Appendix H: SAP worksheets.

Be Lean example data sheet – DER & TER

property as constructed.	been carrie	d out using	Approved	SAP softw	are. It has b	een prepar	ed from pla	ins and spe	cifications	and may n	ot reflect the
Assessor name	Miss Mich	nelle Wang					Ass	essor numi	ber	2018	
Client							Las	t modified		04/02/	2019
Address	Manor Ro	ad Richmo	nd Block 1	, Richmon	d, TW9						
1. Overall dwelling dimens	claus										
1. Overall dwelling dimens	sions			A	rea (m²)		Aver	age storey		Vol	ume (m³)
								ight (m)			
Lowest occupied					101.94	(1a) x		2.63	(2a) =		268.10 (38
Total floor area	(1a)	+ (1b) + (1c) + (1d)(1	in) =	101.94	(4)					
Dwelling volume							(3a)	+ (3b) + (3c) + (3d)(3	in) =	268.10 (5)
2. Ventilation rate											
							. //			m³	per hour
Number of chimneys								0	x 40 =		0 (6;
Number of open flues								0	x 20 =		0 (6)
Number of intermittent fan:	s							0	x 10 =		0 (7:
Number of passive vents								0	x 10 =		0 (7)
Number of flueless gas fires								0	x 40 =		0 (70
										Air c	hanges per hour
infiltration due to chimneys	, flues, fans	, PSVs		(6a)	+ (6b) + (7a	a) + (7b) + (7c) =	0	÷ (5) =	_	
			tended, pr						÷ (5) =	_	hour
lf a pressurisation test has b	een carried	out or is in		oceed to (17), otherwi	ise continue	from (9) to		÷ (5) =	_	hour
infiltration due to chimneys If a pressurisation test has b Air permeability value, q50, If based on air permeability	een carried	out ar is in	tres per ho	oceed to (17), otherwi	ise continue of envelope	from (9) to		÷ (5) =	_	0.00 (8)
If a pressurisation test has b Air permeability value, q50,	een carried expressed i value, then	out ar is in in cubic me (18) = [(17	tres per ho	oceed to (17), otherwi	ise continue of envelope	from (9) to	(16)			0.00 (8) 3.00 (17 0.15 (18 2 (19
If a pressurisation test has be Air permeability value, q50, If based on air permeability Number of sides on which the Shelter factor	expressed in value, then the dwelling	out or is in in cubic me (18) = [(17) is sheltered	tres per ho	oceed to (17), otherwi	ise continue of envelope	from (9) to	(16)	[0.075 x (1	9)] =	0.00 (8) 3.00 (17 0.15 (18 2 (19 0.85 (20
If a pressurisation test has b Air permeability value, q50, If based on air permeability Number of sides on which ti Shelter factor Infiltration rate incorporatir	een carried expressed i value, then he dwelling	f out or is in in cubic me (18) = [(17) is sheltered actor	tres per ho	oceed to (17), otherwi	ise continue of envelope	from (9) to	(16)		9)] =	0.00 (8) 3.00 (17) 0.15 (18) 2 (19)
If a pressurisation test has b Air permeability value, q50, If based on air permeability Number of sides on which ti Shelter factor Infiltration rate incorporatir Infiltration rate modified for	een carried expressed i value, then he dwelling ng shelter fa r monthly w	in cubic me (18) = [(17) is sheltered sector wind speed:	tres per ho) ÷ 20] ÷ (8 d	oceed to (17), otherwi uare metre (se (18) = (16	ise continue of envelope i)	: from (9) to	1-	[0.075 x (1: (18) x (2	9)] =	0.00 (8) 3.00 (17 0.15 (18 2 (19 0.85 (20 0.13 (21)
If a pressurisation test has b Air permeability value, q50, If based on air permeability Number of sides on which ti Shelter factor Infiltration rate incorporatir Infiltration rate modified for Jan	expressed in value, then the dwelling ong shelter far monthly we Feb	f out or is in in cubic me (18) = [(17) is sheltered actor wind speed: Mar	tres per ho	oceed to (17), otherwi	ise continue of envelope	from (9) to	(16)	[0.075 x (1	9)] =	0.00 (8) 3.00 (17 0.15 (18 2 (19 0.85 (20
If a pressurisation test has bear from the permeability value, q50, if based on air permeability Number of sides on which the Shelter factor infiltration rate incorporating infiltration rate modified for Jan Monthly average wind spee	expressed in value, then the dwelling and shelter far monthly w Feb	f out or is in in cubic me i (18) = [(17) is sheltered actor wind speed: Mar le U2	tres per ho) • 20] • (8 d	oceed to (: our per squ i), otherwi May	17), otherwi uare metre se (18) = (16	ise continue of envelope i) Jul	e from (9) to e area	1 - Sep	(0.075 x (1: (18) x (2 Oct	9]] =	0.00 (8) 3.00 (17 0.15 (18 2 (13 0.85 (20 0.13 (21) Dec
If a pressurisation test has be Air permeability value, qS0, if based on air permeability Number of sides on which tis shelter factor infiltration rate incorporatir infiltration rate modified for Jan Monthly average wind spee 5.10	expressed in value, then the dwelling ong shelter far monthly we Feb	f out or is in in cubic me (18) = [(17) is sheltered actor wind speed: Mar	tres per ho) ÷ 20] ÷ (8 d	oceed to (17), otherwi uare metre (se (18) = (16	ise continue of envelope i)	: from (9) to	1-	[0.075 x (1: (18) x (2	9)] =	0.00 (8) 3.00 (17 0.15 (18 2 (19 0.85 (20 0.13 (21)
if a pressurisation test has be Air permeability value, qS0, if based on air permeability Number of sides on which tis Shelter factor in the properties of t	expressed in value, then the dwelling shelter far monthly when the drown the feb d from Table 5.00	out ar is in in cubic mer i (18) = [(17) is sheltered ictor vind speed: Mar le U2 4.90	tres per ho 0 > 20] + (8 d Apr 4.40	oceed to (: our per squ i), otherwi May	17), otherwi uare metre se (18) = (16	ise continue of envelope i) Jul	e from (9) to e area	1 - Sep	(0.075 x (1: (18) x (2 Oct	Nov 4.50	Nour Nour
If a pressurisation test has be Air permeability value, q50, if based on air permeability Number of sides on which ti Shelter factor Infiltration rate incorporatir Infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m + 4 1.28	expressed in value, then the dwelling and shelter far monthly with the following shelter far mon	fout or is in in cubic mer in (18) = [(17) is sheltered sector wind speed: Mar le U2 4.90	Apr 4.40	May 4.30	17), otherwiser metre see (18) = (16) Jun 3.80	ise continue of envelope i) Jul 3.80	Aug	1 - Sep	[0.075 x (1: (18) x (2 Oct	9]] =	0.00 (8) 3.00 (17 0.15 (18 2 (19 0.85 (20 0.13 (21) Dec
If a pressurisation test has be Air permeability value, q50, if based on air permeability Number of sides on which tishelter factor Infiltration rate incorporatir Infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (al	een carried expressed i value, then he dwelling ng shelter fa r monthly w Feb 5.00 1.25	aut ar is in cubic me in cubic me in (18) = [(17) is sheltered with speed: Mar le U2 4.90 1.23 shelter and	Apr 4.40 1.10 wind factors	May 4.30 1.08 pr) (21) x (2)	Jun 3.80 0.95 22a/m	ise continue of envelope i) Jul 3.80	Aug	1 - Sep	[0.075 x (1: (18) x (2 Oct	Nov 4.50	Nour 10.00 (8) 3.00 (1) 3.00 (1) 5 (18
If a pressurisation test has be Air permeability value, q50, if based on air permeability Number of sides on which ti Shelter factor infiltration rate incorporatir infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a)	expressed in value, then the dwelling and shelter far in monthly with the feb of the state of th	aut ar is in cubic me in cubic me in (18) = [(17) is sheltered wind speed: Mar le U2 4.90 1.23 shelter and 0.16	Apr 4.40 1.10 wind facto 0.14	May 4.30	17), otherwiser metre see (18) = (16) Jun 3.80	Jul 3.80	Aug 3.70	1- Sep 4.00	(18) x (2 Oct 4.30	Nov 4.50	Nour Nour
If a pressurisation test has be Air permeability value, q50, if based on air permeability Number of sides on which ti Shelter factor infiltration rate incorporatir infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (a)	een carried expressed i value, then he dwelling ng shelter far monthly w Feb d from Tabl 5.00 1.25 llowing for s 0.16 ge rate for t	aut ar is in in cubic me in (18) = [(17) is sheltered wind speed: Mar le U2 4.90 1.23 shelter and 0.16 he applicab	Apr 4.40 1.10 wind facto 0.14 le case:	May 4.30 1.08 pr) (21) x (2)	Jun 3.80 0.95 22a/m	Jul 3.80	Aug 3.70	1- Sep 4.00	(18) x (2 Oct 4.30	Nov 4.50	Nour 10.00 (8) 3.00 (1) 3.00 (1) 5 (18
if a pressurisation test has be Air permeability value, q50, if based on air permeability Number of sides on which ti Shelter factor Infiltration rate incorporatir Infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al	expressed i value, then the dwelling in shelter far monthly w Feb d from Table 5.00 1.25 1.00 1.16 ge rate for t : air change	out or is in in cubic me in cubic me in (18) = [17] is sheltered sector wind speed: Mar lee U2 4.90 1.23 shelter and 0.16 he applicable rate through	Apr 4.40 1.10 wind facto 0.14 le case: gh system	May 4.30 1.08 r) (21) x (2	17), otherwise (18) = (Jul 3.80 0.95	Aug 3.70	1- Sep 4.00	(18) x (2 Oct 4.30	Nov 4.50	hour 0.00 (8) 3.00 (17) 0.15 (18) 2 (19) 0.85 (20) Dec 4.70 (22) 1.18 (22) 0.15 (22)
if a pressurisation test has be Air permeability value, q50, if based on air permeability Number of sides on which ti Shelter factor Infiltration rate incorporatir Infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m ÷ 4 1.28 Adjusted infiltration rate (al	expressed i value, then he dwelling in shelter far monthly w Feb d from Table 5.00 1.25	aut ar is in in cubic me in cubic me in (18) = [12] is sheltered sixtor wind speed: Mar le U2 4.90 1.23 shelter and 0.16 he applicable rate throughing in % :	Apr 4.40 1.10 wind facto 0.14 le case: gh system allowing fo	May 4.30 1.08 or in-use fa	Jun 3.80 0.95 0.12 octor from To	Jul 3.80 0.95	Aug 3.70 0.93	1- Sep 4.00	(18) x (2 Oct 4.30	Nov 4.50	hour 0.00 (8) 3.00 (17 0.15 (18 0.85 (22 0.13 (21 Dec 4.70 (22 0.15 (22 0.15 (22 0.15 (22) 0.15 (22) 0.15 (22)
if a pressurisation test has be Air permeability value, qS0, if based on air permeability Number of sides on which the Shelter factor Infiltration rate incorporating Infiltration rate modified for Jan Monthly average wind specific parts of the Shelter factor (22) m + 4 1.28 Adjusted infiltration rate (al 0.16 Calculate effective air chang If mechanical ventilation If balanced with heat received.	expressed i value, then he dwelling in shelter far monthly w Feb d from Table 5.00 1.25	aut ar is in in cubic me in cubic me in (18) = [12] is sheltered sixtor wind speed: Mar le U2 4.90 1.23 shelter and 0.16 he applicable rate throughing in % :	Apr 4.40 1.10 wind facto 0.14 le case: gh system allowing fo	May 4.30 1.08 or in-use fa	Jun 3.80 0.95 0.12 octor from To	Jul 3.80 0.95	Aug 3.70 0.93	1- Sep 4.00	(18) x (2 Oct 4.30	Nov 4.50	hour 0.00 (8) 3.00 (17 0.15 (18 0.85 (22 0.13 (21 Dec 4.70 (22 0.15 (22 0.15 (22 0.15 (22) 0.15 (22) 0.15 (22)
If a pressurisation test has be Air permeability value, qS0, if based on air permeability Number of sides on which tis shelter factor infiltration rate incorporatir infiltration rate modified for Jan Monthly average wind spee 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (ai 0.16 Calculate effective air chang if mechanical ventilation if balanced with heat rec a) if balanced mechanica	een carried expressed i value, then the dwelling ag shelter far r monthly w Feb d from Table 5.00 1.25 0.16 ge rate for t d: air change to carried al ventilation 0.28	out or is in in cubic me in (18) = [(17) is sheltered wind speed: Mar le U2 4.90 1.23 shelter and 0.16 he applicable rate through the applicable of the applicable of the in with heat 0.27	Apr 4.40 1.10 wind factor 0.14 le case: gh system allowing for recovery I 0.26	May 4.30 1.08 1.08 1.08 1.08 1.08 1.08 1.08 1.08 1.08 1.08 1.08	Jun 3.80 0.95 2.2a)m 0.12 ctor from T. 2b)m + (23b)	Jul 3.80 0.95 0.12 able 4h) x [1 - (23c	Aug 3.70 0.93 0.12 0.12	Sep 4.00 0.13	(0.075 x (1.1000	Nov 4.50 1.13	hour 0.00 [8] 3.00 [17 0.15 [18 2 [15 0.85 [26 0.13 [21 Dec 4.70 [22 1.18 [22 0.15 [22 0.50 [22 0.50 [22 76.50 [22
if a pressurisation test has be Air permeability value, qS0, if based on air permeability Number of sides on which ti Shelter factor in the properties of th	een carried expressed i value, then the dwelling ag shelter far r monthly w Feb d from Table 5.00 1.25 0.16 ge rate for t d: air change to carried al ventilation 0.28	out or is in in cubic me in (18) = [(17) is sheltered wind speed: Mar le U2 4.90 1.23 shelter and 0.16 he applicable rate through the applicable of the applicable of the in with heat 0.27	Apr 4.40 1.10 wind factor 0.14 le case: gh system allowing for recovery I 0.26	May 4.30 1.08 1.08 1.08 1.08 1.08 1.08 1.08 1.08 1.08 1.08 1.08	Jun 3.80 0.95 2.2a)m 0.12 ctor from T. 2b)m + (23b)	Jul 3.80 0.95 0.12 able 4h) x [1 - (23c	Aug 3.70 0.93 0.12 0.12	Sep 4.00 0.13	(0.075 x (1.1000	Nov 4.50 1.13	hour 0.00 [8] 3.00 [17 0.15 [18 2 [15 0.85 [26 0.13 [21 Dec 4.70 [22 1.18 [22 0.15 [22 0.50 [22 0.50 [22 76.50 [22

Element	Gross area, m ²	Openings m ²	Net area A, m²	U-value W/m²K	A x U W/K	к-value, kJ/m².K	Ахк, kJ/K	
Window	arca, iii		28.36 x		= 37.60	nay in the	nay n	(27)
External wall			48.72 x	=	= 7.31			(29a
External wall			8.64 x	=	- 0.09			(29a
Party wall			31.96 x		= 0.00			(32)
Total area of external elements ∑A, m ²			85.72	0.00	0.00			(31)
Fabric heat loss, W/K = ∑(A × U)			65.72		(26)	(30) + (32) =	44.99	(33)
Heat capacity Cm = 5(A x x)				(28) ((30) + (32) + (33		N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K				(20)(301 - 1327 - 13	_ (Jaze) - [100.00	(35)
Thermal bridges: Σ(L x Ψ) calculated using	Annandis V					ı	16.29	(36)
Total fabric heat loss	Appendix K					ا] = (36) + (36)	61.29	(37)
	Mar Apr	May	Jun Jul	Aug		Oct No		(3/)
Ventilation heat loss calculated monthly (right	iviay	Juli Juli	Aug	эер	Oct No.	W Dec	
	4.21 22.80	22.52	21.11 21.11	20.83	21.68 2	2.52 23.	09 23.65	(38)
24.78 24.50 2 Heat transfer coefficient, W/K (37)m + (38		22.32	21.11 21.11	20.83	21.05	23.	23.05	(38)
	5,50 84.09	83.81	82.40 82.40	82.12	82.96 8	3.81 84.	37 84.94	1
80.07 85.78 8	55.50 64.09	05.01	02.40		02.90 0 Average = Σ(39		84.02	(39)
Heat loss parameter (HLP), W/m²K (39)m	. (4)				werage = 2(39)112/12 = [84.02	(39)
	0.84 0.82	0.82	0.81 0.81	0.81	0.81	0.82 0.8	3 0.83	1
0.84 0.84	0.84 0.82	0.82	0.81 0.81				0.82] [(40)
Number of days in month (Table 1a)				,	Average = ∑(40)112/12 = [0.82	(4U)
Number of days in month (Table 1a)			1	L				1
31.00 28.00 3	30.00	31.00	30.00 31.00	31.00	30.00 3	31.00 30.	00 31.00	(40)
Assumed occupancy, N	er day Vd average	= (25 v N) ±	36			[2.76	(42)
Annual average hot water usage in litres p	er day Vd,average Mar Apr	= (25 x N) +	36 Jun Jul	Aug	Sep	[Oct No	99.67	(42) (43)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb	Mar Apr	May	Jun Jul	Aug	Sep	[Coct No	99.67	1
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each	Mar Apr	May	Jun Jul	Aug 93.69		Oct No	99.67 ov Dec	1
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each	Mar Apr month Vd,m = fact	May or from Tabl	Jun Jul e 1c x (43)		97.68 1	01.67 105	99.67 ov Dec	1
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1	Mar Apr month Vd,m = fact 01.67 97.68	May or from Tabl 93.69	Jun Jul le 1c x (43) 89.71 89.71	93.69	97.68 1		99.67 w Dec	(43)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1 Energy content of hot water used = 4.18 x	Mar Apr month Vd,m = fact 01.67 97.68	May or from Tabl 93.69	Jun Jul le 1c x (43) 89.71 89.71 onth (see Tables 1	93.69 b, 1c 1d)	97.68 10 Σ	01.67 105	99.67 v Dec .65 109.64 1196.08	(43)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1 Energy content of hot water used = 4.18 x	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3	May or from Tabl 93.69	Jun Jul le 1c x (43) 89.71 89.71 onth (see Tables 1	93.69 b, 1c 1d)	97.68 10 2 113.98 11	01.67 105	99.67 v Dec .65 109.64 1196.08	(43)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1 Energy content of hot water used = 4.18 x 162.59 142.21 1	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3	May or from Tabl 93.69	Jun Jul le 1c x (43) 89.71 89.71 onth (see Tables 1	93.69 b, 1c 1d)	97.68 10 2 113.98 11	01.67 105 (44)112 = [32.84 145	99.67 W Dec .65 109.64 1196.08	(43)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3	May or from Tabl 93.69	Jun Jul le 1c x (43) 89.71 89.71 onth (see Tables 1	93.69 b, 1c 1d) 112.64	97.68 10 2 113.98 11	01.67 105 (44)112 = [32.84 145	99.67 Dec .65 109.64 1196.08 .00 157.46 1568.25	(43)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each: 109.64 105.65 1 Energy content of hot water used = 4.18 x 162.59 142.21 1 Distribution loss 0.15 x (45)m 24.39 21.33 2	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93	May or from Tabl 93.69 9.600 kWh/m 122.76 18.41	Jun Jul e 1 c x (43) 89.71 89.71 onth (see Tables 1) 105.93 98.16	93.69 b, 1c 1d) 112.64	97.68 10 2 113.98 11	01.67 105 ((44)112 = [32.84 145 ((45)112 = [99.67 Dec .65 109.64 1196.08 .00 157.46 1568.25	(43)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each. 109.64 105.65 1: Energy content of hot water used = 4.18 x 162.59 142.21 1: Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93	May or from Tabl 93.69 9.600 kWh/m 122.76 18.41	Jun Jul e 1 c x (43) 89.71 89.71 onth (see Tables 1) 105.93 98.16	93.69 b, 1c 1d) 112.64	97.68 10 2 113.98 11	01.67 105 ((44)112 = [32.84 145 ((45)112 = [99.67 Dec .65 109.64 1196.08 .00 157.46 1568.25 75 23.62	(43)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1 Energy content of hot water used = 4.18 x 162.59 142.21 1 Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar Water storage loss:	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storage	May or from Tabl 93.69 93.69 122.76 18.41 e within sam	Jun Jul e 1 c x (43) 89.71 89.71 onth (see Tables 1) 105.93 98.16	93.69 b, 1c 1d) 112.64	97.68 10 2 113.98 11	01.67 105 ((44)112 = [32.84 145 ((45)112 = [99.67 Dec .65 109.64 1196.08 .00 157.46 1568.25 75 23.62	(43)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1 Energy content of hot water used = 4.18 x 162.59 142.21 1 Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar Water storage loss:	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storage	May or from Tabl 93.69 93.69 122.76 18.41 e within sam	Jun Jul e 1 c x (43) 89.71 89.71 onth (see Tables 1) 105.93 98.16	93.69 b, 1c 1d) 112.64	97.68 10 2 113.98 11	01.67 105 ((44)112 = [32.84 145 ((45)112 = [99.67 w Dec .65 109.64 1196.08 .00 157.46 1568.25 75 23.62	(43) (43) (44) (45) (46) (47)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1 Energy content of hot water used = 4.18 x 162.59 142.21 1 Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar Water storage loss: a) If manufacturer's declared loss factor is	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storag	May or from Tabl 93.69 93.69 122.76 18.41 e within sam	Jun Jul e 1 c x (43) 89.71 89.71 onth (see Tables 1) 105.93 98.16	93.69 b, 1c 1d) 112.64	97.68 10 2 113.98 11	01.67 105 ((44)112 = [32.84 145 ((45)112 = [99.67 Dec 65 109.64 1196.08 .00 157.46 1568.25 75 23.62 194.00 1.61	(43) (44) (44) (45) (46) (47)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1 Energy content of hot water used = 4.18 x 162.59 142.21 1 Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar water storage loss: a) If manufacturer's declared loss factor is Temperature factor from Table 2b Energy lost from water storage (kWh/d	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storag	May or from Tabl 93.69 93.69 122.76 18.41 e within sam	Jun Jul e 1 c x (43) 89.71 89.71 onth (see Tables 1) 105.93 98.16	93.69 b, 1c 1d) 112.64	97.68 10 2 113.98 11	01.67 105 ((44)112 = [32.84 145 ((45)112 = [99.67 w Dec 65 109.64 1196.08 .00 157.46 1568.25 75 23.62 194.00 1.61 0.60	(43) (44) (45) (46) (47) (48) (49)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1 Energy content of hot water used = 4.18 x 162.59 142.21 1 Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar water storage loss: a) If manufacturer's declared loss factor is Temperature factor from Table 2b Energy lost from water storage (kWh/dEnter (50) or (54) in (55)	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storag known (kWh/day) (ay) (48) x (49)	May or from Tabl 93.69 93.69 122.76 18.41 e within sam	Jun Jul e 1 c x (43) 89.71 89.71 onth (see Tables 1) 105.93 98.16	93.69 b, 1c 1d) 112.64	97.68 10 2 113.98 11	01.67 105 ((44)112 = [32.84 145 ((45)112 = [99.67 w Dec 65 109.64 1196.08 .00 157.46 1568.25 75 23.62 194.00 1.61 0.60 0.97	(43) (43) (44) (45) (46) (47) (48) (49) (50)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each 109.64 105.65 1 Energy content of hot water used = 4.18 x 162.59 142.21 1 Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar water storage loss: a) If manufacturer's declared loss factor is Temperature factor from Table 2b Energy lost from water storage (kWh/d Enter (50) or (54) in (55) Water storage loss calculated for each mo	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storag known (kWh/day) (ay) (48) x (49)	May or from Tabl 93.69 93.69 122.76 18.41 e within sam	Jun Jul e 1 c x (43) 89.71 89.71 onth (see Tables 1) 105.93 98.16	93.69 b, 1c 1d} 112.64	97.68 1: 2 113.98 1: 2 17.10 1: 1	01.67 105 ((44)112 = [32.84 145 ((45)112 = [99.67 w Dec .65 109.64 1196.08 .00 157.46 1568.25 75 23.62 194.00 1.61 0.60 0.97 0.97	(43) (43) (44) (45) (46) (47) (48) (49) (50)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each. 109.64 105.65 1 Energy content of hot water used = 4.18 x 162.59 142.21 1 Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar water storage loss: a) if manufacturer's declared loss factor is Temperature factor from Table 2b Energy lost from water storage (kWh/d Enter (50) or (54) in (55) Water storage loss calculated for each mo 29.95 27.05 2	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storag known (kWh/day) (ay) (48) x (49) nth (55) x (41)m 19.95 28.98	May or from Table 93.69 16600 kWh/mi 122.76 18.41 e within sam	Jun Jul le 1c x (43) 89.71 89.71 89.71 89.71 105.93 98.16 15.89 14.72 e vessel 28.98 29.95	93.69 b, 1c 1d} 112.64 16.90	97.68 1: 2 113.98 1: 2 17.10 1: 1	01.67 105 [(44)112 = [32.84 145 32.84 145 ((45)112 = [[99.67 w Dec .65 109.64 1196.08 .00 157.46 1568.25 75 23.62 194.00 1.61 0.60 0.97 0.97	(43) (43) (44) (44) (45) (46) (47) (48) (49) (50) (55)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each. 109.64 105.65 1: Energy content of hot water used = 4.18 x 162.59 142.21 1: Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar water storage loss: a) If manufacturer's declared loss factor is Temperature factor from Table 2b Energy lost from water storage (kWh/d Enter (50) or (54) in (55) Water storage loss calculated for each mo 29.95 27.05 2 If the vessel contains dedicated solar storal	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storag known (kWh/day) (ay) (48) x (49) nth (55) x (41)m 19.95 28.98	May or from Table 93.69 16600 kWh/mi 122.76 18.41 e within sam	Jun Jul le 1c x (43) 89.71 89.71 89.71 89.71 105.93 98.16 15.89 14.72 e vessel 28.98 29.95	93.69 b, 1c 1d) 112.64 16.90	97.68 1:1 2 113.98 1: 2 17.10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	01.67 105 [(44)112 = [32.84 145 32.84 145 ((45)112 = [[99.67 w Dec .65 109.64 1196.08 .00 157.46 1568.25 75 23.62 194.00 1.61 0.60 0.97 0.97 98 29.95	(43) (43) (44) (44) (45) (46) (47) (48) (49) (50) (55)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each. 109.64 105.65 1: Energy content of hot water used = 4.18 x 162.59 142.21 1: Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar water storage loss: a) If manufacturer's declared loss factor is Temperature factor from Table 2b Energy lost from water storage (kWh/d Enter (50) or (54) in (55) Water storage loss calculated for each mo 29.95 27.05 2 If the vessel contains dedicated solar stora 29.95 27.05 2	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storag known (kWh/day) (ay) (48) x (49) nth (55) x (41)m 19.95 28.98 age or dedicated W 19.95 28.98	May or from Table 93.69 93.69 122.76 122.76 18.41 e within sam 29.95	Jun Jul le 1c x (43) 89.71 89.71 89.71 89.71 105.93 98.16 15.89 14.72 le vessel 28.98 29.95 la x (47) - Vs] + (47)	93.69 b, 1c 1d) 112.64 16.90	97.68 1:1 2 113.98 1: 2 17.10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	01.67 105 [(44)112 = [32.84 145 [(45)112 = [[[[[[[[[[[[[[99.67 w Dec .65 109.64 1196.08 .00 157.46 1568.25 75 23.62 194.00 1.61 0.60 0.97 0.97 98 29.95	(43) (43) (44) (44) (45) (46) (47) (48) (49) (50) (55)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each. 109.64 105.65 1: Energy content of hot water used = 4.18 x 162.59 142.21 1: Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar water storage loss: a) If manufacturer's declared loss factor is Temperature factor from Table 2b Energy lost from water storage (kWh/d Enter (50) or (54) in (55) Water storage loss calculated for each mo 29.95 27.05 2 If the vessel contains dedicated solar stora 29.95 27.05 2	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storag known (kWh/day) (ay) (48) x (49) nth (55) x (41)m 19.95 28.98 age or dedicated W 19.95 28.98	May or from Table 93.69 93.69 122.76 122.76 18.41 e within sam 29.95	Jun Jul le 1c x (43) 89.71 89.71 89.71 89.71 105.93 98.16 15.89 14.72 le vessel 28.98 29.95 la x (47) - Vs] + (47)	93.69 b, 1c 1d) 112.64 16.90	97.68 1:1 2 113.98 1: 2 17.10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	01.67 105 [(44)112 = [32.84 145 [(45)112 = [[[[[[[[[[[[[[99.67 w Dec .65 109.64 1196.08 .00 157.46 1568.25 75 23.62 194.00 1.61 0.60 0.97 0.97 98 29.95	(43) (43) (44) (44) (45) (46) (47) (48) (49) (50) (55)
Assumed occupancy, N Annual average hot water usage in litres p Jan Feb Hot water usage in litres per day for each. 109.64 105.65 1: Energy content of hot water used = 4.18 x 162.59 142.21 1: Distribution loss 0.15 x (45)m 24.39 21.33 2 Storage volume (litres) including any solar water storage loss: a) If manufacturer's declared loss factor is Temperature factor from Table 2b Energy lost from water storage (kWh/d Enter (50) or (54) in (55) Water storage loss calculated for each mo 29.95 27.05 2 If the vessel contains dedicated solar storal	Mar Apr month Vd,m = fact 01.67 97.68 Vd,m x nm x Tm/3 46.74 127.93 12.01 19.19 or WWHRS storag known (kWh/day) (ay) (48) x (49) nth (55) x (41)m 19.95 28.98 age or dedicated W 19.95 28.98	May or from Table 93.69 93.69 122.76 122.76 18.41 e within sam 29.95	Jun Jul le 1c x (43) 89.71 89.71 89.71 89.71 105.93 98.16 15.89 14.72 le vessel 28.98 29.95 la x (47) - Vs] + (47)	93.69 b, 1c 1d) 112.64 16.90	97.68 1:1 2 113.98 1: 2 17.10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	01.67 105 [(44)112 = [32.84 145 [(45)112 = [99.67 w Dec .65 109.64 1196.08 .00 157.46 1568.25 75 23.62 194.00 1.61 0.60 0.97 0.97 98 29.95	(43) (43) (44) (44) (45) (45) (47) (48) (49) (55) (55) (56)

	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 e												,,
	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 requ	red for wat	er heating c	alculated f	or each mo	onth 0.85 x	(45)m + (4	6)m + (57)	m + (59)m +	(61)m			
	215.80	190.26	199.95	179.43	175.96	157.42	151.37	165.85	165.48	186.05	196.49	210.67 (62)
Solar DHW inpu	t calculated	using Appe	ndix G or A	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 wa	iter heater f	or each mo	nth (kWh/	month) (62	2)m + (63)m	1						
	215.80	190.26	199.95	179.43	175.96	157.42	151.37	165.85	165.48	186.05	196.49	210.67
										∑(64)1:	12 = 2	194.74 (64)
Heat gains from	water heat	ing (kWh/m	onth) 0.25	5 × [0.85 ×	(45)m + (61	.]m]+0.8×	[(46)m+(57)m + (59)	m]			
	96.63	85.73	91.36	83.73	83.38	76.42	75.20	80.02	79.09	86.74	89.41	94.92 (65)
E Internal ani												
5. Internal gair		Feb	Mar			h	Jul	4	6	0.1	None	Dec
**	Jan (Table 5)	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84 (66)
Linksing guine (a	207101	201101	201101	201101	201101	201101	137.84	137.84	137.84	137.84	137.84	137.84 (66)
Lighting gains (o							0.52	1 44 24	45.05	1040	22.20	22.77
Appliance gains	23.13	20.54	16.71	12.65	9.45	7.98	8.62	11.21	15.05	19.10	22.30	23.77 (67)
Appliance gains								1	100.17		220.05	247.00 (60)
		262.12	255.33	240.89	222.66	205.53	194.08	191.39	198.17	212.62	230.85	247.98 (68)
Cooking gains (
	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78 (69)
Pump and fan g									<u> </u>			
	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. evap												
		-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27 (71)
Water heating g						_						
		127.58		116.29	112.07	106.13	101.08	107.55	109.85	116.58	124.18	127.59 (72)
Total internal ga												
	476.78	474.59	459.19	434.19	408.54	383.99	368.14	374.50	387.42	412.65	441.67	463.69 (73)
6. Solar gains												
			Access	actor	Area	Sol	ar flux		ε	FF		Gains
			Table	6d	m²	W	//m²		fic data able 6b	specific d		w
											_{рс} _	
SouthEast			0.7	= =	7.88	=	=		.40		⊣⁻⊨	52.24 (77)
SouthWest			0.7	= =	8.40	===			.40	0.65	ᆗᆥ┝	55.69 (79)
NorthWest			0.7	7× [12.08	× 1	1.28 x	0.9 x 0.9	.40	0.65	∟	24.56 (81)
Solar gains in w												
		233.83		459.58	547.92	558.54	532.42	464.29	382.11	264.28	160.17	112.42 (83)
Total gains - int												
	609.27	708.42	800.79	893.77	956.46	942.53	900.56	838.79	769.53	676.93	601.85	576.11 (84)
7. Mean intern	al tempera	ture (heatir	ng season)									
Temperature di				area from T	able 9 Th1	(°C)						21.00 (85)
. Compensione di	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aug	Sep	Oct	Nov	Dec (65)
Utilisation facto								7106	sep	-		
	0.96	0.94	0.90	0.81	0.68	0.52	0.39	0.43	0.64	0.85	0.94	0.97 (86)
	0.90	0.34	0.30	0.01	0.00	0.32	0.39	0.43	0.04	0.83	0.34	0.37 (00)
												L-A01-SW version 2
						Page 3				NHE	ER Plan Ass	essor version 6.3.4 SAP version 9.92
						rage 3						Jer version 3.32

Mean internal te	emp of living	area T1 (s	teps 3 to 7	7 in Table 9	c)								
	19.33	19.59	19.97	20.42	20.75	20.93	20.98	20.97	20.85	20.42	19.80	19.29 (87	1)
Temperature dur	ring heating	periods in	the rest o	of dwelling	from Table	9, Th2(°C)							
	20.22	20.22	20.22	20.23	20.23	20.25	20.25	20.25	20.24	20.23	20.23	20.22 (88	4)
Utilisation factor	r for gains fo												
otimotron ractor	0.96	0.93	0.88	0.79	0.64	0.47	0.33	0.37	0.59	0.83	0.93	0.96 (89	
								0.37	0.59	0.83	0.93	0.96 (85	"
Mean internal te													
	17.96	18.34	18.88	19.51	19.95	20.18	20.23	20.23	20.08	19.52	18.65	17.90 (90	1)
Living area fracti	ion								Li	ving area -	· (4) =	0.46 (91	.)
Mean internal te	emperature t	or the wh	ole dwellir	ng fLA x T1	+(1 - fLA) x	T2							
	18.58	18.91	19.38	19.93	20.31	20.52	20.57	20.57	20.43	19.93	19.18	18.53 (92	0
Apply adjustmen												,	
repart acquactment					20.31	20.52	20.57	20.57	20.43	19.93		18.53 (93	
	18.58	18.91	19.38	19.93	20.31	20.52	20.57	20.57	20.43	19.93	19.18	18.53 (93	1)
8. Space heating	se requireme	ent											
or space meaning	Jan	Feb	Mar			Jun	Jul	4	fan.	Oct	Nov	Dec	
			Mar	Apr	May	Jun	Jui	Aug	Sep	Oct	NOV	Dec	
Utilisation factor													
	0.94	0.92	0.87	0.78	0.65	0.49	0.36	0.39	0.61	0.82	0.92	0.95 (94	0
Useful gains, ηm	Gm, W (94)	m x (84)m											
	574.80	648.34	694.31	695.67	620.29	459.07	319.75	331.32	466.03	552.82	551.65	547.68 (95	i)
Monthly average				•									
	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	es.
Heat loss rate for							20.00	10.40	24.20	10.00	7.20	4.20	"
				7 99 7				342.05	525.40				
												1217.51 (97	
				927.45		_	327.30	342.03	323.40	704.75	1010.03	(41	")
Space heating re						_	327.30	342.03	323.40	702.75	1018.85	,	7)
Space heating re						_	0.00	0.00	0.00	170.35		498.35	7)
Space heating re	equirement,	kWh/mon	th 0.024 x	c [(97)m - (9	95)m] x (41)m			0.00		336.42		,
Space heating re	487.04	kWh/mon 372.05	th 0.024 x 302.80	c [(97)m - (9	95)m] x (41)m			0.00	170.35 8)15, 10.	336.42	498.35	3)
	487.04	kWh/mon 372.05	th 0.024 x 302.80	c [(97)m - (9	95)m] x (41)m			0.00	170.35 8)15, 10.	336.42	498.35 2409.49 (98	3)
	487.04 equirement k	kWh/mon 372.05 Wh/m²/y	th 0.024 x 302.80	c [(97)m - (9	95)m] x (41)m			0.00	170.35 8)15, 10.	336.42	498.35 2409.49 (98	3)
Space heating re	487.04 equirement k	kWh/mon 372.05 Wh/m²/y	th 0.024 x 302.80	c [(97)m - (9	95)m] x (41)m			0.00	170.35 8)15, 10.	336.42	498.35 2409.49 (98	3)
Space heating re	equirement, 487.04 equirement k ng requirem Jan	kWh/mon 372.05 Wh/m²/yi	th 0.024 x 302.80	((97)m - (97)m	95)m] x (41 75.60)m 0.00	0.00	0.00	0.00 ∑(9	170.35 8)15, 10. (98	336.42 12 =	498.35 2409.49 (98 23.64 (99	3)
Space heating re	equirement, 487.04 equirement k ng requirem Jan	kWh/mon 372.05 Wh/m²/yi	th 0.024 x 302.80	((97)m - (97)m	95)m] x (41 75.60)m 0.00	0.00	0.00 Aug	0.00 ∑(9	170.35 8)15, 10. (98	336.42 12 =	498.35 2409.49 {98 23.64 {99	3)
Space heating re	equirement, 487.04 487.04 equirement k ng requirem Jan n	kWh/mon 372.05 Wh/m²/yi ent Feb	th 0.024 x 302.80 ear Mar	((97)m - (97)m	95 m] x (41 75.60)m 0.00	0.00 Jul	0.00	0.00 Σ(9 Sep	170.35 8)15, 10. (98	336.42 12 =	498.35 2409.49 {98 23.64 {99	3)
Space heating re	equirement, 487.04 equirement k ng requirem Jan n 0.00 r for loss ηm	xWh/mon 372.05 xWh/m²/yi ent Feb	th 0.024 x 302.80 ear Mar	([97)m - (5 166.88 Apr	May	Jun 774.55	Jul 609.76	0.00 Aug 624.09	0.00 Σ(9 Sep	170.35 8)15, 10. (98 Oct	336.42 12 =	498.35 2409.49 (98 23.64 (99 Dec	3)
Space heating re Bc. Space coolin Heat loss rate Lm Utilisation factor	equirement, 487.04 equirement k ng requirem Jan n 0.00 r for loss ηm 0.00	xWh/mon 372.05 Wh/m²/yi ent Feb 0.00	th 0.024 x 302.80 ear Mar 0.00	((97)m - (97)m	95 m] x (41 75.60)m 0.00	0.00 Jul	0.00 Aug	0.00 Σ(9 Sep	170.35 8)15, 10. (98	336.42 12 =	498.35 2409.49 {98 23.64 {99	3)
Space heating re	equirement, 487.04 487.04 equirement k ng requirem Jan 0.00 r for loss ηm 0.00 m (watts) (10	372.05 Wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 x (10	Mar 0.00 0.00 0.00 0.00 0.00	Apr 0.00	May 0.00	Jun 774.55	Jul 609.76	0.00 Aug 624.09	0.00 Σ(9 Sep 0.00	170.35 8)15, 10. (98 Oct 0.00	336.42 12 =	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10	3) 9) 00)
Space heating re Bc. Space coolin Heat loss rate Lm Utilisation factor	equirement, 487.04 equirement k ng requirem Jan n 0.00 r for loss ηm 0.00	xWh/mon 372.05 Wh/m²/yi ent Feb 0.00	th 0.024 x 302.80 ear Mar 0.00	([97)m - (5 166.88 Apr	May	Jun 774.55	Jul 609.76	0.00 Aug 624.09	0.00 Σ(9 Sep	170.35 8)15, 10. (98 Oct	336.42 12 =	498.35 2409.49 (98 23.64 (99 Dec	3) 9) 00)
Space heating re Bc. Space coolin Heat loss rate Lm Utilisation factor	equirement, 487.04 487.04 equirement k ng requirem Jan 0.00 r for loss ηm 0.00 m (watts) (10	372.05 Wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 x (10	Mar 0.00 0.00 0.00 0.00 0.00	Apr 0.00	May 0.00	Jun 774.55	Jul 609.76	0.00 Aug 624.09	0.00 Σ(9 Sep 0.00	170.35 8)15, 10. (98 Oct 0.00	336.42 12 =	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10	3) 9) 00)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss ηmLn	equirement, 487.04 487.04 equirement k ng requirem Jan 0.00 r for loss ηm 0.00 m (watts) (10	372.05 Wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 x (10	Mar 0.00 0.00 0.00 0.00 0.00	Apr 0.00	May 0.00	Jun 774.55	Jul 609.76	0.00 Aug 624.09 0.92	0.00 Σ(9 Sep 0.00	170.35 8)15, 10. (98 Oct 0.00	336.42 12 =	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10	33)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss ηmLn	quirement, 487.04 487.04 487.04 487.04 squirement k squir	372.05 Wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00	May 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11	0.00 Jul 609.76 0.94 571.27	0.00 Aug 624.09 0.92 575.72	0.00 Σ(9 Sep 0.00	170.35 8)15, 10. (98 Oct 0.00	336.42 	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10 0.00 [10	33)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmi.n Gains	quirement, 487.04 487.0	372.05 Wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 whole dwe	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00	May 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 [[103]m - {1	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (43	0.00 Aug 624.09 0.92 575.72 1073.34	0.00 \$(9) \$ep 0.00 0.00	170.35 8)15, 10. (98 Oct 0.00	336.42	498.35 2409.49 198 23.64 198	33)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmi.n Gains	quirement, 487.04 487.04 487.04 487.04 squirement k squir	372.05 Wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00	May 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 [[103]m - {1	0.00 Jul 609.76 0.94 571.27	0.00 Aug 624.09 0.92 575.72 1073.34	0.00 Σ(9 Sep 0.00	170.35 8)15, 10. (98 Oct 0.00 0.00	336.42	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10 0	(3) (3) (3) (3) (4) (4) (5) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmLn Gains Space cooling res	quirement, 487.04 487.0	372.05 Wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 whole dwe	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00	May 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 [[103]m - {1	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (43	0.00 Aug 624.09 0.92 575.72 1073.34	0.00 Σ(9 Sep 0.00 0.00	170.35 8)15, 10. (98 Oct 0.00 0.00 0.00 Σ(104)4	336.42	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10 0.00 [10 0.00 [10 0.00 [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10] [10] [10] [10] [10] [10] [1	(2) (2) (3) (4)
Space heating re Bc. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmkm Gains Space cooling res Cooled fraction	quirement, 487,04 487	wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00	May 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 [[103]m - {1	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (43	0.00 Aug 624.09 0.92 575.72 1073.34	0.00 Σ(9 Sep 0.00 0.00	170.35 8)15, 10. (98 Oct 0.00 0.00	336.42	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10 0	(2) (2) (3) (4)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmLn Gains Space cooling res	quirement, 487,04 487	wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00	May 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 [[103]m - {1	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (43	0.00 Aug 624.09 0.92 575.72 1073.34	0.00 Σ(9 Sep 0.00 0.00	170.35 8)15, 10. (98 Oct 0.00 0.00 0.00 Σ(104)4	336.42	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10 0.00 [10 0.00 [10 0.00 [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10] [10] [10] [10] [10] [10] [1	(2) (2) (3) (4)
Space heating re Bc. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmkm Gains Space cooling res Cooled fraction	quirement, 487,04 487	wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00	May 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 [[103]m - {1	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (43	0.00 Aug 624.09 0.92 575.72 1073.34	0.00 Σ(9 Sep 0.00 0.00	170.35 8)15, 10. (98 Oct 0.00 0.00 0.00 Σ(104)4	336.42	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10 0.00 [10 0.00 [10 0.00 [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10 0.00 [10] [10] [10] [10] [10] [10] [10] [1	(2) (2) (3) (4)
Space heating re Bc. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmkm Gains Space cooling res Cooled fraction	quirement, 487,04 487,04 487,04 487,04 equirement king requirement king requirement king requirement king requirement, 0.00 for loss spin (watts) (3/4 0.00 fo	372.05 Wh/m²/yi ent Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	th 0.024 x 302.80 ear Mar 0.00 0.00 0.00 elling, cont	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 [[103]m - [1 358.56]	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (43 426.16	0.00 Aug 624.09 0.92 575.72 1073.34 1]m 370.23	0.00 Σ(9 Sep 0.00 0.00 0.00	170.35 8)15, 10 (98 Oct 0.00 0.00 0.00 0.00 \$\sum_{(104)}\$ olded area -	336.42	498.35 2409.49 [98 23.64 [99 0.00 [10 0.00 [10 0.00 [1154.95 [10] 0.46 [10]	(33) (30) (31) (31) (32) (33) (34) (35)
Space heating re Bc. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmkm Gains Space cooling res Cooled fraction	quirement, 487,04 487,04 487,04 487,04 equirement kng requirem m 0.00 fror loss nm 0.00 m (watts) (31 0.00 quirement, 10.00 ctor (Table 1 0.00	kWh/mon 372.05 Wh/m²/y Feb 0.00 0.00 0.00 0.00 whole dwe 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 [[103]m - [1 358.56]	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (43 426.16	0.00 Aug 624.09 0.92 575.72 1073.34 1]m 370.23	0.00 Σ(9 Sep 0.00 0.00 0.00	170.35 8)15, 10 (98 Oct 0.00 0.00 0.00 0.00 Σ(104) oled area	336.42	498.35 2409.49 [98 23.64 [99 0.00 [10 0.00 [(33) (30) (31) (31) (32) (33) (34) (35)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmi.n Gains Space cooling re Cooled fraction Intermittency fac	quirement, 487,04 4877,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 4877	kWh/mon 372.05 Wh/m²/y Wh/m²/y Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 [(103)m - {1 358.56 0.25	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (426.16	0.00 Aug 624.09 0.92 575.72 1073.34 1]m 370.23	0.00 Σ(9 5ep 0.00 0.00 0.00	170.35 8)15, 10 (98 Oct 0.00 0.00 0.00 0.00 5(104)4 0.00 5(106)4	336.42	498.35 2409.49 [98 23.64 [99 0.00 [10 0.00 [(33) (30) (31) (31) (32) (33) (34) (35)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmi.n Gains Space cooling re Cooled fraction Intermittency fac	quirement, 487,04 487,04 487,04 487,04 equirement kng requirem m 0.00 fror loss nm 0.00 m (watts) (31 0.00 quirement, 10.00 ctor (Table 1 0.00	kWh/mon 372.05 Wh/m²/y Feb 0.00 0.00 0.00 0.00 whole dwe 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 [[103]m - [1 358.56]	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (43 426.16	0.00 Aug 624.09 0.92 575.72 1073.34 1]m 370.23	0.00 Σ(9 Sep 0.00 0.00 0.00	170.35 8)15, 10 (98 Oct 0.00 0.00 0.00 0.00 Σ(104) oled area	336.42	498.35 2409.49 [98 23.64 [99 0.00 [10 0.00 [(33) (30) (31) (31) (32) (33) (34) (35)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmi.n Gains Space cooling re Cooled fraction Intermittency fac	quirement, 487,04 4877,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 4877	kWh/mon 372.05 Wh/m²/y Wh/m²/y Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 [(103)m - {1 358.56 0.25	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (426.16	0.00 Aug 624.09 0.92 575.72 1073.34 1]m 370.23	0.00 Σ(9 5ep 0.00 0.00 0.00	170.35 8)15, 10 (98 Oct 0.00 0.00 0.00 0.00 5(104)4 0.00 5(106)4	336.42	498.35 2409.49 [98 23.64 [99 0.00 [10 0.00 [(33) (30) (31) (31) (32) (33) (34) (35)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmi.n Gains Space cooling re Cooled fraction Intermittency fac	quirement, 487,04 4877,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 4877	kWh/mon 372.05 Wh/m²/y Wh/m²/y Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 [(103)m - {1 358.56 0.25	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (426.16	0.00 Aug 624.09 0.92 575.72 1073.34 1]m 370.23	0.00 Σ(9 5ep 0.00 0.00 0.00	170.35 8)15, 10 (98 Oct 0.00 0.00 0.00 0.00 5(104)4 0.00 5(106)4	336.42	498.35 2409.49 [98 23.64 [99 0.00 [10 0.00 [10 0.00 [1154.95 [10 0.00 [1	(3) (3) (3) (3) (4) (4) (5) (6)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmi.n Gains Space cooling re Cooled fraction Intermittency fac	quirement, 487,04 4877,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 4877	kWh/mon 372.05 Wh/m²/y Wh/m²/y Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 [(103)m - {1 358.56 0.25	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (426.16	0.00 Aug 624.09 0.92 575.72 1073.34 1]m 370.23	0.00 Σ(9 5ep 0.00 0.00 0.00	170.35 8)15, 10 (98 Oct 0.00 0.00 0.00 0.00 5(104) oled area - 5(106) 0.00 0.00	336.4212 =	498.35 2409.49 [98 23.64 [99 23.64 [99 0.00 [10	(3) (3) (3) (3) (3) (3) (4) (5) (6) (6)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmi.n Gains Space cooling re Cooled fraction Intermittency fac	quirement, 487,04 4877,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 4877	kWh/mon 372.05 Wh/m²/y Wh/m²/y Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 [(103)m - {1 358.56 0.25	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (426.16	0.00 Aug 624.09 0.92 575.72 1073.34 1]m 370.23	0.00 Σ(9 5ep 0.00 0.00 0.00	170.35 8)15, 10 (98 Oct 0.00 0.00 0.00 0.00 5(104) oled area -	336.4212 =	498.35 2409.49 [98 23.64 [99 0.00 [10 0.00 [10 0.00 [1154.95 [10 0.00 [1	000) 000) 011) 022) 001) 001) 001)
Space heating re 8c. Space coolin Heat loss rate Lm Utilisation factor Useful loss nmi.n Gains Space cooling re Cooled fraction Intermittency fac	quirement, 487,04 4877,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 487,04 4877	kWh/mon 372.05 Wh/m²/y Wh/m²/y Feb 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 0.00 Jun 774.55 0.90 697.11 1195.11 [{103}m - {1 358.56} 0.25	0.00 Jul 609.76 0.94 571.27 1144.06 02)m] x (426.16	0.00 Aug 624.09 0.92 575.72 1073.34 1]m 370.23	0.00 Σ(9 5ep 0.00 0.00 0.00	170.35 8)15, 10 (98 Oct 0.00 0.00 0.00 0.00 5(104) oled area -	336.4212 =	498.35 2409.49 [98 23.64 [99 Dec 0.00 [10 0	000) 000) 011) 012) 013) 014) 015)

Space cooling requirement kWh/m²/year	$\Sigma(107)68 = 131.99$ (107) $\{107\} + (4) = 1.29$ (108)
	(207) + (4) = 2.23 (200
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	1.00 (303
Fraction of total space heat from community boilers	(302) x (303a) = 1.00 (304
Factor for control and charging method (Table 4c(3)) for community space heating	
Factor for charging method (Table 4c(3)) for community water heating	1.00 (30)
Distribution loss factor (Table 12c) for community heating system	1.05 (306
Space heating	
Annual space heating requirement	2409.49 (98)
Space heat from boilers	(98) x (304a) x (305) x (306) = 2529.96 (307)
Water heating	
Annual water heating requirement	2194.74 (64)
Water heat from boilers	(64) x (303a) x (305a) x (306) = 2304.47 (316)
Water neat from poliers Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] = 48.34 (313
Electricity used for fleat distribution	0.01 × [(30/8)(30/8) + (3108)(3108)] = 40.34
Cooling System Energy Efficiency Ratio	4.05 (31
Space cooling (if there is a fixed cooling system, if not enter 0)	(107) + (314) 32.59 (31)
Electricity for pumps, fans and electric keep-hot (Table 4f)	
mechanical ventilation fans - balanced, extract or positive input from outside	251.86
Total electricity for the above, kWh/year	251.86 (33)
Electricity for lighting (Appendix L)	408.45 (33)
Total delivered energy for all uses (307) + (309)	9) + (310) + (312) + (315) + (331) + (332)(337b) = 5527.33 (336)
10b. Fuel costs - community heating scheme	
Fuel kWh/year	
	Fuel price Fuel
	cost £/year
Space heating from boilers 2529.96	cost £/year x 4.24 x 0.01 = 107.27 (34)
Space heating from boilers 2529.96 Water heating from boilers 2304.47	x 4.24 x 0.01 = 107.27 {34} x 4.24 x 0.01 = 97.71 {34}
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59	x 4.24 x 0.01 = 107.27 [34] x 4.24 x 0.01 = 97.71 [34] x 13.19 x 0.01 = 4.30 [34]
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans 251.86	x 4.24 x 0.01 = 107.27 [34] x 4.24 x 0.01 = 97.71 [34] x 13.19 x 0.01 = 4.30 [34] x 13.19 x 0.01 = 33.22 [34]
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans 251.86 Electricity for lighting 408.45	x 4.24 x 0.01 = 107.27 [34] x 4.24 x 0.01 = 97.71 [34] x 13.19 x 0.01 = 4.30 [34] x 13.19 x 0.01 = 33.22 [34] x 13.19 x 0.01 = 53.87 [35]
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans 251.86 Electricity for lighting 408.45 Additional standing charges	x 4.24 x 0.01 = 107.27 [34] x 4.24 x 0.01 = 97.71 [34] x 13.19 x 0.01 = 4.30 [34] x 13.19 x 0.01 = 33.22 [34] x 13.19 x 0.01 = 53.87 [35]
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans 251.86 Electricity for lighting 408.45 Additional standing charges Total energy cost	x 4.24 x 0.01 = 107.27 [34] x 4.24 x 0.01 = 97.71 [34] x 13.19 x 0.01 = 4.30 [34] x 13.19 x 0.01 = 33.22 [34] x 13.19 x 0.01 = 53.87 [35]
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans 251.86 Electricity for lighting 408.45 Additional standing charges Total energy cost 11b. SAP rating - community heating scheme	x 4.24 x 0.01 = 107.27 {34} x 4.24 x 0.01 = 97.71 {34} x 13.19 x 0.01 = 4.30 {34} x 13.19 x 0.01 = 33.22 {34} x 13.19 x 0.01 = 53.87 {35} (340a){342e} + (345){354} = 416.37 {35}
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans 251.86 Electricity for lighting 408.45 Additional standing charges Total energy cost 11b. SAP rating - community heating scheme Energy cost deflator (Table 12)	x 4.24 x 0.01 = 107.27 {344} x 4.24 x 0.01 = 97.71 {342} x 13.19 x 0.01 = 4.30 (344) x 13.19 x 0.01 = 33.22 (344) x 13.19 x 0.01 = 53.87 (356) (340a)(342e) + (345)(354) = 416.37 (356)
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans Electricity for lighting 408.45 Additional standing charges Total energy cost 11b. SAP rating - community heating scheme Energy cost deflator (Table 12) Energy cost factor (ECF)	x 4.24 x 0.01 = 107.27 {34} x 4.24 x 0.01 = 97.71 {34} x 13.19 x 0.01 = 4.30 {34} x 13.19 x 0.01 = 33.22 {34} x 13.19 x 0.01 = 53.87 {35} x 13.19 x 0.01 = 53.87 {35} (340a)(342e) + (345)(354) = 416.37 {35} 0.42 {35} 1.19 {35}
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans Electricity for lighting Additional standing charges Total energy cost 11b. SAP rating - community heating scheme Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value	x 4.24 x 0.01 = 107.27 [340] x 4.24 x 0.01 = 97.71 [342] x 13.19 x 0.01 = 4.30 [348] x 13.19 x 0.01 = 33.22 [344] x 13.19 x 0.01 = 53.87 [350] (340a)(342e) + (345)(354) = 416.37 [356] 0.42 [356] 1.19 [356]
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans Electricity for lighting Additional standing charges Total energy cost 11b. SAP rating - community heating scheme Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13)	x 4.24 x 0.01 = 107.27 (340) x 4.24 x 0.01 = 97.71 (342) x 13.19 x 0.01 = 4.30 (348) x 13.19 x 0.01 = 33.22 (348) x 13.19 x 0.01 = 53.87 (350) (340a)(342e) + (345)(354) = 416.37 (356) 0.42 (356) 1.19 (356) 83.40 83 (356)
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans Electricity for lighting Additional standing charges Total energy cost 11b. SAP rating - community heating scheme Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value	x 4.24 x 0.01 = 107.27 [340] x 4.24 x 0.01 = 97.71 [342] x 13.19 x 0.01 = 4.30 [348] x 13.19 x 0.01 = 33.22 [344] x 13.19 x 0.01 = 53.87 [350] (340a)(342e) + (345)(354) = 416.37 [356] 0.42 [356] 1.19 [356]
Space heating from boilers 229.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans Electricity for lighting Additional standing charges Total energy cost 11b. SAP rating - community heating scheme Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12b. CO ₂ emissions - community heating scheme	x 4.24 x 0.01 = 107.27 {344} x 4.24 x 0.01 = 97.71 {342} x 13.19 x 0.01 = 4.30 {344} x 13.19 x 0.01 = 33.22 {344} x 13.19 x 0.01 = 53.87 {356} 120.00 {356} (340a){342e} + (345){354} = 416.37 {356} 1.19 {356} 83.40 83 {356} 8
Space heating from boilers 229.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans Electricity for lighting Additional standing charges Total energy cost 11b. SAP rating - community heating scheme Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band	x 4.24 x 0.01 = 107.27 (340) x 4.24 x 0.01 = 97.71 (342) x 13.19 x 0.01 = 4.30 (348) x 13.19 x 0.01 = 33.22 (349) x 13.19 x 0.01 = 53.87 (350) (340a)(342e) + (345)(354) = 416.37 (356) 0.42 (356) 1.19 (357) 83.40 83 (358)
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans Electricity for lighting Additional standing charges Total energy cost 11b. SAP rating - community heating scheme Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12b. CO, emissions - community heating scheme	X
Space heating from boilers 2529.96 Water heating from boilers 2304.47 Space cooling 32.59 Pumps and fans Electricity for lighting Additional standing charges Total energy cost 11b. SAP rating - community heating scheme Energy cost deflator (Table 12) Energy cost factor (ECF) SAP value SAP rating (section 13) SAP band 12b. CO, emissions - community heating scheme	X

Emissions from other sources (space heating)						
Efficiency of boilers	89.50					(367a)
CO2 emissions from boilers [(307a)+(310a)] x 100 ÷ (367a) =	5401.60	×	0.216	-	1166.75	(367)
Electrical energy for community heat distribution	48.34	x	0.519	=	25.09	(372)
Total CO2 associated with community systems					1191.84	(373)
Total CO2 associated with space and water heating					1191.84	(376)
Space cooling	32.59	ж	0.519	=	16.91	(377)
Pumps and fans	251.86	×	0.519	-	130.71	(378)
Electricity for lighting	408.45	×	0.519	=	211.98	(379)
Total CO ₂ , kg/year				(376)(382) =	1551.45	(383)
Dwelling CO ₂ emission rate				(383) ÷ (4) =	15.22	(384)
El value					85.85	
El rating (section 14)					86	(385)
El band					В	
13b. Primary energy - community heating scheme						
130. Finnary energy - community heating scheme	Energy		Primary factor		Primary energy	
	kWh/year				(kWh/year)	
Primary energy from other sources (space heating)						
Efficiency of boilers	89.50					(367a)
Primary energy from boilers [(307a)+(310a)] x 100 + (367a) =	5401.60	ж	1.22	=	6589.96	(367)
Electrical energy for community heat distribution	48.34	×	3.07	-	148.42	(372)
Total primary energy associated with community systems					6738.38	(373)
Total primary energy associated with space and water heating					6738.38	(376)
Space cooling	32.59	х	3.07	-	100.05	(377)
Pumps and fans	251.86	х	3.07	=	773.20	(378)
Electricity for lighting	408.45	×	3.07	-	1253.94	(379)
Primary energy kWh/year					8865.56	(383)
Dwelling primary energy rate kWh/m2/year					86.97	(384)
				-	IDM: 01 604 011	
					JRN: B1-A01-SW v fan Assessor versi	
	Page 6				SAP vers	

property as constructed.	been carried	out using	Approved	SAP softw	are. It has b	een prepa	red from pl	ans and spe	cifications a	nd may not reflect the
Assessor name	Miss Mich	elle Wang					As	sessor num	ber	2018
Client							Las	t modified		04/02/2019
Address	Manor Ro	ad Richmo	nd Block 1	Richmon	ewr b					
riddi ess	THURST THE	Ja racimo	na bioch z	, 100	a,					
1. Overall dwelling dimer	isions									
				А	rea (m²)			age storey ight (m)		Volume (m³)
						1				
Lowest occupied	(4-)	(4) /4.	1 - (4 d) - (1		101.94	(1a) x		2.63	(2a) =	268.10 (3a)
Total floor area Dwelling volume	(1a) +	+ (1b) + (1c) + (1d)(In) =	101.94	(4)	(22)	+ /2b) + /2c) + (3d)(3r	1) = 268.10 (5)
Dweiling volume							(54)	+ (30) + (30) + (3u)(3i	1) = 268.10 (3)
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 far	15							4	x 10 =	40 (7a)
Number of passive vents								0	x 10 =	0 (7b)
Number of flueless gas fire	s							0	x 40 =	0 (7c)
										Air changes per hour
Infiltration due to chimney	s flues fans	PSVs		(6a)	+ (6b) + (7a	a) + (7b) + (7c) =	40	+ (5) =	0.15 (8)
If a pressurisation test has			tended, pr						. (5)	0.13
Air permeability value, q50								,,		5.00 (17)
If based on air permeability										0.40 (18)
Number of sides on which	the dwelling i	is sheltere	d							2 (19)
Shelter factor								1 -	(0.075 x)] = 0.85 (20)
Infiltration rate incorporat	ng shelter fa	ctor							(18) x (20	0.34 (21)
Infiltration rate modified fo	or monthly wi	ind speed:								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov Dec
Monthly average wind spe	ed from Table	e 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										
	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13 1.18 (22a
1.28	llowing for sl									
Adjusted infiltration rate (a		0.42	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38 0.40 (22)
Adjusted infiltration rate (a	0.42									
Adjusted infiltration rate (a 0.43 Calculate effective air char	ige rate for th	ne applicab	le case:							N/2
Adjusted infiltration rate (a 0.43 Calculate effective air char If mechanical ventilatio	nge rate for th	ne applicab	ole case: igh system							N/A (23a
Adjusted infiltration rate (a 0.43 Calculate effective air char If mechanical ventilatio If balanced with heat re	nge rate for th n: air change covery: effici	ne applicab rate throu iency in % a	ole case: gh system allowing fo	or in-use fa		able 4h				N/A (23a
Adjusted infiltration rate (a 0.43 Calculate effective air char if mechanical ventilation of the balanced with heat red) natural ventilation of	ige rate for th n: air change covery: effici r whole house	ne applicab rate throu iency in % a e positive i	ole case: gh system allowing fo nput venti	or in-use fa	n loft		0 55	0.54	057	N/A (23c
Adjusted infiltration rate (a 0.43 Calculate effective air char if mechanical ventilation of balanced with heat red) natural ventilation of 0.59	ige rate for th n: air change covery: effici r whole house 0.59	ne applicab rate throu iency in % a e positive i 0.59	ole case: gh system allowing fo nput venti 0.57	or in-use fa lation fron 0.57		able 4h 0.55	0.55	0.56	0.57	
Adjusted infiltration rate (a 0.43 Calculate effective air char If mechanical ventilation of balanced with heat red) natural ventilation or	ige rate for th n: air change covery: effici r whole house 0.59	ne applicab rate throu iency in % a e positive i 0.59	ole case: gh system allowing fo nput venti 0.57	or in-use fa lation fron 0.57	n loft		0.55	0.56	0.57	N/A (23c

44.65 N/A 250.00 6.93 51.58 Dec 8 51.27 6 102.85 101.98 1.00 1.00 2.76
44.65 N/A 250.00 6.93 51.58 Dec 8 51.27 6 102.85 101.98 1.01 1.00 0 31.00
44.65 N/A 250.00 6.93 51.58 Dec 8 51.27 6 102.85 101.98 1.00 1.00
44.65 N/A 250.00 6.93 51.58 Dec 8 51.27 6 102.85 101.98 1.00 1.00 31.00
44.65 N/A 250.00 6.93 51.58 Dec 8 51.27 6 102.85 101.98 1.00 1.00 31.00
N/A 250.00 6.93 51.58 Dec 8 51.27 6 102.85 101.98 1.00 31.00
250.00 6.93 51.58 Dec 8 51.27 6 102.85 101.98 1.00 1.00 0 31.00
6.93 51.58 Dec 8 51.27 6 102.85 101.98 1.01 1.00 0 31.00
51.58 Dec 8 51.27 6 102.85 101.98 1.01 1.00 0 31.00
Dec 3 51.27 6 102.85 101.98 1.01 1.00 0 31.00
8 51.27 6 102.85 101.98 1.01 1.00
6 102.85 101.98 1.01 1.00
6 102.85 101.98 1.01 1.00
101.98
101.98
1.01
1.00
1.00
31.00
2.76
2.76
2.76
99.67
99.67 Dec
Dec
5 109.64
1196.08
1190.00
0 157.46
1568.25
1308.23
23.62
194.00
154.00
1.62
0.54
0.88
0.85
27.16
27.16
5

Combi loss for e	ach month f	from Table	3a, 3b or 3	c									
	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 requi	ired for wate	er heating o	alculated f	or each mo	nth 0.85 x	(45)m + (46	6)m + (57)	m + (59)m +	+ (61)m				
,	213.02	187.75	197.17	176.74	173.18	154.73	148.59	163.07	162.78	183.26	193.80	207.89	(62)
					1/3.10	134.73	146.39	103.07	102.76	163.20	193.00	207.09	(02)
olar DHW inpu													
	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 wa	iter heater f	or each mo	nth (kWh/r	month) (62	2)m + (63)n	1							
	213.02	187.75	197.17	176.74	173.18	154.73	148.59	163.07	162.78	183.26	193.80	207.89	l
										∑(64)1	12 = 2	161.99	(64)
leat gains from	water heati	ing (kWh/n	nonth) 0.25	5 × [0.85 × i	(45)m + (61	lml + 0.8 ×	[(46)m + ((57)m + (59)	ml				
rear gams mom	94.40	83.72		81.58	81.16	74.26	72.98	77.79	76.94	84.51	87.25	02.70	(65)
	94.40	83.72	89.13	81.58	81.16	74.20	72.98	11.19	76.94	84.51	87.25	92.70	(65)
5. Internal gair	ns												
J	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
		reb	IVIAI	Apr	iviay	Jun	Jui	Aug	зер	Oct	NOV	Dec	
Metabolic gains													
	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	(66)
ighting gains (c	alculated in	Appendix I	L, equation	L9 or L9a),	also see Ta	able 5							
	23.13	20.54	16.71	12.65	9.45	7.98	8.62	11.21	15.05	19.10	22.30	23.77	(67)
Appliance gains	(calculated	in Appendi	x L, equation	n L13 or L1	L3a), also s	ee Table 5							
*,	259.43		255.33	240.89	222.66	205.53	194.08	191.39	198.17	212.62	230.85	247.98	(68)
							134.00	191.59	130.17	212.02	230.03	247.30	(00)
Cooking gains (_										
	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	(69)
oump and fan g	ains (Table 5	ia)											
	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
osses e.g. evap	oration (Tab	ole 5)											
		-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	(71)
Matar basting			-110:27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	(12)
Nater heating g													
			119.80			103.14	98.09	104.56	106.86	113.59	121.19	124.59	(72)
Total internal ga	ins (66)m +	(67)m + (6	i8)m + (69)ı	m + (70)m -	+ (71)m + (72)m							
	476.79	474.60	459.20	434.20	408.55	384.00	368.15	374.51	387.43	412.66	441.68	463.70	(73)
6. Solar gains													
			Access f		Area		ar flux		g	FF		Gains	
			Table	6d	m²	W	//m²		ific data	specific o		w	
								orı	able 6b	or Table	ъс _		
outhEast			0.7	7 ×	7.09	x 3	6.79 x	0.9 x	0.63 x	0.70	= [_	79.72	(77)
outhWest			0.7	7 x	7.55	x 3	6.79 x	0.9 x	0.63 x	0.70	=	84.90	(79)
NorthWest			0.7	7 × [10.86	x 1	1.28 x	0.9 x	0.63 x	0.70		37.45	(81)
Solar gains in w	atts 5(74)m	(82)m						_					
	202.07	356.64	521.01	700.93	835.65	851.84	812.01	708.11	582.78	403.07	244.30	171.46	(83)
fatal as to the				/00.93	835.05	851.84	812.01	/08.11	382.78	403.07	244.30	1/1.40	(03)
Total gains - into				V									
	678.86	831.24	980.20	1135.13	1244.20	1235.84	1180.16	1082.62	970.21	815.73	685.98	635.16	(84)
7. Mean interr													
emperature du	ıring heating	g periods in	the living a	area from T	able 9, Th1	.(°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Jtilisation facto	r for gains fo	or living are	a n1,m (se	e Table 9a)									
	1.00	0.99	0.97	0.88	0.71	0.51	0.37	0.42	0.68	0.94	0.99	1.00	(86)
Mean internal t						0.51	0.37	0.42	0.00	V.54	0.55	1.00	(30)
viean internal t	emp or living	g area 11 (S	teps 3 to /	iii Table 90	-1								
											URN- D	1-A01-SW v	ersion 2
										NH		sessor versi	
						Page 3						SAP vers	

	20.00	20.20	20.48	20.78	20.95	20.99	21.00	21.00	20.97	20.72	20.30	19.97	(87)
Temperature du	iring heatin	g periods in	the rest o	f dwelling f	rom Table 9	9, Th2(*C)							
	20.07	20.07	20.07	20.08	20.09	20.10	20.10	20.10	20.09	20.09	20.08	20.08	(88)
Utilisation facto	r for gains f	or rest of d	welling n2,	m									
	1.00	0.99	0.95	0.85	0.66	0.44	0.30	0.34	0.61	0.91	0.99	1.00	(89)
Mean internal t	emperature	in the rest	of dwellin	g T2 (follow	steps 3 to	7 in Table	9c)						
	18.73	19.03	19.42	19.84	20.04	20.09	20.10	20.10	20.07	19.78	19.18	18.69	(90)
Living area fract	tion								Li	ving area +	(4) =	0.46	(91)
Mean internal to	emperature	for the wh	ole dwellir	ng fLA x T1 +	(1 - fLA) x 1	Γ2							
	19.31	19.56	19.90	20.27	20.45	20.50	20.51	20.51	20.48	20.21	19.69	19.27	(92)
Apply adjustme	nt to the m	ean interna	l temperat	ure from Ta	ble 4e whe	re approp	riate						
	19.31	19.56	19.90	20.27	20.45	20.50	20.51	20.51	20.48	20.21	19.69	19.27	(93)
8. Space heatir													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation facto													
	0.99	0.98	0.95	0.86	0.68	0.48	0.33	0.38	0.64	0.91	0.99	1.00	(94)
Useful gains, ηn													
		817.80		973.93	847.16	588.07	391.97	410.58	621.24	746.07	676.49	632.59	(95)
Monthly averag	e external t	emperature	e from Tab	le 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 fo	or mean inte	ernal tempe	erature, Lm	, W [(39)m	x [(93)m -	(96)m]							
	1562.54	1521.51	1386.84	1159.51	890.12	592.78	392.46	411.60	643.81	977.22	1287.58	1550.29	(97)
Space heating re	equirement	, kWh/mon	th 0.024 x	[(97)m - (9	5)m] x (41)	m							
	660.30	472.90	337.12	133.61	31.96	0.00	0.00	0.00	0.00	171.97	439.98	682.77]
									Σ(9	8)15, 10	12 = 2	930.61	(98)
		kWh/m²/y								(98)	÷ (4)	28.75	(99)
9a. Energy req	uirements -			stems inclu	iding micro	-СНР				(98)	÷ (4)	28.75	(99)
Space heating		individual	heating sy							(98)	÷ (4)		
Space heating Fraction of spac	e heat from	individual secondary	heating sy									0.00	(201
Space heating Fraction of spac Fraction of spac	e heat from	individual secondary main syste	heating sy /suppleme em(s)							1 - (20		0.00	(201
Space heating Fraction of spac Fraction of spac Fraction of spac	e heat from e heat from e heat from	secondary main system main system	heating sy /suppleme em(s) em 2							1 - (20	01) =	0.00 1.00 0.00] (201] (202] (202
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total	e heat from te heat from te heat from I space heat	secondary main system main system from main	heating sy /suppleme em(s) em 2 system 1						(20	1 - (20 02) x [1- (20	01) =	0.00 1.00 0.00] (201] (202] (202] (204
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total	e heat from te heat from te heat from I space heat I space heat	secondary main syste main syste from main	heating sy /suppleme em(s) em 2 system 1						(20	1 - (20	01) =	0.00 1.00 0.00 1.00] (201] (202] (202] (204] (205
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total	e heat from te heat from te heat from I space heat I space heat in system 1	secondary main syste main syste from main from main (%)	heating sy /suppleme em(s) em 2 system 1 system 2		m (table 11)			(20	1 - (20 02) x [1- (20 (202) x (20	3)] =	0.00 1.00 0.00 1.00 0.00 93.50] (201] (202] (202] (204] (205
Space heating Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma	e heat from te heat from te heat from I space heat I space heat in system 1 Jan	secondary main syste main syste from main from main (%)	/suppleme em(s) em 2 system 1 system 2				Jul	Aug	(20 Sep	1 - (20 02) x [1- (20	01) =	0.00 1.00 0.00 1.00] (201] (202] (202] (204] (205
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total	e heat from the heat from the heat from I space heat I space heat in system 1 Jan uel (main sy	secondary main syste main syste from main from main (%) Feb	/suppleme em(s) em 2 system 1 system 2 Mar	Apr	m (table 11 May	Jun			Sep	1 - (2(02) × [1- (20 (202) × (2(Oct	D1) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec] (201] (202] (202] (204] (205
Space heating Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma	e heat from te heat from te heat from I space heat I space heat in system 1 Jan	secondary main syste main syste from main from main (%)	/suppleme em(s) em 2 system 1 system 2	ntary syste	m (table 11)	Jul 0.00	Aug 0.00	Sep 0.00	1 - (20 02) × [1- (20 (202) × (20 Oct	D1) =	0.00 1.00 0.00 1.00 0.00 93.50] (201] (202] (202] (204] (205
Space heating Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma	e heat from the heat from the heat from I space heat I space heat in system 1 Jan uel (main sy	secondary main syste main syste from main from main (%) Feb	/suppleme em(s) em 2 system 1 system 2 Mar	Apr	m (table 11 May	Jun			Sep 0.00	1 - (2(02) × [1- (20 (202) × (2(Oct	D1) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec] (201] (202] (202] (204] (205] (206
Space heating Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma	e heat from the heat from the heat from I space heat I space heat in system 1 Jan uel (main sy	secondary main syste main syste from main from main (%) Feb	/suppleme em(s) em 2 system 1 system 2 Mar	Apr	m (table 11 May	Jun			Sep 0.00	1 - (20 02) × [1- (20 (202) × (20 Oct	D1) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec] (201] (202] (202] (204] (205] (206
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma Space heating for	te heat from the heat from the heat from I space heat I space heat tin system 1 Jan uel (main sy	secondary main syste main syste from main from main (%) Feb	/suppleme em(s) em 2 system 1 system 2 Mar	Apr	m (table 11 May	Jun			Sep 0.00	1 - (20 02) × [1- (20 (202) × (20 Oct	D1) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec] (201] (202] (202] (204] (205] (206
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma Space heating for	te heat from the heat from the heat from I space heat I space heat tin system 1 Jan uel (main sy	secondary main syste main syste from main from main (%) Feb	/suppleme em(s) em 2 system 1 system 2 Mar	Apr	m (table 11 May	Jun			Sep 0.00	1 - (20 02) × [1- (20 (202) × (20 Oct	D1) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23] (201] (202] (202] (204] (205] (206
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma Space heating for	he heat from the heat from the heat from the heat from the space heat the space h	secondary main syste main syste from main (%) Feb stem 1), kV 505.77	/suppleme em(s) em 2 system 1 system 2 Mar Vh/month 360.56	Apr 142.90	May 34.18	Jun 0.00	0.00	0.00	Sep 0.00 Σ(21	1 - (20) 22) × [1- (20) (202) × (20) Oct 183.93	Nov 470.57	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23] (201] (202] (202] (204] (205] (206
Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa	he heat from the heat from the heat from the heat from the space heat the space h	secondary main syste main syste from main (%) Feb stem 1), kV 505.77	/suppleme em(s) em 2 system 1 system 2 Mar Vh/month 360.56	Apr 142.90	May 34.18	Jun 0.00	0.00	0.00	Sep 0.00 Σ(21	1 - (2(2) x [1- (20) (202) x (2(202) x (2(202) x (2(202) x (2(202) x (202) x (Nov 470.57	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23] (201] (202] (202] (204] (205] (206
Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa	te heat from te heat from te heat from te heat from te space heat to spa	secondary main syste main syste main syste from main (%) Feb stem 1), kV 505.77	/suppleme em(s) em 2 system 1 system 2 Mar Vh/month 360.56	Apr 142.90	May 34.18	Jun 0.00	79.80	79.80	Sep 0.00 Σ{21	1 - (20) × [1- (20) (202) × (20) Cot 183.93 1)15, 10	01) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23 3134.34] (201] (202] (202] (204] (205] (205] (211
Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa	te heat from te heat from te heat from te heat from te space heat to spa	secondary main syste main syste main syste from main (%) Feb stem 1), kV 505.77	/suppleme em(s) em 2 system 1 system 2 Mar Vh/month 360.56	Apr 142.90	May 34.18	Jun 0.00	79.80	79.80	Sep 0.00 Σ{21	1 - (20 02) x [1- (20 02) x (21 0ct 183.93 1)15, 10	01) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23 8134.34] (201] (202] (202] (204] (205] (205] (211
Space heating Fraction of space Fraction of space Fraction of space Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Water heating f	te heat from te space heat to spac	secondary main syste main syste main syste from main from main from main from stem 1), kV 505.77 87.18 onth 215.37	/suppleme em(s) em 2 system 1 system 2 Mar Vh/month 360.56	Apr 142.90	May 34.18	Jun 0.00	79.80	79.80	Sep 0.00 Σ{21	1 - (20 02) x [1- (20 02) x (21 0ct 183.93 1)15, 10	D1) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23 8134.34] (201] (202] (202] (204] (205] (205] (211
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa Water heating f	te heat from te space heat to spac	secondary main syste main syste main syste from main from main from main from stem 1), kV 505.77 87.18 onth 215.37	/suppleme em(s) em 2 system 1 system 2 Mar Vh/month 360.56	Apr 142.90	May 34.18	Jun 0.00	79.80	79.80	Sep 0.00 Σ{21	1 - (20 02) x [1- (20 02) x (21 0ct 183.93 1)15, 10	D1) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23 8134.34 87.75] (201] (202] (202] (204] (205] (205] (211
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa Water heating f	te heat from te space heat to spac	secondary main syste main syste main syste from main from main from main from stem 1), kV 505.77 87.18 onth 215.37	/suppleme em(s) em 2 system 1 system 2 Mar Vh/month 360.56	Apr 142.90	May 34.18	Jun 0.00	79.80	79.80	Sep 0.00 Σ{21	1 - (20 02) x [1- (20 02) x (21 0ct 183.93 1)15, 10	01) =	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23 87.75 236.90 1575.09] (201] (202] (202] (204] (205] (205] (206] (205] (206] (211] (217] (217]
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa Water heating f	te heat from te space heat to spac	secondary main syste main syste main syste from main from main from main from stem 1), kV 505.77 87.18 onth 215.37	/suppleme em(s) em 2 system 1 system 2 Mar Vh/month 360.56	Apr 142.90	May 34.18	Jun 0.00	79.80	79.80	Sep 0.00 Σ{21	1 - (20 D2) × [1- (20 (202) × (20 Oct 183.93 1)15, 10 84.64 216.51 Σ(219a)1	D1) = 33] =	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23 8134.34 87.75 236.90 2575.09] (201] (202] (202] (204] (205] (206] (206] (207] (217] (217] (217]
Space heating Fraction of spac Fraction of spac Fraction of spac Fraction of total Fraction of total Efficiency of ma Space heating for Water heating Efficiency of wa Water heating f	te heat from te space heat to spac	secondary main syste main syste main syste from main from main from main from stem 1), kV 505.77 87.18 onth 215.37	/suppleme em(s) em 2 system 1 system 2 Mar Vh/month 360.56	Apr 142.90	May 34.18	Jun 0.00	79.80	79.80	Sep 0.00 Σ{21	1 - (20 D2) × [1- (20 (202) × (20 Oct 183.93 1)15, 10 84.64 216.51 Σ(219a)1	D1) = 33] =	0.00 1.00 0.00 1.00 0.00 93.50 Dec 730.23 87.75 236.90 1575.09] (201] (202] (202] (204] (205] (206] (206] (207] (217] (217] (217] (219] (219]

Water heating fuel Electricity for pumps, fans and electric keep-hot (Table 4	1f)		2575.09
central heating pump or water pump within warm ai		30.00	(230c)
boiler flue fan	r neating unit	45.00	(230e
Total electricity for the above, kWh/year		45.00	75.00 (231)
Electricity for lighting (Appendix L)			408.45 (232)
Total delivered energy for all uses		(211)(221) + (231) + (232)	
		,,, ,, ,,	, , , , , , , , , , , , , , , , ,
10a. Fuel costs - individual heating systems including		• 1	
	Fuel kWh/year	Fuel price	Fuel cost £/year
Space heating - main system 1	3134.34	x 3.48 x 0	1.01 = 109.08 (240)
Water heating	2575.09	x 3.48 x 0	0.01 = 89.61 (247)
Pumps and fans	75.00	x 13.19 x 0	0.01 = 9.89 (249)
Electricity for lighting	408.45	x 13.19 x 0	0.01 = 53.87 (250)
Additional standing charges			120.00 (251)
Total energy cost		(240)(242) + (245).	(254) = 382.46 (255)
11a. SAP rating - individual heating systems including	micro-CHP		
Energy cost deflator (Table 12)	micro-crip		0.42 (256)
Energy cost factor (ECF)			1.09 (257)
SAP value			84.75
SAP rating (section 13)			85 (258)
SAP band			В
12a. CO ₂ emissions - individual heating systems includ			
	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	3134.34	x 0.216	= 677.02 (261)
Space heating - main system 1 Water heating	3134.34 2575.09	x 0.216 x 0.216	= 677.02 (261) = 556.22 (264)
			= 556.22 (264)
Water heating		x 0.216	= 556.22 (264)
Water heating Space and water heating	2575.09	x 0.216 (261) + (262) + (263)	= 556.22 (264) + (264) = 1233.24 (265)
Water heating Space and water heating Pumps and fans	2575.09 75.00	x 0.216 (261) + (262) + (263) x 0.519 x 0.519	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267)
Water heating Space and water heating Pumps and fans Electricity for lighting	2575.09 75.00	x 0.216 (261) + (262) + (263) x 0.519 x 0.519 (265)	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year	2575.09 75.00	x 0.216 (261) + (262) + (263) x 0.519 x 0.519 (265)	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value	2575.09 75.00	x 0.216 (261) + (262) + (263) x 0.519 x 0.519 (265)	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	2575.09 75.00	x 0.216 (261) + (262) + (263) x 0.519 x 0.519 (265)	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	2575.09 75.00 408.45	x 0.216 (261) + (262) + (263) x 0.519 x 0.519 (265)	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14)	2575.09 75.00 408.45	x 0.216 (261) + (262) + (263) x 0.519 x 0.519 (265)	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) 8 (274) B
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems inclu	2575.09 75.00 408.45 ding micro-CHP Energy kWh/year	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) B Primary Energy kWh/year
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a, Primary energy - individual heating systems inclu Space heating - main system 1	2575.09 75.00 408.45 ding micro-CHP Energy kWh/year 3134.34	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) 8 B (274) Primary Energy kWh/year = 3823.90 (261)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - Individual heating systems inclu Space heating - main system 1 Water heating	2575.09 75.00 408.45 ding micro-CHP Energy kWh/year	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) 8 B (274) Primary Energy kWh/year = 3823.90 (261) = 3141.61 (264)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems inclu Space heating - main system 1 Water heating Space and water heating	2575.09 75.00 408.45 ding micro-CHP Energy kWh/year 3134.34 2575.09	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) 8 B (274) Primary Energy kWh/year = 3823.90 (261) = 3141.61 (264) + (264) = 6965.51 (265)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a, Primary energy - individual heating systems inclu Space heating - main system 1 Water heating Space and water heating Pumps and fans	2575.09 75.00 408.45 tiding micro-CHP Energy kWh/year 3134.34 2575.09	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 86 (274) B Primary Energy kWh/year = 3823.90 (261) = 3141.61 (264) + (264) = 6965.51 (265) = 230.25 (267)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - Individual heating systems inclu Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	2575.09 75.00 408.45 ding micro-CHP Energy kWh/year 3134.34 2575.09	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) B Primary Energy kWh/year = 3823.90 (261) = 3141.61 (264) + (264) = 6965.51 (265) = 230.25 (267) = 1253.94 (268)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - Individual heating systems inclu Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Primary energy kWh/year	2575.09 75.00 408.45 tiding micro-CHP Energy kWh/year 3134.34 2575.09	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268)(271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) 8
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a. Primary energy - individual heating systems inclu Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	2575.09 75.00 408.45 tiding micro-CHP Energy kWh/year 3134.34 2575.09	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268) (271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) B Primary Energy kWh/year = 3823.90 (261) = 3141.61 (264) + (264) = 6965.51 (265) = 230.25 (267) = 1253.94 (268)
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a, Primary energy - Individual heating systems inclu Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Primary energy kWh/year	2575.09 75.00 408.45 tiding micro-CHP Energy kWh/year 3134.34 2575.09	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268)(271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) 8
Water heating Space and water heating Pumps and fans Electricity for lighting Total CO ₂ , kg/year Dwelling CO ₂ emission rate El value El rating (section 14) El band 13a, Primary energy - Individual heating systems inclu Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting Primary energy kWh/year	2575.09 75.00 408.45 tiding micro-CHP Energy kWh/year 3134.34 2575.09	x	= 556.22 (264) + (264) = 1233.24 (265) = 38.93 (267) = 211.98 (268)(271) = 1484.15 (272) 2) + (4) = 14.56 (273) 86.47 (274) 8

property as constructed.	been carried	out using	Approved	SAP softwa	ere. It has b	een prepar	ed from pla	ins and spe	cifications	and may n	ot reflect the
Assessor name	Miss Mich	elle Wang					Ass	essor num	ber	2018	
Client							Las	t modified		04/02/	/2019
Address	Manor Roa	ad Richmo	nd Block 1	, Richmond	, TW9						
1. Overall dwelling dimen	nsions										
				A	rea (m²)			age storey ight (m)		Vol	lume (m³)
Lowest occupied					101.94	(1a) x		2.63	(2a) =		268.10 (3a)
Total floor area	(1a) +	(1b) + (1c) + (1d](1n) =	101.94	(4)					
Dwelling volume							(3a)	+ (3b) + (3c) + (3d)(3	in) =	268.10 (5)
2. Ventilation rate											
							<u> </u>			m³	per hour
Number of chimneys								0	x 40 =		0 (6a)
Number of open flues								0	x 20 =		0 (6b)
Number of intermittent far	15							0	x 10 =		0 (7a)
Number of passive vents								0	× 10 =		0 (7b)
Number of flueless gas fire	s							0	x 40 =		0 (7c)
										Air c	hanges per hour
Infiltration due to chimney	s, flues, fans,	PSVs		(6a)	+ (6b) + (7a	a) + (7b) + (7	7c) =	0	÷ (5) =		0.00 (8)
If a pressurisation test has			tended, pr				_	(16)	1-2		
Air permeability value, q50											3.00 (17)
If based on air permeability											0.15 (18)
Number of sides on which				,,	- ()						2 (19)
Shelter factor								1-	[0.075 x (1	911 =	
	ing shelter fac	ctor						1-	(18) x (19)		0.85 (20)
Infiltration rate incorporati								1-	(0.075 x (19 (18) x (2		
Infiltration rate incorporati			Apr	May	Jun	Jul	Aug	1 - Sep			0.85 (20)
Infiltration rate incorporati Infiltration rate modified fo Jan Monthly average wind spec	Feb ed from Table	nd speed: Mar U2						Sep	(18) × (2	Nov	0.85 (20) 0.13 (21) Dec
Infiltration rate incorporati Infiltration rate modified fo Jan Monthly average wind spec 5.10	or monthly wi	nd speed: Mar	Apr 4.40	May 4.30	Jun 3.80	Jul 3.80	Aug 3.70		(18) x (2	0) =	0.85 (20) 0.13 (21)
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4	Feb ed from Table	Mar U2 4.90	4.40	4.30	3.80	3.80	3.70	Sep 4.00	(18) x (2 Oct	Nov 4.50	0.85 (20) 0.13 (21) Dec 4.70 (22)
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28	Feb ed from Table 5.00	Mar U2 4.90	4.40	4.30	3.80			Sep	(18) × (2	Nov	0.85 (20) 0.13 (21) Dec
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a	r monthly wi Feb ed from Table 5.00 1.25 allowing for sh	Mar U2 4.90 1.23 helter and	4.40 1.10 wind factor	4.30 1.08 or) (21) x (2	3.80 0.95 2a)m	3.80	3.70	Sep 4,00	(18) x (2 Oct 4.30	Nov 4.50	0.85 (20) 0.13 (21) Dec 4.70 (22)
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a	r monthly wi Feb ed from Table 5.00 1.25 allowing for sh 0.16	Mar U2 4.90 1.23 helter and 0.16	4.40 1.10 wind facto	4.30	3.80	3.80	3.70	Sep 4.00	(18) x (2 Oct	Nov 4.50	0.85 (20) 0.13 (21) Dec 4.70 (22)
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a 0.16 Calculate effective air chan	r monthly wi Feb ed from Table 5.00 1.25 sllowing for st 0.16 ge rate for th	Mar U2 4.90 1.23 helter and 0.16 e applicab	4.40 1.10 wind facto 0.14 le case:	4.30 1.08 or) (21) x (2 0.14	3.80 0.95 2a)m	3.80	3.70	Sep 4,00	(18) x (2 Oct 4.30	Nov 4.50	0.85 (20) 0.13 (21) Dec 4.70 (22) 1.18 (22:
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a 0.16 Calculate effective air chan If mechanical ventilation	or monthly wi Feb ed from Table 5.00 1.25 allowing for sh 0.16 ige rate for th n: air change	Mar U2 4.90 1.23 helter and 0.16 he applicabrate through	4.40 1.10 wind facto 0.14 ele case: gh system	4.30 1.08 or) (21) x (2 0.14	3.80 0.95 2a)m 0.12	3.80 0.95	3.70	Sep 4,00	(18) x (2 Oct 4.30	Nov 4.50	0.85 (20) 0.13 (21) Dec 4.70 (22) 1.18 (22c) 0.15 (22c) 0.50 (23e)
Infiltration rate incorporation infiltration rate modified for Jan Monthly average wind specification of the Jan Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a 0.16 Calculate effective air chan if mechanical ventilation if balanced with heat re	or monthly wi Feb ed from Table 5.00 1.25 allowing for sh 0.16 ige rate for th in: air change	Mar tu2 4.90 1.23 helter and 0.16 he applicable rate througency in % a	4.40 1.10 wind facto 0.14 lle case: gh system	4.30 1.08 or) (21) x (2 0.14	3.80 0.95 2a)m 0.12	3.80 0.95 0.12	3.70 0.93 0.12	Sep 4,00	(18) x (2 Oct 4.30	Nov 4.50	0.85 (20) 0.13 (21) Dec 4.70 (22) 1.18 (22:
Infiltration rate incorporation infiltration rate modified for Jan Monthly average wind specific to the Jan Monthly average wind specific to the Jan Monthly average wind specific to the Jan Monthly average wind factor (22)m + 4 1.28 Adjusted infiltration rate (a 0.16 Calculate effective air chan if mechanical ventilation if balanced with heat re a) if balanced mechanic	or monthly wi Feb ed from Table 5.00 1.25 bllowing for sh 0.16 ge rate for th n: air change ecovery: efficical ventilation	Mar 9 U2 4.90 1.23 helter and 0.16 he applicable rate througency in %; with heat	1.10 wind facto 0.14 le case: gh system allowing for recovery	1.08 1.08	3.80 0.95 2a)m 0.12 ctor from Ti	3.80 0.95 0.12 able 4h s) x [1 - (23c	3.70 0.93 0.12)+100]	5ep 4.00 1.00	(18) × (2 Oct 4.30 1.08	Nov 4.50	0.85 (20) 0.13 (21) Dec
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a 0.16 Calculate effective air chan If mechanical ventilation If balanced with heat re a) If balanced mechanic 0.28	pr monthly wi Feb ed from Table 5.00 1.25 1.25 Solowing for sh 0.16 ge rate for th n: air change ecovery: efficial ventilation 0.28	nd speed: Mar 1.23 1.23 helter and 0.16 he applicab rate througency in %: with heat 0.27	1.10 wind facto 0.14 lle case: gh system allowing for recovery 0.26	1.08 r) (21) x (2 0.14 or in-use fac (MVHR) (22 0.25	3.80 0.95 2a)m 0.12	3.80 0.95 0.12	3.70 0.93 0.12	Sep 4,00	(18) x (2 Oct 4.30	Nov 4.50	0.85 (20) 0.13 (21) Dec 4.70 (22) 1.18 (22c) 0.15 (22c) 0.50 (23e)
Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a 0.16 Calculate effective air chan If mechanical ventilation If balanced with heat re a) If balanced mechanic 0.28 Effective air change rate - 6	remonthly wi Feb ed from Table 5.00 1.25 ellowing for sh 0.16 the grate for the covery: efficical ventilation 0.28 enter (24a) or	Mar U2 4.90 1.23 heliter and 0.16 he applicab rate througency in % a with heat 0.27 [24b] or (24b) or (24b)	4.40 1.10 wind facto 0.14 le case: gh system allowing for recovery 0.26 24c) or (24	1.08 1.08	3.80 0.95 2a)m 0.12 ctor from T: bb)m + (23b) 0.24	3.80 0.95 0.12 able 4h 0) x [1 - (23c) 0.24	3.70 0.93 0.12)+100] 0.24	4.00 1.00 0.13	(18) x (2 Oct 4.30 1.08 0.14	Nov 4.50 1.13	0.85 (20) 0.13 (21) Dec
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a 0.16 Calculate effective air chan If mechanical ventilation If balanced with heat re a) If balanced mechanic 0.28	pr monthly wi Feb ed from Table 5.00 1.25 1.25 Solowing for sh 0.16 ge rate for th n: air change ecovery: efficial ventilation 0.28	nd speed: Mar 1.23 1.23 helter and 0.16 he applicab rate througency in %: with heat 0.27	1.10 wind facto 0.14 lle case: gh system allowing for recovery 0.26	1.08 r) (21) x (2 0.14 or in-use fac (MVHR) (22 0.25	3.80 0.95 2a)m 0.12 ctor from Ti	3.80 0.95 0.12 able 4h s) x [1 - (23c	3.70 0.93 0.12)+100]	5ep 4.00 1.00	(18) × (2 Oct 4.30 1.08	Nov 4.50	0.85 (20) 0.13 (21) Dec
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a 0.16 Calculate effective air chan If mechanical ventilation If balanced with heat re a) If balanced mechanic 0.28 Effective air change rate - 6	remonthly wi Feb ed from Table 5.00 1.25 ellowing for sh 0.16 the grate for the covery: efficical ventilation 0.28 enter (24a) or	Mar U2 4.90 1.23 heliter and 0.16 he applicab rate througency in % a with heat 0.27 [24b] or (24b) or (24b)	4.40 1.10 wind facto 0.14 le case: gh system allowing for recovery 0.26 24c) or (24	1.08 1.08	3.80 0.95 2a)m 0.12 ctor from T: bb)m + (23b) 0.24	3.80 0.95 0.12 able 4h 0) x [1 - (23c) 0.24	3.70 0.93 0.12)+100] 0.24	4.00 1.00 0.13	(18) x (2 Oct 4.30 1.08 0.14	Nov 4.50 1.13 0.14 0.26	0.85 (20) 0.13 (21) Dec (22) 1.18 (22) 0.15 (22) 0.50 (23) 76.50 (23) 0.27 (24)
Infiltration rate incorporati Infiltration rate modified for Jan Monthly average wind spec 5.10 Wind factor (22)m + 4 1.28 Adjusted infiltration rate (a 0.16 Calculate effective air chan If mechanical ventilation If balanced with heat re a) If balanced mechanic 0.28 Effective air change rate - 6	remonthly wi Feb ed from Table 5.00 1.25 ellowing for sh 0.16 the grate for the covery: efficical ventilation 0.28 enter (24a) or	Mar U2 4.90 1.23 heliter and 0.16 he applicab rate througency in % a with heat 0.27 [24b] or (24b) or (24b)	4.40 1.10 wind facto 0.14 le case: gh system allowing for recovery 0.26 24c) or (24	1.08 1.08	3.80 0.95 2a)m 0.12 ctor from T: bb)m + (23b) 0.24	3.80 0.95 0.12 able 4h 0) x [1 - (23c) 0.24	3.70 0.93 0.12)+100] 0.24	4.00 1.00 0.13	(18) x (2 Oct 4.30 1.08 0.14 0.25	Nov 4.50 1.13 0.14 0.26 URN: B	0.85 (20) 0.13 (21) Dec

Element	Gross area, m ²	Openings m ²	Net area A, m²	U-value W/m²K	A x U W/K	к-value, kJ/m².К	Ахк, kJ/K	
Window			28.36	1.33	= 37.60			27)
External wall			48.72	0.15	- 7.31			29a)
External wall			8.64	x 0.01	= 0.09			29a)
Party wall			31.96	x 0.00	= 0.00		(3:	32)
Total area of external elements ∑A, m²			85.72				(3	31)
Fabric heat loss, $W/K = \Sigma(A \times U)$					(26)(30) + (32) =	44.99 (3	33)
Heat capacity $Cm = \sum (A \times \kappa)$				(28)	(30) + (32) + (33	2a)(32e) =	N/A (3	34)
Thermal mass parameter (TMP) in kJ/m²K							100.00 (3	35)
Thermal bridges: $\Sigma(L\times\Psi)$ calculated using Ap	pendix K						16.29 (3	36)
Total fabric heat loss						(33) + (36) =	61.29 (3	37)
Jan Feb Ma	ar Apr	May	Jul Jul	Aug	Sep	Oct Nov	Dec	
Ventilation heat loss calculated monthly 0.3:	3 x (25)m x (5)							
24.78 24.50 24.3	_	22.52	21.11 21.11	1 20.83	21.68 2	2.52 23.09	23.65 (3	88)
Heat transfer coefficient, W/K (37)m + (38)m								
86.07 85.78 85.	50 84.09	83.81	82.40 82.40			3.81 84.37	84.94	
				,	Average = ∑(39)112/12 =	84.02 (3:	89)
Heat loss parameter (HLP), W/m ² K (39)m + (
0.84 0.84 0.8	0.82	0.82	0.81 0.81			0.82 0.83	0.83	
Number of descriptions of Architecture					Average = ∑(40)112/12 =	0.82 (4	10)
Number of days in month (Table 1a) 31.00 28.00 31.0	00 30.00	31.00	30.00 31.00	0 31.00	30.00 3	1.00 30.00	31.00 (4	101
31.00 28.00 31.0	30.00	31.00	30.00 31.00	31.00	30.00	1.00 30.00	31.00 (4	,u)
4. Water heating energy requirement								
Assumed occupancy, N							2.76 (4:	(2)
Annual average hot water usage in litres per	day Vd,average	= (25 x N) +	36				99.67 (4	13)
Jan Feb Ma	ar Apr	May	Jun Jul	Aug	Sep	Oct Nov	Dec	
Hot water usage in litres per day for each mo		tor from Tabl						
109.64 105.65 101.	.67 97.68	93.69	89.71 89.7	1 93.69		01.67 105.65	109.64	
					Σ	(44)112 =	1196.08 (4	14)
Energy content of hot water used = 4.18 x Vd								
162.59 142.21 146.	.74 127.93	122.76	105.93 98.10	6 112.64		32.84 145.00		
					Σ	(45)112 =	1568.25 (4	(5)
Distribution loss 0.15 x (45)m			45.00				T	
24.39 21.33 22.0		18.41	15.89 14.72	2 16.90	17.10 1	9.93 21.75		16)
Storage volume (litres) including any solar or Water storage loss:	WWHRS storag	e within sam	ie vessel				194.00 (4	17)
a) If manufacturer's declared loss factor is kn	muum (hAMfin (dimu)						1.61 (4	(8)
Temperature factor from Table 2b	lown (kwn/day)	,				<u> </u>		19)
Energy lost from water storage (kWh/day	(48) v (49)					<u> </u>		50)
Enter (50) or (54) in (55)) (40) x (45)					<u> </u>		55)
Water storage loss calculated for each month	h (55) x (41)m						0.27	-,
29.95 27.05 29.9		29.95	28.98 29.99	5 29.95	28.98 2	9.95 28.98	29.95 (5	66)
If the vessel contains dedicated solar storage				_	20100	20130	20100	-,
29.95 27.05 29.		29.95	28.98 29.99		28.98 2	9.95 28.98	29.95 (5	57)
Primary circuit loss for each month from Tab	le 3							
						IIbn-	B1-A01-SW vers	sion 2
							ssessor version	
			Page 2				SAP version	9.92

	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 e					25.20	22.01	25.20	25.20	22.51	25.20	22.51	25.20 (55)
Cornor loss for e												
	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 requi	ired for wat	er heating c				(45)m + (4	6)m + (57)r	m + (59)m +	(61)m			
	215.80	190.26	199.95	179.43	175.96	157.42	151.37	165.85	165.48	186.05	196.49	210.67 (62)
Solar DHW inpu	rt calculated	using Appe	ndix G or A	ppendix 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 wa	ater heater f	or each mor	nth (kWh/r	month) (62	2\m + (63\m	1						
	215.80	190.26	199.95	179.43	175.96	157,42	151.37	165.85	165.48	186.05	196.49	210.67
	213.00	190.26	199.93	1/3.43	173.90	137.42	131.37	103.63	103.48			
										∑(64)1	12 =2	(64)
Heat gains from	water heat											
	96.63	85.73	91.36	83.73	83.38	76.42	75.20	80.02	79.09	86.74	89.41	94.92 (65)
5. Internal gair	ns											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains	(Table 5)											
	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84 (66)
Lighting gains (c											7	, ,
-8 @ Burns (c	$\overline{}$	20.54				7.98	9.63	11.21	15.05	19.10	22.30	23.77 (67)
	23.13		16.71	12.65	9.45		8.62	11.21	15.05	19.10	22.30	23.77 (67)
Appliance gains												
	259.43	262.12	255.33	240.89	222.66	205.53	194.08	191.39	198.17	212.62	230.85	247.98 (68)
Cooking gains (c	calculated in	Appendix L	, equation	L15 or L15	a), also see	Table 5						
	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78 (69)
Pump and fan g	ains (Table !	ia)										
	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)
			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 (70)
Losses e.g. evap												
	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27 (71)
Water heating g	gains (Table	5)										
	129.88	127.58	122.79	116.29	112.07	106.13	101.08	107.55	109.85	116.58	124.18	127.59 (72)
Total internal ga	ains (66)m +	(67)m + (61	8)m + (69)i	m + (70)m ·	+ (71)m + (72)m						
	476.78	474.59	459.19	434.19	408.54	383.99	368.14	374.50	387.42	412.65	441.67	463.69 (73)
	470.70	474.33	455.15	434.13	400.54	303.55	300.14	374.30	307.42	412.03	441.07	403.03
6. Solar gains												
			Access f	actor	Area	Sol	ar flux		ε	FF		Gains
			Table		m².		V/m²		ific data	specific o	lata	w
								or T	able 6b	or Table	6c	
SouthEast			0.7	7 X F	7.88	7 x 🗆 3	6.79 x	0.9 x	0.40 ×	0.65	□ - □	52.24 (77)
SouthWest			0.7	,	8.40	ī. 🗔	6.79 x	0.9 x	0.40 ×	0.65	≓₌F	55.69 (79)
NorthWest			0.77	= =	12.08	=			0.40 ×	0.65	╡┋┾	24.56 (81)
			0.7	× L	12.06	_ ×	1.20 X	0.9 X	0.40 X	0.65		24.30 (01)
Solar gains in wa												
	132.49	233.83	341.60	459.58	547.92	558.54	532.42	464.29	382.11	264.28	160.17	112.42 (83)
Total gains - into	ernal and so	lar (73)m +	(83)m									
	609.27	708.42	800.79	893.77	956.46	942.53	900.56	838.79	769.53	676.93	601.85	576.11 (84)
	609.27	708.42	800.79	893.77	956.46	942.53	900.56	838.79	769.53	676.93	601.85	576.11 (84)
7. Mean intern				893.77	956.46	942.53	900.56	838.79	769.53	676.93	601.85	576.11 (84)
7. Mean intern Temperature du	nal tempera	ture (heatin	ig season)				900.56	838.79	769.53	676.93	601.85	
	nal tempera	ture (heatin	ig season) the living a	area from T	able 9, Th1	ı('c)			769.53 Sep			21.00 (85)
Temperature du	nal tempera uring heatin Jan	ture (heatin g periods in Feb	ig season) the living a Mar	area from T Apr	able 9, Th1		900.56 Jul	838.79 Aug		676.93 Oct	601.85 Nov	
	nal tempera uring heating Jan or for gains f	ture (heating g periods in Feb or living are	ig season) the living a Mar a n1,m (se	area from T Apr e Table 9a)	able 9, Th3	Jun	Jul	Aug	Sep	Oct	Nov	21.00 (85) Dec
Temperature du	nal tempera uring heatin Jan	ture (heatin g periods in Feb	ig season) the living a Mar	area from T Apr	able 9, Th1	ı('c)						21.00 (85)
Temperature du	nal tempera uring heating Jan or for gains f	ture (heating g periods in Feb or living are	ig season) the living a Mar a n1,m (se	area from T Apr e Table 9a)	able 9, Th3	Jun	Jul	Aug	Sep	Oct	Nov	21.00 (85) Dec
Temperature du	nal tempera uring heating Jan or for gains f	ture (heating g periods in Feb or living are	ig season) the living a Mar a n1,m (se	area from T Apr e Table 9a)	able 9, Th3	Jun	Jul	Aug	Sep	Oct	Nov 0.94	21.00 (85) Dec
Temperature du	nal tempera uring heating Jan or for gains f	ture (heating g periods in Feb or living are	ig season) the living a Mar a n1,m (se	area from T Apr e Table 9a)	able 9, Th3	Jun	Jul	Aug	Sep	Oct 0.85	Nov 0.94 URN: B	21.00 (85) Dec



MANOR ROAD AVANTON RICHMOND DEVELOPMENT LTD

SUSTAINABILITY ENERGY STRATEGY - REV. 03 41

4		T# 4-		i- Table 0									
Mean internal t				20.42		20.93	20.98	20.97	20.85	20.42	19.80	19.29	Lon
emperature di		19.59			20.75		20.98	20.97	20.85	20.42	19.80	19.29	(87)
emperature di	_											T	(88)
	20.22		20.22		20.23	20.25	20.25	20.25	20.24	20.23	20.23	20.22	(88)
Itilisation facto													1
	0.96	0.93	0.88	0.79	0.64	0.47	0.33	0.37	0.59	0.83	0.93	0.96	(89)
Mean internal t							-						1
	17.96	18.34	18.88	19.51	19.95	20.18	20.23	20.23	20.08	19.52	18.65	17.90	(90)
iving area fract Vlean internal t		for the wh	ole dwellin	g fLA x T1 «	+(1 - fLA) x	T2			Liv	ing area ÷	(4) =	0.46	(91)
	18.58	18.91	19.38	19.93	20.31	20.52	20.57	20.57	20.43	19.93	19.18	18.53	(92)
Apply adjustme	ent to the me	ean interna	l temperati	ure from Ta	ble 4e whe	ere appropr	riate						
	18.58	18.91	19.38	19.93	20.31	20.52	20.57	20.57	20.43	19.93	19.18	18.53	(93)
8. Space heati													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Jtilisation facto													
	0.94	0.92	0.87	0.78	0.65	0.49	0.36	0.39	0.61	0.82	0.92	0.95	(94)
Jseful gains, ηn													
		648.34			620.29	459.07	319.75	331.32	466.03	552.82	551.65	547.68	(95)
Monthly averag	ge external t	emperature	e from Tabl	e 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)
leat loss rate fo	or mean inte	ernal tempe	erature, Lm	, W [(39)m	x [(93)m -	(96)m]							
	1229.43	1201.98	1101.29	927.45	721.90	487.67	327.30	342.05	525.40	781.79	1018.89	1217.51	(97)
Space heating r	equirement	1010-1											
	equirement	, kwn/mon	th 0.024 x	[(97)m - (9	5)m] x (41)	m							
		372.05			5)m] x (41) 75.60	0.00	0.00	0.00	0.00	170.35	336.42	498.35]
							0.00	0.00		170.35 3)15, 10		498.35 2409.49	(98)
	487.04	372.05	302.80				0.00	0.00		3)15, 10			(98) (99)
ipace heating n	487.04 requirement	372.05 kWh/m²/y	302.80				0.00	0.00		3)15, 10	.12 =	2409.49	
ipace heating n	487.04 requirement	372.05 kWh/m²/yi	302.80 ear	166.88	75.60	0.00			∑(98	(98)	.12 = : ÷ (4)	2409.49 23.64	
Space heating ri	487.04 requirement ling requirer	372.05 kWh/m²/y	302.80				00.00 lut	0.00 Aug		3)15, 10	.12 =	2409.49	
Space heating ri	487.04 requirement ling requirer Jan	372.05 kWh/m²/yi ment Feb	302.80 ear Mar	166.88 Apr	75.60 May	0.00	Jul	Aug	∑(98 Sep	(98) Oct	.12 = :: + (4) Nov	23.64 Dec	(99)
ipace heating n 8c. Space cool feat loss rate L	487.04 requirement ling requirer Jan .m	372.05 kWh/m²/yı ment Feb	302.80 ear	166.88	75.60	0.00			∑(98	(98)	.12 = : ÷ (4)	2409.49 23.64	
ipace heating n 8c. Space cool feat loss rate L	487.04 requirement ling requirer Jan	372.05 kWh/m²/yı ment Feb 0.00	302.80 ear Mar	Apr 0.00	75.60 May	Jun 774.55	Jul 609.76	Aug 624.09	Σ(98 Sep	(98) Oct	.12 =	2409.49 23.64 Dec	(100)
Space heating ro 8c. Space cool fleat loss rate L Utilisation factor	487.04 requirement ling requirer Jan 0.00 or for loss nr	372.05 kWh/m²/yi ment Feb 0.00	302.80 ear Mar 0.00	166.88 Apr	75.60 May	0.00	Jul	Aug	∑(98 Sep	(98) Oct	.12 = :: + (4) Nov	23.64 Dec	(99)
Space heating ro 8c. Space cool fleat loss rate L Utilisation factor	487.04 requirement ling requirer Jan m 0.00 or for loss nr 0.00 Lm (watts) {	372.05 kWVh/m²/yi ment Feb 0.00 m 0.00 100)m x {10	302.80 ear Mar 0.00	Apr 0.00	May 0.00	Jun 774.55	Jul 609.76	Aug 624.09	\$ep 0.00	(98) Oct 0.00	.12 =	2409.49 23.64 Dec 0.00	(99) (100) (101)
Space heating n 8c. Space cool Heat loss rate L Utilisation facto Useful loss nml	487.04 requirement ling requirer Jan 0.00 or for loss nr	372.05 kWh/m²/yi ment Feb 0.00	302.80 ear Mar 0.00	Apr 0.00	75.60 May	Jun 774.55	Jul 609.76	Aug 624.09	Σ(98 Sep	(98) Oct	.12 =	2409.49 23.64 Dec	(100)
Space heating n 8c. Space cool Heat loss rate L Utilisation facto Useful loss nml	487.04 requirement ling requirer Jan m 0.00 or for loss nr 0.00 Lm (watts) {	372.05 kWVh/m²/yi ment Feb 0.00 m 0.00 100)m x {10	302.80 ear Mar 0.00	Apr 0.00	May 0.00	Jun 774.55	Jul 609.76	Aug 624.09	\$ep 0.00	(98) Oct 0.00	.12 =	2409.49 23.64 Dec 0.00	(99) (100) (101)
Space heating rolls and the space cooling the space cooling and th	487.04 requirement ing requirer Jan m 0.00 or for loss nr 0.00 m (watts) { 0.00 0.00	372.05 kWh/m²/yi ment Feb 0.00 m 0.00 100)m x {100}m x {100} 0.00	Mar 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00	May 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11	Jul 609.76 0.94 571.27	Aug 624.09 0.92 575.72	\$ep 0.00	(98) Oct 0.00	.12 =	2409.49 23.64 Dec 0.00	(99) (100) (101)
Space heating re 8c. Space cool Heat loss rate L Utilisation factor Useful loss nml. Gains	487.04 requirement ing requirer Jan m 0.00 or for loss nr 0.00 m (watts) { 0.00 0.00	372.05 kWh/m²/yi ment Feb 0.00 m 0.00 100)m x {100}m x {100} 0.00	Mar 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00	May 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11	Jul 609.76 0.94 571.27	Aug 624.09 0.92 575.72	Σ(98 Sep 0.00 0.00	Oct 0.00 0.00	.12 =	2409.49 23.64 Dec 0.00 0.00	(100) (101) (102)
Space heating re 8c. Space cool Heat loss rate L Utilisation factor Useful loss nml. Gains	487.04 requirement ing requirer Jan m 0.00 or for loss nr 0.00 m (watts) { 0.00 0.00	372.05 kWh/m²/yi ment Feb 0.00 m 0.00 100)m x {100}m x {100} 0.00	Mar 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00	May 0.00 0.00 0.00 0.00 h) 0.024 x	Jun 774.55 0.90 697.11 1195.11	Jul 609.76 0.94 571.27 1144.06 [02]m] x (4	Aug 624.09 0.92 575.72 1073.34	Σ(98 Sep 0.00 0.00	Oct (98) Oct (90)	12 =	2409.49 23.64 Dec 0.00 0.00	(100) (101) (102)
Space heating ro 8c. Space cool Heat loss rate Li Utilisation factor Useful loss nml. Sains	487.04 487.04 tequirement Jan 0.00 0.00 0.00 (watts) { 0.00 0.00 equirement,	372.05 kWh/m²/yi ment Feb 0.00 m 0.00 100)m x {100 0.00 0.00 whole dwa	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 h) 0.024 x	Jun 774.55 0.90 697.11 1195.11 [(103)m - {1	Jul 609.76 0.94 571.27 1144.06 [02]m] x (4	Aug 624.09 0.92 575.72 1073.34	\$ep 0.00 0.00 0.00 0.00	Oct 0.00 0.00 0.00	12 =	2409.49 23.64 Dec 0.00 0.00 0.00	(100) (101) (102)
Space heating n Bc. Space cool Heat loss rate L Utilisation facto Useful loss nml. Gains Space cooling re	487.04 requirement ing requirer Jan .m 0.00 or for loss nr 0.00 .m (watts) { 0.00 0.00 cquirement, 0.00	372.05 kWh/m²/yi ment Feb 0.00 m 0.00 100)m x {100 0.00 0.00 whole dwa	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 h) 0.024 x	Jun 774.55 0.90 697.11 1195.11 [(103)m - {1	Jul 609.76 0.94 571.27 1144.06 [02]m] x (4	Aug 624.09 0.92 575.72 1073.34	\$(98) \$ep 0.00 0.00 0.00 0.00	Oct (98) Oct (90)	Nov 0.00 0.	Dec 0.00 0.00 0.00 0.00	(100) (101) (102) (103)
Space heating n Bc. Space cool Bc. Space cooling n Cooled fraction	487.04 requirement ing requirer Jan .m 0.00 or for loss nr 0.00 m (watts) { 0.00 0.00 0.00 0.00	372.05 kWh/m²/yi ment Feb 0.00 m 0.00 100)m x {10 0.00 0.00 whole dwe 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 h) 0.024 x	Jun 774.55 0.90 697.11 1195.11 [(103)m - {1	Jul 609.76 0.94 571.27 1144.06 [02]m] x (4	Aug 624.09 0.92 575.72 1073.34	\$(98) \$ep 0.00 0.00 0.00 0.00	Oct (98) Oct 0.00 0.00 0.00 0.00 Σ(104)6	Nov 0.00 0.	Dec 0.00 0.00 0.00 0.00 1154.95	(100) (101) (102) (103)
Space heating n Bc. Space cool Bc. Space cooling n Cooled fraction	487.04 requirement ing requirer Jan .m 0.00 or for loss nr 0.00 m (watts) { 0.00 0.00 0.00 0.00	372.05 kWh/m²/yi ment Feb 0.00 m 0.00 100)m x {10 0.00 0.00 whole dwe 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 h) 0.024 x	Jun 774.55 0.90 697.11 1195.11 [(103)m - {1	Jul 609.76 0.94 571.27 1144.06 [02]m] x (4	Aug 624.09 0.92 575.72 1073.34	\$(98) \$ep 0.00 0.00 0.00 0.00	Oct (98) Oct 0.00 0.00 0.00 0.00 Σ(104)6	Nov 0.00 0.	Dec 0.00 0.00 0.00 0.00 1154.95	(100) (101) (102) (103)
Space heating in 8c. Space cool Heat loss rate L Utilisation factor Useful loss nml. Gains Space cooling in Cooled fraction intermittency for	487.04 requirement ing requirer Jan .m 0.00 or for loss nr 0.00 .m (watts) { 0.00 0.00 equirement, 0.00 actor (Table	372.05 kWh/m²/yi ment 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10) 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 ([103]m - [1] 358.56	Jul 609.76 0.94 571.27 1144.06 102)m] x (4 426.16	Aug 624.09 0.92 575.72 1073.34 1]m 370.23	\$ep 0.00 0.00 0.00 0.00 0.00	Oct (98) Oct 0.00 0.00 0.00 0.00 Σ(104)6 ded area ÷	1.2 =	2409.49 23.64 Dec 0.00 0.00 0.00 0.00 0.00 1154.95 0.46	(100) (101) (102) (103)
Space heating in Bc. Space cool Heat loss rate L Utilisation factor Useful loss nml. Gains Space cooling in Cooled fraction Intermittency for	487.04 requirement Jan m 0.00 or for loss nr 0.00 um (watts) { 0.00 equirement, 0.00 actor (Table 0.00 equirement	372.05 kWh/m²/yi ment Feb 0.00 0.00 0.00 0.00 whole dwt 0.00 10) 0.00 (104)m x (1	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 ((103)m - {1} 358.56	Jul 609.76 0.94 571.27 1144.06 102)m] x (4 426.16	Aug 624.09 0.92 575.72 1073.34 1]m 370.23	\$ep 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 Σ(104)6 0.00 Σ(106)6	1.2 =	2409.49 23.64 Dec 0.00 0.00 0.00 0.00 1154.95 0.46 0.00 0.75	(99) (100) (101) (102) (103) (104) (105)
Space heating in Bc. Space cool Heat loss rate L Utilisation factor Useful loss nml. Gains Space cooling in Cooled fraction Intermittency for	487.04 requirement ing requirer Jan .m 0.00 or for loss nr 0.00 .m (watts) { 0.00 0.00 equirement, 0.00 actor (Table	372.05 kWh/m²/yi ment 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 10) 0.00	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 ([103]m - [1] 358.56	Jul 609.76 0.94 571.27 1144.06 102)m] x (4 426.16	Aug 624.09 0.92 575.72 1073.34 1]m 370.23	\$ep 0.00 0.00 0.00 0.00 0.00	(98) Oct 0.00 0.00 0.00 0.00 0.00 0.00 0.00	1.2 =	2409.49 23.64 Dec 0.00 0.00 0.00 0.00 0.00 0.46	(99) (100) (101) (102) (103) (104) (105)
Space heating in Bc. Space cool Heat loss rate L Utilisation factor Useful loss nml. Gains Space cooling in Cooled fraction Intermittency for	487.04 requirement Jan m 0.00 or for loss nr 0.00 um (watts) { 0.00 equirement, 0.00 actor (Table 0.00 equirement	372.05 kWh/m²/yi ment Feb 0.00 0.00 0.00 0.00 whole dwt 0.00 10) 0.00 (104)m x (1	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 ((103)m - {1} 358.56	Jul 609.76 0.94 571.27 1144.06 102)m] x (4 426.16	Aug 624.09 0.92 575.72 1073.34 1]m 370.23	\$ep 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 Σ(104)6 0.00 Σ(106)6	1.2 =	2409.49 23.64 Dec 0.00 0.00 0.00 0.00 1154.95 0.46 0.00 0.75	(99) (100) (101) (102) (103) (104) (105)
Space heating n	487.04 requirement Jan m 0.00 or for loss nr 0.00 um (watts) { 0.00 equirement, 0.00 actor (Table 0.00 equirement	372.05 kWh/m²/yi ment Feb 0.00 0.00 0.00 0.00 whole dwt 0.00 10) 0.00 (104)m x (1	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 ((103)m - {1} 358.56	Jul 609.76 0.94 571.27 1144.06 102)m] x (4 426.16	Aug 624.09 0.92 575.72 1073.34 1]m 370.23	\$ep 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 Σ(104)6 0.00 Σ(106)6	1.2 =	2409.49 23.64 Dec 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	(99) (100) (101) (102) (103) (104) (105)
Space heating in Bc. Space cool Heat loss rate L Utilisation factor Useful loss nml. Gains Space cooling in Cooled fraction Intermittency for	487.04 requirement Jan m 0.00 or for loss nr 0.00 um (watts) { 0.00 equirement, 0.00 actor (Table 0.00 equirement	372.05 kWh/m²/yi ment Feb 0.00 0.00 0.00 0.00 whole dwt 0.00 10) 0.00 (104)m x (1	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 ((103)m - {1} 358.56	Jul 609.76 0.94 571.27 1144.06 102)m] x (4 426.16	Aug 624.09 0.92 575.72 1073.34 1]m 370.23	\$ep 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 Σ(104)6 0.00 Σ(106)6	1.2 =	2409.49 23.64 Dec 0.00	(99) (100) (101) (102) (103) (104) (105) (106)
Space heating in 8c. Space cool Heat loss rate L Utilisation factor Useful loss nml. Gains Space cooling in Cooled fraction intermittency for	487.04 requirement Jan m 0.00 or for loss nr 0.00 um (watts) { 0.00 equirement, 0.00 actor (Table 0.00 equirement	372.05 kWh/m²/yi ment Feb 0.00 0.00 0.00 0.00 whole dwt 0.00 10) 0.00 (104)m x (1	Mar 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Apr 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	May 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Jun 774.55 0.90 697.11 1195.11 ((103)m - {1} 358.56	Jul 609.76 0.94 571.27 1144.06 102)m] x (4 426.16	Aug 624.09 0.92 575.72 1073.34 1]m 370.23	\$ep 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 Σ(104)6 0.00 Σ(106)6	1.2 =	2409.49 23.64 Dec 0.00 0.00 0.00 0.00 10.00 0.00 0.00 0.75 0.00 0.75	(99) (100) (101) (102) (103) (104) (105) (106)

Space cooling requirement kWh/m²/year	$\Sigma(107)68 = 131.99$ (107) (107) + (4) = 1.29 (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 heat pump	1.00 (303a)
Fraction of total space heat from community heat pump	(302) x (303a) = 1.00 (304a)
Factor for control and charging method (Table 4c(3)) for community space heatin	
Factor for charging method (Table 4c(3)) for community water heating	1.00 (305a)
Distribution loss factor (Table 12c) for community heating system	1.25 (306)
Space heating	
Annual space heating requirement	2409.49 (98)
Space heat from heat pump	(98) x (304a) x (305) x (306) = 3011.86 (307a)
process reads to serious and an appropriate the serious serious serious serious serious serious serious serious	leaf is fac and a least a facet
Water heating	
Annual water heating requirement	2194.74 (64)
Water heat from heat pump	(64) x (303a) x (305a) x (306) = 2743.42 [310a]
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] = 57.55 (313)
Cooling System Energy Efficiency Ratio	4.05 (314)
Space cooling (if there is a fixed cooling system, if not enter 0)	(107) + (314) 32.59 (315)
Electricity for pumps, fans and electric keep-hot (Table 4f)	
mechanical ventilation fans - balanced, extract or positive input from outside	251.86 (330a)
Total electricity for the above, kWh/year	251.86 (331)
Electricity for lighting (Appendix L)	408.45 (332)
Total delivered energy for all uses (307) + (30	9) + (310) + (312) + (315) + (331) + (332)(337b) = 6448.18 (338)
10b. Fuel costs - community heating scheme	
Fuel	Fuel price Fuel
kWh/year	cost £/year
Space heating from heat pump 3011.86	x 4.24 x 0.01 = 127.70 (340a)
Water heating from heat pump 2743.42	x 4.24 x 0.01 = 116.32 (342a)
Space cooling 32.59	x 13.19 x 0.01 = 4.30 (348)
Pumps and fans 251.86	x 13.19 x 0.01 = 33.22 (349)
Electricity for lighting 408.45	x 13.19 x 0.01 = 53.87 (350)
Additional standing charges	120.00 (351)
Total energy cost	(340a)(342e) + (345)(354) = 455.42 (355)
11b. SAP rating - community heating scheme	
Energy cost deflator (Table 12)	0.42 (356)
Energy cost factor (ECF)	1.30 (357)
SAP value	81.84
SAP rating (section 13)	82 (358)
SAP band	В
12b. CO ₂ emissions - community heating scheme	
Energy kWh/year	Emission factor Emissions (kg/year)
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Emissions from other sources (space heating)						
Efficiency of heat pump	180.00					(367a)
CO2 emissions from heat pump [(307a)+(310a)] x 100 ÷ (367a)	3197.38	×	0.519		1659.44	(367)
Electrical energy for community heat distribution	57.55	×	0.519	=	29.87	(372)
Total CO2 associated with community systems					1689.31	(373)
Total CO2 associated with space and water heating						(376)
Space cooling	32.59	x	0.519	=		(377)
Pumps and fans	251.86	×	0.519			(378)
Electricity for lighting	408.45	×	0.519	=		(379)
	400.43	^	0.313			(383)
Total CO ₂ , kg/year				(376)(382)		
Dwelling CO ₂ emission rate				(383) ÷ (4)	===	(384)
El value					81.32	
El rating (section 14)						(385)
El band					В	
13b. Primary energy - community heating scheme						
	Energy		Primary factor		Primary energy	
	kWh/year				(kWh/year)	
Primary energy from other sources (space heating)						
Efficiency of heat pump	180.00					(367a)
Primary energy from heat pump [(307a)+(310a)] x 100 + (367a) :	3197.38	×	3.07	=	9815.95	(367)
Electrical energy for community heat distribution	57.55	×	3.07			(372)
Total primary energy associated with community systems						(373)
Total primary energy associated with space and water heating						(376)
Space cooling	32.59		3.07	_		(377)
Pumps and fans	251.86	х	3.07	=		(378)
Electricity for lighting	408.45	×	3.07	-	=	(379)
Primary energy kWh/year						(383)
Dwelling primary energy rate kWh/m2/year					118.89	(384)
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TER Worksheet Design - Draft					○ NHER
This design submission has property as constructed.	been carried out using Appro	ved SAP software. It has b	oeen prepare	d from plans and specific	ations and may not reflect the
Assessor name	Miss Michelle Wang			Assessor number	2018
Client				Last modified	04/02/2019
Address	Manor Road Richmond Blo	ck 1, Richmond, TW9			
1. Overall dwelling dimen	done				
1. Overall owelling dimen:	HOUS	Area (m²)		Average storey height (m)	Volume (m³)
Lowest occupied		101.94	(1a) x	2.63 (2a) = 268.10 (3a)
Total floor area	(1a) + (1b) + (1c) + (1d)(1n) = 101.94	(4)		
Dwelling volume				(3a) + (3b) + (3c) + (3d)(3n) = 268.10 (5)
2. Ventilation rate					
					m³ per hour
Number of chimneys				0	x 40 = 0 (6a)
lumber of open flues				0	x 20 = 0 (6b)
lumber of intermittent fan	5			4	x 10 = 40 (7a)
lumber of passive vents				0	x 10 = 0 (7b)
lumber of flueless gas fires				0	x 40 = 0 (7c)
					Air changes per hour
nfiltration due to chimneys	, flues, fans, PSVs	(6a) + (6b) + (7a	a) + (7b) + (7d) = 40	÷ (5) = 0.15 (8)
f a pressurisation test has t	een carried out or is intende	d, proceed to (17), otherw	ise continue j	rom (9) to (16)	
ir permeability value, q50,	expressed in cubic metres p	er hour per square metre	of envelope a	rea	5.00 (17)
f based on air permeability	value, then (18) = [(17) ÷ 20]	+ (8), otherwise (18) = (1	6)		0.40 (18)
Number of sides on which t	he dwelling is sheltered				2 (19)
helter factor				-	75 x (19)] = 0.85 (20)
nfiltration rate incorporatir nfiltration rate modified fo				(18) x (20) = 0.34 (21)
Jan	Feb Mar Ap	May Jun	Jul	Aug Sep	Oct Nov Dec
Monthly average wind spee					
5.10	5.00 4.90 4.4	4.30 3.80	3.80	3.70 4.00 4	3.30 4.50 4.70 (22)
Vind factor (22)m ÷ 4					
1.28	1.25 1.23 1.10		0.95	0.93 1.00 1	1.08 1.13 1.18 (22a)
	lowing for shelter and wind t				
0.43	0.42 0.42 0.3		0.32	0.31 0.34 0	0.36 0.38 0.40 (22b)
	ge rate for the applicable case are change rate through sys				N/A (23a)
	: air change rate through sys :overy: efficiency in % allowin		ahle 4h		N/A (23c)
	whole house positive input v	-			N/A (23C)
0.59	0.59 0.59 0.5		0.55	0.55 0.56 0	0.57 0.57 0.58 (24d)
ffective air change rate - e	nter (24a) or (24b) or (24c) o				, ,
0.59	0.59 0.59 0.5	7 0.57 0.55	0.55	0.55 0.56 0	0.57 0.57 0.58 (25)
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Element			Gross	Openings			U-value	AxUV		value,	Axk,	
		a	rea, m²	m²	Α,		W/m²K		_	J/m².K	kJ/K	
Window					25.	= :	1.33	= 33.8	=			(2
External wall					60.	= ;	0.18	= 10.84	=			(2
Party wall					31.	_ '	0.00	= 0.00				(3
Total area of external eler		e.			85.	72		-	e) (an)			(3
Fabric heat loss, W/K = ∑((20)		6)(30) +	=	44.65] (i
Heat capacity Cm = ∑(A x i Thermal mass parameter		~2V					(28)	(30) + (32)	+ (32a)(:	sze) =	N/A 250.00] (:] (:
Thermal bridges: Σ(L x Ψ)			div V							<u> </u>	6.93	٦,
Total fabric heat loss	calculateu u	sing Appen	JIX K						(33) +	(36) = -	51.58	٦,
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_ "
Ventilation heat loss calcu	lated month			,				_				
52.52	52.20	51.88	50.40	50.12	48.83	48.83	48.59	49.33	50.12	50.68	51.27	٦,
Heat transfer coefficient.											02.2.	_,,
104.09	103.77	103.46	101.98	101.70	100.41	100.41	100.17	100.91	101.70	102.26	102.85	٦
	_					7		Average =	Σ(39)112	/12 =	101.98	٦ď
Heat loss parameter (HLP)), W/m²K (39	9)m ÷ (4)										_
1.02	1.02	1.01	1.00	1.00	0.99	0.99	0.98	0.99	1.00	1.00	1.01	٦
								Average =	Σ(40)112	/12 =	1.00	Ī,
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] (
4. Water heating energy	requiremen	it										
4. Water heating energy	requiremen	it									2 76	٦,
Assumed occupancy, N			/d average	= /25 x N) +	36					F	2.76	Ξ,
Assumed occupancy, N			/d,average Apr	= (25 x N) +	36 Jun	Jul	Aug	Sep	Oct	Nov	2.76 99.67 Dec	Ξ,
Assumed occupancy, N Annual average hot water	usage in litr Feb	es per day \	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	99.67	Ξ,
Assumed occupancy, N Annual average hot water Jan	usage in litr Feb ner day for ea	es per day \	Apr	May	Jun		Aug 93.69	Sep 97.68	Oct 101.67		99.67 Dec	Ξ,
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p	usage in litr Feb ner day for ea	es per day \ Mar ach month \	Apr Vd,m = fac	May tor from Tabl	Jun le 1c x (43))				105.65	99.67 Dec	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p	usage in litr Feb eer day for ea 105.65	es per day \ Mar ach month \ 101.67	Apr Vd,m = fac 97.68	May tor from Tabl 93.69	Jun le 1c x (43) 89.71	89.71	93.69		101.67	105.65	99.67 Dec] (
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat	usage in litring Feb oer day for ea 105.65	es per day \ Mar ach month \ 101.67	Apr Vd,m = fac 97.68	May tor from Tabl 93.69	Jun le 1c x (43) 89.71 onth (see	89.71	93.69		101.67 Σ(44)1.	105.65	99.67 Dec 109.64 1196.08] (
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat	usage in litring Feb oer day for ea 105.65	es per day \ Mar ach month \ 101.67	Apr Vd,m = fac 97.68	May tor from Tabl 93.69 8600 kWh/m	Jun le 1c x (43) 89.71 onth (see	89.71 Tables 1b,	93.69 , 1c 1d)	97.68	101.67 Σ(44)1.	105.65 12 =	99.67 Dec 109.64 1196.08	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat	r usage in litre Feb over day for ex 105.65 ter used = 4.3	es per day \ Mar ach month \ 101.67	Apr Vd,m = fac 97.68	May tor from Tabl 93.69 8600 kWh/m	Jun le 1c x (43) 89.71 onth (see	89.71 Tables 1b,	93.69 , 1c 1d)	97.68	101.67 Σ(44)1.	105.65 12 =	99.67 Dec 109.64 1196.08	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4	r usage in litre Feb over day for ex 105.65 ter used = 4.3	es per day \ Mar ach month \ 101.67 18 x Vd,m x 146.74	Apr Vd,m = fact 97.68 nm x Tm/3 127.93	May tor from Tabl 93.69 3600 kWh/m 122.76	Jun le 1c x (43) 89.71 onth (see	89.71 Tables 1b,	93.69 , 1c 1d)	97.68	101.67 Σ(44)1.	105.65 12 =	99.67 Dec 109.64 1196.08	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc	rusage in litrr Feb oer day for ei 105.65 122.21 142.21 21.33	es per day \	Apr Vd,m = fact 97.68 nm x Tm/3 127.93	May tor from Tabl 93.69 8600 kWh/m 122.76	Jun 89.71 onth (see 105.93	89.71 Tables 1b, 98.16	93.69 , 1c 1d) 112.64	97.68	101.67 Σ(44)1. 132.84 Σ(45)1.	105.65 12 = 145.00 12 = 1	99.67 Dec 109.64 1196.08 157.46 1568.25	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc	usage in litr Feb per day for ea 105.65 ter used = 4.1 142.21 5)m 21.33	mar mar ach month 101.67 18 x Vd,m x 146.74 22.01 olar or WW	Apr Vd,m = fact 97.68 nm x Tm/3 127.93	May tor from Tabl 93.69 8600 kWh/m 122.76 18.41 ge within same	Jun 89.71 onth (see 105.93	89.71 Tables 1b, 98.16	93.69 , 1c 1d) 112.64	97.68	101.67 Σ(44)1. 132.84 Σ(45)1.	105.65 12 = 145.00 12 = 1	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc Water storage loss: a) If manufacturer's decla	usage in litr Feb per day for e: 105.65 ter used = 4.: 142.21 5)m 21.33 cred loss factor	mar mar ach month 101.67 18 x Vd,m x 146.74 22.01 olar or WW	Apr Vd,m = fact 97.68 nm x Tm/3 127.93	May tor from Tabl 93.69 8600 kWh/m 122.76 18.41 ge within same	Jun 89.71 onth (see 105.93	89.71 Tables 1b, 98.16	93.69 , 1c 1d) 112.64	97.68	101.67 Σ(44)1. 132.84 Σ(45)1.	105.65 12 = 145.00 12 = 1	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00 1.62	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc Water storage loss: a) If manufacturer's decla Temperature factor fre	usage in litr Feb ner day for ei 105.65 ter used = 4. 142.21 S)m 21.33 Luding any sered loss factor om Table 2b	mar ach month 1 101.67 18 x Vd,m x 146.74 22.01 22.01 olar or WW	Apr Vd,m = fact 97.68 nm x Tm/3 127.93 19.19 HRS storag	May tor from Tabl 93.69 8600 kWh/m 122.76 18.41 ge within same	Jun 89.71 onth (see 105.93	89.71 Tables 1b, 98.16	93.69 , 1c 1d) 112.64	97.68	101.67 Σ(44)1. 132.84 Σ(45)1.	105.65 12 = 145.00 12 = 1	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc Water storage loss: a) If manufacturer's decla Temperature factor fro Energy lost from water	usage in litr Feb eer day for ei 105.65 teer used = 4. 142.21 S)m 21.33 Ludding any sered loss factor om Table 2b	mar ach month 1 101.67 18 x Vd,m x 146.74 22.01 22.01 olar or WW	Apr Vd,m = fact 97.68 nm x Tm/3 127.93 19.19 HRS storag	May tor from Tabl 93.69 8600 kWh/m 122.76 18.41 ge within same	Jun 89.71 onth (see 105.93	89.71 Tables 1b, 98.16	93.69 , 1c 1d) 112.64	97.68	101.67 Σ(44)1. 132.84 Σ(45)1.	105.65 12 = 145.00 12 = 1	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00 1.62 0.54 0.88	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc Water storage loss: a) If manufacturer's decla Temperature factor fro Energy lost from water Enter (50) or (54) in (55)	usage in litr Feb ser day for ex 105.65 ter used = 4 142.21 5)m 21.33 cluding any sered loss factor m Table 2b extorage (kW	mar ach month \(\) 101.67 18 x Vd,m x 146.74 22.01 olar or WW or is known	Apr Vd,m = fact 97.68 nm x Tm/3 127.93 19.19 tHRS storag (kWh/day)	May tor from Tabl 93.69 8600 kWh/m 122.76 18.41 ge within same	Jun 89.71 onth (see 105.93	89.71 Tables 1b, 98.16	93.69 , 1c 1d) 112.64	97.68	101.67 Σ(44)1. 132.84 Σ(45)1.	105.65 12 = 145.00 12 = 1	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00 1.62 0.54	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc Water storage loss: a) If manufacturer's decla Temperature factor fro Energy lost from water Enter (50) or (54) in (55) Water storage loss calcula	usage in litr Feb ser day for ei 105.65 ter used = 4 142.21 55)m 21.33 21.33 cred loss facts om Table 2b storage (kW	mar ach month \ 101.67 \ 18 x Vd,m x \ 146.74 \ 22.01 \ 21.01 \ 22.01 \ 22.01 \ 23.01 \ 23.01 \ 24.01 \ 25.01	Apr Vd,m = fact 97.68 nm x Tm/3 127.93 19.19 (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day)	May tor from Table 93.69 93.600 kWh/m 122.76 18.41 ge within sam	Jun le 1c x {43; 89.71 onth (see 105.93 15.89 ne vessel	89.71 Tables 1b, 98.16	93.69 , 1c 1d) 112.64	97.68	101.67 Σ(44)1. 132.84 Σ(45)1. 19.93	105.6512 = 145.0012 = 21.75	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00 1.62 0.54 0.88 0.88	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc Water storage loss: a) If manufacturer's decla Temperature factor fre Energy lost from water Enter (50) or (54) in (55) Water storage loss calcula	usage in litr Feb ser day for ei 105.65 ter used = 4.1 142.21 21.33 21.33 21.33 ered loss facts om Table 2b storage (kW	wes per day \\ \text{Mar} \text{ach month \cdot \text{101.67}} \text{101.67} \text{18 x Vd,m x} \text{146.74} \text{22.01} \text{colar or WW} \text{or is known} \text{vh/day) (48} \text{month (55} \text{27.16}	Apr Vd,m = fac 97.68 nm x Tm/3 127.93 19.19 HRS storag (kWh/day) 8) x (49) 26.29	May tor from Table 93.69 33600 kWh/m 122.76 18.41 ge within sam	Jun le 1c x {43; 89.71 onth (see 105.93 15.89 ne vessel	89.71 Tables 1b, 98.16 14.72	93.69 , 1c 1d) 112.64 16.90	97.68	101.67 Σ(44)1. 132.84 Σ(45)1.	105.65 12 = 145.00 12 = 1	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00 1.62 0.54 0.88	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres p 109.64 Energy content of hot wate 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc Water storage loss: a) If manufacturer's declar Temperature factor for Energy lost from water Enter (50) or (54) in (55) Water storage loss calcula 27.16 If the vessel contains dedi	usage in litring Feb per day for each 105.65 ter used = 4.1 142.21 21.33 cluding any streed loss factor m Table 2b or storage (kW teed for each 24.54 cated solar storage storage)	who was per day \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Apr Vd,m = fac 97.68 nm x Tm/3 127.93 19.19 (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day)	May tor from Table 93.69 93.600 kWh/m 122.76 18.41 ge within sarr 27.16 WWHRS (56)n	Jun le 1c x (43; 89.71 onth (see 105.93 15.89 ne vessel	98.16 98.16 14.72 27.16 Vs] ÷ (47),	93.69 .1c 1d) .112.64 .16.90 .27.16 else (56)	97.68	101.67 Σ(44)1. 132.84 Σ(45)1. 19.93	105.6512 = 145.0012 = 21.75	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00 1.62 0.54 0.88 0.88	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres in 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc Water storage loss: a) If manufacturer's decla Temperature factor fre Energy lost from water Enter (50) or (54) in (55) Water storage loss calculated in the second of the	usage in litring Feb per day for each as a case of the second and	es per day \	Apr Vd,m = fac 97.68 nm x Tm/3 127.93 19.19 HRS storag (kWh/day) 8) x (49) 26.29	May tor from Table 93.69 33600 kWh/m 122.76 18.41 ge within sam	Jun le 1c x {43; 89.71 onth (see 105.93 15.89 ne vessel	89.71 Tables 1b, 98.16 14.72	93.69 , 1c 1d) 112.64 16.90	97.68	101.67 Σ(44)1. 132.84 Σ(45)1. 19.93	105.6512 = 145.0012 = 21.75	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00 1.62 0.54 0.88 0.88	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres in 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) ine Water storage loss: a) If manufacturer's decla Temperature factor fre Energy lost from water Enter (50) or (54) in (55) Water storage loss calcular in the vessel contains dedi	usage in litr Feb per day for ea 105.65 ter used = 4.: 142.21 5)m 21.33 21.33 cred loss factom Table 2b or storage (kW ated for each 24.54 cated solar s 24.54 ch month from	wes per day \ Mar ach month \ 101.67 18 x Vd,m x 146.74 22.01 olar or WW or is known wh/day) (48 month (55) 27.16 torage or d 27.16 m Table 3	Apr Vd,m = fac 97.68 nm x Tm/3 127.93 19.19 (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day)	May tor from Table 93.69 3600 kWh/m 122.76 18.41 ge within sam 27.16 vwHRS (56)n 27.16	Jun le 1c x (43) 89.71 onth (see 105.93 15.89 ne vessel 26.29 n x [(47) - 26.29	98.16 14.72 27.16 Vs] ÷ (47),	93.69 , 1c 1d) 112.64 16.90 27.16 else (56) 27.16	97.68 113.98 17.10	101.67 \(\Sigma(44)\)1. 132.84 \(\Sigma(45)\)1. 19.93 27.16	105.6512 =	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00 1.62 0.54 0.88 0.88 27.16	
Assumed occupancy, N Annual average hot water Jan Hot water usage in litres in 109.64 Energy content of hot wat 162.59 Distribution loss 0.15 x (4 24.39 Storage volume (litres) inc Water storage loss: a) If manufacturer's decla Temperature factor fre Energy lost from water Enter (50) or (54) in (55) Water storage loss calculated in the second of the	usage in litring Feb per day for each as a case of the second and	es per day \	Apr Vd,m = fac 97.68 nm x Tm/3 127.93 19.19 (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day) (kWh/day)	May tor from Table 93.69 93.600 kWh/m 122.76 18.41 ge within sarr 27.16 WWHRS (56)n	Jun le 1c x (43; 89.71 onth (see 105.93 15.89 ne vessel	98.16 98.16 14.72 27.16 Vs] ÷ (47),	93.69 .1c 1d) .112.64 .16.90 .27.16 else (56)	97.68	101.67 Σ(44)1. 132.84 Σ(45)1. 19.93	105.6512 = 145.0012 = 21.75	99.67 Dec 109.64 1196.08 157.46 1568.25 23.62 194.00 1.62 0.54 0.88 0.88	

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Combi loss for e	ach month	from Table	3a, 3b or 3	С								
	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 requ	ired for wate	er heating o	alculated f	or each mo	onth 0.85 x	(45)m + (46	5)m + (57)n	n + (59)m +	(61)m			
	213.02	187.75	197.17	176.74	173.18	154.73	148.59	163.07	162.78	183.26	193.80	207.89 (62)
Solar DHW inpu	t calculated	using Appe	endix G or A	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 wa												(44)
output monn we	213.02	187.75	197.17	176.74	173.18	154.73	148.59	163.07	162.78	183.26	193.80	207.89
	213.02	107.73	197.17	1/0./4	1/3.10	134.73	140.39	103.07	102.76			_
		(1.44 ft. /		10 05	(45) (64			71 /50		Σ(64)1:	12 = 2	161.99 (64)
Heat gains from												
	94.40	83.72	89.13	81.58	81.16	74.26	72.98	77.79	76.94	84.51	87.25	92.70 (65)
5. Internal gai	ns											
or meeting Ban	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains		100	with	Apr.	iviay	3011	201	Aug	эср	Oct	1100	bee
Wetabolic gails	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84	137.84 (66)
							137.84	137.84	137.84	137.84	137.84	137.84 (66)
Lighting gains (
	23.13	20.54	16.71	12.65	9.45	7.98	8.62	11.21	15.05	19.10	22.30	23.77 (67)
Appliance gains	(calculated	in Appendi	x L, equatio	on L13 or L1	L3a), also s	ee Table 5						
	259.43	262.12	255.33	240.89	222.66	205.53	194.08	191.39	198.17	212.62	230.85	247.98 (68)
Cooking gains (alculated in	Appendix	L, equation	L15 or L15	a), also see	Table 5						
	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78	36.78 (69)
Pump and fan g	ains (Table 5	Sa)										
	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00 (70)
Losses e.g. evap	oration (Tal	ole 5)										
	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27	-110.27 (71)
Water heating a	tains (Table		220.27	220.27	220.23	-110.27	-110.27	-110.27	-110.27	-110.27	110.27	(,,,,
Water heating រូ		5)										
	126.89	5) 124.59	119.80	113.30	109.08	103.14	98.09	104.56	106.86	113.59	121.19	124.59 (72)
Water heating g	126.89 ains (66)m +	5) 124.59 - (67)m + (6	119.80 i8)m + (69)r	113.30 m + (70)m -	109.08 + (71)m + (103.14 72)m	98.09	104.56	106.86	113.59	121.19	124.59 (72)
	126.89	5) 124.59	119.80	113.30	109.08	103.14						
	126.89 ains (66)m +	5) 124.59 - (67)m + (6	119.80 i8)m + (69)r	113.30 m + (70)m -	109.08 + (71)m + (103.14 72)m	98.09	104.56	106.86	113.59	121.19	124.59 (72)
Total internal g	126.89 ains (66)m +	5) 124.59 - (67)m + (6	119.80 i8)m + (69)r	113.30 m + (70)m - 434.20	109.08 + (71)m + (103.14 72)m 384.00	98.09	104.56	106.86	113.59	121.19	124.59 (72)
Total internal g	126.89 ains (66)m +	5) 124.59 - (67)m + (6	119.80 88)m + (69)r 459.20	113.30 m + (70)m - 434.20 actor	109.08 + (71)m + (408.55	103.14 72)m 384.00	98.09 368.15	104.56 374.51	106.86 387.43 g	113.59 412.66 FF specific d	121.19 441.68	124.59 (72) 463.70 (73)
Total internal g	126.89 ains (66)m +	5) 124.59 - (67)m + (6	119.80 8)m + (69)r 459.20	113.30 m + (70)m - 434.20 actor	109.08 + (71)m + (408.55	103.14 72)m 384.00	98.09 368.15	104.56 374.51	106.86 387.43	113.59 412.66	121.19 441.68	124.59 (72) 463.70 (73)
Total internal g	126.89 ains (66)m +	5) 124.59 - (67)m + (6	119.80 8)m + (69)r 459.20	113.30 m + (70)m - 434.20 actor 6d	109.08 + (71)m + (408.55	103.14 72)m 384.00 Soli	98.09 368.15 or flux //m²	104.56 374.51 spec or T	106.86 387.43 g	113.59 412.66 FF specific d	121.19 441.68	124.59 (72) 463.70 (73)
Total internal g	126.89 ains (66)m +	5) 124.59 - (67)m + (6	119.80 8)m + (69)r 459.20 Access f Table	113.30 m + (70)m - 434.20 actor 6d	109.08 + (71)m + (408.55 Area m ²	103.14 72)m 384.00 Soli W	98.09 368.15 ar flux //m²	104.56 374.51 spec or T	106.86 387.43 g ific data able 6b	113.59 412.66 FF specific do or Table	121.19 441.68	124.59 (72) 463.70 (73) Gains
Total internal g	126.89 ains (66)m +	5) 124.59 - (67)m + (6	119.80 8)m + (69)n 459.20 Access f Table	113.30 m + (70)m - 434.20 actor 6d 7 x	109.08 + (71)m + (408.55 Area m ² 7.09	103.14 72)m 384.00 Solu W	98.09 368.15 ar flux t/m² 5.79 ×	374.51 spec or T 0.9 x	387.43 g ific data able 6b	113.59 412.66 FF specific d or Table 0.70	121.19 441.68	124.59 (72) 463.70 (73) Gains W 79.72 (77)
Total internal g: 6. Solar gains SouthEast SouthWest	126.89 ains (66)m + 476.79	124.59 124.59 - (67)m + (6 474.60	119.80 18)m + (69)a 459.20 Access f Table	113.30 m + (70)m - 434.20 actor 6d 7 x	109.08 + (71)m + (' 408.55 Area m ² 7.09 7.55	103.14 72)m 384.00 Solu W	98.09 368.15 ar flux t/m² 5.79 ×	374.51 spec or T 0.9 x	387.43 g lific data able 6b 0.63 x	113.59 412.66 FF specific d or Table 0.70 0.70	121.19 441.68 ata 6c = = =	124.59 (72) 463.70 (73) Gains w 79.72 (77) 84.90 (79)
Total internal g: 6. Solar gains SouthEast SouthWest NorthWest	126.89 ains (66)m + 476.79	124.59 124.59 - (67)m + (6 474.60	119.80 18)m + (69)a 459.20 Access f Table	113.30 m + (70)m - 434.20 actor 6d 7 x	109.08 + (71)m + (' 408.55 Area m ² 7.09 7.55	103.14 72)m 384.00 Solu W	98.09 368.15 ar flux t/m² 5.79 ×	374.51 spec or T 0.9 x	387.43 g lific data able 6b 0.63 x	113.59 412.66 FF specific d or Table 0.70 0.70	121.19 441.68 ata 6c = = =	124.59 (72) 463.70 (73) Gains w 79.72 (77) 84.90 (79)
Total internal g: 6. Solar gains SouthEast SouthWest NorthWest	126.89 1	124.59 124.59 (67)m+(6 474.60	119.80 18)m + (69)i 459.20 Access f Table 0.77 0.77	113.30 m + (70)m - 434.20 actor 6d 7 x 7 x 7	109.08 + (71)m + ('408.55) Area m² 7.09 7.55	103.14 772)m 384.00 Soli W x 30 x 31 x 1	98.09 368.15 ar flux //m² 5.79 × 1.28 ×	374.51 spec or T 0.9 x 0.9 x 0.9 x	8 sific data able 6b 0.63 × 0.63 × 0.63 ×	113.59 412.66 FF specific d or Table 0.70 0.70	121.19 441.68 ata 6c = = = = = = = = = = = = = = = = = = =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81)
6. Solar gains SouthEast SouthWest NorthWest Solar gains in w	126.89 1	124.59 124.59 (67)m + (6 474.60 (82)m 356.64 lar (73)m +	119.80 119.80 18)m + (69)ii 459.20 Access f Table 0.77 0.77 0.77 521.01 (83)m	113.30 m + (70)m - 434.20 actor 6d 7 x 7 7 x 7 700.93	109.08 + (71)m + (72)m + (73)m + (74)m	103.14 72)m 384.00 Solution x 33 x 33 x 1	98.09 368.15 ar flux //m² 5.79 × 1.28 × 812.01	104.56 374.51 spec or T 0.9 x 0.9 x 708.11	8 8 1fic data able 6b 0.63 × 0.63 × 582.78	113.59 412.66 FF specific d or Table 0.70 0.70 403.07	121.19 441.68 ata 6c = = = 244.30	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83)
6. Solar gains SouthEast SouthWest NorthWest Solar gains in w	126.89 1	124.59 124.59 (67)m+(6 474.60	119.80 119.80 18)m + (69)ii 459.20 Access f Table 0.77 0.77 0.77 521.01 (83)m	113.30 m + (70)m - 434.20 actor 6d 7 x 7 x 7	109.08 + (71)m + (72)m + (73)m + (74)m	103.14 72)m 384.00 Solution x 33 x 33 x 1	98.09 368.15 ar flux //m² 5.79 × 1.28 ×	104.56 374.51 spec or T 0.9 x 0.9 x 708.11	8 sific data able 6b 0.63 × 0.63 × 0.63 ×	113.59 412.66 FF specific d or Table 0.70 0.70	121.19 441.68 ata 6c = = = = = = = = = = = = = = = = = = =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81)
6. Solar gains SouthEast SouthWest NorthWest Solar gains in w	126.89 126.89 1476.79 476.79 476.79 202.07 202.07 678.86	5) 124.59 (67)m + (6 474.60 474.60 (82)m 356.64 lar (73)m +	119.80 (8)m + (69) 459.20 Access f Table 0.77 0.77 521.01 (83)m 980.20	113.30 m + (70)m - 434.20 actor 6d 7 x 7 7 x 7 700.93	109.08 + (71)m + (72)m + (73)m + (74)m	103.14 72)m 384.00 Solution x 33 x 33 x 1	98.09 368.15 ar flux //m² 5.79 × 1.28 × 812.01	104.56 374.51 spec or T 0.9 x 0.9 x 708.11	8 8 1fic data able 6b 0.63 × 0.63 × 582.78	113.59 412.66 FF specific d or Table 0.70 0.70 403.07	121.19 441.68 ata 6c = = = 244.30	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83)
6. Solar gains 6. Solar gains SouthEast SouthWest NorthWest Solar gains in w Total gains - int	126.89 ains (66)m + 476.79 476.79 atts Σ(74)m 202.07 ernal and so 678.86 al tempera	5) 124.59 - (67)m + (6 474.60 (82)m 356.64 lar (73)m + 831.24 ture (heati	119.80 459.20 459.20 Access f Table 0.77 0.77 0.77 (83)m 980.20	113.30 m + (70)m - 434.20 actor 6d 7 × 7 × 700.93	109.08 + (71)m + ('1408.55) Area m² 7.09 7.55 10.86 835.65	103.14 72)m 384.00 Solution x 3.3 x 3.3 x 1 851.84	98.09 368.15 ar flux //m² 5.79 × 1.28 × 812.01	104.56 374.51 spec or T 0.9 x 0.9 x 708.11	8 8 1fic data able 6b 0.63 × 0.63 × 582.78	113.59 412.66 FF specific d or Table 0.70 0.70 403.07	121.19 441.68 ata 6c = = = = = = = = = = = = = = = = = = =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83)
6. Solar gains SouthEast SouthWest NorthWest Solar gains in w Total gains - int	126.89 ains (66)m + 476.79 476.79 atts Σ(74)m 202.07 ernal and so 678.86 al tempera	5) 124.59 - (67)m + (6 474.60 (82)m 356.64 lar (73)m + 831.24 ture (heati	119.80 459.20 459.20 Access f Table 0.77 0.77 0.77 (83)m 980.20	113.30 m + (70)m - 434.20 actor 6d 7 × 7 × 700.93	109.08 + (71)m + ('1408.55) Area m² 7.09 7.55 10.86 835.65	103.14 72)m 384.00 Solution x 3.3 x 3.3 x 1 851.84	98.09 368.15 ar flux //m² 5.79 × 1.28 × 812.01	104.56 374.51 spec or T 0.9 x 0.9 x 708.11	8 8 1fic data able 6b 0.63 × 0.63 × 582.78	113.59 412.66 FF specific d or Table 0.70 0.70 403.07	121.19 441.68 ata 6c = = = = = = = = = = = = = = = = = = =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83) 635.16 (84)
6. Solar gains SouthEast SouthWest NorthWest Solar gains in w Total gains - int	126.89 sins (66)m + 476.79 atts Σ(74)m 202.07 ernal and so 678.86 al tempera uring heating Jan	124.59 124.59 - (67)m + (6 474.60 474.60 356.64 lar (73)m + 831.24 ture (heatilg periods in Feb	119.80 88)m + (69)n 459.20 Access f Table 0.77 0.77 521.01 (83)m 980.20 ng season) the living a	113.30 m + (70)m - (434.20 data) (actor 6d data) 7	109.08 + (71)m + (' 408.55 Area m² 7.09 7.55 10.86 835.65	103.14 72)m 384.00 Soli W x 3: x 3: x 1 851.84 1235.84	98.09 368.15 ar flux /m² 5.79 x 5.79 x 812.01	374.51 spec or T 0.9 x 0.9 x 708.11 1082.62	106.86 387.43 g ffic data able 6b 0.63 ×	113.59 412.66 FF specific d or Table 0.70 0.70 403.07	121.19 441.68 ata 6c = = = = = = = = = = = = = = = = = = =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83) 635.16 (84)
6. Solar gains SouthEast SouthWest NorthWest Solar gains in w Total gains - int 7. Mean intern Temperature di	126.89 sins (66)m + 476.79 atts Σ(74)m 202.07 ernal and so 678.86 al tempera uring heating Jan	124.59 124.59 - (67)m + (6 474.60 474.60 356.64 lar (73)m + 831.24 ture (heatilg periods in Feb	119.80 88)m + (69)n 459.20 Access f Table 0.77 0.77 521.01 (83)m 980.20 ng season) the living a	113.30 m + (70)m - (434.20 data) (actor 6d data) 7	109.08 + (71)m + (' 408.55 Area m² 7.09 7.55 10.86 835.65	103.14 72)m 384.00 Soli W x 3: x 3: x 1 851.84 1235.84	98.09 368.15 ar flux /m² 5.79 x 5.79 x 812.01	374.51 spec or T 0.9 x 0.9 x 708.11 1082.62	106.86 387.43 g ffic data able 6b 0.63 ×	113.59 412.66 FF specific d or Table 0.70 0.70 403.07	121.19 441.68 ata 6c = = = = = = = = = = = = = = = = = = =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83) 635.16 (84)
6. Solar gains SouthEast SouthWest NorthWest Solar gains in w Total gains - int 7. Mean intern Temperature di	126.89 ains (66)m 4 476.79 atts Σ(74)m 202.07 ernal and so 678.86 all tempera uring heating Jan r for gains fr	124.59 124.59 - (67)m + (6 474.60 474.60 356.64 lar (73)m + 831.24 ture (heating periods in Feb or living area	119.80 18)m + (69)m 459.20 Access f Table 0.77 0.77 521.01 (83)m 980.20 ng season) the living a Mar an 1,m (see	113.30 m + (70)m - 434.20 actor 6d 7	109.08 + (71)m + (100.00) 408.55 Area m ² 7.09 7.55 10.86 835.65 1244.20 Table 9, Th1 May	103.14 72)m 384.00 Soli W x 33 x 1 851.84 1235.84	98.09 368.15 ar flux //m² 5.79 × 5.79 × 1.28 × 812.01 1180.16	374.51 spec or T 0.9 x 0.9 x 708.11 1082.62	8 fific data able 6b 0.63 × 0.63 × 0.63 × 0.63 × 582.78	113.59 412.66 FF specific d or Table 10.70 403.07 815.73	121.19 441.68 ata 6c = = = = = = = = = = = = = = = = = = =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83) 635.16 (84) 21.00 (85) Dec
6. Solar gains 6. Solar gains SouthEast SouthWest NorthWest Solar gains in w Total gains - int 7. Mean interr Temperature du Utilisation factor	126.89 ains (66)m 4 476.79 atts Σ(74)m 202.07 ernal and so 678.86 all tempera uring heating Jan r for gains fr	124.59 124.59 - (67)m + (6 474.60 474.60 356.64 lar (73)m + 831.24 ture (heating periods in Feb or living area	119.80 18)m + (69)m 459.20 Access f Table 0.77 0.77 521.01 (83)m 980.20 ng season) the living a Mar an 1,m (see	113.30 m + (70)m - 434.20 actor 6d 7	109.08 + (71)m + (100.00) 408.55 Area m ² 7.09 7.55 10.86 835.65 1244.20 Table 9, Th1 May	103.14 72)m 384.00 Soli W x 33 x 1 851.84 1235.84	98.09 368.15 ar flux //m² 5.79 × 5.79 × 1.28 × 812.01 1180.16	374.51 spec or T 0.9 x 0.9 x 708.11 1082.62	8 fific data able 6b 0.63 × 0.63 × 0.63 × 0.63 × 582.78	113.59 412.66 FF specific d or Table 10.70 403.07 815.73	121.19 441.68 ata 6c = = = = = = = = = = = = = = = = = = =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83) 635.16 (84) 21.00 (85) Dec
6. Solar gains 6. Solar gains SouthEast SouthWest NorthWest Solar gains in w Total gains - int 7. Mean interr Temperature du Utilisation factor	126.89 ains (66)m 4 476.79 atts Σ(74)m 202.07 ernal and so 678.86 all tempera uring heating Jan r for gains fr	124.59 124.59 - (67)m + (6 474.60 474.60 356.64 lar (73)m + 831.24 ture (heating periods in Feb or living area	119.80 18)m + (69)m 459.20 Access f Table 0.77 0.77 521.01 (83)m 980.20 ng season) the living a Mar an 1,m (see	113.30 m + (70)m - 434.20 actor 6d 7	109.08 + (71)m + (100.00) 408.55 Area m ² 7.09 7.55 10.86 835.65 1244.20 Table 9, Th1 May	103.14 72)m 384.00 Soli W x 33 x 1 851.84 1235.84	98.09 368.15 ar flux //m² 5.79 × 5.79 × 1.28 × 812.01 1180.16	374.51 spec or T 0.9 x 0.9 x 708.11 1082.62	8 fific data able 6b 0.63 × 0.63 × 0.63 × 0.63 × 582.78	113.59 412.66 FF specific d or Table 10.70 403.07 815.73	121.19 441.68 ata 6c = = = = = = = = = = = = = = = = = = =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83) 635.16 (84) 21.00 (85) Dec
6. Solar gains 6. Solar gains SouthEast SouthWest NorthWest Solar gains in w Total gains - int 7. Mean interr Temperature du Utilisation factor	126.89 ains (66)m 4 476.79 atts Σ(74)m 202.07 ernal and so 678.86 all tempera uring heating Jan r for gains fr	124.59 124.59 - (67)m + (6 474.60 474.60 356.64 lar (73)m + 831.24 ture (heating periods in Feb or living area	119.80 18)m + (69)m 459.20 Access f Table 0.77 0.77 521.01 (83)m 980.20 ng season) the living a Mar an 1,m (see	113.30 m + (70)m - 434.20 actor 6d 7	109.08 + (71)m + (100.00) 408.55 Area m ² 7.09 7.55 10.86 835.65 1244.20 Table 9, Th1 May	103.14 72)m 384.00 Soli W x 33 x 1 851.84 1235.84	98.09 368.15 ar flux //m² 5.79 × 5.79 × 1.28 × 812.01 1180.16	374.51 spec or T 0.9 x 0.9 x 708.11 1082.62	8 fific data able 6b 0.63 × 0.63 × 0.63 × 0.63 × 582.78	113.59 412.66 FF specific d or Table 0.70 0.70 403.07 815.73 Oct	121.19 441.68 ata 6c =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83) 635.16 (84) 21.00 (85) Dec 1.00 (86)
6. Solar gains 6. Solar gains SouthEast SouthWest NorthWest Solar gains in w Total gains - int 7. Mean interr Temperature du Utilisation factor	126.89 ains (66)m 4 476.79 atts Σ(74)m 202.07 ernal and so 678.86 all tempera uring heating Jan or for gains fo	124.59 124.59 - (67)m + (6 474.60 474.60 356.64 lar (73)m + 831.24 ture (heating periods in Feb or living area	119.80 18)m + (69)m 459.20 Access f Table 0.77 0.77 521.01 (83)m 980.20 ng season) the living a Mar an 1,m (see	113.30 m + (70)m - 434.20 actor 6d 7	109.08 + (71)m + (100.00) 408.55 Area m ² 7.09 7.55 10.86 835.65 1244.20 Table 9, Th1 May	103.14 72)m 384.00 Soli W x 33 x 1 851.84 1235.84	98.09 368.15 ar flux //m² 5.79 × 5.79 × 1.28 × 812.01 1180.16	374.51 spec or T 0.9 x 0.9 x 708.11 1082.62	8 fific data able 6b 0.63 × 0.63 × 0.63 × 0.63 × 582.78	113.59 412.66 FF specific d or Table 0.70 0.70 403.07 815.73 Oct	121.19 441.68 ata 6c =	124.59 (72) 463.70 (73) Gains W 79.72 (77) 84.90 (79) 37.45 (81) 171.46 (83) 635.16 (84) 21.00 (85) Dec

70.00 20.00 20.00 20.00 20.00		24.00		20.72	20.20	40.07	(0.7)
20.00 20.20 20.48 20.78 20.95 Temperature during heating periods in the rest of dwelling from Tab		21.00 21.00	20.97	20.72	20.30	19.97	(87)
20.07 20.07 20.08 20.08		20.10 20.10	20.09	20.09	20.08	20.08	(88)
Jtilisation factor for gains for rest of dwelling n2,m	20.10	20.10 20.10	20.09	20.09	20.08	20.08	(88)
1.00 0.99 0.95 0.85 0.66	0.44	0.30 0.34	0.61	0.91	0.99	1.00	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3			0.61	0.91	0.99	1.00	(03)
18.73 19.03 19.42 19.84 20.04		20.10 20.10	20.07	19.78	19.18	18.69	(90)
.iving area fraction	20.03	20.10 20.10		ing area +		0.46	(91)
Nean internal temperature for the whole dwelling fLA x T1 +(1 - fLA)	x T2		LIV	ilig area +	(4) -	2.40	(31)
19.31 19.56 19.90 20.27 20.45		20.51 20.51	20.48	20.21	19.69	19.27	(92)
apply adjustment to the mean internal temperature from Table 4e v			20110	20.22	25.05	23.27	()
19.31 19.56 19.90 20.27 20.45		20.51 20.51	20.48	20.21	19.69	19.27	(93)
2552 2550 2550 2510	20.20	20.02	20.10	20.22	25.05	25.27	(55)
8. Space heating requirement							
Jan Feb Mar Apr May	Jun	Jul Aug	Sep	Oct	Nov	Dec	
Jtilisation factor for gains, ηm							
0.99 0.98 0.95 0.86 0.68	0.48	0.33 0.38	0.64	0.91	0.99	1.00	(94)
seful gains, ηmGm, W (94)m x (84)m							
675.04 817.80 933.72 973.93 847.1	6 588.07	391.97 410.58	621.24	746.07	676.49	632.59	(95)
Nonthly 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)
leat loss rate for mean internal temperature, Lm, W [(39)m x [(93)r							
1562.54 1521.51 1386.84 1159.51 890.1		392.46 411.60	643.81	977.22	1287.58	1550.29	(97)
pace heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (4	11)m						
660.30 472.90 337.12 133.61 31.96	0.00	0.00 0.00	0.00	171.97	439.98	682.77	
660.30 472.90 337.12 133.61 31.96	0.00	0.00 0.00		171.97 3)15, 10		682.77 30.61	(98)
	0.00	0.00 0.00		3)15, 10	12 = 29	30.61	(98) (99)
pace heating requirement kWh/m²/year		0.00 0.00		3)15, 10	12 = 29	30.61	
pace heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mi		0.00 0.00		3)15, 10	12 = 29	30.61	
pace heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mi pace heating	cro-CHP	0.00 0.00		3)15, 10	12 = 29 ÷ (4) 2	30.61	
pace heating requirement kWh/m²/year 9a. Energy requirements - Individual heating systems including mi pace heating raction of space heat from secondary/supplementary system (table	cro-CHP	0.00 0.00		3)15, 10	12 = 29 ÷ (4) 2	30.61 8.75	(99)
pace heating requirement kWh/m²/year 9a. Energy requirements – individual heating systems including mi pace heating raction of space heat from secondary/supplementary system (table raction of space heat from main system(s)	cro-CHP	0.00 0.00		(98) (98)	12 = 29 ÷ (4) 2	30.61 8.75	(99)
pace heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mi pace heating raction of space heat from secondary/supplementary system (table raction of space heat from main system(s) raction of space heat from main system 2	cro-CHP	0.00 0.00	∑(98	(98)	12 = 29 ÷ (4) 2	30.61 8.75 0.00	(99) (201) (202)
pace heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mipace heating raction of space heat from secondary/supplementary system (table raction of space heat from main system(s) raction of space heat from main system 2 raction of total space heat from main system 1	cro-CHP	0.00 0.00	∑(98	3)15, 10 (98)	12 = 29 ÷ (4) 2 01) = (0)	30.61 8.75 0.00 1.00	(201) (202) (202)
pace heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mipace heating raction of space heat from secondary/supplementary system (table raction of space heat from main system(s) raction of space heat from main system 2 raction of total space heat from main system 1 raction of total space heat from main system 2	cro-CHP	0.00 0.00	∑(98	3}15, 10 (98) 1 - (20	12 = 29 ÷ (4) 2 01) = (0) (3)] = (0)	30.61 8.75 0.00 1.00 0.00	(201) (202) (202) (204)
pace heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mipace heating raction of space heat from secondary/supplementary system (table raction of space heat from main system(s) raction of space heat from main system 2 raction of total space heat from main system 1 raction of total space heat from main system 2	cro-CHP	0.00 0.00	∑(98	3}15, 10 (98) 1 - (20	12 = 29 ÷ (4) 2 01) = (0) (3)] = (0)	30.61 8.75 0.00 1.00 0.00	(201) (202) (202) (202) (204) (205)
space heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mispace heating ipace heating irraction of space heat from secondary/supplementary system (table irraction of space heat from main system(s) irraction of space heat from main system 2 irraction of total space heat from main system 1 irraction of total space heat from main system 1 irraction of total space heat from main system 2 irraction of total space heat from main system 2 irraction of total space heat from main system 2 irraction of total space heat from Main system 1 irraction of total space heat from Main system 2 irraction of total space heat from Main system 1 irraction of total space heat from Main system 1 irraction of total space heat from Main system 2 irraction of total space heat from Main system 2 irraction of total space heat from Main system 2 irraction of total space heat from Main system 2 irraction of total space heat from Main system 2 irraction of total space heat from Main system 2 irraction of total space heat from Main system 3 irraction of total space heat from Main syste	cro-CHP		Σ(38	1 - (20 (202) x (202) x (202)	12 = 29 ÷ (4) 2 D1) = 3 3)] = 3 9	30.61 8.75 0.00 1.00 0.00 1.00 0.00	(201) (202) (202) (202) (204) (205)
space heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mily pace heating requirements - individual heating systems including mily pace heating reaction of space heat from main system(s) raction of space heat from main system 2 raction of total space heat from main system 1 raction of total space heat from main system 2 friciency of main system 1 (%) Jan Feb Mar Apr May	cro-CHP		Σ(38	1 - (20 (202) x (202) x (202)	12 = 29 ÷ (4) 2 D1) = 3 3)] = 3 9	30.61 8.75 0.00 1.00 0.00 1.00 0.00	(201) (202) (202) (202) (204) (205)
pace heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mi pace heating raction of space heat from secondary/supplementary system (table raction of space heat from main system(s) raction of space heat from main system 2 raction of total space heat from main system 1 raction of total space heat from main system 2 fficiency of main system 1 (%) Jan Feb Mar Apr May pace heating fuel (main system 1), kWh/month	cro-CHP	Jul Aug	Σ(98 (20 Sep	(98) 1 - (20) 2) x [1- (20) (202) x (20)	12 = 29 ÷ (4) 2 (4) 2 (5) (4) 2 (6) (7) (7) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	30.61 8.75 0.00 1.00 0.00 1.00 0.00 3.50 Dec	(201) (202) (202) (202) (204) (205)
pace heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mipace heating pace heating raction of space heat from secondary/supplementary system (table raction of space heat from main system 2 raction of space heat from main system 2 raction of total space heat from main system 1 raction of total space heat from main system 2 fficiency of main system 1 (%) Jan Feb Mar Apr May pace heating fuel (main system 1), kWh/month 706.20 505.77 360.56 142.90 34.18	cro-CHP	Jul Aug	Σ(98 (20 Sep	(98) 1 - (20) 2) x [1- (20) (202) x (20) Oct	12 = 29 ÷ (4) 2 (4) 2 (5) (4) 2 (6) (7) (7) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	30.61 30.61 30.60 30.00 10.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00	(201) (202) (202) (202) (204) (205) (206)
pace heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including mispace heating raction of space heat from secondary/supplementary system (table raction of space heat from main system 2 raction of total space heat from main system 2 raction of total space heat from main system 1 raction of total space heat from main system 2 fficiency of main system 1 (%) Jan Feb Mar Apr May pace heating fuel (main system 1), kWh/month 706.20 505.77 360.56 142.90 34.18	cro-CHP	Jul Aug	Σ(98 (20 Sep	(98) 1 - (20) 2) x [1- (20) (202) x (20) Oct	12 = 29 ÷ (4) 2 (4) 2 (5) (4) 2 (6) (7) (7) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	30.61 30.61 30.60 30.00 10.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00 30.00	(201) (202) (202) (202) (204) (205) (206)
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93. Energy requirements - individual heating systems including milipace heating prace heating prace heating praction of space heat from secondary/supplementary system (table fraction of space heat from main system(s) praction of space heat from main system 2 praction of total space heat from main system 1 praction of total space heat from main system 1 praction of total space heat from main system 2 praction of total space heat from main system 2 praction of total space heat from main system 2 practice of main system 1 (%) Jan Feb Mar Apr May prace heating fuel (main system 1), kWh/month 706.20 505.77 360.56 142.90 34.18 Water heating Practice of water heater 87.63 87.18 86.23 84.08 81.30	Jun 8 0.00	Jul Aug	Σ(98) (20) Sep 0.00 Σ(211)	1 - (20 (22) × [1 - (20 (202) × (20 Oct 183.93 1)15, 10	12 = 29 ÷ (4) 2 (4) 2 (5) 2 (6) 2 (7) 3} = (7) 3 (8) 9 Nov	30.61 8.75 0.00 1.00 0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 3.50 Dec	(201) (202) (202) (202) (204) (205) (206)
93. Energy requirements - individual heating systems including milipace heating prace heating prace heating praction of space heat from secondary/supplementary system (table fraction of space heat from main system(s) praction of space heat from main system 2 praction of total space heat from main system 1 praction of total space heat from main system 1 praction of total space heat from main system 2 praction of total space heat from main system 2 praction of total space heat from main system 2 practice of main system 1 (%) Jan Feb Mar Apr May prace heating fuel (main system 1), kWh/month 706.20 505.77 360.56 142.90 34.18 Water heating Practice of water heater 87.63 87.18 86.23 84.08 81.30	Jun 8 0.00 79.80	Jul Aug	Σ(98) (20) Sep 0.00 Σ(21) 79.80	1 - (20 (20) x (20 Oct 183.93)15, 10	12 = 29 ÷ (4) 2 101} = (1) (0) (1) (1) (1) (2) (3) (3) (4) (4) (5) (7) (7) (8) (9) (9) (1) (1) (1) (1) (2) (3) (4) (4) (4) (4) (5) (6) (6) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7	30.61 8.75 0.00 1.00 0.00 1.00 0.00 3.50 Dec 730.23 34.34	(201) (202) (202) (202) (204) (205) (206) (211)
Space heating requirements - individual heating systems including miles of Space heating fraction of space heat from secondary/supplementary system (table fraction of space heat from main system(s) fraction of space heat from main system 2 fraction of total space heat from main system 2 fraction of total space heat from main system 1 fraction of total space heat from main system 2 friction of total space heat from main system 2 from for total space heat from main system 2 from main system 1 (%) Jan Feb Mar Apr May Space heating fuel (main system 1), kWh/month 706.20 S05.77 360.56 142.90 34.18 Water heating ###################################	Jun 8 0.00 79.80	Jul Aug 0.00 0.00 79.80 79.80	Σ(98) (20) Sep 0.00 Σ(21) 79.80	1 - (20) (98) 1 - (20) (202) x (21-(200) (202) x (200) (203) x (200) (204) (205) x (200) (206) x (200) (207) x (200) (208) x (2	12 = 29 ÷ (4) 2 101} = (1) (0) (1) (1) (1) (2) (3) (3) (4) (4) (5) (7) (7) (8) (9) (9) (1) (1) (1) (1) (2) (3) (4) (4) (4) (4) (5) (6) (6) (6) (6) (7) (7) (7) (7) (7) (7) (7) (7	30.61 8.75 0.00 1.00 0.00 1.00 0.00 3.50 Dec 730.23 34.34	(201) (202) (202) (202) (204) (205) (206)
Space heating requirement kWh/m³/year 9a. Energy requirements - Individual heating systems including miles of Space heating space heat from secondary/supplementary system (table Fraction of space heat from main system(s) Fraction of space heat from main system 2 Fraction of total space heat from main system 1 Fraction of total space heat from main system 1 Fraction of total space heat from main system 2 Efficiency of main system 1 (%) Jan Feb Mar Apr May Space heating fuel (main system 1), kWh/month 706.20 505.77 360.56 142.90 34.18 Water heating Efficiency of water heater 87.63 87.18 86.23 84.08 81.30 Water heating fuel, kWh/month 243.08 215.37 228.65 210.20 213.0	Jun 8 0.00 79.80	Jul Aug 0.00 0.00 79.80 79.80	Σ(98) (20) Sep 0.00 Σ(21) 79.80	1 - (20 (20) x (20 Oct 183.93)15, 10	12 = 29 ÷ (4) 2 101) = (0) (3) (3) (3) (3) (4) (4) (5) (6) (7) (8) (9) (10)	30.61 8.75 0.00 1.00 0.00 1.00 0.00 3.50 Dec 730.23 34.34 87.75 236.90 75.09	(201) (202) (202) (202) (204) (205) (206) (211)
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Space heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including milespace heating Fraction of space heat from secondary/supplementary system (table fraction of space heat from main system(s) Fraction of space heat from main system 2 Fraction of total space heat from main system 1 Fraction of total space heat from main system 1 Fraction of total space heat from main system 2 Efficiency of main system 1 (%) Jan Feb Mar Apr May Space heating fuel (main system 1), kWh/month 706.20 \$05.77 \$360.56 \$142.90 \$34.18 Water heating Fficiency of water heater 87.63 87.18 86.23 84.08 81.30 Water heating fuel, kWh/month 243.08 \$215.37 \$228.65 \$210.20 \$213.0	Jun 8 0.00 79.80	Jul Aug 0.00 0.00 79.80 79.80	Σ(98) (20) Sep 0.00 Σ(21) 79.80	1 - (20 (20) x (20 Oct 183.93)15, 10	12 = 29 ÷ (4) 2 101) = (0) (3) (3) (3) (3) (4) (4) (5) (6) (7) (8) (9) (10)	30.61 8.75 0.00 1.00 0.00 1.00 0.00 3.50 Dec 730.23 34.34 87.75 236.90 75.09	(201) (202) (202) (202) (204) (205) (206) (211)
Space heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including milespace heating Fraction of space heat from secondary/supplementary system (table fraction of space heat from main system(s) Fraction of space heat from main system 2 Fraction of total space heat from main system 1 Fraction of total space heat from main system 1 Fraction of total space heat from main system 2 Efficiency of main system 1 (%) Jan Feb Mar Apr May Space heating fuel (main system 1), kWh/month 706.20 \$05.77 \$360.56 \$142.90 \$34.18 Water heating Fficiency of water heater 87.63 87.18 86.23 84.08 81.30 Water heating fuel, kWh/month 243.08 \$215.37 \$228.65 \$210.20 \$213.0	Jun 8 0.00 79.80	Jul Aug 0.00 0.00 79.80 79.80	Σ(98) (20) Sep 0.00 Σ(21) 79.80	1 - (20 (22) x (1- (20 (202) x (20 Oct 183.93 1)15, 10 84.64 216.51 Σ(219a)1	12 = 29 ÷ (4) 2 in (4) 3 in (4) 3 in (4) 4	30.61 8.75 0.00 1.00 0.00 1.00 0.00 3.50 0.00 33.50 0.00 34.34 87.75 236.90 75.09	(201) (202) (202) (204) (205) (206) (211) (217) (219)
Space heating requirement kWh/m²/year 9a. Energy requirements - individual heating systems including milespace heating Fraction of space heat from secondary/supplementary system (table fraction of space heat from main system(s) Fraction of space heat from main system 2 Fraction of total space heat from main system 1 Fraction of total space heat from main system 1 Fraction of total space heat from main system 2 Efficiency of main system 1 (%) Jan Feb Mar Apr May Space heating fuel (main system 1), kWh/month 706.20 \$05.77 \$360.56 \$142.90 \$34.18 Water heating Fficiency of water heater 87.63 87.18 86.23 84.08 81.30 Water heating fuel, kWh/month 243.08 \$215.37 \$228.65 \$210.20 \$213.0	Jun 8 0.00 79.80	Jul Aug 0.00 0.00 79.80 79.80	Σ(98) (20) Sep 0.00 Σ(21) 79.80	1 - (20 (22) x (1- (20 (202) x (20 Oct 183.93 1)15, 10 84.64 216.51 Σ(219a)1	12 = 29 ÷ (4) 2 (4) 2 (5) 2 (6) 2 (7) 3} = (7) 3 (8) 4 (9) 12 = 31 (10) 2 (10) 3 (10) 4 (10) 4 (10	30.61 8.75 0.00 1.00 0.00 1.00 0.00 3.50 0.00 33.50 0.00 34.34 87.75 236.90 75.09	(201) (202) (202) (204) (205) (206) (211) (217) (219)

Water heating fuel Electricity for pumps, fans and electric keep-hot (Table	4f)			2575.09
central heating pump or water pump within warm a			30.00	(230c)
boiler flue fan	. Heating and		45.00	(230e)
Total electricity for the above, kWh/year				75.00 (231)
Electricity for lighting (Appendix L)				408.45 (232)
Total delivered energy for all uses		(2	11)(221) + (231) + (232)(23	7b) = 6192.89 (238)
10a. Fuel costs - individual heating systems including	micro-CHP			
	Fuel kWh/year		Fuel price	Fuel cost £/year
Space heating - main system 1	3134.34	×	3.48 x 0.01	
Water heating	2575.09	x	3.48 x 0.01	= 89.61 (247)
Pumps and fans	75.00	×	13.19 x 0.01	
Electricity for lighting	408.45	x	13.19 x 0.01	= 53.87 (250)
Additional standing charges				120.00 (251)
Total energy cost			(240)(242) + (245)(2	54) = 382.46 (255)
11a. SAP rating - individual heating systems including	micro-CHP			
Energy cost deflator (Table 12)				0.42 (256)
Energy cost factor (ECF)				1.09 (257)
SAP value				84.75
SAP rating (section 13)				85 (258)
SAP band				В
12a. CO ₂ emissions - individual heating systems include	ding micro-CHP			
	Energy		Emission factor	Emissions
	kWh/year		kg CO _z /kWh	kg CO₂/year
Space heating - main system 1	3134.34	х	0.216 =	677.02 (261)
Water heating	2575.09	×	0.216 =	556.22 (264)
Space and water heating			(261) + (262) + (263) + (2	
Pumps and fans	75.00	×	0.519 =	38.93 (267)
Electricity for lighting	408.45	х	0.519 =	211.98 (268)
Total CO ₂ , kg/year			(265)(2	
Dwelling CO ₂ emission rate			(272) ÷	
El value				86.47
				86 (274) B
El band	uding micro-CHR			
	Energy		Primary factor	B Primary Energy
El band	Energy kWh/year			B Primary Energy kWh/year
El band 13a. Primary energy - individual heating systems inclusions in the systems included by the systems included by the system includ	Energy kWh/year 3134.34	x	1.22	Primary Energy kWh/year 3823.90 (261)
El band 13a. Primary energy - individual heating systems incl Space heating - main system 1 Water heating	Energy kWh/year	x x	1.22 =	Primary Energy kWh/year 3823.90 (261) 3141.61 (264)
El band 13a. Primary energy - individual heating systems incl Space heating - main system 1 Water heating	Energy kWh/year 3134,34 2575.09	x x	1.22 = 1.22 = (261) + (262) + (263) + (2	B Primary Energy kWh/year 3823.90 (261) 3141.61 (264) 6965.51 (265)
El band 13a. Primary energy - individual heating systems included in the system syste	Energy kWh/year 3134.34 2575.09	x x	1.22 = 1.22 = (261) + (262) + (263) + (2 3.07 =	Primary Energy kWh/year 3823.90 (261) 3141.61 (264) 6965.51 (265) 230.25 (267)
Space heating - main system 1 Water heating Space and water heating Pumps and fans Electricity for lighting	Energy kWh/year 3134,34 2575.09	x x x	1.22 = 1.22 = (261) + (262) + (263) + (2	Primary Energy kWh/year 3823.90 (261) 3141.61 (264) 64) = 6965.51 (265) 230.25 (267) 1253.94 (268)
El band 13a. Primary energy - individual heating systems included in the system of th	Energy kWh/year 3134.34 2575.09	x	1.22 = 1.22 = (261) + (262) + (263) + (2 3.07 =	Primary Energy kWh/year 3823.90 (261) 3141.61 (264) 6965.51 (265) 230.25 (267) 1253.94 (268) 8449.70 (272)
El band 13a. Primary energy - individual heating systems included in the system of th	Energy kWh/year 3134.34 2575.09	x	1.22 = 1.22 = (261) + (262) + (263) + (2 3.07 =	Primary Energy kWh/year 3823.90 (261) 3141.61 (264) 64) = 6965.51 (265) 230.25 (267) 1253.94 (268)
El band 13a. Primary energy - individual heating systems included in the system of th	Energy kWh/year 3134.34 2575.09	x	1.22 = 1.22 = (261) + (262) + (263) + (2 3.07 =	Primary Energy kWh/year 3823.90 (261) 3141.61 (264) 6965.51 (265) 230.25 (267) 1253.94 (268) 8449.70 (272) 82.89 (273)
El band 13a. Primary energy - individual heating systems included in the system of th	Energy kWh/year 3134.34 2575.09	x	1.22 = 1.22 = (261) + (262) + (263) + (2 3.07 = 3.07 =	Primary Energy kWh/year 3823.90 (261) 3141.61 (264) 6965.51 (265) 230.25 (267) 1253.94 (268) 8449.70 (272)

AVANTON RICHMOND DEVELOPMENT LTD

Appendix I: BRUKL summary

Be lean BRUKL

BRUKL Output Document M HM Government Compliance with England Building Regulations Part L 2013 Project name

Manor Road - Retail A1 (Lean)

As designed

Date: Fri Jan 25 17:34:01 2019

Administrative information

Building Details

Address: Richmond, London, TW9

Telephone number: Address: , ,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.10

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.10 BRUKL compliance check version: v5.4.b.0

Telephone number Address: , ,

Certifier details

Owner Details

Name: Avanton Richmond Development Ltd.

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	43.8
Target CO ₂ emission rate (TER), kgCO ₃ /m ² .annum	43.8
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	33.6
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 fixed building services should achieve reasonable overall standards of energy efficiency

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

Building fabric

Element	Ua-Limit	Ua-Calc	Ui-Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	00000001:Surf[2]
Floor	0.25	0.13	0.13	00000001:Surf[0]
Roof	0.25	0.16	0.16	00000001:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	00000001:Surf[3]
Personnel doors	2.2	1.4	1.4	00000001:Surf[4]
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-Link} = Limiting area-weighted average U-values [W U_{a-Calc} = Calculated area-weighted average U-values			Ukasa = C	alculated maximum individual element U-values [W/(m²K)]
* There might be more than one surface where the m ** Automatic U-value check by the tool does not appl *** Display windows and similar glazing are excluded.	ly to curtai	n walls wi	ose limitir	ng 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

Page 1 of 6

Technical Data Sheet (Actual vs. Notional Building)

	Actual	Notional
Area [m²]	434.5	434.5
External area [m²]	965.6	965.6
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	311.82	399.49
Average U-value [W/m²K]	0.32	0.41
Alpha value* [%]	10	10

Building Global Parameters

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

C2 Residential Institutions: Hospitals and Care Homes C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building D1 Non-residential Institutions: Grown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres Others: Passenger terminals

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	11.55	13.15
Cooling	5.88	8.82
Auxiliary	16.97	17.66
Lighting	37.77	53.7
Hot water	1.86	1.86
Equipment*	20.26	20.26
TOTAL**	74.04	95.19

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions ** Total is not 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	0	0
Solar thermal systems	0	0

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	127.99	161.17
Primary energy* [kWh/m²]	197.83	258.32
Total emissions [kg/m ²]	33.6	43.8

^{*} Printery energy is net of any electrical energy displaced by CHP generators, if applicable.

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DEVELOPMENT LTD

ENERGY STRATEGY - REV. 03

Be green BRUKL

BRUKL Output Document

₩ HM Government

Compliance with England Building Regulations Part L 2013

Project name

Manor Road - Retail A1 (Green)

As designed

Date: Fri Jan 25 17:39:38 2019

Administrative information

Building Details

Owner Details

Address: Richmond, London, TW9

Name: Avanton Richmond Development Ltd.

Telephone number: Certification tool

Address: , ,

Calculation engine: Apache

Certifier details

Calculation engine version: 7.0.10

Interface to calculation engine: IES Virtual Environment Interface to calculation engine version: 7.0.10

Telephone number Address: , ,

BRUKL compliance check version: v5.4.b.0

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m².annum	36
Target CO _z emission rate (TER), kgCO _z /m².annum	36
Building CO ₂ emission rate (BER), kgCO ₂ /m²,annum	27.3
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 fixed building services should achieve reasonable overall standards of energy efficiency

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

Air Permeability

m3/(h.m2) at 50 Pa

Building labric						
Element	U _{a-Limit}	U _{a-Calc}	Ul-Calc	Surface where the maximum value occurs*		
Wall**	0.35	0.15	0.15	00000001:Surf[2]		
Floor	0.25	0.13	0.13	00000001:Surf[0]		
Roof	0.25	0.16	0.16	00000001:Surf[1]		
Windows***, roof windows, and rooflights	2.2	1.4	1.4	00000001:Surf[3]		
Personnel doors	2.2	1.4	1.4	00000001:Surf[4]		
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		
Uscale = Limiting area-weighted average U-values [V Uscale = Calculated area-weighted average U-values			U-cate = C	alculated maximum individual element U-values [W/(m²K)]		
* There might be more than one surface where the n ** Automatic U-value check by the tool does not app ** Display windows and similar glazing are excluded N.B.: Neither roof ventilators (inc. smoke vents) nor a	y to curtai from the	n walls wh U-value c	ose limitir heck.	g standard is similar to that for windows. elled or checked against the limiting standards by the tool.		

Worst acceptable standard This building

Technical Data Sheet (Actual vs. Notional Building)

Actual Notional 434.5 434.5 External area [m²] 965.6 965.6 Weather LON LON Infiltration [m³/hm²@ 50Pa] 3 Average conductance [W/K] 311.82 399.49 Average U-value [W/m²K] 0.32 Alpha value* [%] 10 10

Building Global Parameters

Building Use

6 Area	Building Type
00	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takea
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Gre
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Home
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Cent

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: 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	1.98	4.43
Cooling	5.32	8.82
Auxiliary	7.13	3.06
Lighting	37.77	53.7
Hot water	1.7	1.86
Equipment*	20.26	20.26
TOTAL**	53.9	71.88

^{*} Energy used by equipment does not count towards the total for consumption or calculating emissions ** Total is not 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	0	0
Solar thermal systems	0	0

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	127.99	161.17
Primary energy* [kWh/m²]	167.27	224.88
Total emissions [kg/m²]	27.3	36

^{*} Primary energy is not of any electrical energy displaced by CHP generators, if applicable.

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Appendix J: Boiler and ASHP operational cost analysis

	Communal gas boiler			ASHP + local storage with immersion			ASHP + local storage with immersion		
	Communal gas boiler			Communal ASHP			Communal ASHP		
	Equivalent heat price	p/kWh	4.0	Equivalent heat price (inc. RHI)	p/kWh	2.5	Equivalent heat price (excl. RHI)	p/kWh	5.6
						Yes			No
System Inputs	Tenant heat demand	kWh/yr	1	Tenant heat demand	kWh/yr	1	Tenant heat demand	kWh/yr	1
	Proportion of demand is space heat	-	0.50	Proportion of demand is space heat	-	0.33	Proportion of demand is space heat	-	0.33
	Proportion of demand is DHW	-	0.50	Proportion of demand is DHW	-	0.67	Proportion of demand is DHW	-	0.67
	Communal distribution heat losses	-	0.30	Communal distribution heat losses	-	0.19	Communal distribution heat losses	-	0.19
	Communal storage heat losses	-	0.00	Communal storage heat losses	-	0.00	Communal storage heat losses	-	0.00
	Gas boiler efficiency	-	0.95	Gas boiler efficiency	-	-	Gas boiler efficiency	-	-
	Pumping energy % of heat generated	-	0.01	Pumping energy % of heat generated	-	0.01	Pumping energy % of heat generated	-	0.01
	Cold water flow temp	С	10	Cold water flow temp	С	10	Cold water flow temp	С	10
	Hot water storage temp	С	-	Hot water storage temp	С	60	Hot water storage temp	С	60
	Communal distribution flow temp	С	70	Communal distribution flow temp	С	55	Communal distribution flow temp	С	55
	Communal distribution return temp	С	40	Communal distribution return temp	С	30	Communal distribution return temp	С	30
				Electric heating efficiency	-	1.00	Electric heating efficiency	-	1.00
				ASHP heating efficiency	-	2.90	ASHP heating efficiency	-	2.90
Calculation	Heat generated	kWh/yr	1.429	Percentage of communal hot water	-	0.90	Percentage of communal hot water	-	0.90
				Percentage of local storage hot water	-	0.10	Percentage of local storage hot water	-	0.10
				Communal heat generated	kWh/yr	1.156	Communal heat generated	kWh/yr	1.156
				Tenant heat generated	kWh/yr	0.067	Tenant heat generated	kWh/yr	0.067
Output (heat system)	Landlord gas consumption	kWh/yr	1.504	Landlord gas consumption	kWh/yr	0.000	Landlord gas consumption	kWh/yr	0.000
	Landlord electricity consumption	kWh/yr	0.014	Landlord electricity consumption	kWh/yr	0.410	Landlord electricity consumption	kWh/yr	0.410
	Tenant electricity consumption	kWh/yr	0.000	Tenant electricity consumption	kWh/yr	0.067	Tenant electricity consumption	kWh/yr	0.067
	Total net energy consumption	kWh/yr	1.518	Total net energy consumption	kWh/yr	0.477	Total net energy consumption	kWh/yr	0.477
	Landlord gas consumption	р	3.865	Landlord gas consumption	р	0.000	Landlord gas consumption	р	0.000
	Landlord electricity consumption	р	0.158	Landlord electricity consumption	р	4.530	Landlord electricity consumption	р	4.530
	Landlord RHI	р	0.000	Landlord RHI	р	-3.110	Landlord RHI	р	0.000
	Tenant gas consumption	p	0.000	Tenant gas consumption	р	0.000	Tenant gas consumption	р	0.000
	Tenant electricity consumption	p	0.000	Tenant electricity consumption	p	1.099	Tenant electricity consumption	р	1.099
	Total energy consumption	n	4.022	Total energy consumption	n	2.518	Total energy consumption	p	5.629

Table 23: Boiler & ASHP operational cost analysis inputs and results





LOUISE WILLE

PRINCIPAL SUSTAINABILITY CONSULTANT

+44 20 3668 7290 louisewille@hoarelea.com

HOARELEA.COM

Western Transit Shed 12-13 Stable Street London N1C 4AB England

