gains, January					242.10	(83-1)

Solar gains												
242.10	439.16	668.69	936.81	1144.24	1176.68	1117.58	957.29	761.03	503.97	294.94	203.94	(83)
Total gains												
1011.81	1203.39	1404.42	1628.11	1789.51	1781.09	1698.34	1548.07	1377.60	1165.22	1005.90	953.01	(84)

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
57.58	57.70	57.82	58.37	58.48	58.97	58.97	59.06	58.78	58.48	58.27	58.04	
alpha												
4.84	4.85	4.85	4.89	4.90	4.93	4.93	4.94	4.92	4.90	4.88	4.87	
Utilisation factor for gains for living area												
0.99	0.98	0.95	0.87	0.71	0.52	0.38	0.43	0.69	0.92	0.98	0.99	(86)
Tweekday												
19.97	20.14	20.40	20.69	20.86	20.92	20.93	20.93	20.89	20.64	20.24	19.94	
Tweekend												
20.42	20.51	20.66	20.82	20.92	20.96	20.96	20.96	20.94	20.79	20.57	20.40	
24 instead of 16												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
24 instead of 9												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16 instead of 9												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean internal temperature in living area T1												
20.10	20.25	20.48	20.72	20.88	20.93	20.94	20.94	20.90	20.68	20.33	20.07	(87)
Temperature during heating periods in rest of dwelling Th2												
19.99	19.99	19.99	20.00	20.00	20.01	20.01	20.01	20.01	20.00	20.00	20.00	(88)
Utilisation factor for gains for rest of dwelling												
0.99	0.98	0.94	0.84	0.65	0.44	0.30	0.34	0.61	0.90	0.98	0.99	(89)
Tweekday												
18.79	19.01	19.33	19.68	19.86	19.92	19.93	19.93	19.90	19.63	19.15	18.75	
Tweekend												
18.79	19.01	19.33	19.68	19.86	19.92	19.93	19.93	19.90	19.63	19.15	18.75	
Mean internal temperature in the rest of dwelling T2												
18.79	19.01	19.33	19.68	19.86	19.92	19.93	19.93	19.90	19.63	19.15	18.75	(90)

Living area fraction (38.72 / 135.69) 0.29 (91)

Mean internal temperature (for the whole dwelling)

19.16	19.36	19.66	19.98	20.15	20.21	20.22	20.22	20.18	19.93	19.48	19.13	(92)

Apply adjustment to the mean internal temperature, where appropriate

19.16	19.36	19.66	19.98	20.15	20.21	20.22	20.22	20.18	19.93	19.48	19.13	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.97	0.94	0.84	0.66	0.46	0.31	0.36	0.62	0.89	0.98	0.99	(94)
Useful gains												
1000.06	1172.46	1316.08	1362.56	1183.78	819.17	533.64	561.12	860.03	1042.72	982.00	944.46	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
2250.6	2185.6	1984.19	1654.63	1260.41	829.52	534.87	563.57	902.33	1391.12	1853.34	2242.3	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
930.40	680.86	497.08	210.29	57.01	-	-	-	-	259.21	627.37	965.61	

Total space heating requirement per year (kWh/year) (October to May) 4227.82 (98)

Space heating requirement per m² (kWh/m²/year) 31.16 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	421.68%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
930.40	680.86	497.08	210.29	57.01	-	-	-	-	259.21	627.37	965.61	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
220.64	161.47	117.88	49.87	13.52	-	-	-	-	61.47	148.78	228.99	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
227.38	200.30	210.09	187.97	183.93	163.96	157.10	172.90	172.75	194.93	206.58	221.79	(64)

Efficiency of water heater	279.11	(216)

279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	(217)
Water heating fuel												
81.47	71.76	75.27	67.34	65.90	58.75	56.29	61.95	61.89	69.84	74.01	79.46	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	1002.62	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	823.93	(219)
Electricity for pumps, fans and electric keep-hot		
Total electricity for the above, kWh/year	0.00	(231)
Electricity for lighting (100.00% fixed LEL)	485.33	(232)
Energy saving/generation technologies		
Electricity generated - µCHP/heat pump	0.00	(235)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	2311.89	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	1002.621	13.190	132.25	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
High-rate percentage	100.000%			(243)
Low-rate percentage	0.000%			(244)
High-rate cost	823.93	13.190	108.68	(245)
Low-rate	0.00	13.190	0.00	(246)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	0.000	13.190	0.00	(249)
Energy for lighting	485.335	13.190	64.02	(250)
Additional standing charges			0.00	(251)
Electricity generated - PVs	0.000	0.000	0.00	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			304.94	(255)

11a. SAP rating

	0.42	**(256)**
	0.71	**(257)**
SAP value	90.11	
	90	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	1002.62	0.519	520.36	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	823.93	0.519	427.62	(264)
Space and water heating			947.98	(265)
Electricity for pumps and fans	0.00	0.519	0.00	(267)
Electricity for lighting	485.33	0.519	251.89	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.519	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1199.87	(272)

	kg/m²/year	
CO2 emissions per m²	**8.84**	(273)
EI value	91.10	(273a)
EI rating	**91**	(274)
EI band	**B**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(13.19 / 4.2168) x (1 + (0.29 x 0.25)) = 3.3548, stars = 5
Main heating environmental impact	(0.5190 / 4.2168) x (1 + (0.29 x 0.25)) = 0.1320, stars = 5
Water heating energy efficiency	13.19 / 2.7911 = 4.7257, stars = 4
Water heating environmental impact	0.52 / + (0.00 x 0.52) = 0.1859, stars = 5

Project Information
Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 1
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.05.054, printed on 07/03/2022 at 09:08:47

New dwelling as designed

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1 TER and DER
Fuel for main heating system: Standard tariff (fuel factor = 1.55)

Target Carbon Dioxide Emission Rate	TER = 23.71	
Dwelling Carbon Dioxide Emission Rate	DER = 9.62	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 54.8	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 42.3	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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2b Fabric U-values

Element	Average	Highest	
Wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	4.00	OK
Maximum :	10.00	

---

4 Heating efficiency
Main heating system:
Air source heat pump, underfloor, electric
Daikin Altherma EPRA16DV3 + ETBH16D6V
Source of efficiency: from boiler database
Secondary heating system:
None -

---

5 Cylinder insulation
Hot water storage No cylinder

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	2207 Time and temperature zone control	OK
Hot water controls	No cylinder	
Boiler Interlock	No	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100.0%
Minimum: 75.0% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): OK

Not significant OK

Based on:

Thermal mass parameter : 231.33
Overshading : Average or unknown (20-60 % sky blocked)
Orientation : South
Ventilation rate : 8.00
Blinds/curtains :
None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Double-glazed, argon filled, low-E, En=0.1, soft coat U-value 1.10 W/m²K
Flat roofs U-value 0.11 W/m²K
Solid door U-value 1.10 W/m²K
Walls U-value 0.14 W/m²K

Project Information

Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 2
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	49.29	2.50	123.22	(3a)
First floor	43.20	2.80	120.96	(3b)
Second floor	43.20	2.80	120.96	(3c)
	135.69			**(4)**
			365.14	**(5)**

2. Ventilation rate

			m³ per hour	
	main + seondary + other heating			
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	5	x 10	50.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
		0.14	**(8)**
Pressure test, result q50	4.00		(17)
Air permeability		0.34	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.29	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18

13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.37	0.36	0.35	0.32	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34

3.76 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**6.720**	**1.05 (1.10)**	7.08			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East) SIDE			**3.480**	**1.05 (1.10)**	3.67			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT			**7.120**	**1.05 (1.10)**	7.50			(27)
Solid door FRONT			**2.270**	**1.10**	2.50			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**7.510**	**1.10**	8.26			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**2.170**	**1.05 (1.10)**	2.29			(27)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**1.320**	**1.05 (1.10)**	1.39			(27)
Walls EXTERNAL #WINDOWS & DOORS			126.80	0.14	17.75	70.00	8876.00	(29)
Ground floors UNDERGROUND			49.29	0.13	6.41	110.00	5421.90	(28)
Flat roofs GF REAR #ROOFLIGHTS			3.92	0.11	0.43	9.00	35.28	(30)
Flat roofs MAIN ROOF #ROOFLIGHTS			41.88	0.11	4.61	9.00	376.92	(30)
Party wall SOLID			80.15	0.00	0.00	180.00	14427.00	
Internal floor FF			43.20	0.00	0.00	18.00	777.60	
Internal floor SF			43.20	0.00	0.00	18.00	777.60	
Internal ceiling FF			43.20	0.00	0.00	9.00	388.80	
Internal ceiling GF			43.20	0.00	0.00	9.00	388.80	

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.91 (42)

Annual average hot water usage in litres per day Vd,average 108.71 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
119.58	115.23	110.88	106.54	102.19	97.84	97.84	102.19	106.54	110.88	115.23	119.58	(44)
Energy content of hot water used												
177.33	155.10	160.05	139.53	133.89	115.53	107.06	122.85	124.32	144.88	158.15	171.74	

Energy content (annual) 1710.43 (45)

Distribution loss												
26.60	23.26	24.01	20.93	20.08	17.33	16.06	18.43	18.65	21.73	23.72	25.76	(46)

Cylinder volume, l 300.00 (47)

Manufacturer's declared cylinder loss factor (kWh/day) 2.14 (48)

Temperature Factor 0.5400 (49)

Energy lost from hot water cylinder (kWh/day) 1.16 (55)

Total storage loss												
35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82	(56)
Net storage loss												
35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82	(57)
Primary loss												
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(62)
Output from water heater for each month, kWh/month												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(64)

2406.12 (64)

Heat gains from water heating, kWh/month												
106.23	94.26	100.48	92.14	91.79	84.16	82.87	88.12	87.08	95.44	98.33	104.37	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	(66)
Lighting gains												
69.23	61.49	50.00	37.86	28.30	23.89	25.81	33.55	45.04	57.18	66.74	71.15	(67)
Appliances gains												
454.41	459.13	447.24	421.95	390.02	360.00	339.95	335.24	347.12	372.42	404.35	434.36	(68)
Cooking gains												
55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	(71)
Water heating gains												
142.79	140.27	135.06	127.97	123.37	116.89	111.38	118.44	120.94	128.28	136.57	140.29	(72)
Total internal gains												
782.95	777.41	748.84	704.30	658.21	617.31	593.67	603.76	629.63	674.41	724.19	762.32	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 6.720	10.63	0.63 x 0.80	0.77	24.9577	
REAR						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East)	0.9 x 3.480	19.64	0.63 x 0.80	0.77	23.8721	
SIDE						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South)	0.9 x 7.120	46.75	0.63 x 0.80	0.77	116.2638	
FRONT						
Solid door	0.9 x 2.270	0.00	0.00 x 0.70	0.77	0.0000	
FRONT						
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 7.510	10.63	0.63 x 0.80	0.77	27.8917	
REAR						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 2.170	26.00	0.63 x 0.80	1.00	25.5921	
ROOF						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 1.320	26.00	0.63 x 0.80	1.00	15.5676	
ROOF						
Total solar gains, January					234.15	(83-1)

Solar gains												
234.15	423.59	643.05	899.42	1098.42	1129.78	1072.92	918.93	731.21	485.49	285.02	197.40	(83)
Total gains												
1017.10	1201.01	1391.88	1603.72	1756.63	1747.09	1666.60	1522.69	1360.84	1159.91	1009.20	959.72	(84)

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau											
58.14	58.26	58.38	58.94	59.05	59.55	59.55	59.65	59.36	59.05	58.83	58.61
alpha											
4.88	4.88	4.89	4.93	4.94	4.97	4.97	4.98	4.96	4.94	4.92	4.91
Utilisation factor for gains for living area											
0.99	0.98	0.96	0.87	0.72	0.53	0.39	0.44	0.69	0.93	0.98	0.99 (86)
Mean internal temperature in living area T1											
20.11	20.26	20.48	20.73	20.88	20.93	20.94	20.94	20.90	20.69	20.35	20.08 (87)
Temperature during heating periods in rest of dwelling Th2											
19.99	20.00	20.00	20.01	20.01	20.02	20.02	20.02	20.01	20.01	20.00	20.00 (88)
Utilisation factor for gains for rest of dwelling											
0.99	0.98	0.94	0.84	0.66	0.45	0.30	0.35	0.61	0.90	0.98	0.99 (89)
Mean internal temperature in the rest of dwelling T2											
18.81	19.03	19.34	19.68	19.87	19.93	19.94	19.94	19.90	19.64	19.17	18.78 (90)

Living area fraction (38.72 / 135.69) 0.29 (91)

Mean internal temperature (for the whole dwelling)

19.18	19.38	19.67	19.98	20.16	20.22	20.22	20.22	20.19	19.94	19.50	19.15 (92)

Apply adjustment to the mean internal temperature, where appropriate

19.18	19.38	19.67	19.98	20.16	20.22	20.22	20.22	20.19	19.94	19.50	19.15 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains											
0.99	0.97	0.94	0.84	0.67	0.47	0.32	0.37	0.63	0.90	0.98	0.99 (94)
Useful gains											
1005.11	1170.37	1306.34	1349.33	1173.99	813.78	530.55	557.82	854.47	1038.64	984.96	950.93 (95)
Monthly average external temperature											
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20 (96)
Heat loss rate for mean internal temperature											
2238.0	2172.6	1971.42	1643.53	1252.03	824.31	531.79	560.27	896.65	1382.55	1843.07	2229.8 (97)
Fraction of month for heating											
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00
Space heating requirement for each month, kWh/month											
917.23	673.52	494.81	211.82	58.07	-	-	-	-	255.87	617.84	951.45

Total space heating requirement per year (kWh/year) (October to May) 4180.61 (98)

Space heating requirement per m² (kWh/m²/year) 30.81 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	90.90%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
917.23	673.52	494.81	211.82	58.07	-	-	-	-	255.87	617.84	951.45	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
1009.06	740.94	544.35	233.03	63.88	-	-	-	-	281.48	679.69	1046.70	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(64)
Efficiency of water heater												80.20 (216)
88.48	88.12	87.32	85.41	82.44	80.20	80.20	80.20	80.20	85.82	87.87	88.59	(217)
Water heating fuel												
267.20	236.57	250.94	230.31	234.06	215.35	207.16	226.85	226.31	237.66	245.05	260.55	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4599.13	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2838.02	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00	(231)
Electricity for lighting (100.00% fixed LEL)	489.03	(232)
Energy saving/generation technologies		
PVs 0.80 x 2.000 x 950.616 x 1.000	1520.986	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
	1520.986	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	6480.19	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4599.126	3.480	160.05	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating cost	2838.02	3.480	98.76	(247)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	75.000	13.190	9.89	(249)
Energy for lighting	489.027	13.190	64.50	(250)
Additional standing charges			120.00	(251)
Electricity generated - PVs	1520.986	13.190	-200.62	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			252.59	(255)

11a. SAP rating

	0.42	**(256)**
	0.59	**(257)**
SAP value	91.81	
	92	(258)
SAP band	**A**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4599.13	0.216	993.41	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2838.02	0.216	613.01	(264)
Space and water heating			1606.42	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	489.03	0.519	253.80	(268)
Electricity generated - PVs	-1520.99	0.519	-789.39	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1109.76	(272)

	kg/m²/year	
CO2 emissions per m²	**8.18**	(273)
EI value	91.77	(273a)
EI rating	**92**	(274)
EI band	**A**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(3.48 / 0.9090) x (1 + (0.29 x 0.25)) = 4.1059, stars = 4
Main heating environmental impact	(0.2160 / 0.9090) x (1 + (0.29 x 0.25)) = 0.2549, stars = 4
Water heating energy efficiency	3.48 / 0.8457 = 4.1148, stars = 4
Water heating environmental impact	0.2160 / 0.8457 = 0.2554, stars = 4

Project Information
Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 2
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.05.054, printed on 07/03/2022 at 09:08:47

New dwelling as designed

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1 TER and DER
Fuel for main heating system: Gas (mains) (fuel factor = 1.00)

Target Carbon Dioxide Emission Rate	TER = 16.08	
Dwelling Carbon Dioxide Emission Rate	DER = 9.67	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 54.6	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 42.3	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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2b Fabric U-values

Element	Average	Highest	
Wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	4.00	OK
Maximum :	10.00	

---

4 Heating efficiency
Main heating system:
Boiler and underfloor heating, mains gas
Vaillant ecoFIT pure 630
Source of efficiency: from boiler database
Vaillant ecoFIT pure 630 VU 306/6-3 (H-GB)
Efficiency: 89.9% SEDBUK2009
Minimum: 88.0% OK
Secondary heating system:
None -

5 Cylinder insulation

Hot water storage

	Manufacturer's declared cylinder loss factor (kWh/day)	2.14	
	Permitted by DBSCG	2.86	OK
Primary pipework insulated	Yes		OK

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	Time and temperature zone control	OK
	Cylinderstat - Yes	OK
	Independent timer for DHW - Yes	OK
Boiler Interlock	Yes	OK

7 Low energy lights

	Percentage of fixed lights with low-energy fittings: 100.0%	
	Minimum: 75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley):		OK
	Not significant	OK

Based on:

Thermal mass parameter :	231.92
Overshading :	Average or unknown (20-60 % sky blocked)

Orientation : South

Ventilation rate :	8.00

Blinds/curtains :

None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Double-glazed, argon filled, low-E, En=0.1, soft coat U-value 1.10 W/m²K
Flat roofs U-value 0.11 W/m²K
Solid door U-value 1.10 W/m²K
Walls U-value 0.14 W/m²K
Photovoltaic array

Project Information

Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 2
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	49.29	2.50	123.22	(3a)
First floor	43.20	2.80	120.96	(3b)
Second floor	43.20	2.80	120.96	(3c)
	135.69			**(4)**
			365.14	**(5)**

2. Ventilation rate

			m³ per hour	
	main + seondary + other heating			
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	5	x 10	50.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
		0.14	**(8)**
Pressure test, result q50	4.00		(17)
Air permeability		0.34	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.29	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18

13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.37	0.36	0.35	0.32	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34

3.76 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT			**7.120**	**1.05 (1.10)**	7.50			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East) SIDE			**3.480**	**1.05 (1.10)**	3.67			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**6.720**	**1.05 (1.10)**	7.08			(27)
Solid door FRONT			**2.270**	**1.10**	2.50			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**7.510**	**1.10**	8.26			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**2.170**	**1.05 (1.10)**	2.29			(27)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**1.320**	**1.05 (1.10)**	1.39			(27)
Walls EXTERNAL #WINDOWS & DOORS			126.80	0.14	17.75	70.00	8876.00	(29)
Ground floors UNDERGROUND			49.29	0.13	6.41	110.00	5421.90	(28)
Flat roofs GF REAR #ROOFLIGHTS			3.92	0.11	0.43	9.00	35.28	(30)
Flat roofs MAIN ROOF #ROOFLIGHTS			41.88	0.11	4.61	9.00	376.92	(30)
Party wall SOLID			80.15	0.00	0.00	180.00	14427.00	
Internal floor FF			43.20	0.00	0.00	18.00	777.60	
Internal floor SF			43.20	0.00	0.00	18.00	777.60	
Internal ceiling FF			43.20	0.00	0.00	9.00	388.80	
Internal ceiling GF			43.20	0.00	0.00	9.00	388.80	

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.91 (42)

Annual average hot water usage in litres per day Vd,average 108.71 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
119.58	115.23	110.88	106.54	102.19	97.84	97.84	102.19	106.54	110.88	115.23	119.58	(44)
Energy content of hot water used												
177.33	155.10	160.05	139.53	133.89	115.53	107.06	122.85	124.32	144.88	158.15	171.74	

Energy content (annual) 1710.43 (45)

Distribution loss												
26.60	23.26	24.01	20.93	20.08	17.33	16.06	18.43	18.65	21.73	23.72	25.76	(46)

Cylinder volume, l 300.00 (47)

Manufacturer's declared cylinder loss factor (kWh/day) 2.14 (48)

Temperature Factor 0.5400 (49)

Energy lost from hot water cylinder (kWh/day) 1.16 (55)

Total storage loss												
35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82	(56)
Net storage loss												
35.82	32.36	35.82	34.67	35.82	34.67	35.82	35.82	34.67	35.82	34.67	35.82	(57)
Primary loss												
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(62)
Output from water heater for each month, kWh/month												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(64)

2406.12 (64)

Heat gains from water heating, kWh/month												
106.23	94.26	100.48	92.14	91.79	84.16	82.87	88.12	87.08	95.44	98.33	104.37	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	(66)
Lighting gains												
69.23	61.49	50.00	37.86	28.30	23.89	25.81	33.55	45.04	57.18	66.74	71.15	(67)
Appliances gains												
454.41	459.13	447.24	421.95	390.02	360.00	339.95	335.24	347.12	372.42	404.35	434.36	(68)
Cooking gains												
55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	(71)
Water heating gains												
142.79	140.27	135.06	127.97	123.37	116.89	111.38	118.44	120.94	128.28	136.57	140.29	(72)
Total internal gains												
782.95	777.41	748.84	704.30	658.21	617.31	593.67	603.76	629.63	674.41	724.19	762.32	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South)	0.9 x 7.120	46.75	0.63 x 0.80	0.77	116.2638	
FRONT						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East)	0.9 x 3.480	19.64	0.63 x 0.80	0.77	23.8721	
SIDE						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 6.720	10.63	0.63 x 0.80	0.77	24.9577	
REAR						
Solid door	0.9 x 2.270	0.00	0.00 x 0.70	0.77	0.0000	
FRONT						
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 7.510	10.63	0.63 x 0.80	0.77	27.8917	
REAR						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 2.170	26.00	0.63 x 0.80	1.00	25.5921	
ROOF						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 1.320	26.00	0.63 x 0.80	1.00	15.5676	
ROOF						
Total solar gains, January					234.15	(83-1)

Solar gains												
234.15	423.59	643.05	899.42	1098.42	1129.78	1072.92	918.93	731.21	485.49	285.02	197.40	(83)
Total gains												
1017.10	1201.01	1391.88	1603.72	1756.63	1747.09	1666.60	1522.69	1360.84	1159.91	1009.20	959.72	(84)

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau											
58.14	58.26	58.38	58.94	59.05	59.55	59.55	59.65	59.36	59.05	58.83	58.61
alpha											
4.88	4.88	4.89	4.93	4.94	4.97	4.97	4.98	4.96	4.94	4.92	4.91
Utilisation factor for gains for living area											
0.99	0.98	0.96	0.87	0.72	0.53	0.39	0.44	0.69	0.93	0.98	0.99 (86)
Mean internal temperature in living area T1											
20.11	20.26	20.48	20.73	20.88	20.93	20.94	20.94	20.90	20.69	20.35	20.08 (87)
Temperature during heating periods in rest of dwelling Th2											
19.99	20.00	20.00	20.01	20.01	20.02	20.02	20.02	20.01	20.01	20.00	20.00 (88)
Utilisation factor for gains for rest of dwelling											
0.99	0.98	0.94	0.84	0.66	0.45	0.30	0.35	0.61	0.90	0.98	0.99 (89)
Mean internal temperature in the rest of dwelling T2											
18.81	19.03	19.34	19.68	19.87	19.93	19.94	19.94	19.90	19.64	19.17	18.78 (90)

Living area fraction (38.72 / 135.69) 0.29 (91)

Mean internal temperature (for the whole dwelling)

19.18	19.38	19.67	19.98	20.16	20.22	20.22	20.22	20.19	19.94	19.50	19.15 (92)

Apply adjustment to the mean internal temperature, where appropriate

19.18	19.38	19.67	19.98	20.16	20.22	20.22	20.22	20.19	19.94	19.50	19.15 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains											
0.99	0.97	0.94	0.84	0.67	0.47	0.32	0.37	0.63	0.90	0.98	0.99 (94)
Useful gains											
1005.11	1170.37	1306.34	1349.33	1173.99	813.78	530.55	557.82	854.47	1038.64	984.96	950.93 (95)
Monthly average external temperature											
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20 (96)
Heat loss rate for mean internal temperature											
2238.0	2172.6	1971.42	1643.53	1252.03	824.31	531.79	560.27	896.65	1382.55	1843.07	2229.8 (97)
Fraction of month for heating											
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00
Space heating requirement for each month, kWh/month											
917.23	673.52	494.81	211.82	58.07	-	-	-	-	255.87	617.84	951.45

Total space heating requirement per year (kWh/year) (October to May) 4180.61 (98)

Space heating requirement per m² (kWh/m²/year) 30.81 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	90.90%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
917.23	673.52	494.81	211.82	58.07	-	-	-	-	255.87	617.84	951.45	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
1009.06	740.94	544.35	233.03	63.88	-	-	-	-	281.48	679.69	1046.70	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
236.42	208.47	219.13	196.71	192.97	172.71	166.14	181.94	181.50	203.97	215.33	230.83	(64)
Efficiency of water heater												80.20 (216)
88.48	88.12	87.32	85.41	82.44	80.20	80.20	80.20	80.20	85.82	87.87	88.59	(217)
Water heating fuel												
267.20	236.57	250.94	230.31	234.06	215.35	207.16	226.85	226.31	237.66	245.05	260.55	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	4599.13	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2838.02	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00	(231)
Electricity for lighting (100.00% fixed LEL)	489.03	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	8001.17	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4599.126	3.480	160.05	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating cost	2838.02	3.480	98.76	(247)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	75.000	13.190	9.89	(249)
Energy for lighting	489.027	13.190	64.50	(250)
Additional standing charges			120.00	(251)
Electricity generated - PVs	0.000	0.000	0.00	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			453.21	(255)

11a. SAP rating

	0.42	**(256)**
	1.05	**(257)**
SAP value	85.30	
	85	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4599.13	0.216	993.41	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2838.02	0.216	613.01	(264)
Space and water heating			1606.42	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	489.03	0.519	253.80	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1899.15	(272)

	kg/m²/year	
CO2 emissions per m²	**14.00**	(273)
EI value	85.92	(273a)
EI rating	**86**	(274)
EI band	**B**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(3.48 / 0.9090) x (1 + (0.29 x 0.25)) = 4.1059, stars = 4
Main heating environmental impact	(0.2160 / 0.9090) x (1 + (0.29 x 0.25)) = 0.2549, stars = 4
Water heating energy efficiency	3.48 / 0.8457 = 4.1148, stars = 4
Water heating environmental impact	0.2160 / 0.8457 = 0.2554, stars = 4

Project Information
Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 2
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.05.054, printed on 07/03/2022 at 09:08:47

New dwelling as designed

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1 TER and DER
Fuel for main heating system: Gas (mains) (fuel factor = 1.00)

Target Carbon Dioxide Emission Rate	TER = 16.08	
Dwelling Carbon Dioxide Emission Rate	DER = 15.49	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 54.6	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 42.3	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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2b Fabric U-values

Element	Average	Highest	
Wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	4.00	OK
Maximum :	10.00	

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4 Heating efficiency
Main heating system:
Boiler and underfloor heating, mains gas
Vaillant ecoFIT pure 630
Source of efficiency: from boiler database
Vaillant ecoFIT pure 630 VU 306/6-3 (H-GB)
Efficiency: 89.9% SEDBUK2009
Minimum: 88.0% OK
Secondary heating system:
None -

5 Cylinder insulation

Hot water storage

	Manufacturer's declared cylinder loss factor (kWh/day)	2.14	
	Permitted by DBSCG	2.86	OK
Primary pipework insulated	Yes		OK

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	Time and temperature zone control	OK
	Cylinderstat - Yes	OK
	Independent timer for DHW - Yes	OK
Boiler Interlock	Yes	OK

7 Low energy lights

	Percentage of fixed lights with low-energy fittings: 100.0%	
	Minimum: 75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): OK

Not significant OK

Based on:

Thermal mass parameter :	231.92
Overshading :	Average or unknown (20-60 % sky blocked)

Orientation : South

Ventilation rate :	8.00
Blinds/curtains :	

None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Double-glazed, argon filled, low-E, En=0.1, soft coat U-value 1.10 W/m²K
Flat roofs U-value 0.11 W/m²K
Solid door U-value 1.10 W/m²K
Walls U-value 0.14 W/m²K

Project Information

Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 2
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	49.29	2.50	123.22	(3a)
First floor	43.20	2.80	120.96	(3b)
Second floor	43.20	2.80	120.96	(3c)
	135.69			**(4)**
			365.14	**(5)**

2. Ventilation rate

	main + seondary + other heating		m³ per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	5	x 10	50.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
		0.14	**(8)**
Pressure test, result q50	4.00		(17)
Air permeability		0.34	(18)
		2.00	**(19)**
		0.85	**(20)**
Infiltration rate incorporating shelter factor		0.29	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70

52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18

13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.37	0.36	0.35	0.32	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34

3.76 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**6.720**	**1.05 (1.10)**	7.08			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East) SIDE			**3.480**	**1.05 (1.10)**	3.67			(27)
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South) FRONT			**7.120**	**1.05 (1.10)**	7.50			(27)
Solid door FRONT			**2.270**	**1.10**	2.50			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) REAR			**7.510**	**1.10**	8.26			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**2.170**	**1.05 (1.10)**	2.29			(27)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a) ROOF			**1.320**	**1.05 (1.10)**	1.39			(27)
Walls EXTERNAL #WINDOWS & DOORS			126.80	0.14	17.75	70.00	8876.00	(29)
Ground floors UNDERGROUND			49.29	0.13	6.41	110.00	5421.90	(28)
Flat roofs GF REAR #ROOFLIGHTS			3.92	0.11	0.43	9.00	35.28	(30)
Flat roofs MAIN ROOF #ROOFLIGHTS			41.88	0.11	4.61	9.00	376.92	(30)
Party wall SOLID			80.15	0.00	0.00	180.00	14427.00	
Internal floor FF			43.20	0.00	0.00	18.00	777.60	
Internal floor SF			43.20	0.00	0.00	18.00	777.60	
Internal ceiling FF			43.20	0.00	0.00	9.00	388.80	
Internal ceiling GF			43.20	0.00	0.00	9.00	388.80	

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N 2.91 (42)

Annual average hot water usage in litres per day Vd,average 108.71 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
119.58	115.23	110.88	106.54	102.19	97.84	97.84	102.19	106.54	110.88	115.23	119.58	(44)
Energy content of hot water used												
177.33	155.10	160.05	139.53	133.89	115.53	107.06	122.85	124.32	144.88	158.15	171.74	

Energy content (annual) 1710.43 (45)

Distribution loss												
26.60	23.26	24.01	20.93	20.08	17.33	16.06	18.43	18.65	21.73	23.72	25.76	(46)

Cylinder volume, l 150.00 (47)

Manufacturer's declared cylinder loss factor (kWh/day) 1.60 (48)

Temperature Factor 0.5400 (49)

Energy lost from hot water cylinder (kWh/day) 0.86 (55)

Total storage loss												
26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78	(56)
Net storage loss												
26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78	(57)
Primary loss												
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month												
227.38	200.30	210.09	187.97	183.93	163.96	157.10	172.90	172.75	194.93	206.58	221.79	(62)
Output from water heater for each month, kWh/month												
227.38	200.30	210.09	187.97	183.93	163.96	157.10	172.90	172.75	194.93	206.58	221.79	(64)

2299.68 (64)

Heat gains from water heating, kWh/month												
99.00	87.73	93.25	85.14	84.55	77.16	75.63	80.89	80.08	88.21	91.33	97.14	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	174.50	(66)
Lighting gains												
69.23	61.49	50.00	37.86	28.30	23.89	25.81	33.55	45.04	57.18	66.74	71.15	(67)
Appliances gains												
454.41	459.13	447.24	421.95	390.02	360.00	339.95	335.24	347.12	372.42	404.35	434.36	(68)
Cooking gains												
55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	55.36	(69)
Pumps and fans gains												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (negative values)												
-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	-116.34	(71)
Water heating gains												
133.07	130.55	125.34	118.25	113.65	107.17	101.66	108.72	111.22	118.56	126.85	130.57	(72)
Total internal gains												
770.23	764.69	736.12	691.58	645.49	604.59	580.95	591.04	616.91	661.69	711.47	749.60	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 6.720	10.63	0.63 x 0.80	0.77	24.9577	
REAR						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (East)	0.9 x 3.480	19.64	0.63 x 0.80	0.77	23.8721	
SIDE						
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (South)	0.9 x 7.120	46.75	0.63 x 0.80	0.77	116.2638	
FRONT						
Solid door	0.9 x 2.270	0.00	0.00 x 0.70	0.77	0.0000	
FRONT						
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (North)	0.9 x 7.510	10.63	0.63 x 0.80	0.77	27.8917	
REAR						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 2.170	26.00	0.63 x 0.80	1.00	25.5921	
ROOF						
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.1, soft coat (n/a)	0.9 x 1.320	26.00	0.63 x 0.80	1.00	15.5676	
ROOF						
Total solar gains, January					234.15	(83-1)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains												
234.15	423.59	643.05	899.42	1098.42	1129.78	1072.92	918.93	731.21	485.49	285.02	197.40	(83)
Total gains												
1004.38	1188.29	1379.16	1591.00	1743.91	1734.37	1653.88	1509.97	1348.12	1147.19	996.48	947.00	(84)

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 0.75

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
58.14	58.26	58.38	58.94	59.05	59.55	59.55	59.65	59.36	59.05	58.83	58.61	
alpha												
4.88	4.88	4.89	4.93	4.94	4.97	4.97	4.98	4.96	4.94	4.92	4.91	
Utilisation factor for gains for living area												
0.99	0.98	0.96	0.88	0.72	0.53	0.39	0.44	0.70	0.93	0.99	0.99	(86)
Tweekday												
19.98	20.15	20.40	20.68	20.86	20.92	20.94	20.93	20.89	20.64	20.25	19.94	
Tweekend												
20.42	20.52	20.66	20.82	20.92	20.96	20.96	20.96	20.94	20.79	20.57	20.40	
24 instead of 16												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
24 instead of 9												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
16 instead of 9												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Mean internal temperature in living area T1												
20.11	20.25	20.47	20.72	20.88	20.93	20.94	20.94	20.90	20.68	20.34	20.08	(87)
Temperature during heating periods in rest of dwelling Th2												
19.99	20.00	20.00	20.01	20.01	20.02	20.02	20.02	20.01	20.01	20.00	20.00	(88)
Utilisation factor for gains for rest of dwelling												
0.99	0.98	0.95	0.85	0.66	0.45	0.30	0.35	0.62	0.90	0.98	0.99	(89)
Tweekday												
18.80	19.02	19.33	19.68	19.87	19.93	19.93	19.94	19.90	19.63	19.16	18.77	
Tweekend												
18.80	19.02	19.33	19.68	19.87	19.93	19.93	19.94	19.90	19.63	19.16	18.77	
Mean internal temperature in the rest of dwelling T2												
18.80	19.02	19.33	19.68	19.87	19.93	19.93	19.94	19.90	19.63	19.16	18.77	(90)

Living area fraction (38.72 / 135.69) 0.29 (91)

Mean internal temperature (for the whole dwelling)

19.18	19.37	19.66	19.98	20.16	20.22	20.22	20.22	20.19	19.93	19.49	19.14	(92)

Apply adjustment to the mean internal temperature, where appropriate

19.18	19.37	19.66	19.98	20.16	20.22	20.22	20.22	20.19	19.93	19.49	19.14	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.94	0.84	0.67	0.47	0.32	0.37	0.63	0.90	0.98	0.99	(94)
Useful gains												
993.11	1159.12	1296.84	1343.40	1171.91	813.42	530.50	557.72	852.91	1030.91	973.63	938.78	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
2236.7	2171.4	1970.39	1642.77	1251.83	824.27	531.78	560.26	896.49	1381.72	1841.54	2228.5	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
925.22	680.22	501.12	215.54	59.46	-	-	-	-	261.00	624.90	959.55	

Total space heating requirement per year (kWh/year) (October to May) 4227.01 (98)

Space heating requirement per m² (kWh/m²/year) 31.15 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected

Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main heating system	421.33%	(206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
925.22	680.22	501.12	215.54	59.46	-	-	-	-	261.00	624.90	959.55	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
219.60	161.45	118.94	51.16	14.11	-	-	-	-	61.95	148.32	227.74	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
227.38	200.30	210.09	187.97	183.93	163.96	157.10	172.90	172.75	194.93	206.58	221.79	(64)
Efficiency of water heater												279.11 (216)
279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	279.11	(217)
Water heating fuel												
81.47	71.76	75.27	67.34	65.90	58.75	56.29	61.95	61.89	69.84	74.01	79.46	(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	1003.26	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	823.93	(219)
Electricity for pumps, fans and electric keep-hot		
Total electricity for the above, kWh/year	0.00	(231)
Electricity for lighting (100.00% fixed LEL)	489.03	(232)
Energy saving/generation technologies		
Electricity generated - µCHP/heat pump	0.00	(235)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	2316.22	(238)

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	1003.261	13.190	132.33	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
High-rate percentage	100.000%			(243)
Low-rate percentage	0.000%			(244)
High-rate cost	823.93	13.190	108.68	(245)
Low-rate	0.00	13.190	0.00	(246)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	0.000	13.190	0.00	(249)
Energy for lighting	489.027	13.190	64.50	(250)
Additional standing charges			0.00	(251)
Electricity generated - PVs	0.000	0.000	0.00	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			305.51	(255)

11a. SAP rating

	0.42	**(256)**
	0.71	**(257)**
SAP value	90.09	
	90	(258)
SAP band	**B**	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	1003.26	0.519	520.69	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	823.93	0.519	427.62	(264)
Space and water heating			948.31	(265)
Electricity for pumps and fans	0.00	0.519	0.00	(267)
Electricity for lighting	489.03	0.519	253.80	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.519	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1202.12	(272)

	kg/m²/year	
CO2 emissions per m²	**8.86**	(273)
EI value	91.09	(273a)
EI rating	**91**	(274)
EI band	**B**	

Calculation of stars for heating and DHW

Main heating energy efficiency	(13.19 / 4.2133) x (1 + (0.29 x 0.25)) = 3.3576, stars = 5
Main heating environmental impact	(0.5190 / 4.2133) x (1 + (0.29 x 0.25)) = 0.1321, stars = 5
Water heating energy efficiency	13.19 / 2.7911 = 4.7257, stars = 4
Water heating environmental impact	0.52 / + (0.00 x 0.52) = 0.1859, stars = 5

Project Information
Building type Semi-detached house

Reference
Date 1 March 2022
Email: NONE Project House 2
The Garages
Ferrymore
St Richard's Court
HAM
TW10 7NS

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New dwelling as designed

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1 TER and DER
Fuel for main heating system: Standard tariff (fuel factor = 1.55)

Target Carbon Dioxide Emission Rate	TER = 23.71	
Dwelling Carbon Dioxide Emission Rate	DER = 9.65	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 54.6	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 42.3	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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2b Fabric U-values

Element	Average	Highest	
Wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.10 (max. 2.00)	1.10 (max. 3.30)	OK

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3 Air permeability

Air permeability at 50 pascals:	4.00	OK
Maximum :	10.00	

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4 Heating efficiency
Main heating system:
Air source heat pump, underfloor, electric
Daikin Altherma EPRA16DV3 + ETBH16D6V
Source of efficiency: from boiler database
Secondary heating system:
None -

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5 Cylinder insulation
Hot water storage No cylinder

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	2207 Time and temperature zone control	OK
Hot water controls	No cylinder	
Boiler Interlock	No	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100.0%
Minimum: 75.0% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): OK

Not significant OK

Based on:

Thermal mass parameter : 231.92
Overshading : Average or unknown (20-60 % sky blocked)
Orientation : South
Ventilation rate : 8.00
Blinds/curtains :
None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Double-glazed, argon filled, low-E, En=0.1, soft coat U-value 1.10 W/m²K
Flat roofs U-value 0.11 W/m²K
Solid door U-value 1.10 W/m²K
Walls U-value 0.14 W/m²K