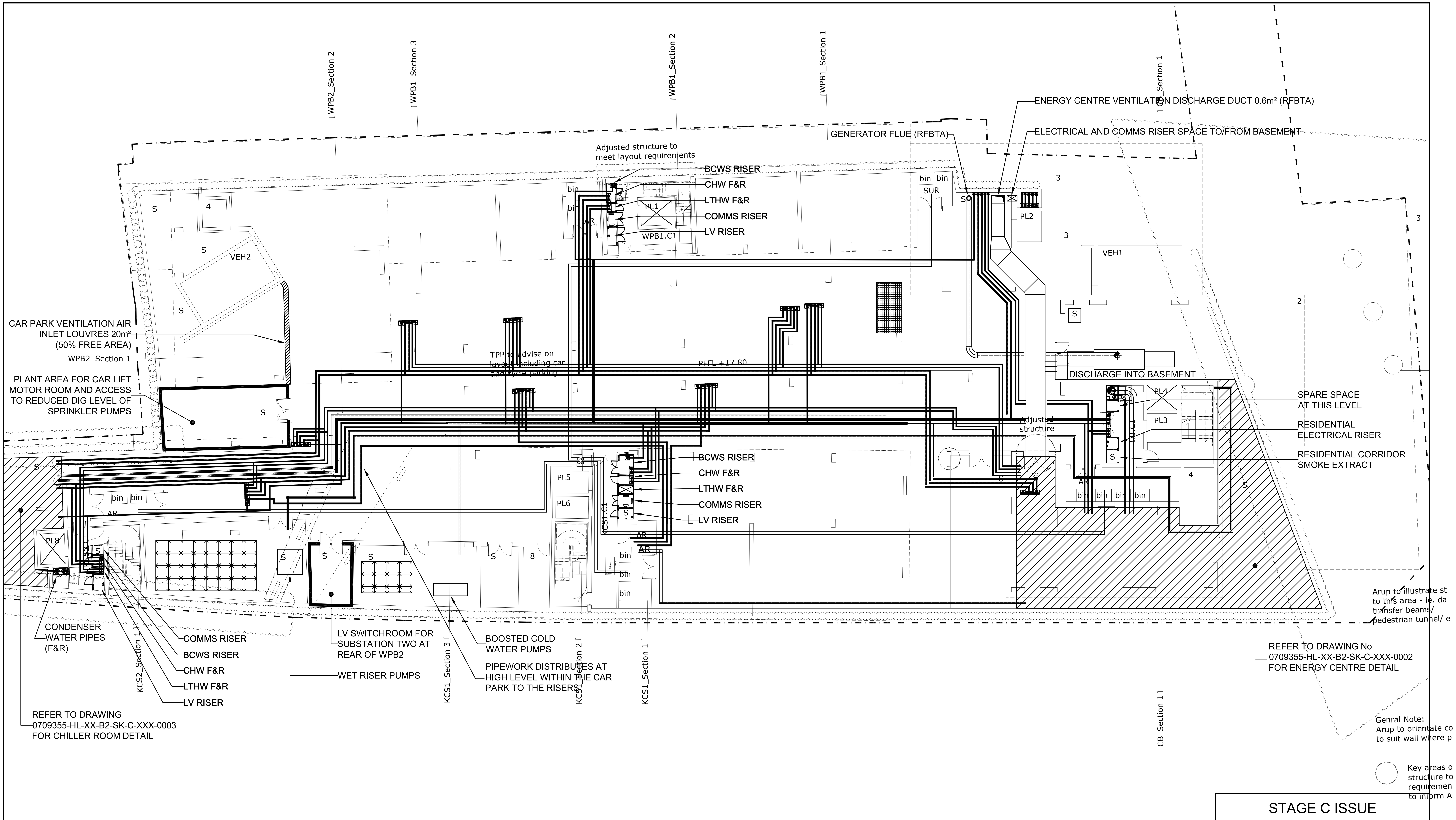
APPENDIX 4 – SITE WIDE SCHEMATICS

This drawing shall not be scaled. Work from the dimensions shown in the drawing or given in relevant specifications



STAGE C ISSUE

Index	Description	Drawn & Chk by	Rev'd by	Date
P3	DRAWING UPDATED TO SUIT LATEST ARCHITECTS INFORMATION	RS	RE	OCT15

Revisions

CAD ORIGINAL - NOT TO BE MODIFIED BY HAND

NOTES:

1. The drawing does not necessarily show all the information needed to interpret the design intent or the construction details.
2. The drawing contains information from more than one source and must be read in conjunction with all relevant specifications.
3. Any apparent drafting errors and differences between other drawings and specifications shall be brought to our attention.
4. Information provided is for further discussion + coordination with the design team.
5. Services rotes to cores to be discussed option at B1 & B2 possible.
6. Smaller plant to be shown as design devlops e.g. Pumps, Refuse fans etc.
7. Smoke vent strategy from basement rooms to be further developed.
8. Perimeter building risers & office riser vertical continuity to be further discussed

CDM Pre-Construction Information

The following information is provided in pursuance of Regulations 11 (6) of the CDM Regulations 2007:

NONE UNLESS STATED:

Architect
URBAN SENSE

Client
Notting Hill Gate KCS Limited

Project Title
NOTTING HILL GATE

Drawing Title
COMBINED SERVICES
BASEMENT LEVEL-2

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BRISTOL
CARDIFF
ISLE of MAN
LEEDS
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Project No	Drawn & Checked by	Reviewed by
0709355	RS	RE
Date	Scale	Issuing Office
JULY 2018	1:200@ A2	BOURNEMOUTH

DRAWING NUMBER

Project Code	Orig.	Zone	Level	Type	Role	Class.	Number	Rev.
0709355	HL	XX	B2	SK	C	XXX	0001	P3

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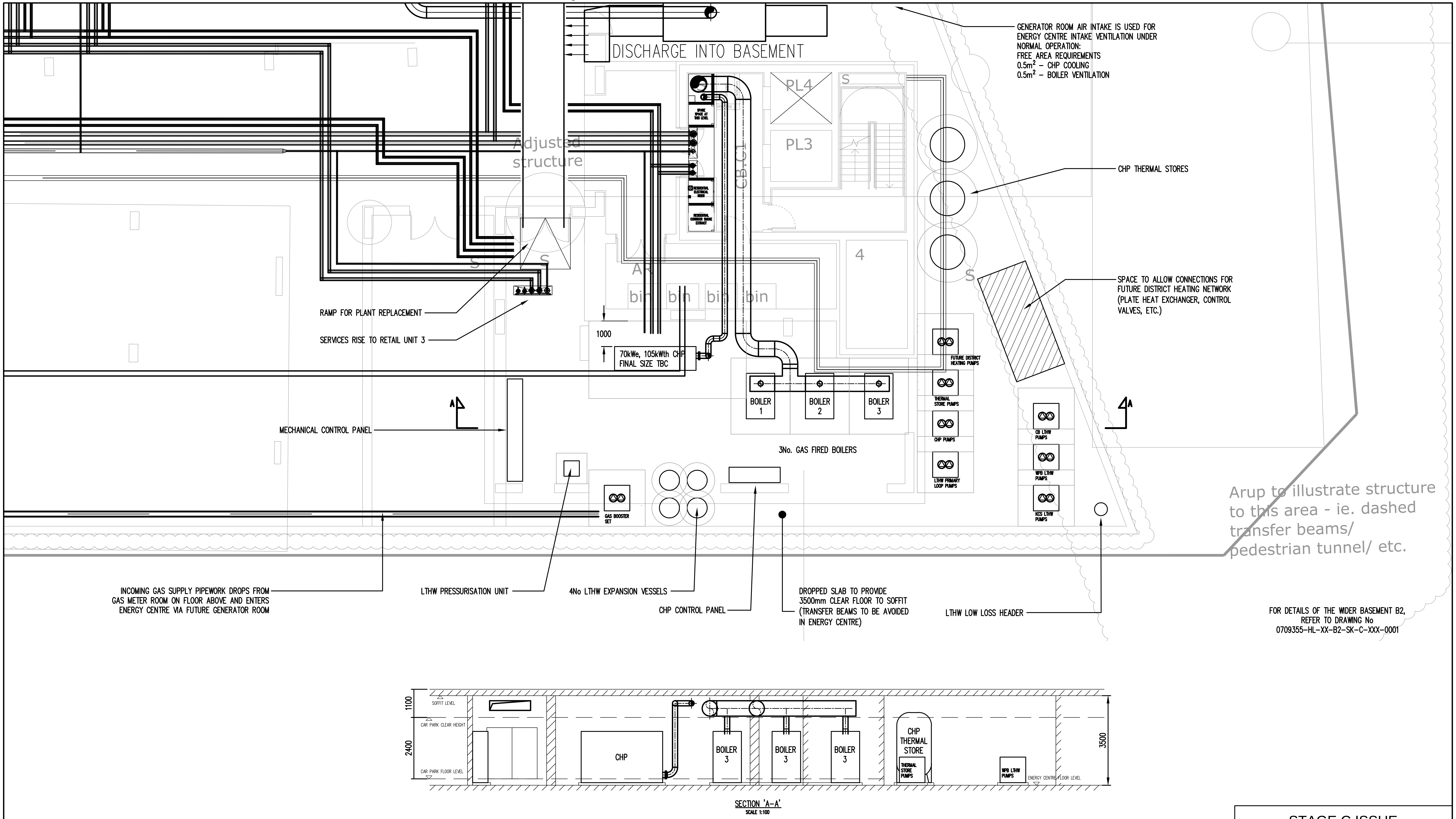
This drawing shall not be scaled. Work from the dimensions shown in the drawing or given in relevant specifications



STAGE C ISSUE

NOTES:

1. The drawing does not necessarily show all the information needed to interpret the design intent or the construction details.
2. The drawing contains information from more than one source and must be read in conjunction with all relevant specifications.
3. Any apparent drafting errors and differences between other drawings and specifications shall be brought to our attention.
4. Information provided is for further discussion + coordination with the design team.

CDM Pre-Construction Information

The following information is provided in pursuance of Regulations 11 (6) of the CDM Regulations 2007:

NONE UNLESS STATED:

Index	Description	Drawn & Chk by	Rev'd by	Date
P3	DRAWING UPDATED TO SUIT LATEST ARCHITECTS INFORMATION	RS	RE	OCT15

Revisions

CAD ORIGINAL - NOT TO BE MODIFIED BY HAND

Architect: URBAN SENSE

Client: Notting Hill Gate KCS Limited

Project Title: NOTTING HILL GATE

Drawing Title: ENERGY CENTRE LAYOUT BASEMENT -2

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Project No	Drawn & Checked by	Reviewed by
0709355	AH	RS

Date	Scale	Issuing Office
JULY 2018	1:100 @ A2	BOURNEMOUTH

DRAWING NUMBER

Project Code	Orig.	Zone	Level	Type	Role	Class.	Number	Rev.
0709355	HL	XX	B2	SK	C	XXX	0002	P3

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This drawing shall not be scaled. Work from the dimensions shown in the drawing or given in relevant specifications

NOTES:

1. The drawing does not necessarily show all the information needed to interpret the design intent or the construction details.
2. The drawing contains information from more than one source and must be read in conjunction with all relevant specifications.
3. Any apparent drafting errors and differences between other drawings and specifications shall be brought to our attention.

Index	Description	Drawn & Chk by	Rev'd by	Date

Revisions

CAD ORIGINAL - NOT TO BE MODIFIED BY HAND

CDM Pre-Construction Information
The following information is provided in pursuance of Regulations 9 of the CDM Regulations 2015:
NONE UNLESS STATED:

Architect
URBAN SENSE

Client
Notting Hill Gate KCS Limited

Project Title
NOTTING HILL GATE

Drawing Title
MECHANICAL SERVICES
ENERGY CENTRE AND PRIMARY
DISTRIBUTION SCHEMATIC

STAGE D ISSUE

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Project No	Drawn & Checked by	Reviewed by
0709355	AH	RS
Date	**Scale**	**Issuing Office**
JULY 2018	NTS @ A0	BOURNEMOUTH

DRAWING NUMBER

Project Code	Orig.	Zone	Level	Type	Role	Class.	Number	Rev.
0709355	HL	XX	ZZ	SK	M	532	0007	P1

This drawing shall not be scaled. Work from the dimensions shown in the drawing or given in relevant specifications

NOTES:

1. The drawing does not necessarily show all the information needed to interpret the design intent or the construction details.
2. The drawing contains information from more than one source and must be read in conjunction with all relevant specifications.
3. Any apparent drafting errors and differences between other drawings and specifications shall be brought to our attention.

Index	Description	Drawn & Chk by	Rev'd by	Date
P2	UPDATED FOR REVISED LAYOUT	AH	RS	OCT'15

Revisions

CAD ORIGINAL - NOT TO BE MODIFIED BY HAND

CDM Pre-Construction Information
The following information is provided in pursuance of Regulations 9 of the CDM Regulations 2015:
NONE UNLESS STATED:

Architect
URBAN SENSE

Client
Notting Hill Gate KCS Limited

Project Title
NOTTING HILL GATE

Drawing Title
MECHANICAL SERVICES
LTHW SCHEMATIC
CORNER BUILDING & WPB3

STAGE D ISSUE

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Project No	Drawn & Checked by	Reviewed by
0709355	AH	RS
Date	Scale	Issuing Office
JULY 2018	NTS @ A0	BOURNEMOUTH

DRAWING NUMBER

Project Code	Orig.	Zone	Level	Type	Role	Class.	Number	Rev.
0709355	HL	XX	ZZ	SK	M	532	0008	P2

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This drawing shall not be scaled. Work from the dimensions shown in the drawing or given in relevant specifications

NOTES:

1. The drawing does not necessarily show all the information needed to interpret the design intent or the construction details.
2. The drawing contains information from more than one source and must be read in conjunction with all relevant specifications.
3. Any apparent drafting errors and differences between other drawings and specifications shall be brought to our attention.

Index	Description	Drawn & Chk by	Rev'd by	Date
P2	UPDATED FOR REVISED LAYOUT	AH	RS	OCT'15

Revisions

CAD ORIGINAL - NOT TO BE MODIFIED BY HAND

CDM Pre-Construction Information
The following information is provided in pursuance of Regulations 9 of the CDM Regulations 2015:
NONE UNLESS STATED:

Architect
URBAN SENSE

Client
Notting Hill Gate KCS Limited

Project Title
NOTTING HILL GATE

Drawing Title
MECHANICAL SERVICES
LTHW SCHEMATIC
WPB1, KCS1 & KCS2 BUILDINGS

STAGE D ISSUE

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Project No	Drawn & Checked by	Reviewed by
0709355	AH	RS
Date	Scale	Issuing Office
JULY 2018	NTS @ A0	BOURNEMOUTH

DRAWING NUMBER

Project Code	Orig.	Zone	Level	Type	Role	Class.	Number	Rev.
0709355	HL	XX	ZZ	SK	M	532	0009	P2

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APPENDIX 5 – SAMPLE 'BE CLEAN' DER WORKSHEETS & BRUKL DOCUMENTS

HOARE LEA (H.)

SAP Results Sheet.

Project Newcombe House - CB (CLEAN)
Revision 2
Version 8
Date 22/05/2018

Dwelling Reference	Dwelling Area (m²)	No. of Dwelling Type	TER	DER	Criterion 1 DER/TER Variance	TFEE	DFEE	Criterion 1 DFEE/TFEE Variance	Criterion 3 Overheating Strategy	Criterion 3 Overheating Risk
CB-A1	164.79	1	15.66	10.74	-31.40%	58.90	54.40	-7.65%	1.5	Medium
CB-A17 Duplex	333.64	1	14.86	9.94	-33.13%	64.95	61.11	-5.91%	1.9	Medium
CB-A2	162.36	1	16.50	11.80	-28.53%	62.82	59.04	-6.02%	1.4	Medium
CB-A20 Duplex	365.9	1	13.92	9.27	-33.40%	60.95	56.66	-7.03%	1.9	Medium
CB-A21 Duplex	367.27	1	19.28	13.20	-31.55%	88.15	85.58	-2.92%	2.4	Medium
CB-A3	164.79	2	13.28	8.92	-32.88%	47.03	42.64	-9.35%	1.8	Medium
CB-A4	162.81	2	14.22	10.09	-29.05%	51.49	48.22	-6.35%	1.9	Medium
CB-A7	165.65	5	13.45	9.02	-32.98%	48.12	43.51	-9.59%	1.9	Medium
CB-A8	162.21	7	14.58	10.32	-29.25%	53.32	49.72	-6.75%	1.9	Medium
Area Weighted Results	4012.88	21	14.73	10.13	-31.23%	57.05	53.17	-6.80%		0

Parameters Used.

Category	Parameter	Value	Notes
External Fabric	External Wall U-Values (W/m²K)	0.25	As Calculated by BS EN ISO 6946
	Floor U-Values (W/m²K)	0.09	As Calculated by BS EN ISO 6946
	Roof U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Glazing U-Value (W/m2K)	1.10	As Calculated by BS EN ISO 12567 or 10077 (U-Value includes glass and frame)
	G-Value (-)	0.55	
	Fraction Glazed (%)	0.80	Proportion of glass to overall opening size
Internal Walls	To Other Apartments	Fully Filled Cavity with Sealed Edges	
	To Corridors (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Risers (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Lift Shafts (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Stair Wells (W/m²K)	0.18	As Calculated by BS EN ISO 6946
Thermal Mass	Thermal Mass Parameter (Simple)	Low	Based on Construction of Walls, Floors, Roofs (including party and internal walls, floors and ceilings)
Thermal Bridging	Thermal Bridge Specification	Default	No further information required on thermal bridges
Air Permeability	Air Permeability Rate (m3/hm2 at 50Pa)	3	As stated on a test certificate from a person registered by an authorised air pressure testing scheme Note to use the measured air perm rate each dwelling has to be pressure tested. If a dwelling is not pressure tested the value used in the calculation is an average of the tested dwellings of the same type plus 2.
Mechanical Ventilation	Strategy	Balanced with Heat Recovery	
	SFP (W/l/s)	0.52 (K+1), 0.55 (K+2), 63 (K+3), 74 (K+4), 86 (K+5)	SAP Appendix Q Test Results
	Heat Exchange Efficiency (%)	92 (K+1), 92 (K+2), 90 (K+3), 89 (K+4), 89 (K+5)	SAP Appendix Q Test Results
	Installer approved	Yes	The installer has be registered with a Government Approved Scheme e.g. BESCA, Blue Flame Certification, Certsure, NAPIT and Stroma
	Duct Type	Rigid	All ductwork is rigid except for occasional flexible ducting to join components together
	Ductwork Insulated	Yes	Ductwork can be assumed to be insulated if all of the ductwork is inside the insulated envelope even if the ductwork itself is uninsulated.
Space Heating	Category	Communal	
	Boilers - Fraction of Heat (-)	0.3	As design specification
	Boilers - Efficiency (%)	91.8	As calculated by SAP Appendix D
	CHP - Fraction of Heat (-)	0.7	As design specification
	CHP - Efficiency (%)	80	Gross Efficiency from Manufacturers Literature
	CHP - Heat to Power Ratio (-)	1.54	Heat Supplied / Power Supplied
	Heat Distribution System	Pre-insulated low temperature, variable flow (1991 or later)	District heating specification
	Controls	Charging system linked to use, programmer and TRVs	
	Emitter	Underfloor (Screed)	
Water Heating	Type	From Main System	
	Cylinder in Dwelling	No	
	Plate Heat Exchanger	Yes	
	Volume (litres)	1	
	Insulation Type	Spray Foam	
	Insulation Thickness (mm)	30	
	Waste Water Heat Recovery	No	
Renewables	Type	None	
Cooling	Areas Cooled	All Living Spaces and Bedrooms	
	EER	4.5	
	Controls	Variable Speed Compressor	
Summertime Overheating	Openable Windows	No	
	Mechanical Ventilation Required	Yes	
	Blinds	Light-coloured curtain or roller blind	

HOARE LEA

SAP Results Sheet.

Project	Newcombe House - KCS1 (CLEAN)
Revision	2
Version	8
Date	22/05/2018

Dwelling Reference	Dwelling Area (m²)	No. of Dwelling Type	TER	DER	Criterion 1 DER/TER Variance	TFEE	DFEE	Criterion 1 DFEE/TFEE Variance	Criterion 3 Overheating Strategy	Criterion 3 Overheating Risk
KCS1-A1	175.68	1	15.16	9.95	-34.40%	57.80	51.95	-10.12%	1.8	Medium
KCS1-A10	42.3	1	21.78	15.75	-27.68%	58.86	66.26	12.57%	2.9	Medium
KCS1-A11	151	1	13.73	8.75	-36.24%	48.00	41.09	-14.40%	2.2	Medium
KCS1-A12	58.88	1	17.09	11.41	-33.22%	44.17	42.11	-4.66%	2.6	Medium
KCS1-A13	183.45	1	15.89	11.26	-29.14%	62.25	59.91	-3.76%	2	Medium
KCS1-A14	151	1	16.04	11.21	-30.10%	59.61	57.18	-4.08%	2.2	Medium
KCS1-A15	58.88	1	19.40	13.80	-28.85%	55.76	57.64	3.37%	2.2	Medium
KCS1-A2	42.3	1	21.78	14.64	-32.79%	58.86	62.44	6.09%	3	Medium
KCS1-A3	143.5	1	16.35	10.65	-34.87%	60.02	53.47	-10.91%	1.8	Medium
KCS1-A4	58.88	1	19.40	12.72	-34.42%	55.76	53.44	-4.16%	2.3	Medium
KCS1-A5	175.68	1	12.79	8.41	-34.25%	46.04	40.28	-12.51%	2.1	Medium
KCS1-A6	42.3	1	19.52	13.60	-30.36%	47.32	52.20	10.30%	3.3	Medium
KCS1-A7	143.5	1	14.00	9.07	-35.17%	48.26	41.87	-13.25%	2.1	Medium
KCS1-A8	58.88	1	17.09	11.41	-33.22%	44.17	42.11	-4.66%	2.6	Medium
KCS1-A9	183.45	1	13.48	8.81	-34.66%	50.16	43.90	-12.49%	2.1	Medium
Area Weighted Results	1669.68	15	15.64	10.49	-32.92%	53.54	49.66	-7.25%		0

Parameters Used.

Category	Parameter	Value	Notes
External Fabric	External Wall U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Floor U-Values (W/m²K)	0.09	As Calculated by BS EN ISO 6946
	Roof U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Glazing U-Value (W/m2K)	1.10	As Calculated by BS EN ISO 12567 or 10077 (U-Value includes glass and frame)
	G-Value (-)	0.55	
	Fraction Glazed (%)	0.80	Proportion of glass to overall opening size
Internal Walls	To Other Apartments	Fully Filled Cavity with Sealed Edges	
	To Corridors (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Risers (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Lift Shafts (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Stair Wells (W/m²K)	0.18	As Calculated by BS EN ISO 6946
Thermal Mass	Thermal Mass Parameter (Simple)	Low	Based on Construction of Walls, Floors, Roofs (including party and internal walls, floors and ceilings)
Thermal Bridging	Thermal Bridge Specification	Default	No further information required on thermal bridges
Air Permeability	Air Permeability Rate (m3/hm2 at 50Pa)	3	As stated on a test certificate from a person registered by an authorised air pressure testing scheme Note to use the measured air perm rate each dwelling has to be pressure tested. If a dwelling is not pressure tested the value used in the calculation is an average of the tested dwellings of the same type plus 2.
Mechanical Ventilation	Strategy	Balanced with Heat Recovery	
	SFP (W/l/s)	0.52 (K+1), 0.55 (K+2), 63 (K+3), 74 (K+4), 86 (K+5)	SAP Appendix Q Test Results
	Heat Exchange Efficiency (%)	92 (K+1), 92 (K+2), 90 (K+3), 89 (K+4), 89 (K+5)	SAP Appendix Q Test Results
	Installer approved	Yes	The installer has be registered with a Government Approved Scheme e.g. BESCA, Blue Flame Certification, Certsure, NAPIT and Stroma
	Duct Type	Rigid	All ductwork is rigid except for occasional flexible ducting to join components together
	Ductwork Insulated	Yes	Ductwork can be assumed to be insulated if all of the ductwork is inside the insulated envelope even if the ductwork itself is uninsulated.
Space Heating	Category	Communal	
	Boilers - Fraction of Heat (-)	0.3	As design specification
	Boilers - Efficiency (%)	91.8	As calculated by SAP Appendix D
	CHP - Fraction of Heat (-)	0.7	As design specification
	CHP - Efficiency (%)	80	Gross Efficiency from Manufacturers Literature
	CHP - Heat to Power Ratio (-)	1.54	Heat Supplied / Power Supplied
	Heat Distribution System	Pre-insulated low temperature, variable flow (1991 or later)	District heating specification
	Controls	Charging system linked to use, programmer and TRVs	
	Emitter	Underfloor (Screed)	
Water Heating	Type	From Main System	
	Cylinder in Dwelling	No	
	Plate Heat Exchanger	Yes	
	Volume (litres)	1	
	Insulation Type	Spray Foam	
	Insulation Thickness (mm)	30	
	Waste Water Heat Recovery	No	
Renewables	Type	None	
Cooling	Areas Cooled	All Living Spaces and Bedrooms	Private Units have Comfort Cooling Affordable Units have no Comfort Cooling
	EER	4.5	
	Controls	Variable Speed Compressor	
Summertime Overheating	Openable Windows	No	
	Mechanical Ventilation Required	Yes	
	Blinds	Light-coloured curtain or roller blind	

HOARE LEA

SAP Results Sheet.

Project	Newcombe House - KCS2 (CLEAN)
Revision	2
Version	8
Date	22/05/2018

Dwelling Reference	Dwelling Area (m²)	No. of Dwelling Type	TER	DER	Criterion 1 DER/TER Variance	TFEE	DFEE	Criterion 1 DFEE/TFEE Variance	Criterion 3 Overheating Strategy	Criterion 3 Overheating Risk
KCS2-A1	110.05	1	16.35	10.87	-33.54%	54.74	51.32	-6.25%	2.4	Medium
KCS2-A2	50.2	1	19.84	12.82	-35.37%	53.83	51.63	-4.07%	2.3	Medium
KCS2-A3	140.6	1	16.03	10.33	-35.60%	58.21	50.77	-12.78%	1.7	Medium
KCS2-A4	110.05	1	14.11	9.18	-34.94%	43.46	40.48	-6.86%	2.7	Medium
KCS2-A5	50.2	1	17.51	11.02	-37.06%	42.13	40.25	-4.46%	2.6	Medium
KCS2-A6	140.6	1	13.73	8.48	-38.24%	46.61	39.06	-16.21%	2.0	Medium
KCS2-A7	110.05	1	17.19	11.96	-30.45%	59.07	59.43	0.61%	2.5	Medium
KCS2-A8	50.2	1	19.84	13.50	-31.95%	53.83	55.86	3.78%	2.2	Medium
KCS2-A9	140.6	1	16.60	11.23	-32.36%	61.20	57.43	-6.16%	1.8	Medium
Area Weighted Results	902.55	9	16.21	10.66	-34.26%	53.37	49.60	-7.07%		0

Parameters Used.

Category	Parameter	Value	Notes
External Fabric	External Wall U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Floor U-Values (W/m²K)	0.09	As Calculated by BS EN ISO 6946
	Roof U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Glazing U-Value (W/m2K)	1.10	As Calculated by BS EN ISO 12567 or 10077 (U-Value includes glass and frame)
	G-Value (-)	0.55	
	Fraction Glazed (%)	0.80	Proportion of glass to overall opening size
Internal Walls	To Other Apartments	Fully Filled Cavity with Sealed Edges	
	To Corridors (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Risers (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Lift Shafts (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Stair Wells (W/m²K)	0.18	As Calculated by BS EN ISO 6946
Thermal Mass	Thermal Mass Parameter (Simple)	Low	Based on Construction of Walls, Floors, Roofs (including party and internal walls, floors and ceilings)
Thermal Bridging	Thermal Bridge Specification	Default	No further information required on thermal bridges
Air Permeability	Air Permeability Rate (m^3/hm^2 at 50Pa)	3	As stated on a test certificate from a person registered by an authorised air pressure testing scheme Note to use the measured air perm rate each dwelling has to be pressure tested. If a dwelling is not pressure tested the value used in the calculation is an average of the tested dwellings of the same type plus 2.
Mechanical Ventilation	Strategy	Balanced with Heat Recovery	
	SFP (W/l/s)	0.52 (K+1), 0.55 (K+2), 63 (K+3), 74 (K+4), 86 (K+5)	SAP Appendix Q Test Results
	Heat Exchange Efficiency (%)	92 (K+1), 92 (K+2), 90 (K+3), 89 (K+4), 89 (K+5)	SAP Appendix Q Test Results
	Installer approved	Yes	The installer has be registered with a Government Approved Scheme e.g. BESCA, Blue Flame Certification, Certsure, NAPIT and Stroma
	Duct Type	Rigid	All ductwork is rigid except for occasional flexible ducting to join components together
	Ductwork Insulated	Yes	Ductwork can be assumed to be insulated if all of the ductwork is inside the insulated envelope even if the ductwork itself is uninsulated.
Space Heating	Category	Communal	
	Boilers - Fraction of Heat (-)	0.3	As design specification
	Boilers - Efficiency (%)	91.8	As calculated by SAP Appendix D
	CHP - Fraction of Heat (-)	0.7	As design specification
	CHP - Efficiency (%)	80	Gross Efficiency from Manufacturers Literature
	CHP - Heat to Power Ratio (-)	1.54	Heat Supplied / Power Supplied
	Heat Distribution System	Pre-insulated low temperature, variable flow (1991 or later)	District heating specification
	Controls	Charging system linked to use, programmer and TRVs	
	Emitter	Underfloor (Screed)	
Water Heating	Type	From Main System	
	Cylinder in Dwelling	No	
	Plate Heat Exchanger	Yes	
	Volume (litres)	1	
	Insulation Type	Spray Foam	
	Insulation Thickness (mm)	30	
	Waste Water Heat Recovery	No	
Renewables	Type	None	
Summertime Overheating	Openable Windows	No	
	Mechanical Ventilation Required	Yes	
	Blinds	Light-coloured curtain or roller blind	

HOARE LEA

SAP Results Sheet.

Project Newcombe House - WPB1 (CLEAN)
Revision 2
Version 8
Date 22/05/2018

Dwelling Reference	Dwelling Area (m²)	No. of Dwelling Type	TER	DER	Criterion 1 DER/TER Variance	TFEE	DFEE	Criterion 1 DFEE/TFEE Variance	Criterion 3 Overheating Strategy	Criterion 3 Overheating Risk
WPB1-A1	111.03	1	18.66	12.50	-33.02%	66.59	62.91	-5.52%	1.8	Medium
WPB1-A2	103.55	1	18.58	12.41	-33.24%	64.98	61.44	-5.45%	1.8	Medium
WPB1-A3	95.21	1	18.94	12.75	-32.68%	64.73	61.71	-4.67%	1.9	Medium
WPB1-A4	112.47	1	18.63	12.48	-33.02%	66.72	62.97	-5.62%	1.8	Medium
Area Weighted Results	422.26	4	18.70	12.53	-33.00%	65.81	62.29	-5.34%		0

Parameters Used.

Category	Parameter	Value	Notes
External Fabric	External Wall U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Floor U-Values (W/m²K)	0.09	As Calculated by BS EN ISO 6946
	Roof U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Glazing U-Value (W/m2K)	1.10	As Calculated by BS EN ISO 12567 or 10077 (U-Value includes glass and frame)
	G-Value (-)	0.55	
	Fraction Glazed (%)	0.80	Proportion of glass to overall opening size
Internal Walls	To Other Apartments	Fully Filled Cavity with Sealed Edges	
	To Corridors (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Risers (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Lift Shafts (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Stair Wells (W/m²K)	0.18	As Calculated by BS EN ISO 6946
Thermal Mass	Thermal Mass Parameter (Simple)	Low	Based on Construction of Walls, Floors, Roofs (including party and internal walls, floors and ceilings)
Thermal Bridging	Thermal Bridge Specification	Default	No further information required on thermal bridges
Air Permeability	Air Permeability Rate (m3/hm2 at 50Pa)	3	As stated on a test certificate from a person registered by an authorised air pressure testing scheme Note to use the measured air perm rate each dwelling has to be pressure tested. If a dwelling is not pressure tested the value used in the calculation is an average of the tested dwellings of the same type plus 2.
Mechanical Ventilation	Strategy	Balanced with Heat Recovery	
	SFP (W/l/s)	0.52 (K+1), 0.55 (K+2), 63 (K+3), 74 (K+4), 86 (K+5)	SAP Appendix Q Test Results
	Heat Exchange Efficiency (%)	92 (K+1), 92 (K+2), 90 (K+3), 89 (K+4), 89 (K+5)	SAP Appendix Q Test Results
	Installer approved	Yes	The installer has be registered with a Government Approved Scheme e.g. BESCA, Blue Flame Certification, Certsure, NAPIT and Stroma
	Duct Type	Rigid	All ductwork is rigid except for occasional flexible ducting to join components together
	Ductwork Insulated	Yes	Ductwork can be assumed to be insulated if all of the ductwork is inside the insulated envelope even if the ductwork itself is uninsulated.
Space Heating	Category	Communal	
	Boilers - Fraction of Heat (-)	0.3	As design specification
	Boilers - Efficiency (%)	91.8	As calculated by SAP Appendix D
	CHP - Fraction of Heat (-)	0.7	As design specification
	CHP - Efficiency (%)	80	Gross Efficiency from Manufacturers Literature
	CHP - Heat to Power Ratio (-)	1.54	Heat Supplied / Power Supplied
	Heat Distribution System	Pre-insulated low temperature, variable flow (1991 or later)	District heating specification
	Controls	Charging system linked to use, programmer and TRVs	
	Emitter	Underfloor (Screed)	
Water Heating	Type	From Main System	
	Cylinder in Dwelling	No	
	Plate Heat Exchanger	Yes	
	Volume (litres)	1	
	Insulation Type	Spray Foam	
	Insulation Thickness (mm)	30	
	Waste Water Heat Recovery	No	
Renewables	Type	None	
Summertime Overheating	Openable Windows	No	
	Mechanical Ventilation Required	Yes	
	Blinds	Light-coloured curtain or roller blind	

DER Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Liam Holden	Assessor number	10245
Client		Last modified	20/06/2018
Address	A1, London		

1. Overall dwelling dimensions

		Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied		164.79	(1a)	x	2.85	(2a)	=	469.65	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	164.79	(4)						
Dwelling volume							(3a) + (3b) + (3c) + (3d)...(3n) =	469.65	(5)

2. Ventilation rate

			m^3 per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs (6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)		0.15	(18)
Number of sides on which the dwelling is sheltered		1	(19)
Shelter factor	1 - [0.075 x (19)] =	0.93	(20)
Infiltration rate incorporating shelter factor	(18) x (20) =	0.14	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	79.90	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window			43.25	x	1.05	=	45.57			(27)
Ground floor			164.79	x	0.09	=	14.83			(28a)
External wall			95.46	x	0.25	=	23.87			(29a)
External wall			30.12	x	0.18	=	5.42			(29a)
Party wall			9.58	x	0.00	=	0.00			(32)
Total area of external elements ∑A, m²			333.62							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	89.69	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		50.04	(36)
Total fabric heat loss	(33) + (36) =	139.73	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	42.99	42.46	41.92	39.23	38.69	36.00	36.00	35.47	37.08	38.69	39.77	40.84	(38)
Heat transfer coefficient, W/K (37)m + (38)m	182.72	182.19	181.65	178.96	178.42	175.74	175.74	175.20	176.81	178.42	179.50	180.57	
Average = ∑(39)1...12/12 =												178.83	(39)
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	1.11	1.11	1.10	1.09	1.08	1.07	1.07	1.06	1.07	1.08	1.09	1.10	
Average = ∑(40)1...12/12 =												1.09	(40)
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	2.96	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	104.39	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	114.83	110.66	106.48	102.31	98.13	93.95	93.95	98.13	102.31	106.48	110.66	114.83	
∑(44)1...12 =												1252.73	(44)
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	170.29	148.94	153.69	133.99	128.57	110.95	102.81	117.97	119.38	139.13	151.87	164.92	
∑(45)1...12 =												1642.52	(45)
Distribution loss 0.15 x (45)m	25.54	22.34	23.05	20.10	19.29	16.64	15.42	17.70	17.91	20.87	22.78	24.74	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)

Water storage loss:

b) Manufacturer's declared loss factor is not known

Hot water storage loss factor from Table 2 (kWh/litre/day)	0.02	(51)
Volume factor from Table 2a	4.93	(52)
Temperature factor from Table 2b	1.00	(53)
Energy lost from water storage (kWh/day) (47) x (51) x (52) x (53)	0.10	(54)
Enter (50) or (54) in (55)	0.10	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water storage loss calculated for each month (55) x (41)m	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(56)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(57)
Primary circuit loss for each month from Table 3	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for each month from Table 3a, 3b or 3c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m	196.79	172.88	180.19	159.64	155.07	136.59	129.31	144.47	145.03	165.63	177.52	191.42	(62)
Solar DHW input calculated using Appendix G or Appendix H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from water heater for each month (kWh/month) (62)m + (63)m	196.79	172.88	180.19	159.64	155.07	136.59	129.31	144.47	145.03	165.63	177.52	191.42	

∑(64)1...12 = 1954.54 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	77.82	68.67	72.30	65.07	63.95	57.41	55.38	60.43	60.21	67.46	71.01	76.04	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.97	26.62	21.65	16.39	12.25	10.34	11.18	14.53	19.50	24.76	28.90	30.81	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	336.20	339.69	330.89	312.18	288.55	266.35	251.52	248.03	256.82	275.53	299.16	321.36	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	(69)
Pump and fan gains (Table 5a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (Table 5)	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	(71)
Water heating gains (Table 5)	104.60	102.19	97.18	90.37	85.95	79.73	74.44	81.22	83.63	90.67	98.63	102.20	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	538.10	535.83	517.06	486.28	454.09	423.76	404.47	411.11	427.28	458.30	494.02	521.70	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
North	0.77	x	9.09	x	10.63	x 0.9 x	0.55	x	0.80	=	29.47	(74)
East	0.77	x	15.15	x	19.64	x 0.9 x	0.55	x	0.80	=	90.73	(76)
South	0.77	x	16.18	x	46.75	x 0.9 x	0.55	x	0.80	=	230.66	(78)
West	0.77	x	2.83	x	19.64	x 0.9 x	0.55	x	0.80	=	16.95	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains in watts ∑(74)m...(82)m	367.81	644.72	923.79	1203.51	1393.85	1401.80	1344.14	1200.78	1021.19	724.43	444.03	312.43	(83)
Total gains - internal and solar (73)m + (83)m	905.91	1180.55	1440.85	1689.78	1847.94	1825.56	1748.60	1611.89	1448.46	1182.73	938.04	834.13	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area n1,m (see Table 9a)	0.97	0.95	0.90	0.81	0.69	0.54	0.41	0.46	0.67	0.87	0.95	0.98	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	18.61	19.00	19.52	20.12	20.57	20.85	20.95	20.93	20.72	20.08	19.23	18.55	(87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(˚C)	19.99	20.00	20.00	20.01	20.01	20.03	20.03	20.03	20.02	20.01	20.01	20.00	(88)
Utilisation factor for gains for rest of dwelling n2,m	0.97	0.94	0.88	0.79	0.65	0.48	0.33	0.38	0.61	0.84	0.95	0.97	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	16.79	17.35	18.10	18.94	19.54	19.89	19.99	19.98	19.74	18.90	17.69	16.70	(90)

Living area fraction — Living area ÷ (4) = 0.52 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2	17.73	18.20	18.83	19.55	20.07	20.38	20.48	20.47	20.25	19.51	18.48	17.65	(92)
Apply adjustment to the mean internal temperature from Table 4e where appropriate	17.73	18.20	18.83	19.55	20.07	20.38	20.48	20.47	20.25	19.51	18.48	17.65	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm	0.95	0.92	0.86	0.77	0.65	0.50	0.37	0.41	0.62	0.83	0.93	0.96	(94)
Useful gains, ηmGm, W (94)m x (84)m	864.90	1085.31	1244.65	1305.22	1199.41	914.16	649.87	668.22	897.92	978.85	872.35	802.63	(95)
Monthly average external temperature from Table U1	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	2453.60	2422.80	2240.29	1905.95	1494.28	1016.32	682.55	712.76	1086.51	1589.86	2043.28	2429.30	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	1182.00	898.80	740.76	432.53	219.38	0.00	0.00	0.00	0.00	454.59	843.07	1210.24	

∑(98)1...5, 10...12 = 5981.35 (98)

Space heating requirement kWh/m²/year — (98) ÷ (4) 36.30 (99)

8c. Space cooling requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm	0.00	0.00	0.00	0.00	0.00	1651.91	1300.44	1331.50	0.00	0.00	0.00	0.00	(100)
Utilisation factor for loss ηm	0.00	0.00	0.00	0.00	0.00	0.83	0.88	0.86	0.00	0.00	0.00	0.00	(101)
Useful loss ηmLm (watts) (100)m x (101)m	0.00	0.00	0.00	0.00	0.00	1377.96	1149.02	1145.93	0.00	0.00	0.00	0.00	(102)
Gains	0.00	0.00	0.00	0.00	0.00	2256.40	2163.65	2006.03	0.00	0.00	0.00	0.00	(103)
Space cooling requirement, whole dwelling, continuous (kWh) 0.024 x [(103)m - (102)m] x (41)m	0.00	0.00	0.00	0.00	0.00	632.48	754.88	639.92	0.00	0.00	0.00	0.00	

∑(104)6...8 = 2027.28 (104)

Cooled fraction — cooled area ÷ (4) = 0.82 (105)

Intermittency factor (Table 10)

0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.25	0.00	0.00	0.00	0.00

∑(106)6...8 = 0.75 (106)

Space cooling requirement (104)m x (105) x (106)m

0.00	0.00	0.00	0.00	0.00	129.77	154.88	131.29	0.00	0.00	0.00	0.00

∑(107)6...8 = 415.94 (107)

Space cooling requirement kWh/m²/year (107) ÷ (4) = 2.52 (108)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)	'0' if none		0.00	(301)
Fraction of space heat from community system	1 - (301) =		1.00	(302)
Fraction of community heat from boilers			0.30	(303a)
Fraction of community heat from CHP			0.70	(303b)
Fraction of total space heat from community CHP	(302) x (303a) =		0.70	(304a)
Fraction of total space heat from community boilers	(302) x (303b) =		0.30	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating			1.00	(305a)
Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heating				
Annual space heating requirement		5981.35		(98)
Space heat from CHP	(98) x (304a) x (305) x (306) =		4396.29	(307a)
Space heat from boilers	(98) x (304b) x (305) x (306) =		1884.13	(307b)
Water heating				
Annual water heating requirement		1954.54		(64)
Water heat from CHP	(64) x (303a) x (305a) x (306) =		1436.59	(310a)
Water heat from boilers	(64) x (303b) x (305a) x (306) =		615.68	(310b)
Electricity used for heat distribution	0.01 × [(307a)...(307e) + (310a)...(310e)] =		83.33	(313)
Cooling System Energy Efficiency Ratio			6.08	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	(107) ÷ (314)		68.47	(315)
Electricity for pumps, fans and electric keep-hot (Table 4f)				
mechanical ventilation fans - balanced, extract or positive input from outside		379.60		(330a)
Total electricity for the above, kWh/year			379.60	(331)
Electricity for lighting (Appendix L)			529.32	(332)
Total delivered energy for all uses	(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =		9310.07	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from CHP	4396.29	x	2.97	x 0.01 =	130.57	(340a)
Space heating from boilers	1884.13	x	4.24	x 0.01 =	79.89	(340b)
Water heating from CHP	1436.59	x	2.97	x 0.01 =	42.67	(342a)
Water heating from boilers	615.68	x	4.24	x 0.01 =	26.10	(342b)
Space cooling	68.47	x	13.19	x 0.01 =	9.03	(348)
Pumps and fans	379.60	x	13.19	x 0.01 =	50.07	(349)
Electricity for lighting	529.32	x	13.19	x 0.01 =	69.82	(350)
Additional standing charges					120.00	(351)
Total energy cost				(340a)...(342e) + (345)...(354) =	528.15	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)
Energy cost factor (ECF)	1.06	(357)
SAP value	85.25	
SAP rating (section 13)	85	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	9063.7862	x	0.2160	=	1957.7778	(363)
less credit emissions for electricity		-2854.7358	x	0.5190	=	-1481.6079	(364)
Water heated by CHP		2961.8001	x	0.2160	=	639.7488	(365)
less credit emissions for electricity		-932.8504	x	0.5190	=	-484.1494	(366)
Emissions from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
CO2 emissions from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	2723.10	x	0.216	=	588.19	(368)
Electrical energy for community heat distribution		83.33	x	0.519	=	43.25	(372)
Total CO2 associated with community systems						1263.21	(373)
Total CO2 associated with space and water heating						1263.21	(376)
Space cooling		68.47	x	0.519	=	35.53	(377)
Pumps and fans		379.60	x	0.519	=	197.01	(378)
Electricity for lighting		529.32	x	0.519	=	274.72	(379)
Total CO_2, kg/year					(376)..(382) =	1770.47	(383)
Dwelling CO_2 emission rate					(383) ÷ (4) =	10.74	(384)
EI value						88.69	
EI rating (section 14)						89	(385)
EI band						B	

13b. Primary energy - community heating scheme

		Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary Energy from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	9063.79	x	1.22	=	11057.82	(363)
less credit energy for electricity		-2854.74	x	3.07	=	-8764.04	(364)
Water heated by CHP		2961.80	x	1.22	=	3613.40	(365)
less credit energy for electricity		-932.85	x	3.07	=	-2863.85	(366)
Primary energy from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
Primary energy from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	2723.10	x	1.22	=	3322.18	(368)
Electrical energy for community heat distribution		83.33	x	3.07	=	255.81	(372)
Total primary energy associated with community systems						6621.32	(373)
Total primary energy associated with space and water heating						6621.32	(376)
Space cooling		68.47	x	3.07	=	210.19	(377)

Pumps and fans	379.60	x	3.07	=	1165.36	(378)
Electricity for lighting	529.32	x	3.07	=	1625.01	(379)
Primary energy kWh/year					9621.89	(383)
Dwelling primary energy rate kWh/m2/year					58.39	(384)

DER Worksheet
Design - Draft

NHER

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Liam Holden	Assessor number	10245
Client		Last modified	20/06/2018
Address	A1, London		

1. Overall dwelling dimensions

		Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied		175.68	(1a)	x	2.70	(2a)	=	474.34	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	175.68	(4)						
Dwelling volume							(3a) + (3b) + (3c) + (3d)...(3n) =	474.34	(5)

2. Ventilation rate

				m³ per hour	
Number of chimneys		0	x 40 =	0	(6a)
Number of open flues		0	x 20 =	0	(6b)
Number of intermittent fans		0	x 10 =	0	(7a)
Number of passive vents		0	x 10 =	0	(7b)
Number of flueless gas fires		0	x 40 =	0	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)		0.15	(18)
Number of sides on which the dwelling is sheltered		1	(19)
Shelter factor	1 - [0.075 x (19)] =	0.93	(20)
Infiltration rate incorporating shelter factor	(18) x (20) =	0.14	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	79.90	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window			50.94	x	1.05	=	53.67			(27)
Ground floor			175.65	x	0.09	=	15.81			(28a)
External wall			126.94	x	0.18	=	22.85			(29a)
Total area of external elements ∑A, m²			353.53							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	92.33	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		53.03	(36)
Total fabric heat loss	(33) + (36) =	145.36	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	43.42	42.88	42.34	39.62	39.08	36.36	36.36	35.82	37.45	39.08	40.16	41.25	(38)
Heat transfer coefficient, W/K (37)m + (38)m	188.78	188.24	187.70	184.98	184.44	181.72	181.72	181.18	182.81	184.44	185.52	186.61	
Average = ∑(39)1...12/12 = 184.85													(39)
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	1.07	1.07	1.07	1.05	1.05	1.03	1.03	1.03	1.04	1.05	1.06	1.06	
Average = ∑(40)1...12/12 = 1.05													(40)
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	2.97	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	104.74	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	115.21	111.02	106.84	102.65	98.46	94.27	94.27	98.46	102.65	106.84	111.02	115.21	
∑(44)1...12 = 1256.89													(44)
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	170.86	149.44	154.20	134.44	129.00	111.31	103.15	118.37	119.78	139.59	152.37	165.47	
∑(45)1...12 = 1647.98													(45)
Distribution loss 0.15 x (45)m	25.63	22.42	23.13	20.17	19.35	16.70	15.47	17.75	17.97	20.94	22.86	24.82	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)
Water storage loss:		
b) Manufacturer's declared loss factor is not known		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.02	(51)
Volume factor from Table 2a	4.93	(52)
Temperature factor from Table 2b	1.00	(53)
Energy lost from water storage (kWh/day) (47) x (51) x (52) x (53)	0.10	(54)
Enter (50) or (54) in (55)	0.10	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water storage loss calculated for each month (55) x (41)m	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(56)
If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(57)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Primary circuit loss for each month from Table 3	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for each month from Table 3a, 3b or 3c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m	197.36	173.37	180.70	160.08	155.50	136.96	129.65	144.87	145.42	166.09	178.02	191.97	(62)
Solar DHW input calculated using Appendix G or Appendix H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from water heater for each month (kWh/month) (62)m + (63)m	197.36	173.37	180.70	160.08	155.50	136.96	129.65	144.87	145.42	166.09	178.02	191.97	
∑(64)1...12 = 1960.00													(64)
Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	78.01	68.84	72.47	65.22	64.09	57.53	55.50	60.56	60.34	67.61	71.18	76.22	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.96	27.50	22.36	16.93	12.66	10.69	11.55	15.01	20.14	25.58	29.85	31.82	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.30	350.90	341.82	322.49	298.08	275.14	259.82	256.22	265.30	284.63	309.04	331.98	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	(69)
Pump and fan gains (Table 5a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (Table 5)	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	(71)
Water heating gains (Table 5)	104.85	102.43	97.41	90.58	86.14	79.90	74.59	81.39	83.81	90.88	98.86	102.44	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	550.67	548.39	529.15	497.55	464.44	433.28	413.51	420.17	436.80	468.64	505.30	533.79	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
East	0.77	x	20.62	x	19.64	x 0.9 x	0.55	x	0.80	=	123.49	(76)
South	0.77	x	11.45	x	46.75	x 0.9 x	0.55	x	0.80	=	163.23	(78)
West	0.77	x	18.87	x	19.64	x 0.9 x	0.55	x	0.80	=	113.01	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains in watts ∑(74)m...(82)m	399.72	729.96	1102.41	1496.04	1762.84	1779.99	1704.28	1506.24	1241.83	837.29	488.36	335.52	(83)
Total gains - internal and solar (73)m + (83)m	950.39	1278.35	1631.56	1993.59	2227.27	2213.27	2117.79	1926.41	1678.63	1305.93	993.66	869.32	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(°C)	21.00	(85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area n1,m (see Table 9a)												

	0.97	0.94	0.88	0.77	0.63	0.48	0.36	0.41	0.62	0.86	0.95	0.98	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	18.67	19.09	19.66	20.27	20.68	20.89	20.96	20.95	20.77	20.16	19.29	18.60	(87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(˚C)	20.02	20.02	20.03	20.04	20.04	20.05	20.05	20.06	20.05	20.04	20.04	20.03	(88)
Utilisation factor for gains for rest of dwelling n2,m	0.97	0.93	0.87	0.75	0.59	0.42	0.29	0.33	0.56	0.83	0.95	0.98	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	16.89	17.49	18.31	19.16	19.69	19.96	20.03	20.02	19.83	19.03	17.79	16.80	(90)

Living area fraction — Living area ÷ (4) = 0.52 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2	17.82	18.33	19.01	19.74	20.21	20.45	20.52	20.51	20.32	19.62	18.57	17.74	(92)
Apply adjustment to the mean internal temperature from Table 4e where appropriate	17.82	18.33	19.01	19.74	20.21	20.45	20.52	20.51	20.32	19.62	18.57	17.74	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm	0.96	0.92	0.85	0.74	0.60	0.45	0.33	0.37	0.58	0.82	0.93	0.96	(94)
Useful gains, ηmGm, W (94)m x (84)m	908.88	1171.61	1384.03	1467.34	1328.59	986.71	689.26	711.31	976.18	1065.30	924.67	838.21	(95)
Monthly average external temperature from Table U1	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	2552.91	2528.02	2348.91	2004.92	1568.97	1062.76	712.23	744.18	1137.63	1663.13	2128.35	2526.93	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	1223.16	911.51	717.87	387.06	178.84	0.00	0.00	0.00	0.00	444.78	866.65	1256.40	

∑(98)1...5, 10...12 = 5986.28 (98)

Space heating requirement kWh/m²/year — (98) ÷ (4) = 34.07 (99)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)	'0' if none	0.00	(301)
Fraction of space heat from community system	1 - (301) =	1.00	(302)
Fraction of community heat from boilers		0.30	(303a)
Fraction of community heat from CHP		0.70	(303b)
Fraction of total space heat from community CHP	(302) x (303a) =	0.70	(304a)
Fraction of total space heat from community boilers	(302) x (303b) =	0.30	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating		1.00	(305a)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating

Annual space heating requirement	5986.28		(98)
Space heat from CHP	(98) x (304a) x (305) x (306) =	4399.91	(307a)
Space heat from boilers	(98) x (304b) x (305) x (306) =	1885.68	(307b)

Water heating

Annual water heating requirement	1960.00	(64)

Water heat from CHP	(64) x (303a) x (305a) x (306) =	1440.60	(310a)
Water heat from boilers	(64) x (303b) x (305a) x (306) =	617.40	(310b)
Electricity used for heat distribution	0.01 × [(307a)...(307e) + (310a)...(310e)] =	83.44	(313)

Electricity for pumps, fans and electric keep-hot (Table 4f)

mechanical ventilation fans - balanced, extract or positive input from outside	383.38		(330a)
Total electricity for the above, kWh/year		383.38	(331)
Electricity for lighting (Appendix L)		546.80	(332)
Total delivered energy for all uses	(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =	9273.77	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from CHP	4399.91	x	2.97	x 0.01 =	130.68	(340a)
Space heating from boilers	1885.68	x	4.24	x 0.01 =	79.95	(340b)
Water heating from CHP	1440.60	x	2.97	x 0.01 =	42.79	(342a)
Water heating from boilers	617.40	x	4.24	x 0.01 =	26.18	(342b)
Pumps and fans	383.38	x	13.19	x 0.01 =	50.57	(349)
Electricity for lighting	546.80	x	13.19	x 0.01 =	72.12	(350)
Additional standing charges					120.00	(351)
Total energy cost				(340a)...(342e) + (345)...(354) =	522.28	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)
Energy cost factor (ECF)	0.99	(357)
SAP value	86.13	
SAP rating (section 13)	86	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	9071.2496	x	0.2160	=	1959.3899	(363)
less credit emissions for electricity		-2857.0865	x	0.5190	=	-1482.8279	(364)
Water heated by CHP		2970.0618	x	0.2160	=	641.5334	(365)
less credit emissions for electricity		-935.4525	x	0.5190	=	-485.4999	(366)
Emissions from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
CO2 emissions from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	2726.66	x	0.216	=	588.96	(368)
Electrical energy for community heat distribution		83.44	x	0.519	=	43.30	(372)
Total CO2 associated with community systems						1264.86	(373)
Total CO2 associated with space and water heating						1264.86	(376)
Pumps and fans		383.38	x	0.519	=	198.98	(378)
Electricity for lighting		546.80	x	0.519	=	283.79	(379)
Total CO_2, kg/year					(376)..(382) =	1747.62	(383)
Dwelling CO_2 emission rate					(383) ÷ (4) =	9.95	(384)

EI value					89.39	
EI rating (section 14)					89	(385)
EI band					B	

13b. Primary energy - community heating scheme

	Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary Energy from community CHP (space and water heating)						
Power efficiency of CHP unit	31.50					(361)
Heat efficiency of CHP unit	48.50					(362)
Space heating from CHP (307a) × 100 ÷ (362) =	9071.25	x	1.22	=	11066.92	(363)
less credit energy for electricity	-2857.09	x	3.07	=	-8771.26	(364)
Water heated by CHP	2970.06	x	1.22	=	3623.48	(365)
less credit energy for electricity	-935.45	x	3.07	=	-2871.84	(366)
Primary energy from other sources (space heating)						
Efficiency of boilers	91.80					(367b)
Primary energy from boilers [(307b)+(310b)] x 100 ÷ (367b) =	2726.66	x	1.22	=	3326.53	(368)
Electrical energy for community heat distribution	83.44	x	3.07	=	256.15	(372)
Total primary energy associated with community systems					6629.98	(373)
Total primary energy associated with space and water heating					6629.98	(376)
Pumps and fans	383.38	x	3.07	=	1176.98	(378)
Electricity for lighting	546.80	x	3.07	=	1678.67	(379)
Primary energy kWh/year					9485.63	(383)
Dwelling primary energy rate kWh/m2/year					53.99	(384)

DER Worksheet
Design - Draft

NHER

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Liam Holden	Assessor number	10245
Client		Last modified	20/06/2018
Address	A1, London		

1. Overall dwelling dimensions

	Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied	110.05	(1a)	x	2.70	(2a)	=	297.14	(3a)
Total floor area (1a) + (1b) + (1c) + (1d)...(1n) =	110.05	(4)						
Dwelling volume (3a) + (3b) + (3c) + (3d)...(3n) =							297.14	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs (6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.15	(18)
Number of sides on which the dwelling is sheltered	1	(19)
Shelter factor 1 - [0.075 x (19)] =	0.93	(20)
Infiltration rate incorporating shelter factor (18) x (20) =	0.14	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	79.90	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window			40.70	x	1.05	=	42.88			(27)
Ground floor			110.05	x	0.09	=	9.90			(28a)
External wall			74.41	x	0.18	=	13.39			(29a)
Party wall			21.57	x	0.00	=	0.00			(32)
Total area of external elements ∑A, m²			225.16							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	66.18	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		33.77	(36)
Total fabric heat loss	(33) + (36) =	99.96	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	27.20	26.86	26.52	24.82	24.48	22.78	22.78	22.44	23.46	24.48	25.16	25.84	(38)
Heat transfer coefficient, W/K (37)m + (38)m	127.16	126.82	126.48	124.78	124.44	122.73	122.73	122.39	123.41	124.44	125.12	125.80	
Average = ∑(39)1...12/12 =												124.69	(39)
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	1.16	1.15	1.15	1.13	1.13	1.12	1.12	1.11	1.12	1.13	1.14	1.14	
Average = ∑(40)1...12/12 =												1.13	(40)
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	2.82	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	101.06	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	111.17	107.12	103.08	99.04	95.00	90.95	90.95	95.00	99.04	103.08	107.12	111.17	
∑(44)1...12 =												1212.71	(44)
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	164.85	144.18	148.78	129.71	124.46	107.40	99.52	114.21	115.57	134.68	147.02	159.65	
∑(45)1...12 =												1590.06	(45)
Distribution loss 0.15 x (45)m	24.73	21.63	22.32	19.46	18.67	16.11	14.93	17.13	17.34	20.20	22.05	23.95	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)
Water storage loss:		
b) Manufacturer's declared loss factor is not known		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.02	(51)
Volume factor from Table 2a	4.93	(52)
Temperature factor from Table 2b	1.00	(53)
Energy lost from water storage (kWh/day) (47) x (51) x (52) x (53)	0.10	(54)
Enter (50) or (54) in (55)	0.10	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water storage loss calculated for each month (55) x (41)m	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(56)
If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(57)
Primary circuit loss for each month from Table 3	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for each month from Table 3a, 3b or 3c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m	191.36	168.12	175.28	155.36	150.96	133.05	126.02	140.71	141.21	161.19	172.66	186.15	(62)
Solar DHW input calculated using Appendix G or Appendix H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from water heater for each month (kWh/month) (62)m + (63)m	191.36	168.12	175.28	155.36	150.96	133.05	126.02	140.71	141.21	161.19	172.66	186.15	
∑(64)1...12 =												1902.08	(64)
Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	76.01	67.09	70.67	63.65	62.58	56.23	54.29	59.17	58.94	65.98	69.40	74.28	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.22	21.51	17.49	13.24	9.90	8.36	9.03	11.74	15.75	20.00	23.35	24.89	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.63	274.45	267.34	252.22	233.13	215.19	203.21	200.39	207.49	222.62	241.70	259.64	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	(69)
Pump and fan gains (Table 5a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (Table 5)	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	(71)
Water heating gains (Table 5)	102.17	99.84	94.99	88.40	84.12	78.09	72.97	79.53	81.87	88.69	96.39	99.85	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	463.24	461.02	445.05	419.09	392.38	366.87	350.44	356.89	370.34	396.53	426.67	449.60	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
East	0.77	x	14.57	x	19.64	x 0.9 x	0.55	x	0.80	=	87.26	(76)
South	0.77	x	9.83	x	46.75	x 0.9 x	0.55	x	0.80	=	140.13	(78)
West	0.77	x	16.30	x	19.64	x 0.9 x	0.55	x	0.80	=	97.62	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains in watts ∑(74)m...(82)m	325.00	591.15	887.93	1199.03	1408.84	1421.09	1361.22	1205.58	998.08	676.66	396.62	273.12	(83)
Total gains - internal and solar (73)m + (83)m	788.24	1052.17	1332.98	1618.12	1801.22	1787.96	1711.66	1562.47	1368.42	1073.20	823.28	722.72	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C)	21.00	(85)

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

Utilisation factor for gains for living area n1,m (see Table 9a)

0.95	0.91	0.83	0.70	0.55	0.41	0.31	0.34	0.54	0.79	0.92	0.96	(86)

Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)

18.77	19.23	19.81	20.38	20.74	20.91	20.97	20.96	20.82	20.27	19.40	18.69	(87)

Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)

19.96	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.98	19.98	19.97	19.97	(88)

Utilisation factor for gains for rest of dwelling n2,m

0.94	0.89	0.80	0.67	0.51	0.35	0.24	0.27	0.48	0.75	0.91	0.95	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

17.00	17.65	18.46	19.24	19.70	19.92	19.97	19.96	19.81	19.12	17.91	16.88	(90)

Living area fraction — Living area ÷ (4) = 0.38 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

17.67	18.25	18.98	19.68	20.09	20.30	20.35	20.34	20.20	19.56	18.48	17.57	(92)

Apply adjustment to the mean internal temperature from Table 4e where appropriate

17.67	18.25	18.98	19.68	20.09	20.30	20.35	20.34	20.20	19.56	18.48	17.57	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm	0.92	0.87	0.78	0.65	0.51	0.37	0.26	0.30	0.49	0.74	0.88	0.93	(94)
Useful gains, ηmGm, W (94)m x (84)m	727.25	911.71	1041.00	1059.62	923.52	662.85	450.08	467.85	674.17	792.78	727.91	675.41	(95)
Monthly average external temperature from Table U1	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	1700.39	1693.44	1577.84	1344.68	1044.37	699.01	460.40	482.62	752.30	1114.68	1423.42	1681.75	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	724.01	525.32	399.41	205.24	89.91	0.00	0.00	0.00	0.00	239.49	500.76	748.72	

	∑(98)1...5, 10...12 =	3432.87	(98)
Space heating requirement kWh/m²/year	(98) ÷ (4)	31.19	(99)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)	'0' if none	0.00	(301)
Fraction of space heat from community system	1 - (301) =	1.00	(302)
Fraction of community heat from boilers		0.30	(303a)
Fraction of community heat from CHP		0.70	(303b)
Fraction of total space heat from community CHP	(302) x (303a) =	0.70	(304a)
Fraction of total space heat from community boilers	(302) x (303b) =	0.30	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating		1.00	(305a)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating

Annual space heating requirement	3432.87			(98)
Space heat from CHP		(98) x (304a) x (305) x (306) =	2523.16	(307a)
Space heat from boilers		(98) x (304b) x (305) x (306) =	1081.35	(307b)

Water heating

Annual water heating requirement	1902.08			(64)
Water heat from CHP		(64) x (303a) x (305a) x (306) =	1398.03	(310a)
Water heat from boilers		(64) x (303b) x (305a) x (306) =	599.15	(310b)
Electricity used for heat distribution		0.01 × [(307a)...(307e) + (310a)...(310e)] =	56.02	(313)

Electricity for pumps, fans and electric keep-hot (Table 4f)

mechanical ventilation fans - balanced, extract or positive input from outside	240.16			(330a)
Total electricity for the above, kWh/year			240.16	(331)
Electricity for lighting (Appendix L)			427.66	(332)
Total delivered energy for all uses		(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =	6269.51	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from CHP	2523.16	x	2.97	x 0.01 =	74.94	(340a)
Space heating from boilers	1081.35	x	4.24	x 0.01 =	45.85	(340b)
Water heating from CHP	1398.03	x	2.97	x 0.01 =	41.52	(342a)
Water heating from boilers	599.15	x	4.24	x 0.01 =	25.40	(342b)
Pumps and fans	240.16	x	13.19	x 0.01 =	31.68	(349)
Electricity for lighting	427.66	x	13.19	x 0.01 =	56.41	(350)
Additional standing charges					120.00	(351)
Total energy cost				(340a)...(342e) + (345)...(354) =	395.80	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)
Energy cost factor (ECF)	1.07	(357)
SAP value	85.04	
SAP rating (section 13)	85	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	5201.9677	x	0.2160	=	1123.6250	(363)
less credit emissions for electricity		-1638.4150	x	0.5190	=	-850.3374	(364)
Water heated by CHP		2882.2936	x	0.2160	=	622.5754	(365)
less credit emissions for electricity		-907.8090	x	0.5190	=	-471.1529	(366)
Emissions from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
CO2 emissions from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	1830.62	x	0.216	=	395.41	(368)
Electrical energy for community heat distribution		56.02	x	0.519	=	29.07	(372)
Total CO2 associated with community systems						849.20	(373)
Total CO2 associated with space and water heating						849.20	(376)
Pumps and fans		240.16	x	0.519	=	124.64	(378)
Electricity for lighting		427.66	x	0.519	=	221.95	(379)
Total CO_2, kg/year					(376)..(382) =	1195.79	(383)

Dwelling CO_2 emission rate	(383) ÷ (4) = 10.87	(384)
EI value	89.67	
EI rating (section 14)	90	(385)
EI band	B	

13b. Primary energy - community heating scheme

		Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary Energy from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	5201.97	x	1.22	=	6346.40	(363)
less credit energy for electricity		-1638.42	x	3.07	=	-5029.93	(364)
Water heated by CHP		2882.29	x	1.22	=	3516.40	(365)
less credit energy for electricity		-907.81	x	3.07	=	-2786.97	(366)
Primary energy from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
Primary energy from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	1830.62	x	1.22	=	2233.35	(368)
Electrical energy for community heat distribution		56.02	x	3.07	=	171.97	(372)
Total primary energy associated with community systems						4451.22	(373)
Total primary energy associated with space and water heating						4451.22	(376)
Pumps and fans		240.16	x	3.07	=	737.29	(378)
Electricity for lighting		427.66	x	3.07	=	1312.91	(379)
Primary energy kWh/year						6501.42	(383)
Dwelling primary energy rate kWh/m2/year						59.08	(384)

DER Worksheet
Design - Draft

NHER

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Liam Holden	Assessor number	10245
Client		Last modified	20/06/2018
Address	TH A1, London		

1. Overall dwelling dimensions

		Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied		69.47	(1a)	x	2.70	(2a)	=	187.57	(3a)
+1		41.56	(1b)	x	3.15	(2b)	=	130.91	(3b)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	111.03	(4)						
Dwelling volume						(3a) + (3b) + (3c) + (3d)...(3n) =		318.48	(5)

2. Ventilation rate

				m³ per hour	
Number of chimneys		0	x 40 =	0	(6a)
Number of open flues		0	x 20 =	0	(6b)
Number of intermittent fans		0	x 10 =	0	(7a)
Number of passive vents		0	x 10 =	0	(7b)
Number of flueless gas fires		0	x 40 =	0	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)		0.15	(18)
Number of sides on which the dwelling is sheltered		1	(19)
Shelter factor	1 - [0.075 x (19)] =	0.93	(20)
Infiltration rate incorporating shelter factor	(18) x (20) =	0.14	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	79.90	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)

0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window			33.63	x	1.05	=	35.43			(27)
Exposed floor			69.47	x	0.09	=	6.25			(28b
External wall			122.55	x	0.18	=	22.06			(29a)
Party wall			38.39	x	0.00	=	0.00			(32)
Roof			56.66	x	0.18	=	10.20			(30)
Total area of external elements ∑A, m²			282.31							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	73.94	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		42.35	(36)
Total fabric heat loss	(33) + (36) =	116.29	(37)

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

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
29.16	28.79	28.43	26.60	26.24	24.42	24.42	24.05	25.15	26.24	26.97	27.70	(38)

Heat transfer coefficient, W/K (37)m + (38)m

145.45	145.08	144.72	142.89	142.53	140.71	140.71	140.34	141.44	142.53	143.26	143.99	

Average = ∑(39)1...12/12 = 142.80 (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

1.31	1.31	1.30	1.29	1.28	1.27	1.27	1.26	1.27	1.28	1.29	1.30	

Average = ∑(40)1...12/12 = 1.29 (40)

Number of days in month (Table 1a)

31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	2.82	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	101.20	(43)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
111.32	107.27	103.22	99.17	95.12	91.08	91.08	95.12	99.17	103.22	107.27	111.32	

∑(44)1...12 = 1214.35 (44)

Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

165.08	144.38	148.98	129.89	124.63	107.55	99.66	114.36	115.73	134.87	147.22	159.87	

∑(45)1...12 = 1592.20 (45)

Distribution loss 0.15 x (45)m

24.76	21.66	22.35	19.48	18.69	16.13	14.95	17.15	17.36	20.23	22.08	23.98	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)

Water storage loss:

b) Manufacturer's declared loss factor is not known

Hot water storage loss factor from Table 2 (kWh/litre/day)	0.02	(51)
Volume factor from Table 2a	4.93	(52)
Temperature factor from Table 2b	1.00	(53)
Energy lost from water storage (kWh/day) (47) x (51) x (52) x (53)	0.10	(54)
Enter (50) or (54) in (55)	0.10	(55)

Water storage loss calculated for each month (55) x (41)m

3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)

3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(57)

Primary circuit loss for each month from Table 3

23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss for each month from Table 3a, 3b or 3c

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)

Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m

191.58	168.31	175.49	155.53	151.13	133.19	126.16	140.86	141.37	161.37	172.86	186.37	(62)

Solar DHW input calculated using Appendix G or Appendix H

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)

Output from water heater for each month (kWh/month) (62)m + (63)m

191.58	168.31	175.49	155.53	151.13	133.19	126.16	140.86	141.37	161.37	172.86	186.37	

∑(64)1...12 = 1904.22 (64)

Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

76.09	67.15	70.74	63.70	62.64	56.28	54.34	59.22	59.00	66.04	69.47	74.36	(65)

5. Internal gains

Metabolic gains (Table 5)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	(66)

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

24.34	21.62	17.58	13.31	9.95	8.40	9.08	11.80	15.84	20.11	23.47	25.02	(67)

Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

273.03	275.86	268.72	253.52	234.34	216.30	204.26	201.42	208.56	223.76	242.95	260.98	(68)

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

37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	(69)

Pump and fan gains (Table 5a)

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)

Losses e.g. evaporation (Table 5)

-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	(71)

Water heating gains (Table 5)

102.27	99.93	95.08	88.48	84.19	78.16	73.03	79.60	81.94	88.77	96.48	99.94	(72)

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

464.95	462.72	446.69	420.62	393.79	368.18	351.68	358.14	371.65	397.95	428.21	451.25	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
East	0.77	x	27.91	x	19.64	x 0.9 x	0.55	x	0.80	=	167.14	(76)
West	0.77	x	5.72	x	19.64	x 0.9 x	0.55	x	0.80	=	34.26	(80)

Solar gains in watts ∑(74)m...(82)m

201.40	393.98	648.83	946.28	1159.70	1187.16	1130.23	970.85	754.62	467.49	251.12	165.62	(83)

Total gains - internal and solar (73)m + (83)m

666.35	856.71	1095.53	1366.91	1553.50	1555.34	1481.91	1328.99	1126.27	865.44	679.33	616.87	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C)	21.00	(85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area n1,m (see Table 9a)	0.97	0.94	0.89	0.79	0.65	0.50	0.39	0.44	0.66	0.87	0.95	0.97	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	18.28	18.67	19.28	20.00	20.52	20.82	20.93	20.91	20.64	19.87	18.94	18.21	(87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)	19.83	19.84	19.84	19.85	19.85	19.87	19.87	19.87	19.86	19.85	19.85	19.84	(88)
Utilisation factor for gains for rest of dwelling n2,m	0.96	0.93	0.87	0.76	0.60	0.43	0.30	0.35	0.59	0.84	0.94	0.97	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	16.22	16.78	17.66	18.65	19.34	19.71	19.83	19.81	19.52	18.52	17.18	16.13	(90)

Living area fraction — Living area ÷ (4) = 0.45 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2	17.15	17.63	18.39	19.26	19.87	20.21	20.32	20.30	20.02	19.13	17.97	17.07	(92)
Apply adjustment to the mean internal temperature from Table 4e where appropriate	17.15	17.63	18.39	19.26	19.87	20.21	20.32	20.30	20.02	19.13	17.97	17.07	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm	0.94	0.91	0.85	0.74	0.60	0.46	0.34	0.38	0.60	0.82	0.92	0.95	(94)
Useful gains, ηmGm, W (94)m x (84)m	629.67	779.35	925.83	1007.18	935.26	708.49	496.93	509.65	675.52	707.78	625.42	587.72	(95)
Monthly average external temperature from Table U1	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	1868.49	1846.58	1720.27	1480.04	1164.42	789.51	523.86	547.60	837.64	1215.64	1557.26	1852.91	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	921.68	717.18	591.06	340.45	170.50	0.00	0.00	0.00	0.00	377.85	670.93	941.31	

∑(98)1...5, 10...12 = 4730.96 (98)

Space heating requirement kWh/m²/year — (98) ÷ (4) 42.61 (99)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)	'0' if none	0.00	(301)
Fraction of space heat from community system	1 - (301) =	1.00	(302)
Fraction of community heat from boilers		0.30	(303a)
Fraction of community heat from CHP		0.70	(303b)
Fraction of total space heat from community CHP	(302) x (303a) =	0.70	(304a)
Fraction of total space heat from community boilers	(302) x (303b) =	0.30	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating		1.00	(305a)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating

Annual space heating requirement		4730.96	(98)
Space heat from CHP	(98) x (304a) x (305) x (306) =	3477.25	(307a)
Space heat from boilers	(98) x (304b) x (305) x (306) =	1490.25	(307b)

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SAP version 9.92

Water heating

Annual water heating requirement	1904.22		(64)
Water heat from CHP	(64) x (303a) x (305a) x (306) =	1399.60	(310a)
Water heat from boilers	(64) x (303b) x (305a) x (306) =	599.83	(310b)
Electricity used for heat distribution	0.01 × [(307a)...(307e) + (310a)...(310e)] =	69.67	(313)

Electricity for pumps, fans and electric keep-hot (Table 4f)

mechanical ventilation fans - balanced, extract or positive input from outside	208.85		(330a)
Total electricity for the above, kWh/year		208.85	(331)
Electricity for lighting (Appendix L)		429.86	(332)
Total delivered energy for all uses	(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =	7605.65	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from CHP	3477.25	x	2.97	x 0.01 =	103.27	(340a)
Space heating from boilers	1490.25	x	4.24	x 0.01 =	63.19	(340b)
Water heating from CHP	1399.60	x	2.97	x 0.01 =	41.57	(342a)
Water heating from boilers	599.83	x	4.24	x 0.01 =	25.43	(342b)
Pumps and fans	208.85	x	13.19	x 0.01 =	27.55	(349)
Electricity for lighting	429.86	x	13.19	x 0.01 =	56.70	(350)
Additional standing charges					120.00	(351)
Total energy cost				(340a)...(342e) + (345)...(354) =	437.71	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)
Energy cost factor (ECF)	1.18	(357)
SAP value	83.56	
SAP rating (section 13)	84	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	7169.0134	x	0.2160	=	1548.5069	(363)
less credit emissions for electricity		-2257.9570	x	0.5190	=	-1171.8797	(364)
Water heated by CHP		2885.5458	x	0.2160	=	623.2779	(365)
less credit emissions for electricity		-908.8333	x	0.5190	=	-471.6845	(366)
Emissions from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
CO2 emissions from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	2276.78	x	0.216	=	491.78	(368)
Electrical energy for community heat distribution		69.67	x	0.519	=	36.16	(372)
Total CO2 associated with community systems						1056.16	(373)
Total CO2 associated with space and water heating						1056.16	(376)
Pumps and fans		208.85	x	0.519	=	108.39	(378)
Electricity for lighting		429.86	x	0.519	=	223.10	(379)

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SAP version 9.92

Total CO_2, kg/year	(376)..(382) =				1387.65	(383)
Dwelling CO_2 emission rate	(383) ÷ (4) =				12.50	(384)
EI value					88.08	
EI rating (section 14)					88	(385)
EI band					B	

13b. Primary energy - community heating scheme

		Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary Energy from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	7169.01	x	1.22	=	8746.20	(363)
less credit energy for electricity		-2257.96	x	3.07	=	-6931.93	(364)
Water heated by CHP		2885.55	x	1.22	=	3520.37	(365)
less credit energy for electricity		-908.83	x	3.07	=	-2790.12	(366)
Primary energy from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
Primary energy from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	2276.78	x	1.22	=	2777.67	(368)
Electrical energy for community heat distribution		69.67	x	3.07	=	213.89	(372)
Total primary energy associated with community systems						5536.07	(373)
Total primary energy associated with space and water heating						5536.07	(376)
Pumps and fans		208.85	x	3.07	=	641.15	(378)
Electricity for lighting		429.86	x	3.07	=	1319.68	(379)
Primary energy kWh/year						7496.90	(383)
Dwelling primary energy rate kWh/m2/year						67.52	(384)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Notting Hill Gate Office - Be Clean

As designed

Date: Mon May 21 12:16:36 2018

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.6

BRUKL compliance check version: v5.2.g.3

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	21.5
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	21.5
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	14.2
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values not achieving standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.25	1F000000:Surf[1]
Floor	0.25	0.16	0.16	1F000000:Surf[0]
Roof	0.25	0.16	0.16	2F000001:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.1	1.1	1F000000:Surf[2]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs.
Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- FCU

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.5	0	1.6	0.75
Standard value	0.91*	3.2	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Allowed SFP may be increased by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

"No HWS in project, or hot water is provided by HVAC system"

1- CHECK2-CHP

	CHPQA quality index	CHP electrical efficiency
This building	105	0.34
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
1F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
GF - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
GF - Office Reception W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
2F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1F - Office W	100	-	-	1562
2F - Office W	100	-	-	1562
3F - Office W	100	-	-	1562
GF - Office Circulation	-	100	-	91
GF - Office Reception W	-	100	70	741
1F - Office Circulation W	-	100	-	52
1F - Office W	100	-	-	1025
1F - Office Circulation	-	100	-	50
1F - Office W	100	-	-	418
1F - Office Circulation W	-	100	-	30
1F - Office Circulation	-	100	-	125
1F - Office	100	-	-	284
2F - Office Circulation W	-	100	-	52
2F - Office Circulation W	-	100	-	30
2F - Office Circulation	-	100	-	125
2F - Office	100	-	-	284
2F - Office W	100	-	-	1025
2F - Office W	100	-	-	418
2F - Office Circulation	-	100	-	50
3F - Office Circulation W	-	100	-	52
3F - Office Circulation W	-	100	-	30
3F - Office Circulation	-	100	-	125
3F - Office	100	-	-	284
3F - Office W	100	-	-	1025
3F - Office W	100	-	-	418

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
3F - Office Circulation	-	100	-	50

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1F - Office W	NO (-63.9%)	YES
2F - Office W	NO (-56.7%)	YES
3F - Office W	NO (-60.7%)	YES
GF - Office Circulation	NO (-93.1%)	NO
GF - Office Reception W	NO (-22.3%)	YES
1F - Office Circulation W	NO (-58.2%)	YES
1F - Office W	NO (-56.8%)	YES
1F - Office Circulation	NO (-97.3%)	NO
1F - Office W	NO (-57.7%)	YES
1F - Office Circulation W	NO (-37.3%)	YES
1F - Office Circulation	NO (-98.2%)	NO
1F - Office	NO (-98.8%)	NO
2F - Office Circulation W	NO (-58.2%)	YES
2F - Office Circulation W	NO (-37.4%)	YES
2F - Office Circulation	NO (-98.1%)	NO
2F - Office	NO (-98.8%)	NO
2F - Office W	NO (-53.6%)	YES
2F - Office W	NO (-57.5%)	YES
2F - Office Circulation	NO (-97.2%)	NO
3F - Office Circulation W	NO (-58.1%)	YES
3F - Office Circulation W	NO (-36.4%)	YES
3F - Office Circulation	NO (-98%)	NO
3F - Office	NO (-98.7%)	NO
3F - Office W	NO (-51.5%)	YES
3F - Office W	NO (-56.7%)	YES
3F - Office Circulation	NO (-97.2%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	2367.6	2367.6
External area [m²]	2554.6	2554.6
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1320.6	1374.19
Average U-value [W/m²K]	0.52	0.54
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	15.34	13.19
Cooling	2.6	5.06
Auxiliary	11.92	15.62
Lighting	5.85	15.18
Hot water	10.81	2.2
Equipment*	31.57	31.57
TOTAL**	**42.81**	**51.26**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	3.71	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	88.47	110.01
Primary energy* [kWh/m²]	82.43	126.14
Total emissions [kg/m²]	14.2	21.5

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	47.8	40.6	15.3	2.6	11.3	0.87	4.34	0.96	5.5
Notional	40.9	69.1	13.2	5.1	15.6	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.25	1F000000:Surf[1]
Floor	0.2	0.16	1F000000:Surf[0]
Roof	0.15	0.16	2F000001:Surf[0]
Windows, roof windows, and rooflights	1.5	1.1	1F000000:Surf[2]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Notting Hill Gate Retail - Be Clean

As designed

Date: Fri May 18 10:05:59 2018

Administrative information

Building Details

Address: Notthing Hill Gate, London, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.6

BRUKL compliance check version: v5.2.g.3

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	56.1
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	56.1
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	43.3
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values not achieving standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.25	GF000002:Surf[3]
Floor	0.25	0.16	0.16	GF000002:Surf[0]
Roof	0.25	-	-	UNKNOWN
Windows***, roof windows, and rooflights	2.2	1.1	1.1	GF000002:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs.
Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- FCU

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.5	0	1.6	0.75
Standard value	0.91*	0.7	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Allowed SFP may be increased by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

"No HWS in project, or hot water is provided by HVAC system"

1- CHECK2-CHP

	CHPQA quality index	CHP electrical efficiency
This building	105	0.34
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
GF - Retail	-	-	-	-	-	-	-	0.2	-	-	N/A
GF - Retail	-	-	-	-	-	-	-	0.2	-	-	N/A
GF - Retail	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting

	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
GF - Retail	-	100	70	723
GF - Retail	-	100	70	818
GF - Retail	-	100	70	766

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF - Retail	YES (+12%)	NO
GF - Retail	NO (-46.6%)	NO
GF - Retail	NO (-43.2%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	151.7	151.7
External area [m²]	567.9	567.9
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	318.43	246.13
Average U-value [W/m²K]	0.56	0.43
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	**A1/A2 Retail/Financial and Professional services**
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	74.96	44.55
Cooling	6.19	7.22
Auxiliary	26.91	21.46
Lighting	18.96	62.36
Hot water	38.59	1.86
Equipment*	20.26	20.26
TOTAL**	**152.37**	**137.46**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	13.24	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	327.96	236.81
Primary energy* [kWh/m²]	249.16	329.15
Total emissions [kg/m²]	43.3	56.1

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	233.8	94.2	75	6.2	16.5	0.87	4.34	0.96	5.5
Notional	138.3	98.5	44.6	7.2	21.5	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.25	GF000002:Surf[3]
Floor	0.2	0.16	GF000002:Surf[0]
Roof	0.15	-	UNKNOWN
Windows, roof windows, and rooflights	1.5	1.1	GF000002:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	3

APPENDIX 6 - SAMPLE 'BE GREEN' DER WORKSHEETS & BRUKL DOCUMENT

HOARE LEA

SAP Results Sheet.

Project	Newcombe House - CB (GREEN)
Revision	2
Version	3
Date	22/05/2018

Dwelling Reference	Dwelling Area (m^2)	No. of Dwelling Type	TER	DER	Criterion 1 DER/TER Variance	TFEE	DFEE	Criterion 1 DFEE/TFEE Variance	Criterion 3 Overheating Strategy	Criterion 3 Overheating Risk
CB-A1	164.79	1	15.66	8.80	-43.79%	58.90	54.40	-7.65%	1.5	Medium
CB-A17 Duplex	333.64	1	14.86	8.00	-46.19%	64.95	61.11	-5.91%	1.9	Medium
CB-A2	162.36	1	16.50	9.85	-40.31%	62.82	59.04	-6.02%	1.4	Medium
CB-A20 Duplex	365.9	1	13.92	7.33	-47.35%	60.95	56.66	-7.03%	1.9	Medium
CB-A21 Duplex	367.27	1	19.28	11.25	-41.64%	88.15	85.58	-2.92%	2.4	Medium
CB-A3	164.79	2	13.28	6.98	-47.49%	47.03	42.64	-9.35%	1.8	Medium
CB-A4	162.81	2	14.22	8.15	-42.69%	51.49	48.22	-6.35%	1.9	Medium
CB-A7	165.65	5	13.45	7.06	-47.51%	48.12	43.51	-9.59%	1.9	Medium
CB-A8	162.21	7	14.58	8.37	-42.60%	53.32	49.72	-6.75%	1.9	Medium
Area Weighted Results	4012.88	21	14.73	8.18	-44.44%	57.05	53.17	-6.80%		0

Parameters Used.

Category	Parameter	Value	Notes
External Fabric	External Wall U-Values (W/m^{2}K)	0.25	As Calculated by BS EN ISO 6946
	Floor U-Values (W/m^{2}K)	0.09	As Calculated by BS EN ISO 6946
	Roof U-Values (W/m^{2}K)	0.18	As Calculated by BS EN ISO 6946
	Glazing U-Value (W/m2K)	1.10	As Calculated by BS EN ISO 12567 or 10077 (U-Value includes glass and frame)
	G-Value (-)	0.55	
	Fraction Glazed (%)	0.80	Proportion of glass to overall opening size
Internal Walls	To Other Apartments	Fully Filled Cavity with Sealed Edges	
	To Corridors (W/m^{2}K)	0.18	As Calculated by BS EN ISO 6946
	To Risers (W/m^{2}K)	0.18	As Calculated by BS EN ISO 6946
	To Lift Shafts (W/m^{2}K)	0.18	As Calculated by BS EN ISO 6946
	To Stair Wells (W/m^{2}K)	0.18	As Calculated by BS EN ISO 6946
Thermal Mass	Thermal Mass Parameter (Simple)	Low	Based on Construction of Walls, Floors, Roofs (including party and internal walls, floors and ceilings)
Thermal Bridging	Thermal Bridge Specification	Default	No further information required on thermal bridges
Air Permeability	Air Permeability Rate (m3/hm2 at 50Pa)	3	As stated on a test certificate from a person registered by an authorised air pressure testing scheme Note to use the measured air perm rate each dwelling has to be pressure tested. If a dwelling is not pressure tested the value used in the calculation is an average of the tested dwellings of the same type plus 2.
Mechanical Ventilation	Strategy	Balanced with Heat Recovery	
	SFP (W/l/s)	0.52 (K+1), 0.55 (K+2), 63 (K+3), 74 (K+4), 86 (K+5)	SAP Appendix Q Test Results
	Heat Exchange Efficiency (%)	92 (K+1), 92 (K+2), 90 (K+3), 89 (K+4), 89 (K+5)	SAP Appendix Q Test Results
	Installer approved	Yes	The installer has be registered with a Government Approved Scheme e.g. BESCA, Blue Flame Certification, Certsure, NAPIT and Stroma
	Duct Type	Rigid	All ductwork is rigid except for occasional flexible ducting to join components together
	Ductwork Insulated	Yes	Ductwork can be assumed to be insulated if all of the ductwork is inside the insulated envelope even if the ductwork itself is uninsulated.
Space Heating	Category	Communal	
	Boilers - Fraction of Heat (-)	0.3	As design specification
	Boilers - Efficiency (%)	91.8	As calculated by SAP Appendix D
	CHP - Fraction of Heat (-)	0.7	As design specification
	CHP - Efficiency (%)	80	Gross Efficiency from Manufacturers Literature
	CHP - Heat to Power Ratio (-)	1.54	Heat Supplied / Power Supplied
	Heat Distribution System	Pre-insulated low temperature, variable flow (1991 or later)	District heating specification
	Controls	Charging system linked to use, programmer and TRVs	
	Emitter	Underfloor (Screed)	
Water Heating	Type	From Main System	
	Cylinder in Dwelling	No	
	Plate Heat Exchanger	Yes	
	Volume (litres)	1	
	Insulation Type	Spray Foam	
	Insulation Thickness (mm)	30	
	Waste Water Heat Recovery	No	
Renewables	Type	PV Panels	
	Peak Power (kWp)	33	Peak power under 1kW/m^2 of radiation at 25°C
	Orientation	South East	
	Tilt	Horizontal	
Cooling	Areas Cooled	All Living Spaces and Bedrooms	
	EER	4.5	
	Controls	Variable Speed Compressor	
Summertime Overheating	Openable Windows	No	
	Mechanical Ventilation Required	Yes	
	Blinds	Light-coloured curtain or roller blind	

HOARE LEA

SAP Results Sheet.

Project	Newcombe House - KCS1 (GREEN)
Revision	2
Version	3
Date	22/05/2018

Dwelling Reference	Dwelling Area (m²)	No. of Dwelling Type	TER	DER	Criterion 1 DER/TER Variance	TFEE	DFEE	Criterion 1 DFEE/TFEE Variance	Criterion 3 Overheating Strategy	Criterion 3 Overheating Risk
KCS1-A1	175.68	1	15.16	7.99	-47.29%	57.80	51.95	-10.12%	1.8	Medium
KCS1-A10	42.3	1	21.78	13.79	-36.68%	58.86	66.26	12.57%	2.9	Medium
KCS1-A11	151	1	13.73	6.82	-50.33%	48.00	41.09	-14.40%	2.2	Medium
KCS1-A12	58.88	1	17.09	9.47	-44.59%	44.17	42.11	-4.66%	2.6	Medium
KCS1-A13	183.45	1	15.89	9.32	-41.33%	62.25	59.91	-3.76%	2	Medium
KCS1-A14	151	1	16.04	9.27	-42.16%	59.61	57.18	-4.08%	2.2	Medium
KCS1-A15	58.88	1	19.40	11.86	-38.87%	55.76	57.64	3.37%	2.2	Medium
KCS1-A2	42.3	1	21.78	12.68	-41.79%	58.86	62.44	6.09%	3	Medium
KCS1-A3	143.5	1	16.35	8.69	-46.82%	60.02	53.47	-10.91%	1.8	Medium
KCS1-A4	58.88	1	19.40	10.78	-44.44%	55.76	53.44	-4.16%	2.3	Medium
KCS1-A5	175.68	1	12.79	6.46	-49.53%	46.04	40.28	-12.51%	2.1	Medium
KCS1-A6	42.3	1	19.52	11.64	-40.40%	47.32	52.20	10.30%	3.3	Medium
KCS1-A7	143.5	1	14.00	7.12	-49.12%	48.26	41.87	-13.25%	2.1	Medium
KCS1-A8	58.88	1	17.09	9.47	-44.59%	44.17	42.11	-4.66%	2.6	Medium
KCS1-A9	183.45	1	13.48	6.87	-49.02%	50.16	43.90	-12.49%	2.1	Medium
Area Weighted Results	1669.68	15	15.64	8.55	-45.36%	53.54	49.66	-7.25%		0

Parameters Used.

Category	Parameter	Value	Notes
External Fabric	External Wall U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Floor U-Values (W/m²K)	0.09	As Calculated by BS EN ISO 6946
	Roof U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Glazing U-Value (W/m2K)	1.10	As Calculated by BS EN ISO 12567 or 10077 (U-Value includes glass and frame)
	G-Value (-)	0.55	
	Fraction Glazed (%)	0.80	Proportion of glass to overall opening size
Internal Walls	To Other Apartments	Fully Filled Cavity with Sealed Edges	
	To Corridors (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Risers (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Lift Shafts (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Stair Wells (W/m²K)	0.18	As Calculated by BS EN ISO 6946
Thermal Mass	Thermal Mass Parameter (Simple)	Low	Based on Construction of Walls, Floors, Roofs (including party and internal walls, floors and ceilings)
Thermal Bridging	Thermal Bridge Specification	Default	No further information required on thermal bridges
Air Permeability	Air Permeability Rate (m3/hm2 at 50Pa)	3	As stated on a test certificate from a person registered by an authorised air pressure testing scheme Note to use the measured air perm rate each dwelling has to be pressure tested. If a dwelling is not pressure tested the value used in the calculation is an average of the tested dwellings of the same type plus 2.
Mechanical Ventilation	Strategy	Balanced with Heat Recovery	
	SFP (W/l/s)	0.52 (K+1), 0.55 (K+2), 63 (K+3), 74 (K+4), 86 (K+5)	SAP Appendix Q Test Results
	Heat Exchange Efficiency (%)	92 (K+1), 92 (K+2), 90 (K+3), 89 (K+4), 89 (K+5)	SAP Appendix Q Test Results
	Installer approved	Yes	The installer has be registered with a Government Approved Scheme e.g. BESCA, Blue Flame Certification, Certsure, NAPIT and Stroma
	Duct Type	Rigid	All ductwork is rigid except for occasional flexible ducting to join components together
	Ductwork Insulated	Yes	Ductwork can be assumed to be insulated if all of the ductwork is inside the insulated envelope even if the ductwork itself is uninsulated.
Space Heating	Category	Communal	
	Boilers - Fraction of Heat (-)	0.3	As design specification
	Boilers - Efficiency (%)	91.8	As calculated by SAP Appendix D
	CHP - Fraction of Heat (-)	0.7	As design specification
	CHP - Efficiency (%)	80	Gross Efficiency from Manufacturers Literature
	CHP - Heat to Power Ratio (-)	1.54	Heat Supplied / Power Supplied
	Heat Distribution System	Pre-insulated low temperature, variable flow (1991 or later)	District heating specification
	Controls	Charging system linked to use, programmer and TRVs	
	Emitter	Underfloor (Screed)	
Water Heating	Type	From Main System	
	Cylinder in Dwelling	No	
	Plate Heat Exchanger	Yes	
	Volume (litres)	1	
	Insulation Type	Spray Foam	
	Insulation Thickness (mm)	30	
	Waste Water Heat Recovery	No	
Renewables	Type	PV Panels	
	Peak Power (kWp)	33	Peak power under 1kW/m² of radiation at 25°C
	Orientation	South East	
	Tilt	Horizontal	
Cooling	Areas Cooled	All Living Spaces and Bedrooms	Private Units have Comfort Cooling Affordable Units have no Cooling
	EER	4.5	
	Controls	Variable Speed Compressor	
Summertime Overheating	Openable Windows	No	
	Mechanical Ventilation Required	Yes	
	Blinds	Light-coloured curtain or roller blind	

HOARE LEA

SAP Results Sheet.

Project	Newcombe House - KCS2 (GREEN)
Revision	2
Version	3
Date	22/05/2018

Dwelling Reference	Dwelling Area (m²)	No. of Dwelling Type	TER	DER	Criterion 1 DER/TER Variance	TFEE	DFEE	Criterion 1 DFEE/TFEE Variance	Criterion 3 Overheating Strategy	Criterion 3 Overheating Risk
KCS2-A1	110.05	1	16.35	8.93	-45.38%	54.74	51.32	-6.25%	2.4	Medium
KCS2-A2	50.2	1	19.84	10.86	-45.28%	53.83	51.63	-4.07%	2.3	Medium
KCS2-A3	140.6	1	16.03	8.39	-47.68%	58.21	50.77	-12.78%	1.7	Medium
KCS2-A4	110.05	1	14.11	7.24	-48.67%	43.46	40.48	-6.86%	2.7	Medium
KCS2-A5	50.2	1	17.51	9.05	-48.29%	42.13	40.25	-4.46%	2.6	Medium
KCS2-A6	140.6	1	13.73	6.54	-52.35%	46.61	39.06	-16.21%	2.0	Medium
KCS2-A7	110.05	1	17.19	10.02	-41.71%	59.07	59.43	0.61%	2.5	Medium
KCS2-A8	50.2	1	19.84	11.53	-41.86%	53.83	55.86	3.78%	2.2	Medium
KCS2-A9	140.6	1	16.60	9.29	-44.03%	61.20	57.43	-6.16%	1.8	Medium
Area Weighted Results	902.55	9	16.21	8.72	-46.24%	53.37	49.60	-7.07%		0

Parameters Used.

Category	Parameter	Value	Notes
External Fabric	External Wall U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Floor U-Values (W/m²K)	0.09	As Calculated by BS EN ISO 6946
	Roof U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Glazing U-Value (W/m2K)	1.10	As Calculated by BS EN ISO 12567 or 10077 (U-Value includes glass and frame)
	G-Value (-)	0.55	
	Fraction Glazed (%)	0.80	Proportion of glass to overall opening size
Internal Walls	To Other Apartments	Fully Filled Cavity with Sealed Edges	
	To Corridors (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Risers (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Lift Shafts (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Stair Wells (W/m²K)	0.18	As Calculated by BS EN ISO 6946
Thermal Mass	Thermal Mass Parameter (Simple)	Low	Based on Construction of Walls, Floors, Roofs (including party and internal walls, floors and ceilings)
Thermal Bridging	Thermal Bridge Specification	Default	No further information required on thermal bridges
Air Permeability	Air Permeability Rate (m3/hm2 at 50Pa)	3	As stated on a test certificate from a person registered by an authorised air pressure testing scheme Note to use the measured air perm rate each dwelling has to be pressure tested. If a dwelling is not pressure tested the value used in the calculation is an average of the tested dwellings of the same type plus 2.
Mechanical Ventilation	Strategy	Balanced with Heat Recovery	
	SFP (W/l/s)	0.52 (K+1), 0.55 (K+2), 63 (K+3), 74 (K+4), 86 (K+5)	SAP Appendix Q Test Results
	Heat Exchange Efficiency (%)	92 (K+1), 92 (K+2), 90 (K+3), 89 (K+4), 89 (K+5)	SAP Appendix Q Test Results
	Installer approved	Yes	The installer has be registered with a Government Approved Scheme e.g. BESCA, Blue Flame Certification, Certsure, NAPIT and Stroma
	Duct Type	Rigid	All ductwork is rigid except for occasional flexible ducting to join components together
	Ductwork Insulated	Yes	Ductwork can be assumed to be insulated if all of the ductwork is inside the insulated envelope even if the ductwork itself is uninsulated.
Space Heating	Category	Communal	
	Boilers - Fraction of Heat (-)	0.3	As design specification
	Boilers - Efficiency (%)	91.8	As calculated by SAP Appendix D
	CHP - Fraction of Heat (-)	0.7	As design specification
	CHP - Efficiency (%)	80	Gross Efficiency from Manufacturers Literature
	CHP - Heat to Power Ratio (-)	1.54	Heat Supplied / Power Supplied
	Heat Distribution System	Pre-insulated low temperature, variable flow (1991 or later)	District heating specification
	Controls	Charging system linked to use, programmer and TRVs	
	Emitter	Underfloor (Screed)	
Water Heating	Type	From Main System	
	Cylinder in Dwelling	No	
	Plate Heat Exchanger	Yes	
	Volume (litres)	1	
	Insulation Type	Spray Foam	
	Insulation Thickness (mm)	30	
	Waste Water Heat Recovery	No	
Renewables	Type	PV Panels	
	Peak Power (kWp)	33	Peak power under $1kW/m^2$ of radiation at $25^{\circ}C$
	Orientation	South East	
	Tilt	Horizontal	
Summertime Overheating	Openable Windows	No	
	Mechanical Ventilation Required	Yes	
	Blinds	Light-coloured curtain or roller blind	

HOARE LEA

SAP Results Sheet.

Project	Newcombe House - WPB1 (GREEN)
Revision	2
Version	3
Date	22/05/2018

Dwelling Reference	Dwelling Area (m²)	No. of Dwelling Type	TER	DER	Criterion 1 DER/TER Variance	TFEE	DFEE	Criterion 1 DFEE/TFEE Variance	Criterion 3 Overheating Strategy	Criterion 3 Overheating Risk
WPB1-A1	111.03	1	18.66	10.54	-43.50%	66.59	62.91	-5.52%	1.8	Medium
WPB1-A2	103.55	1	18.58	10.46	-43.70%	64.98	61.44	-5.45%	1.8	Medium
WPB1-A3	95.21	1	18.94	10.80	-42.97%	64.73	61.71	-4.67%	1.9	Medium
WPB1-A4	112.47	1	18.63	10.55	-43.38%	66.72	62.97	-5.62%	1.8	Medium
Area Weighted Results	422.26	4	18.70	10.58	-43.39%	65.81	62.29	-5.34%		0

Parameters Used.

Category	Parameter	Value	Notes
External Fabric	External Wall U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Floor U-Values (W/m²K)	0.09	As Calculated by BS EN ISO 6946
	Roof U-Values (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	Glazing U-Value (W/m2K)	1.10	As Calculated by BS EN ISO 12567 or 10077 (U-Value includes glass and frame)
	G-Value (-)	0.55	
	Fraction Glazed (%)	0.80	Proportion of glass to overall opening size
Internal Walls	To Other Apartments	Fully Filled Cavity with Sealed Edges	
	To Corridors (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Risers (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Lift Shafts (W/m²K)	0.18	As Calculated by BS EN ISO 6946
	To Stair Wells (W/m²K)	0.18	As Calculated by BS EN ISO 6946
Thermal Mass	Thermal Mass Parameter (Simple)	Low	Based on Construction of Walls, Floors, Roofs (including party and internal walls, floors and ceilings)
Thermal Bridging	Thermal Bridge Specification	Default	No further information required on thermal bridges
Air Permeability	Air Permeability Rate (m3/hm2 at 50Pa)	3	As stated on a test certificate from a person registered by an authorised air pressure testing scheme. Note to use the measured air perm rate each dwelling has to be pressure tested. If a dwelling is not pressure tested the value used in the calculation is an average of the tested dwellings of the same type plus 2.
Mechanical Ventilation	Strategy	Balanced with Heat Recovery	
	SFP (W/l/s)	0.52 (K+1), 0.55 (K+2), 63 (K+3), 74 (K+4), 86 (K+5)	SAP Appendix Q Test Results
	Heat Exchange Efficiency (%)	92 (K+1), 92 (K+2), 90 (K+3), 89 (K+4), 89 (K+5)	SAP Appendix Q Test Results
	Installer approved	Yes	The installer has be registered with a Government Approved Scheme e.g. BESCA, Blue Flame Certification, Certsure, NAPIT and Stroma
	Duct Type	Rigid	All ductwork is rigid except for occasional flexible ducting to join components together
	Ductwork Insulated	Yes	Ductwork can be assumed to be insulated if all of the ductwork is inside the insulated envelope even if the ductwork itself is uninsulated.
Space Heating	Category	Communal	
	Boilers - Fraction of Heat (-)	0.3	As design specification
	Boilers - Efficiency (%)	91.8	As calculated by SAP Appendix D
	CHP - Fraction of Heat (-)	0.7	As design specification
	CHP - Efficiency (%)	80	Gross Efficiency from Manufacturers Literature
	CHP - Heat to Power Ratio (-)	1.54	Heat Supplied / Power Supplied
	Heat Distribution System	Pre-insulated low temperature, variable flow (1991 or later)	District heating specification
	Controls	Charging system linked to use, programmer and TRVs	
	Emitter	Underfloor (Screed)	
Water Heating	Type	From Main System	
	Cylinder in Dwelling	No	
	Plate Heat Exchanger	Yes	
	Volume (litres)	1	
	Insulation Type	Spray Foam	
	Insulation Thickness (mm)	30	
	Waste Water Heat Recovery	No	
Renewables	Type	PV Panels	
	Peak Power (kWp)	33	Peak power under 1kW/m² of radiation at 25°C
	Orientation	South East	
	Tilt	Horizontal	
Summertime Overheating	Openable Windows	No	
	Mechanical Ventilation Required	Yes	
	Blinds	Light-coloured curtain or roller blind	

DER Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Liam Holden	Assessor number	10245
Client		Last modified	20/06/2018
Address	A1, London		

1. Overall dwelling dimensions

		Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied		164.79	(1a)	x	2.85	(2a)	=	469.65	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	164.79	(4)						
Dwelling volume							(3a) + (3b) + (3c) + (3d)...(3n) =	469.65	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs (6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)		0.15	(18)
Number of sides on which the dwelling is sheltered		1	(19)
Shelter factor	1 - [0.075 x (19)] =	0.93	(20)
Infiltration rate incorporating shelter factor	(18) x (20) =	0.14	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	79.90	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window			43.25	x	1.05	=	45.57			(27)
Ground floor			164.79	x	0.09	=	14.83			(28a)
External wall			95.46	x	0.25	=	23.87			(29a)
External wall			30.12	x	0.18	=	5.42			(29a)
Party wall			9.58	x	0.00	=	0.00			(32)
Total area of external elements ∑A, m²			333.62							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	89.69	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		50.04	(36)
Total fabric heat loss	(33) + (36) =	139.73	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	42.99	42.46	41.92	39.23	38.69	36.00	36.00	35.47	37.08	38.69	39.77	40.84	(38)
Heat transfer coefficient, W/K (37)m + (38)m	182.72	182.19	181.65	178.96	178.42	175.74	175.74	175.20	176.81	178.42	179.50	180.57	

Average = ∑(39)1...12/12 = 178.83 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	1.11	1.11	1.10	1.09	1.08	1.07	1.07	1.06	1.07	1.08	1.09	1.10

Average = ∑(40)1...12/12 = 1.09 (40)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	2.96	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	104.39	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	114.83	110.66	106.48	102.31	98.13	93.95	93.95	98.13	102.31	106.48	110.66	114.83

∑(44)1...12 = 1252.73 (44)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	170.29	148.94	153.69	133.99	128.57	110.95	102.81	117.97	119.38	139.13	151.87	164.92

∑(45)1...12 = 1642.52 (45)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss 0.15 x (45)m	25.54	22.34	23.05	20.10	19.29	16.64	15.42	17.70	17.91	20.87	22.78	24.74	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)
Water storage loss:		
b) Manufacturer's declared loss factor is not known		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.02	(51)
Volume factor from Table 2a	4.93	(52)
Temperature factor from Table 2b	1.00	(53)
Energy lost from water storage (kWh/day) (47) x (51) x (52) x (53)	0.10	(54)
Enter (50) or (54) in (55)	0.10	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water storage loss calculated for each month (55) x (41)m	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(56)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(57)
Primary circuit loss for each month from Table 3	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for each month from Table 3a, 3b or 3c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m	196.79	172.88	180.19	159.64	155.07	136.59	129.31	144.47	145.03	165.63	177.52	191.42	(62)
Solar DHW input calculated using Appendix G or Appendix H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from water heater for each month (kWh/month) (62)m + (63)m	196.79	172.88	180.19	159.64	155.07	136.59	129.31	144.47	145.03	165.63	177.52	191.42	

∑(64)1...12 = 1954.54 (64)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	77.82	68.67	72.30	65.07	63.95	57.41	55.38	60.43	60.21	67.46	71.01	76.04	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	147.78	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.97	26.62	21.65	16.39	12.25	10.34	11.18	14.53	19.50	24.76	28.90	30.81	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	336.20	339.69	330.89	312.18	288.55	266.35	251.52	248.03	256.82	275.53	299.16	321.36	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	(69)
Pump and fan gains (Table 5a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (Table 5)	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	-118.22	(71)
Water heating gains (Table 5)	104.60	102.19	97.18	90.37	85.95	79.73	74.44	81.22	83.63	90.67	98.63	102.20	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	538.10	535.83	517.06	486.28	454.09	423.76	404.47	411.11	427.28	458.30	494.02	521.70	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
North	0.77	x	9.09	x	10.63	x 0.9 x	0.55	x	0.80	=	29.47	(74)
East	0.77	x	15.15	x	19.64	x 0.9 x	0.55	x	0.80	=	90.73	(76)
South	0.77	x	16.18	x	46.75	x 0.9 x	0.55	x	0.80	=	230.66	(78)
West	0.77	x	2.83	x	19.64	x 0.9 x	0.55	x	0.80	=	16.95	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains in watts ∑(74)m...(82)m	367.81	644.72	923.79	1203.51	1393.85	1401.80	1344.14	1200.78	1021.19	724.43	444.03	312.43	(83)
Total gains - internal and solar (73)m + (83)m	905.91	1180.55	1440.85	1689.78	1847.94	1825.56	1748.60	1611.89	1448.46	1182.73	938.04	834.13	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area n1,m (see Table 9a)	0.97	0.95	0.90	0.81	0.69	0.54	0.41	0.46	0.67	0.87	0.95	0.98	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	18.61	19.00	19.52	20.12	20.57	20.85	20.95	20.93	20.72	20.08	19.23	18.55	(87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(˚C)	19.99	20.00	20.00	20.01	20.01	20.03	20.03	20.03	20.02	20.01	20.01	20.00	(88)
Utilisation factor for gains for rest of dwelling n2,m	0.97	0.94	0.88	0.79	0.65	0.48	0.33	0.38	0.61	0.84	0.95	0.97	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	16.79	17.35	18.10	18.94	19.54	19.89	19.99	19.98	19.74	18.90	17.69	16.70	(90)

Living area fraction — Living area ÷ (4) = 0.52 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2	17.73	18.20	18.83	19.55	20.07	20.38	20.48	20.47	20.25	19.51	18.48	17.65	(92)
Apply adjustment to the mean internal temperature from Table 4e where appropriate	17.73	18.20	18.83	19.55	20.07	20.38	20.48	20.47	20.25	19.51	18.48	17.65	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm	0.95	0.92	0.86	0.77	0.65	0.50	0.37	0.41	0.62	0.83	0.93	0.96	(94)
Useful gains, ηmGm, W (94)m x (84)m	864.90	1085.31	1244.65	1305.22	1199.41	914.16	649.87	668.22	897.92	978.85	872.35	802.63	(95)
Monthly average external temperature from Table U1	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	2453.60	2422.80	2240.29	1905.95	1494.28	1016.32	682.55	712.76	1086.51	1589.86	2043.28	2429.30	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	1182.00	898.80	740.76	432.53	219.38	0.00	0.00	0.00	0.00	454.59	843.07	1210.24	

∑(98)1...5, 10...12 = 5981.35 (98)

Space heating requirement kWh/m²/year — (98) ÷ (4) 36.30 (99)

8c. Space cooling requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm	0.00	0.00	0.00	0.00	0.00	1651.91	1300.44	1331.50	0.00	0.00	0.00	0.00	(100)
Utilisation factor for loss ηm	0.00	0.00	0.00	0.00	0.00	0.83	0.88	0.86	0.00	0.00	0.00	0.00	(101)
Useful loss ηmLm (watts) (100)m x (101)m	0.00	0.00	0.00	0.00	0.00	1377.96	1149.02	1145.93	0.00	0.00	0.00	0.00	(102)
Gains	0.00	0.00	0.00	0.00	0.00	2256.40	2163.65	2006.03	0.00	0.00	0.00	0.00	(103)
Space cooling requirement, whole dwelling, continuous (kWh) 0.024 x [(103)m - (102)m] x (41)m	0.00	0.00	0.00	0.00	0.00	632.48	754.88	639.92	0.00	0.00	0.00	0.00	

∑(104)6...8 = 2027.28 (104)

Cooled fraction — cooled area ÷ (4) = 0.82 (105)

Intermittency factor (Table 10)

0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.25	0.00	0.00	0.00	0.00

∑(106)6...8 = 0.75 (106)

Space cooling requirement (104)m x (105) x (106)m

0.00	0.00	0.00	0.00	0.00	129.77	154.88	131.29	0.00	0.00	0.00	0.00

∑(107)6...8 = 415.94 (107)

Space cooling requirement kWh/m²/year (107) ÷ (4) = 2.52 (108)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)	'0' if none		0.00	(301)
Fraction of space heat from community system	1 - (301) =		1.00	(302)
Fraction of community heat from boilers			0.30	(303a)
Fraction of community heat from CHP			0.70	(303b)
Fraction of total space heat from community CHP	(302) x (303a) =		0.70	(304a)
Fraction of total space heat from community boilers	(302) x (303b) =		0.30	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating			1.00	(305a)
Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heating				
Annual space heating requirement		5981.35		(98)
Space heat from CHP	(98) x (304a) x (305) x (306) =		4396.29	(307a)
Space heat from boilers	(98) x (304b) x (305) x (306) =		1884.13	(307b)
Water heating				
Annual water heating requirement		1954.54		(64)
Water heat from CHP	(64) x (303a) x (305a) x (306) =		1436.59	(310a)
Water heat from boilers	(64) x (303b) x (305a) x (306) =		615.68	(310b)
Electricity used for heat distribution	0.01 × [(307a)...(307e) + (310a)...(310e)] =		83.33	(313)
Cooling System Energy Efficiency Ratio			6.08	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	(107) ÷ (314)		68.47	(315)
Electricity for pumps, fans and electric keep-hot (Table 4f)				
mechanical ventilation fans - balanced, extract or positive input from outside		379.60		(330a)
Total electricity for the above, kWh/year			379.60	(331)
Electricity for lighting (Appendix L)			529.32	(332)
Energy saving/generation technologies				
electricity generated by PV (Appendix M)			-616.00	(333)
Total delivered energy for all uses	(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =		8694.07	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from CHP	4396.29	x	2.97	x 0.01 =	130.57	(340a)
Space heating from boilers	1884.13	x	4.24	x 0.01 =	79.89	(340b)
Water heating from CHP	1436.59	x	2.97	x 0.01 =	42.67	(342a)
Water heating from boilers	615.68	x	4.24	x 0.01 =	26.10	(342b)
Space cooling	68.47	x	13.19	x 0.01 =	9.03	(348)
Pumps and fans	379.60	x	13.19	x 0.01 =	50.07	(349)
Electricity for lighting	529.32	x	13.19	x 0.01 =	69.82	(350)

Additional standing charges					120.00	(351)
Energy saving/generation technologies						
pv savings	-616.00	x	13.19	x 0.01 =	0.00	(352)
Total energy cost				(340a)...(342e) + (345)...(354) =	528.15	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)
Energy cost factor (ECF)	1.06	(357)
SAP value	85.25	
SAP rating (section 13)	85	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	9063.7862	x	0.2160	=	1957.7778	(363)
less credit emissions for electricity		-2854.7358	x	0.5190	=	-1481.6079	(364)
Water heated by CHP		2961.8001	x	0.2160	=	639.7488	(365)
less credit emissions for electricity		-932.8504	x	0.5190	=	-484.1494	(366)
Emissions from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
CO2 emissions from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	2723.10	x	0.216	=	588.19	(368)
Electrical energy for community heat distribution		83.33	x	0.519	=	43.25	(372)
Total CO2 associated with community systems						1263.21	(373)
Total CO2 associated with space and water heating						1263.21	(376)
Space cooling		68.47	x	0.519	=	35.53	(377)
Pumps and fans		379.60	x	0.519	=	197.01	(378)
Electricity for lighting		529.32	x	0.519	=	274.72	(379)
Energy saving/generation technologies							
pv savings		-616.00	x	0.519	=	-319.70	(380)
Total CO_2, kg/year					(376)..(382) =	1450.76	(383)
Dwelling CO_2 emission rate					(383) ÷ (4) =	8.80	(384)
EI value						90.73	
EI rating (section 14)						91	(385)
EI band						B	

13b. Primary energy - community heating scheme

		Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary Energy from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	9063.79	x	1.22	=	11057.82	(363)
less credit energy for electricity		-2854.74	x	3.07	=	-8764.04	(364)
Water heated by CHP		2961.80	x	1.22	=	3613.40	(365)
less credit energy for electricity		-932.85	x	3.07	=	-2863.85	(366)

Primary energy from other sources (space heating)						
Efficiency of boilers	91.80					(367b)
Primary energy from boilers [(307b)+(310b)] x 100 ÷ (367b) =	2723.10	x	1.22	=	3322.18	(368)
Electrical energy for community heat distribution	83.33	x	3.07	=	255.81	(372)
Total primary energy associated with community systems					6621.32	(373)
Total primary energy associated with space and water heating					6621.32	(376)
Space cooling	68.47	x	3.07	=	210.19	(377)
Pumps and fans	379.60	x	3.07	=	1165.36	(378)
Electricity for lighting	529.32	x	3.07	=	1625.01	(379)
Energy saving/generation technologies						
Electricity generated - PVs	-616.00	x	3.07	=	-1891.12	(380)
Primary energy kWh/year					7730.77	(383)
Dwelling primary energy rate kWh/m2/year					46.91	(384)

DER Worksheet
Design - Draft

NHER

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Liam Holden	Assessor number	10245
Client		Last modified	20/06/2018
Address	A1, London		

1. Overall dwelling dimensions

		Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied		175.68	(1a)	x	2.70	(2a)	=	474.34	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	175.68	(4)						
Dwelling volume							(3a) + (3b) + (3c) + (3d)...(3n) =	474.34	(5)

2. Ventilation rate

				m³ per hour	
Number of chimneys		0	x 40 =	0	(6a)
Number of open flues		0	x 20 =	0	(6b)
Number of intermittent fans		0	x 10 =	0	(7a)
Number of passive vents		0	x 10 =	0	(7b)
Number of flueless gas fires		0	x 40 =	0	(7c)
				Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)		0.15	(18)
Number of sides on which the dwelling is sheltered		1	(19)
Shelter factor	1 - [0.075 x (19)] =	0.93	(20)
Infiltration rate incorporating shelter factor	(18) x (20) =	0.14	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	79.90	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window			50.94	x	1.05	=	53.67			(27)
Ground floor			175.65	x	0.09	=	15.81			(28a)
External wall			126.94	x	0.18	=	22.85			(29a)
Total area of external elements ∑A, m²			353.53							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	92.33	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		53.03	(36)
Total fabric heat loss	(33) + (36) =	145.36	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	43.42	42.88	42.34	39.62	39.08	36.36	36.36	35.82	37.45	39.08	40.16	41.25	(38)
Heat transfer coefficient, W/K (37)m + (38)m	188.78	188.24	187.70	184.98	184.44	181.72	181.72	181.18	182.81	184.44	185.52	186.61	
Average = ∑(39)1...12/12 =												184.85	(39)
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	1.07	1.07	1.07	1.05	1.05	1.03	1.03	1.03	1.04	1.05	1.06	1.06	
Average = ∑(40)1...12/12 =												1.05	(40)
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	2.97	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	104.74	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	115.21	111.02	106.84	102.65	98.46	94.27	94.27	98.46	102.65	106.84	111.02	115.21	
∑(44)1...12 =												1256.89	(44)
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	170.86	149.44	154.20	134.44	129.00	111.31	103.15	118.37	119.78	139.59	152.37	165.47	
∑(45)1...12 =												1647.98	(45)
Distribution loss 0.15 x (45)m	25.63	22.42	23.13	20.17	19.35	16.70	15.47	17.75	17.97	20.94	22.86	24.82	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)
Water storage loss:		
b) Manufacturer's declared loss factor is not known		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.02	(51)
Volume factor from Table 2a	4.93	(52)
Temperature factor from Table 2b	1.00	(53)
Energy lost from water storage (kWh/day) (47) x (51) x (52) x (53)	0.10	(54)
Enter (50) or (54) in (55)	0.10	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water storage loss calculated for each month (55) x (41)m	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(56)
If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(57)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Primary circuit loss for each month from Table 3	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for each month from Table 3a, 3b or 3c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m	197.36	173.37	180.70	160.08	155.50	136.96	129.65	144.87	145.42	166.09	178.02	191.97	(62)
Solar DHW input calculated using Appendix G or Appendix H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from water heater for each month (kWh/month) (62)m + (63)m	197.36	173.37	180.70	160.08	155.50	136.96	129.65	144.87	145.42	166.09	178.02	191.97	
∑(64)1...12 =												1960.00	(64)
Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	78.01	68.84	72.47	65.22	64.09	57.53	55.50	60.56	60.34	67.61	71.18	76.22	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	148.51	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.96	27.50	22.36	16.93	12.66	10.69	11.55	15.01	20.14	25.58	29.85	31.82	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	347.30	350.90	341.82	322.49	298.08	275.14	259.82	256.22	265.30	284.63	309.04	331.98	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	37.85	(69)
Pump and fan gains (Table 5a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (Table 5)	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	-118.80	(71)
Water heating gains (Table 5)	104.85	102.43	97.41	90.58	86.14	79.90	74.59	81.39	83.81	90.88	98.86	102.44	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	550.67	548.39	529.15	497.55	464.44	433.28	413.51	420.17	436.80	468.64	505.30	533.79	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
East	0.77	x	20.62	x	19.64	x 0.9 x	0.55	x	0.80	=	123.49	(76)
South	0.77	x	11.45	x	46.75	x 0.9 x	0.55	x	0.80	=	163.23	(78)
West	0.77	x	18.87	x	19.64	x 0.9 x	0.55	x	0.80	=	113.01	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains in watts ∑(74)m...(82)m	399.72	729.96	1102.41	1496.04	1762.84	1779.99	1704.28	1506.24	1241.83	837.29	488.36	335.52	(83)
Total gains - internal and solar (73)m + (83)m	950.39	1278.35	1631.56	1993.59	2227.27	2213.27	2117.79	1926.41	1678.63	1305.93	993.66	869.32	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(°C)	21.00	(85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area n1,m (see Table 9a)												

0.97	0.94	0.88	0.77	0.63	0.48	0.36	0.41	0.62	0.86	0.95	0.98	(86)

Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)

18.67	19.09	19.66	20.27	20.68	20.89	20.96	20.95	20.77	20.16	19.29	18.60	(87)

Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)

20.02	20.02	20.03	20.04	20.04	20.05	20.05	20.06	20.05	20.04	20.04	20.03	(88)

Utilisation factor for gains for rest of dwelling n2,m

0.97	0.93	0.87	0.75	0.59	0.42	0.29	0.33	0.56	0.83	0.95	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

16.89	17.49	18.31	19.16	19.69	19.96	20.03	20.02	19.83	19.03	17.79	16.80	(90)

Living area fraction	Living area ÷ (4) =	0.52	(91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

17.82	18.33	19.01	19.74	20.21	20.45	20.52	20.51	20.32	19.62	18.57	17.74	(92)

Apply adjustment to the mean internal temperature from Table 4e where appropriate

17.82	18.33	19.01	19.74	20.21	20.45	20.52	20.51	20.32	19.62	18.57	17.74	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm												
0.96	0.92	0.85	0.74	0.60	0.45	0.33	0.37	0.58	0.82	0.93	0.96	(94)
Useful gains, ηmGm, W (94)m x (84)m												
908.88	1171.61	1384.03	1467.34	1328.59	986.71	689.26	711.31	976.18	1065.30	924.67	838.21	(95)
Monthly average external temperature from Table U1												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]												
2552.91	2528.02	2348.91	2004.92	1568.97	1062.76	712.23	744.18	1137.63	1663.13	2128.35	2526.93	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m												
1223.16	911.51	717.87	387.06	178.84	0.00	0.00	0.00	0.00	444.78	866.65	1256.40	

	∑(98)1...5, 10...12 =	5986.28	(98)
Space heating requirement kWh/m²/year	(98) ÷ (4)	34.07	(99)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)	'0' if none	0.00	(301)
Fraction of space heat from community system	1 - (301) =	1.00	(302)
Fraction of community heat from boilers		0.30	(303a)
Fraction of community heat from CHP		0.70	(303b)
Fraction of total space heat from community CHP	(302) x (303a) =	0.70	(304a)
Fraction of total space heat from community boilers	(302) x (303b) =	0.30	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating		1.00	(305a)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating

Annual space heating requirement	5986.28		(98)
Space heat from CHP	(98) x (304a) x (305) x (306) =	4399.91	(307a)
Space heat from boilers	(98) x (304b) x (305) x (306) =	1885.68	(307b)

Water heating

Annual water heating requirement	1960.00		(64)

Water heat from CHP	(64) x (303a) x (305a) x (306) =	1440.60	(310a)
Water heat from boilers	(64) x (303b) x (305a) x (306) =	617.40	(310b)
Electricity used for heat distribution	0.01 × [(307a)...(307e) + (310a)...(310e)] =	83.44	(313)

Electricity for pumps, fans and electric keep-hot (Table 4f)			
mechanical ventilation fans - balanced, extract or positive input from outside	383.38		(330a)
Total electricity for the above, kWh/year		383.38	(331)
Electricity for lighting (Appendix L)		546.80	(332)
Energy saving/generation technologies			
electricity generated by PV (Appendix M)		-661.63	(333)
Total delivered energy for all uses	(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =	8612.14	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from CHP	4399.91	x	2.97	x 0.01 =	130.68	(340a)
Space heating from boilers	1885.68	x	4.24	x 0.01 =	79.95	(340b)
Water heating from CHP	1440.60	x	2.97	x 0.01 =	42.79	(342a)
Water heating from boilers	617.40	x	4.24	x 0.01 =	26.18	(342b)
Pumps and fans	383.38	x	13.19	x 0.01 =	50.57	(349)
Electricity for lighting	546.80	x	13.19	x 0.01 =	72.12	(350)
Additional standing charges					120.00	(351)
Energy saving/generation technologies						
pv savings	-661.63	x	13.19	x 0.01 =	0.00	(352)
Total energy cost				(340a)...(342e) + (345)...(354) =	522.28	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)
Energy cost factor (ECF)	0.99	(357)
SAP value	86.13	
SAP rating (section 13)	86	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	9071.2496	x	0.2160	=	1959.3899	(363)
less credit emissions for electricity		-2857.0865	x	0.5190	=	-1482.8279	(364)
Water heated by CHP		2970.0618	x	0.2160	=	641.5334	(365)
less credit emissions for electricity		-935.4525	x	0.5190	=	-485.4999	(366)
Emissions from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
CO2 emissions from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	2726.66	x	0.216	=	588.96	(368)
Electrical energy for community heat distribution		83.44	x	0.519	=	43.30	(372)
Total CO2 associated with community systems						1264.86	(373)
Total CO2 associated with space and water heating						1264.86	(376)

Pumps and fans	383.38	x	0.519	=	198.98	(378)
Electricity for lighting	546.80	x	0.519	=	283.79	(379)
Energy saving/generation technologies						
pv savings	-661.63	x	0.519	=	-343.39	(380)
Total CO_2, kg/year				(376)..(382) =	1404.24	(383)
Dwelling CO_2 emission rate				(383) ÷ (4) =	7.99	(384)
EI value					91.47	
EI rating (section 14)					91	(385)
EI band					B	

13b. Primary energy - community heating scheme

	Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary Energy from community CHP (space and water heating)						
Power efficiency of CHP unit	31.50					(361)
Heat efficiency of CHP unit	48.50					(362)
Space heating from CHP (307a) × 100 ÷ (362) =	9071.25	x	1.22	=	11066.92	(363)
less credit energy for electricity	-2857.09	x	3.07	=	-8771.26	(364)
Water heated by CHP	2970.06	x	1.22	=	3623.48	(365)
less credit energy for electricity	-935.45	x	3.07	=	-2871.84	(366)
Primary energy from other sources (space heating)						
Efficiency of boilers	91.80					(367b)
Primary energy from boilers [(307b)+(310b)] x 100 ÷ (367b) =	2726.66	x	1.22	=	3326.53	(368)
Electrical energy for community heat distribution	83.44	x	3.07	=	256.15	(372)
Total primary energy associated with community systems					6629.98	(373)
Total primary energy associated with space and water heating					6629.98	(376)
Pumps and fans	383.38	x	3.07	=	1176.98	(378)
Electricity for lighting	546.80	x	3.07	=	1678.67	(379)
Energy saving/generation technologies						
Electricity generated - PVs	-661.63	x	3.07	=	-2031.20	(380)
Primary energy kWh/year					7454.43	(383)
Dwelling primary energy rate kWh/m2/year					42.43	(384)

DER Worksheet
Design - Draft

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Liam Holden	Assessor number	10245
Client		Last modified	20/06/2018
Address	A1, London		

1. Overall dwelling dimensions

	Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied	110.05	(1a)	x	2.70	(2a)	=	297.14	(3a)
Total floor area (1a) + (1b) + (1c) + (1d)...(1n) =	110.05	(4)						
Dwelling volume						(3a) + (3b) + (3c) + (3d)...(3n) =	297.14	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs (6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)		0.15	(18)
Number of sides on which the dwelling is sheltered		1	(19)
Shelter factor	1 - [0.075 x (19)] =	0.93	(20)
Infiltration rate incorporating shelter factor	(18) x (20) =	0.14	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	79.90	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window			40.70	x	1.05	=	42.88			(27)
Ground floor			110.05	x	0.09	=	9.90			(28a)
External wall			74.41	x	0.18	=	13.39			(29a)
Party wall			21.57	x	0.00	=	0.00			(32)
Total area of external elements ∑A, m²			225.16							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	66.18	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		33.77	(36)
Total fabric heat loss	(33) + (36) =	99.96	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	27.20	26.86	26.52	24.82	24.48	22.78	22.78	22.44	23.46	24.48	25.16	25.84	(38)
Heat transfer coefficient, W/K (37)m + (38)m	127.16	126.82	126.48	124.78	124.44	122.73	122.73	122.39	123.41	124.44	125.12	125.80	

Average = ∑(39)1...12/12 = 124.69 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	1.16	1.15	1.15	1.13	1.13	1.12	1.12	1.11	1.12	1.13	1.14	1.14

Average = ∑(40)1...12/12 = 1.13 (40)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	2.82	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	101.06	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	111.17	107.12	103.08	99.04	95.00	90.95	90.95	95.00	99.04	103.08	107.12	111.17	

∑(44)1...12 = 1212.71 (44)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	164.85	144.18	148.78	129.71	124.46	107.40	99.52	114.21	115.57	134.68	147.02	159.65

∑(45)1...12 = 1590.06 (45)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Distribution loss 0.15 x (45)m	24.73	21.63	22.32	19.46	18.67	16.11	14.93	17.13	17.34	20.20	22.05	23.95	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)

Water storage loss:

b) Manufacturer's declared loss factor is not known

Hot water storage loss factor from Table 2 (kWh/litre/day)	0.02	(51)
Volume factor from Table 2a	4.93	(52)
Temperature factor from Table 2b	1.00	(53)
Energy lost from water storage (kWh/day) (47) x (51) x (52) x (53)	0.10	(54)
Enter (50) or (54) in (55)	0.10	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Water storage loss calculated for each month (55) x (41)m	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(56)

If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)

	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(57)
Primary circuit loss for each month from Table 3	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for each month from Table 3a, 3b or 3c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m	191.36	168.12	175.28	155.36	150.96	133.05	126.02	140.71	141.21	161.19	172.66	186.15	(62)
Solar DHW input calculated using Appendix G or Appendix H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from water heater for each month (kWh/month) (62)m + (63)m	191.36	168.12	175.28	155.36	150.96	133.05	126.02	140.71	141.21	161.19	172.66	186.15	

∑(64)1...12 = 1902.08 (64)

Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	76.01	67.09	70.67	63.65	62.58	56.23	54.29	59.17	58.94	65.98	69.40	74.28	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	140.76	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.22	21.51	17.49	13.24	9.90	8.36	9.03	11.74	15.75	20.00	23.35	24.89	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	271.63	274.45	267.34	252.22	233.13	215.19	203.21	200.39	207.49	222.62	241.70	259.64	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	37.08	(69)
Pump and fan gains (Table 5a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (Table 5)	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	-112.61	(71)
Water heating gains (Table 5)	102.17	99.84	94.99	88.40	84.12	78.09	72.97	79.53	81.87	88.69	96.39	99.85	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	463.24	461.02	445.05	419.09	392.38	366.87	350.44	356.89	370.34	396.53	426.67	449.60	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
East	0.77	x	14.57	x	19.64	x 0.9 x	0.55	x	0.80	=	87.26	(76)
South	0.77	x	9.83	x	46.75	x 0.9 x	0.55	x	0.80	=	140.13	(78)
West	0.77	x	16.30	x	19.64	x 0.9 x	0.55	x	0.80	=	97.62	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains in watts ∑(74)m...(82)m	325.00	591.15	887.93	1199.03	1408.84	1421.09	1361.22	1205.58	998.08	676.66	396.62	273.12	(83)
Total gains - internal and solar (73)m + (83)m	788.24	1052.17	1332.98	1618.12	1801.22	1787.96	1711.66	1562.47	1368.42	1073.20	823.28	722.72	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C)	21.00	(85)

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

Utilisation factor for gains for living area n1,m (see Table 9a)

0.95	0.91	0.83	0.70	0.55	0.41	0.31	0.34	0.54	0.79	0.92	0.96	(86)

Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)

18.77	19.23	19.81	20.38	20.74	20.91	20.97	20.96	20.82	20.27	19.40	18.69	(87)

Temperature during heating periods in the rest of dwelling from Table 9, Th2(°C)

19.96	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.98	19.98	19.97	19.97	(88)

Utilisation factor for gains for rest of dwelling n2,m

0.94	0.89	0.80	0.67	0.51	0.35	0.24	0.27	0.48	0.75	0.91	0.95	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

17.00	17.65	18.46	19.24	19.70	19.92	19.97	19.96	19.81	19.12	17.91	16.88	(90)

Living area fraction — Living area ÷ (4) = 0.38 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

17.67	18.25	18.98	19.68	20.09	20.30	20.35	20.34	20.20	19.56	18.48	17.57	(92)

Apply adjustment to the mean internal temperature from Table 4e where appropriate

17.67	18.25	18.98	19.68	20.09	20.30	20.35	20.34	20.20	19.56	18.48	17.57	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm	0.92	0.87	0.78	0.65	0.51	0.37	0.26	0.30	0.49	0.74	0.88	0.93	(94)
Useful gains, ηmGm, W (94)m x (84)m	727.25	911.71	1041.00	1059.62	923.52	662.85	450.08	467.85	674.17	792.78	727.91	675.41	(95)
Monthly average external temperature from Table U1	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	1700.39	1693.44	1577.84	1344.68	1044.37	699.01	460.40	482.62	752.30	1114.68	1423.42	1681.75	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	724.01	525.32	399.41	205.24	89.91	0.00	0.00	0.00	0.00	239.49	500.76	748.72	

	∑(98)1...5, 10...12 =	3432.87	(98)
Space heating requirement kWh/m²/year	(98) ÷ (4)	31.19	(99)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)	'0' if none	0.00	(301)
Fraction of space heat from community system	1 - (301) =	1.00	(302)
Fraction of community heat from boilers		0.30	(303a)
Fraction of community heat from CHP		0.70	(303b)
Fraction of total space heat from community CHP	(302) x (303a) =	0.70	(304a)
Fraction of total space heat from community boilers	(302) x (303b) =	0.30	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating		1.00	(305a)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating

Annual space heating requirement	3432.87			(98)
Space heat from CHP		(98) x (304a) x (305) x (306) =	2523.16	(307a)
Space heat from boilers		(98) x (304b) x (305) x (306) =	1081.35	(307b)

Water heating

Annual water heating requirement	1902.08			(64)
Water heat from CHP		(64) x (303a) x (305a) x (306) =	1398.03	(310a)
Water heat from boilers		(64) x (303b) x (305a) x (306) =	599.15	(310b)
Electricity used for heat distribution		0.01 × [(307a)...(307e) + (310a)...(310e)] =	56.02	(313)

Electricity for pumps, fans and electric keep-hot (Table 4f)				
mechanical ventilation fans - balanced, extract or positive input from outside	240.16			(330a)
Total electricity for the above, kWh/year			240.16	(331)
Electricity for lighting (Appendix L)			427.66	(332)
Energy saving/generation technologies				
electricity generated by PV (Appendix M)			-410.67	(333)
Total delivered energy for all uses		(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =	5858.85	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from CHP	2523.16	x	2.97	x 0.01 =	74.94	(340a)
Space heating from boilers	1081.35	x	4.24	x 0.01 =	45.85	(340b)
Water heating from CHP	1398.03	x	2.97	x 0.01 =	41.52	(342a)
Water heating from boilers	599.15	x	4.24	x 0.01 =	25.40	(342b)
Pumps and fans	240.16	x	13.19	x 0.01 =	31.68	(349)
Electricity for lighting	427.66	x	13.19	x 0.01 =	56.41	(350)
Additional standing charges					120.00	(351)
Energy saving/generation technologies						
pv savings	-410.67	x	13.19	x 0.01 =	0.00	(352)
Total energy cost				(340a)...(342e) + (345)...(354) =	395.80	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)
Energy cost factor (ECF)	1.07	(357)
SAP value	85.04	
SAP rating (section 13)	85	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	5201.9677	x	0.2160	=	1123.6250	(363)
less credit emissions for electricity		-1638.4150	x	0.5190	=	-850.3374	(364)
Water heated by CHP		2882.2936	x	0.2160	=	622.5754	(365)
less credit emissions for electricity		-907.8090	x	0.5190	=	-471.1529	(366)
Emissions from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
CO2 emissions from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	1830.62	x	0.216	=	395.41	(368)
Electrical energy for community heat distribution		56.02	x	0.519	=	29.07	(372)
Total CO2 associated with community systems						849.20	(373)

Total CO2 associated with space and water heating					849.20	(376)
Pumps and fans	240.16	x	0.519	=	124.64	(378)
Electricity for lighting	427.66	x	0.519	=	221.95	(379)
Energy saving/generation technologies						
pv savings	-410.67	x	0.519	=	-213.14	(380)
Total CO_2, kg/year				(376)..(382) =	982.66	(383)
Dwelling CO_2 emission rate				(383) ÷ (4) =	8.93	(384)
EI value					91.51	
EI rating (section 14)					92	(385)
EI band					A	

13b. Primary energy - community heating scheme

	Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary Energy from community CHP (space and water heating)						
Power efficiency of CHP unit	31.50					(361)
Heat efficiency of CHP unit	48.50					(362)
Space heating from CHP (307a) × 100 ÷ (362) =	5201.97	x	1.22	=	6346.40	(363)
less credit energy for electricity	-1638.42	x	3.07	=	-5029.93	(364)
Water heated by CHP	2882.29	x	1.22	=	3516.40	(365)
less credit energy for electricity	-907.81	x	3.07	=	-2786.97	(366)
Primary energy from other sources (space heating)						
Efficiency of boilers	91.80					(367b)
Primary energy from boilers [(307b)+(310b)] x 100 ÷ (367b) =	1830.62	x	1.22	=	2233.35	(368)
Electrical energy for community heat distribution	56.02	x	3.07	=	171.97	(372)
Total primary energy associated with community systems					4451.22	(373)
Total primary energy associated with space and water heating					4451.22	(376)
Pumps and fans	240.16	x	3.07	=	737.29	(378)
Electricity for lighting	427.66	x	3.07	=	1312.91	(379)
Energy saving/generation technologies						
Electricity generated - PVs	-410.67	x	3.07	=	-1260.74	(380)
Primary energy kWh/year					5240.67	(383)
Dwelling primary energy rate kWh/m2/year					47.62	(384)

DER Worksheet
Design - Draft

NHER

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mr Liam Holden	Assessor number	10245
Client		Last modified	20/06/2018
Address	TH A1, London		

1. Overall dwelling dimensions

	Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied	69.47	(1a)	x	2.70	(2a)	=	187.57	(3a)
+1	41.56	(1b)	x	3.15	(2b)	=	130.91	(3b)
Total floor area (1a) + (1b) + (1c) + (1d)...(1n) =	111.03	(4)						
Dwelling volume						(3a) + (3b) + (3c) + (3d)...(3n) =	318.48	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs (6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	3.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)	0.15	(18)
Number of sides on which the dwelling is sheltered	1	(19)
Shelter factor 1 - [0.075 x (19)] =	0.93	(20)
Infiltration rate incorporating shelter factor (18) x (20) =	0.14	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	79.90	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]

0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(24a)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)

	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window			33.63	x	1.05	=	35.43			(27)
Exposed floor			69.47	x	0.09	=	6.25			(28b
External wall			122.55	x	0.18	=	22.06			(29a)
Party wall			38.39	x	0.00	=	0.00			(32)
Roof			56.66	x	0.18	=	10.20			(30)
Total area of external elements ∑A, m²			282.31							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	73.94	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		100.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		42.35	(36)
Total fabric heat loss	(33) + (36) =	116.29	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	29.16	28.79	28.43	26.60	26.24	24.42	24.42	24.05	25.15	26.24	26.97	27.70	(38)
Heat transfer coefficient, W/K (37)m + (38)m	145.45	145.08	144.72	142.89	142.53	140.71	140.71	140.34	141.44	142.53	143.26	143.99	
Average = ∑(39)1...12/12 =												142.80	(39)
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	1.31	1.31	1.30	1.29	1.28	1.27	1.27	1.26	1.27	1.28	1.29	1.30	
Average = ∑(40)1...12/12 =												1.29	(40)
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	2.82	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	101.20	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	111.32	107.27	103.22	99.17	95.12	91.08	91.08	95.12	99.17	103.22	107.27	111.32	
∑(44)1...12 =												1214.35	(44)
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	165.08	144.38	148.98	129.89	124.63	107.55	99.66	114.36	115.73	134.87	147.22	159.87	
∑(45)1...12 =												1592.20	(45)
Distribution loss 0.15 x (45)m	24.76	21.66	22.35	19.48	18.69	16.13	14.95	17.15	17.36	20.23	22.08	23.98	(46)

Storage volume (litres) including any solar or WWHRS storage within same vessel	1.00	(47)
Water storage loss:		
b) Manufacturer's declared loss factor is not known		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.02	(51)
Volume factor from Table 2a	4.93	(52)
Temperature factor from Table 2b	1.00	(53)
Energy lost from water storage (kWh/day) (47) x (51) x (52) x (53)	0.10	(54)
Enter (50) or (54) in (55)	0.10	(55)

Water storage loss calculated for each month (55) x (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(56)
If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)	3.24	2.92	3.24	3.13	3.24	3.13	3.24	3.24	3.13	3.24	3.13	3.24	(57)
Primary circuit loss for each month from Table 3	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi loss for each month from Table 3a, 3b or 3c	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m	191.58	168.31	175.49	155.53	151.13	133.19	126.16	140.86	141.37	161.37	172.86	186.37	(62)
Solar DHW input calculated using Appendix G or Appendix H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)
Output from water heater for each month (kWh/month) (62)m + (63)m	191.58	168.31	175.49	155.53	151.13	133.19	126.16	140.86	141.37	161.37	172.86	186.37	
∑(64)1...12 =												1904.22	(64)
Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	76.09	67.15	70.74	63.70	62.64	56.28	54.34	59.22	59.00	66.04	69.47	74.36	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	141.04	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.34	21.62	17.58	13.31	9.95	8.40	9.08	11.80	15.84	20.11	23.47	25.02	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	273.03	275.86	268.72	253.52	234.34	216.30	204.26	201.42	208.56	223.76	242.95	260.98	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	37.10	(69)
Pump and fan gains (Table 5a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (Table 5)	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	-112.83	(71)
Water heating gains (Table 5)	102.27	99.93	95.08	88.48	84.19	78.16	73.03	79.60	81.94	88.77	96.48	99.94	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	464.95	462.72	446.69	420.62	393.79	368.18	351.68	358.14	371.65	397.95	428.21	451.25	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
East	0.77	x	27.91	x	19.64	x 0.9 x	0.55	x	0.80	=	167.14	(76)
West	0.77	x	5.72	x	19.64	x 0.9 x	0.55	x	0.80	=	34.26	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains in watts ∑(74)m...(82)m	201.40	393.98	648.83	946.28	1159.70	1187.16	1130.23	970.85	754.62	467.49	251.12	165.62	(83)
Total gains - internal and solar (73)m + (83)m	666.35	856.71	1095.53	1366.91	1553.50	1555.34	1481.91	1328.99	1126.27	865.44	679.33	616.87	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(°C)	21.00	(85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area n1,m (see Table 9a)													
	0.97	0.94	0.89	0.79	0.65	0.50	0.39	0.44	0.66	0.87	0.95	0.97	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)													
	18.28	18.67	19.28	20.00	20.52	20.82	20.93	20.91	20.64	19.87	18.94	18.21	(87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(˚C)													
	19.83	19.84	19.84	19.85	19.85	19.87	19.87	19.87	19.86	19.85	19.85	19.84	(88)
Utilisation factor for gains for rest of dwelling n2,m													
	0.96	0.93	0.87	0.76	0.60	0.43	0.30	0.35	0.59	0.84	0.94	0.97	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
	16.22	16.78	17.66	18.65	19.34	19.71	19.83	19.81	19.52	18.52	17.18	16.13	(90)

Living area fraction — Living area ÷ (4) = 0.45 (91)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2													
	17.15	17.63	18.39	19.26	19.87	20.21	20.32	20.30	20.02	19.13	17.97	17.07	(92)
Apply adjustment to the mean internal temperature from Table 4e where appropriate													
	17.15	17.63	18.39	19.26	19.87	20.21	20.32	20.30	20.02	19.13	17.97	17.07	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm													
	0.94	0.91	0.85	0.74	0.60	0.46	0.34	0.38	0.60	0.82	0.92	0.95	(94)
Useful gains, ηmGm, W (94)m x (84)m													
	629.67	779.35	925.83	1007.18	935.26	708.49	496.93	509.65	675.52	707.78	625.42	587.72	(95)
Monthly average external temperature from Table U1													
	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]													
	1868.49	1846.58	1720.27	1480.04	1164.42	789.51	523.86	547.60	837.64	1215.64	1557.26	1852.91	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m													
	921.68	717.18	591.06	340.45	170.50	0.00	0.00	0.00	0.00	377.85	670.93	941.31	

	∑(98)1...5, 10...12 =	4730.96	(98)
Space heating requirement kWh/m²/year	(98) ÷ (4)	42.61	(99)

9b. Energy requirements - community heating scheme

Fraction of space heat from secondary/supplementary system (table 11)	'0' if none	0.00	(301)
Fraction of space heat from community system	1 - (301) =	1.00	(302)
Fraction of community heat from boilers		0.30	(303a)
Fraction of community heat from CHP		0.70	(303b)
Fraction of total space heat from community CHP	(302) x (303a) =	0.70	(304a)
Fraction of total space heat from community boilers	(302) x (303b) =	0.30	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.00	(305)
Factor for charging method (Table 4c(3)) for community water heating		1.00	(305a)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)

Space heating

Annual space heating requirement	4730.96			(98)
Space heat from CHP		(98) x (304a) x (305) x (306) =	3477.25	(307a)
Space heat from boilers		(98) x (304b) x (305) x (306) =	1490.25	(307b)

Water heating

Annual water heating requirement	1904.22			(64)
Water heat from CHP		(64) x (303a) x (305a) x (306) =	1399.60	(310a)
Water heat from boilers		(64) x (303b) x (305a) x (306) =	599.83	(310b)
Electricity used for heat distribution		0.01 × [(307a)...(307e) + (310a)...(310e)] =	69.67	(313)
Electricity for pumps, fans and electric keep-hot (Table 4f)				
mechanical ventilation fans - balanced, extract or positive input from outside	208.85			(330a)
Total electricity for the above, kWh/year			208.85	(331)
Electricity for lighting (Appendix L)			429.86	(332)
Energy saving/generation technologies				
electricity generated by PV (Appendix M)			-418.27	(333)
Total delivered energy for all uses		(307) + (309) + (310) + (312) + (315) + (331) + (332)...(337b) =	7187.38	(338)

10b. Fuel costs - community heating scheme

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating from CHP	3477.25	x	2.97	x 0.01 =	103.27	(340a)
Space heating from boilers	1490.25	x	4.24	x 0.01 =	63.19	(340b)
Water heating from CHP	1399.60	x	2.97	x 0.01 =	41.57	(342a)
Water heating from boilers	599.83	x	4.24	x 0.01 =	25.43	(342b)
Pumps and fans	208.85	x	13.19	x 0.01 =	27.55	(349)
Electricity for lighting	429.86	x	13.19	x 0.01 =	56.70	(350)
Additional standing charges					120.00	(351)
Energy saving/generation technologies						
pv savings	-418.27	x	13.19	x 0.01 =	0.00	(352)
Total energy cost				(340a)...(342e) + (345)...(354) =	437.71	(355)

11b. SAP rating - community heating scheme

Energy cost deflator (Table 12)	0.42	(356)
Energy cost factor (ECF)	1.18	(357)
SAP value	83.56	
SAP rating (section 13)	84	(358)
SAP band	B	

12b. CO_2 emissions - community heating scheme

		Energy kWh/year		Emission factor		Emissions (kg/year)	
Emissions from community CHP (space and water heating)							
Power efficiency of CHP unit		31.50					(361)
Heat efficiency of CHP unit		48.50					(362)
Space heating from CHP	(307a) × 100 ÷ (362) =	7169.0134	x	0.2160	=	1548.5069	(363)
less credit emissions for electricity		-2257.9570	x	0.5190	=	-1171.8797	(364)
Water heated by CHP		2885.5458	x	0.2160	=	623.2779	(365)
less credit emissions for electricity		-908.8333	x	0.5190	=	-471.6845	(366)
Emissions from other sources (space heating)							
Efficiency of boilers		91.80					(367b)
CO2 emissions from boilers	[(307b)+(310b)] x 100 ÷ (367b) =	2276.78	x	0.216	=	491.78	(368)
Electrical energy for community heat distribution		69.67	x	0.519	=	36.16	(372)

Total CO2 associated with community systems					1056.16	(373)
Total CO2 associated with space and water heating					1056.16	(376)
Pumps and fans	208.85	x	0.519	=	108.39	(378)
Electricity for lighting	429.86	x	0.519	=	223.10	(379)
Energy saving/generation technologies						
pv savings	-418.27	x	0.519	=	-217.08	(380)
Total CO_2, kg/year				(376)..(382) =	1170.57	(383)
Dwelling CO_2 emission rate				(383) ÷ (4) =	10.54	(384)
EI value					89.95	
EI rating (section 14)					90	(385)
EI band					B	

13b. Primary energy - community heating scheme

	Energy kWh/year		Primary factor		Primary energy (kWh/year)	
Primary Energy from community CHP (space and water heating)						
Power efficiency of CHP unit	31.50					(361)
Heat efficiency of CHP unit	48.50					(362)
Space heating from CHP (307a) × 100 ÷ (362) =	7169.01	x	1.22	=	8746.20	(363)
less credit energy for electricity	-2257.96	x	3.07	=	-6931.93	(364)
Water heated by CHP	2885.55	x	1.22	=	3520.37	(365)
less credit energy for electricity	-908.83	x	3.07	=	-2790.12	(366)
Primary energy from other sources (space heating)						
Efficiency of boilers	91.80					(367b)
Primary energy from boilers [(307b)+(310b)] x 100 ÷ (367b) =	2276.78	x	1.22	=	2777.67	(368)
Electrical energy for community heat distribution	69.67	x	3.07	=	213.89	(372)
Total primary energy associated with community systems					5536.07	(373)
Total primary energy associated with space and water heating					5536.07	(376)
Pumps and fans	208.85	x	3.07	=	641.15	(378)
Electricity for lighting	429.86	x	3.07	=	1319.68	(379)
Energy saving/generation technologies						
Electricity generated - PVs	-418.27	x	3.07	=	-1284.09	(380)
Primary energy kWh/year					6212.81	(383)
Dwelling primary energy rate kWh/m2/year					55.96	(384)

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Notting Hill Gate Office - Be Green

As designed

Date: Fri May 18 10:34:49 2018

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.6

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.6

BRUKL compliance check version: v5.2.g.3

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

CO_2 emission rate from the notional building, kgCO_2/m².annum	21.5
Target CO_2 emission rate (TER), kgCO_2/m².annum	21.5
Building CO_2 emission rate (BER), kgCO_2/m².annum	13.4
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values not achieving standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.25	1F000000:Surf[1]
Floor	0.25	0.16	0.16	1F000000:Surf[0]
Roof	0.25	0.16	0.16	2F000001:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.1	1.1	1F000000:Surf[2]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs.
Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- FCU

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.5	0	1.6	0.75
Standard value	0.91*	3.2	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Allowed SFP may be increased by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

"No HWS in project, or hot water is provided by HVAC system"

1- CHECK2-CHP

	CHPQA quality index	CHP electrical efficiency
This building	105	0.34
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
1F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
GF - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
GF - Office Reception W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
1F - Office	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
2F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
2F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office Circulation W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office W	-	-	-	-	-	-	-	0.2	-	-	N/A
3F - Office Circulation	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
1F - Office W	100	-	-	1562
2F - Office W	100	-	-	1562
3F - Office W	100	-	-	1562
GF - Office Circulation	-	100	-	91
GF - Office Reception W	-	100	70	741
1F - Office Circulation W	-	100	-	52
1F - Office W	100	-	-	1025
1F - Office Circulation	-	100	-	50
1F - Office W	100	-	-	418
1F - Office Circulation W	-	100	-	30
1F - Office Circulation	-	100	-	125
1F - Office	100	-	-	284
2F - Office Circulation W	-	100	-	52
2F - Office Circulation W	-	100	-	30
2F - Office Circulation	-	100	-	125
2F - Office	100	-	-	284
2F - Office W	100	-	-	1025
2F - Office W	100	-	-	418
2F - Office Circulation	-	100	-	50
3F - Office Circulation W	-	100	-	52
3F - Office Circulation W	-	100	-	30
3F - Office Circulation	-	100	-	125
3F - Office	100	-	-	284
3F - Office W	100	-	-	1025
3F - Office W	100	-	-	418

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
3F - Office Circulation	-	100	-	50

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1F - Office W	NO (-63.9%)	YES
2F - Office W	NO (-56.7%)	YES
3F - Office W	NO (-60.7%)	YES
GF - Office Circulation	NO (-93.1%)	NO
GF - Office Reception W	NO (-22.3%)	YES
1F - Office Circulation W	NO (-58.2%)	YES
1F - Office W	NO (-56.8%)	YES
1F - Office Circulation	NO (-97.3%)	NO
1F - Office W	NO (-57.7%)	YES
1F - Office Circulation W	NO (-37.3%)	YES
1F - Office Circulation	NO (-98.2%)	NO
1F - Office	NO (-98.8%)	NO
2F - Office Circulation W	NO (-58.2%)	YES
2F - Office Circulation W	NO (-37.4%)	YES
2F - Office Circulation	NO (-98.1%)	NO
2F - Office	NO (-98.8%)	NO
2F - Office W	NO (-53.6%)	YES
2F - Office W	NO (-57.5%)	YES
2F - Office Circulation	NO (-97.2%)	NO
3F - Office Circulation W	NO (-58.1%)	YES
3F - Office Circulation W	NO (-36.4%)	YES
3F - Office Circulation	NO (-98%)	NO
3F - Office	NO (-98.7%)	NO
3F - Office W	NO (-51.5%)	YES
3F - Office W	NO (-56.7%)	YES
3F - Office Circulation	NO (-97.2%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	2367.6	2367.6
External area [m²]	2554.6	2554.6
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1320.6	1374.19
Average U-value [W/m²K]	0.52	0.54
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	15.34	13.19
Cooling	2.6	5.06
Auxiliary	11.92	15.62
Lighting	5.85	15.18
Hot water	10.81	2.2
Equipment*	31.57	31.57
TOTAL**	**42.81**	**51.26**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	1.44	0
Wind turbines	0	0
CHP generators	3.71	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	88.47	110.01
Primary energy* [kWh/m²]	82.43	126.14
Total emissions [kg/m²]	13.4	21.5

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	47.8	40.6	15.3	2.6	11.3	0.87	4.34	0.96	5.5
Notional	40.9	69.1	13.2	5.1	15.6	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.25	1F000000:Surf[1]
Floor	0.2	0.16	1F000000:Surf[0]
Roof	0.15	0.16	2F000001:Surf[0]
Windows, roof windows, and rooflights	1.5	1.1	1F000000:Surf[2]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

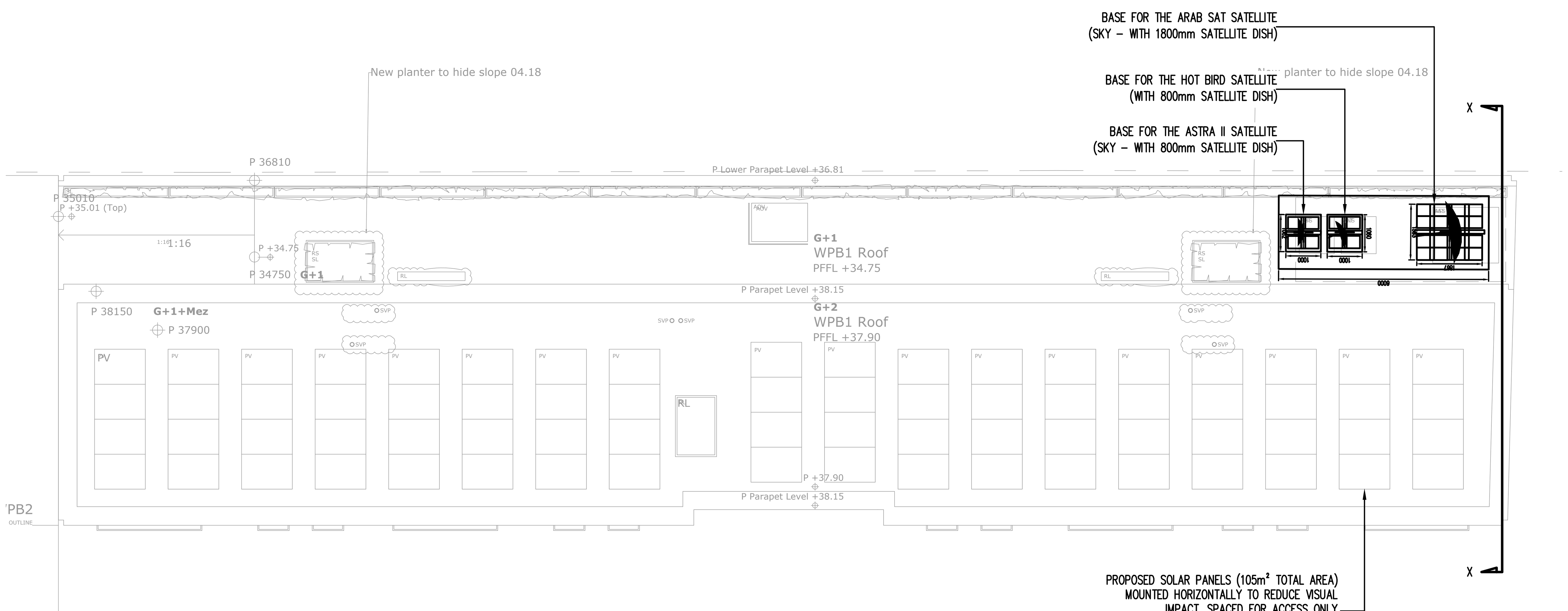
$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

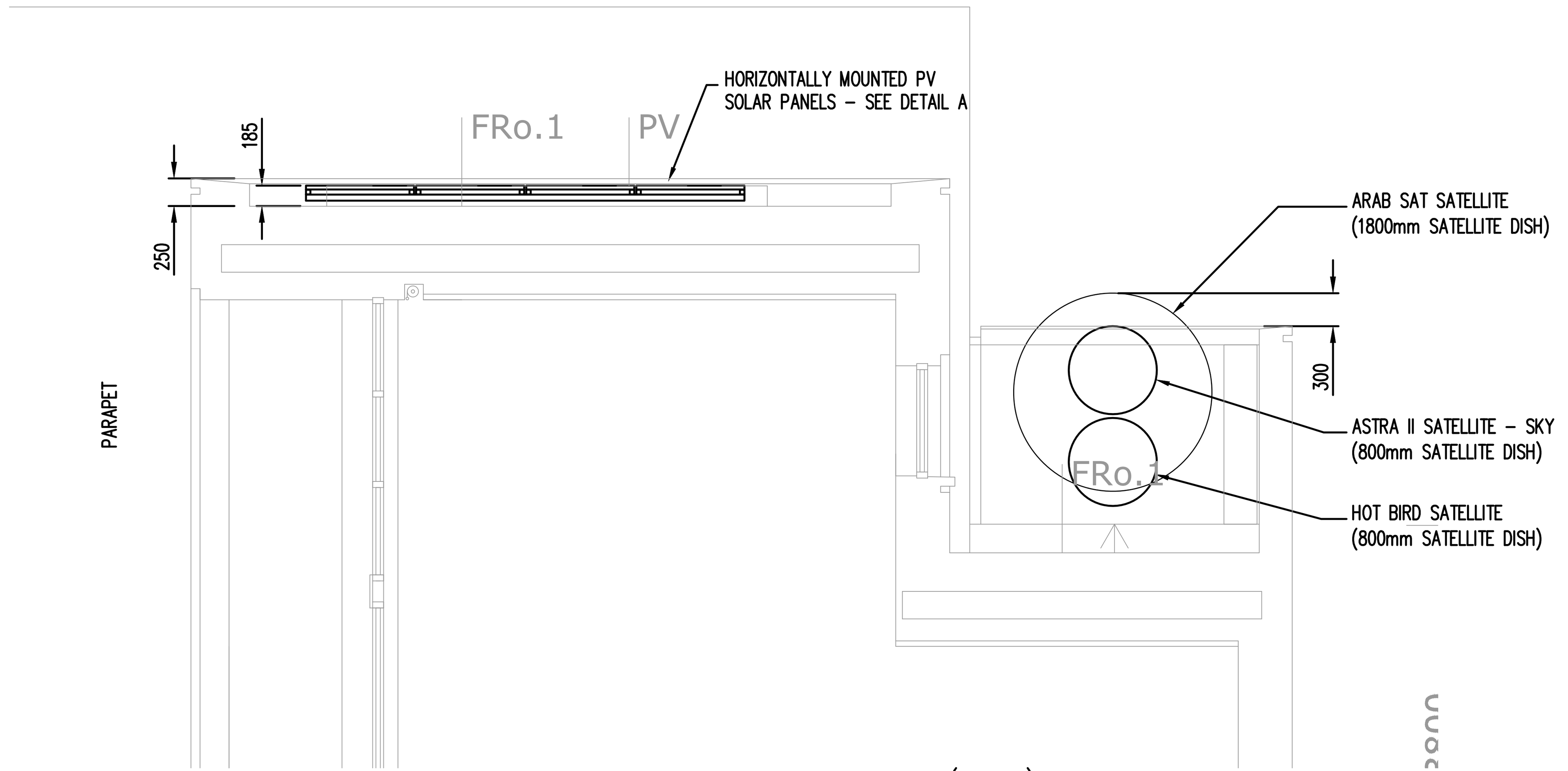
Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

APPENDIX 7 - ROOF LAYOUT

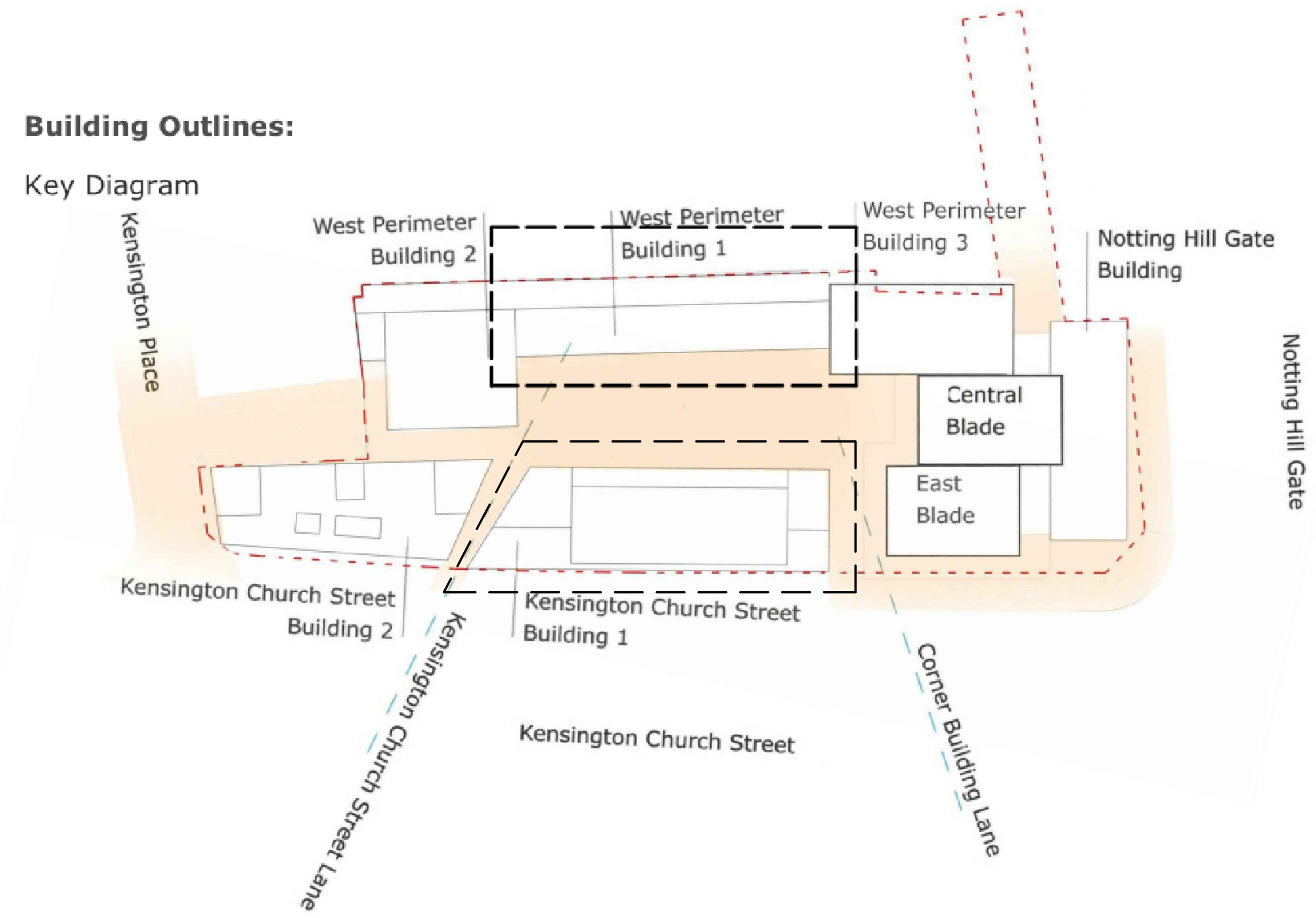
This drawing shall not be scaled. Work from the dimensions shown in the drawing or given in relevant specifications



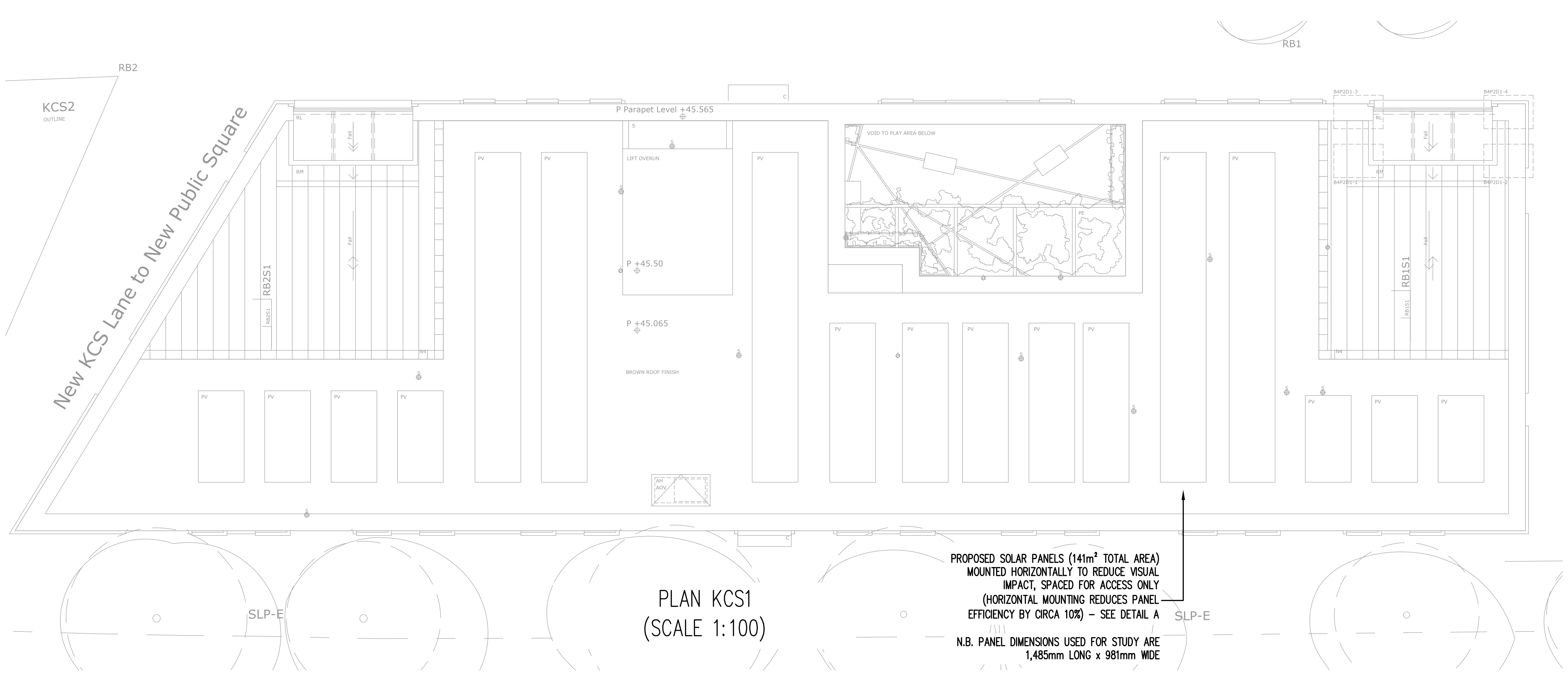
PLAN WPB1
(SCALE 1:100)



SECTION X-X (1:50)



PROPOSED SITE PLAN (NTS)



PLAN KCS1
(SCALE 1:100)

DETAIL A (NTS)

PLANNING ISSUE

NOTES:

1. The drawing does not necessarily show all the information needed to interpret the design intent or the construction details.
2. The drawing contains information from more than one source and must be read in conjunction with all relevant specifications.
3. Any apparent drafting errors and differences between other drawings and specifications shall be brought to our attention.

CDM Pre-Construction Information
The following information is provided in pursuance of Regulations 9 of the CDM Regulations 2015:
NONE UNLESS STATED:

Index	Description	Drawn & Chk by	Rev'd by	Date
PL2	PLANNING ISSUE - KCS1 ROOF ALSO USED FOR PV PANELS	RS	RE	MAY18
PL1	PLANNING ISSUE	RS	RE	NOV15

Revisions

CAD ORIGINAL - NOT TO BE MODIFIED BY HAND

Architect: URBAN SENSE

Project Title: NOTTING HILL GATE

Client: Notting Hill Gate KCS Limited

Drawing Title: WPB1 & KCS1 PROPOSED PHOTO VOLTAIC PANELS MOUNTED FLAT

HOARE LEA
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Project No	Drawn & Checked by	Reviewed by
0709355	RS	RE
Date	Scale	Issuing Office
JULY 2018	1:50 &1:100 @ A1	BOURNEMOUTH

DRAWING NUMBER

Project Code	Orig.	Zone	Level	Type	Role	Class.	Number	Rev.
0709355	HL	W1	RF	SK	C	XXX	0001	PL2

X:\DRAWINGS\0709355 - Notting Hill\005 COORDINATION\002 - Preliminary Issue\Planning Issue\0709355-HL-W1-RF-SK-C-XXX-XXXX-PL1 - Copy.dwg , skeetsr , 05:23:18 | 13:09:41 <001>