RS MEP
DESIGN LTD

Whole Life Cycle Carbon Assessment

34a Netherhall Gardens, London, NW3 5TP

December 2024

Issue and Revision Record

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1. Executive Summary

The following report has been produced to identify and report on the life cycle carbon assessment for the redevelopment of 34A Netherhall Gardens, to ensure that the demolition and rebuild provides a more sustainable and future proofed alternative when comparing against the refurbishment of the existing building. Moreso, this report has been written to ensure compliance with the sustainability requirements of Camden Council.

The aim of this assessment is to detail the 'as built' Whole Life Carbon (WLC) for the proposed works, resulting from the construction and 'in use' building elements over the entirety of its life, including demolition and disposal.

The site is located at 34a Netherhall Gardens in the London Borough of Camden (LBC). The property is within the Fitzjohn's/Netherhall Conservation Area, but is not listed, nor do the proposals affect any listed buildings. The entrance to the site faces southwest onto Netherhall Gardens. The rear of the site backs onto the rear gardens of the property at 36 Netherhall Gardens.

The current proposal is to demolish the existing, two-storey building, currently in poor repair. Replacing this will be a 4-storey building, with basement floor, mirroring a forward-facing building. Sustainable materials, site-based operations, paired with future proof design are at the forefront of the development.

The report compares the following options.

1. Renovation of existing building, to AD Part L 2021 benchmarks. Considering upgraded fabric and services. Includes light demolition works to account for site operations.
2. Demolition of existing building and construction of a new building.

The focus of the report results is to account for the proposed works, resulting from the construction and 'in use' building elements over the entirety of its life, including demolition and disposal. This assessment captures the operational emissions as well as its embodied carbon emissions, associated with the extraction, manufacture and transport of building materials, construction and the resultant emissions associated with maintenance, repair, and replacement. Also included is the dismantling, and eventual material disposal of the existing building.

2. Whole Life Carbon Reporting

Climate change is widely considered to be one of the most pressing challenges of the modern era. Industrialism has resulted in the use of fossil fuels as a main energy source and as such, have released carbon dioxide into the atmosphere, causing an exponential increase in concentration of carbon dioxide and other pollutants. This has shown an ever-increasing average surface temperature, globally.

Carbon emissions from the operational use of buildings has been the subject of regulation for some time and is the primary focus in reducing the building environment carbon footprint. More recently, this focus has extended to include carbon emissions associated with the impact of building materials. It has been noted that around 15-20% of the total carbon emissions for buildings over their lifespan is from embodied carbon. With increasing energy efficiency within buildings and an increasingly decarbonised electricity supply, building operational carbon emission are being acknowledged to be reducing. As this occurs, the significance of embodied carbon emissions increases and the potential for reduction of overall carbon emissions through structural design choice and material selection becomes greater.

2.1 Requirements of Conducting a WLC Assessment

Whole life assessment should be undertaken sequentially during the design, procurement, construction, and post completion staged, starting as early as RIBA Stage 2 (concept stage), if possible. Early-stage assessment is recommended to establish detailed baseline carbon estimate for the project. This allows the integration of whole life carbon into the process and allows the design team to identify carbon reduction measures across the various stages. The design team will therefore fully engage and understand the impacts of whole life carbon assessing on the project.

Further assessment stages are advisable for monitoring the carbon budget progress as the project develops and at practical completion, the actual carbon footprint is provided and cross checked with the earlier stage assumptions.

As a minimum, a whole life carbon assessment must be conducted before the commencement of the technical design (RIBA Stage 4 or equivalent) of the project.

Interim assessments and carbon impact studies have been conducted as appropriate, according to the nature of each project and whole life carbon savings for a project can only be quantified and claimed when whole life carbon assessments have been conducted at a minimum of two different points in time. Within this scheme, three points of time have been used for this project. An early-stage assessment, mid project and ‘as complete.

2.2 Camden Council Requirements

The purpose of an energy assessment is to demonstrate that the proposed climate mitigation measures comply with the London Plan. It ensures that carbon reduction remains an integral part

of the development's design and evolution. The energy assessment must clearly outline the CO2 savings that will be achieved and the measures that will be put in place to reduce energy demand.

A Whole Life Carbon assessment should be submitted, following the GLA Draft SPG and including long term carbon factors, as set out in the GLA Whole Life Carbon SPG.

This approach is justified through Local Plan policy CC1 which requires all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building. Paragraph 8.17 of the Local Plan states this should be justified in terms of optimisation of resources and energy use. As such a Whole Life Carbon assessment will be expected for all applications proposing substantial demolition

3. Methodology and OneClick LCA

3.1 Embodied Carbon Emissions

To accurately assess the embodied carbon for the project, the Lifecycle Assessment tool 'One Click LCA has been used to make allocations for the anticipated materials quantities in an inventory analysis. The materials are represented within the model by using materials with associated Environmental Product Declarations (EPDs).

EPDs are produced by manufacturers and identify the carbon emissions of a product. By scheduling the materials proposed for the development, the overall carbon emissions can be approximated. In the event where a specified material is not included in the database, the most similar material in terms of material composition is selected instead.

In line with standard UK practice, the LCA process and results included by this report have been assessed in line with BS 15978:2011 and the RICS Professional Statement: Whole Life Carbon assessment for the built environment. All EPDs used have been produced in line with the requirements of BS EN 15804:2012.

Each material has been assessed against the following lifecycle stage:

3. A1-A3: Product stage
4. A4: Material transportation to site
5. B4-B5: Replacement and maintenance
6. C1-C4: End of life

Together with these stages, the contribution of life cycle stage A5 has also been explored separately, giving an estimate of the emissions related to the construction and site impacts. For example, the site energy, water, transport, and waste use are to be assumed and then noted as the project proceeds.

The following sub-sections provide guidance on defining what needs to be considered for the complete whole life carbon assessment of a built project. Several mandatory requirements are set out to enable consistency. Any selective scope and boundaries, beyond the mandatory stipulations, should be aligned with the assessment objectives and should be clearly identified and justified.

3.2 Data Sources and Gathering Evidence

The following data sources were used to create the WLC model:

- OneClick LCA database of materials, components, and EPC data
- Material quantities from planning drawings
- Relevant drawings, plans, sections, elevations, and specification
- Design Stage SAP Assessment
- Designbuilder model
- Operational energy modelling

- Energy Performance Certification

3.3 Materials

Material quantities were meticulously recorded from planning stage drawings and U value calculations.

3.4 Operational Energy Use

Operational energy use has been derived from the SAP10 worksheets for notional unit and new proposal, using an all-electric baseline for clarity.

3.5 Refrigerant

Newly installed systems that had refrigerant were specifically proposed in line with their Global Warming and Ozone Depletion value. The figures used within the WLC report have been taken directly from the equipment.

4. Assessment Design Considerations

This life cycle carbon assessment compares the carbon emissions associated with two scenarios: redeveloping and operating a new proposal versus renovating and continuing the operation of the existing building. The goal is to evaluate which option results in lower overall carbon emissions throughout its lifecycle.

Emissions from the proposed materials for the new development were calculated using One Click LCA's 'RICS: Whole Life Cycle Assessment' tool. Whole life-cycle carbon emissions encompass greenhouse gas emissions from raw material extraction, material manufacturing and transport, construction, maintenance, and eventual disposal. The scope of the assessments is outlined in the following table.

Production Stage			Construction Stage		Use Stage							End of Life			
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Raw Material	Transportation	Manufacture	Transport	Construction	Use	Maintenance	Repair	Replace	Refurbish	Operational Energy Use	Operational Water Use	Demolition	Transport	Waste Processing	Disposal
Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 1: LCA Scope

Internal walls and floors have been added to the scope, while internal and external finishes have been alleviated, subject to further design. This keeps consistency between both scenarios. The embodied carbon related to building services have been added and kept consistent within each scenario, although the new build unit has a larger floor area. This includes heating, hot water, lighting, ventilation, and distribution.

The final life cycle carbon emission values include both operational energy and material emissions, enabling a direct comparison of the lifetime carbon emissions for both options. Additionally, the difference in operational energy emissions was calculated and compared to material emissions to determine a "payback time," which is the point at which the new development's construction and operational emissions are lower than those of refurbishing and continuing the operation of the existing building. The assessment covers a 60-year period for both buildings.

5. Existing Building

The existing building at 34A Netherhall Gardens is 2-storeys, comprised of garaging at ground floor level with accommodation above. The building was constructed as a single-storey 3-car garage between 1910 and 1930. In 1945 permission was granted to extend the building upwards by a single storey to provide residential accommodation over the garaging.

5.1 Construction of the Existing Building

5.1.1 Walls

Ground Floor: Solid brick garage walls (not insulated)

First Floor: Cavity brick walls with minimal cavity (not insulated)

Internal Floors: Concrete slab (not insulated)

Windows: Steel-framed, single-glazed windows.

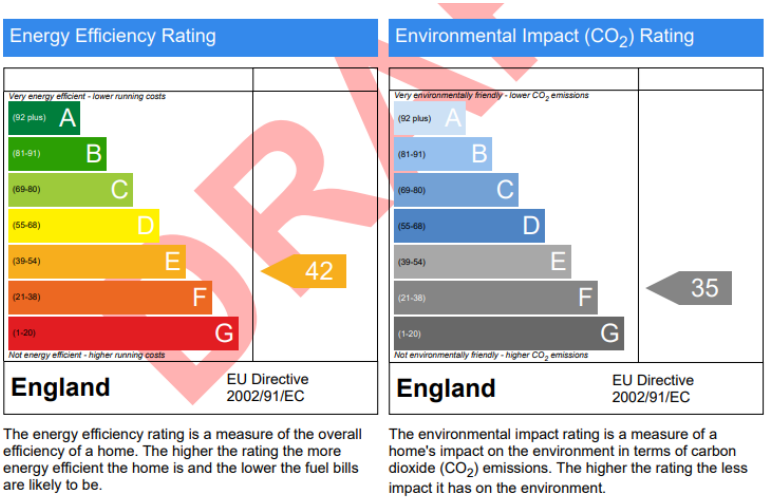
Roof: Felt roof on plywood substrate on timber frame with signs of water ingress at the ridge.

Timber weatherboard fascia (font)

Services At end of life.

The SAP calculation was undertaken for the existing house, shows a Dwelling Emission Rate (DER) of 35.714 kgCO2/m2.

The SAP calculation found the Energy Efficiency Rating to be Lodged as a C 70 rating. However, the EPC available on the MHLG register does not take into the actual building fabric and building services that are present. The EPC rating for this building, in line with current EPC conventions is E42.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

The existing building has poor environmental performance and modern living standard. This can be seen from the existing EPC (below).

5.2 Consideration of Potential Upgrade

The building is nearing the end of its functional life. Even if some improvements are made to the existing fabric, these must be considered of short-term benefit because the building will need to be reconstructed in the near future.

The potential to improve the existing building fabric was limited by the following conditions:

- Large parts of the existing building need to be replaced due to the poor condition or unsuitability (including all the building's metal glazing).
- Retrospective insulation of the floors, walls and roof would result in poor internal and external details and build-ups with limited performance and longevity over the building's lifetime.
- Retrospective insulation of the floor and ceiling at ground floor level will result in unsatisfactory floor-to-ceiling heights (approximately 2.2m)
- Air tightness is poor, causing drafts and heat loss which would negate any improvement in thermal performance that would have been provided by retrofitted insulation.
- Cold bridging is extensive and would negate thermal improvement provided by any retrofitted insulation.
- Retaining the existing fabric will prohibit the adoption of passive environmental strategies such as the orientation of glazing, increased natural daylight and ventilation (and the satisfaction and wellbeing associated with these design benefits).

5.3 Summary

On the balance of the reasons listed above it is conclusive that the existing house cannot be adapted to adequately reduce its energy consumption. The key strategy should be to create a future proofed dwelling.

6. Notional Development- Refurbishment

Within the refurbished development, most of the existing external masonry and roofing are kept, with external walls, party walls, and the roof upgraded with internal insulation to meet the required Ad Part L1b fabric energy efficiency standard, in line with Table 4.2 of ADL2021. External windows, doors, and internal floors are preserved, while internal partitions and non-load-bearing walls are demolished and replaced with stud partitions, to create a layout similar to the proposed new build, excluding basement. Significant work on the ground floor includes potentially underpinning existing retaining walls and adding steel and concrete to ensure structural compliance (Part A)

The following build ups have been used on the retention and upgrade scheme. These materials were used where possible, with OneClick LCA databases. Where this is not applicable, this has been matched with the closest construction possible within the database.

Building Element	Construction	Thermal Performance	
Foundations	Reinforced concrete trench foundations. Underpinned and insulated	-	W/m2k
Lower Ground Floor	Reinforced concrete slab (425mm), Damp proof membrane, 100mm Kingspan Insulation, separation layer (0.5mm) Screed (120mm)	0.11	
Ground Floor	150m concrete slab, Insulation, 6mm screed self-levelling	0.11	
Upper floors	Timber framed flooring to replace existing. Insulation between joists	0.00	
Roof – pitched	Existing structure (No embodied emissions), Insulation between and below joists. Insulated plasterboard	0.16	
Roof – flat	Cold applied waterproofing, Ply Sarking board (18mm), steel beam structure supporting a Posi joist webbed flat roofing system, insulation with insulated plasterboard to interior (Kooltherm K18)	0.16	
External Walls	Existing Masonry, timber battens, Insulation (Kooltherm K118, 75mm)	0.55	
Party Walls	None	-	
Glazing	New double-glazed unit - UPVC with a U value of 1.60W/m2k	1.60	
Doors	New timber external doors, insulated with a U value of 1.40W/m2k	1.40	

Table 2: Building Elements and Fabric Values

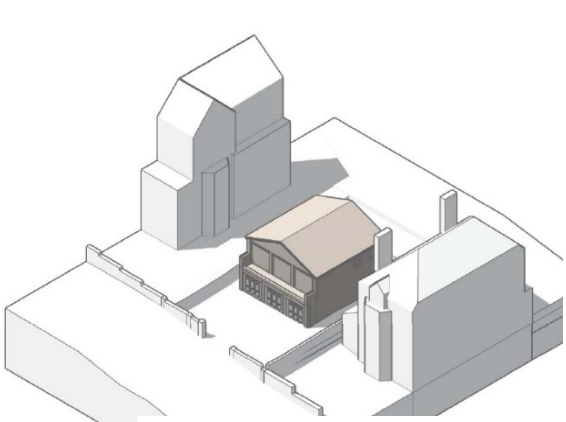
6.1 Building Services

With the condition of the existing building, it is assumed that the project will see the complete strip out and renovation of services, including heating via heat pump, lighting, ventilation, and water distribution systems. The details have been consistently applied to each scenario, as follows.

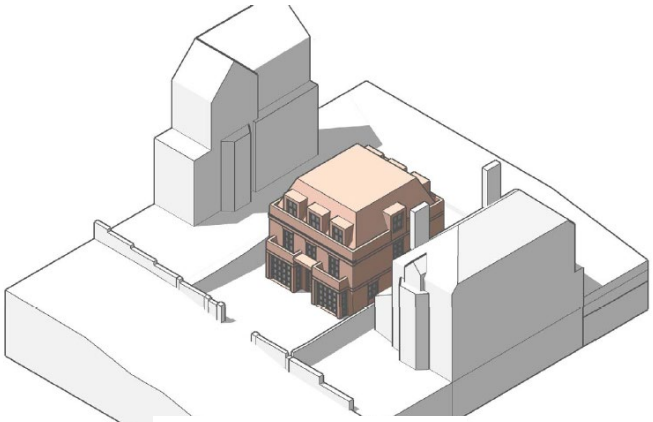
Services Element	Proposal
Heating	Heating provided via air source heat pump, 250% efficient (COP 2.5). Heating supplied via radiators and/or underfloor heating. Time and temperature zone controllers in at least two habitable zones
Hot Water	Three hundred litre immersion, direct electric, insulated, with Cylinderstat
Ventilation	System 1: Extracts in kitchen and bathrooms
Lighting	LED lighting throughout, auto PIRs in WCs

7. Proposed Development

The proposal includes the demolition of the existing building and construction of a new, four storey building (with basement area). The floor area will increase from 85m2 to 356 m^2. The building footprint will remain of a comparable size.



Existing Scheme



Proposed Scheme

The proposed unit will see the implementation of efficient building fabric, considering passive design and overheating risk mitigation. The design scope would see a 25% minimum improvement in building fabric, compared to Part L1 2021 fabric targets, something unachievable with a retrofit scheme. Glazing forms a large part of the external fabric and therefore the specification of thermally broken glazing, with insulated frames, provides significant thermal improvements. The basement and ground floor slabs will be designed to be highly insulated. To conclude, by adopting the new build project scope, the energy demand will be drastically reduced through heat loss mitigation and provide a future proofed and highly efficient building fabric. This will additionally allow the building services to perform at an optimum capacity, increasing the lifespan overall.

New fabric measures are detailed below.

Building Element	Construction	Thermal Performance	
Foundations	-	-	W/m2k
Basement and Ground Floor	Reinforced concrete slab (425mm), Damp proof membrane (0.9mm), Insulation (125mm), separation layer (0.5mm) Screed (60mm)	0.09	
Upper floors	Steel or timber beam structure, supporting timber I-joists	-	
Roof – pitched	Clay roof tiles, breathable sarking membrane, sarking board (18mm), new rafters (4mm at 600mm centres) insulation filling all space between rafters), plaster (3mm skim coat)	0.10	
External Walls	Brick to front (glazed brick to rear 102.5mm), insulation (Kingspan Kooltherm cavity board 60mm), Lightweight blockwork (100mm), dabs, Insulated plasterboard (K118 62.5mm), plaster skim	0.16	
Party Walls	None	0.00	
Glazing	New double-glazed unit - UPVC with a U value of 1.20W/m2k	1.20	
Doors	New timber external doors, insulated with a U value of 1.00W/m2k	1.00	

7.1 Building Services

Services Element	Proposal
Heating	Heating provided via air source heat pump, 250% efficient (COP 2.5). Heating supplied via radiators and/or underfloor heating. Time and temperature zone controllers in at least two habitable zones
Hot Water	Three hundred litre immersion, direct electric, insulated, with Cylinderstat
Ventilation	System 1: Extracts in kitchen and bathrooms
Lighting	LED lighting throughout, auto PIRs in WCs

8. Climate Change Adaption

8.1 Water Efficiency

Low flow rate sanitaryware will be adopted in the units, to ensure a daily water use, no higher than 105 litres per person per day (including external water use). The following flow rates are recommended, to ensure compliance.

Showers	8 l/min
Baths	160 litres to overflow
Kitchen Tap	12 l/min
Other Taps	3 l/min
Toilets	Dual flush 3/6l
Dishwashers	1.25l per place setting
Washing Machines	8l/Kg dry load

8.2 Waste Management

A site waste management plan has been produced, to ensure minimal site waste during the construction phase, with minimal waste going to landfill. Any demolition work waste will be monitored via a pre demolition audit. Once the project is completed, the units will have dedicated bins, provided by, and governed by the local authority.

Preference will be given to the use of local materials & suppliers where viable to reduce the transport distances and to support the local economy. A full evaluation of these suppliers will be undertaken at the next stage of design.

In addition, timber would be sourced, where practical, certified by PEFC or an equivalent approved certification body and all site timber used within the construction process would be recycled.

All insulation materials will have a zero-ozone depleting potential.

Moreso, the use of uPVC has been avoided to avoid affecting internal air quality and embodied carbon. The main materials used in the floors, walls and roofs which make up the greatest proportion of embodied carbon will be selected to achieve the best possible BRE Green Guide Rating. For more information, see Site Waste Management Plan (SWMP), in the appendices.

9. Calculation Results

9.1 Embodied Carbon Emissions

The comparison between the two scenarios are shown in the following table, broken down into the relevant RICS categories. The table below does not consider any operational energy or water use and instead focuses on the materials and construction site activity. When comparing the scenarios, the refurbishment option yields a lifetime emissions figure of 163,309.00$KgCO_2e$. construction a new dwelling (option 2) shows a slightly higher figure of 167,066.00 $KgCO_2e$.

This has been divided by the overall floor area, considering the increased building area. The results show Option 1 to have 1,917.90 $KgCO_2e$ per m2, compared to 469.29 $KgCO_2e$/m2 from option two.

RICS Category	Option 1 - Refurbishment	Option 2 - New Build
Area	85.15	356
	KgCO2e	
Demolition	-	534
Standard Foundations	6,010	2,103
Basement Floor	1,879	8,210
Floors	28,130	5,550
External Walls	29,010	42,110
Roofs and Coverings	2,620	2,320
Stairs and Ramp Structures	167	167
External Windows	4,100	4,420
External Doors	350	4,421
Internal Walls and Partitions	1,002	6,215
Construction Site Operations	8,275	9,250
Building Services	81,766	81,766
Total (No Operational Energy/Water)	163,309	167,066

9.2 Calculating Operational Energy Use

The operational energy use is outlined in the table below and considers the same building services strategy. However, option two allows a more efficient scheme and reduces energy demand significantly.

Option	Area	Heating	Hot Water	Ventilation	Lighting	Total	Yearly Energy Carbon Emissions	Lifecycle Energy Use Emissions
	m2	Kwh/year					TCO2e/yr	TCO2e
Option A - Refurbishment	85.16	9,347	1,801	75	386	11,609	15.90	95.399
Option B - New Build	356	3215	1792	75	126	5208	2.63	15.806

9.3 Combined Lifecycle Emissions

When adding operational energy use to the overall calculation, the results show that Option B (new build) drastically reduces the lifecycle emissions for the scheme. This result is derived from excellent building fabric, which reduces the energy demand of the scheme. Where a heat pump is required for new schemes, this lends well to a new build, as the temperature of heating will be lower than that of a mains gas boiler. It is therefore imperative that the building fabric performs at an optimum level.

RICS Category	Option 1 - Refurbishment	Option 2 - New Build
Area	85.15	356
	KgCO2e	
Demolition	-	534
Standard Foundations	6,010	2,103
Basement Floor	1,879	8,210
Floors	28,130	5,550
External Walls	29,010	42,110
Roofs and Coverings	2,620	2,320
Stairs and Ramp Structures	167	167
External Windows	4,100	4,420
External Doors	350	4,421
Internal Walls and Partitions	1,002	6,215
Construction Site Operations	8,275	9,250
Building Services	81,766	81,766
Operational Energy Consumption	95,399.0	15,806.00
Total (with Operational Energy)	**179,452.00**	**102,659.00**

9.4 Payback Time

The results indicate that the total embodied carbon difference, when not considering the operational energy use is 3,757 KgCO2e higher when adopting the new build option (B). while this is slightly higher than the renovation option (A), when divided between floor area, option B yields a far better result when it comes to embodied carbon. When considering the operational energy, likely to result from each option, there is an approximate decrease of 42.79% (76,793 KgCO2e) when adopting option B. Therefore, it is evidence that the emissions from the construction and running of the new proposed development will be less then emissions from the continued running of the building in its current renovated state.

It is therefore concluded that the new development option will allow a better whole life carbon strategy, than that of a renovation/refurbishment project.

Figures in this report are based on provisional estimates of material and energy use and is subject to further detailed design.

10. APPENDICES

- SAP Documentation
- Site Waste Management Plan

Summary for Input Data

elmhurst energy

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Baseline Existing Building	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	42 E	**DER**	62.29	**TER**	10.59
Environmental	35 F	**% DER < TER**			-488.20
CO_2 Emissions (t/year)	19.95	**DFEE**	158.36	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			-218.17
% DPER < TPER	-501.45	**DPER**	336.21	**TPER**	55.90

Assessor Details	Mr. Lee Pasifull	**Assessor ID**	Y856-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, Detached	
Which Floor	0	
2.0 Number of Storeys	4	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	195.43	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	42.24 m	95.93 m²	3.50 m
Ground floor:	42.24 m	95.93 m²	3.70 m
1st Storey:	37.11 m	88.40 m²	3.10 m
2nd Storey:	35.44 m	78.38 m²	2.75 m

8.0 Living Area	52.15	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall Basement	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	1.60	140.00	147.84	131.15	0.00	None	16.69	Enter Gross Area
External Wall GF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	1.60	140.00	145.84	100.96	0.00	None	44.88	Enter Gross Area
External Wall FF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	1.60	140.00	119.97	83.83	0.00	None	36.14	Enter Gross Area
External Wall SF	Timber Frame	Timber framed wall (one layer of plasterboard)	1.60	9.00	60.96	60.96	0.00	None	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall basement	Plasterboard on timber frame	9.00	221.62
Internal Wall GF	Plasterboard on timber frame	9.00	96.48
Internal Wall FF	Plasterboard on timber frame	9.00	236.84
Internal Wall SF	Plasterboard on timber frame	9.00	186.50

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Top Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.54	9.00	37.26	24.34	Room In Roof	0.50	Enter Gross Area	12.92

Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.54	9.00	7.70	7.70	None	0.00	Enter Gross Area	0.00
Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.54	9.00	12.27	12.27	Room In Roof	0.50	Enter Gross Area	0.00
Sloping roof	External Slope Roof	Plasterboard, insulated slope	0.54	9.00	44.76	44.76	Room In Roof	0.50	Enter Gross Area	0.00
Dormer flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.54	9.00	9.00	9.00	Room In Roof	0.50	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Basement Ceiling	Basement	Plasterboard ceiling, carpeted chipboard floor	95.93
GF Ceiling	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	95.93
FF Ceiling	+1	Plasterboard ceiling, carpeted chipboard floor	88.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Basement floor	Ground Floor - Solid	Basement	Slab on ground, screed over insulation	1.00	None	0.00	110.00	95.93
First floor	Exposed Floor - Solid	+1	Other	1.00	None	0.00	0.00	2.85

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Ground floor		Plasterboard ceiling, carpeted chipboard floor	9.00	95.93
First floor		Plasterboard ceiling, carpeted chipboard floor	9.00	85.55
Second floor		Plasterboard ceiling, carpeted chipboard floor	9.00	78.38

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	5.20
Rooflights	Manufacturer	Roof Light	Double Low-E Soft 0.05			0.63		0.70	5.20
Roof windows	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	5.20
Entrance door	Manufacturer	Solid Door				0.00			5.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Gym glazing door Basement	Windows	External Wall Basement	West	11.20	0
Lounge glazing door GF	Windows	External Wall GF	West	5.60	0
Dining glazing door GF	Windows	External Wall GF	West	5.60	0
Gym windows Basement	Windows	External Wall Basement	North	2.74	0
Gym windows Basement	Windows	External Wall Basement	South	2.74	0
Lounge windows GF	Windows	External Wall GF	North	1.37	0
Dining windows GF	Windows	External Wall GF	North	1.37	0
Lounge windows GF	Windows	External Wall GF	South	1.37	0
Dining windows GF	Windows	External Wall GF	South	1.37	0
Corridor full height glazing FF	Windows	External Wall FF	West	3.18	0
Study glazing door FF	Windows	External Wall FF	West	2.98	0
Master bedroom glazing door FF	Windows	External Wall FF	West	2.98	0
Bedroom roof windows SF	Roof windows	Top Plane roof	West	4.02	0
Staircase windows GF	Windows	External Wall GF	North	5.02	0
Staircase windows FF	Windows	External Wall FF	North	6.48	0
Staircase rooflights SF	Rooflights	Top Plane roof	North	3.00	0
Living & Dining glazing GF	Windows	External Wall GF	East	11.08	0
Master Bedroom glazing FF	Windows	External Wall FF	East	11.08	0
Dressing windows FF	Windows	External Wall FF	East	5.94	0
Kitchen+Dining window GF	Windows	External Wall GF	South	4.94	0
Kitchen+Dining glazing door GF	Windows	External Wall GF	South	3.77	0
Dressing window FF	Windows	External Wall FF	South	3.51	0
Bathroom rooflight	Rooflights	Top Plane roof	South	1.88	0
Bedroom roof windows SF	Roof windows	Top Plane roof	East	4.02	0
Entrance door	Entrance door	External Wall GF	West	3.38	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging User Input

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate		35.92	0.00	0.00	No
E3 Sill		11.00	0.00	0.00	No
E4 Jamb		135.24	0.00	0.00	Yes
E6 Intermediate floor within a dwelling		104.65	0.00	0.00	No
E16 Corner (normal)		73.20	0.00	0.00	No
R1 Head of roof window		6.00	0.00	0.00	No
R2 Sill of roof window		6.00	0.00	0.00	No
R3 Jamb of roof window		16.09	0.00	0.00	No
R11 Upstands or kerbs of rooflights		12.50	0.00	0.00	No
E22 Basement floor		42.24	0.00	0.00	No

E17 Corner (inverted – internal area greater than external area)	19.60	0.00	0.00	No
E11 Eaves (insulation at rafter level)	29.44	0.00	0.00	No
R9 Roof to wall (flat ceiling)	24.00	0.00	0.00	No
R7 Flat ceiling (inverted)	23.50	0.00	0.00	No
R6 Flat ceiling	18.42	0.00	0.00	No
E8 Balcony within a dwelling, wall insulation continuous	4.80	0.00	0.00	No
E21 Exposed floor (inverted)	2.99	0.00	0.00	No
E20 Exposed floor (normal)	4.89	0.00	0.00	No

Y-value	0.06	W/m²K
Description	0.055	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	0
0.15	In Room Fan Other Wet Room	0
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	9	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	No	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	110.00	8.00	880.00	60

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Mains gas	
SAP Code	101	
In Winter	69.00	
In Summer	64.00	
Controls SAP Code	2101	
Delayed Start Stat	No	
Burner Control	Modulating	

Summary for Input Data

elmhurst energy

HETAS approved System	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	55.00
Boiler Interlock	No

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

27.0 Secondary Heating — None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	5
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	300.00	L
Loss	1.82	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store — None

Summary for Input Data

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Baseline Existing Building	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	42 E	**DER**	62.29	**TER**	10.59
Environmental	35 F	**% DER < TER**			-488.20
CO_2 Emissions (t/year)	19.95	**DFEE**	158.36	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			-218.17
% DPER < TPER	-501.45	**DPER**	336.21	**TPER**	55.90

Assessor Details	Mr. Lee Pasifull	**Assessor ID**	Y856-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300 (1a)	x	3.5000 (2a)	=	335.7550	(1a) - (3a)
Ground floor	95.9300 (1b)	x	3.7000 (2b)	=	354.9410	(1b) - (3b)
First floor	88.4000 (1c)	x	3.1000 (2c)	=	274.0400	(1c) - (3c)
Second floor	78.3800 (1d)	x	2.7500 (2d)	=	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1180.2810	(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	9 * 10 =	90.0000	(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) =	90.0000 / (5) =	0.0763	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2763	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2763	(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	0.3522	0.3453	0.3384	0.3039	0.2970	0.2624	0.2624	0.2555	0.2763	0.2970	0.3108	0.3246	(22b)
Effective ac	0.5620	0.5596	0.5573	0.5462	0.5441	0.5344	0.5344	0.5326	0.5382	0.5441	0.5483	0.5527	(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	
Windows (Uw = 5.20)			94.3200	4.3046	406.0132			(27)
Entrance door			3.3800	5.2000	17.5760			(26)
Staircase rooflights SF			3.0000	4.3046	12.9139			(27a)
Bathroom rooflight			1.8800	4.3046	8.0927			(27a)
Bedroom roof windows SF			4.0200	4.3046	17.3046			(27a)
Bedroom roof windows SF			4.0200	4.3046	17.3046			(27a)
Basement floor			95.9300	1.0000	95.9300	110.0000	10552.3000	(28a)
First floor			2.8500	1.0000	2.8500			(28b)
External Wall Basement	147.8400	16.6800	131.1600	1.6000	209.8560	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	1.6000	161.5520	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	1.6000	134.1120	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	1.6000	97.5360	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.4252	10.3493	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.5400	4.1580	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.4252	5.2172	9.0000	110.4300	(30)
Sloping roof	44.7600		44.7600	0.4252	19.0318	9.0000	402.8400	(30)
Dormer flat roof	9.0000		9.0000	0.4252	3.8268	9.0000	81.0000	(30)

Total net area of external elements Aum(A, m2)	684.3800			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	1223.6242		(33)
Internal Wall basement	221.6200		9.0000	1994.5800 (32c)
Internal Wall GF	96.4800		9.0000	868.3200 (32c)
Internal Wall FF	236.8400		9.0000	2131.5600 (32c)
Internal Wall SF	186.5000		9.0000	1678.5000 (32c)
Ground floor	95.9300		18.0000	1726.7400 (32d)
First floor	85.5500		18.0000	1539.9000 (32d)
Second floor	78.3800		18.0000	1410.8400 (32d)
Basement Ceiling	95.9300		9.0000	863.3700 (32e)
GF Ceiling	95.9300		9.0000	863.3700 (32e)
FF Ceiling	88.4000		9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	1261.2651 (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	218.9067	217.9686	217.0490	212.7296	211.9215	208.1595	208.1595	207.4628	209.6086	211.9215	213.5564	215.2655	(38)
Heat transfer coeff	1480.1718	1479.2336	1478.3141	1473.9947	1473.1866	1469.4246	1469.4246	1468.7279	1470.8737	1473.1866	1474.8214	1476.5306	(39)
Average = Sum(39)m / 12 =												1473.9908	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	4.1272	4.1246	4.1220	4.1100	4.1077	4.0972	4.0972	4.0953	4.1013	4.1077	4.1123	4.1170	(40)
HLP (average)												4.1099	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy			3.2082	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)

Hot water usage for baths

33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)

Hot water usage for other uses

47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)

Average daily hot water use (litres/day)		146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
										Total per year (kWh/year) = Sum(64)m =		3062.7700	(64)
12Total per year (kWh/year)												3063	(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	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains	1003.0419	1032.6137	986.5832	954.7208	903.2969	867.6174	832.0691	830.8244	857.1601	888.4690	944.1399	979.2269	(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

North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800 (74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652 (76)
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983 (78)
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132 (80)
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582 (82)
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005 (82)
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)

Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990 (83)
Total gains	1802.4252	2529.4384	3338.9132	4289.9987	4958.2773	5016.3887	4781.9668	4236.4049	3554.7453	2630.1176	1927.5614	1645.8260 (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	13.1534	13.1617	13.1699	13.2085	13.2157	13.2496	13.2496	13.2559	13.2365	13.2157	13.2011	13.1858	
alpha	1.8769	1.8774	1.8780	1.8806	1.8810	1.8833	1.8833	1.8837	1.8824	1.8810	1.8801	1.8791	
util living area	0.9932	0.9867	0.9742	0.9470	0.9004	0.8293	0.7460	0.7907	0.9052	0.9697	0.9894	0.9943	(86)
MIT	17.1034	17.3643	17.8745	18.5900	19.3304	19.9815	20.3655	20.2822	19.7061	18.7530	17.8036	17.0589	(87)
Th 2	18.9364	18.9377	18.9390	18.9450	18.9461	18.9514	18.9514	18.9524	18.9494	18.9461	18.9439	18.9415	(88)
util rest of house	0.9914	0.9831	0.9665	0.9289	0.8578	0.7289	0.5438	0.6127	0.8438	0.9563	0.9859	0.9928	(89)
MIT 2	15.5369	15.7977	16.3062	17.0170	17.7365	18.3431	18.6512	18.6033	18.1131	17.1877	16.2415	15.4959	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	15.7647	16.0255	16.5342	17.2457	17.9683	18.5814	18.9005	18.8475	18.3447	17.4153	16.4686	15.7232	(92)
Temperature adjustment												0.6000	
adjusted MIT	16.3647	16.6255	17.1342	17.8457	18.5683	19.1814	19.5005	19.4475	18.9447	18.0153	17.0686	16.3232	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9878	0.9769	0.9566	0.9150	0.8471	0.7439	0.6150	0.6710	0.8436	0.9470	0.9809	0.9897	(94)
Useful gains	1780.5017	2471.0325	3193.9253	3925.3117	4200.2187	3731.6157	2941.0533	2842.7651	2998.7640	2490.6963	1890.7223	1628.9467	(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	17857.8651	17344.7883	15720.7170	13185.9485	10118.2183	6731.9942	4262.0765	4475.8838	7125.9438	10924.1354	14701.9687	17900.2353	(97)
Space heating kWh	11961.5584	9995.1639	9319.9331	6667.6585	4402.9917	0.0000	0.0000	0.0000	0.0000	6274.4787	9224.0974	12105.8387	(98a)
Space heating requirement - total per year (kWh/year)												69951.7203	
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	11961.5584	9995.1639	9319.9331	6667.6585	4402.9917	0.0000	0.0000	0.0000	0.0000	6274.4787	9224.0974	12105.8387	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												69951.7203	
Space heating per m2											(98c) / (4) =	195.0472	(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 %)	69.0000 (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	11961.5584	9995.1639	9319.9331	6667.6585	4402.9917	0.0000	0.0000	0.0000	0.0000	6274.4787	9224.0974	12105.8387	(98)
Space heating efficiency (main heating system 1)	69.0000	69.0000	69.0000	69.0000	69.0000	0.0000	0.0000	0.0000	0.0000	69.0000	69.0000	69.0000	(210)
Space heating fuel (main heating system)	17335.5919	14485.7448	13507.1493	9663.2732	6381.1473	0.0000	0.0000	0.0000	0.0000	9093.4474	13368.2571	17544.6938	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
Efficiency of water heater												64.0000	(216)
(217)m	68.7129	68.6968	68.6564	68.5830	68.4013	59.0000	59.0000	59.0000	59.0000	68.5545	68.6723	68.7194	(217)
Fuel for water heating, kWh/month	445.0519	393.5244	417.6943	365.9070	354.5183	368.9137	362.9100	378.0318	382.9945	369.0590	393.6363	439.9011	(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	8.3488	7.5408	8.3488	8.0795	8.3488	8.0795	8.3488	8.3488	8.0795	8.3488	8.0795	8.3488	(231)
Lighting	47.8320	38.3726	34.5503	25.3130	19.5525	15.9746	17.8365	23.1845	30.1144	39.5117	44.6284	49.1614	(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	101379.3048	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	64.0000	
Water heating fuel used	4672.1423	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	53.3000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	98.3000	(231)
Electricity for lighting (calculated in Appendix L)	386.0318	(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	106535.7789	(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	101379.3048	0.2100	21289.6540	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4672.1423	0.2100	981.1499	(264)
Space and water heating			22270.8039	(265)
Pumps, fans and electric keep-hot	98.3000	0.1387	13.6354	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Total CO2, kg/year			22340.1556	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			62.2900	(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	101379.3048	1.1300	114558.6144	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4672.1423	1.1300	5279.5208	(278)
Space and water heating			119838.1352	(279)
Pumps, fans and electric keep-hot	98.3000	1.5128	148.7082	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Total Primary energy kWh/year			120578.9519	(286)
Dwelling Primary energy Rate (DPER)			336.2100	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336 (22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556 (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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3 Sill	11.0000	0.0500	0.5500
E4 Jamb	135.2400	0.0500	6.7620
E6 Intermediate floor within a dwelling	104.6500	0.0000	0.0000
E16 Corner (normal)	73.2000	0.0900	6.5880
R1 Head of roof window	6.0000	0.0800	0.4800
R2 Sill of roof window	6.0000	0.0600	0.3600
R3 Jamb of roof window	16.0900	0.0800	1.2872
R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22 Basement floor	42.2400	0.0700	2.9568
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6 Flat ceiling	18.4200	0.0600	1.1052
E8 Balcony within a dwelling, wall insulation continuous	4.8000	0.0000	0.0000
E21 Exposed floor (inverted)	2.9900	0.3200	0.9568
E20 Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.7204 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 230.2666 (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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
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 3.2082 (42)

Hot water usage for mixer showers	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)

Average daily hot water use (litres/day) 146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)

Energy content (annual) Total = Sum(45)m = 2430.1520

Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)

Water storage loss:

Store volume 300.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.1127 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.1409 (55)

Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	310.7076	274.7639	291.6737	255.6915	247.3948	222.4006	219.0165	227.9384	230.7083	257.9063	275.0605	307.1969	(62)
WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)

											Total per year (kWh/year) = Sum(64)m =	2789.0930	(64)
12Total per year (kWh/year)												2789	(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	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													
130.7193	116.1155	124.3905	111.5422	109.6677	100.4730	100.2320	103.1985	103.2353	113.1628	117.9824	129.5519		(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	175.6979	172.7909	167.1915	154.9197	147.4029	139.5459	134.7204	138.7076	143.3824	152.1006	163.8645	174.1289	(72)
Total internal gains													
	1008.3103	1037.8821	991.8516	959.9892	908.5653	872.8858	837.3375	836.0928	862.4285	893.7374	949.4083	984.4953	(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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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													
	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)	92.3000	(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												

	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134 (98)
Space heating efficiency (main heating system 1)												
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)												
	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234 (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												
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943 (64)
Efficiency of water heater												79.8000 (216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494 (217)
Fuel for water heating, kWh/month												
	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359 (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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587 (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	17373.7503 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3279.1232 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	426.4437 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4741.5806 (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	16423.7367 (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	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	
PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Baseline Existing Building	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	42 E	**DER**	62.29	**TER**	10.59
Environmental	35 F	**% DER < TER**			-488.20
CO_2 Emissions (t/year)	19.95	**DFEE**	158.36	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			-218.17
% DPER < TPER	-501.45	**DPER**	336.21	**TPER**	55.90

Assessor Details	Mr. Lee Pasifull	**Assessor ID**	Y856-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2339	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2339	(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	0.2982	0.2924	0.2865	0.2573	0.2514	0.2222	0.2222	0.2163	0.2339	0.2514	0.2631	0.2748	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5445	0.5427	0.5410	0.5331	0.5316	0.5247	0.5247	0.5234	0.5274	0.5316	0.5346	0.5378	(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	
Windows (Uw = 5.20)			94.3200	4.3046	406.0132			(27)
Entrance door			3.3800	5.2000	17.5760			(26)
Staircase rooflights SF			3.0000	4.3046	12.9139			(27a)
Bathroom rooflight			1.8800	4.3046	8.0927			(27a)
Bedroom roof windows SF			4.0200	4.3046	17.3046			(27a)
Bedroom roof windows SF			4.0200	4.3046	17.3046			(27a)
Basement floor			95.9300	1.0000	95.9300	110.0000	10552.3000	(28a)
First floor			2.8500	1.0000	2.8500			(28b)
External Wall Basement	147.8400	16.6800	131.1600	1.6000	209.8560	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	1.6000	161.5520	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	1.6000	134.1120	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	1.6000	97.5360	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.4252	10.3493	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.5400	4.1580	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.4252	5.2172	9.0000	110.4300	(30)

Sloping roof	44.7600	44.7600	0.4252	19.0318	9.0000	402.8400 (30)
Dormer flat roof	9.0000	9.0000	0.4252	3.8268	9.0000	81.0000 (30)
Total net area of external elements Aum(A, m2)		684.3800				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		1223.6242		(33)
Internal Wall basement		221.6200			9.0000	1994.5800 (32c)
Internal Wall GF		96.4800			9.0000	868.3200 (32c)
Internal Wall FF		236.8400			9.0000	2131.5600 (32c)
Internal Wall SF		186.5000			9.0000	1678.5000 (32c)
Ground floor		95.9300			18.0000	1726.7400 (32d)
First floor		85.5500			18.0000	1539.9000 (32d)
Second floor		78.3800			18.0000	1410.8400 (32d)
Basement Ceiling		95.9300			9.0000	863.3700 (32e)
GF Ceiling		95.9300			9.0000	863.3700 (32e)
FF Ceiling		88.4000			9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	1261.2651 (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	212.0650	211.3925	210.7333	207.6371	207.0579	204.3612	204.3612	203.8618	205.3999	207.0579	208.2297	209.4549	(38)
Heat transfer coeff	1473.3301	1472.6576	1471.9984	1468.9022	1468.3229	1465.6263	1465.6263	1465.1269	1466.6650	1468.3229	1469.4948	1470.7200	(39)
Average = Sum(39)m / 12 =												1468.8994	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	4.1081	4.1062	4.1044	4.0958	4.0941	4.0866	4.0866	4.0852	4.0895	4.0941	4.0974	4.1008	(40)
HLP (average)												4.0957	
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					3.2082	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												74.3856	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		710.6291	(64a)
Heat gains from water heating, kWh/month	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800	(74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652	(76)

South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983	(78)
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132	(80)
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582	(82)
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005	(82)
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)

Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990	(83)
Total gains	1686.6984	2415.1651	3227.9957	4187.1728	4860.2115	4926.3502	4695.3646	4147.5116	3463.0844	2529.8484	1819.5688	1531.2001	(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	13.2145	13.2205	13.2264	13.2543	13.2595	13.2839	13.2839	13.2884	13.2745	13.2595	13.2490	13.2379	
alpha	1.8810	1.8814	1.8818	1.8836	1.8840	1.8856	1.8856	1.8859	1.8850	1.8840	1.8833	1.8825	
util living area	0.9940	0.9878	0.9756	0.9490	0.9031	0.8330	0.7508	0.7957	0.9087	0.9716	0.9904	0.9950	(86)
MIT	16.0054	16.3536	17.0344	17.9885	18.9774	19.8470	20.3612	20.2483	19.4770	18.2034	16.9368	15.9443	(87)
Th 2	18.2983	18.2989	18.2994	18.3022	18.3027	18.3051	18.3051	18.3055	18.3042	18.3027	18.3017	18.3006	(88)
util rest of house	0.9917	0.9831	0.9654	0.9240	0.8428	0.6848	0.4418	0.5200	0.8177	0.9532	0.9859	0.9931	(89)
MIT 2	14.1700	14.5167	15.1931	16.1326	17.0806	17.8556	18.2123	18.1667	17.5759	16.3603	15.1018	14.1100	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	14.4369	14.7838	15.4608	16.4025	17.3564	18.1452	18.5247	18.4694	17.8523	16.6283	15.3686	14.3767	(92)
Temperature adjustment												0.0000	
adjusted MIT	14.4369	14.7838	15.4608	16.4025	17.3564	18.1452	18.5247	18.4694	17.8523	16.6283	15.3686	14.3767	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9853	0.9714	0.9456	0.8933	0.8079	0.6707	0.4816	0.5480	0.7900	0.9307	0.9761	0.9877	(94)
Useful gains	1661.9117	2346.1416	3052.5034	3740.2601	3926.4043	3304.1770	2261.4588	2272.9627	2735.7229	2354.4369	1776.0838	1512.3693	(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	14934.9474	14555.4770	13190.3449	11020.3911	8305.4454	5195.9549	2820.9609	3031.8938	5503.4273	8851.5545	12150.6818	14967.0692	(97)
Space heating kWh	9875.1385	8204.6733	7542.5540	5241.6943	3258.0066	0.0000	0.0000	0.0000	0.0000	4833.8555	7469.7105	10010.2967	(98a)
Space heating requirement - total per year (kWh/year)												56435.9296	
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	9875.1385	8204.6733	7542.5540	5241.6943	3258.0066	0.0000	0.0000	0.0000	0.0000	4833.8555	7469.7105	10010.2967	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												56435.9296	
Space heating per m2											(98c) / (4) =	157.3609	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	13776.8868	10845.6343	11134.9642	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.3515	0.4088	0.3633	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	4841.9269	4433.9782	4045.2800	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	5460.3459	5204.6194	4597.2049	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	445.2617	573.3570	410.6321	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.3154	143.3393	102.6580	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												357.3127	(107)
Energy for space heating												157.3609	(99)
Energy for space cooling												0.9963	(108)
Total												158.3572	(109)
Fabric Energy Efficiency (DFEE)												158.4	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d)	x 2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556	(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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	Kl Element	Length	Psi-value	Total
	E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
	E3 Sill	11.0000	0.0500	0.5500
	E4 Jamb	135.2400	0.0500	6.7620
	E6 Intermediate floor within a dwelling	104.6500	0.0000	0.0000
	E16 Corner (normal)	73.2000	0.0900	6.5880
	R1 Head of roof window	6.0000	0.0800	0.4800
	R2 Sill of roof window	6.0000	0.0600	0.3600
	R3 Jamb of roof window	16.0900	0.0800	1.2872
	R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
	E22 Basement floor	42.2400	0.0700	2.9568
	E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
	E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
	R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
	R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
	R6 Flat ceiling	18.4200	0.0600	1.1052
	E8 Balcony within a dwelling, wall insulation continuous	4.8000	0.0000	0.0000
	E21 Exposed floor (inverted)	2.9900	0.3200	0.9568
	E20 Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		26.7204	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	230.2666	(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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.2082 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)

Hot water usage for other uses
47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581 47.4848 (42c)
Average daily hot water use (litres/day) 74.3856 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)													
	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					710.6291	(64a)
Heat gains from water heating, kWh/month													
	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains													
	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1530.1363	2122.0562	2767.4536	3534.2811	4066.4815	4114.2726	3922.2104	3480.8782	2934.9833	2188.8255	1626.9719	1400.6375	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9984	0.9940	0.9791	0.9242	0.8024	0.6267	0.4770	0.5493	0.8117	0.9711	0.9961	0.9988	(86)
MIT	18.8835	19.1888	19.6590	20.2537	20.6957	20.9174	20.9782	20.9628	20.7661	20.1196	19.3838	18.8400	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9979	0.9923	0.9729	0.9022	0.7496	0.5383	0.3650	0.4313	0.7391	0.9591	0.9947	0.9985	(89)
MIT 2	17.9374	18.2432	18.7102	19.2906	19.6853	19.8603	19.8940	19.8899	19.7601	19.1760	18.4460	17.9000	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9889	0.9653	0.8911	0.7464	0.5481	0.3809	0.4476	0.7398	0.9504	0.9923	0.9977	(94)
Useful gains	1525.0977	2098.5808	2671.3234	3149.4945	3035.1663	2254.8644	1494.0492	1558.0137	2171.2439	2080.2850	1614.3880	1397.3494	(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													
	6205.9919	6060.0629	5538.9643	4675.6410	3603.7839	2377.6959	1515.8956	1598.5164	2558.9128	3861.2608	5108.2564	6180.6080	(97)
Space heating kWh													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98a)
Space heating requirement - total per year (kWh/year)												17199.4787	
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													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												17199.4787	
Space heating per m2											(98c) / (4) =	47.9575	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	4128.2735	3249.9174	3332.1616	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8347	0.8945	0.8512	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3445.7583	2907.1052	2836.1942	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4545.2049	4333.1010	3844.7448	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	791.6016	1060.9409	750.3616	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	197.9004	265.2352	187.5904	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												650.7260	(107)
Energy for space heating												47.9575	(99)
Energy for space cooling												1.8144	(108)
Total												49.7719	(109)
Fabric Energy Efficiency (TFEE)												49.8	(109)

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Baseline Existing Building	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	42 E	**DER**	62.29	**TER**	10.59
Environmental	35 F	**% DER < TER**			-488.20
CO_2 Emissions (t/year)	19.95	**DFEE**	158.36	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			-218.17
% DPER < TPER	-501.45	**DPER**	336.21	**TPER**	55.90

Assessor Details	Mr. Lee Pasifull	**Assessor ID**	Y856-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300 (1a)	x	3.5000 (2a)	=	335.7550	(1a) - (3a)
Ground floor	95.9300 (1b)	x	3.7000 (2b)	=	354.9410	(1b) - (3b)
First floor	88.4000 (1c)	x	3.1000 (2c)	=	274.0400	(1c) - (3c)
Second floor	78.3800 (1d)	x	2.7500 (2d)	=	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1180.2810	(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	9 * 10 =	90.0000	(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) =	90.0000 / (5) =	0.0763	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2763	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2763	(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	0.3522	0.3453	0.3384	0.3039	0.2970	0.2624	0.2624	0.2555	0.2763	0.2970	0.3108	0.3246	(22b)
Effective ac	0.5620	0.5596	0.5573	0.5462	0.5441	0.5344	0.5344	0.5326	0.5382	0.5441	0.5483	0.5527	(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	
Windows (Uw = 5.20)			94.3200	4.3046	406.0132			(27)
Entrance door			3.3800	5.2000	17.5760			(26)
Staircase rooflights SF			3.0000	4.3046	12.9139			(27a)
Bathroom rooflight			1.8800	4.3046	8.0927			(27a)
Bedroom roof windows SF			4.0200	4.3046	17.3046			(27a)
Bedroom roof windows SF			4.0200	4.3046	17.3046			(27a)
Basement floor			95.9300	1.0000	95.9300	110.0000	10552.3000	(28a)
First floor			2.8500	1.0000	2.8500			(28b)
External Wall Basement	147.8400	16.6800	131.1600	1.6000	209.8560	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	1.6000	161.5520	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	1.6000	134.1120	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	1.6000	97.5360	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.4252	10.3493	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.5400	4.1580	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.4252	5.2172	9.0000	110.4300	(30)
Sloping roof	44.7600		44.7600	0.4252	19.0318	9.0000	402.8400	(30)
Dormer flat roof	9.0000		9.0000	0.4252	3.8268	9.0000	81.0000	(30)

Total net area of external elements Aum(A, m2)	684.3800			(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	1223.6242		(33)
Internal Wall basement	221.6200		9.0000	1994.5800 (32c)
Internal Wall GF	96.4800		9.0000	868.3200 (32c)
Internal Wall FF	236.8400		9.0000	2131.5600 (32c)
Internal Wall SF	186.5000		9.0000	1678.5000 (32c)
Ground floor	95.9300		18.0000	1726.7400 (32d)
First floor	85.5500		18.0000	1539.9000 (32d)
Second floor	78.3800		18.0000	1410.8400 (32d)
Basement Ceiling	95.9300		9.0000	863.3700 (32e)
GF Ceiling	95.9300		9.0000	863.3700 (32e)
FF Ceiling	88.4000		9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	1261.2651 (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	218.9067	217.9686	217.0490	212.7296	211.9215	208.1595	208.1595	207.4628	209.6086	211.9215	213.5564	215.2655	(38)
Heat transfer coeff	1480.1718	1479.2336	1478.3141	1473.9947	1473.1866	1469.4246	1469.4246	1468.7279	1470.8737	1473.1866	1474.8214	1476.5306	(39)
Average = Sum(39)m / 12 =												1473.9908	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	4.1272	4.1246	4.1220	4.1100	4.1077	4.0972	4.0972	4.0953	4.1013	4.1077	4.1123	4.1170	(40)
HLP (average)												4.1099	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy			3.2082	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)

Hot water usage for baths

33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)

Hot water usage for other uses

47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)

Average daily hot water use (litres/day)		146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
										Total per year (kWh/year) = Sum(64)m =		3062.7700	(64)
12Total per year (kWh/year)												3063	(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	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains	1003.0419	1032.6137	986.5832	954.7208	903.2969	867.6174	832.0691	830.8244	857.1601	888.4690	944.1399	979.2269	(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

North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800 (74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652 (76)
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983 (78)
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132 (80)
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582 (82)
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005 (82)
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)

Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990 (83)
Total gains	1802.4252	2529.4384	3338.9132	4289.9987	4958.2773	5016.3887	4781.9668	4236.4049	3554.7453	2630.1176	1927.5614	1645.8260 (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	13.1534	13.1617	13.1699	13.2085	13.2157	13.2496	13.2496	13.2559	13.2365	13.2157	13.2011	13.1858	
alpha	1.8769	1.8774	1.8780	1.8806	1.8810	1.8833	1.8833	1.8837	1.8824	1.8810	1.8801	1.8791	
util living area	0.9932	0.9867	0.9742	0.9470	0.9004	0.8293	0.7460	0.7907	0.9052	0.9697	0.9894	0.9943	(86)
MIT	17.1034	17.3643	17.8745	18.5900	19.3304	19.9815	20.3655	20.2822	19.7061	18.7530	17.8036	17.0589	(87)
Th 2	18.9364	18.9377	18.9390	18.9450	18.9461	18.9514	18.9514	18.9524	18.9494	18.9461	18.9439	18.9415	(88)
util rest of house	0.9914	0.9831	0.9665	0.9289	0.8578	0.7289	0.5438	0.6127	0.8438	0.9563	0.9859	0.9928	(89)
MIT 2	15.5369	15.7977	16.3062	17.0170	17.7365	18.3431	18.6512	18.6033	18.1131	17.1877	16.2415	15.4959	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	15.7647	16.0255	16.5342	17.2457	17.9683	18.5814	18.9005	18.8475	18.3447	17.4153	16.4686	15.7232	(92)
Temperature adjustment												0.6000	
adjusted MIT	16.3647	16.6255	17.1342	17.8457	18.5683	19.1814	19.5005	19.4475	18.9447	18.0153	17.0686	16.3232	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9878	0.9769	0.9566	0.9150	0.8471	0.7439	0.6150	0.6710	0.8436	0.9470	0.9809	0.9897	(94)
Useful gains	1780.5017	2471.0325	3193.9253	3925.3117	4200.2187	3731.6157	2941.0533	2842.7651	2998.7640	2490.6963	1890.7223	1628.9467	(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	17857.8651	17344.7883	15720.7170	13185.9485	10118.2183	6731.9942	4262.0765	4475.8838	7125.9438	10924.1354	14701.9687	17900.2353	(97)
Space heating kWh	11961.5584	9995.1639	9319.9331	6667.6585	4402.9917	0.0000	0.0000	0.0000	0.0000	6274.4787	9224.0974	12105.8387	(98a)
Space heating requirement - total per year (kWh/year)												69951.7203	
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	11961.5584	9995.1639	9319.9331	6667.6585	4402.9917	0.0000	0.0000	0.0000	0.0000	6274.4787	9224.0974	12105.8387	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												69951.7203	
Space heating per m2											(98c) / (4) =	195.0472	(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 %)	69.0000 (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	11961.5584	9995.1639	9319.9331	6667.6585	4402.9917	0.0000	0.0000	0.0000	0.0000	6274.4787	9224.0974	12105.8387	(98)
Space heating efficiency (main heating system 1)	69.0000	69.0000	69.0000	69.0000	69.0000	0.0000	0.0000	0.0000	0.0000	69.0000	69.0000	69.0000	(210)
Space heating fuel (main heating system)	17335.5919	14485.7448	13507.1493	9663.2732	6381.1473	0.0000	0.0000	0.0000	0.0000	9093.4474	13368.2571	17544.6938	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
Efficiency of water heater												64.0000	(216)
(217)m	68.7129	68.6968	68.6564	68.5830	68.4013	59.0000	59.0000	59.0000	59.0000	68.5545	68.6723	68.7194	(217)
Fuel for water heating, kWh/month	445.0519	393.5244	417.6943	365.9070	354.5183	368.9137	362.9100	378.0318	382.9945	369.0590	393.6363	439.9011	(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	8.3488	7.5408	8.3488	8.0795	8.3488	8.0795	8.3488	8.3488	8.0795	8.3488	8.0795	8.3488	(231)
Lighting	47.8320	38.3726	34.5503	25.3130	19.5525	15.9746	17.8365	23.1845	30.1144	39.5117	44.6284	49.1614	(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	101379.3048	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	64.0000	
Water heating fuel used	4672.1423	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	53.3000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	98.3000	(231)
Electricity for lighting (calculated in Appendix L)	386.0318	(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	106535.7789	(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	101379.3048	0.2100	21289.6540	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4672.1423	0.2100	981.1499	(264)
Space and water heating			22270.8039	(265)
Pumps, fans and electric keep-hot	98.3000	0.1387	13.6354	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Total CO2, kg/year			22340.1556	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			62.2900	(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	101379.3048	1.1300	114558.6144	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4672.1423	1.1300	5279.5208	(278)
Space and water heating			119838.1352	(279)
Pumps, fans and electric keep-hot	98.3000	1.5128	148.7082	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Total Primary energy kWh/year			120578.9519	(286)
Dwelling Primary energy Rate (DPER)			336.2100	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336 (22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556 (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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3 Sill	11.0000	0.0500	0.5500
E4 Jamb	135.2400	0.0500	6.7620
E6 Intermediate floor within a dwelling	104.6500	0.0000	0.0000
E16 Corner (normal)	73.2000	0.0900	6.5880
R1 Head of roof window	6.0000	0.0800	0.4800
R2 Sill of roof window	6.0000	0.0600	0.3600
R3 Jamb of roof window	16.0900	0.0800	1.2872
R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22 Basement floor	42.2400	0.0700	2.9568
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6 Flat ceiling	18.4200	0.0600	1.1052
E8 Balcony within a dwelling, wall insulation continuous	4.8000	0.0000	0.0000
E21 Exposed floor (inverted)	2.9900	0.3200	0.9568
E20 Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.7204 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 230.2666 (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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
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 3.2082 (42)

Hot water usage for mixer showers	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)

Average daily hot water use (litres/day) 146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)

Energy content (annual) Total = Sum(45)m = 2430.1520

Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)

Water storage loss:

Store volume 300.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.1127 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.1409 (55)

Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	310.7076	274.7639	291.6737	255.6915	247.3948	222.4006	219.0165	227.9384	230.7083	257.9063	275.0605	307.1969	(62)
WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)

											Total per year (kWh/year) = Sum(64)m =	2789.0930	(64)
12Total per year (kWh/year)												2789	(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	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													
130.7193	116.1155	124.3905	111.5422	109.6677	100.4730	100.2320	103.1985	103.2353	113.1628	117.9824	129.5519		(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	175.6979	172.7909	167.1915	154.9197	147.4029	139.5459	134.7204	138.7076	143.3824	152.1006	163.8645	174.1289	(72)
Total internal gains													
	1008.3103	1037.8821	991.8516	959.9892	908.5653	872.8858	837.3375	836.0928	862.4285	893.7374	949.4083	984.4953	(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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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													
	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)	92.3000	(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												

	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134 (98)
Space heating efficiency (main heating system 1)												
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)												
	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234 (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												
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943 (64)
Efficiency of water heater												79.8000 (216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494 (217)
Fuel for water heating, kWh/month												
	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359 (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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587 (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	17373.7503 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3279.1232 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	426.4437 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4741.5806 (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	16423.7367 (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	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	
PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Predicted Energy Assessment

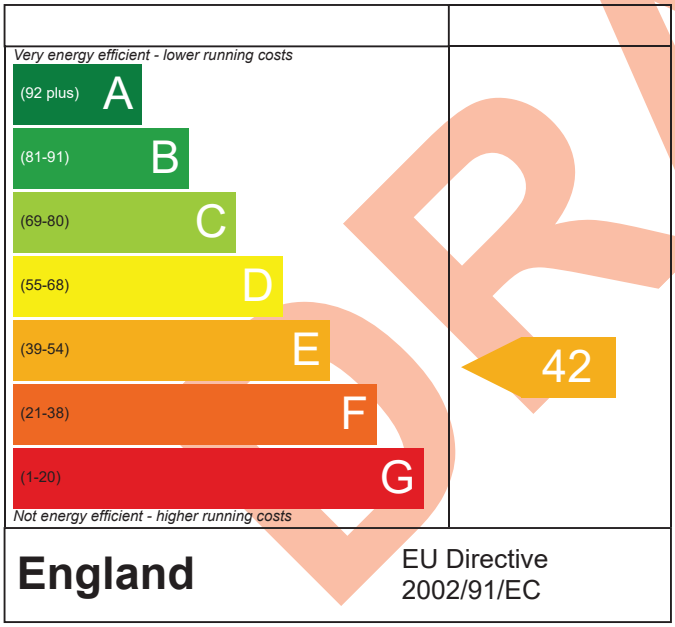
Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP

Dwelling type:	Bungalow, Detached
Date of assessment:	17/12/2024
Produced by:	Lee Pasifull
Total floor area:	358.64 m²
DRRN:	

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

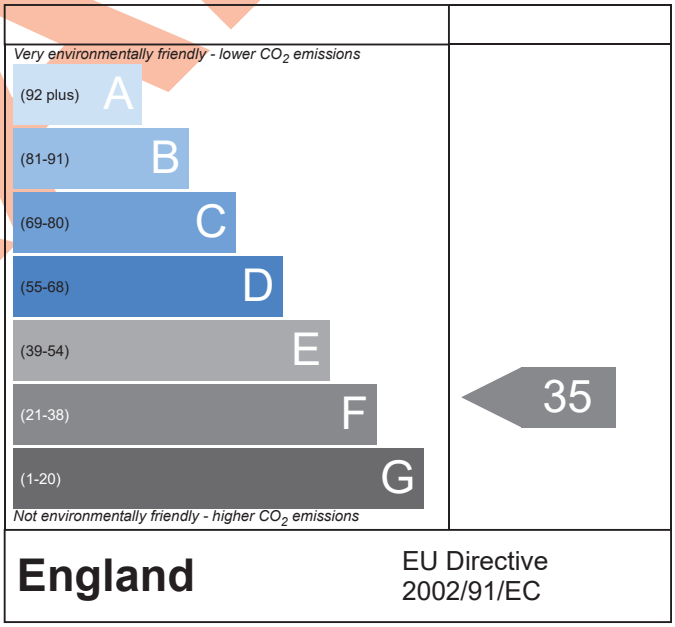
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Baseline-Gas Boiler	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	86 B	**DER**	13.77	**TER**	10.59
Environmental	84 B	**% DER < TER**			-30.03
CO_2 Emissions (t/year)	4.27	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	-34.34	**DPER**	75.10	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, Detached	
Which Floor	0	
2.0 Number of Storeys	4	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	195.43	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	42.24 m	95.93 m²	3.50 m
Ground floor:	42.24 m	95.93 m²	3.70 m
1st Storey:	37.11 m	88.40 m²	3.10 m
2nd Storey:	35.44 m	78.38 m²	2.75 m

8.0 Living Area	52.15	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall Basement	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	147.84	131.15	0.00	None	16.69	Enter Gross Area
External Wall GF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	145.84	100.96	0.00	None	44.88	Enter Gross Area
External Wall FF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	119.97	83.83	0.00	None	36.14	Enter Gross Area
External Wall SF	Timber Frame	Timber framed wall (one layer of plasterboard)	0.16	9.00	60.96	60.96	0.00	None	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall basement	Plasterboard on timber frame	9.00	221.62
Internal Wall GF	Plasterboard on timber frame	9.00	96.48
Internal Wall FF	Plasterboard on timber frame	9.00	236.84
Internal Wall SF	Plasterboard on timber frame	9.00	186.50

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Top Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	37.26	24.34	Room In Roof	0.50	Enter Gross Area	12.92

Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	7.70	7.70	None	0.00	Enter Gross Area	0.00
Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	12.27	12.27	Room In Roof	0.50	Enter Gross Area	0.00
Sloping roof	External Slope Roof	Plasterboard, insulated slope	0.10	9.00	44.76	44.76	Room In Roof	0.50	Enter Gross Area	0.00
Dormer flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	9.00	9.00	Room In Roof	0.50	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Basement Ceiling	Basement	Plasterboard ceiling, carpeted chipboard floor	95.93
GF Ceiling	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	95.93
FF Ceiling	+1	Plasterboard ceiling, carpeted chipboard floor	88.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Basement floor	Ground Floor - Solid	Basement	Slab on ground, screed over insulation	0.10	None	0.00	110.00	95.93
First floor	Exposed Floor - Solid	+1	Other	0.10	None	0.00	0.00	2.85

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Ground floor		Plasterboard ceiling, carpeted chipboard floor	9.00	95.93
First floor		Plasterboard ceiling, carpeted chipboard floor	9.00	85.55
Second floor		Plasterboard ceiling, carpeted chipboard floor	9.00	78.38

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Rooflights	Manufacturer	Roof Light	Double Low-E Soft 0.05			0.63		0.70	1.20
Roof windows	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Entrance door	Manufacturer	Solid Door				0.00			1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Gym glazing door Basement	Windows	External Wall Basement	West	11.20	0
Lounge glazing door GF	Windows	External Wall GF	West	5.60	0
Dining glazing door GF	Windows	External Wall GF	West	5.60	0
Gym windows Basement	Windows	External Wall Basement	North	2.74	0
Gym windows Basement	Windows	External Wall Basement	South	2.74	0
Lounge windows GF	Windows	External Wall GF	North	1.37	0
Dining windows GF	Windows	External Wall GF	North	1.37	0
Lounge windows GF	Windows	External Wall GF	South	1.37	0
Dining windows GF	Windows	External Wall GF	South	1.37	0
Corridor full height glazing FF	Windows	External Wall FF	West	3.18	0
Study glazing door FF	Windows	External Wall FF	West	2.98	0
Master bedroom glazing door FF	Windows	External Wall FF	West	2.98	0
Bedroom roof windows SF	Roof windows	Top Plane roof	West	4.02	0
Staircase windows GF	Windows	External Wall GF	North	5.02	0
Staircase windows FF	Windows	External Wall FF	North	6.48	0
Staircase rooflights SF	Rooflights	Top Plane roof	North	3.00	0
Living & Dining glazing GF	Windows	External Wall GF	East	11.08	0
Master Bedroom glazing FF	Windows	External Wall FF	East	11.08	0
Dressing windows FF	Windows	External Wall FF	East	5.94	0
Kitchen+Dining window GF	Windows	External Wall GF	South	4.94	0
Kitchen+Dining glazing door GF	Windows	External Wall GF	South	3.77	0
Dressing window FF	Windows	External Wall FF	South	3.51	0
Bathroom rooflight	Rooflights	Top Plane roof	South	1.88	0
Bedroom roof windows SF	Roof windows	Top Plane roof	East	4.02	0
Entrance door	Entrance door	External Wall GF	West	3.38	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging User Input

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate		35.92	0.00	0.00	No
E3 Sill		11.00	0.00	0.00	No
E4 Jamb		135.24	0.00	0.00	Yes
E6 Intermediate floor within a dwelling		104.65	0.00	0.00	No
E16 Corner (normal)		73.20	0.00	0.00	No
R1 Head of roof window		6.00	0.00	0.00	No
R2 Sill of roof window		6.00	0.00	0.00	No
R3 Jamb of roof window		16.09	0.00	0.00	No
R11 Upstands or kerbs of rooflights		12.50	0.00	0.00	No
E22 Basement floor		42.24	0.00	0.00	No

E17 Corner (inverted – internal area greater than external area)	19.60	0.00	0.00	No
E11 Eaves (insulation at rafter level)	29.44	0.00	0.00	No
R9 Roof to wall (flat ceiling)	24.00	0.00	0.00	No
R7 Flat ceiling (inverted)	23.50	0.00	0.00	No
R6 Flat ceiling	18.42	0.00	0.00	No
E8 Balcony within a dwelling, wall insulation continuous	4.80	0.00	0.00	No
E21 Exposed floor (inverted)	2.99	0.00	0.00	No
E20 Exposed floor (normal)	4.89	0.00	0.00	No

Y-value	0.06	W/m²K
Description	0.055	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	0
0.15	In Room Fan Other Wet Room	0
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	9	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	No	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	110.00	8.00	880.00	60

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	15107	
Fuel Type	Mains gas	
SAP Code	0	
In Winter	83.50	
In Summer	79.50	
Model Name	Ecotec plus 438	
Manufacturer	Vaillant	
System Type	Regular boiler	

Summary for Input Data

Controls SAP Code	2110
Delayed Start Stat	No
Burner Control	Modulating
HETAS approved System	No
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	55.00
Boiler Interlock	No

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

27.0 Secondary Heating — None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	5
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — Hot Water Cylinder

Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	300.00	L

Summary for Input Data

Loss	1.82	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Baseline-Gas Boiler	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	86 B	**DER**	13.77	**TER**	10.59
Environmental	84 B	**% DER < TER**			-30.03
CO_2 Emissions (t/year)	4.27	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	-34.34	**DPER**	75.10	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d)	x 2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	9 * 10 =	90.0000	(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) =	90.0000 / (5) =	0.0763	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2763	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2763	(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	0.3522	0.3453	0.3384	0.3039	0.2970	0.2624	0.2624	0.2555	0.2763	0.2970	0.3108	0.3246	(22b)
Effective ac	0.5620	0.5596	0.5573	0.5462	0.5441	0.5344	0.5344	0.5326	0.5382	0.5441	0.5483	0.5527	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300	(30)
Sloping roof	44.7600		44.7600	0.0952	4.2629	9.0000	402.8400	(30)
Dormer flat roof	9.0000		9.0000	0.0952	0.8571	9.0000	81.0000	(30)

Total net area of external elements Aum(A, m2)	684.3800		(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) = 205.7342		(33)
Internal Wall basement	221.6200	9.0000	1994.5800 (32c)
Internal Wall GF	96.4800	9.0000	868.3200 (32c)
Internal Wall FF	236.8400	9.0000	2131.5600 (32c)
Internal Wall SF	186.5000	9.0000	1678.5000 (32c)
Ground floor	95.9300	18.0000	1726.7400 (32d)
First floor	85.5500	18.0000	1539.9000 (32d)
Second floor	78.3800	18.0000	1410.8400 (32d)
Basement Ceiling	95.9300	9.0000	863.3700 (32e)
GF Ceiling	95.9300	9.0000	863.3700 (32e)
FF Ceiling	88.4000	9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	243.3751 (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	218.9067	217.9686	217.0490	212.7296	211.9215	208.1595	208.1595	207.4628	209.6086	211.9215	213.5564	215.2655	(38)
Heat transfer coeff	462.2818	461.3436	460.4240	456.1047	455.2966	451.5346	451.5346	450.8379	452.9836	455.2966	456.9314	458.6406	(39)
Average = Sum(39)m / 12 =												456.1008	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2890	1.2864	1.2838	1.2718	1.2695	1.2590	1.2590	1.2571	1.2631	1.2695	1.2741	1.2788	(40)
HLP (average)												1.2718	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy			3.2082 (42)
Hot water usage for mixer showers	78.0103 76.8379 75.1296 71.8610 69.4489 66.7589 65.2299 66.9253 68.7838 71.6720 75.0108		77.7114 (42a)
Hot water usage for baths	33.6702 33.1701 32.4660 31.1676 30.1954 29.1174 28.5351 29.2343 29.9957 31.1492 32.4743		33.5564 (42b)
Hot water usage for other uses	47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581		47.4848 (42c)
Average daily hot water use (litres/day)			146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
										Total per year (kWh/year) = Sum(64)m =		3062.7700	(64)
12Total per year (kWh/year)												3063	(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	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains	1003.0419	1032.6137	986.5832	954.7208	903.2969	867.6174	832.0691	830.8244	857.1601	888.4690	944.1399	979.2269	(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

North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800 (74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652 (76)
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983 (78)
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132 (80)
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582 (82)
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005 (82)
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)

Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990 (83)
Total gains	1802.4252	2529.4384	3338.9132	4289.9987	4958.2773	5016.3887	4781.9668	4236.4049	3554.7453	2630.1176	1927.5614	1645.8260 (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	42.1156	42.2012	42.2855	42.6860	42.7617	43.1180	43.1180	43.1846	42.9801	42.7617	42.6087	42.4499	
alpha	3.8077	3.8134	3.8190	3.8457	3.8508	3.8745	3.8745	3.8790	3.8653	3.8508	3.8406	3.8300	
util living area	0.9970	0.9891	0.9632	0.8801	0.7271	0.5452	0.4073	0.4734	0.7405	0.9510	0.9928	0.9979	(86)
MIT	19.3619	19.6235	20.0087	20.4598	20.7537	20.8793	20.9100	20.9023	20.7898	20.3302	19.7494	19.3222	(87)
Th 2	19.8495	19.8515	19.8535	19.8630	19.8648	19.8731	19.8731	19.8746	19.8699	19.8648	19.8612	19.8575	(88)
util rest of house	0.9961	0.9861	0.9531	0.8496	0.6675	0.4604	0.3068	0.3648	0.6589	0.9321	0.9904	0.9973	(89)
MIT 2	17.9264	18.2615	18.7483	19.3012	19.6239	19.7466	19.7672	19.7654	19.6753	19.1635	18.4309	17.8813	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	18.1351	18.4595	18.9316	19.4696	19.7882	19.9113	19.9334	19.9307	19.8374	19.3332	18.6226	18.0908	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1351	18.4595	18.9316	19.4696	19.7882	19.9113	19.9334	19.9307	19.8374	19.3332	18.6226	18.0908	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9942	0.9809	0.9425	0.8372	0.6631	0.4634	0.3123	0.3704	0.6562	0.9203	0.9865	0.9958	(94)
Useful gains	1791.9848	2481.1318	3147.0292	3591.5270	3287.9196	2324.4765	1493.3895	1569.2985	2332.6438	2420.5991	1901.5969	1638.9729	(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	6395.7284	6255.5935	5723.8037	4820.8645	3682.5208	2398.2277	1505.1341	1591.7852	2598.9362	3976.1769	5265.0600	6370.8954	(97)
Space heating kWh	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98a)
Space heating requirement - total per year (kWh/year)												16157.0438	
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	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16157.0438	
Space heating per m2											(98c) / (4) =	45.0509	(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 %)	83.5000 (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	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98)
Space heating efficiency (main heating system 1)	83.5000	83.5000	83.5000	83.5000	83.5000	0.0000	0.0000	0.0000	0.0000	83.5000	83.5000	83.5000	(210)
Space heating fuel (main heating system)	4102.0182	3037.6506	2295.9524	1060.0276	351.5967	0.0000	0.0000	0.0000	0.0000	1386.0478	2900.2317	4216.2280	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
Efficiency of water heater												79.5000	(216)
(217)m	82.6864	82.5454	82.2153	81.3409	79.1887	74.5000	74.5000	74.5000	74.5000	81.7385	82.5053	82.7148	(217)
Fuel for water heating, kWh/month	369.8409	327.5026	348.8088	308.5162	306.2243	292.1598	287.4053	299.3809	303.3111	309.5320	327.6384	365.4695	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	47.8320	38.3726	34.5503	25.3130	19.5525	15.9746	17.8365	23.1845	30.1144	39.5117	44.6284	49.1614	(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	19349.7531	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.5000	
Water heating fuel used	3845.7899	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	386.0318	(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	23667.5748	(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	19349.7531	0.2100	4063.4481	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3845.7899	0.2100	807.6159	(264)
Space and water heating			4871.0640	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Total CO2, kg/year			4938.7096	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.7700	(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	19349.7531	1.1300	21865.2210	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3845.7899	1.1300	4345.7426	(278)
Space and water heating			26210.9635	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Total Primary energy kWh/year			26933.1728	(286)
Dwelling Primary energy Rate (DPER)			75.1000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000 (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) =	40.0000 / (5) =	0.0339 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2839 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839 (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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336 (22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556 (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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3 Sill	11.0000	0.0500	0.5500
E4 Jamb	135.2400	0.0500	6.7620
E6 Intermediate floor within a dwelling	104.6500	0.0000	0.0000
E16 Corner (normal)	73.2000	0.0900	6.5880
R1 Head of roof window	6.0000	0.0800	0.4800
R2 Sill of roof window	6.0000	0.0600	0.3600
R3 Jamb of roof window	16.0900	0.0800	1.2872
R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22 Basement floor	42.2400	0.0700	2.9568
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6 Flat ceiling	18.4200	0.0600	1.1052
E8 Balcony within a dwelling, wall insulation continuous	4.8000	0.0000	0.0000
E21 Exposed floor (inverted)	2.9900	0.3200	0.9568
E20 Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.7204 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 230.2666 (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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
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 3.2082 (42)

Hot water usage for mixer showers	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)

Average daily hot water use (litres/day) 146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)

Energy content (annual) Total = Sum(45)m = 2430.1520

Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)

Water storage loss:

Store volume 300.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.1127 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.1409 (55)

Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	310.7076	274.7639	291.6737	255.6915	247.3948	222.4006	219.0165	227.9384	230.7083	257.9063	275.0605	307.1969	(62)
WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)

											Total per year (kWh/year) = Sum(64)m =	2789.0930	(64)
12Total per year (kWh/year)												2789	(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	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													
130.7193	116.1155	124.3905	111.5422	109.6677	100.4730	100.2320	103.1985	103.2353	113.1628	117.9824	129.5519		(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	175.6979	172.7909	167.1915	154.9197	147.4029	139.5459	134.7204	138.7076	143.3824	152.1006	163.8645	174.1289	(72)
Total internal gains													
	1008.3103	1037.8821	991.8516	959.9892	908.5653	872.8858	837.3375	836.0928	862.4285	893.7374	949.4083	984.4953	(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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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													
	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)	92.3000	(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												

	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134 (98)
Space heating efficiency (main heating system 1)												
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)												
	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234 (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												
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943 (64)
Efficiency of water heater												79.8000 (216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494 (217)
Fuel for water heating, kWh/month												
	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359 (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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587 (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	17373.7503 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3279.1232 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	426.4437 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4741.5806 (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	16423.7367 (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	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	
PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Baseline-Gas Boiler	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	86 B	**DER**	13.77	**TER**	10.59
Environmental	84 B	**% DER < TER**			-30.03
CO_2 Emissions (t/year)	4.27	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	-34.34	**DPER**	75.10	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2339	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2339	(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	0.2982	0.2924	0.2865	0.2573	0.2514	0.2222	0.2222	0.2163	0.2339	0.2514	0.2631	0.2748	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5445	0.5427	0.5410	0.5331	0.5316	0.5247	0.5247	0.5234	0.5274	0.5316	0.5346	0.5378	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300	(30)

Sloping roof	44.7600	44.7600	0.0952	4.2629	9.0000	402.8400 (30)
Dormer flat roof	9.0000	9.0000	0.0952	0.8571	9.0000	81.0000 (30)
Total net area of external elements Aum(A, m2)		684.3800				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		205.7342		(33)
Internal Wall basement		221.6200			9.0000	1994.5800 (32c)
Internal Wall GF		96.4800			9.0000	868.3200 (32c)
Internal Wall FF		236.8400			9.0000	2131.5600 (32c)
Internal Wall SF		186.5000			9.0000	1678.5000 (32c)
Ground floor		95.9300			18.0000	1726.7400 (32d)
First floor		85.5500			18.0000	1539.9000 (32d)
Second floor		78.3800			18.0000	1410.8400 (32d)
Basement Ceiling		95.9300			9.0000	863.3700 (32e)
GF Ceiling		95.9300			9.0000	863.3700 (32e)
FF Ceiling		88.4000			9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	243.3751 (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	212.0650	211.3925	210.7333	207.6371	207.0579	204.3612	204.3612	203.8618	205.3999	207.0579	208.2297	209.4549	(38)
Heat transfer coeff	455.4401	454.7676	454.1084	451.0122	450.4329	447.7362	447.7362	447.2369	448.7750	450.4329	451.6048	452.8300	(39)
Average = Sum(39)m / 12 =												451.0094	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2699	1.2680	1.2662	1.2576	1.2559	1.2484	1.2484	1.2470	1.2513	1.2559	1.2592	1.2626	(40)
HLP (average)												1.2576	
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												3.2082	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												74.3856	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		710.6291	(64a)
Heat gains from water heating, kWh/month	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800	(74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652	(76)

South				17.7000	46.7521	0.6300	0.7000	0.7700	252.8983	(78)			
West				31.5400	19.6403	0.6300	0.7000	0.7700	189.3132	(80)			
North				3.0000	26.0000	0.6300	0.7000	1.0000	30.9582	(82)			
South				1.8800	26.0000	0.6300	0.7000	1.0000	19.4005	(82)			
East				4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)			
West				4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)			
Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990	(83)
Total gains	1686.6984	2415.1651	3227.9957	4187.1728	4860.2115	4926.3502	4695.3646	4147.5116	3463.0844	2529.8484	1819.5688	1531.2001	(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	42.7482	42.8115	42.8736	43.1679	43.2234	43.4838	43.4838	43.5323	43.3831	43.2234	43.1113	42.9946	
alpha	3.8499	3.8541	3.8582	3.8779	3.8816	3.8989	3.8989	3.9022	3.8922	3.8816	3.8741	3.8663	
util living area	0.9976	0.9906	0.9664	0.8851	0.7323	0.5500	0.4112	0.4793	0.7489	0.9557	0.9941	0.9984	(86)
MIT	18.9154	19.2645	19.7795	20.3821	20.7777	20.9449	20.9861	20.9754	20.8222	20.1999	19.4238	18.8573	(87)
Th 2	19.8645	19.8660	19.8674	19.8742	19.8755	19.8815	19.8815	19.8826	19.8792	19.8755	19.8729	19.8702	(88)
util rest of house	0.9970	0.9880	0.9571	0.8556	0.6734	0.4653	0.3106	0.3704	0.6683	0.9384	0.9921	0.9979	(89)
MIT 2	17.9615	18.3098	18.8175	19.3919	19.7309	19.8559	19.8776	19.8750	19.7805	19.2387	18.4749	17.9076	(90)
Living area fraction									fLA = Living area / (4) =			0.1454	(91)
MIT	18.1002	18.4486	18.9574	19.5359	19.8831	20.0142	20.0388	20.0350	19.9320	19.3785	18.6129	18.0457	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1002	18.4486	18.9574	19.5359	19.8831	20.0142	20.0388	20.0350	19.9320	19.3785	18.6129	18.0457	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9834	0.9473	0.8452	0.6738	0.4758	0.3250	0.3857	0.6725	0.9283	0.9888	0.9968	(94)
Useful gains	1678.8873	2374.9964	3057.7301	3539.1064	3275.0044	2344.1140	1526.2195	1599.8643	2329.0917	2348.3462	1799.1971	1526.2243	(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	6285.1645	6161.4829	5656.9928	4796.9204	3685.9457	2424.1525	1539.6682	1625.6988	2617.2487	3954.1093	5199.2878	6269.7301	(97)
Space heating kWh	3427.0703	2544.5190	1933.8515	905.6261	305.7404	0.0000	0.0000	0.0000	0.0000	1194.6877	2448.0653	3529.1683	(98a)
Space heating requirement - total per year (kWh/year)												16288.7285	
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	3427.0703	2544.5190	1933.8515	905.6261	305.7404	0.0000	0.0000	0.0000	0.0000	1194.6877	2448.0653	3529.1683	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16288.7285	
Space heating per m2											(98c) / (4) =	45.4180	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	4208.7206	3313.2481	3399.0001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8847	0.9299	0.8961	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3723.6534	3080.8348	3045.9868	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	5460.3459	5204.6194	4597.2049	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1250.4186	1580.0957	1154.1062	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	312.6046	395.0239	288.5266	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												996.1551	(107)
Energy for space heating												45.4180	(99)
Energy for space cooling												2.7776	(108)
Total												48.1956	(109)
Fabric Energy Efficiency (DFEE)												48.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Basement floor		95.9300 (1a)	x	3.5000 (2a)	=	335.7550 (1a) - (3a)	
Ground floor		95.9300 (1b)	x	3.7000 (2b)	=	354.9410 (1b) - (3b)	
First floor		88.4000 (1c)	x	3.1000 (2c)	=	274.0400 (1c) - (3c)	
Second floor		78.3800 (1d)	x	2.7500 (2d)	=	215.5450 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556	(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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	Kl Element	Length	Psi-value	Total
	E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
	E3 Sill	11.0000	0.0500	0.5500
	E4 Jamb	135.2400	0.0500	6.7620
	E6 Intermediate floor within a dwelling	104.6500	0.0000	0.0000
	E16 Corner (normal)	73.2000	0.0900	6.5880
	R1 Head of roof window	6.0000	0.0800	0.4800
	R2 Sill of roof window	6.0000	0.0600	0.3600
	R3 Jamb of roof window	16.0900	0.0800	1.2872
	R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
	E22 Basement floor	42.2400	0.0700	2.9568
	E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
	E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
	R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
	R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
	R6 Flat ceiling	18.4200	0.0600	1.1052
	E8 Balcony within a dwelling, wall insulation continuous	4.8000	0.0000	0.0000
	E21 Exposed floor (inverted)	2.9900	0.3200	0.9568
	E20 Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		26.7204	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	230.2666	(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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.2082 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)

Hot water usage for other uses
47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581 47.4848 (42c)
Average daily hot water use (litres/day) 74.3856 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)													
	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					710.6291	(64a)
Heat gains from water heating, kWh/month													
	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains													
	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1530.1363	2122.0562	2767.4536	3534.2811	4066.4815	4114.2726	3922.2104	3480.8782	2934.9833	2188.8255	1626.9719	1400.6375	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9984	0.9940	0.9791	0.9242	0.8024	0.6267	0.4770	0.5493	0.8117	0.9711	0.9961	0.9988	(86)
MIT	18.8835	19.1888	19.6590	20.2537	20.6957	20.9174	20.9782	20.9628	20.7661	20.1196	19.3838	18.8400	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9979	0.9923	0.9729	0.9022	0.7496	0.5383	0.3650	0.4313	0.7391	0.9591	0.9947	0.9985	(89)
MIT 2	17.9374	18.2432	18.7102	19.2906	19.6853	19.8603	19.8940	19.8899	19.7601	19.1760	18.4460	17.9000	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9889	0.9653	0.8911	0.7464	0.5481	0.3809	0.4476	0.7398	0.9504	0.9923	0.9977	(94)
Useful gains	1525.0977	2098.5808	2671.3234	3149.4945	3035.1663	2254.8644	1494.0492	1558.0137	2171.2439	2080.2850	1614.3880	1397.3494	(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													
	6205.9919	6060.0629	5538.9643	4675.6410	3603.7839	2377.6959	1515.8956	1598.5164	2558.9128	3861.2608	5108.2564	6180.6080	(97)
Space heating kWh													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98a)
Space heating requirement - total per year (kWh/year)												17199.4787	
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													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												17199.4787	
Space heating per m2											(98c) / (4) =	47.9575	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	4128.2735	3249.9174	3332.1616	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8347	0.8945	0.8512	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3445.7583	2907.1052	2836.1942	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4545.2049	4333.1010	3844.7448	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	791.6016	1060.9409	750.3616	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	197.9004	265.2352	187.5904	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												650.7260	(107)
Energy for space heating												47.9575	(99)
Energy for space cooling												1.8144	(108)
Total												49.7719	(109)
Fabric Energy Efficiency (TFEE)												49.8	(109)

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Baseline-Gas Boiler	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	86 B	**DER**	13.77	**TER**	10.59
Environmental	84 B	**% DER < TER**			-30.03
CO_2 Emissions (t/year)	4.27	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	-34.34	**DPER**	75.10	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d)	x 2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	9 * 10 =	90.0000	(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) =	90.0000 / (5) =	0.0763	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2763	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2763	(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	0.3522	0.3453	0.3384	0.3039	0.2970	0.2624	0.2624	0.2555	0.2763	0.2970	0.3108	0.3246	(22b)
Effective ac	0.5620	0.5596	0.5573	0.5462	0.5441	0.5344	0.5344	0.5326	0.5382	0.5441	0.5483	0.5527	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300	(30)
Sloping roof	44.7600		44.7600	0.0952	4.2629	9.0000	402.8400	(30)
Dormer flat roof	9.0000		9.0000	0.0952	0.8571	9.0000	81.0000	(30)

Total net area of external elements Aum(A, m2)	684.3800		(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) = 205.7342		(33)
Internal Wall basement	221.6200	9.0000	1994.5800 (32c)
Internal Wall GF	96.4800	9.0000	868.3200 (32c)
Internal Wall FF	236.8400	9.0000	2131.5600 (32c)
Internal Wall SF	186.5000	9.0000	1678.5000 (32c)
Ground floor	95.9300	18.0000	1726.7400 (32d)
First floor	85.5500	18.0000	1539.9000 (32d)
Second floor	78.3800	18.0000	1410.8400 (32d)
Basement Ceiling	95.9300	9.0000	863.3700 (32e)
GF Ceiling	95.9300	9.0000	863.3700 (32e)
FF Ceiling	88.4000	9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	243.3751 (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	218.9067	217.9686	217.0490	212.7296	211.9215	208.1595	208.1595	207.4628	209.6086	211.9215	213.5564	215.2655	(38)
Heat transfer coeff	462.2818	461.3436	460.4240	456.1047	455.2966	451.5346	451.5346	450.8379	452.9836	455.2966	456.9314	458.6406	(39)
Average = Sum(39)m / 12 =												456.1008	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2890	1.2864	1.2838	1.2718	1.2695	1.2590	1.2590	1.2571	1.2631	1.2695	1.2741	1.2788	(40)
HLP (average)												1.2718	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy			3.2082 (42)
Hot water usage for mixer showers	78.0103 76.8379 75.1296 71.8610 69.4489 66.7589 65.2299 66.9253 68.7838 71.6720 75.0108		77.7114 (42a)
Hot water usage for baths	33.6702 33.1701 32.4660 31.1676 30.1954 29.1174 28.5351 29.2343 29.9957 31.1492 32.4743		33.5564 (42b)
Hot water usage for other uses	47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581		47.4848 (42c)
Average daily hot water use (litres/day)			146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
										Total per year (kWh/year) = Sum(64)m =		3062.7700	(64)
12Total per year (kWh/year)												3063	(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	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains	1003.0419	1032.6137	986.5832	954.7208	903.2969	867.6174	832.0691	830.8244	857.1601	888.4690	944.1399	979.2269	(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

North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800 (74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652 (76)
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983 (78)
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132 (80)
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582 (82)
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005 (82)
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)

Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990 (83)
Total gains	1802.4252	2529.4384	3338.9132	4289.9987	4958.2773	5016.3887	4781.9668	4236.4049	3554.7453	2630.1176	1927.5614	1645.8260 (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	42.1156	42.2012	42.2855	42.6860	42.7617	43.1180	43.1180	43.1846	42.9801	42.7617	42.6087	42.4499	
alpha	3.8077	3.8134	3.8190	3.8457	3.8508	3.8745	3.8745	3.8790	3.8653	3.8508	3.8406	3.8300	
util living area	0.9970	0.9891	0.9632	0.8801	0.7271	0.5452	0.4073	0.4734	0.7405	0.9510	0.9928	0.9979	(86)
MIT	19.3619	19.6235	20.0087	20.4598	20.7537	20.8793	20.9100	20.9023	20.7898	20.3302	19.7494	19.3222	(87)
Th 2	19.8495	19.8515	19.8535	19.8630	19.8648	19.8731	19.8731	19.8746	19.8699	19.8648	19.8612	19.8575	(88)
util rest of house	0.9961	0.9861	0.9531	0.8496	0.6675	0.4604	0.3068	0.3648	0.6589	0.9321	0.9904	0.9973	(89)
MIT 2	17.9264	18.2615	18.7483	19.3012	19.6239	19.7466	19.7672	19.7654	19.6753	19.1635	18.4309	17.8813	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	18.1351	18.4595	18.9316	19.4696	19.7882	19.9113	19.9334	19.9307	19.8374	19.3332	18.6226	18.0908	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1351	18.4595	18.9316	19.4696	19.7882	19.9113	19.9334	19.9307	19.8374	19.3332	18.6226	18.0908	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9942	0.9809	0.9425	0.8372	0.6631	0.4634	0.3123	0.3704	0.6562	0.9203	0.9865	0.9958	(94)
Useful gains	1791.9848	2481.1318	3147.0292	3591.5270	3287.9196	2324.4765	1493.3895	1569.2985	2332.6438	2420.5991	1901.5969	1638.9729	(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	6395.7284	6255.5935	5723.8037	4820.8645	3682.5208	2398.2277	1505.1341	1591.7852	2598.9362	3976.1769	5265.0600	6370.8954	(97)
Space heating kWh	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98a)
Space heating requirement - total per year (kWh/year)												16157.0438	
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	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16157.0438	
Space heating per m2											(98c) / (4) =	45.0509	(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 %)	83.5000 (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	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98)
Space heating efficiency (main heating system 1)	83.5000	83.5000	83.5000	83.5000	83.5000	0.0000	0.0000	0.0000	0.0000	83.5000	83.5000	83.5000	(210)
Space heating fuel (main heating system)	4102.0182	3037.6506	2295.9524	1060.0276	351.5967	0.0000	0.0000	0.0000	0.0000	1386.0478	2900.2317	4216.2280	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
Efficiency of water heater												79.5000	(216)
(217)m	82.6864	82.5454	82.2153	81.3409	79.1887	74.5000	74.5000	74.5000	74.5000	81.7385	82.5053	82.7148	(217)
Fuel for water heating, kWh/month	369.8409	327.5026	348.8088	308.5162	306.2243	292.1598	287.4053	299.3809	303.3111	309.5320	327.6384	365.4695	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	47.8320	38.3726	34.5503	25.3130	19.5525	15.9746	17.8365	23.1845	30.1144	39.5117	44.6284	49.1614	(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	19349.7531	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.5000	
Water heating fuel used	3845.7899	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	386.0318	(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	23667.5748	(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	19349.7531	0.2100	4063.4481	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3845.7899	0.2100	807.6159	(264)
Space and water heating			4871.0640	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Total CO2, kg/year			4938.7096	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.7700	(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	19349.7531	1.1300	21865.2210	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3845.7899	1.1300	4345.7426	(278)
Space and water heating			26210.9635	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Total Primary energy kWh/year			26933.1728	(286)
Dwelling Primary energy Rate (DPER)			75.1000	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000 (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) =	40.0000 / (5) =	0.0339 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.2839 (18)
Number of sides sheltered		0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839 (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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336 (22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556 (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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3 Sill	11.0000	0.0500	0.5500
E4 Jamb	135.2400	0.0500	6.7620
E6 Intermediate floor within a dwelling	104.6500	0.0000	0.0000
E16 Corner (normal)	73.2000	0.0900	6.5880
R1 Head of roof window	6.0000	0.0800	0.4800
R2 Sill of roof window	6.0000	0.0600	0.3600
R3 Jamb of roof window	16.0900	0.0800	1.2872
R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22 Basement floor	42.2400	0.0700	2.9568
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6 Flat ceiling	18.4200	0.0600	1.1052
E8 Balcony within a dwelling, wall insulation continuous	4.8000	0.0000	0.0000
E21 Exposed floor (inverted)	2.9900	0.3200	0.9568
E20 Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.7204 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 230.2666 (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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
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 3.2082 (42)

Hot water usage for mixer showers	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)

Average daily hot water use (litres/day) 146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)

Energy content (annual) Total = Sum(45)m = 2430.1520

Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)

Water storage loss:

Store volume 300.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.1127 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.1409 (55)

Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	310.7076	274.7639	291.6737	255.6915	247.3948	222.4006	219.0165	227.9384	230.7083	257.9063	275.0605	307.1969	(62)
WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)

											Total per year (kWh/year) = Sum(64)m =	2789.0930	(64)
12Total per year (kWh/year)												2789	(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	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													
130.7193	116.1155	124.3905	111.5422	109.6677	100.4730	100.2320	103.1985	103.2353	113.1628	117.9824	129.5519		(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000		(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	175.6979	172.7909	167.1915	154.9197	147.4029	139.5459	134.7204	138.7076	143.3824	152.1006	163.8645	174.1289	(72)
Total internal gains													
	1008.3103	1037.8821	991.8516	959.9892	908.5653	872.8858	837.3375	836.0928	862.4285	893.7374	949.4083	984.4953	(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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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													
	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)	92.3000	(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												

	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134 (98)
Space heating efficiency (main heating system 1)												
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)												
	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234 (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												
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943 (64)
Efficiency of water heater												79.8000 (216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494 (217)
Fuel for water heating, kWh/month												
	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359 (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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587 (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	17373.7503 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	79.8000
Water heating fuel used	3279.1232 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	426.4437 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-4741.5806 (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	16423.7367 (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	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	
PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Predicted Energy Assessment

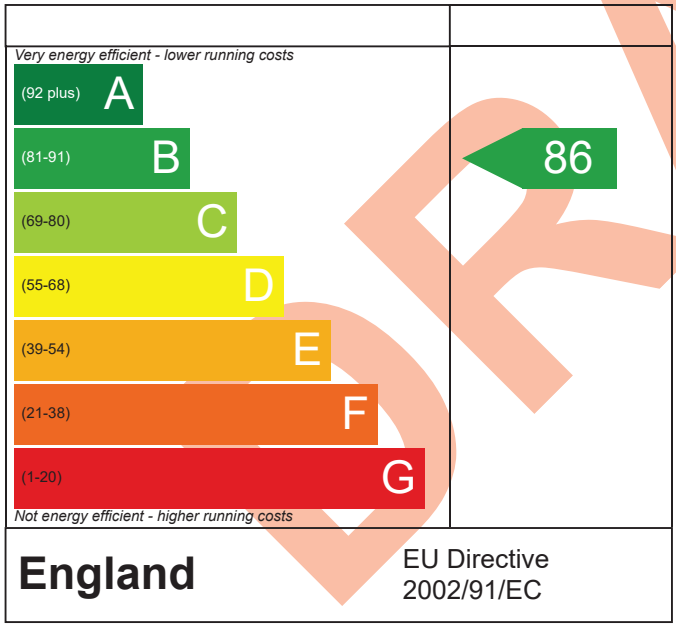
Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP

Dwelling type:	Bungalow, Detached
Date of assessment:	17/12/2024
Produced by:	Paul Pasifull
Total floor area:	358.64 m²
DRRN:	

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

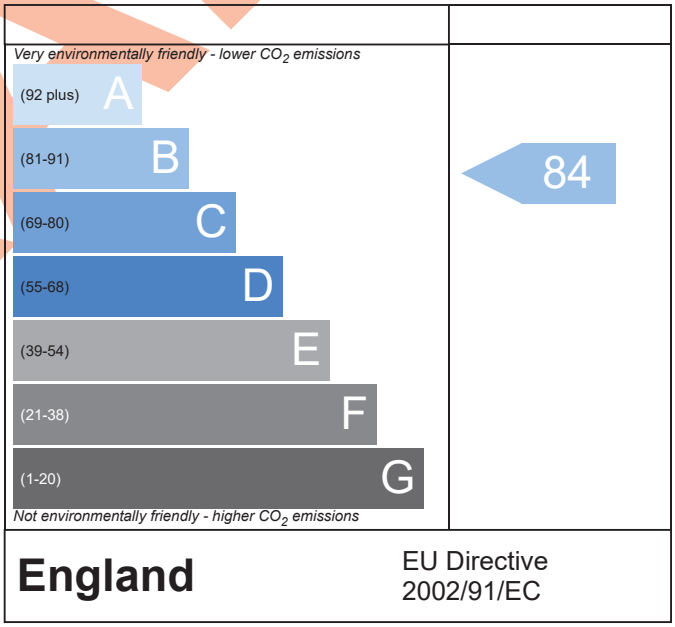
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Clean - Specified ASHP+PV	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	82 B	**DER**	3.10	**TER**	10.59
Environmental	96 A	**% DER < TER**			70.73
CO_2 Emissions (t/year)	1.01	**DFEE**	47.74	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			4.07
% DPER < TPER	41.63	**DPER**	32.63	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, Detached	
Which Floor	0	
2.0 Number of Storeys	4	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	195.43	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	42.24 m	95.93 m²	3.50 m
Ground floor:	42.24 m	95.93 m²	3.70 m
1st Storey:	37.11 m	88.40 m²	3.10 m
2nd Storey:	35.44 m	78.38 m²	2.75 m

8.0 Living Area	52.15	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall Basement	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	147.84	131.15	0.00	None	16.69	Enter Gross Area
External Wall GF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	145.84	100.96	0.00	None	44.88	Enter Gross Area
External Wall FF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	119.97	83.83	0.00	None	36.14	Enter Gross Area
External Wall SF	Timber Frame	Timber framed wall (one layer of plasterboard)	0.16	9.00	60.96	60.96	0.00	None	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall basement	Plasterboard on timber frame	9.00	221.62
Internal Wall GF	Plasterboard on timber frame	9.00	96.48
Internal Wall FF	Plasterboard on timber frame	9.00	236.84
Internal Wall SF	Plasterboard on timber frame	9.00	186.50

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Top Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	37.26	24.34	Room In Roof	0.50	Enter Gross Area	12.92

Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	7.70	7.70	None	0.00	Enter Gross Area	0.00
Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	12.27	12.27	Room In Roof	0.50	Enter Gross Area	0.00
Sloping roof	External Slope Roof	Plasterboard, insulated slope	0.10	9.00	44.76	44.76	Room In Roof	0.50	Enter Gross Area	0.00
Dormer Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	9.00	9.00	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Basement Ceiling	Basement	Plasterboard ceiling, carpeted chipboard floor	95.93
GF Ceiling	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	95.93
FF Ceiling	+1	Plasterboard ceiling, carpeted chipboard floor	88.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Basement floor	Ground Floor - Solid	Basement	Slab on ground, screed over insulation	0.10	None	0.00	110.00	95.93
First floor	Exposed Floor - Solid	+1	Other	0.10	None	0.00	0.00	2.85

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Ground floor		Plasterboard ceiling, carpeted chipboard floor	9.00	95.93
First floor		Plasterboard ceiling, carpeted chipboard floor	9.00	85.55
Second floor		Plasterboard ceiling, carpeted chipboard floor	9.00	78.38

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Rooflights	Manufacturer	Roof Light	Double Low-E Soft 0.05			0.63		0.70	1.20
Roof windows	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Entrance door	Manufacturer	Solid Door				0.00			1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Gym glazing door Basement	Windows	External Wall Basement	West	11.20	0
Lounge glazing door GF	Windows	External Wall GF	West	5.60	0
Dining glazing door GF	Windows	External Wall GF	West	5.60	0
Gym windows Basement	Windows	External Wall Basement	North	2.74	0
Gym windows Basement	Windows	External Wall Basement	South	2.74	0
Lounge windows GF	Windows	External Wall GF	North	1.37	0
Dining windows GF	Windows	External Wall GF	North	1.37	0
Lounge windows GF	Windows	External Wall GF	South	1.37	0
Dining windows GF	Windows	External Wall GF	South	1.37	0
Corridor full height glazing FF	Windows	External Wall FF	West	3.18	0
Study glazing door FF	Windows	External Wall FF	West	2.98	0
Master bathroom glazing door FF	Windows	External Wall FF	West	2.98	0
Bedroom roof windows SF	Roof windows	Top Plane roof	West	4.02	0
Staircase windows GF	Windows	External Wall GF	North	5.02	0
Staircase windows FF	Windows	External Wall FF	North	6.48	0
Staircase rooflights SF	Rooflights	Top Plane roof	North	3.00	0
Living & Dining glazing GF	Windows	External Wall GF	East	11.08	0
Master Bedroom glazing FF	Windows	External Wall FF	East	11.08	0
Dressing windows FF	Windows	External Wall FF	East	5.94	0
Kitchen+Dining window GF	Windows	External Wall GF	South	4.94	0
Kitchen+Dining glazing door GF	Windows	External Wall GF	South	3.77	0
Dressing window FF	Windows	External Wall FF	South	3.51	0
Bathroom rooflight	Rooflights	Top Plane roof	South	1.88	0
Bedroom roof windows SF	Roof windows	Top Plane roof	East	4.02	0
Entrance door	Entrance door	External Wall GF	West	3.38	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging User Input

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate		35.92	0.00	0.00	Yes
E3 Sill		11.00	0.00	0.00	No
E4 Jamb		135.24	0.00	0.00	Yes
E6 Intermediate floor within a dwelling		74.14	0.00	0.00	No
E16 Corner (normal)		73.20	0.00	0.00	No
R1 Head of roof window		6.00	0.00	0.00	No
R2 Sill of roof window		6.00	0.00	0.00	No
R3 Jamb of roof window		16.09	0.00	0.00	No
R11 Upstands or kerbs of rooflights		12.50	0.00	0.00	No
E22 Basement floor		42.24	0.00	0.00	No

E17 Corner (inverted – internal area greater than external area)	19.60	0.00	0.00	No
E11 Eaves (insulation at rafter level)	29.44	0.00	0.00	No
R9 Roof to wall (flat ceiling)	24.00	0.00	0.00	No
R7 Flat ceiling (inverted)	23.50	0.00	0.00	No
R6 Flat ceiling	18.42	0.00	0.00	No
E8 Balcony within a dwelling, wall insulation continuous	12.80	0.00	0.00	No
E20 Exposed floor (normal)	4.89	0.00	0.00	No
E21 Exposed floor (inverted)	2.99	0.00	0.00	No

Y-value	0.05	W/m²K
Description	0.05	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes	
Approved Installation	No	
Mechanical Ventilation data Type	Data Sheet	
Type	Balanced mechanical ventilation with heat recovery	
Manufacturer SFP	2.17	
Duct Type	Rigid	
MVHR Efficiency	85.00	
Wet Rooms	5	
Brand, Model	Swegon Unit	
SFP from Installer Commissioning Certificate	Yes	
MVHR System Location	Inside heated envelope (installed exclusively)	
Duct Installation Specification	Level 1	

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	0
0.15	In Room Fan Other Wet Room	0
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	Yes	
Cooled Area	198	m²
Data Source	SAP table	
Energy Class	A+	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

Summary for Input Data

elmhurst energy

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	110.00	8.00	880.00	60

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104860	
Fuel Type	Electricity	
SAP Code	0	
In Winter	405.59	
In Summer	170.86	
Model Name	EPRA16DW1 + ETBH16D6V	
Manufacturer	Daikin Europe NV	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
HETAS approved System	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

27.0 Secondary Heating	None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	5
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	

Summary for Input Data

Shower	Vented hot water system	7.00	No
Shower	Vented hot water system	7.00	No
Shower	Vented hot water system	7.00	No

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	300.00	L
Loss	1.82	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store	None

32.0 Photovoltaic Unit	One Dwelling	
Export Capable Meter?	Yes	
Connected To Dwelling	Yes	
Diverter	Yes	
Battery Capacity [kWh]	0.00	

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.00	South	30°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Clean - Specified ASHP+PV	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	82 B	**DER**	3.10	**TER**	10.59
Environmental	96 A	**% DER < TER**			70.73
CO_2 Emissions (t/year)	1.01	**DFEE**	47.74	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			4.07
% DPER < TPER	41.63	**DPER**	32.63	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	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		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2000	(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	0.2550	0.2500	0.2450	0.2200	0.2150	0.1900	0.1900	0.1850	0.2000	0.2150	0.2250	0.2350	(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) =	76.5000 (23c)

Effective ac	0.3725	0.3675	0.3625	0.3375	0.3325	0.3075	0.3075	0.3025	0.3175	0.3325	0.3425	0.3525	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)

Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600 (30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000 (30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300 (30)
Sloping roof	44.7600		44.7600	0.0952	4.2629	9.0000	402.8400 (30)
Dormer Flat roof	9.0000		9.0000	0.1000	0.9000	9.0000	81.0000 (30)
Total net area of external elements Aum(A, m2)			684.3800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		205.7770		(33)
Internal Wall basement			221.6200			9.0000	1994.5800 (32c)
Internal Wall GF			96.4800			9.0000	868.3200 (32c)
Internal Wall FF			236.8400			9.0000	2131.5600 (32c)
Internal Wall SF			186.5000			9.0000	1678.5000 (32c)
Ground floor			95.9300			18.0000	1726.7400 (32d)
First floor			85.5500			18.0000	1539.9000 (32d)
Second floor			78.3800			18.0000	1410.8400 (32d)
Basement Ceiling			95.9300			9.0000	863.3700 (32e)
GF Ceiling			95.9300			9.0000	863.3700 (32e)
FF Ceiling			88.4000			9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		34.2190 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	239.9960 (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	145.0860	143.1386	141.1911	131.4538	129.5063	119.7690	119.7690	117.8216	123.6639	129.5063	133.4013	137.2962	(38)
Heat transfer coeff	385.0821	383.1346	381.1871	371.4498	369.5023	359.7650	359.7650	357.8176	363.6600	369.5023	373.3973	377.2922	(39)
Average = Sum(39)m / 12 =												370.9629	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0737	1.0683	1.0629	1.0357	1.0303	1.0031	1.0031	0.9977	1.0140	1.0303	1.0411	1.0520	(40)
HLP (average)												1.0344	
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												3.2082	(42)
Hot water usage for mixer showers													
	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths													
	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses													
	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												146.3084	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m													
	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss													
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage													
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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													
	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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	-6.8910	-15.1781	-31.5094	-49.4165	-67.0718	-67.7741	-66.5494	-55.0152	-39.0480	-21.8940	-9.2761	-5.3699	(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													
	298.9170	255.1603	255.2646	201.5334	175.4234	149.8849	147.5675	168.0236	186.9188	231.1127	261.0428	296.9273	(64)
										Total per year (kWh/year) = Sum(64)m =		2627.7763	(64)
12Total per year (kWh/year)												2628	(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													
	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains													
	1000.0419	1029.6137	983.5832	951.7208	900.2969	867.6174	832.0691	830.8244	857.1601	885.4690	941.1399	976.2269	(73)

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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	
North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800	(74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652	(76)
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983	(78)
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132	(80)
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582	(82)
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005	(82)
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990	(83)
Total gains	1799.4252	2526.4384	3335.9132	4286.9987	4955.2773	5016.3887	4781.9668	4236.4049	3554.7453	2627.1176	1924.5614	1642.8260	(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	50.5587	50.8157	51.0753	52.4143	52.6905	54.1166	54.1166	54.4111	53.5370	52.6905	52.1409	51.6026	
alpha	4.3706	4.3877	4.4050	4.4943	4.5127	4.6078	4.6078	4.6274	4.5691	4.5127	4.4761	4.4402	
util living area	0.9972	0.9881	0.9541	0.8368	0.6465	0.4520	0.3297	0.3855	0.6565	0.9352	0.9925	0.9982	(86)
Living	19.6517	19.9165	20.2823	20.6790	20.8667	20.9231	20.9310	20.9296	20.8833	20.5458	20.0205	19.6293	
Non living	18.4249	18.7657	19.2277	19.7167	19.9171	19.9887	19.9939	19.9980	19.9507	19.5793	18.9171	18.4097	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	5	
16 / 9	0	28	31	0	0	0	0	0	0	0	15	26	
MIT	21.0000	20.3863	20.5935	20.6790	20.8667	20.9231	20.9310	20.9296	20.8833	20.5458	20.2328	20.3489	(87)
Th 2	20.0223	20.0268	20.0313	20.0537	20.0582	20.0807	20.0807	20.0852	20.0717	20.0582	20.0492	20.0402	(88)
util rest of house	0.9965	0.9851	0.9428	0.8037	0.5932	0.3898	0.2615	0.3103	0.5842	0.9136	0.9902	0.9977	(89)
MIT 2	20.0223	19.4702	19.6766	19.7167	19.9171	19.9887	19.9939	19.9980	19.9507	19.5793	19.2333	19.4366	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	20.1645	19.6034	19.8099	19.8566	20.0552	20.1246	20.1301	20.1334	20.0863	19.7199	19.3786	19.5693	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1645	19.6034	19.8099	19.8566	20.0552	20.1246	20.1301	20.1334	20.0863	19.7199	19.3786	19.5693	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9834	0.9397	0.7961	0.5931	0.3928	0.2652	0.3143	0.5854	0.9040	0.9880	0.9973	(94)
Useful gains	1793.3423	2484.5766	3134.8846	3412.9224	2938.7424	1970.6063	1267.9451	1331.4952	2080.9474	2374.9460	1901.4266	1638.4676	(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	6109.1370	5633.3811	5073.5724	4069.8321	3087.2585	1987.5482	1270.0194	1335.8857	2176.9946	3369.8169	4584.8105	5798.7090	(97)
Space heating kWh	3210.9512	2115.9966	1442.3837	472.9750	110.4960	0.0000	0.0000	0.0000	0.0000	740.1840	1932.0364	3095.2196	(98a)
Space heating requirement - total per year (kWh/year)												13120.2425	
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	3210.9512	2115.9966	1442.3837	472.9750	110.4960	0.0000	0.0000	0.0000	0.0000	740.1840	1932.0364	3095.2196	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13120.2425	
Space heating per m2											(98c) / (4) =	36.5833	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	3381.7913	2662.2612	2719.4135	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9574	0.9785	0.9644	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3237.8167	2605.0610	2622.5556	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	5546.9927	5287.5566	4681.3344	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1662.6067	1995.7767	1531.7314	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.5521	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	229.4753	275.4599	211.4117	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												716.3470	(107)

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 %)	405.5871	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)	5.6000	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	3210.9512	2115.9966	1442.3837	472.9750	110.4960	0.0000	0.0000	0.0000	0.0000	740.1840	1932.0364	3095.2196	(98)
Space heating efficiency (main heating system 1)	405.5871	405.5871	405.5871	405.5871	405.5871	0.0000	0.0000	0.0000	0.0000	405.5871	405.5871	405.5871	(210)
Space heating fuel (main heating system)	791.6799	521.7120	355.6286	116.6149	27.2435	0.0000	0.0000	0.0000	0.0000	182.4969	476.3555	763.1455	(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

298.9170	255.1603	255.2646	201.5334	175.4234	149.8849	147.5675	168.0236	186.9188	231.1127	261.0428	296.9273	(64)

Efficiency of water heater

(217)m	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	(217)

Fuel for water heating, kWh/month

174.9467	149.3373	149.3984	117.9512	102.6698	87.7230	86.3666	98.3390	109.3977	135.2630	152.7802	173.7822	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	40.9777	49.1893	37.7521	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	291.9218	263.6713	291.9218	282.5049	291.9218	282.5049	291.9218	291.9218	282.5049	291.9218	282.5049	291.9218	(231)
Lighting	47.8320	38.3726	34.5503	25.3130	19.5525	15.9746	17.8365	23.1845	30.1144	39.5117	44.6284	49.1614	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-42.6442	-66.0913	-103.4493	-124.5022	-142.0623	-135.8709	-134.5677	-122.2231	-101.6408	-78.5125	-48.6291	-36.1108	(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	0.2144	-0.6241	-3.8865	-11.3627	-19.0963	-20.5383	-20.1401	-16.4229	-11.4356	-4.0067	-0.4739	0.1636	(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	3234.8769	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.8617	
Water heating fuel used	1537.9550	(219)
Space cooling fuel	127.9191	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 2.3870)

mechanical ventilation fans (SFP = 2.3870)	3437.1435	(230a)
Total electricity for the above, kWh/year	3437.1435	(231)
Electricity for lighting (calculated in Appendix L)	386.0318	(232)

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

PV generation	-1243.9131	(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	7480.0133	(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	3234.8769	0.1571	508.3430	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1537.9550	0.1430	219.9537	(264)
Space and water heating			728.2967	(265)
Space cooling	127.9191	0.1142	14.6056	(266)
Pumps, fans and electric keep-hot	3437.1435	0.1387	476.7742	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1136.3040	0.1330	-151.1468	
PV Unit electricity exported	-107.6090	0.1150	-12.3746	
Total			-163.5214	(269)
Total CO2, kg/year			1111.8713	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1000	(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	3234.8769	1.5817	5116.6387	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1537.9550	1.5289	2351.4206	(278)
Space and water heating			7468.0593	(279)
Space cooling	127.9191	1.4208	181.7495	(280)
Pumps, fans and electric keep-hot	3437.1435	1.5128	5199.7107	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1136.3040	1.4915	-1694.8206	
PV Unit electricity exported	-107.6090	0.4217	-45.3775	
Total			-1740.1981	(283)
Total Primary energy kWh/year			11701.4299	(286)
Dwelling Primary energy Rate (DPER)			32.6300	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d)	x 2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336	(22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556	(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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer Flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3 Sill	11.0000	0.0500	0.5500
E4 Jamb	135.2400	0.0500	6.7620
E6 Intermediate floor within a dwelling	74.1400	0.0000	0.0000
E16 Corner (normal)	73.2000	0.0900	6.5880
R1 Head of roof window	6.0000	0.0800	0.4800
R2 Sill of roof window	6.0000	0.0600	0.3600
R3 Jamb of roof window	16.0900	0.0800	1.2872
R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22 Basement floor	42.2400	0.0700	2.9568
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6 Flat ceiling	18.4200	0.0600	1.1052
E8 Balcony within a dwelling, wall insulation continuous	12.8000	0.0000	0.0000
E20 Exposed floor (normal)	4.8900	0.3200	1.5648
E21 Exposed floor (inverted)	2.9900	0.3200	0.9568

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		26.7204	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	230.2666	(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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
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												3.2082	(42)
Hot water usage for mixer showers													
	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths													
	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses													
	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												146.3084	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m													
	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.1127	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.1409	(55)
Total storage loss													
	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage													
	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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													
	310.7076	274.7639	291.6737	255.6915	247.3948	222.4006	219.0165	227.9384	230.7083	257.9063	275.0605	307.1969	(62)
WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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													
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)
										Total per year (kWh/year) = Sum(64)m =		2789.0930	(64)
12Total per year (kWh/year)												2789	(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													
	130.7193	116.1155	124.3905	111.5422	109.6677	100.4730	100.2320	103.1985	103.2353	113.1628	117.9824	129.5519	(65)

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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													
(66)m	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	175.6979	172.7909	167.1915	154.9197	147.4029	139.5459	134.7204	138.7076	143.3824	152.1006	163.8645	174.1289	(72)
Total internal gains													
	1008.3103	1037.8821	991.8516	959.9892	908.5653	872.8858	837.3375	836.0928	862.4285	893.7374	949.4083	984.4953	(73)

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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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)

Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)
Living area fraction									fLA = Living area / (4) =			0.1454	(91)
MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)												92.3000	(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	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234	(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	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494	(217)
Fuel for water heating, kWh/month	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359	(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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587	(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												17373.7503	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												3279.1232	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												426.4437	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4741.5806	(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												16423.7367	(238)

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

	Energy	Emission factor	Emissions	

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	
PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Clean - Specified ASHP+PV	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	82 B	**DER**	3.10	**TER**	10.59
Environmental	96 A	**% DER < TER**			70.73
CO_2 Emissions (t/year)	1.01	**DFEE**	47.74	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			4.07
% DPER < TPER	41.63	**DPER**	32.63	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2339	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2339	(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	0.2982	0.2924	0.2865	0.2573	0.2514	0.2222	0.2222	0.2163	0.2339	0.2514	0.2631	0.2748	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5445	0.5427	0.5410	0.5331	0.5316	0.5247	0.5247	0.5234	0.5274	0.5316	0.5346	0.5378	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300	(30)

Sloping roof	44.7600	44.7600	0.0952	4.2629	9.0000	402.8400 (30)
Dormer Flat roof	9.0000	9.0000	0.1000	0.9000	9.0000	81.0000 (30)
Total net area of external elements Aum(A, m2)		684.3800				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		205.7770		(33)
Internal Wall basement		221.6200			9.0000	1994.5800 (32c)
Internal Wall GF		96.4800			9.0000	868.3200 (32c)
Internal Wall FF		236.8400			9.0000	2131.5600 (32c)
Internal Wall SF		186.5000			9.0000	1678.5000 (32c)
Ground floor		95.9300			18.0000	1726.7400 (32d)
First floor		85.5500			18.0000	1539.9000 (32d)
Second floor		78.3800			18.0000	1410.8400 (32d)
Basement Ceiling		95.9300			9.0000	863.3700 (32e)
GF Ceiling		95.9300			9.0000	863.3700 (32e)
FF Ceiling		88.4000			9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		34.2190 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	239.9960 (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	212.0650	211.3925	210.7333	207.6371	207.0579	204.3612	204.3612	203.8618	205.3999	207.0579	208.2297	209.4549	(38)
Heat transfer coeff	452.0610	451.3885	450.7293	447.6332	447.0539	444.3572	444.3572	443.8578	445.3959	447.0539	448.2258	449.4509	(39)
Average = Sum(39)m / 12 =												447.6304	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2605	1.2586	1.2568	1.2481	1.2465	1.2390	1.2390	1.2376	1.2419	1.2465	1.2498	1.2532	(40)
HLP (average)												1.2481	
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												3.2082	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												74.3856	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		710.6291	(64a)
Heat gains from water heating, kWh/month	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800	(74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652	(76)

South				17.7000	46.7521	0.6300	0.7000	0.7700	252.8983	(78)			
West				31.5400	19.6403	0.6300	0.7000	0.7700	189.3132	(80)			
North				3.0000	26.0000	0.6300	0.7000	1.0000	30.9582	(82)			
South				1.8800	26.0000	0.6300	0.7000	1.0000	19.4005	(82)			
East				4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)			
West				4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)			
Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990	(83)
Total gains	1686.6984	2415.1651	3227.9957	4187.1728	4860.2115	4926.3502	4695.3646	4147.5116	3463.0844	2529.8484	1819.5688	1531.2001	(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	43.0678	43.1319	43.1950	43.4938	43.5502	43.8144	43.8144	43.8637	43.7123	43.5502	43.4363	43.3179	
alpha	3.8712	3.8755	3.8797	3.8996	3.9033	3.9210	3.9210	3.9242	3.9142	3.9033	3.8958	3.8879	
util living area	0.9977	0.9906	0.9661	0.8839	0.7298	0.5469	0.4085	0.4763	0.7464	0.9554	0.9941	0.9984	(86)
MIT	18.9311	19.2802	19.7940	20.3935	20.7840	20.9471	20.9868	20.9765	20.8271	20.2103	19.4372	18.8730	(87)
Th 2	19.8719	19.8734	19.8748	19.8817	19.8830	19.8889	19.8889	19.8900	19.8866	19.8830	19.8804	19.8777	(88)
util rest of house	0.9970	0.9880	0.9568	0.8543	0.6710	0.4630	0.3090	0.3686	0.6660	0.9380	0.9921	0.9979	(89)
MIT 2	17.9824	18.3308	18.8372	19.4084	19.7425	19.8644	19.8852	19.8828	19.7907	19.2544	18.4936	17.9286	(90)
Living area fraction									fLA = Living area / (4) =			0.1454	(91)
MIT	18.1204	18.4688	18.9764	19.5516	19.8939	20.0218	20.0454	20.0418	19.9414	19.3934	18.6308	18.0659	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1204	18.4688	18.9764	19.5516	19.8939	20.0218	20.0454	20.0418	19.9414	19.3934	18.6308	18.0659	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9834	0.9470	0.8441	0.6716	0.4735	0.3233	0.3838	0.6704	0.9279	0.9888	0.9968	(94)
Useful gains	1678.9422	2375.0221	3056.9984	3534.4081	3264.2101	2332.4339	1518.2013	1591.7604	2321.8079	2347.4324	1799.2527	1526.2684	(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	6247.6595	6124.8041	5623.4629	4768.0308	3663.1360	2409.2162	1530.9960	1616.4425	2601.7464	3931.1188	5168.4204	6232.0362	(97)
Space heating kWh	3399.1256	2519.8535	1909.4496	888.2083	296.8009	0.0000	0.0000	0.0000	0.0000	1178.2627	2425.8007	3501.0912	(98a)
Space heating requirement - total per year (kWh/year)												16118.5927	
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	3399.1256	2519.8535	1909.4496	888.2083	296.8009	0.0000	0.0000	0.0000	0.0000	1178.2627	2425.8007	3501.0912	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16118.5927	
Space heating per m2											(98c) / (4) =	44.9437	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	4176.9576	3288.2432	3373.3193	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8878	0.9321	0.8990	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3708.1731	3064.8881	3032.5905	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	5460.3459	5204.6194	4597.2049	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1261.5644	1591.9601	1164.0731	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	315.3911	397.9900	291.0183	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												1004.3994	(107)
Energy for space heating												44.9437	(99)
Energy for space cooling												2.8006	(108)
Total												47.7442	(109)
Fabric Energy Efficiency (DFEE)												47.7	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d)	x 2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556	(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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer Flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	Kl Element	Length	Psi-value	Total
	E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
	E3 Sill	11.0000	0.0500	0.5500
	E4 Jamb	135.2400	0.0500	6.7620
	E6 Intermediate floor within a dwelling	74.1400	0.0000	0.0000
	E16 Corner (normal)	73.2000	0.0900	6.5880
	R1 Head of roof window	6.0000	0.0800	0.4800
	R2 Sill of roof window	6.0000	0.0600	0.3600
	R3 Jamb of roof window	16.0900	0.0800	1.2872
	R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
	E22 Basement floor	42.2400	0.0700	2.9568
	E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
	E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
	R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
	R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
	R6 Flat ceiling	18.4200	0.0600	1.1052
	E8 Balcony within a dwelling, wall insulation continuous	12.8000	0.0000	0.0000
	E20 Exposed floor (normal)	4.8900	0.3200	1.5648
	E21 Exposed floor (inverted)	2.9900	0.3200	0.9568

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.7204 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 230.2666 (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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.2082 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)

Hot water usage for other uses
47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581 47.4848 (42c)
Average daily hot water use (litres/day) 74.3856 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)													
	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					710.6291	(64a)
Heat gains from water heating, kWh/month													
	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains													
	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1530.1363	2122.0562	2767.4536	3534.2811	4066.4815	4114.2726	3922.2104	3480.8782	2934.9833	2188.8255	1626.9719	1400.6375	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9984	0.9940	0.9791	0.9242	0.8024	0.6267	0.4770	0.5493	0.8117	0.9711	0.9961	0.9988	(86)
MIT	18.8835	19.1888	19.6590	20.2537	20.6957	20.9174	20.9782	20.9628	20.7661	20.1196	19.3838	18.8400	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9979	0.9923	0.9729	0.9022	0.7496	0.5383	0.3650	0.4313	0.7391	0.9591	0.9947	0.9985	(89)
MIT 2	17.9374	18.2432	18.7102	19.2906	19.6853	19.8603	19.8940	19.8899	19.7601	19.1760	18.4460	17.9000	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9889	0.9653	0.8911	0.7464	0.5481	0.3809	0.4476	0.7398	0.9504	0.9923	0.9977	(94)
Useful gains	1525.0977	2098.5808	2671.3234	3149.4945	3035.1663	2254.8644	1494.0492	1558.0137	2171.2439	2080.2850	1614.3880	1397.3494	(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													
	6205.9919	6060.0629	5538.9643	4675.6410	3603.7839	2377.6959	1515.8956	1598.5164	2558.9128	3861.2608	5108.2564	6180.6080	(97)
Space heating kWh													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98a)
Space heating requirement - total per year (kWh/year)												17199.4787	
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													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												17199.4787	
Space heating per m2											(98c) / (4) =	47.9575	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	4128.2735	3249.9174	3332.1616	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8347	0.8945	0.8512	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3445.7583	2907.1052	2836.1942	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4545.2049	4333.1010	3844.7448	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	791.6016	1060.9409	750.3616	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	197.9004	265.2352	187.5904	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												650.7260	(107)
Energy for space heating												47.9575	(99)
Energy for space cooling												1.8144	(108)
Total												49.7719	(109)
Fabric Energy Efficiency (TFEE)												49.8	(109)

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Clean - Specified ASHP+PV	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	82 B	**DER**	3.10	**TER**	10.59
Environmental	96 A	**% DER < TER**			70.73
CO_2 Emissions (t/year)	1.01	**DFEE**	47.74	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			4.07
% DPER < TPER	41.63	**DPER**	32.63	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	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		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2000	(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	0.2550	0.2500	0.2450	0.2200	0.2150	0.1900	0.1900	0.1850	0.2000	0.2150	0.2250	0.2350	(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) =	76.5000 (23c)

Effective ac	0.3725	0.3675	0.3625	0.3375	0.3325	0.3075	0.3075	0.3025	0.3175	0.3325	0.3425	0.3525	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)

Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600 (30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000 (30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300 (30)
Sloping roof	44.7600		44.7600	0.0952	4.2629	9.0000	402.8400 (30)
Dormer Flat roof	9.0000		9.0000	0.1000	0.9000	9.0000	81.0000 (30)
Total net area of external elements Aum(A, m2)			684.3800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		205.7770		(33)
Internal Wall basement			221.6200			9.0000	1994.5800 (32c)
Internal Wall GF			96.4800			9.0000	868.3200 (32c)
Internal Wall FF			236.8400			9.0000	2131.5600 (32c)
Internal Wall SF			186.5000			9.0000	1678.5000 (32c)
Ground floor			95.9300			18.0000	1726.7400 (32d)
First floor			85.5500			18.0000	1539.9000 (32d)
Second floor			78.3800			18.0000	1410.8400 (32d)
Basement Ceiling			95.9300			9.0000	863.3700 (32e)
GF Ceiling			95.9300			9.0000	863.3700 (32e)
FF Ceiling			88.4000			9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.050 * total exposed area)		34.2190 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	239.9960 (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	145.0860	143.1386	141.1911	131.4538	129.5063	119.7690	119.7690	117.8216	123.6639	129.5063	133.4013	137.2962	(38)
Heat transfer coeff	385.0821	383.1346	381.1871	371.4498	369.5023	359.7650	359.7650	357.8176	363.6600	369.5023	373.3973	377.2922	(39)
Average = Sum(39)m / 12 =												370.9629	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0737	1.0683	1.0629	1.0357	1.0303	1.0031	1.0031	0.9977	1.0140	1.0303	1.0411	1.0520	(40)
HLP (average)												1.0344	
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												3.2082	(42)
Hot water usage for mixer showers													
	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths													
	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses													
	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												146.3084	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m													
	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss													
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage													
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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													
	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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	-6.8910	-15.1781	-31.5094	-49.4165	-67.0718	-67.7741	-66.5494	-55.0152	-39.0480	-21.8940	-9.2761	-5.3699	(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													
	298.9170	255.1603	255.2646	201.5334	175.4234	149.8849	147.5675	168.0236	186.9188	231.1127	261.0428	296.9273	(64)
										Total per year (kWh/year) = Sum(64)m =		2627.7763	(64)
12Total per year (kWh/year)												2628	(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													
	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains													
	1000.0419	1029.6137	983.5832	951.7208	900.2969	867.6174	832.0691	830.8244	857.1601	885.4690	941.1399	976.2269	(73)

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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	
North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800	(74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652	(76)
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983	(78)
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132	(80)
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582	(82)
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005	(82)
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990	(83)
Total gains	1799.4252	2526.4384	3335.9132	4286.9987	4955.2773	5016.3887	4781.9668	4236.4049	3554.7453	2627.1176	1924.5614	1642.8260	(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	50.5587	50.8157	51.0753	52.4143	52.6905	54.1166	54.1166	54.4111	53.5370	52.6905	52.1409	51.6026	
alpha	4.3706	4.3877	4.4050	4.4943	4.5127	4.6078	4.6078	4.6274	4.5691	4.5127	4.4761	4.4402	
util living area	0.9972	0.9881	0.9541	0.8368	0.6465	0.4520	0.3297	0.3855	0.6565	0.9352	0.9925	0.9982	(86)
Living	19.6517	19.9165	20.2823	20.6790	20.8667	20.9231	20.9310	20.9296	20.8833	20.5458	20.0205	19.6293	
Non living	18.4249	18.7657	19.2277	19.7167	19.9171	19.9887	19.9939	19.9980	19.9507	19.5793	18.9171	18.4097	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	5	
16 / 9	0	28	31	0	0	0	0	0	0	0	15	26	
MIT	21.0000	20.3863	20.5935	20.6790	20.8667	20.9231	20.9310	20.9296	20.8833	20.5458	20.2328	20.3489	(87)
Th 2	20.0223	20.0268	20.0313	20.0537	20.0582	20.0807	20.0807	20.0852	20.0717	20.0582	20.0492	20.0402	(88)
util rest of house	0.9965	0.9851	0.9428	0.8037	0.5932	0.3898	0.2615	0.3103	0.5842	0.9136	0.9902	0.9977	(89)
MIT 2	20.0223	19.4702	19.6766	19.7167	19.9171	19.9887	19.9939	19.9980	19.9507	19.5793	19.2333	19.4366	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	20.1645	19.6034	19.8099	19.8566	20.0552	20.1246	20.1301	20.1334	20.0863	19.7199	19.3786	19.5693	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1645	19.6034	19.8099	19.8566	20.0552	20.1246	20.1301	20.1334	20.0863	19.7199	19.3786	19.5693	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9834	0.9397	0.7961	0.5931	0.3928	0.2652	0.3143	0.5854	0.9040	0.9880	0.9973	(94)
Useful gains	1793.3423	2484.5766	3134.8846	3412.9224	2938.7424	1970.6063	1267.9451	1331.4952	2080.9474	2374.9460	1901.4266	1638.4676	(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	6109.1370	5633.3811	5073.5724	4069.8321	3087.2585	1987.5482	1270.0194	1335.8857	2176.9946	3369.8169	4584.8105	5798.7090	(97)
Space heating kWh	3210.9512	2115.9966	1442.3837	472.9750	110.4960	0.0000	0.0000	0.0000	0.0000	740.1840	1932.0364	3095.2196	(98a)
Space heating requirement - total per year (kWh/year)												13120.2425	
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	3210.9512	2115.9966	1442.3837	472.9750	110.4960	0.0000	0.0000	0.0000	0.0000	740.1840	1932.0364	3095.2196	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13120.2425	
Space heating per m2											(98c) / (4) =	36.5833	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	3381.7913	2662.2612	2719.4135	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9574	0.9785	0.9644	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3237.8167	2605.0610	2622.5556	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	5546.9927	5287.5566	4681.3344	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1662.6067	1995.7767	1531.7314	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		0.5521	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	229.4753	275.4599	211.4117	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												716.3470	(107)

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 %)	405.5871	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)	5.6000	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	3210.9512	2115.9966	1442.3837	472.9750	110.4960	0.0000	0.0000	0.0000	0.0000	740.1840	1932.0364	3095.2196	(98)
Space heating efficiency (main heating system 1)	405.5871	405.5871	405.5871	405.5871	405.5871	0.0000	0.0000	0.0000	0.0000	405.5871	405.5871	405.5871	(210)
Space heating fuel (main heating system)	791.6799	521.7120	355.6286	116.6149	27.2435	0.0000	0.0000	0.0000	0.0000	182.4969	476.3555	763.1455	(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

298.9170	255.1603	255.2646	201.5334	175.4234	149.8849	147.5675	168.0236	186.9188	231.1127	261.0428	296.9273	(64)

Efficiency of water heater

(217)m	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	170.8617	(217)

Fuel for water heating, kWh/month

174.9467	149.3373	149.3984	117.9512	102.6698	87.7230	86.3666	98.3390	109.3977	135.2630	152.7802	173.7822	(219)

Space cooling fuel requirement

(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	40.9777	49.1893	37.7521	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	291.9218	263.6713	291.9218	282.5049	291.9218	282.5049	291.9218	291.9218	282.5049	291.9218	282.5049	291.9218	(231)
Lighting	47.8320	38.3726	34.5503	25.3130	19.5525	15.9746	17.8365	23.1845	30.1144	39.5117	44.6284	49.1614	(232)

Electricity generated by PVs (Appendix M) (negative quantity)

(233a)m	-42.6442	-66.0913	-103.4493	-124.5022	-142.0623	-135.8709	-134.5677	-122.2231	-101.6408	-78.5125	-48.6291	-36.1108	(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	0.2144	-0.6241	-3.8865	-11.3627	-19.0963	-20.5383	-20.1401	-16.4229	-11.4356	-4.0067	-0.4739	0.1636	(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	3234.8769	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.8617	
Water heating fuel used	1537.9550	(219)
Space cooling fuel	127.9191	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 2.3870)

mechanical ventilation fans (SFP = 2.3870)	3437.1435	(230a)
Total electricity for the above, kWh/year	3437.1435	(231)
Electricity for lighting (calculated in Appendix L)	386.0318	(232)

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

PV generation	-1243.9131	(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	7480.0133	(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	3234.8769	0.1571	508.3430	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1537.9550	0.1430	219.9537	(264)
Space and water heating			728.2967	(265)
Space cooling	127.9191	0.1142	14.6056	(266)
Pumps, fans and electric keep-hot	3437.1435	0.1387	476.7742	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1136.3040	0.1330	-151.1468	
PV Unit electricity exported	-107.6090	0.1150	-12.3746	
Total			-163.5214	(269)
Total CO2, kg/year			1111.8713	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1000	(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	3234.8769	1.5817	5116.6387	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1537.9550	1.5289	2351.4206	(278)
Space and water heating			7468.0593	(279)
Space cooling	127.9191	1.4208	181.7495	(280)
Pumps, fans and electric keep-hot	3437.1435	1.5128	5199.7107	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1136.3040	1.4915	-1694.8206	
PV Unit electricity exported	-107.6090	0.4217	-45.3775	
Total			-1740.1981	(283)
Total Primary energy kWh/year			11701.4299	(286)
Dwelling Primary energy Rate (DPER)			32.6300	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d)	x 2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336	(22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556	(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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer Flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3 Sill	11.0000	0.0500	0.5500
E4 Jamb	135.2400	0.0500	6.7620
E6 Intermediate floor within a dwelling	74.1400	0.0000	0.0000
E16 Corner (normal)	73.2000	0.0900	6.5880
R1 Head of roof window	6.0000	0.0800	0.4800
R2 Sill of roof window	6.0000	0.0600	0.3600
R3 Jamb of roof window	16.0900	0.0800	1.2872
R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22 Basement floor	42.2400	0.0700	2.9568
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6 Flat ceiling	18.4200	0.0600	1.1052
E8 Balcony within a dwelling, wall insulation continuous	12.8000	0.0000	0.0000
E20 Exposed floor (normal)	4.8900	0.3200	1.5648
E21 Exposed floor (inverted)	2.9900	0.3200	0.9568

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		26.7204	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	230.2666	(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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
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												3.2082	(42)
Hot water usage for mixer showers													
	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths													
	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses													
	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												146.3084	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m													
	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.1127	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.1409	(55)
Total storage loss													
	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage													
	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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													
	310.7076	274.7639	291.6737	255.6915	247.3948	222.4006	219.0165	227.9384	230.7083	257.9063	275.0605	307.1969	(62)
WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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													
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)
										Total per year (kWh/year) = Sum(64)m =		2789.0930	(64)
12Total per year (kWh/year)												2789	(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													
	130.7193	116.1155	124.3905	111.5422	109.6677	100.4730	100.2320	103.1985	103.2353	113.1628	117.9824	129.5519	(65)

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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													
(66)m	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	175.6979	172.7909	167.1915	154.9197	147.4029	139.5459	134.7204	138.7076	143.3824	152.1006	163.8645	174.1289	(72)
Total internal gains													
	1008.3103	1037.8821	991.8516	959.9892	908.5653	872.8858	837.3375	836.0928	862.4285	893.7374	949.4083	984.4953	(73)

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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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)

Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)
Living area fraction									fLA = Living area / (4) =			0.1454	(91)
MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)												92.3000	(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	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234	(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	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494	(217)
Fuel for water heating, kWh/month	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359	(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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587	(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												17373.7503	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												3279.1232	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												426.4437	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4741.5806	(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												16423.7367	(238)

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

	Energy	Emission factor	Emissions	

	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating - main system 1	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	
PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Predicted Energy Assessment

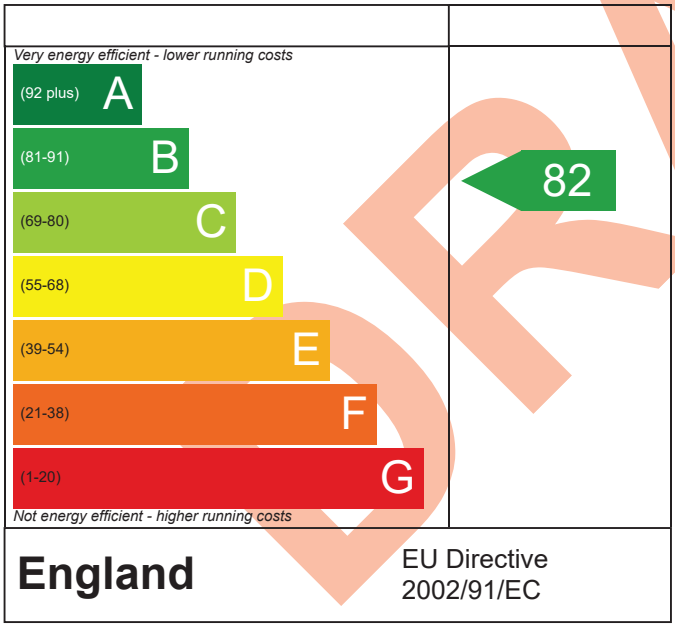
Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP

Dwelling type:	Bungalow, Detached
Date of assessment:	17/12/2024
Produced by:	Paul Pasifull
Total floor area:	358.64 m²
DRRN:	

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

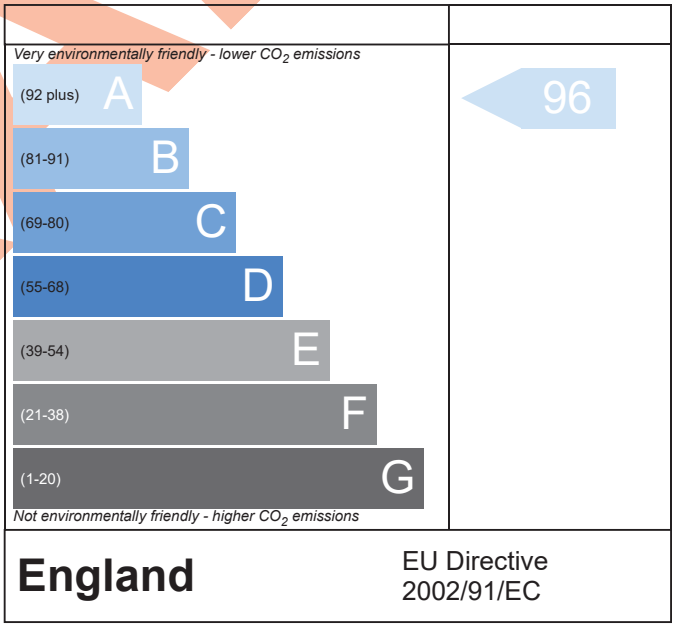
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Green - Specified ASHP	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	79 C	**DER**	3.67	**TER**	10.59
Environmental	96 A	**% DER < TER**			65.34
CO_2 Emissions (t/year)	1.22	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	30.69	**DPER**	38.75	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, Detached	
Which Floor	0	
2.0 Number of Storeys	4	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	195.43	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	42.24 m	95.93 m²	3.50 m
Ground floor:	42.24 m	95.93 m²	3.70 m
1st Storey:	37.11 m	88.40 m²	3.10 m
2nd Storey:	35.44 m	78.38 m²	2.75 m

8.0 Living Area	52.15	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall Basement	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	147.84	131.15	0.00	None	16.69	Enter Gross Area
External Wall GF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	145.84	100.96	0.00	None	44.88	Enter Gross Area
External Wall FF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	119.97	83.83	0.00	None	36.14	Enter Gross Area
External Wall SF	Timber Frame	Timber framed wall (one layer of plasterboard)	0.16	9.00	60.96	60.96	0.00	None	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall basement	Plasterboard on timber frame	9.00	221.62
Internal Wall GF	Plasterboard on timber frame	9.00	96.48
Internal Wall FF	Plasterboard on timber frame	9.00	236.84
Internal Wall SF	Plasterboard on timber frame	9.00	186.50

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Top Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	37.26	24.34	Room In Roof	0.50	Enter Gross Area	12.92

Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	7.70	7.70	None	0.00	Enter Gross Area	0.00
Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	12.27	12.27	Room In Roof	0.50	Enter Gross Area	0.00
Sloping roof	External Slope Roof	Plasterboard, insulated slope	0.10	9.00	44.76	44.76	Room In Roof	0.50	Enter Gross Area	0.00
Dormer Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	9.00	9.00	Room In Roof	0.50	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Basement Ceiling	Basement	Plasterboard ceiling, carpeted chipboard floor	95.93
GF Ceiling	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	95.93
FF Ceiling	+1	Plasterboard ceiling, carpeted chipboard floor	88.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Basement floor	Ground Floor - Solid	Basement	Slab on ground, screed over insulation	0.10	None	0.00	110.00	95.93
First floor	Exposed Floor - Solid	+1	Other	0.10	None	0.00	0.00	2.85

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Ground floor		Plasterboard ceiling, carpeted chipboard floor	9.00	95.93
First floor		Plasterboard ceiling, carpeted chipboard floor	9.00	85.55
Second floor		Plasterboard ceiling, carpeted chipboard floor	9.00	78.38

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Rooflights	Manufacturer	Roof Light	Double Low-E Soft 0.05			0.63		0.70	1.20
Roof windows	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Entrance Door	Manufacturer	Solid Door				0.00			1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Gym glazing door Basement	Windows	External Wall Basement	West	11.20	0
Lounge glazing door GF	Windows	External Wall GF	West	5.60	0
Dining glazing door GF	Windows	External Wall GF	West	5.60	0
Gym windows Basement	Windows	External Wall Basement	North	2.74	0
Gym windows Basement	Windows	External Wall Basement	South	2.74	0
Lounge windows GF	Windows	External Wall GF	North	1.37	0
Dining windows GF	Windows	External Wall GF	North	1.37	0
Lounge windows GF	Windows	External Wall GF	South	1.37	0
Dining windows GF	Windows	External Wall GF	South	1.37	0
Corridor full height glazing FF	Windows	External Wall FF	West	3.18	0
Study glazing door FF	Windows	External Wall FF	West	2.98	0
Master bathroom glazing door FF	Windows	External Wall FF	West	2.98	0
Bedroom roof windows SF	Roof windows	Top Plane roof	West	4.02	0
Staircase windows GF	Windows	External Wall GF	North	5.02	0
Staircase windows FF	Windows	External Wall FF	North	6.48	0
Staircase rooflights SF	Rooflights	Top Plane roof	North	3.00	0
Living & Dining glazing GF	Windows	External Wall GF	East	11.08	0
Master Bedroom glazing FF	Windows	External Wall FF	East	11.08	0
Dressing windows FF	Windows	External Wall FF	East	5.94	0
Kitchen+Dining window GF	Windows	External Wall GF	South	4.94	0
Kitchen+Dining glazing door GF	Windows	External Wall GF	South	3.77	0
Dressing window FF	Windows	External Wall FF	South	3.51	0
Bathroom rooflight	Rooflights	Top Plane roof	South	1.88	0
Bedroom roof windows SF	Roof windows	Top Plane roof	East	4.02	0
Entrance door	Entrance Door	External Wall GF	West	3.38	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging User Input

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate		35.92	0.00	0.00	Yes
E3 Sill		11.00	0.00	0.00	No
E4 Jamb		135.24	0.00	0.00	Yes
E6 Intermediate floor within a dwelling		104.65	0.00	0.00	No
E16 Corner (normal)		73.20	0.00	0.00	No
R1 Head of roof window		6.00	0.00	0.00	No
R2 Sill of roof window		6.00	0.00	0.00	No
R3 Jamb of roof window		16.09	0.00	0.00	No
R11 Upstands or kerbs of rooflights		12.50	0.00	0.00	No
E22 Basement floor		42.24	0.00	0.00	No

E17 Corner (inverted – internal area greater than external area)	19.60	0.00	0.00	No
E11 Eaves (insulation at rafter level)	29.44	0.00	0.00	No
R9 Roof to wall (flat ceiling)	24.00	0.00	0.00	No
R7 Flat ceiling (inverted)	23.50	0.00	0.00	No
R6 Flat ceiling	18.42	0.00	0.00	No
E8 Balcony within a dwelling, wall insulation continuous	12.80	0.00	0.00	No
E21 Exposed floor (inverted)	2.99	0.00	0.00	No
E20 Exposed floor (normal)	4.89	0.00	0.00	No

Y-value	0.06	W/m²K
Description	0.055	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes	
Approved Installation	No	
Mechanical Ventilation data Type	Data Sheet	
Type	Balanced mechanical ventilation with heat recovery	
Manufacturer SFP	2.17	
Duct Type	Rigid	
MVHR Efficiency	85.00	
Wet Rooms	5	
Brand, Model	Swegon Unit	
SFP from Installer Commissioning Certificate	Yes	
MVHR System Location	Inside heated envelope (installed exclusively)	
Duct Installation Specification	Level 1	

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	0
0.15	In Room Fan Other Wet Room	0
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	0	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	Yes	
Cooled Area	198	m²
Data Source	SAP table	
Energy Class	A+	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

Summary for Input Data

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22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	110.00	8.00	880.00	60

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104860	
Fuel Type	Electricity	
SAP Code	0	
In Winter	405.75	
In Summer	170.88	
Model Name	EPRA16DW1 + ETBH16D6V	
Manufacturer	Daikin Europe NV	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
HETAS approved System	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

27.0 Secondary Heating	None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	5
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	

Summary for Input Data

Shower	Vented hot water system	7.00	No
Shower	Vented hot water system	7.00	No
Shower	Vented hot water system	7.00	No

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	300.00	L
Loss	1.82	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

elmhurst energy

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Green - Specified ASHP	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	79 C	**DER**	3.67	**TER**	10.59
Environmental	96 A	**% DER < TER**			65.34
CO_2 Emissions (t/year)	1.22	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	30.69	**DPER**	38.75	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SAP 10 WORKSHEET FOR New Build (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)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	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		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2000	(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	0.2550	0.2500	0.2450	0.2200	0.2150	0.1900	0.1900	0.1850	0.2000	0.2150	0.2250	0.2350	(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) =	76.5000 (23c)

Effective ac	0.3725	0.3675	0.3625	0.3375	0.3325	0.3075	0.3075	0.3025	0.3175	0.3325	0.3425	0.3525	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance Door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)

Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600 (30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000 (30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300 (30)
Sloping roof	44.7600		44.7600	0.0952	4.2629	9.0000	402.8400 (30)
Dormer Flat roof	9.0000		9.0000	0.0952	0.8571	9.0000	81.0000 (30)
Total net area of external elements Aum(A, m2)			684.3800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		205.7342		(33)
Internal Wall basement			221.6200			9.0000	1994.5800 (32c)
Internal Wall GF			96.4800			9.0000	868.3200 (32c)
Internal Wall FF			236.8400			9.0000	2131.5600 (32c)
Internal Wall SF			186.5000			9.0000	1678.5000 (32c)
Ground floor			95.9300			18.0000	1726.7400 (32d)
First floor			85.5500			18.0000	1539.9000 (32d)
Second floor			78.3800			18.0000	1410.8400 (32d)
Basement Ceiling			95.9300			9.0000	863.3700 (32e)
GF Ceiling			95.9300			9.0000	863.3700 (32e)
FF Ceiling			88.4000			9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)	37.6409 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 243.3751 (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	145.0860	143.1386	141.1911	131.4538	129.5063	119.7690	119.7690	117.8216	123.6639	129.5063	133.4013	137.2962	(38)
Heat transfer coeff	388.4611	386.5136	384.5662	374.8289	372.8814	363.1441	363.1441	361.1966	367.0390	372.8814	376.7763	380.6712	(39)
Average = Sum(39)m / 12 =												374.3420	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0832	1.0777	1.0723	1.0451	1.0397	1.0126	1.0126	1.0071	1.0234	1.0397	1.0506	1.0614	(40)
HLP (average)												1.0438	
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												3.2082	(42)
Hot water usage for mixer showers													
	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths													
	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses													
	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												146.3084	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m													
	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss													
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage													
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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													
	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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													
	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
										Total per year (kWh/year) = Sum(64)m =		3062.7700	(64)
12Total per year (kWh/year)												3063	(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													
	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains													
	1000.0419	1029.6137	983.5832	951.7208	900.2969	867.6174	832.0691	830.8244	857.1601	885.4690	941.1399	976.2269	(73)

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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	
North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800	(74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652	(76)
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983	(78)
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132	(80)
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582	(82)
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005	(82)
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990	(83)
Total gains	1799.4252	2526.4384	3335.9132	4286.9987	4955.2773	5016.3887	4781.9668	4236.4049	3554.7453	2627.1176	1924.5614	1642.8260	(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	50.1190	50.3715	50.6266	51.9417	52.2130	53.6131	53.6131	53.9021	53.0441	52.2130	51.6733	51.1446	
alpha	4.3413	4.3581	4.3751	4.4628	4.4809	4.5742	4.5742	4.5935	4.5363	4.4809	4.4449	4.4096	
util living area	0.9972	0.9882	0.9547	0.8392	0.6504	0.4558	0.3327	0.3889	0.6605	0.9361	0.9926	0.9981	(86)
Living	19.6384	19.9032	20.2702	20.6706	20.8630	20.9219	20.9304	20.9288	20.8803	20.5371	20.0089	19.6159	
Non living	18.4020	18.7429	19.2065	19.7002	19.9060	19.9798	19.9853	19.9894	19.9406	19.5624	18.8964	18.3867	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	7	
16 / 9	0	28	31	0	0	0	0	0	0	0	16	24	
MIT	21.0000	20.3788	20.5866	20.6706	20.8630	20.9219	20.9304	20.9288	20.8803	20.5371	20.2381	20.3931	(87)
Th 2	20.0146	20.0191	20.0235	20.0459	20.0504	20.0729	20.0729	20.0774	20.0639	20.0504	20.0414	20.0325	(88)
util rest of house	0.9965	0.9851	0.9434	0.8062	0.5968	0.3927	0.2633	0.3125	0.5876	0.9147	0.9902	0.9976	(89)
MIT 2	20.0146	19.4558	19.6629	19.7002	19.9060	19.9798	19.9853	19.9894	19.9406	19.5624	19.2375	19.4701	(90)
Living area fraction									fLA = Living area / (4) =			0.1454	(91)
MIT	20.1579	19.5900	19.7972	19.8413	20.0452	20.1168	20.1228	20.1260	20.0772	19.7042	19.3830	19.6043	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1579	19.5900	19.7972	19.8413	20.0452	20.1168	20.1228	20.1260	20.0772	19.7042	19.3830	19.6043	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9835	0.9404	0.7984	0.5965	0.3957	0.2670	0.3166	0.5887	0.9050	0.9881	0.9974	(94)
Useful gains	1793.3231	2484.7621	3136.9527	3422.6914	2955.6339	1985.2180	1277.0174	1341.0666	2092.8233	2377.5215	1901.6123	1638.4957	(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	6160.1782	5677.8900	5113.6667	4101.1312	3111.7612	2003.3983	1279.2698	1345.8098	2193.8738	3394.7688	4627.9594	5863.9692	(97)
Space heating kWh	3248.9402	2145.7819	1470.6753	488.4767	116.1588	0.0000	0.0000	0.0000	0.0000	756.8319	1962.9699	3143.7522	(98a)
Space heating requirement - total per year (kWh/year)												13333.5869	
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	3248.9402	2145.7819	1470.6753	488.4767	116.1588	0.0000	0.0000	0.0000	0.0000	756.8319	1962.9699	3143.7522	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13333.5869	
Space heating per m2											(98c) / (4) =	37.1782	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	3413.5543	2687.2661	2745.0942	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9553	0.9772	0.9625	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3260.8776	2626.0852	2642.0957	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	5546.9927	5287.5566	4681.3344	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1646.0029	1980.1347	1517.1936	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.5521	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	227.1837	273.3010	209.4052	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												709.8898	(107)

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 %)	405.7454	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)	5.6000	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	3248.9402	2145.7819	1470.6753	488.4767	116.1588	0.0000	0.0000	0.0000	0.0000	756.8319	1962.9699	3143.7522	(98)
Space heating efficiency (main heating system 1)	405.7454	405.7454	405.7454	405.7454	405.7454	0.0000	0.0000	0.0000	0.0000	405.7454	405.7454	405.7454	(210)
Space heating fuel (main heating system)	800.7337	528.8494	362.4626	120.3899	28.6285	0.0000	0.0000	0.0000	0.0000	186.5288	483.7935	774.8091	(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
305.8080 270.3385 286.7741 250.9499 242.4952 217.6591 214.1169 223.0388 225.9667 253.0067 270.3190 302.2973 (64)
Efficiency of water heater 170.8781 (216)
(217)m 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 (217)
Fuel for water heating, kWh/month
178.9627 158.2055 167.8238 146.8590 141.9112 127.3768 125.3039 130.5251 132.2386 148.0627 158.1941 176.9082 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 40.5685 48.8037 37.3938 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 291.9218 263.6713 291.9218 282.5049 291.9218 282.5049 291.9218 291.9218 282.5049 291.9218 282.5049 291.9218 (231)
Lighting 47.8320 38.3726 34.5503 25.3130 19.5525 15.9746 17.8365 23.1845 30.1144 39.5117 44.6284 49.1614 (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 3286.1956 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 170.8781
Water heating fuel used 1792.3715 (219)
Space cooling fuel 126.7660 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 2.3870)
mechanical ventilation fans (SFP = 2.3870) 3437.1435 (230a)
Total electricity for the above, kWh/year 3437.1435 (231)
Electricity for lighting (calculated in Appendix L) 386.0318 (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 9028.5085 (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	3286.1956	0.1571	516.3016	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1792.3715	0.1410	252.6997	(264)
Space and water heating			769.0013	(265)
Space cooling	126.7660	0.1142	14.4735	(266)
Pumps, fans and electric keep-hot	3437.1435	0.1387	476.7742	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Total CO2, kg/year			1315.9654	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6700	(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	3286.1956	1.5816	5197.4244	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1792.3715	1.5213	2726.7711	(278)
Space and water heating			7924.1955	(279)
Space cooling	126.7660	1.4208	180.1099	(280)
Pumps, fans and electric keep-hot	3437.1435	1.5128	5199.7107	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Total Primary energy kWh/year			13896.1246	(286)
Dwelling Primary energy Rate (DPER)			38.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a)	= 335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b)	= 354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c)	= 274.0400	(1c) - (3c)

Second floor		78.3800 (1d) x 2.7500 (2d) =	215.5450 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1180.2810	(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		4 * 10 =	40.0000 (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) =		40.0000 / (5) =	0.0339 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.2839 (18)
Number of sides sheltered			0 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2839 (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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336	(22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556	(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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer Flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E1	Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3	Sill	11.0000	0.0500	0.5500
E4	Jamb	135.2400	0.0500	6.7620
E6	Intermediate floor within a dwelling	104.6500	0.0000	0.0000
E16	Corner (normal)	73.2000	0.0900	6.5880
R1	Head of roof window	6.0000	0.0800	0.4800
R2	Sill of roof window	6.0000	0.0600	0.3600
R3	Jamb of roof window	16.0900	0.0800	1.2872
R11	Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22	Basement floor	42.2400	0.0700	2.9568
E17	Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11	Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9	Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7	Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6	Flat ceiling	18.4200	0.0600	1.1052
E8	Balcony within a dwelling, wall insulation continuous	12.8000	0.0000	0.0000
E21	Exposed floor (inverted)	2.9900	0.3200	0.9568
E20	Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			26.7204 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	230.2666 (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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)
Average = Sum(39)m / 12 =												444.0003	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.2082 (42)

Hot water usage for mixer showers
78.0103 76.8379 75.1296 71.8610 69.4489 66.7589 65.2299 66.9253 68.7838 71.6720 75.0108 77.7114 (42a)

Hot water usage for baths
33.6702 33.1701 32.4660 31.1676 30.1954 29.1174 28.5351 29.2343 29.9957 31.1492 32.4743 33.5564 (42b)

Hot water usage for other uses
47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581 47.4848 (42c)

Average daily hot water use (litres/day) 146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)

Energy content (annual) Total = Sum(45)m = 2430.1520

Distribution loss (46)m = 0.15 x (45)m
37.8118 33.2713 34.9567 29.8431 28.3149 24.8495 24.0582 25.3964 26.0956 29.8916 32.7484 37.2852 (46)

Water storage loss:
Store volume 300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.1127 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.1409 (55)

Total storage loss
35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 (56)

If cylinder contains dedicated solar storage
35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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
310.7076 274.7639 291.6737 255.6915 247.3948 222.4006 219.0165 227.9384 230.7083 257.9063 275.0605 307.1969 (62)

WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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
275.0446 243.2232 258.6461 228.3433 221.9073 200.5908 198.5733 206.1991 208.1430 231.3043 244.9237 272.1943 (64)

Total per year (kWh/year) = Sum(64)m = 2789.0930 (64)

12Total per year (kWh/year) 2789 (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
130.7193 116.1155 124.3905 111.5422 109.6677 100.4730 100.2320 103.1985 103.2353 113.1628 117.9824 129.5519 (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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
254.3040 281.5508 254.3040 262.7808 254.3040 262.7808 254.3040 254.3040 262.7808 254.3040 262.7808 254.3040 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
504.1860 509.4179 496.2338 468.1663 432.7361 399.4367 377.1907 371.9588 385.1430 413.2105 448.6406 481.9400 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 (69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)
-128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 (71)

Water heating gains (Table 5)
175.6979 172.7909 167.1915 154.9197 147.4029 139.5459 134.7204 138.7076 143.3824 152.1006 163.8645 174.1289 (72)

Total internal gains
1008.3103 1037.8821 991.8516 959.9892 908.5653 872.8858 837.3375 836.0928 862.4285 893.7374 949.4083 984.4953 (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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)

Living area fraction fLA = Living area / (4) = 0.1454 (91)

MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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													
	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)												92.3000	(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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234	(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													
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494	(217)
Fuel for water heating, kWh/month													
	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359	(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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587	(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	17373.7503	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3279.1232	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	426.4437	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4741.5806	(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	16423.7367	(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	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	

PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Green - Specified ASHP	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	79 C	**DER**	3.67	**TER**	10.59
Environmental	96 A	**% DER < TER**			65.34
CO_2 Emissions (t/year)	1.22	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	30.69	**DPER**	38.75	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2339	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2339	(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	0.2982	0.2924	0.2865	0.2573	0.2514	0.2222	0.2222	0.2163	0.2339	0.2514	0.2631	0.2748	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5445	0.5427	0.5410	0.5331	0.5316	0.5247	0.5247	0.5234	0.5274	0.5316	0.5346	0.5378	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance Door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300	(30)

Sloping roof	44.7600	44.7600	0.0952	4.2629	9.0000	402.8400 (30)
Dormer Flat roof	9.0000	9.0000	0.0952	0.8571	9.0000	81.0000 (30)
Total net area of external elements Aum(A, m2)		684.3800				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		205.7342		(33)
Internal Wall basement		221.6200			9.0000	1994.5800 (32c)
Internal Wall GF		96.4800			9.0000	868.3200 (32c)
Internal Wall FF		236.8400			9.0000	2131.5600 (32c)
Internal Wall SF		186.5000			9.0000	1678.5000 (32c)
Ground floor		95.9300			18.0000	1726.7400 (32d)
First floor		85.5500			18.0000	1539.9000 (32d)
Second floor		78.3800			18.0000	1410.8400 (32d)
Basement Ceiling		95.9300			9.0000	863.3700 (32e)
GF Ceiling		95.9300			9.0000	863.3700 (32e)
FF Ceiling		88.4000			9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	243.3751 (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	212.0650	211.3925	210.7333	207.6371	207.0579	204.3612	204.3612	203.8618	205.3999	207.0579	208.2297	209.4549	(38)
Heat transfer coeff	455.4401	454.7676	454.1084	451.0122	450.4329	447.7362	447.7362	447.2369	448.7750	450.4329	451.6048	452.8300	(39)
Average = Sum(39)m / 12 =												451.0094	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2699	1.2680	1.2662	1.2576	1.2559	1.2484	1.2484	1.2470	1.2513	1.2559	1.2592	1.2626	(40)
HLP (average)												1.2576	
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												3.2082	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												74.3856	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		710.6291	(64a)
Heat gains from water heating, kWh/month	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800	(74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652	(76)

South				17.7000	46.7521	0.6300	0.7000	0.7700	252.8983	(78)			
West				31.5400	19.6403	0.6300	0.7000	0.7700	189.3132	(80)			
North				3.0000	26.0000	0.6300	0.7000	1.0000	30.9582	(82)			
South				1.8800	26.0000	0.6300	0.7000	1.0000	19.4005	(82)			
East				4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)			
West				4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)			
Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990	(83)
Total gains	1686.6984	2415.1651	3227.9957	4187.1728	4860.2115	4926.3502	4695.3646	4147.5116	3463.0844	2529.8484	1819.5688	1531.2001	(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	42.7482	42.8115	42.8736	43.1679	43.2234	43.4838	43.4838	43.5323	43.3831	43.2234	43.1113	42.9946	
alpha	3.8499	3.8541	3.8582	3.8779	3.8816	3.8989	3.8989	3.9022	3.8922	3.8816	3.8741	3.8663	
util living area	0.9976	0.9906	0.9664	0.8851	0.7323	0.5500	0.4112	0.4793	0.7489	0.9557	0.9941	0.9984	(86)
MIT	18.9154	19.2645	19.7795	20.3821	20.7777	20.9449	20.9861	20.9754	20.8222	20.1999	19.4238	18.8573	(87)
Th 2	19.8645	19.8660	19.8674	19.8742	19.8755	19.8815	19.8815	19.8826	19.8792	19.8755	19.8729	19.8702	(88)
util rest of house	0.9970	0.9880	0.9571	0.8556	0.6734	0.4653	0.3106	0.3704	0.6683	0.9384	0.9921	0.9979	(89)
MIT 2	17.9615	18.3098	18.8175	19.3919	19.7309	19.8559	19.8776	19.8750	19.7805	19.2387	18.4749	17.9076	(90)
Living area fraction									fLA = Living area / (4) =			0.1454	(91)
MIT	18.1002	18.4486	18.9574	19.5359	19.8831	20.0142	20.0388	20.0350	19.9320	19.3785	18.6129	18.0457	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1002	18.4486	18.9574	19.5359	19.8831	20.0142	20.0388	20.0350	19.9320	19.3785	18.6129	18.0457	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9834	0.9473	0.8452	0.6738	0.4758	0.3250	0.3857	0.6725	0.9283	0.9888	0.9968	(94)
Useful gains	1678.8873	2374.9964	3057.7301	3539.1064	3275.0044	2344.1140	1526.2195	1599.8643	2329.0917	2348.3462	1799.1971	1526.2243	(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	6285.1645	6161.4829	5656.9928	4796.9204	3685.9457	2424.1525	1539.6682	1625.6988	2617.2487	3954.1093	5199.2878	6269.7301	(97)
Space heating kWh	3427.0703	2544.5190	1933.8515	905.6261	305.7404	0.0000	0.0000	0.0000	0.0000	1194.6877	2448.0653	3529.1683	(98a)
Space heating requirement - total per year (kWh/year)												16288.7285	
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	3427.0703	2544.5190	1933.8515	905.6261	305.7404	0.0000	0.0000	0.0000	0.0000	1194.6877	2448.0653	3529.1683	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16288.7285	
Space heating per m2											(98c) / (4) =	45.4180	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	4208.7206	3313.2481	3399.0001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8847	0.9299	0.8961	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3723.6534	3080.8348	3045.9868	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	5460.3459	5204.6194	4597.2049	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1250.4186	1580.0957	1154.1062	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	312.6046	395.0239	288.5266	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												996.1551	(107)
Energy for space heating												45.4180	(99)
Energy for space cooling												2.7776	(108)
Total												48.1956	(109)
Fabric Energy Efficiency (DFEE)												48.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Basement floor		95.9300 (1a)	x	3.5000 (2a)	=	335.7550 (1a) - (3a)	
Ground floor		95.9300 (1b)	x	3.7000 (2b)	=	354.9410 (1b) - (3b)	
First floor		88.4000 (1c)	x	3.1000 (2c)	=	274.0400 (1c) - (3c)	
Second floor		78.3800 (1d)	x	2.7500 (2d)	=	215.5450 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556	(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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer Flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	195.4309	(35)

List of Thermal Bridges

	Kl Element	Length	Psi-value	Total
	E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
	E3 Sill	11.0000	0.0500	0.5500
	E4 Jamb	135.2400	0.0500	6.7620
	E6 Intermediate floor within a dwelling	104.6500	0.0000	0.0000
	E16 Corner (normal)	73.2000	0.0900	6.5880
	R1 Head of roof window	6.0000	0.0800	0.4800
	R2 Sill of roof window	6.0000	0.0600	0.3600
	R3 Jamb of roof window	16.0900	0.0800	1.2872
	R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
	E22 Basement floor	42.2400	0.0700	2.9568
	E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
	E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
	R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
	R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
	R6 Flat ceiling	18.4200	0.0600	1.1052
	E8 Balcony within a dwelling, wall insulation continuous	12.8000	0.0000	0.0000
	E21 Exposed floor (inverted)	2.9900	0.3200	0.9568
	E20 Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	26.7204	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 230.2666	(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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 =	444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.2082	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)

Hot water usage for other uses
47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581 47.4848 (42c)
Average daily hot water use (litres/day) 74.3856 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)													
	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					710.6291	(64a)
Heat gains from water heating, kWh/month													
	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains													
	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1530.1363	2122.0562	2767.4536	3534.2811	4066.4815	4114.2726	3922.2104	3480.8782	2934.9833	2188.8255	1626.9719	1400.6375	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9984	0.9940	0.9791	0.9242	0.8024	0.6267	0.4770	0.5493	0.8117	0.9711	0.9961	0.9988	(86)
MIT	18.8835	19.1888	19.6590	20.2537	20.6957	20.9174	20.9782	20.9628	20.7661	20.1196	19.3838	18.8400	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9979	0.9923	0.9729	0.9022	0.7496	0.5383	0.3650	0.4313	0.7391	0.9591	0.9947	0.9985	(89)
MIT 2	17.9374	18.2432	18.7102	19.2906	19.6853	19.8603	19.8940	19.8899	19.7601	19.1760	18.4460	17.9000	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9889	0.9653	0.8911	0.7464	0.5481	0.3809	0.4476	0.7398	0.9504	0.9923	0.9977	(94)
Useful gains	1525.0977	2098.5808	2671.3234	3149.4945	3035.1663	2254.8644	1494.0492	1558.0137	2171.2439	2080.2850	1614.3880	1397.3494	(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													
	6205.9919	6060.0629	5538.9643	4675.6410	3603.7839	2377.6959	1515.8956	1598.5164	2558.9128	3861.2608	5108.2564	6180.6080	(97)
Space heating kWh													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98a)
Space heating requirement - total per year (kWh/year)												17199.4787	
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													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												17199.4787	
Space heating per m2											(98c) / (4) =	47.9575	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	4128.2735	3249.9174	3332.1616	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8347	0.8945	0.8512	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3445.7583	2907.1052	2836.1942	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4545.2049	4333.1010	3844.7448	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	791.6016	1060.9409	750.3616	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	197.9004	265.2352	187.5904	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												650.7260	(107)
Energy for space heating												47.9575	(99)
Energy for space cooling												1.8144	(108)
Total												49.7719	(109)
Fabric Energy Efficiency (TFEE)												49.8	(109)

Full SAP Calculation Printout

elmhurst energy

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Green - Specified ASHP	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	79 C	**DER**	3.67	**TER**	10.59
Environmental	96 A	**% DER < TER**			65.34
CO_2 Emissions (t/year)	1.22	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	30.69	**DPER**	38.75	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SAP 10 WORKSHEET FOR New Build (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)	
Basement floor	95.9300	(1a) x	3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b) x	3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c) x	3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d) x	2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	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		4.0000	(17)
Infiltration rate		0.2000	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2000	(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	0.2550	0.2500	0.2450	0.2200	0.2150	0.1900	0.1900	0.1850	0.2000	0.2150	0.2250	0.2350	(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) =	76.5000 (23c)

Effective ac	0.3725	0.3675	0.3625	0.3375	0.3325	0.3075	0.3075	0.3025	0.3175	0.3325	0.3425	0.3525	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance Door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)

Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600 (30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000 (30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300 (30)
Sloping roof	44.7600		44.7600	0.0952	4.2629	9.0000	402.8400 (30)
Dormer Flat roof	9.0000		9.0000	0.0952	0.8571	9.0000	81.0000 (30)
Total net area of external elements Aum(A, m2)			684.3800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		205.7342		(33)
Internal Wall basement			221.6200			9.0000	1994.5800 (32c)
Internal Wall GF			96.4800			9.0000	868.3200 (32c)
Internal Wall FF			236.8400			9.0000	2131.5600 (32c)
Internal Wall SF			186.5000			9.0000	1678.5000 (32c)
Ground floor			95.9300			18.0000	1726.7400 (32d)
First floor			85.5500			18.0000	1539.9000 (32d)
Second floor			78.3800			18.0000	1410.8400 (32d)
Basement Ceiling			95.9300			9.0000	863.3700 (32e)
GF Ceiling			95.9300			9.0000	863.3700 (32e)
FF Ceiling			88.4000			9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)	37.6409 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 243.3751 (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	145.0860	143.1386	141.1911	131.4538	129.5063	119.7690	119.7690	117.8216	123.6639	129.5063	133.4013	137.2962	(38)
Heat transfer coeff	388.4611	386.5136	384.5662	374.8289	372.8814	363.1441	363.1441	361.1966	367.0390	372.8814	376.7763	380.6712	(39)
Average = Sum(39)m / 12 =												374.3420	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0832	1.0777	1.0723	1.0451	1.0397	1.0126	1.0126	1.0071	1.0234	1.0397	1.0506	1.0614	(40)
HLP (average)												1.0438	
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												3.2082	(42)
Hot water usage for mixer showers													
	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths													
	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses													
	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												146.3084	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m													
	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss													
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage													
	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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													
	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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													
	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
										Total per year (kWh/year) = Sum(64)m =		3062.7700	(64)
12Total per year (kWh/year)												3063	(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													
	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains													
	1000.0419	1029.6137	983.5832	951.7208	900.2969	867.6174	832.0691	830.8244	857.1601	885.4690	941.1399	976.2269	(73)

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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	
North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800	(74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652	(76)
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983	(78)
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132	(80)
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582	(82)
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005	(82)
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990	(83)
Total gains	1799.4252	2526.4384	3335.9132	4286.9987	4955.2773	5016.3887	4781.9668	4236.4049	3554.7453	2627.1176	1924.5614	1642.8260	(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	50.1190	50.3715	50.6266	51.9417	52.2130	53.6131	53.6131	53.9021	53.0441	52.2130	51.6733	51.1446	
alpha	4.3413	4.3581	4.3751	4.4628	4.4809	4.5742	4.5742	4.5935	4.5363	4.4809	4.4449	4.4096	
util living area	0.9972	0.9882	0.9547	0.8392	0.6504	0.4558	0.3327	0.3889	0.6605	0.9361	0.9926	0.9981	(86)
Living	19.6384	19.9032	20.2702	20.6706	20.8630	20.9219	20.9304	20.9288	20.8803	20.5371	20.0089	19.6159	
Non living	18.4020	18.7429	19.2065	19.7002	19.9060	19.9798	19.9853	19.9894	19.9406	19.5624	18.8964	18.3867	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	31	0	0	0	0	0	0	0	0	0	0	7	
16 / 9	0	28	31	0	0	0	0	0	0	0	16	24	
MIT	21.0000	20.3788	20.5866	20.6706	20.8630	20.9219	20.9304	20.9288	20.8803	20.5371	20.2381	20.3931	(87)
Th 2	20.0146	20.0191	20.0235	20.0459	20.0504	20.0729	20.0729	20.0774	20.0639	20.0504	20.0414	20.0325	(88)
util rest of house	0.9965	0.9851	0.9434	0.8062	0.5968	0.3927	0.2633	0.3125	0.5876	0.9147	0.9902	0.9976	(89)
MIT 2	20.0146	19.4558	19.6629	19.7002	19.9060	19.9798	19.9853	19.9894	19.9406	19.5624	19.2375	19.4701	(90)
Living area fraction									fLA = Living area / (4) =			0.1454	(91)
MIT	20.1579	19.5900	19.7972	19.8413	20.0452	20.1168	20.1228	20.1260	20.0772	19.7042	19.3830	19.6043	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1579	19.5900	19.7972	19.8413	20.0452	20.1168	20.1228	20.1260	20.0772	19.7042	19.3830	19.6043	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9835	0.9404	0.7984	0.5965	0.3957	0.2670	0.3166	0.5887	0.9050	0.9881	0.9974	(94)
Useful gains	1793.3231	2484.7621	3136.9527	3422.6914	2955.6339	1985.2180	1277.0174	1341.0666	2092.8233	2377.5215	1901.6123	1638.4957	(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	6160.1782	5677.8900	5113.6667	4101.1312	3111.7612	2003.3983	1279.2698	1345.8098	2193.8738	3394.7688	4627.9594	5863.9692	(97)
Space heating kWh	3248.9402	2145.7819	1470.6753	488.4767	116.1588	0.0000	0.0000	0.0000	0.0000	756.8319	1962.9699	3143.7522	(98a)
Space heating requirement - total per year (kWh/year)												13333.5869	
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	3248.9402	2145.7819	1470.6753	488.4767	116.1588	0.0000	0.0000	0.0000	0.0000	756.8319	1962.9699	3143.7522	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13333.5869	
Space heating per m2											(98c) / (4) =	37.1782	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	3413.5543	2687.2661	2745.0942	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9553	0.9772	0.9625	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3260.8776	2626.0852	2642.0957	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	5546.9927	5287.5566	4681.3344	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1646.0029	1980.1347	1517.1936	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			0.5521	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	227.1837	273.3010	209.4052	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												709.8898	(107)

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 %)	405.7454	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Cooling System Energy Efficiency Ratio (see Table 10c)	5.6000	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	3248.9402	2145.7819	1470.6753	488.4767	116.1588	0.0000	0.0000	0.0000	0.0000	756.8319	1962.9699	3143.7522	(98)
Space heating efficiency (main heating system 1)	405.7454	405.7454	405.7454	405.7454	405.7454	0.0000	0.0000	0.0000	0.0000	405.7454	405.7454	405.7454	(210)
Space heating fuel (main heating system)	800.7337	528.8494	362.4626	120.3899	28.6285	0.0000	0.0000	0.0000	0.0000	186.5288	483.7935	774.8091	(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
305.8080 270.3385 286.7741 250.9499 242.4952 217.6591 214.1169 223.0388 225.9667 253.0067 270.3190 302.2973 (64)
Efficiency of water heater 170.8781 (216)
(217)m 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 170.8781 (217)
Fuel for water heating, kWh/month
178.9627 158.2055 167.8238 146.8590 141.9112 127.3768 125.3039 130.5251 132.2386 148.0627 158.1941 176.9082 (219)
Space cooling fuel requirement
(221)m 0.0000 0.0000 0.0000 0.0000 0.0000 40.5685 48.8037 37.3938 0.0000 0.0000 0.0000 0.0000 (221)
Pumps and Fa 291.9218 263.6713 291.9218 282.5049 291.9218 282.5049 291.9218 291.9218 282.5049 291.9218 282.5049 291.9218 (231)
Lighting 47.8320 38.3726 34.5503 25.3130 19.5525 15.9746 17.8365 23.1845 30.1144 39.5117 44.6284 49.1614 (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 3286.1956 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 170.8781
Water heating fuel used 1792.3715 (219)
Space cooling fuel 126.7660 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.1000, SFP = 2.3870)
mechanical ventilation fans (SFP = 2.3870) 3437.1435 (230a)
Total electricity for the above, kWh/year 3437.1435 (231)
Electricity for lighting (calculated in Appendix L) 386.0318 (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 9028.5085 (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	3286.1956	0.1571	516.3016	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1792.3715	0.1410	252.6997	(264)
Space and water heating			769.0013	(265)
Space cooling	126.7660	0.1142	14.4735	(266)
Pumps, fans and electric keep-hot	3437.1435	0.1387	476.7742	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Total CO2, kg/year			1315.9654	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.6700	(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	3286.1956	1.5816	5197.4244	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1792.3715	1.5213	2726.7711	(278)
Space and water heating			7924.1955	(279)
Space cooling	126.7660	1.4208	180.1099	(280)
Pumps, fans and electric keep-hot	3437.1435	1.5128	5199.7107	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Total Primary energy kWh/year			13896.1246	(286)
Dwelling Primary energy Rate (DPER)			38.7500	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a)	= 335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b)	= 354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c)	= 274.0400	(1c) - (3c)

Second floor		78.3800 (1d) x 2.7500 (2d) =	215.5450 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	1180.2810	(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		4 * 10 =	40.0000 (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) =		40.0000 / (5) =	0.0339 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.2839 (18)
Number of sides sheltered			0 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2839 (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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336	(22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556	(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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer Flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E1	Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3	Sill	11.0000	0.0500	0.5500
E4	Jamb	135.2400	0.0500	6.7620
E6	Intermediate floor within a dwelling	104.6500	0.0000	0.0000
E16	Corner (normal)	73.2000	0.0900	6.5880
R1	Head of roof window	6.0000	0.0800	0.4800
R2	Sill of roof window	6.0000	0.0600	0.3600
R3	Jamb of roof window	16.0900	0.0800	1.2872
R11	Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22	Basement floor	42.2400	0.0700	2.9568
E17	Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11	Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9	Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7	Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6	Flat ceiling	18.4200	0.0600	1.1052
E8	Balcony within a dwelling, wall insulation continuous	12.8000	0.0000	0.0000
E21	Exposed floor (inverted)	2.9900	0.3200	0.9568
E20	Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K)			26.7204 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	230.2666 (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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)
Average = Sum(39)m / 12 =												444.0003	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.2082 (42)

Hot water usage for mixer showers
78.0103 76.8379 75.1296 71.8610 69.4489 66.7589 65.2299 66.9253 68.7838 71.6720 75.0108 77.7114 (42a)

Hot water usage for baths
33.6702 33.1701 32.4660 31.1676 30.1954 29.1174 28.5351 29.2343 29.9957 31.1492 32.4743 33.5564 (42b)

Hot water usage for other uses
47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581 47.4848 (42c)

Average daily hot water use (litres/day) 146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)

Energy content (annual) Total = Sum(45)m = 2430.1520

Distribution loss (46)m = 0.15 x (45)m
37.8118 33.2713 34.9567 29.8431 28.3149 24.8495 24.0582 25.3964 26.0956 29.8916 32.7484 37.2852 (46)

Water storage loss:
Store volume 300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 2.1127 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.1409 (55)

Total storage loss
35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 (56)

If cylinder contains dedicated solar storage
35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 (57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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
310.7076 274.7639 291.6737 255.6915 247.3948 222.4006 219.0165 227.9384 230.7083 257.9063 275.0605 307.1969 (62)

WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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
275.0446 243.2232 258.6461 228.3433 221.9073 200.5908 198.5733 206.1991 208.1430 231.3043 244.9237 272.1943 (64)

Total per year (kWh/year) = Sum(64)m = 2789.0930 (64)

12Total per year (kWh/year) 2789 (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
130.7193 116.1155 124.3905 111.5422 109.6677 100.4730 100.2320 103.1985 103.2353 113.1628 117.9824 129.5519 (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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
254.3040 281.5508 254.3040 262.7808 254.3040 262.7808 254.3040 254.3040 262.7808 254.3040 262.7808 254.3040 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
504.1860 509.4179 496.2338 468.1663 432.7361 399.4367 377.1907 371.9588 385.1430 413.2105 448.6406 481.9400 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 39.0408 (69)

Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)
-128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 -128.3265 (71)

Water heating gains (Table 5)
175.6979 172.7909 167.1915 154.9197 147.4029 139.5459 134.7204 138.7076 143.3824 152.1006 163.8645 174.1289 (72)

Total internal gains
1008.3103 1037.8821 991.8516 959.9892 908.5653 872.8858 837.3375 836.0928 862.4285 893.7374 949.4083 984.4953 (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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)

Living area fraction fLA = Living area / (4) = 0.1454 (91)

MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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													
	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)												92.3000	(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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98)
Space heating efficiency (main heating system 1)													
	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234	(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													
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494	(217)
Fuel for water heating, kWh/month													
	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359	(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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587	(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	17373.7503	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3279.1232	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	426.4437	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4741.5806	(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	16423.7367	(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	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	

PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Predicted Energy Assessment

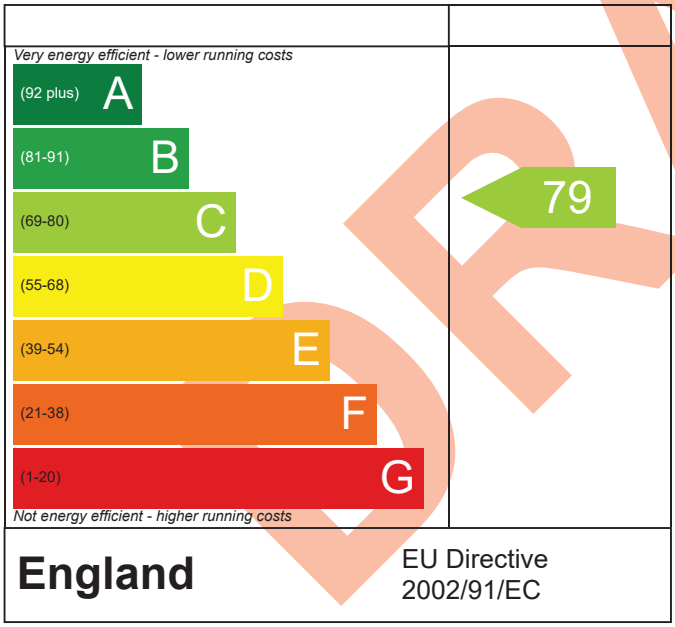
Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP

Dwelling type:	Bungalow, Detached
Date of assessment:	17/12/2024
Produced by:	Paul Pasifull
Total floor area:	358.64 m²
DRRN:	

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

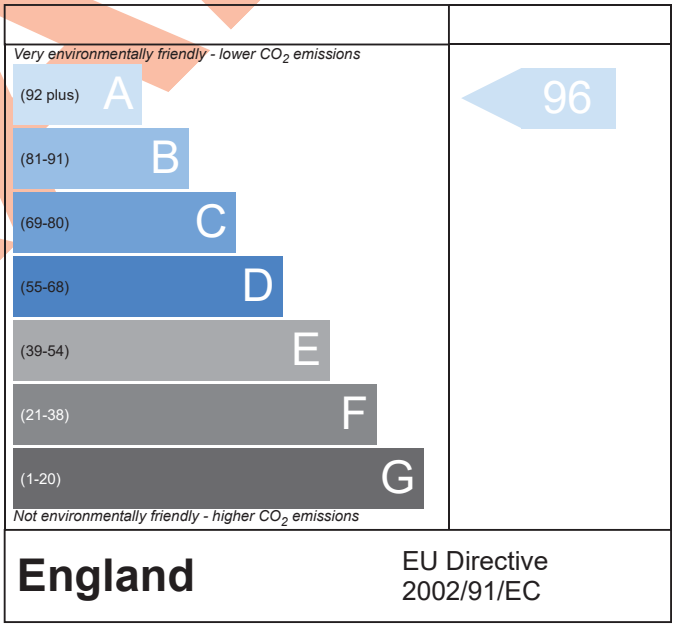
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Summary for Input Data

elmhurst energy

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Lean - SAP Table ASHP	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	73 C	**DER**	5.00	**TER**	10.59
Environmental	94 A	**% DER < TER**			52.79
CO_2 Emissions (t/year)	1.55	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	8.60	**DPER**	51.09	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West	
Property Tenture	ND	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	Bungalow, Detached	
Which Floor	0	
2.0 Number of Storeys	4	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	195.43	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	42.24 m	95.93 m²	3.50 m
Ground floor:	42.24 m	95.93 m²	3.70 m
1st Storey:	37.11 m	88.40 m²	3.10 m
2nd Storey:	35.44 m	78.38 m²	2.75 m

8.0 Living Area	52.15	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall Basement	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	147.84	131.15	0.00	None	16.69	Enter Gross Area
External Wall GF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	145.84	100.96	0.00	None	44.88	Enter Gross Area
External Wall FF	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.16	140.00	119.97	83.83	0.00	None	36.14	Enter Gross Area
External Wall SF	Timber Frame	Timber framed wall (one layer of plasterboard)	0.16	9.00	60.96	60.96	0.00	None	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall basement	Plasterboard on timber frame	9.00	221.62
Internal Wall GF	Plasterboard on timber frame	9.00	96.48
Internal Wall FF	Plasterboard on timber frame	9.00	236.84
Internal Wall SF	Plasterboard on timber frame	9.00	186.50

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Top Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	37.26	24.34	Room In Roof	0.50	Enter Gross Area	12.92

Flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	7.70	7.70	None	0.00	Enter Gross Area	0.00
Plane roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	12.27	12.27	Room In Roof	0.50	Enter Gross Area	0.00
Sloping roof	External Slope Roof	Plasterboard, insulated slope	0.10	9.00	44.76	44.76	Room In Roof	0.50	Enter Gross Area	0.00
Dormer flat roof	External Flat Roof	Plasterboard, insulated flat roof	0.10	9.00	9.00	9.00	Room In Roof	0.50	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Basement Ceiling	Basement	Plasterboard ceiling, carpeted chipboard floor	95.93
GF Ceiling	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	95.93
FF Ceiling	+1	Plasterboard ceiling, carpeted chipboard floor	88.40

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Basement floor	Ground Floor - Solid	Basement	Slab on ground, screed over insulation	0.10	None	0.00	110.00	95.93
First floor	Exposed Floor - Solid	+1	Other	0.10	None	0.00	0.00	2.85

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Ground floor		Plasterboard ceiling, carpeted chipboard floor	9.00	95.93
First floor		Plasterboard ceiling, carpeted chipboard floor	9.00	85.55
Second floor		Plasterboard ceiling, carpeted chipboard floor	9.00	78.38

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Rooflights	Manufacturer	Roof Light	Double Low-E Soft 0.05			0.63		0.70	1.20
Roof windows	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Entrance door	Manufacturer	Solid Door				0.00			1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Gym glazing door Basement	Windows	External Wall Basement	West	11.20	0
Lounge glazing door GF	Windows	External Wall GF	West	5.60	0
Dining glazing door GF	Windows	External Wall GF	West	5.60	0
Gym windows Basement	Windows	External Wall Basement	North	2.74	0
Gym windows Basement	Windows	External Wall Basement	South	2.74	0
Lounge windows GF	Windows	External Wall GF	North	1.37	0
Dining windows GF	Windows	External Wall GF	North	1.37	0
Lounge windows GF	Windows	External Wall GF	South	1.37	0
Dining windows GF	Windows	External Wall GF	South	1.37	0
Corridor full height glazing FF	Windows	External Wall FF	West	3.18	0
Study glazing door FF	Windows	External Wall FF	West	2.98	0
Master bedroom glazing door FF	Windows	External Wall FF	West	2.98	0
Bedroom roof windows SF	Roof windows	Top Plane roof	West	4.02	0
Staircase windows GF	Windows	External Wall GF	North	5.02	0
Staircase windows FF	Windows	External Wall FF	North	6.48	0
Staircase rooflights SF	Rooflights	Top Plane roof	North	3.00	0
Living & Dining glazing GF	Windows	External Wall GF	East	11.08	0
Master Bedroom glazing FF	Windows	External Wall FF	East	11.08	0
Dressing windows FF	Windows	External Wall FF	East	5.94	0
Kitchen+Dining window GF	Windows	External Wall GF	South	4.94	0
Kitchen+Dining glazing door GF	Windows	External Wall GF	South	3.77	0
Dressing window FF	Windows	External Wall FF	South	3.51	0
Bathroom rooflight	Rooflights	Top Plane roof	South	1.88	0
Bedroom roof windows SF	Roof windows	Top Plane roof	East	4.02	0
Entrance door	Entrance door	External Wall GF	West	3.38	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging User Input

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E1 Steel lintel with perforated steel base plate		35.92	0.00	0.00	No
E3 Sill		11.00	0.00	0.00	No
E4 Jamb		135.24	0.00	0.00	Yes
E6 Intermediate floor within a dwelling		104.65	0.00	0.00	No
E16 Corner (normal)		73.20	0.00	0.00	No
R1 Head of roof window		6.00	0.00	0.00	No
R2 Sill of roof window		6.00	0.00	0.00	No
R3 Jamb of roof window		16.09	0.00	0.00	No
R11 Upstands or kerbs of rooflights		12.50	0.00	0.00	No
E22 Basement floor		42.24	0.00	0.00	No

E17 Corner (inverted – internal area greater than external area)	19.60	0.00	0.00	No
E11 Eaves (insulation at rafter level)	29.44	0.00	0.00	No
R9 Roof to wall (flat ceiling)	24.00	0.00	0.00	No
R7 Flat ceiling (inverted)	23.50	0.00	0.00	No
R6 Flat ceiling	18.42	0.00	0.00	No
E8 Balcony within a dwelling, wall insulation continuous	4.80	0.00	0.00	No
E21 Exposed floor (inverted)	2.99	0.00	0.00	No
E20 Exposed floor (normal)	4.89	0.00	0.00	No

Y-value	0.06	W/m²K
Description	0.055	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.15	In Room Fan Kitchen	0
0.15	In Room Fan Other Wet Room	0
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.11	Through Wall Fan Kitchen	0
0.14	Through Wall Fan Other Wet Room	0

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys	0	
Number of open flues	0	
Number of chimneys/flues attached to closed fire	0	
Number of flues attached to solid fuel boiler	0	
Number of flues attached to other heater	0	
Number of blocked chimneys	0	
Number of intermittent extract fans	9	
Number of passive vents	0	
Number of flueless gas fires	0	

21.0 Fixed Cooling System	No	

22.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	110.00	8.00	880.00	60

24.0 Main Heating 1	SAP table	
Percentage of Heat	100.00	%
Database Ref. No.	0	
Fuel Type	Electricity	
SAP Code	224	
In Winter	170.00	
In Summer	170.00	
Controls SAP Code	2207	
Delayed Start Stat	No	
HETAS approved System	No	

Summary for Input Data

elmhurst energy

Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	55.00

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

27.0 Secondary Heating — None

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	5
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	
Shower	Vented hot water system	7.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder — Hot Water Cylinder

Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	300.00	L
Loss	1.82	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	

31.0 Thermal Store — None

34.0 Small-scale Hydro — None

Electricity Generated	0.00

Summary for Input Data

Apportioned	0.00	kWh/Year
Connected to dwelling's electricity meter	Yes	
Electricity Generation	Annual	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Lean - SAP Table ASHP	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	73 C	**DER**	5.00	**TER**	10.59
Environmental	94 A	**% DER < TER**			52.79
CO_2 Emissions (t/year)	1.55	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	8.60	**DPER**	51.09	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d)	x 2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	9 * 10 =	90.0000	(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) =	90.0000 / (5) =	0.0763	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2763	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2763	(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	0.3522	0.3453	0.3384	0.3039	0.2970	0.2624	0.2624	0.2555	0.2763	0.2970	0.3108	0.3246	(22b)
Effective ac	0.5620	0.5596	0.5573	0.5462	0.5441	0.5344	0.5344	0.5326	0.5382	0.5441	0.5483	0.5527	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300	(30)
Sloping roof	44.7600		44.7600	0.0952	4.2629	9.0000	402.8400	(30)
Dormer flat roof	9.0000		9.0000	0.0952	0.8571	9.0000	81.0000	(30)

Total net area of external elements Aum(A, m2)	684.3800		(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) = 205.7342		(33)
Internal Wall basement	221.6200	9.0000	1994.5800 (32c)
Internal Wall GF	96.4800	9.0000	868.3200 (32c)
Internal Wall FF	236.8400	9.0000	2131.5600 (32c)
Internal Wall SF	186.5000	9.0000	1678.5000 (32c)
Ground floor	95.9300	18.0000	1726.7400 (32d)
First floor	85.5500	18.0000	1539.9000 (32d)
Second floor	78.3800	18.0000	1410.8400 (32d)
Basement Ceiling	95.9300	9.0000	863.3700 (32e)
GF Ceiling	95.9300	9.0000	863.3700 (32e)
FF Ceiling	88.4000	9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	243.3751 (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	218.9067	217.9686	217.0490	212.7296	211.9215	208.1595	208.1595	207.4628	209.6086	211.9215	213.5564	215.2655	(38)
Heat transfer coeff	462.2818	461.3436	460.4240	456.1047	455.2966	451.5346	451.5346	450.8379	452.9836	455.2966	456.9314	458.6406	(39)
Average = Sum(39)m / 12 =												456.1008	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2890	1.2864	1.2838	1.2718	1.2695	1.2590	1.2590	1.2571	1.2631	1.2695	1.2741	1.2788	(40)
HLP (average)												1.2718	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy			3.2082 (42)
Hot water usage for mixer showers	78.0103 76.8379 75.1296 71.8610 69.4489 66.7589 65.2299 66.9253 68.7838 71.6720 75.0108		77.7114 (42a)
Hot water usage for baths	33.6702 33.1701 32.4660 31.1676 30.1954 29.1174 28.5351 29.2343 29.9957 31.1492 32.4743		33.5564 (42b)
Hot water usage for other uses	47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581		47.4848 (42c)
Average daily hot water use (litres/day)			146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
										Total per year (kWh/year) = Sum(64)m =		3062.7700	(64)
12Total per year (kWh/year)												3063	(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	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains	1003.0419	1032.6137	986.5832	954.7208	903.2969	867.6174	832.0691	830.8244	857.1601	888.4690	944.1399	979.2269	(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

North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800 (74)						
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652 (76)						
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983 (78)						
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132 (80)						
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582 (82)						
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005 (82)						
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)						
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)						

Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990 (83)
Total gains	1802.4252	2529.4384	3338.9132	4289.9987	4958.2773	5016.3887	4781.9668	4236.4049	3554.7453	2630.1176	1927.5614	1645.8260 (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	42.1156	42.2012	42.2855	42.6860	42.7617	43.1180	43.1180	43.1846	42.9801	42.7617	42.6087	42.4499	
alpha	3.8077	3.8134	3.8190	3.8457	3.8508	3.8745	3.8745	3.8790	3.8653	3.8508	3.8406	3.8300	
util living area	0.9970	0.9891	0.9632	0.8801	0.7271	0.5452	0.4073	0.4734	0.7405	0.9510	0.9928	0.9979	(86)
MIT	19.3619	19.6235	20.0087	20.4598	20.7537	20.8793	20.9100	20.9023	20.7898	20.3302	19.7494	19.3222	(87)
Th 2	19.8495	19.8515	19.8535	19.8630	19.8648	19.8731	19.8731	19.8746	19.8699	19.8648	19.8612	19.8575	(88)
util rest of house	0.9961	0.9861	0.9531	0.8496	0.6675	0.4604	0.3068	0.3648	0.6589	0.9321	0.9904	0.9973	(89)
MIT 2	17.9264	18.2615	18.7483	19.3012	19.6239	19.7466	19.7672	19.7654	19.6753	19.1635	18.4309	17.8813	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	18.1351	18.4595	18.9316	19.4696	19.7882	19.9113	19.9334	19.9307	19.8374	19.3332	18.6226	18.0908	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1351	18.4595	18.9316	19.4696	19.7882	19.9113	19.9334	19.9307	19.8374	19.3332	18.6226	18.0908	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9942	0.9809	0.9425	0.8372	0.6631	0.4634	0.3123	0.3704	0.6562	0.9203	0.9865	0.9958	(94)
Useful gains	1791.9848	2481.1318	3147.0292	3591.5270	3287.9196	2324.4765	1493.3895	1569.2985	2332.6438	2420.5991	1901.5969	1638.9729	(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	6395.7284	6255.5935	5723.8037	4820.8645	3682.5208	2398.2277	1505.1341	1591.7852	2598.9362	3976.1769	5265.0600	6370.8954	(97)
Space heating kWh	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98a)
Space heating requirement - total per year (kWh/year)												16157.0438	
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	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16157.0438	
Space heating per m2											(98c) / (4) =	45.0509	(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 %)	170.0000 (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	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	2014.8148	1492.0225	1127.7178	520.6606	172.6960	0.0000	0.0000	0.0000	0.0000	680.7941	1424.5256	2070.9120	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	179.8871	159.0226	168.6906	147.6176	142.6442	128.0347	125.9511	131.1993	132.9216	148.8275	159.0112	177.8219	(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	47.8320	38.3726	34.5503	25.3130	19.5525	15.9746	17.8365	23.1845	30.1144	39.5117	44.6284	49.1614	(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	9504.1434	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	1801.6294	(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)	386.0318	(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	11691.8046	(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	9504.1434	0.1560	1482.1796	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1801.6294	0.1410	254.0049	(264)
Space and water heating			1736.1845	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Total CO2, kg/year			1791.9008	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0000	(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	9504.1434	1.5773	14991.2644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1801.6294	1.5213	2740.8553	(278)
Space and water heating			17732.1197	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Total Primary energy kWh/year			18324.2282	(286)
Dwelling Primary energy Rate (DPER)			51.0900	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300 (1a)	x	3.5000 (2a)	=	335.7550 (1a) - (3a)	
Ground floor	95.9300 (1b)	x	3.7000 (2b)	=	354.9410 (1b) - (3b)	
First floor	88.4000 (1c)	x	3.1000 (2c)	=	274.0400 (1c) - (3c)	
Second floor	78.3800 (1d)	x	2.7500 (2d)	=	215.5450 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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												
	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336 (22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556 (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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E1	Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3	Sill	11.0000	0.0500	0.5500
E4	Jamb	135.2400	0.0500	6.7620
E6	Intermediate floor within a dwelling	104.6500	0.0000	0.0000
E16	Corner (normal)	73.2000	0.0900	6.5880
R1	Head of roof window	6.0000	0.0800	0.4800
R2	Sill of roof window	6.0000	0.0600	0.3600
R3	Jamb of roof window	16.0900	0.0800	1.2872
R11	Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22	Basement floor	42.2400	0.0700	2.9568
E17	Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11	Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9	Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7	Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6	Flat ceiling	18.4200	0.0600	1.1052
E8	Balcony within a dwelling, wall insulation continuous	4.8000	0.0000	0.0000
E21	Exposed floor (inverted)	2.9900	0.3200	0.9568
E20	Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.7204 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 230.2666 (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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
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 3.2082 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)

Average daily hot water use (litres/day) 146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)

Energy content (annual) Total = Sum(45)m = 2430.1520

Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)

Water storage loss:

Store volume 300.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.1127 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.1409 (55)

Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	310.7076	274.7639	291.6737	255.6915	247.3948	222.4006	219.0165	227.9384	230.7083	257.9063	275.0605	307.1969	(62)
WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)

Total per year (kWh/year) = Sum(64)m = 2789.0930 (64)

12Total per year (kWh/year) 2789 (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

130.7193	116.1155	124.3905	111.5422	109.6677	100.4730	100.2320	103.1985	103.2353	113.1628	117.9824	129.5519	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	175.6979	172.7909	167.1915	154.9197	147.4029	139.5459	134.7204	138.7076	143.3824	152.1006	163.8645	174.1289	(72)
Total internal gains													
	1008.3103	1037.8821	991.8516	959.9892	908.5653	872.8858	837.3375	836.0928	862.4285	893.7374	949.4083	984.4953	(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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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													
	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)	92.3000 (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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98)
Space heating efficiency (main heating system 1)													

	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234	(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													
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494	(217)
Fuel for water heating, kWh/month													
	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359	(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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587	(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	17373.7503	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3279.1232	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	426.4437	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4741.5806	(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	16423.7367	(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	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	
PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Lean - SAP Table ASHP	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	73 C	**DER**	5.00	**TER**	10.59
Environmental	94 A	**% DER < TER**			52.79
CO_2 Emissions (t/year)	1.55	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	8.60	**DPER**	51.09	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d)	x 2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2339	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2339	(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	0.2982	0.2924	0.2865	0.2573	0.2514	0.2222	0.2222	0.2163	0.2339	0.2514	0.2631	0.2748	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5445	0.5427	0.5410	0.5331	0.5316	0.5247	0.5247	0.5234	0.5274	0.5316	0.5346	0.5378	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300	(30)

Sloping roof	44.7600	44.7600	0.0952	4.2629	9.0000	402.8400 (30)
Dormer flat roof	9.0000	9.0000	0.0952	0.8571	9.0000	81.0000 (30)
Total net area of external elements Aum(A, m2)		684.3800				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		205.7342		(33)
Internal Wall basement		221.6200			9.0000	1994.5800 (32c)
Internal Wall GF		96.4800			9.0000	868.3200 (32c)
Internal Wall FF		236.8400			9.0000	2131.5600 (32c)
Internal Wall SF		186.5000			9.0000	1678.5000 (32c)
Ground floor		95.9300			18.0000	1726.7400 (32d)
First floor		85.5500			18.0000	1539.9000 (32d)
Second floor		78.3800			18.0000	1410.8400 (32d)
Basement Ceiling		95.9300			9.0000	863.3700 (32e)
GF Ceiling		95.9300			9.0000	863.3700 (32e)
FF Ceiling		88.4000			9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	243.3751 (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	212.0650	211.3925	210.7333	207.6371	207.0579	204.3612	204.3612	203.8618	205.3999	207.0579	208.2297	209.4549	(38)
Heat transfer coeff	455.4401	454.7676	454.1084	451.0122	450.4329	447.7362	447.7362	447.2369	448.7750	450.4329	451.6048	452.8300	(39)
Average = Sum(39)m / 12 =												451.0094	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2699	1.2680	1.2662	1.2576	1.2559	1.2484	1.2484	1.2470	1.2513	1.2559	1.2592	1.2626	(40)
HLP (average)												1.2576	
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												3.2082	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)
Average daily hot water use (litres/day)												74.3856	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		710.6291	(64a)
Heat gains from water heating, kWh/month	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800	(74)
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652	(76)

South				17.7000	46.7521	0.6300	0.7000	0.7700	252.8983	(78)			
West				31.5400	19.6403	0.6300	0.7000	0.7700	189.3132	(80)			
North				3.0000	26.0000	0.6300	0.7000	1.0000	30.9582	(82)			
South				1.8800	26.0000	0.6300	0.7000	1.0000	19.4005	(82)			
East				4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)			
West				4.0200	26.0000	0.6300	0.7000	1.0000	41.4840	(82)			
Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990	(83)
Total gains	1686.6984	2415.1651	3227.9957	4187.1728	4860.2115	4926.3502	4695.3646	4147.5116	3463.0844	2529.8484	1819.5688	1531.2001	(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	42.7482	42.8115	42.8736	43.1679	43.2234	43.4838	43.4838	43.5323	43.3831	43.2234	43.1113	42.9946	
alpha	3.8499	3.8541	3.8582	3.8779	3.8816	3.8989	3.8989	3.9022	3.8922	3.8816	3.8741	3.8663	
util living area	0.9976	0.9906	0.9664	0.8851	0.7323	0.5500	0.4112	0.4793	0.7489	0.9557	0.9941	0.9984	(86)
MIT	18.9154	19.2645	19.7795	20.3821	20.7777	20.9449	20.9861	20.9754	20.8222	20.1999	19.4238	18.8573	(87)
Th 2	19.8645	19.8660	19.8674	19.8742	19.8755	19.8815	19.8815	19.8826	19.8792	19.8755	19.8729	19.8702	(88)
util rest of house	0.9970	0.9880	0.9571	0.8556	0.6734	0.4653	0.3106	0.3704	0.6683	0.9384	0.9921	0.9979	(89)
MIT 2	17.9615	18.3098	18.8175	19.3919	19.7309	19.8559	19.8776	19.8750	19.7805	19.2387	18.4749	17.9076	(90)
Living area fraction									fLA = Living area / (4) =			0.1454	(91)
MIT	18.1002	18.4486	18.9574	19.5359	19.8831	20.0142	20.0388	20.0350	19.9320	19.3785	18.6129	18.0457	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1002	18.4486	18.9574	19.5359	19.8831	20.0142	20.0388	20.0350	19.9320	19.3785	18.6129	18.0457	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9834	0.9473	0.8452	0.6738	0.4758	0.3250	0.3857	0.6725	0.9283	0.9888	0.9968	(94)
Useful gains	1678.8873	2374.9964	3057.7301	3539.1064	3275.0044	2344.1140	1526.2195	1599.8643	2329.0917	2348.3462	1799.1971	1526.2243	(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	6285.1645	6161.4829	5656.9928	4796.9204	3685.9457	2424.1525	1539.6682	1625.6988	2617.2487	3954.1093	5199.2878	6269.7301	(97)
Space heating kWh	3427.0703	2544.5190	1933.8515	905.6261	305.7404	0.0000	0.0000	0.0000	0.0000	1194.6877	2448.0653	3529.1683	(98a)
Space heating requirement - total per year (kWh/year)												16288.7285	
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	3427.0703	2544.5190	1933.8515	905.6261	305.7404	0.0000	0.0000	0.0000	0.0000	1194.6877	2448.0653	3529.1683	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16288.7285	
Space heating per m2											(98c) / (4) =	45.4180	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	4208.7206	3313.2481	3399.0001	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8847	0.9299	0.8961	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3723.6534	3080.8348	3045.9868	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	5460.3459	5204.6194	4597.2049	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1250.4186	1580.0957	1154.1062	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	312.6046	395.0239	288.5266	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												996.1551	(107)
Energy for space heating												45.4180	(99)
Energy for space cooling												2.7776	(108)
Total												48.1956	(109)
Fabric Energy Efficiency (DFEE)												48.2	(109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Basement floor		95.9300 (1a)	x	3.5000 (2a)	=	335.7550 (1a) - (3a)	
Ground floor		95.9300 (1b)	x	3.7000 (2b)	=	354.9410 (1b) - (3b)	
First floor		88.4000 (1c)	x	3.1000 (2c)	=	274.0400 (1c) - (3c)	
Second floor		78.3800 (1d)	x	2.7500 (2d)	=	215.5450 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556	(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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	Kl Element	Length	Psi-value	Total
	E1 Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
	E3 Sill	11.0000	0.0500	0.5500
	E4 Jamb	135.2400	0.0500	6.7620
	E6 Intermediate floor within a dwelling	104.6500	0.0000	0.0000
	E16 Corner (normal)	73.2000	0.0900	6.5880
	R1 Head of roof window	6.0000	0.0800	0.4800
	R2 Sill of roof window	6.0000	0.0600	0.3600
	R3 Jamb of roof window	16.0900	0.0800	1.2872
	R11 Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
	E22 Basement floor	42.2400	0.0700	2.9568
	E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
	E11 Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
	R9 Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
	R7 Flat ceiling (inverted)	23.5000	0.0400	0.9400
	R6 Flat ceiling	18.4200	0.0600	1.1052
	E8 Balcony within a dwelling, wall insulation continuous	4.8000	0.0000	0.0000
	E21 Exposed floor (inverted)	2.9900	0.3200	0.9568
	E20 Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		26.7204	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	230.2666	(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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.2082 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)

Hot water usage for other uses
47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581 47.4848 (42c)
Average daily hot water use (litres/day) 74.3856 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	81.1550	78.9282	76.4973	73.4722	70.7733	67.9685	67.3863	69.8122	72.3003	75.1805	78.2324	81.0411	(44)
Energy conte	128.5296	112.3927	117.5735	100.5798	95.2745	83.5753	81.4978	86.4421	89.1535	102.0193	111.4563	126.8908	(45)
Energy content (annual)										Total = Sum(45)m =		1235.3852	
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage 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	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(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													
	109.2502	95.5338	99.9375	85.4928	80.9833	71.0390	69.2732	73.4758	75.7805	86.7164	94.7379	107.8572	(64)
										Total per year (kWh/year) = Sum(64)m =		1050.0775	(64)
12Total per year (kWh/year)												1050	(64)
Electric shower(s)													
	62.4732	55.6641	60.7831	58.0046	59.0930	56.3690	58.2480	59.0930	58.0046	60.7831	59.6402	62.4732	(64a)
							Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =					710.6291	(64a)
Heat gains from water heating, kWh/month													
	42.9308	37.7995	40.1801	35.8743	35.0191	31.8520	31.8803	33.1422	33.4463	36.8749	38.5945	42.5826	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(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)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	57.7028	56.2492	54.0056	49.8255	47.0686	44.2389	42.8498	44.5460	46.4531	49.5630	53.6035	57.2347	(72)
Total internal gains													
	887.3152	918.3404	875.6657	851.8949	805.2311	777.5788	745.4669	741.9312	765.4993	788.1998	836.1473	864.6011	(73)

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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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1530.1363	2122.0562	2767.4536	3534.2811	4066.4815	4114.2726	3922.2104	3480.8782	2934.9833	2188.8255	1626.9719	1400.6375	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9984	0.9940	0.9791	0.9242	0.8024	0.6267	0.4770	0.5493	0.8117	0.9711	0.9961	0.9988	(86)
MIT	18.8835	19.1888	19.6590	20.2537	20.6957	20.9174	20.9782	20.9628	20.7661	20.1196	19.3838	18.8400	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9979	0.9923	0.9729	0.9022	0.7496	0.5383	0.3650	0.4313	0.7391	0.9591	0.9947	0.9985	(89)
MIT 2	17.9374	18.2432	18.7102	19.2906	19.6853	19.8603	19.8940	19.8899	19.7601	19.1760	18.4460	17.9000	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.0749	18.3807	18.8482	19.4306	19.8322	20.0140	20.0517	20.0459	19.9064	19.3132	18.5824	18.0367	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9967	0.9889	0.9653	0.8911	0.7464	0.5481	0.3809	0.4476	0.7398	0.9504	0.9923	0.9977	(94)
Useful gains	1525.0977	2098.5808	2671.3234	3149.4945	3035.1663	2254.8644	1494.0492	1558.0137	2171.2439	2080.2850	1614.3880	1397.3494	(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													
	6205.9919	6060.0629	5538.9643	4675.6410	3603.7839	2377.6959	1515.8956	1598.5164	2558.9128	3861.2608	5108.2564	6180.6080	(97)
Space heating kWh													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98a)
Space heating requirement - total per year (kWh/year)												17199.4787	
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													
	3482.5853	2662.1160	2133.5248	1098.8255	423.0515	0.0000	0.0000	0.0000	0.0000	1325.0460	2515.5853	3558.7444	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												17199.4787	
Space heating per m2											(98c) / (4) =	47.9575	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	4128.2735	3249.9174	3332.1616	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8347	0.8945	0.8512	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3445.7583	2907.1052	2836.1942	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4545.2049	4333.1010	3844.7448	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	791.6016	1060.9409	750.3616	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	197.9004	265.2352	187.5904	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												650.7260	(107)
Energy for space heating												47.9575	(99)
Energy for space cooling												1.8144	(108)
Total												49.7719	(109)
Fabric Energy Efficiency (TFEE)												49.8	(109)

Full SAP Calculation Printout

Property Reference	34a Netherhall Gardens	**Issued on Date**	17/12/2024
Assessment Reference	Lean - SAP Table ASHP	**Prop Type Ref**	
Property	Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP		

SAP Rating	73 C	**DER**	5.00	**TER**	10.59
Environmental	94 A	**% DER < TER**			52.79
CO_2 Emissions (t/year)	1.55	**DFEE**	48.20	**TFEE**	49.77
Compliance Check	See BREL	**% DFEE < TFEE**			3.17
% DPER < TPER	8.60	**DPER**	51.09	**TPER**	55.90

Assessor Details	Mr. Paul Pasifull	**Assessor ID**	Q133-0001
Client			

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300	(1a)	x 3.5000	(2a) =	335.7550	(1a) - (3a)
Ground floor	95.9300	(1b)	x 3.7000	(2b) =	354.9410	(1b) - (3b)
First floor	88.4000	(1c)	x 3.1000	(2c) =	274.0400	(1c) - (3c)
Second floor	78.3800	(1d)	x 2.7500	(2d) =	215.5450	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		1180.2810	(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	9 * 10 =	90.0000	(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) =	90.0000 / (5) =	0.0763	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2763	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2763	(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	0.3522	0.3453	0.3384	0.3039	0.2970	0.2624	0.2624	0.2555	0.2763	0.2970	0.3108	0.3246	(22b)
Effective ac	0.5620	0.5596	0.5573	0.5462	0.5441	0.5344	0.5344	0.5326	0.5382	0.5441	0.5483	0.5527	(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	
Windows (Uw = 1.20)			94.3200	1.1450	108.0000			(27)
Entrance door			3.3800	1.0000	3.3800			(26)
Staircase rooflights SF			3.0000	1.1450	3.4351			(27a)
Bathroom rooflight			1.8800	1.1450	2.1527			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Bedroom roof windows SF			4.0200	1.1450	4.6031			(27a)
Basement floor			95.9300	0.1000	9.5930	110.0000	10552.3000	(28a)
First floor			2.8500	0.1000	0.2850			(28b)
External Wall Basement	147.8400	16.6800	131.1600	0.1600	20.9856	140.0000	18362.4000	(29a)
External Wall GF	145.8400	44.8700	100.9700	0.1600	16.1552	140.0000	14135.8000	(29a)
External Wall FF	119.9700	36.1500	83.8200	0.1600	13.4112	140.0000	11734.8000	(29a)
External Wall SF	60.9600		60.9600	0.1600	9.7536	9.0000	548.6400	(29a)
Top Plane roof	37.2600	12.9200	24.3400	0.0952	2.3181	9.0000	219.0600	(30)
Flat roof	7.7000		7.7000	0.1000	0.7700	9.0000	69.3000	(30)
Plane roof	12.2700		12.2700	0.0952	1.1686	9.0000	110.4300	(30)
Sloping roof	44.7600		44.7600	0.0952	4.2629	9.0000	402.8400	(30)
Dormer flat roof	9.0000		9.0000	0.0952	0.8571	9.0000	81.0000	(30)

Total net area of external elements Aum(A, m2)	684.3800		(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) = 205.7342		(33)
Internal Wall basement	221.6200	9.0000	1994.5800 (32c)
Internal Wall GF	96.4800	9.0000	868.3200 (32c)
Internal Wall FF	236.8400	9.0000	2131.5600 (32c)
Internal Wall SF	186.5000	9.0000	1678.5000 (32c)
Ground floor	95.9300	18.0000	1726.7400 (32d)
First floor	85.5500	18.0000	1539.9000 (32d)
Second floor	78.3800	18.0000	1410.8400 (32d)
Basement Ceiling	95.9300	9.0000	863.3700 (32e)
GF Ceiling	95.9300	9.0000	863.3700 (32e)
FF Ceiling	88.4000	9.0000	795.6000 (32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	70089.3500 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		195.4309 (35)
Thermal bridges (User defined value 0.055 * total exposed area)		37.6409 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	243.3751 (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	218.9067	217.9686	217.0490	212.7296	211.9215	208.1595	208.1595	207.4628	209.6086	211.9215	213.5564	215.2655	(38)
Heat transfer coeff	462.2818	461.3436	460.4240	456.1047	455.2966	451.5346	451.5346	450.8379	452.9836	455.2966	456.9314	458.6406	(39)
Average = Sum(39)m / 12 =												456.1008	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2890	1.2864	1.2838	1.2718	1.2695	1.2590	1.2590	1.2571	1.2631	1.2695	1.2741	1.2788	(40)
HLP (average)												1.2718	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy			3.2082 (42)
Hot water usage for mixer showers	78.0103 76.8379 75.1296 71.8610 69.4489 66.7589 65.2299 66.9253 68.7838 71.6720 75.0108		77.7114 (42a)
Hot water usage for baths	33.6702 33.1701 32.4660 31.1676 30.1954 29.1174 28.5351 29.2343 29.9957 31.1492 32.4743		33.5564 (42b)
Hot water usage for other uses	47.4848 45.7581 44.0313 42.3046 40.5779 38.8512 38.8512 40.5779 42.3046 44.0313 45.7581		47.4848 (42c)
Average daily hot water use (litres/day)			146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)
Energy content (annual)										Total = Sum(45)m =		2430.1520	
Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8200	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9828	(55)
Total storage loss	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(56)
If cylinder contains dedicated solar storage	30.4668	27.5184	30.4668	29.4840	30.4668	29.4840	30.4668	30.4668	29.4840	30.4668	29.4840	30.4668	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
										Total per year (kWh/year) = Sum(64)m =		3062.7700	(64)
12Total per year (kWh/year)												3063	(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	126.7996	112.5751	120.4708	107.7490	105.7480	96.6798	96.3123	99.2788	99.4421	109.2431	114.1892	125.6322	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)	170.4295	167.5225	161.9231	149.6513	142.1345	134.2775	129.4520	133.4392	138.1140	146.8322	158.5961	168.8605	(72)
Total internal gains	1003.0419	1032.6137	986.5832	954.7208	903.2969	867.6174	832.0691	830.8244	857.1601	888.4690	944.1399	979.2269	(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

North	16.9800	10.6334	0.6300	0.7000	0.7700	55.1800 (74)						
East	28.1000	19.6403	0.6300	0.7000	0.7700	168.6652 (76)						
South	17.7000	46.7521	0.6300	0.7000	0.7700	252.8983 (78)						
West	31.5400	19.6403	0.6300	0.7000	0.7700	189.3132 (80)						
North	3.0000	26.0000	0.6300	0.7000	1.0000	30.9582 (82)						
South	1.8800	26.0000	0.6300	0.7000	1.0000	19.4005 (82)						
East	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)						
West	4.0200	26.0000	0.6300	0.7000	1.0000	41.4840 (82)						

Solar gains	799.3832	1496.8247	2352.3300	3335.2779	4054.9804	4148.7714	3949.8977	3405.5805	2697.5851	1741.6486	983.4215	666.5990 (83)
Total gains	1802.4252	2529.4384	3338.9132	4289.9987	4958.2773	5016.3887	4781.9668	4236.4049	3554.7453	2630.1176	1927.5614	1645.8260 (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	42.1156	42.2012	42.2855	42.6860	42.7617	43.1180	43.1180	43.1846	42.9801	42.7617	42.6087	42.4499	
alpha	3.8077	3.8134	3.8190	3.8457	3.8508	3.8745	3.8745	3.8790	3.8653	3.8508	3.8406	3.8300	
util living area	0.9970	0.9891	0.9632	0.8801	0.7271	0.5452	0.4073	0.4734	0.7405	0.9510	0.9928	0.9979	(86)
MIT	19.3619	19.6235	20.0087	20.4598	20.7537	20.8793	20.9100	20.9023	20.7898	20.3302	19.7494	19.3222	(87)
Th 2	19.8495	19.8515	19.8535	19.8630	19.8648	19.8731	19.8731	19.8746	19.8699	19.8648	19.8612	19.8575	(88)
util rest of house	0.9961	0.9861	0.9531	0.8496	0.6675	0.4604	0.3068	0.3648	0.6589	0.9321	0.9904	0.9973	(89)
MIT 2	17.9264	18.2615	18.7483	19.3012	19.6239	19.7466	19.7672	19.7654	19.6753	19.1635	18.4309	17.8813	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	18.1351	18.4595	18.9316	19.4696	19.7882	19.9113	19.9334	19.9307	19.8374	19.3332	18.6226	18.0908	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1351	18.4595	18.9316	19.4696	19.7882	19.9113	19.9334	19.9307	19.8374	19.3332	18.6226	18.0908	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9942	0.9809	0.9425	0.8372	0.6631	0.4634	0.3123	0.3704	0.6562	0.9203	0.9865	0.9958	(94)
Useful gains	1791.9848	2481.1318	3147.0292	3591.5270	3287.9196	2324.4765	1493.3895	1569.2985	2332.6438	2420.5991	1901.5969	1638.9729	(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	6395.7284	6255.5935	5723.8037	4820.8645	3682.5208	2398.2277	1505.1341	1591.7852	2598.9362	3976.1769	5265.0600	6370.8954	(97)
Space heating kWh	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98a)
Space heating requirement - total per year (kWh/year)												16157.0438	
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	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16157.0438	
Space heating per m2											(98c) / (4) =	45.0509	(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 %)	170.0000 (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	3425.1852	2536.4383	1917.1203	885.1230	293.5833	0.0000	0.0000	0.0000	0.0000	1157.3499	2421.6935	3520.5504	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	2014.8148	1492.0225	1127.7178	520.6606	172.6960	0.0000	0.0000	0.0000	0.0000	680.7941	1424.5256	2070.9120	(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	305.8080	270.3385	286.7741	250.9499	242.4952	217.6591	214.1169	223.0388	225.9667	253.0067	270.3190	302.2973	(64)
Efficiency of water heater												170.0000	(216)
(217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(217)
Fuel for water heating, kWh/month	179.8871	159.0226	168.6906	147.6176	142.6442	128.0347	125.9511	131.1993	132.9216	148.8275	159.0112	177.8219	(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	47.8320	38.3726	34.5503	25.3130	19.5525	15.9746	17.8365	23.1845	30.1144	39.5117	44.6284	49.1614	(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	9504.1434	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	170.0000	
Water heating fuel used	1801.6294	(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)	386.0318	(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	11691.8046	(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	9504.1434	0.1560	1482.1796	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1801.6294	0.1410	254.0049	(264)
Space and water heating			1736.1845	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	386.0318	0.1443	55.7163	(268)
Total CO2, kg/year			1791.9008	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.0000	(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	9504.1434	1.5773	14991.2644	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1801.6294	1.5213	2740.8553	(278)
Space and water heating			17732.1197	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	386.0318	1.5338	592.1085	(282)
Total Primary energy kWh/year			18324.2282	(286)
Dwelling Primary energy Rate (DPER)			51.0900	(287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	95.9300 (1a)	x	3.5000 (2a)	=	335.7550 (1a) - (3a)	
Ground floor	95.9300 (1b)	x	3.7000 (2b)	=	354.9410 (1b) - (3b)	
First floor	88.4000 (1c)	x	3.1000 (2c)	=	274.0400 (1c) - (3c)	
Second floor	78.3800 (1d)	x	2.7500 (2d)	=	215.5450 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	358.6400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1180.2810	(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	4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0339	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.2839	(18)
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1.0000	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2839	(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												
	0.3620	0.3549	0.3478	0.3123	0.3052	0.2697	0.2697	0.2626	0.2839	0.3052	0.3194	0.3336 (22b)
Effective ac	0.5655	0.5630	0.5605	0.5488	0.5466	0.5364	0.5364	0.5345	0.5403	0.5466	0.5510	0.5556 (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	
TER Opaque door			3.3800	1.0000	3.3800			(26)
TER Opening Type (Uw = 1.20)			75.8800	1.1450	86.8855			(27)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Bedroom roof windows SF			3.2300	1.5918	5.1414			(27a)
Staircase rooflights SF			2.4100	2.0221	4.8732			(27a)
Bathroom rooflight			1.5100	2.0221	3.0533			(27a)
Basement floor			95.9300	0.1300	12.4709			(28a)
First floor			2.8500	0.1300	0.3705			(28b)
External Wall Basement	147.8400	13.4100	134.4300	0.1800	24.1974			(29a)
External Wall GF	145.8400	36.7600	109.0800	0.1800	19.6344			(29a)
External Wall FF	119.9700	29.0900	90.8800	0.1800	16.3584			(29a)
External Wall SF	60.9600		60.9600	0.1800	10.9728			(29a)
Top Plane roof	37.2600	10.3800	26.8800	0.1100	2.9568			(30)
Flat roof	7.7000		7.7000	0.1100	0.8470			(30)
Plane roof	12.2700		12.2700	0.1100	1.3497			(30)
Sloping roof	44.7600		44.7600	0.1100	4.9236			(30)
Dormer flat roof	9.0000		9.0000	0.1100	0.9900			(30)
Total net area of external elements Aum(A, m2)			684.3800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	203.5462			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 195.4309 (35)

List of Thermal Bridges

	K1 Element	Length	Psi-value	Total
E1	Steel lintel with perforated steel base plate	35.9200	0.0500	1.7960
E3	Sill	11.0000	0.0500	0.5500
E4	Jamb	135.2400	0.0500	6.7620
E6	Intermediate floor within a dwelling	104.6500	0.0000	0.0000
E16	Corner (normal)	73.2000	0.0900	6.5880
R1	Head of roof window	6.0000	0.0800	0.4800
R2	Sill of roof window	6.0000	0.0600	0.3600
R3	Jamb of roof window	16.0900	0.0800	1.2872
R11	Upstands or kerbs of rooflights	12.5000	0.0800	1.0000
E22	Basement floor	42.2400	0.0700	2.9568
E17	Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640
E11	Eaves (insulation at rafter level)	29.4400	0.0400	1.1776
R9	Roof to wall (flat ceiling)	24.0000	0.0400	0.9600
R7	Flat ceiling (inverted)	23.5000	0.0400	0.9400
R6	Flat ceiling	18.4200	0.0600	1.1052
E8	Balcony within a dwelling, wall insulation continuous	4.8000	0.0000	0.0000
E21	Exposed floor (inverted)	2.9900	0.3200	0.9568
E20	Exposed floor (normal)	4.8900	0.3200	1.5648

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 26.7204 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 230.2666 (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	220.2611	219.2703	218.2992	213.7377	212.8843	208.9114	208.9114	208.1757	210.4417	212.8843	214.6108	216.4157	(38)
Heat transfer coeff	450.5277	449.5369	448.5658	444.0043	443.1509	439.1780	439.1780	438.4423	440.7083	443.1509	444.8774	446.6824	(39)

Average = Sum(39)m / 12 = 444.0003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2562	1.2534	1.2507	1.2380	1.2356	1.2246	1.2246	1.2225	1.2288	1.2356	1.2405	1.2455	(40)
HLP (average)												1.2380	
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 3.2082 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	78.0103	76.8379	75.1296	71.8610	69.4489	66.7589	65.2299	66.9253	68.7838	71.6720	75.0108	77.7114	(42a)
Hot water usage for baths	33.6702	33.1701	32.4660	31.1676	30.1954	29.1174	28.5351	29.2343	29.9957	31.1492	32.4743	33.5564	(42b)
Hot water usage for other uses	47.4848	45.7581	44.0313	42.3046	40.5779	38.8512	38.8512	40.5779	42.3046	44.0313	45.7581	47.4848	(42c)

Average daily hot water use (litres/day) 146.3084 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	159.1652	155.7661	151.6269	145.3332	140.2221	134.7274	132.6161	136.7375	141.0841	146.8525	153.2431	158.7525	(44)
Energy conte	252.0788	221.8089	233.0449	198.9539	188.7660	165.6631	160.3877	169.3096	173.9707	199.2775	218.3230	248.5681	(45)

Energy content (annual) Total = Sum(45)m = 2430.1520

Distribution loss (46)m = 0.15 x (45)m	37.8118	33.2713	34.9567	29.8431	28.3149	24.8495	24.0582	25.3964	26.0956	29.8916	32.7484	37.2852	(46)

Water storage loss:

Store volume 300.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 2.1127 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.1409 (55)

Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(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	310.7076	274.7639	291.6737	255.6915	247.3948	222.4006	219.0165	227.9384	230.7083	257.9063	275.0605	307.1969	(62)
WWHRS	-35.6630	-31.5407	-33.0276	-27.3481	-25.4875	-21.8098	-20.4432	-21.7393	-22.5653	-26.6020	-30.1368	-35.0026	(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	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)

Total per year (kWh/year) = Sum(64)m = 2789.0930 (64)

12Total per year (kWh/year) 2789 (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

130.7193	116.1155	124.3905	111.5422	109.6677	100.4730	100.2320	103.1985	103.2353	113.1628	117.9824	129.5519	(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	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	160.4081	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	254.3040	281.5508	254.3040	262.7808	254.3040	262.7808	254.3040	254.3040	262.7808	254.3040	262.7808	254.3040	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	504.1860	509.4179	496.2338	468.1663	432.7361	399.4367	377.1907	371.9588	385.1430	413.2105	448.6406	481.9400	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	39.0408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	-128.3265	(71)
Water heating gains (Table 5)													
	175.6979	172.7909	167.1915	154.9197	147.4029	139.5459	134.7204	138.7076	143.3824	152.1006	163.8645	174.1289	(72)
Total internal gains													
	1008.3103	1037.8821	991.8516	959.9892	908.5653	872.8858	837.3375	836.0928	862.4285	893.7374	949.4083	984.4953	(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	
North	13.6500	10.6334	0.6300	0.7000	0.7700	44.3584	(74)
East	22.6200	19.6403	0.6300	0.7000	0.7700	135.7725	(76)
South	14.2200	46.7521	0.6300	0.7000	0.7700	203.1759	(78)
West	25.3900	19.6403	0.6300	0.7000	0.7700	152.3989	(80)
East	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
West	3.2300	26.0000	0.6300	0.7000	1.0000	33.3317	(82)
North	2.4100	26.0000	0.6300	0.7000	1.0000	24.8698	(82)
South	1.5100	26.0000	0.6300	0.7000	1.0000	15.5823	(82)

Solar gains	642.8211	1203.7158	1891.7879	2682.3861	3261.2504	3336.6938	3176.7435	2738.9470	2169.4841	1400.6257	790.8246	536.0365	(83)
Total gains	1651.1314	2241.5978	2883.6395	3642.3753	4169.8157	4209.5795	4014.0810	3575.0398	3031.9126	2294.3631	1740.2329	1520.5318	(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	43.2144	43.3096	43.4034	43.8493	43.9337	44.3311	44.3311	44.4055	44.1772	43.9337	43.7632	43.5864	
alpha	3.8810	3.8873	3.8936	3.9233	3.9289	3.9554	3.9554	3.9604	3.9451	3.9289	3.9175	3.9058	
util living area													
	0.9978	0.9927	0.9761	0.9178	0.7924	0.6158	0.4672	0.5371	0.7990	0.9665	0.9950	0.9984	(86)
MIT	18.9258	19.2297	19.6962	20.2808	20.7103	20.9223	20.9797	20.9656	20.7804	20.1522	19.4231	18.8821	(87)
Th 2	19.8753	19.8775	19.8796	19.8897	19.8916	19.9004	19.9004	19.9020	19.8970	19.8916	19.8878	19.8838	(88)
util rest of house													
	0.9972	0.9907	0.9692	0.8945	0.7385	0.5279	0.3570	0.4207	0.7245	0.9529	0.9933	0.9980	(89)
MIT 2	17.4428	17.8325	18.4254	19.1524	19.6411	19.8523	19.8928	19.8878	19.7338	19.0129	18.0878	17.3922	(90)
Living area fraction										fLA = Living area / (4) =		0.1454	(91)
MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.6584	18.0357	18.6102	19.3165	19.7966	20.0079	20.0509	20.0445	19.8860	19.1786	18.2820	17.6089	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9855	0.9583	0.8796	0.7333	0.5370	0.3725	0.4366	0.7236	0.9405	0.9893	0.9965	(94)
Useful gains	1643.1994	2209.1025	2763.2945	3203.8900	3057.8274	2260.7321	1495.3674	1560.8017	2193.9776	2157.9432	1721.6493	1515.1632	(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													
	6018.3341	5904.9729	5432.2285	4624.9674	3588.0008	2375.0214	1515.5492	1597.8962	2549.9317	3801.6056	4974.6166	5989.5092	(97)
Space heating kWh													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98a)
Space heating requirement - total per year (kWh/year)												16035.9716	
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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												16035.9716	
Space heating per m2											(98c) / (4) =	44.7133	(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 %)	92.3000 (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													
	3255.1002	2483.6250	1985.6869	1023.1757	394.4490	0.0000	0.0000	0.0000	0.0000	1222.8848	2342.1365	3328.9134	(98)
Space heating efficiency (main heating system 1)													

	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)													
	3526.6525	2690.8179	2151.3401	1108.5328	427.3554	0.0000	0.0000	0.0000	0.0000	1324.9023	2537.5259	3606.6234	(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													
	275.0446	243.2232	258.6461	228.3433	221.9073	200.5908	198.5733	206.1991	208.1430	231.3043	244.9237	272.1943	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.0265	87.9156	87.6606	87.0096	85.3350	79.8000	79.8000	79.8000	79.8000	87.2351	87.8619	88.0494	(217)
Fuel for water heating, kWh/month													
	312.4566	276.6554	295.0539	262.4347	260.0426	251.3669	248.8387	258.3948	260.8309	265.1506	278.7600	309.1381	(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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	52.8393	42.3897	38.1672	27.9629	21.5994	17.6469	19.7037	25.6116	33.2669	43.6480	49.3003	54.3079	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-87.4822	-122.1945	-173.9346	-193.4107	-206.4712	-191.6201	-188.8779	-179.1058	-161.8949	-138.3214	-95.6202	-75.7359	(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	-52.9782	-111.0157	-219.9914	-329.6025	-435.2376	-437.4248	-432.6418	-366.9067	-269.4625	-158.9346	-70.7566	-41.9587	(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	17373.7503	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.8000	
Water heating fuel used	3279.1232	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	426.4437	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4741.5806	(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	16423.7367	(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	17373.7503	0.2100	3648.4876	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3279.1232	0.2100	688.6159	(264)
Space and water heating			4337.1034	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	426.4437	0.1443	61.5490	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	0.1348	-244.7008	
PV Unit electricity exported	-2926.9112	0.1259	-368.6400	
Total			-613.3409	(269)
Total CO2, kg/year			3797.2408	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.5900	(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	17373.7503	1.1300	19632.3379	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3279.1232	1.1300	3705.4092	(278)
Space and water heating			23337.7471	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	426.4437	1.5338	654.0936	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1814.6694	1.4984	-2719.0695	
PV Unit electricity exported	-2926.9112	0.4623	-1353.1642	
Total			-4072.2337	(283)
Total Primary energy kWh/year			20049.7078	(286)
Target Primary Energy Rate (TPER)			55.9000	(287)

Predicted Energy Assessment

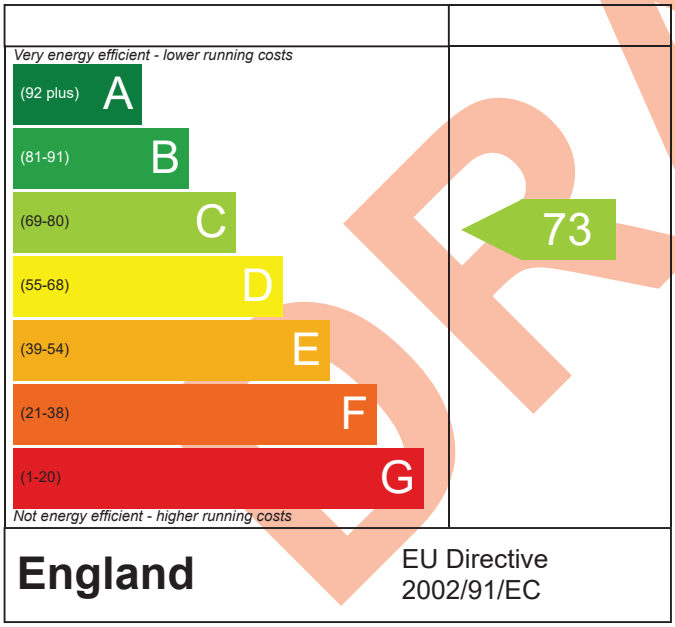
Netherhall Gardens, 34a, London, United Kingdom, NW3 5TP

Dwelling type:	Bungalow, Detached
Date of assessment:	17/12/2024
Produced by:	Paul Pasifull
Total floor area:	358.64 m²
DRRN:	

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

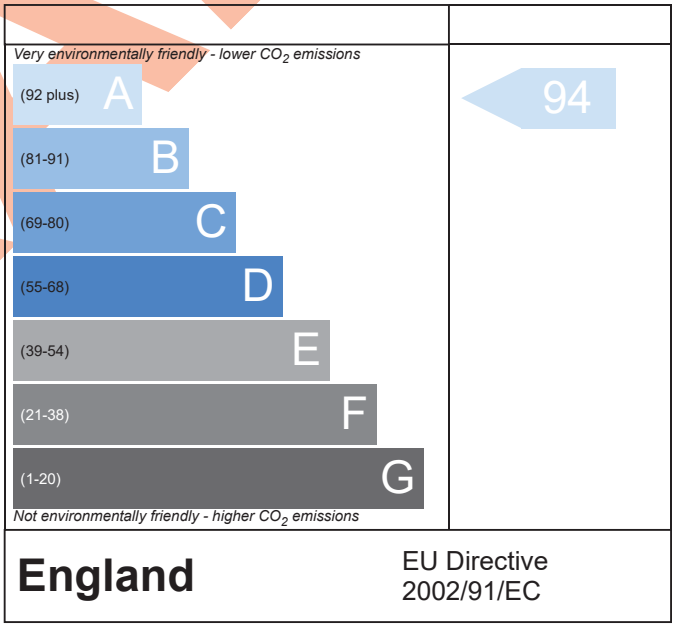
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

Pre-Demolition Audit & Site Waste Management Plan

For the demolition works at
34A Netherhall Gardens, Hampstead, London, NW3 5TP



Front Elevation: Existing Building at 34A Netherhall Gardens

1. Amendment Record

Any amendments or additional parts of revised pages will be marked in highlight

Issue	Date	Description of Amendments
Draft	**19th December 2024**	Issue for planning

2. Introduction

This document will describe how all wastes are removed safely and effectively managed and sent for appropriate and legal processing/disposal.

All reasonable steps shall be taken to ensure that all waste is dealt with in accordance with the waste duty of care in Section 34 of the Environmental Protection Act 1990 and the Environmental Protection (Duty of Care) Regulation 1991.

The proposed development at 34A Netherhall Gardens will achieve recycling and sustainability targets and will seek opportunities to minimise waste production and in particular to minimise quantities of wastes destined for Landfill. In accordance with the SWMP Regs 2008 and the Waste (England and Wales) Regs 2011. As reasonably practicable, steps will be taken to prevent the generations of waste and then that waste produced during construction is re-used, recycled or recovered.

3. Description of the Project

The proposals include the demolition of the existing building and construction of a new family home including a basement.

The existing building comprises a single-family home with 3 x garages occupying the ground floor.

The demolition includes the demolition of the entire building with recycling of the existing materials wherever practicable.

4. Scope Of Work

The works under this contract will comprise but not limited to:

- Service disconnections
- Erection of hoardings to secure the site
- Removal of any identified asbestos containing materials prior to demolition works
- Erection of temporary works as necessary
- Soft-strip all structures
- Demolition of structures down to ground slab level
- Removal of ground slabs and hardstandings as required
- Removal of foundations to a depth of 1.5m below existing ground levels
- Making good / temporary works to walls exposed by the demolition works

• Clearance of debris arising to licensed disposal / recycling sites
• Issue a post demolition report on completion of the works including all environmental

5. Project Directory

Client:	Nedko Kyuchukov & Irena Tzekina Property Owners and Planning Applicants
Contract Administrator:	Sphere Cost Mark Horton mark@spherecost.com 07712 812 892
Principal Designer:	Beech Hill Safety Ltd Dr James Thornhill james@beechhillsafety.co.uk +44(0)7919 123683
Principal Contractor:	To be confirmed

6. Objectives

(a) 100% wastes to be accurately recorded off site, hauled by registered carriers and accepted at bona-fide end user point. Items sent off site as waste shall be delivered to a suitably licensed (or exempt) facility.

(b) Recycling Target of 95% for the works.

7. Responsibilities

Estimators shall lead the process during Tender, identifying opportunities to salvage removed materials and minimise waste generation during Demolition. They shall be assisted in these endeavours by the Resource Manager who will be responsible during Project lead in for further development of these opportunities and the recording of arrangements on the Waste Record Spreadsheet during project execution, the Site and Contracts Managers shall be responsible for implementation of the Site Waste Management Plan and issue of the regular Progress Report which will contain a summary of waste processing for the previous reporting period.

8. Prior Decisions

The project development discussions and planning processes contained strict requirements to maximise *Refuse Reduce Reuse Recycle and Rot* opportunities. All materials removed from site will be recycled or go for final disposal as per the company Environmental procedures and the information contained within this document.

The project planning process to minimise the carbon footprint for the demolition phase, identifying local disposal points and maximising re-use and recycling of the construction waste.

9. Waste Types & Quantities

Initial analysis reveals the following anticipated waste streams from the Demolition processes.

Materials for removal: Waste Type	Forecast Estimated Quantity	Waste Minimisation Option	Waste management route	Justification
Concrete	13.2m3	Recycling at source	Recycling on site	Fine crush concrete and store on site for later use around all the below ground drainage and permeable material.
Bricks				
40% bricks	26.40m3	Recycling at source	Recycling on site	Bricks are not of reclaim quality and will be utilised on site to create the *piling mat*
40% bricks	26.40m3	Recycling at source	Recycling on site	Bricks are not of reclaim quality and will be crushed and utilised on site to create the hardcore base below the new concrete slab
20% bricks	13.20m3	Sent as reclaim	Recycling	Remove plaster and mortar and send for recovery at a material recycling/ reclaimed facility
Timber	35.0m3	Segregate at source	Recovery at transfer station	Timber will be sent for recovery at a material recycling facility.
Windows Metal	2.00m3	Segregate at source	Recycling	Metal will be segregated and sent to a specialist recycler for further processing.
Glass	1.00m3	Segregate at source	Recycling	Glass will be segregated and sent to a specialist recycler for further processing.
Strip Out				
Finishes	4.00m3	Strip out	Mixed general waste	Recovery at transfer station
Copper Pipes	2.00m3	Segregate at source	Recycling	Metal will be segregated and sent to a specialist recycler for further processing.
Timber Doors/ Frames	9.00m3			
Plasterboard	12.00m3	Segregation at source	Recycling	Plasterboard will be segregated and sent to a specialist recycler for further processing.
WEEE Waste	0.25m3			Light fittings, sockets etc will be segregated into individual streams and sent to specialist recyclers.
Roof Felt	2.00m3	Strip out	Segregate at source	Remove the felt by hand and will be put into the mixed waste skip and sent for recovery at a material recycling facility
Asbestos *	TBC	Strip out	Removed at source	Permitted Landfill

*Only if identified during the pre-construction asbestos survey.

Imported Waste Materials:

General builders' wastes ranging from material packaging, PPE and other consumables.	11m3 (2 x 12 yard skips)	Mixed general waste	Recovery at transfer station	Mixed waste will be sent for recovery at a materials recycling facility where materials will be segregated into individual streams and sent to specialist recyclers. A small proportion will be sent to energy recovery.

9. Waste Management Options

Waste Management will be conducted in distinct phases, as follows, although phases will overlap between different areas of the site:

- Asbestos removal (ONLY IF APPLICABLE FOLLOWING INVASIVE ASBESTOS SURVEY)
- Soft strip of all floors - metal, timber, plasterboard, glass, carpets, insulation, M&E.
- Internal and external demolition of all floors - hardcore and brick/blockwork, structural timber.
- Ground floor slab

Designated waste skips (Roll on/ Roll off) will be provided from the outset subject to the work load in hand. The majority of the waste created by the project will be from the Demolition and removal of the above.

Waste will be removed in its designated streams. It will be loaded into roll on roll off skips in the loading area. It will be taken directly to the transfer stations.

All waste carriers and approved suppliers have been pre-qualified having the necessary registrations and insurances to provide the services listed.

10. Procedures

Training
Induction training carried out to site shall include Environmental issues, Clifford Devlin Inductions will specifically include a reminder to all staff on the expected levels of recycling and waste control and the standard of segregation required for acceptable disposal.

Planning
Designated areas shall be established for storage of materials during sorting. Skips will be loaded with one designated stream at a time for removal off site.

Measurement
All skips on and off site shall be recorded by CDL Labour Resource Manager, measurement made of vehicle weight and copies of all transfer notes collated.

Monitoring and records
When any haulage arrangements are made, copies of the haulier's carriage registration and the tips Waste Management Licence shall be retained on site.

The Weekly Progress Report contains data for waste movements and is assembled by senior contract managers who shall review the previous week's activity during report compilation. In addition HSQE inspections will monitor condition of roads, skips and the contents whilst assessing other site hazards.

Review

On completion of the Project, a Project Close out Report shall be prepared (also containing information for the Health and Safety File, as-built /record drawings etc), recording the eventual totals of wastes and recycling performance statistics. This shall be used to reassess the cost effectiveness of techniques used (Reg 8 (4) d), the suitability of the systems employed and the general impact on both internal and external stakeholders. It will also report on any lessons learned in relation to waste management.

The Waste (England and Wales) Regulations 2011

These regulations make some important changes to the existing framework as follows:
Regulation 12 makes it an offence NOT to follow the Waste Hierarchy, and Regulation 35 extends the requirements for information to be contained in a Waste Transfer Note WTN. These regulations are reproduced in italics for information, as follows:

Duty in relation to the waste hierarchy
12. (1) An establishment or undertaking which imports, produces, collects, transports, recovers or disposes of waste, or which as a dealer or broker has control of waste must, on the transfer of waste, take all such measures available to it as are reasonable in the circumstances to apply the following waste hierarchy as a priority order—

(a)prevention;

(b)preparing for re-use;

(c)recycling;

(d)other recovery (for example energy recovery);

(e)disposal.

The transfer note
35. (1) This regulation takes effect as if it were made in exercise of the power in section 34(5) of the Environmental Protection Act 1990.

(2) When controlled waste is transferred in accordance with section 34(1)(c) of that Act the written description of the waste ("the transfer note") must—

(a) identify the waste to which it relates by reference to the appropriate codes in the List of Wastes (England) Regulations 2005(1) or, as the case may be, the List of Wastes (Wales) Regulations 2005(2), give a description of the waste and state—

(i) its quantity and whether it is loose or in a container,

(ii) if in a container, the kind of container,

(iii) the time and place of transfer, and

(iv) the SIC code of the transferor;

(b) give the name and address of the transferor and the transferee and be signed by them;

(c) state whether each of the transferor and transferee are—

(i) the producer of the waste,

(ii) the importer of the waste,

(iii) the transporter of the waste,

(iv) a local authority,

(v) a holder of an environmental permit under the Environmental Permitting (England and Wales) Regulations 2010, in which case the note must include the permit number (if any),

(vi) a person carrying on an operation to which section 33(1)(a) of the Environmental Protection Act 1990 does not apply by virtue of regulation 68(2) of the Environmental Permitting (England and Wales) Regulations 2010,

(vii) a person registered as a carrier of controlled waste under the Control of Pollution (Amendment) Act 1989, in which case the note must include the registration number (if any),

(viii) a person registered as a broker of or dealer in controlled waste, in which case the note must include the registration number (if any);

(d) confirm that the transferor has discharged the duty in regulation 12.

On Site Waste Record Form

Site	Netherhall Gardens				
Date/Time	Driver	Company	Waste Ticket number	Waste Type	Destination

APPENDICES

Carriers registration Certificates and Tip Registration Details
Are to be retained here BEFORE the first load of each individual waste stream is removed from site, particularly if any new waste stream or haulier or disposal site is identified other than those listed in this document.

Site Managers should be aware of the Fixed penalty system as follows:

Fixed penalty notices

16.—(1) A person authorised to enforce these Regulations who believes that any person has contravened regulation 13(d) (production of a site waste management plan or other record to a person acting in the execution of these Regulations) may give to that person a notice offering the opportunity of discharging any liability to conviction for that offence by payment of a fixed penalty of £300.

Failure to produce any record required by the regulations, from the plan itself to tip certificate, carriers registration to the Waste transfer Note can lead to the fixed penalty notice.