BASEENERGY
Building Assessments for a Sustainable Environment

Energy Statement

Linford Gardens

Job number: 13853

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1 Executive Summary

This report has been produced by Base Energy on behalf of Greenbank Estates Ltd and in support of the planning application for the development named as Linford Gardens comprising the extension to 2 existing residential blocks to create an additional 14 apartments, falling under the requirements of Greater Manchester Authority.

It sets out the design approach with regards to energy, carbon dioxide emissions, and sustainability in order to ensure the development complies with:

- National Planning Policy
- The Greater Manchester Combined Authority
- Places for everyone joint development plan, JP-S2 Carbon and Energy

The above policies require:

- Be Net Zero Carbon where feasible
- As an interim measure, development should be consistent with 2022 Part L building regulations (this would be Part L 2021)

The design of the development will incorporate energy efficient building fabric and services in addition to low carbon technology:

- Thermal specification meeting and exceeding Part L 2021 limiting U-values
- A design which limits air permeability, targeting 3.0
- A design which limits thermal bridging where feasible
- Energy saving building services including low energy lighting, heating controls, heat recovery ventilation
- Solar PV Panels & Air source heat pumps for HWS only

This results in an overall 69% carbon emissions reduction over Part L 2021.

2 Existing and Proposed Development

The development site is located on land at Linford Gardens, 114 Boundary Lane, Manchester, M15 6FD.

The development proposals are for the extension to 2 existing residential blocks to create an additional 14 apartments.

The development proposals constitute a major development.

Aspects of the site location, shape, and surroundings (in particular the adjacent buildings), along with any other requirements of planning, use type, and scale will naturally constrain the development proposals in terms of the layout, positioning, and orientation of the proposed development. Subsequently, these constraints will impact on the feasibility of certain renewable technologies (as discussed in Section 4 of this report).

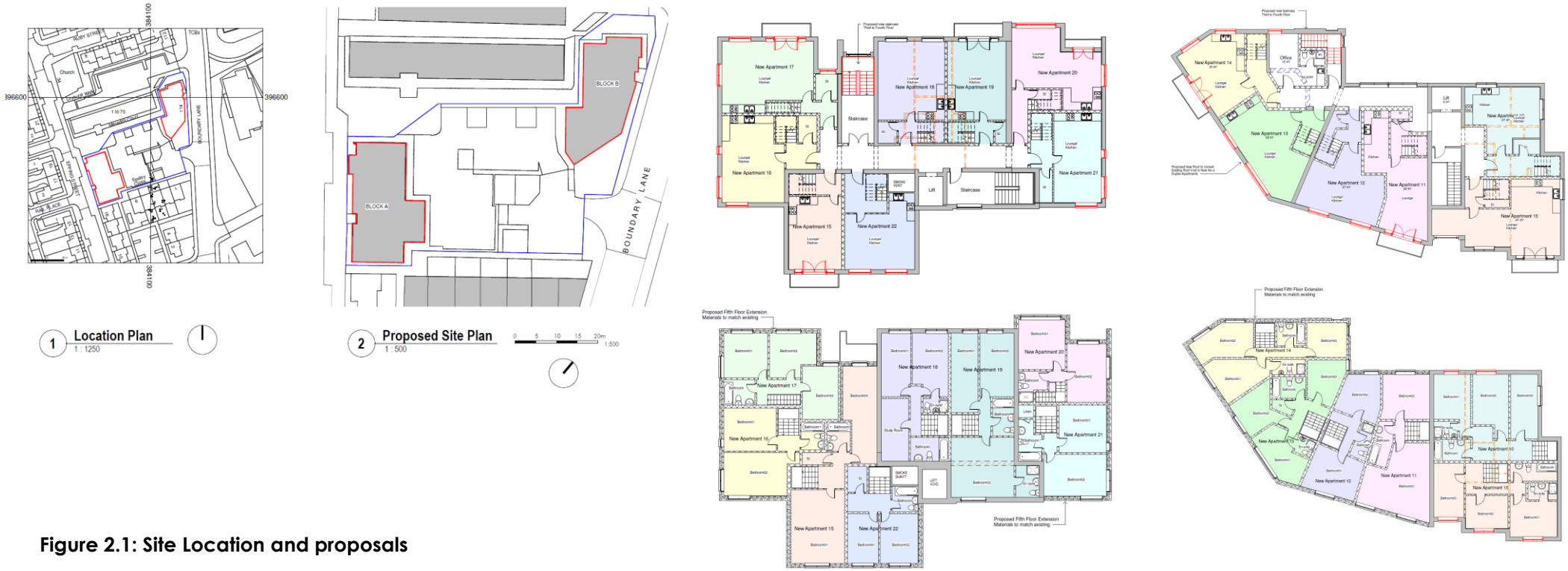


Figure 2.1: Site Location and proposals

3 Planning Policy

National Planning Policy Framework 2025

The NPPF was updated in February 2025 to place greater emphasis on beauty, place-making, the environment, and sustainable development. The strengthened environmental objectives aim to protect and enhance the natural, built, and historic environment, and encourage effective land use, greater biodiversity, prudent use of natural resources, minimisation of waste and pollution, and adaptation to climate change alongside a move to a low carbon economy.

The Greater Manchester Combined Authority

The relevant Local Planning Policy requirements are as follows.

- Places for everyone joint development plan, JP-S2 Carbon and Energy

The development should target:

1. Promoting the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy, heating and cooling;
2. Promoting the use of life cycle cost and carbon assessment tools to ensure the long-term impacts from development can be captured;
3. Taking a positive approach to renewable and low carbon energy schemes, particularly schemes that are led by, or meet the needs of local communities;
4. Increasing the range of nature-based solutions including carbon sequestration through the restoration of peat-based habitats, woodland management, tree-planting and natural flood management techniques;

As this development does not comprise a new building, section 5 will not be targeted.

Based on the above the property is aiming to meet a saving in CO2 and energy over Part L 2021 building regulations.

4 Methodology

The Standard Assessment Procedure (SAP) is the UK Government methodology for assessing and calculating the energy performance of dwellings.

The Simplified Building Energy Model (SBEM) is the UK Government methodology for assessing and calculating the energy performance of non-domestic buildings.

SAP and SBEM calculations take into account a range of factors that contribute to energy efficiency, including:

- Materials used for the construction and the thermal insulation of the building fabric (u-values[1] and thermal mass)
- Air permeability
- Efficiency, fuel source, and control of heating and cooling systems
- Ventilation system energy use and heat recovery
- Lighting energy
- Low carbon and energy saving or generating technologies

Approved Document Part L of current Building Regulations addresses the conservation of fuel and power. Part L is divided into two separate documents:

- Part L1 Newly constructed and extended or renovated existing dwellings
- Part L2 Newly constructed and extended or renovated existing non-domestic buildings

To comply with Part L, the calculations should demonstrate how the building will either meet or achieve a percentage reduction in the Building Emission Rate (BER) under the required Target Emission Rate (TER).

The calculation software has been used to calculate a baseline of energy demand and carbon dioxide emissions as appropriate from which any reductions or contributions have been measured.

[1] U-values (Thermal Transmittance) - the measure of the overall rate of heat transfer by all mechanisms under standard conditions, through a particular section of a construction. Lower u-values mean better thermal insulation

5 Baseline Energy & CO_2

Energy modelling software has been used to calculate a baseline for the development. This forms the basis from which compliance with planning policy has been measured.

Table 5.1: Baseline CO_2

	CO_2 Emission Rate (kg CO_2/m2/year)	**Floor Area (m2)**	**Total Baseline Emissions (kg CO_2/year)**
Baseline	14.9	1,171	17,448

The **Total Baseline CO_2 Emissions** for the development are shown to be 17,448 kg/year.

6 Low Carbon Design – Fabric First – Be Lean

Before considering low carbon energy generating technology the development has been designed to reduce energy demand through the first step of the energy hierarchy by considering 'fabric first'. A thermally efficient building envelope will follow the design standards as set out below.

Table 6.0: Building Fabric Standards (including u-values W/m²K)

	Part L 2021 Limiting Targets	Proposed Development
New walls	0.18	0.18
New walls to corridor/elevator	0.18	0.18
Existing walls	0.30	0.28
New floor over corridor	0.18	0.18
New roof	0.15	0.11
Windows	1.4	1.2
Glazed doors	1.4	1.2
Corridor doors	1.6	1.0

- Insulation: The specified building envelope is designed to exceed and meet the limiting Part L targets and will help to limit the energy demand of the dwelling for space heating
- Thermal bridging: The design will seek to limit heat loss through thermal bridging where feasible

Once heat retention has been addressed the next step is to ensure energy consuming building services are efficient.

- Lighting: Low energy LED lighting throughout with a minimum efficacy of 80 lumens per watt
- Space & Water Heating: Electric panel heaters & electric immersion HWS
- Heating Controls: Programmer and room thermostat
- Ventilation: Mechanical ventilation (efficiency: 91%), with heat recovery
- Shower flow rate: 8 L/min
- Air permeability test: 3.00 @AP50

7 Low Carbon Technology Review & Recommendations

Having set out an energy efficient design, the next step is to incorporate low carbon technology for energy generation. A number of technologies exist and should be specified where they:

- Comply with planning policy
- Are feasible for the site
- Are cost efficient
- Are appropriate for proposed development form and function
- Protect against fuel poverty
- Promote fuel security
- Reduce reliance on fossil fuels
- Reduce carbon emissions
- Reduce resource depletion
- Reduce pollution

Site location and development form and function will influence the suitability of different technologies through:

- Orientation
- Space (inside and outside of the buildings)
- Surrounding topography, structures, and natural features
- Wind speed
- Overshading
- Geology and ground conditions
- Building form, function, and density

In determining the most feasible renewable technologies for the dwelling, the following have been reviewed:

- Wind turbines
- Ground Source Heat Pumps
- Air Source Heat Pumps
- Biomass
- Combined Heat and Power
- Photovoltaic Panels
- Solar water heating

WIND TURBINES

Wind turbines are used to produce electricity. They can be either pole mounted (in a suitably exposed position) or building mounted; building mounted systems need a sufficient wind speed at the structural height and both a structural survey and planning permission.

- Wind speed can be too low on low rise buildings
- Taller systems need sufficient space
- Wind resources very variable and unpredictable
- May need planning permission

Wind turbines technology is **not recommended** for this development

GROUND SOURCE HEAT PUMP (GSHP)

GSHPs use naturally occurring underground low-level heat in areas with appropriate geological features. Heat is transferred from the ground by either extracting and discharging (re-charging) water from/to the ground directly (open loop) or circulating water through pipes buried within the ground, (closed loop). The water is passed through a heat pump to transfer the heat from this water into a higher temperature water circuit to provide heating. The loop can be fitted horizontally (laid in a shallow trench) or vertically (in a borehole).

- Feasibility analysis is costly
- Suitable ground conditions required
- More capital intensive than air source heat pumps
- Can be more efficient and lower running costs than ASHPs
- Well suited to highly insulated buildings

Ground source heat pump technology is **not recommended** for this development

AIR SOURCE HEAT PUMP (ASHP)

ASHP systems absorb heat from outside air at a low temperature into a fluid which is then passed through an electrically driven compressor where its temperature is increased. There are two main types of ASHP systems: Air to Water systems distribute heat through wet central heating; Air to air produce warm air which is circulated by fans For an ASHP system to be installed, there needs to be ample outdoor space for the external condensing unit; these units can also be noisy and blow out colder air to the neighbouring environment.

- Requires space for external plant and internal hot water tank for wet systems supplying DHW
- Can generate noise though quieter systems have been developed
- Least efficient when most needed
- Longer life than fossil fuel boilers
- High capital costs vs gas systems but lower than GSHPs
- Well suited to highly insulated buildings

Air source heat pump technology **is recommended** for this development but due to limited space, only heat pump cylinders have been used.

BIOMASS

Biomass systems burn wood pellets, chips, or logs to provide heat in a single room, or to power central heating and hot water boilers. There needs to be ample space available for both the boiler and the storage of fuel. There will also be regular deliveries of fuel and therefore adequate site access is required.

- Carbon emissions are cyclical unlike fossil fuel
- Requires fuel storage space and bulk delivery
- Carbon 'neutral' fuel in isolation but supply side emissions are still present so not neutral overall
- Harmful particulate emissions impact air quality and health

Biomass technology **is not recommended** for this development

COMBINED HEAT AND POWER (CHP)

CHP is effectively an on-site small power plant providing both electrical power and thermal heat energy. It is an energy efficiency and low carbon measure rather than a renewable energy technology. A CHP system operates by burning a primary fuel (normally natural gas) by use of either a reciprocating engine or turbine, which in turn drives an alternator to generate electrical power. The heat emitted by the engine and exhaust gases is recovered and used to heat the building or to provide hot water.

- Reduces consumption of and reliance on grid electricity
- Works best with high and consistent heat and hot water demand
- Recovers waste energy
- Can export to the grid
- Uses fossil fuel
- Emissions on site rather than upstream
- Efficiency is sensitive to sizing

CHP **is not recommended** for this development

DISTRICT HEATING

District Heating systems provide multiple buildings or dwellings with heat and hot water from a central boiler house, or 'energy centre'. The system can provide heating or cooling which is transferred from the energy centre through a network of highly insulated pipes carrying the heated water to each dwelling.



- Economies of scale
- Frees up space in habitable areas of development
- Variety of systems
- Can make use of waste heat from industry
- Can be fossil fuel based and dependent

With reference to the Local Heat Map it has been determined that there are no existing or proposed heat networks or energy centres within a suitable radius from the development and there are no existing networks local to the site. (see adjacent image)

District heating **is not recommended** for this development

SOLAR PHOTOVOLTAIC (PV)

Solar PV cells (which are mounted together in panels or tiles on the roof) convert sunlight into electricity. The cells are made from layers of semi-conducting material; when the light shines on the cell, an electric field is created across the layers. Although PV cells are most effective in bright sunlight, they can still generate electricity on a cloudy day. The power of a PV cell is measured in kilowatts peak (kWp). Each PV panel produces 250 Watts to 420 Watts depending on the manufacture.

- Passive technology, requires no energy input from grid
- Does not require sunny days to generate power
- Capital costs can be high although payback is effective
- Needs sufficient roof space and orientation
- Zero site or upstream emissions
- Can export to the grid

Solar PV technology **is recommended** for this development

SOLAR HOT WATER

Solar hot water systems absorb energy from the sun and transfer this energy using heat exchangers to heat water which can then be stored. Systems should be roof mounted and oriented to face between a south-east and south-west direction.

- Mostly passive technology but requires pump energy
- Not suitable for combi boilers and developments without roof space
- Lower CO_2 reductions than other technologies

Solar hot water technology **is not recommended** for this development

Low Carbon Technology Summary

The low carbon technology review indicates that Air Source Heat Pumps and Solar PV would be potentially feasible. The following low carbon technology is recommended:

Solar PV: 2.0 kWp per unit at horizontal pitch with none or little overshading and export capable meter included.

ASHP: Dimplex EDL200 (Water heating efficiency: 350%)

This technology is deemed optimal for meeting the needs of the development and achieving policy compliance. It has been incorporated into the energy model, and the results are presented in the next section.

8 Low Carbon Technology – Renewable Energy Generation - Be Green

The selected Low Carbon Technology has been incorporated into the calculation, and the results are set out below.

Table 8.1: Baseline vs Be Green CO_2

	CO_2 Emission Rate (kg CO_2/m2/year)	Floor Area (m2)	Total Baseline Emissions (kg CO_2/year)	Reduction in CO_2
Baseline	14.9	1,171	17,448	N/A
Be Lean & Green Design	4.6	1,171	5,387	**69%**

The **CO_2 Emissions reduction** as a result of energy efficient fabric and services is shown to be 12,061 kg/year which equals a 69% reduction.

9 Conclusion

Proposals are for the development named as Linford Gardens comprising the extension to 2 existing residential blocks to create an additional 14 apartments falling under the requirements of the Greater Manchester combined authority.

Under the local planning policy, the proposed development is required to achieve a saving in CO2 via renewable energy over Part L 2021 building regulations.

Energy modelling software has been used to calculate a baseline against which compliance with the above can be measured.

The proposed development will be designed to limit energy demand through the inclusion of a thermally efficient building fabric and energy efficient services.

Low carbon technology will be incorporated and is to comprise:

- Solar PV at 2.0 kWp per unit
- HWS ASHP Dimplex EDL200 (Water heating efficiency: 350%) in each unit

This results in a 69% saving in CO2 emissions over Part L 2021 regulations.

This Energy Statement and the calculations on which it is based demonstrate that the proposed development complies with the local planning policy requirements.

10 Appendix 1 Baseline DER SAP Worksheets (Block A)

Full SAP Calculation Printout

Plot Reference	13853 A15	**Issued on Date**	25/06/2026
Assessment Reference	notional	**Plot Type Ref**	Block A Plot 15
Plot Address	Linford Gardens Block A , 114, Boundary Lane, Manchester, M15 6FD	**SAP Version**	10.2

SAP Rating	41 E	**DER**	14.62	**TER**	
Environmental	88 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	1.02	**DFEE**	68.98	**TFEE**	
Compliance Check	N/A	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	151.97	**TPER**	

Assessor Details	Mr. Peter Kinsella	**Assessor ID**	L770-0002
Client			

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.1200 (1b)	x	2.9300 (2b)	=	82.3916	(1b) - (3b)
First floor	51.7700 (1c)	x	3.0000 (2c)	=	155.3100	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.8900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.7016	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		2 * 10 =	20.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000 / (5) =	0.0841	(8)
Pressure test			No	
Pressure Test Method			Blower Door	
Measured/design AP50			15.0000	(17)
Infiltration rate			0.8341	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.7090	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.9040	0.8863	0.8685	0.7799	0.7622	0.6736	0.6736	0.6558	0.7090	0.7622	0.7976	0.8331	(22b)
Effective ac	0.9086	0.8927	0.8772	0.8041	0.7905	0.7268	0.7268	0.7151	0.7514	0.7905	0.8181	0.8470	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows			5.6900	1.3258	7.5436			(27)
Corridor door			1.8900	1.6000	3.0240			(26)
Glazed door			3.5100	1.3258	4.6534			(27)
New floor over corridor			28.1200	0.1705	4.7941			(28b)
Existing wall	25.2000	5.6600	19.5400	0.3000	5.8620			(29a)
New wall	29.4900	3.5400	25.9500	0.1800	4.6710			(29a)
New wall to unheated corridor	4.5400	1.8900	2.6500	0.1700	0.4505			(29a)
External Roof 1	51.9300		51.9300	0.1500	7.7895			(30)
Total net area of external elements Aum(A, m2)			139.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.7881			(33)
Main dwelling								
Party Wall 1			123.2700	0.0000	0.0000			(32)
Party Floor 1			28.1200					(32d)
Party Floor 2			1.5800					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	27.8560	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	66.6441	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	71.2725	70.0279	68.8079	63.0778	62.0057	57.0149	57.0149	56.0907	58.9373	62.0057	64.1745	66.4419	(38)
Heat transfer coeff	137.9165	136.6719	135.4520	129.7218	128.6498	123.6590	123.6590	122.7348	125.5814	128.6498	130.8186	133.0860	(39)
Average = Sum(39)m / 12 =												129.7167	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7263	1.7108	1.6955	1.6238	1.6103	1.5479	1.5479	1.5363	1.5719	1.6103	1.6375	1.6659	(40)
HLP (average)												1.6237	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4608	(42)
Hot water usage for mixer showers	90.0333	88.6802	86.7086	82.9363	80.1524	77.0478	75.2832	77.2399	79.3848	82.7181	86.5715	89.6883	(42a)
Hot water usage for baths	28.2812	27.8612	27.2697	26.1792	25.3626	24.4571	23.9680	24.5553	25.1948	26.1637	27.2767	28.1856	(42b)
Hot water usage for other uses	39.8308	38.3824	36.9340	35.4856	34.0372	32.5888	32.5888	34.0372	35.4856	36.9340	38.3824	39.8308	(42c)
Average daily hot water use (litres/day)												145.4386	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	158.1452	154.9238	150.9123	144.6010	139.5521	134.0937	131.8400	135.8324	140.0652	145.8158	152.2306	157.7047	(44)
Energy conte	250.4634	220.6095	231.9466	197.9516	187.8640	164.8838	159.4490	168.1889	172.7144	197.8707	216.8804	246.9274	(45)
Energy content (annual)										Total = Sum(45)m =		2415.7498	
Distribution loss (46)m = 0.15 x (45)m	37.5695	33.0914	34.7920	29.6927	28.1796	24.7326	23.9174	25.2283	25.9072	29.6806	32.5321	37.0391	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.1340	(55)
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	285.6174	252.3615	267.1006	231.9716	223.0180	198.9038	194.6030	203.3429	206.7344	233.0247	250.9004	282.0814	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	285.6174	252.3615	267.1006	231.9716	223.0180	198.9038	194.6030	203.3429	206.7344	233.0247	250.9004	282.0814	(64)
										Total per year (kWh/year) = Sum(64)m =		2829.6598	(64)
12Total per year (kWh/year)												2830	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	111.4023	98.7542	105.2455	93.0349	90.5880	82.0399	81.1400	84.0460	84.6435	93.9152	99.3287	110.2266	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8457	137.1149	123.8457	127.9739	123.8457	127.9739	123.8457	123.8457	127.9739	123.8457	127.9739	123.8457	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.2105	221.4852	215.7530	203.5498	188.1454	173.6675	163.9953	161.7206	167.4528	179.6560	195.0604	209.5383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	(71)
Water heating gains (Table 5)	149.7343	146.9557	141.4589	129.2151	121.7580	113.9443	109.0591	112.9651	117.5605	126.2301	137.9566	148.1540	(72)
Total internal gains	552.7020	565.4674	540.9692	520.6504	493.6607	475.4972	456.8118	458.4430	472.8988	489.6435	520.9025	541.4496	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.3100	36.7938	0.6300	0.7000	0.7700	48.4645	(77)
Northwest	1.3800	11.2829	0.6300	0.7000	0.7700	4.7585	(81)
Southeast	3.5100	36.7938	0.6300	0.7000	0.7700	39.4688	(77)

Solar gains	92.6919	159.4692	222.3910	282.5903	322.9478	323.4377	310.6527	280.1122	243.1710	177.3794	111.3114	79.1387	(83)
Total gains	645.3939	724.9366	763.3602	803.2407	816.6085	798.9349	767.4644	738.5552	716.0698	667.0228	632.2138	620.5883	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	40.2266	40.5929	40.9586	42.7678	43.1242	44.8646	44.8646	45.2025	44.1779	43.1242	42.4092	41.6867	
alpha	3.6818	3.7062	3.7306	3.8512	3.8749	3.9910	3.9910	4.0135	3.9452	3.8749	3.8273	3.7791	

util living area													
	0.9933	0.9890	0.9818	0.9615	0.9144	0.7958	0.6452	0.6816	0.8660	0.9650	0.9885	0.9943	(86)
MIT	18.9816	19.1939	19.5175	20.0151	20.4433	20.8053	20.9388	20.9233	20.6930	20.1405	19.5292	19.0144	(87)
Th 2	19.5220	19.5331	19.5441	19.5960	19.6058	19.6518	19.6518	19.6604	19.6340	19.6058	19.5860	19.5654	(88)
util rest of house													
	0.9910	0.9850	0.9747	0.9448	0.8719	0.6916	0.4766	0.5196	0.7857	0.9464	0.9836	0.9923	(89)
MIT 2	17.2473	17.5244	17.9422	18.5996	19.1211	19.5359	19.6331	19.6340	19.4223	18.7681	17.9863	17.3161	(90)
Living area fraction										fLA = Living area / (4) =		0.2629	(91)
MIT	17.7032	17.9632	18.3563	18.9717	19.4686	19.8696	19.9763	19.9729	19.7563	19.1288	18.3919	17.7625	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7032	17.9632	18.3563	18.9717	19.4686	19.8696	19.9763	19.9729	19.7563	19.1288	18.3919	17.7625	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9864	0.9787	0.9663	0.9347	0.8665	0.7112	0.5211	0.5616	0.7946	0.9375	0.9774	0.9883	(94)
Useful gains	636.6057	709.4615	737.6151	750.7633	707.6211	568.1897	399.9040	414.7930	568.9613	625.3268	617.9275	613.3403	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	1848.5234	1785.3760	1605.9587	1306.5209	999.4330	651.6321	417.5150	438.5169	710.3315	1097.2342	1477.1912	1804.9824	(97)
Space heating kWh													
	901.6668	723.0146	646.0476	400.1455	217.1080	0.0000	0.0000	0.0000	0.0000	351.0991	618.6699	886.5817	(98a)
Space heating requirement - total per year (kWh/year)												4744.3332	
Solar heating kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh													
	901.6668	723.0146	646.0476	400.1455	217.1080	0.0000	0.0000	0.0000	0.0000	351.0991	618.6699	886.5817	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4744.3332	
Space heating per m2											(98c) / (4) =	59.3858	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												100.0000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	901.6668	723.0146	646.0476	400.1455	217.1080	0.0000	0.0000	0.0000	0.0000	351.0991	618.6699	886.5817	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	901.6668	723.0146	646.0476	400.1455	217.1080	0.0000	0.0000	0.0000	0.0000	351.0991	618.6699	886.5817	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	285.6174	252.3615	267.1006	231.9716	223.0180	198.9038	194.6030	203.3429	206.7344	233.0247	250.9004	282.0814	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month													
	285.6174	252.3615	267.1006	231.9716	223.0180	198.9038	194.6030	203.3429	206.7344	233.0247	250.9004	282.0814	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	30.3578	24.3541	21.9282	16.0655	12.4095	10.1386	11.3203	14.7146	19.1128	25.0771	28.3245	31.2015	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												4744.3332	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												2829.6598	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												245.0045	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												7818.9974	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4744.3332	0.1545	733.0598	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2829.6598	0.1412	399.4322	(264)
Space and water heating			1132.4920	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	245.0045	0.1443	35.3617	(268)
Total CO2, kg/year			1167.8537	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.6200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4744.3332	1.5720	7458.3151	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2829.6598	1.5220	4306.6519	(278)
Space and water heating			11764.9670	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	245.0045	1.5338	375.7961	(282)
Total Primary energy kWh/year			12140.7630	(286)
Dwelling Primary energy Rate (DPER)			151.9700	(287)

11 Appendix 2 Be Green DER SAP Worksheets (Block A)

Full SAP Calculation Printout

Plot Reference	13853 A15	**Issued on Date**	25/06/2026
Assessment Reference	rev0	**Plot Type Ref**	Block A Plot 15
Plot Address	Linford Gardens Block A , 114, Boundary Lane, Manchester, M15 6FD	**SAP Version**	10.2

SAP Rating	83 B	**DER**	4.03	**TER**	
Environmental	97 A	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.26	**DFEE**	47.49	**TFEE**	
Compliance Check	N/A	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	47.98	**TPER**	

Assessor Details	Mr. Peter Kinsella	**Assessor ID**	L770-0002
Client			

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	28.1200 (1b)	x	2.9300 (2b)	=	82.3916	(1b) - (3b)
First floor	51.7700 (1c)	x	3.0000 (2c)	=	155.3100	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	79.8900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.7016	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	81.9000	(23c)

Effective ac	0.2531	0.2499	0.2467	0.2307	0.2276	0.2116	0.2116	0.2084	0.2180	0.2276	0.2339	0.2403	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows			5.6900	1.1450	6.5153			(27)
Corridor door			1.8900	1.0000	1.8900			(26)
Glazed door			3.5100	1.1450	4.0191			(27)
New floor over corridor			28.1200	0.1705	4.7941			(28b)
Existing wall	25.2000	5.6600	19.5400	0.2800	5.4712			(29a)
New wall	29.4900	3.5400	25.9500	0.1800	4.6710			(29a)
New wall to unheated corridor	4.5400	1.8900	2.6500	0.1700	0.4505			(29a)
External Roof 1	51.9300		51.9300	0.1100	5.7123			(30)
Total net area of external elements Aum(A, m2)			139.2800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.5234			(33)
Main dwelling								
Party Wall 1			123.2700	0.0000	0.0000			(32)
Party Floor 1			28.1200					(32d)
Party Floor 2			1.5800					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area) 27.8560 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 61.3794 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	19.8506	19.6006	19.3505	18.1004	17.8504	16.6002	16.6002	16.3502	17.1003	17.8504	18.3504	18.8505	(38)
Heat transfer coeff	81.2301	80.9800	80.7300	79.4798	79.2298	77.9796	77.9796	77.7296	78.4797	79.2298	79.7299	80.2299	(39)
Average = Sum(39)m / 12 =												79.4173	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0168	1.0136	1.0105	0.9949	0.9917	0.9761	0.9761	0.9730	0.9823	0.9917	0.9980	1.0043	(40)
HLP (average)												0.9941	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4608 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	65.4787	64.4947	63.0608	60.3173	58.2926	56.0348	54.7514	56.1744	57.7344	60.1587	62.9611	65.2279	(42a)
Hot water usage for baths	28.2812	27.8612	27.2697	26.1792	25.3626	24.4571	23.9680	24.5553	25.1948	26.1637	27.2767	28.1856	(42b)
Hot water usage for other uses	39.8308	38.3824	36.9340	35.4856	34.0372	32.5888	32.5888	34.0372	35.4856	36.9340	38.3824	39.8308	(42c)
Average daily hot water use (litres/day)												122.8001	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	133.5907	130.7383	127.2645	121.9820	117.6924	113.0807	111.3082	114.7670	118.4148	123.2563	128.6202	133.2442	(44)
Energy conte	211.5750	186.1696	195.6008	166.9873	158.4366	139.0459	134.6176	142.1055	146.0173	167.2577	183.2431	208.6283	(45)
Energy content (annual)										Total = Sum(45)m =		2039.6847	
Distribution loss (46)m = 0.15 x (45)m	31.7363	27.9254	29.3401	25.0481	23.7655	20.8569	20.1926	21.3158	21.9026	25.0887	27.4865	31.2942	(46)
Water storage loss (or HIU loss):													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	238.5264	210.5128	222.5522	193.0693	185.3880	165.1279	161.5690	169.0569	172.0993	194.2091	209.3251	235.5797	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	238.5264	210.5128	222.5522	193.0693	185.3880	165.1279	161.5690	169.0569	172.0993	194.2091	209.3251	235.5797	(64)
									Total per year (kWh/year) = Sum(64)m =			2357.0157	(64)
12Total per year (kWh/year)												2357	(64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	70.3487	61.9014	65.0373	55.5233	52.6802	46.2327	44.7604	47.2501	48.5507	55.6132	60.9283	69.3689	(65)

5. Internal gains (see Table 5 and 5a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	123.0385	(66)m
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	123.8457	137.1149	123.8457	127.9739	123.8457	127.9739	123.8457	123.8457	127.9739	123.8457	127.9739	123.8457	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.2105	221.4852	215.7530	203.5498	188.1454	173.6675	163.9953	161.7206	167.4528	179.6560	195.0604	209.5383	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	35.3039	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	-98.4308	(71)
Water heating gains (Table 5)	94.5547	92.1152	87.4157	77.1157	70.8067	64.2122	60.1618	63.5082	67.4316	74.7489	84.6227	93.2378	(72)
Total internal gains	497.5225	510.6269	486.9260	468.5509	442.7094	425.7651	407.9144	408.9861	422.7699	438.1622	467.5686	486.5334	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	4.3100	36.7938	0.6300	0.7000	0.7700	48.4645	(77)
Northwest	1.3800	11.2829	0.6300	0.7000	0.7700	4.7585	(81)
Southeast	3.5100	36.7938	0.6300	0.7000	0.7700	39.4688	(77)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	92.6919	159.4692	222.3910	282.5903	322.9478	323.4377	310.6527	280.1122	243.1710	177.3794	111.3114	79.1387	(83)
Total gains	590.2144	670.0960	709.3170	751.1412	765.6572	749.2028	718.5671	689.0983	665.9409	615.5416	578.8799	565.6721	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.2988	68.5097	68.7219	69.8028	70.0231	71.1457	71.1457	71.3746	70.6924	70.0231	69.5839	69.1502	
alpha	5.5533	5.5673	5.5815	5.6535	5.6682	5.7430	5.7430	5.7583	5.7128	5.6682	5.6389	5.6100	
util living area													
	0.9944	0.9879	0.9750	0.9329	0.8333	0.6431	0.4739	0.5131	0.7510	0.9435	0.9876	0.9955	(86)
MIT	19.9416	20.1169	20.3405	20.6396	20.8634	20.9761	20.9964	20.9945	20.9428	20.6639	20.2595	19.9183	(87)
Th 2	20.0694	20.0720	20.0746	20.0876	20.0902	20.1033	20.1033	20.1059	20.0981	20.0902	20.0850	20.0798	(88)
util rest of house													
	0.9927	0.9842	0.9670	0.9113	0.7841	0.5626	0.3793	0.4164	0.6752	0.9208	0.9830	0.9941	(89)
MIT 2	18.8429	19.0671	19.3503	19.7250	19.9760	20.0897	20.1021	20.1040	20.0607	19.7620	19.2594	18.8210	(90)
Living area fraction										fLA = Living area / (4) =		0.2629	(91)
MIT	19.1317	19.3430	19.6106	19.9654	20.2093	20.3227	20.3372	20.3380	20.2925	19.9991	19.5223	19.1095	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1317	19.3430	19.6106	19.9654	20.2093	20.3227	20.3372	20.3380	20.2925	19.9991	19.5223	19.1095	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9902	0.9803	0.9619	0.9080	0.7911	0.5830	0.4042	0.4419	0.6927	0.9181	0.9793	0.9920	(94)
Useful gains	584.4361	656.8753	682.3189	682.0017	605.7136	436.7591	290.4520	304.5056	461.2916	565.1143	566.8999	561.1745	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1204.7785	1169.5964	1058.4183	879.4779	674.1869	446.2535	291.4263	306.1025	485.9875	744.6902	990.4267	1196.1842	(97)
Space heating kWh	461.5347	344.5486	279.8180	142.1829	50.9442	0.0000	0.0000	0.0000	0.0000	133.6045	304.9393	472.4472	(98a)
Space heating requirement - total per year (kWh/year)												2190.0193	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	461.5347	344.5486	279.8180	142.1829	50.9442	0.0000	0.0000	0.0000	0.0000	133.6045	304.9393	472.4472	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2190.0193	
Space heating per m2											(98c) / (4) =	27.4129	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	461.5347	344.5486	279.8180	142.1829	50.9442	0.0000	0.0000	0.0000	0.0000	133.6045	304.9393	472.4472	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	461.5347	344.5486	279.8180	142.1829	50.9442	0.0000	0.0000	0.0000	0.0000	133.6045	304.9393	472.4472	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	238.5264	210.5128	222.5522	193.0693	185.3880	165.1279	161.5690	169.0569	172.0993	194.2091	209.3251	235.5797	(64)
Efficiency of water heater												342.2533	(216)
(217)m	342.2533	342.2533	342.2533	342.2533	342.2533	342.2533	342.2533	342.2533	342.2533	342.2533	342.2533	342.2533	(217)
Fuel for water heating, kWh/month	69.6930	61.5079	65.0256	56.4112	54.1669	48.2473	47.2074	49.3953	50.2842	56.7443	61.1609	68.8320	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	26.2061	23.6700	26.2061	25.3607	26.2061	25.3607	26.2061	26.2061	25.3607	26.2061	25.3607	26.2061	(231)
Lighting	27.7554	22.2664	20.0484	14.6883	11.3457	9.2695	10.3499	13.4532	17.4744	22.9274	25.8964	28.5268	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.6094	-43.4465	-74.8521	-93.6008	-102.2889	-91.9180	-90.3065	-81.8076	-66.5674	-51.7282	-29.8470	-21.0938	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-5.3410	-14.6143	-39.4263	-79.1992	-126.2679	-138.4820	-134.6791	-105.0852	-65.9126	-26.8382	-8.1690	-3.9046	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2190.0193	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												342.2533	
Water heating fuel used												688.6758	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.0640)		
mechanical ventilation fans (SFP = 1.0640)	308.5557	(230a)
Total electricity for the above, kWh/year	308.5557	(231)
Electricity for lighting (calculated in Appendix L)	224.0020	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1520.9856	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	1890.2672	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2190.0193	0.1559	341.4518	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	688.6758	0.1412	97.2357	(264)
Space and water heating			438.6875	(265)
Pumps, fans and electric keep-hot	308.5557	0.1387	42.8005	(267)
Energy for lighting	224.0020	0.1443	32.3304	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-773.0662	0.1330	-102.7833	
PV Unit electricity exported	-747.9194	0.1191	-89.0755	
Total			-191.8588	(269)
Total CO2, kg/year			321.9596	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0300	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2190.0193	1.5772	3454.1348	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	688.6758	1.5221	1048.2282	(278)
Space and water heating			4502.3630	(279)
Pumps, fans and electric keep-hot	308.5557	1.5128	466.7831	(281)
Energy for lighting	224.0020	1.5338	343.5817	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-773.0662	1.4913	-1152.8890	
PV Unit electricity exported	-747.9194	0.4368	-326.6746	
Total			-1479.5636	(283)
Total Primary energy kWh/year			3833.1642	(286)
Dwelling Primary energy Rate (DPER)			47.9800	(287)

12 Appendix 3 Baseline DER SAP Worksheets (Block B)

Full SAP Calculation Printout

Plot Reference	13853 B10	**Issued on Date**	25/06/2026
Assessment Reference	notional	**Plot Type Ref**	Block B Plot 10
Plot Address	Linford Gardens Block B, 114, Boundary Lane, Manchester, M15 6FD	**SAP Version**	10.2

SAP Rating	33 F	**DER**	15.86	**TER**	
Environmental	86 B	**% DER < TER**			N/A
CO_2 Emissions (t/year)	1.37	**DFEE**	81.39	**TFEE**	
Compliance Check	N/A	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	164.43	**TPER**	

Assessor Details	Mr. Peter Kinsella	**Assessor ID**	L770-0002
Client			

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.7000 (1b)	x	2.9300 (2b)	=	107.5310	(1b) - (3b)
First floor	61.7600 (1c)	x	3.0500 (2c)	=	188.3680	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	98.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	295.8990	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0676	(8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.8176	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6950	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.8861	0.8687	0.8513	0.7644	0.7471	0.6602	0.6602	0.6428	0.6950	0.7471	0.7818	0.8166	(22b)
Effective ac	0.8926	0.8773	0.8624	0.7922	0.7791	0.7179	0.7179	0.7066	0.7415	0.7791	0.8056	0.8334	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows			9.8500	1.3258	13.0587			(27)
Corridor door			1.8900	1.6000	3.0240			(26)
New floor over corridor			19.6900	0.1705	3.3569			(28b)
New floor over shaft			5.3700	0.1800	0.9666			(28b)
Existing wall	42.3400	5.0400	37.3000	0.3000	11.1900			(29a)
New wall	53.9200	4.8100	49.1100	0.1800	8.8398			(29a)
New wall to unheated corridor	19.4400	1.8900	17.5500	0.1700	2.9835			(29a)
New wall to shaft	6.0800		6.0800	0.1800	1.0944			(29a)
External Roof 1	61.8600		61.8600	0.1500	9.2790			(30)
Total net area of external elements Aum(A, m2)			208.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.7929			(33)
Main dwelling								
Party Wall 1			67.3200	0.0000	0.0000			(32)
Party Floor 1			36.7000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	41.7400	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	95.5329	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	87.1550	85.6665	84.2075	77.3547	76.0726	70.1040	70.1040	68.9987	72.4030	76.0726	78.6663	81.3780	(38)
Heat transfer coeff	182.6879	181.1994	179.7404	172.8876	171.6054	165.6369	165.6369	164.5316	167.9359	171.6054	174.1992	176.9109	(39)
Average = Sum(39)m / 12 =												172.8815	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8555	1.8403	1.8255	1.7559	1.7429	1.6823	1.6823	1.6710	1.7056	1.7429	1.7692	1.7968	(40)
HLP (average)												1.7559	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7248 (42)

Hot water usage for mixer showers

	96.1205	94.6760	92.5710	88.5437	85.5715	82.2571	80.3731	82.4621	84.7520	88.3108	92.4247	95.7522	(42a)

Hot water usage for baths

	30.1850	29.7367	29.1054	27.9415	27.0699	26.1034	25.5814	26.2083	26.8908	27.9250	29.1129	30.0830	(42b)

Hot water usage for other uses

	42.5347	40.9880	39.4413	37.8946	36.3479	34.8011	34.8011	36.3479	37.8946	39.4413	40.9880	42.5347	(42c)

Average daily hot water use (litres/day) 155.2741 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	168.8402	165.4007	161.1178	154.3797	148.9893	143.1616	140.7557	145.0183	149.5375	155.6770	162.5256	168.3699	(44)
Energy conte	267.4016	235.5284	247.6320	211.3381	200.5682	176.0339	170.2318	179.5629	184.3946	211.2523	231.5475	263.6266	(45)
Energy content (annual)										Total = Sum(45)m =		2579.1179	
Distribution loss (46)m = 0.15 x (45)m	40.1102	35.3293	37.1448	31.7007	30.0852	26.4051	25.5348	26.9344	27.6592	31.6878	34.7321	39.5440	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8900 (48)

Temperature factor from Table 2b 0.6000 (49)

Enter (49) or (54) in (55) 1.1340 (55)

Total storage loss

	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)

If cylinder contains dedicated solar storage

	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	302.5556	267.2804	282.7860	245.3581	235.7222	210.0539	205.3858	214.7169	218.4146	246.4063	265.5675	298.7806	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

	302.5556	267.2804	282.7860	245.3581	235.7222	210.0539	205.3858	214.7169	218.4146	246.4063	265.5675	298.7806	(64)
										Total per year (kWh/year) = Sum(64)m =		2993.0279	(64)
12Total per year (kWh/year)												2993	(64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

	117.0342	103.7148	110.4608	97.4859	94.8121	85.7473	84.7253	87.8279	88.5272	98.3646	104.2055	115.7790	(65)

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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.8151	163.6525	147.8151	152.7423	147.8151	152.7423	147.8151	147.8151	152.7423	147.8151	152.7423	147.8151	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	253.8138	256.4476	249.8105	235.6810	217.8450	201.0816	189.8827	187.2489	193.8860	208.0155	225.8515	242.6149	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	(71)
Water heating gains (Table 5)	157.3041	154.3375	148.4689	135.3971	127.4357	119.0935	113.8781	118.0482	122.9545	132.2105	144.7299	155.6170	(72)
Total internal gains	622.8051	638.3096	609.9666	587.6925	556.9678	536.7895	515.4480	516.9843	533.4548	551.9132	587.1958	609.9191	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.8400	11.2829	0.6300	0.7000	0.7700	13.2411	(75)
Northwest	6.0100	11.2829	0.6300	0.7000	0.7700	20.7238	(81)

Solar gains	33.9649	69.1365	124.5621	204.5667	274.9778	293.1554	274.2409	218.6280	151.7808	84.4903	42.7366	27.7374	(83)
Total gains	656.7700	707.4462	734.5287	792.2592	831.9456	829.9449	789.6888	735.6123	685.2356	636.4035	629.9325	637.6565	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	37.4272	37.7347	38.0410	39.5488	39.8443	41.2801	41.2801	41.5574	40.7149	39.8443	39.2510	38.6494	
alpha	3.4951	3.5156	3.5361	3.6366	3.6563	3.7520	3.7520	3.7705	3.7143	3.6563	3.6167	3.5766	
util living area													

	0.9963	0.9948	0.9918	0.9816	0.9535	0.8739	0.7568	0.8015	0.9366	0.9850	0.9943	0.9968	(86)
MIT	18.6879	18.8592	19.1796	19.7113	20.2113	20.6677	20.8698	20.8337	20.4889	19.8623	19.2438	18.7243	(87)
Th 2	19.4314	19.4419	19.4522	19.5010	19.5102	19.5536	19.5536	19.5617	19.5368	19.5102	19.4916	19.4723	(88)
util rest of house	0.9950	0.9928	0.9884	0.9726	0.9256	0.7850	0.5759	0.6378	0.8841	0.9759	0.9917	0.9956	(89)
MIT 2	16.8182	17.0435	17.4592	18.1645	18.7912	19.3384	19.5097	19.4966	19.1471	18.3654	17.5659	16.8889	(90)
Living area fraction										fLA = Living area / (4) =		0.2438	(91)
MIT	17.2740	17.4861	17.8786	18.5415	19.1374	19.6624	19.8413	19.8225	19.4742	18.7303	17.9749	17.3363	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.2740	17.4861	17.8786	18.5415	19.1374	19.6624	19.8413	19.8225	19.4742	18.7303	17.9749	17.3363	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9918	0.9887	0.9827	0.9638	0.9157	0.7936	0.6190	0.6745	0.8810	0.9683	0.9875	0.9929	(94)
Useful gains	651.4026	699.4399	721.8118	763.5486	761.8036	658.6456	488.7805	496.1953	603.6601	616.2589	622.0440	633.1099	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2370.1869	2280.5885	2045.1936	1666.9008	1276.2954	838.5208	536.8720	563.1066	902.5131	1395.1993	1894.3967	2323.9547	(97)
Space heating kWh	1278.7755	1062.5319	984.5960	650.4136	382.7819	0.0000	0.0000	0.0000	0.0000	579.5316	916.0939	1257.9885	(98a)
Space heating requirement - total per year (kWh/year)												7112.7130	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	1278.7755	1062.5319	984.5960	650.4136	382.7819	0.0000	0.0000	0.0000	0.0000	579.5316	916.0939	1257.9885	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7112.7130	
Space heating per m2											(98c) / (4) =	72.2396	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1278.7755	1062.5319	984.5960	650.4136	382.7819	0.0000	0.0000	0.0000	0.0000	579.5316	916.0939	1257.9885	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	1278.7755	1062.5319	984.5960	650.4136	382.7819	0.0000	0.0000	0.0000	0.0000	579.5316	916.0939	1257.9885	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	302.5556	267.2804	282.7860	245.3581	235.7222	210.0539	205.3858	214.7169	218.4146	246.4063	265.5675	298.7806	(64)
Efficiency of water heater												100.0000	(216)
(217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(217)
Fuel for water heating, kWh/month	302.5556	267.2804	282.7860	245.3581	235.7222	210.0539	205.3858	214.7169	218.4146	246.4063	265.5675	298.7806	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	37.8462	30.3616	27.3373	20.0285	15.4706	12.6396	14.1128	18.3443	23.8274	31.2629	35.3114	38.8981	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	7112.7130	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	2993.0279	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	305.4407	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	10411.1815	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	7112.7130	0.1539	1094.8237	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2993.0279	0.1412	422.5616	(264)
Space and water heating			1517.3852	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	305.4407	0.1443	44.0845	(268)
Total CO2, kg/year			1561.4698	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			15.8600	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	7112.7130	1.5699	11166.0911	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2993.0279	1.5221	4555.5498	(278)
Space and water heating			15721.6409	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	305.4407	1.5338	468.4951	(282)
Total Primary energy kWh/year			16190.1360	(286)
Dwelling Primary energy Rate (DPER)			164.4300	(287)

13 Appendix 4 Be Green DER SAP Worksheets (Block B)

Full SAP Calculation Printout

Plot Reference	13853 B10	**Issued on Date**	25/06/2026
Assessment Reference	rev0	**Plot Type Ref**	Block B Plot 10
Plot Address	Linford Gardens Block B, 114, Boundary Lane, Manchester, M15 6FD	**SAP Version**	10.2

SAP Rating	71 C	**DER**	6.52	**TER**	
Environmental	94 A	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.54	**DFEE**	61.34	**TFEE**	
Compliance Check	N/A	**% DFEE < TFEE**			
% DPER < TPER		**DPER**	71.72	**TPER**	

Assessor Details	Mr. Peter Kinsella	**Assessor ID**	L770-0002
Client			

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	36.7000 (1b)	x	2.9300 (2b)	=	107.5310	(1b) - (3b)
First floor	61.7600 (1c)	x	3.0500 (2c)	=	188.3680	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	98.4600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	295.8990	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.0000	(17)
Infiltration rate		0.1500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery		
If mechanical ventilation		0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		81.9000 (23c)

Effective ac	0.2531	0.2499	0.2467	0.2307	0.2276	0.2116	0.2116	0.2084	0.2180	0.2276	0.2339	0.2403	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows			9.8500	1.1450	11.2786			(27)
Corridor door			1.8900	1.0000	1.8900			(26)
New floor over corridor			19.6900	0.1705	3.3569			(28b)
New floor over shaft			5.3700	0.1800	0.9666			(28b)
Existing wall	42.3400	5.0400	37.3000	0.2800	10.4440			(29a)
New wall	53.9200	4.8100	49.1100	0.1800	8.8398			(29a)
New wall to unheated corridor	19.4400	1.8900	17.5500	0.1700	2.9835			(29a)
New wall to shaft	6.0800		6.0800	0.1800	1.0944			(29a)
External Roof 1	61.8600		61.8600	0.1100	6.8046			(30)
Total net area of external elements Aum(A, m2)			208.7000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		47.6584			(33)
Main dwelling								
Party Wall 1			67.3200	0.0000	0.0000			(32)
Party Floor 1			36.7000					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area) 41.7400 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 89.3984 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.7107	24.3995	24.0882	22.5320	22.2207	20.6645	20.6645	20.3532	21.2870	22.2207	22.8432	23.4657	(38)
Heat transfer coeff	114.1091	113.7979	113.4866	111.9304	111.6191	110.0629	110.0629	109.7516	110.6854	111.6191	112.2416	112.8641	(39)

Average = Sum(39)m / 12 = 111.8526

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1589	1.1558	1.1526	1.1368	1.1336	1.1178	1.1178	1.1147	1.1242	1.1336	1.1400	1.1463	(40)
HLP (average)												1.1360	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.7248 (42)
Hot water usage for mixer showers

69.9058	68.8553	67.3244	64.3954	62.2338	59.8233	58.4532	59.9724	61.6378	64.2260	67.2179	69.6380	(42a)

Hot water usage for baths

30.1850	29.7367	29.1054	27.9415	27.0699	26.1034	25.5814	26.2083	26.8908	27.9250	29.1129	30.0830	(42b)

Hot water usage for other uses

42.5347	40.9880	39.4413	37.8946	36.3479	34.8011	34.8011	36.3479	37.8946	39.4413	40.9880	42.5347	(42c)

Average daily hot water use (litres/day) 131.1050 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	142.6255	139.5800	135.8711	130.2314	125.6516	120.7279	118.8357	122.5286	126.4233	131.5923	137.3189	142.2557	(44)
Energy conte	225.8840	198.7600	208.8289	178.2803	169.1512	148.4490	143.7215	151.7160	155.8925	178.5695	195.6359	222.7380	(45)

Energy content (annual) Total = Sum(45)m = 2177.6268

Distribution loss (46)m = 0.15 x (45)m

33.8826	29.8140	31.3243	26.7420	25.3727	22.2674	21.5582	22.7574	23.3839	26.7854	29.3454	33.4107	(46)

Water storage loss (or HIU loss):
Store volume 201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)

If cylinder contains dedicated solar storage

26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

252.8354	223.1032	235.7803	204.3623	196.1026	174.5310	170.6729	178.6674	181.9745	205.5209	221.7179	249.6894	(62)
WWHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter -0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	(63b)
Solar input 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)

Output from w/h

252.8354	223.1032	235.7803	204.3623	196.1026	174.5310	170.6729	178.6674	181.9745	205.5209	221.7179	249.6894	(64)

Total per year (kWh/year) = Sum(64)m = 2494.9578 (64)
12Total per year (kWh/year) 2495 (64)
Electric shower(s)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

75.1064	66.0877	69.4356	59.2782	56.2428	49.3593	47.7874	50.4456	51.8343	59.3743	65.0489	74.0604	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	136.2402	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	147.8151	163.6525	147.8151	152.7423	147.8151	152.7423	147.8151	147.8151	152.7423	147.8151	152.7423	147.8151	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	253.8138	256.4476	249.8105	235.6810	217.8450	201.0816	189.8827	187.2489	193.8860	208.0155	225.8515	242.6149	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	36.6240	(69)
Pumps, fans 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	-108.9922	(71)
Water heating gains (Table 5)	100.9495	98.3448	93.3274	82.3308	75.5951	68.5546	64.2304	67.8032	71.9920	79.8042	90.3457	99.5435	(72)
Total internal gains	566.4505	582.3170	554.8252	534.6262	505.1273	486.2506	465.8003	466.7393	482.4924	499.5070	532.8117	553.8456	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	3.8400	11.2829	0.6300	0.7000	0.7700	13.2411	(75)
Northwest	6.0100	11.2829	0.6300	0.7000	0.7700	20.7238	(81)

Solar gains 33.9649	69.1365	124.5621	204.5667	274.9778	293.1554	274.2409	218.6280	151.7808	84.4903	42.7366	27.7374	(83)
Total gains 600.4154	651.4535	679.3872	739.1929	780.1051	779.4060	740.0412	685.3673	634.2732	583.9973	575.5483	581.5830	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.9207	60.0846	60.2494	61.0871	61.2574	62.1236	62.1236	62.2998	61.7742	61.2574	60.9177	60.5817	
alpha	4.9947	5.0056	5.0166	5.0725	5.0838	5.1416	5.1416	5.1533	5.1183	5.0838	5.0612	5.0388	
util living area	0.9979	0.9964	0.9930	0.9784	0.9294	0.7921	0.6268	0.6893	0.9035	0.9846	0.9959	0.9982	(86)
MIT	19.5799	19.7133	19.9434	20.3112	20.6582	20.9047	20.9776	20.9644	20.7914	20.3603	19.9235	19.5667	(87)
Th 2	19.9530	19.9555	19.9581	19.9709	19.9734	19.9863	19.9863	19.9889	19.9811	19.9734	19.9683	19.9632	(88)
util rest of house	0.9971	0.9951	0.9904	0.9693	0.8974	0.7058	0.4962	0.5601	0.8472	0.9765	0.9943	0.9976	(89)
MIT 2	18.2967	18.4692	18.7649	19.2389	19.6604	19.9263	19.9785	19.9748	19.8217	19.3065	18.7477	18.2871	(90)
Living area fraction										fLA = Living area / (4) =		0.2438	(91)
MIT	18.6095	18.7725	19.0522	19.5003	19.9036	20.1648	20.2221	20.2160	20.0581	19.5634	19.0343	18.5990	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6095	18.7725	19.0522	19.5003	19.9036	20.1648	20.2221	20.2160	20.0581	19.5634	19.0343	18.5990	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9930	0.9871	0.9638	0.8947	0.7227	0.5281	0.5914	0.8524	0.9720	0.9920	0.9964	(94)
Useful gains	597.8434	646.8750	670.6238	712.4065	697.9784	563.2910	390.8369	405.2941	540.6584	567.6312	570.9561	579.4724	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1632.8464	1578.6553	1424.5073	1186.4970	915.6801	612.4727	398.6548	418.8175	659.4729	1000.4843	1339.5265	1625.1336	(97)
Space heating kWh	770.0422	626.1564	560.8894	341.3452	161.9701	0.0000	0.0000	0.0000	0.0000	322.0427	553.3707	777.9719	(98a)
Space heating requirement - total per year (kWh/year)												4113.7885	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	770.0422	626.1564	560.8894	341.3452	161.9701	0.0000	0.0000	0.0000	0.0000	322.0427	553.3707	777.9719	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4113.7885	
Space heating per m2											(98c) / (4) =	41.7813	(99)

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	770.0422	626.1564	560.8894	341.3452	161.9701	0.0000	0.0000	0.0000	0.0000	322.0427	553.3707	777.9719	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	770.0422	626.1564	560.8894	341.3452	161.9701	0.0000	0.0000	0.0000	0.0000	322.0427	553.3707	777.9719	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	252.8354	223.1032	235.7803	204.3623	196.1026	174.5310	170.6729	178.6674	181.9745	205.5209	221.7179	249.6894	(64)
Efficiency of water heater												339.6234	(216)
(217)m	339.6234	339.6234	339.6234	339.6234	339.6234	339.6234	339.6234	339.6234	339.6234	339.6234	339.6234	339.6234	(217)
Fuel for water heating, kWh/month	74.4458	65.6914	69.4240	60.1732	57.7412	51.3896	50.2536	52.6075	53.5813	60.5143	65.2835	73.5195	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	32.6222	29.4652	32.6222	31.5699	32.6222	31.5699	32.6222	32.6222	31.5699	32.6222	31.5699	32.6222	(231)
Lighting	35.1918	28.2322	25.4200	18.6237	14.3855	11.7531	13.1229	17.0577	22.1563	29.0702	32.8348	36.1699	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4367	-45.8056	-81.1883	-105.3899	-116.9097	-97.7885	-96.0547	-86.5265	-69.7801	-56.0575	-31.1547	-21.6978	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-4.5137	-12.2552	-33.0901	-67.4101	-111.6471	-132.6115	-128.9309	-100.3663	-62.6999	-22.5089	-6.8613	-3.3006	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	4113.7885	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	339.6234	
Water heating fuel used	734.6248	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.0640)		
mechanical ventilation fans (SFP = 1.0640)	384.1006	(230a)
Total electricity for the above, kWh/year	384.1006	(231)
Electricity for lighting (calculated in Appendix L)	284.0181	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1520.9856	(233)

Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	3995.5464	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4113.7885	0.1546	635.8766	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	734.6248	0.1412	103.7390	(264)
Space and water heating			739.6156	(265)
Pumps, fans and electric keep-hot	384.1006	0.1387	53.2795	(267)
Energy for lighting	284.0181	0.1443	40.9926	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.7899	0.1330	-111.0285	
PV Unit electricity exported	-686.1957	0.1177	-80.7857	
Total			-191.8142	(269)
Total CO2, kg/year			642.0735	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			6.5200	(273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	4113.7885	1.5723	6468.0276	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	734.6248	1.5222	1118.2256	(278)
Space and water heating			7586.2531	(279)
Pumps, fans and electric keep-hot	384.1006	1.5128	581.0673	(281)
Energy for lighting	284.0181	1.5338	435.6365	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-834.7899	1.4915	-1245.0907	
PV Unit electricity exported	-686.1957	0.4316	-296.1423	
Total			-1541.2330	(283)
Total Primary energy kWh/year			7061.7239	(286)
Dwelling Primary energy Rate (DPER)			71.7200	(287)